ACTIVISION

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IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF CALIFORNIA

THE MAGNAVOX COMPANY, A CORPORATION, AND SANDERS ASSOCIATES, INC., A CORPORATION,

PLAINTIFS,

VS.

ACTIVISION, INC., A CORPORATION,

DEFENDANTS.

NO. C 82 5270 CAL

AND RELATED CROSS-ACTION.

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REPORTER'S TRANSCRIPT OF PROCEEDINGS

MONDAY, AUGUST 12, 1985

9:00 A.M.

BEFORE: HON. CHARLES A. LEGGE

MC CUTCHEN, DOYLE, BROWN & ENERSEN, THREE EMBARCADERO CENTER, SAN FRANCISCO, CALIFORNIA 94111; AND NEUMAN, WILLIAMS, ANDERSON & OLSON, 77 WEST WASHINGTON STREET, SUITE 2000, CHICAGO, ILLINOIS 60602, BY THEODORE W. ANDERSON, ESQUIRE, AND JAMES T. WILLIAMS, ESQUIRE, APPEARED AS COUNSEL FOR PLAINTIFS;

HOWARD, RICE, NEMEROVSKI, CANADY, ROBERTSON & FALK, THREE EMBARCADERO CENTER, 7TH FLOOR, SAN FRANCISCO, CALIFORNIA 94111, BY MARTIN R. GLICK, ESQUIRE, H. JOSEPH ESCHER III, ESQUIRE, AND MARLA J. MILLER, ESQUIRE; AND

SCOTT HOVER-SMOOT, ESQUIRE, FOUR EMBARCADERO CENTER, SUITE 3400, SAN FRANCISCO, CALIFORNIA 94111, APPEARED AS COUNSEL FOR DEFENDANT AND COUNTERCLAIMANT ACTIVISION, INC.

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THE COURT: A FEW MATTERS OF MECHANICS BEFORE WE GET STARTED THIS MORNING.

YOU HAVE REQUESTED A CONTINUATION OF A DAILY TRANSCRIPT AND THAT'S GOING TO BE PREPARED, BUT IN A LITTLE DIFFERENT MANNER THAN WE DID DURING THE FIRST SESSION OF THE TRIAL, AND THAT IS, INSTEAD OF TWO COURT REPORTERS, THIS ONE YOUNG LADY HERE IS GOING TO BE TAKING IT ALL DOWN. SO SHE HAS TO INTERRUPT YOU ABOUT EVERY HOUR IN ORDER TO GET THE COMPUTER TAPE INTO THE HANDS OF THE MESSENGER.

SO YOU SHOULD TAKE YOUR SIGNALS FROM HER AS TO WHEN TO TAKE A BREAK SO SHE CAN FINISH THE TRANSCRIPT AND GET IT OUT FOR PREPARATION, AND THEN TO BEGIN WITH ANOTHER SECTION OF THE TAPE.

WITH RESPECT TO THE SCHEDULING, I WOULD LIKE TO TRY, IF IT'S POSSIBLE, TO GET THE TRIAL COMPLETED IN 4 DAYS IF IT'S POSSIBLE. I'M NOT GOING TO CUT YOU OFF ON COURT TESTIMONY, BUT IF YOU CAN WORK TOWARD THAT, I WOULD APPRECIATE IT. OUR DAYS WILL BE, INSTEAD OF HALF DAYS AS BEFORE, WILL BE MORE FULL DAYS.

WE'LL BEGIN, I BELIEVE, AT 9:00 O'CLOCK EVERY MORNING AND WE WILL JUST TAKE A LUNCH BREAK AND TERMINATE WHEN WE REACH A LOGICAL BREAKING POINT WITH RESPECT TO THE EVIDENCE IN THE EVENING, SOMEWHERE AROUND 4:00, 4:30, 5:00, WHATEVER SUITS THE CONVENIENCE OF YOU PEOPLE.

I WANT TO SAY THAT I HAVE GONE BACK AND REREAD SOME OF THE DOCUMENTS AND REREAD MY NOTES, SO I THINK I'M UP TO SPEED ON WHERE WE WERE WHEN WE ADJOURNED, AND I DON'T THINK YOU HAVE TO SPEND YOUR TIME GETTING THE WHEELS GOING AGAIN THIS MORNING.

WITH RESPECT TO THE MOTION THAT HAS BEEN MADE BY MAGNAVOX, A MOTION IN LIMINE TO EXCLUDE OR REDUCE TESTIMONY, I DON'T THINK THERE IS ANY REASON FOR MY ACTUALLY RULING ON THAT MOTION. I APPRECIATE THE OBJECTIVES OF IT AND AM SYMPATHETIC WITH THE OBJECTIONS. I DON'T THINK I NEED DUPLICATIVE TESTIMONY FROM THE EXPERTS.

AS LONG AS YOU HAVE AN EXPERT WHO COVERS THE SUBJECT MATTERS THAT YOU'RE INTERESTED IN COVERING AND THEY DO COVER THEM, I'M GOING TO ASSUME ON BOTH SIDES OF THE TABLE, PLAINTIFFS AND DEFENDANT, THAT YOU COULD PRODUCE OTHER EXPERTS TO TESTIFY TO THE SAME THING, SO DON'T BE PUTTING IN CUMULATIVE EXPERTS FOR THE SAKE OF PUTTING MORE IN NUMBER.

IF YOU HAVE DIFFERENT WRINKLES ON THE OPINIONS, THAT'S UP TO YOU AND I WON'T CUT YOU OFF.

WITH THOSE GUIDELINES, I'M NOT GOING TO RULE ON THE MOTION, BUT FOR THE RECORD I'M DENYING IT WITHOUT PREJUDICE. ALL RIGHT.

MR. GLICK, ARE YOU READY TO PROCEED?

MR. ESCHER: YOUR HONOR, I WOULD LIKE TO RECALL MR. CHARLES THACKER.

MR. ANDERSON: I WONDER IF WE COULD JUST TRY TO OUTLINE WHAT WE'VE GOT LEFT TO DO. PERHAPS BE AS SPECIFIC AS POSSIBLE ABOUT WHAT THE DEFENDANT HAS IN THE WAY OF WITNESSES

AND I'LL DO THE SAME.

THE COURT: LET'S GET STARTED WITH THE TESTIMONY AND GIVE US A DAY OR HALF DAY OF LOOKING AT IT AND WE CAN DISCUSS THAT AT NOON TODAY OR MAYBE AT THE END OF THE DAY.

MR. ANDERSON: THANK YOU, YOUR HONOR.

THE COURT: MR. THACKER, YOU'LL REMEMBER THAT YOU'RE UNDER OATH FROM YOUR TESTIMONY LAST MONTH.

THE WITNESS: T-H-A-C-K-E-R, CHARLES H.

CHARLES H. THACKER,

CALLED AS A WITNESS BY THE DEFENDANT HEREIN, HAVING BEEN PREVOUSLY DULY SWORN, TESTIFIED FURTHER AS FOLLOWS.

DIRECT EXAMINATION (RESUMED)

MR. ESCHER: GOOD MORNING. TO RECAPITULATE BRIEFLY, MR. THACKER'S FIRST DAY OF TESTIMONY BACK IN JUNE CONCERNED HIS EXPERT QUALIFICATION, A GENERAL DESCRIPTION OF HOW THE ATARI 2600 SYSTEM WORKED AND HIS EXPERT OPINION THAT IF ATARI 2600 WAS A STORE PROGRAM DIGITAL COMPUTER.

THE PHOTOMICROGRAPHS DISPLAYED TO THE WITNESS'S SIDE ARE THE INPUT AND OUTPUT CHIP, AND IT WAS MARKED AS EXHIBIT HR FOLLOWED BY THE TIA CHIP OR TELEVISION INTERFACE ADAPTER CHIP MARKED AS HP, THE MIKE PROCESSOR MARKED AS HQ, AND BELOW IT THE READ-ONLY MEMORY CHIP FOR THE ACTIVISION DECATHELON GAME MARKED AS EXHIBIT GW. AND THESE WERE THE MAJOR FUNCTIONAL COMPONENTS OF THE ATARI 2600 AS EXPLAINED BY MR. THACKER IN JUNE.

Q. MR. THACKER, HAVE YOU HAD A CHANCE TO EXAMINE ANY OF THE EARLIER ODYSSEY GAMES, THE NON-MICROPROCESSOR GAMES --

THE COURT: BEAR THE MIND, THE COURT REPORTER HAS

NOT HEARD ANY OF THE NAMES OR TERMINOLOGY, SO DO IT SLOWLY OR SPELL THEM OUT.

MR. ESCHER: I'LL MAKE MY BEST EFFORT.

Q. -- WHICH WERE EXHIBITED BY PLAINTIFFS DURING MR. BAER'S TESTIMONY?

A. I HAVE NOT REVIEWED THE PHYSICAL GAMES THEMSELVES, BUT I'VE LOOKED OVER THE LOGIC DIAGRAMS OF THE GAMES, IN PARTICULAR THE ODYSSEY ITL 200 GAME, YES.

Q. SO YOU HAVE EXAMINED THE SCHEMATIC OF THE ODYSSEY ITL 200 EXHIBITED BY PLAINTIFFS AS THE FIRST COMMERCIAL ODYSSEY GAME?

A. YES, I HAVE.

Q. MR. THACKER, HAVE YOU EXAMINED THE BAER 1 AND BHR 3 PATENTS AS WELL AS THE RUSCH 2 PATENT IN THIS CASE?

A. YES, I'VE EXAMINED ALL 3 OF THE PATENTS.

Q. OF THE CIRCUITRY DISCLOSED IN THE GAMES PATENTS, THE BAER 1, THE RUSCH 2, AND THE BHR 3, WHICH ONE MOST CLOSELY RESEMBLES THE ODYSSEY ITL 200 GAME?

A. THE CIRCUITRY IN THE ITL 200 IS VERY SIMILAR AND MOST CLOSELY RESEMBLES THE CIRCUITRY IN THE BHR 3 PACK.

Q. COULD YOU EXPLAIN WHY, IN YOUR OPINION, THE ODYSSEY ITL 200 GAME IS MORE CLOSELY RELATED TO THE BHR 3 PATENT THAN THE BAER 1 PATENT OR THE RUSCH 2 PATENT?

A. YES. IN THE AREAS WHERE THE SPECIFICATIONS AND DRAWINGS OF THE PATENT ARE VERY EXPLICIT, THAT IS, THE DESCRIPTIONS ARE CARRIED TO THE LEVEL OF TRANSISTORS AND CAPACITORS, MANY OF THE CIRCUITS IN THE BHR 3 PATENT ARE ESSENTIALLY IDENTICAL TO THOSE IN THE ITL 200.

Q. MR. THACKER, WHAT ARE THE MAJOR DISTINGUISHING FEATURES

OF THE BAER 1 PATENT AS CONTRASTED WITH THE BHR 3 PATENT?

A. WELL, THE BAER 1 PATENT WAS THE FIRST OF THIS SERIES 3 UNDER DISCUSSION. IT CONTAINED A DESCRIPTION OF 2 PLAYER GAMES, A DESCRIPTION OF SPOT GENERATORS CONTROLLING SPOTS ON THE SCREEN.

THE MAJOR ADDITION THAT THE BHR 3 PATENT MADE TO THIS EARLIER PATENT WAS THE ADDITION OF GAME CONTROLLED OR AUTOMATIC MOTION, THAT IS, THE GAME COULD, IN FACT, GENERATE THE VOLTAGES THAT DROVE THE SPOT GENERATORS. THAT'S REALLY THE PRIMARY DIFFERENCE.

Q. WHAT ARE THE SECONDARY DIFFERENCES?

A. SOME OF THE INDIVIDUAL CIRCUITS ARE QUITE A BIT DIFFERENT BETWEEN THE BAER 1 AND THE BHR 3. IN PARTICULAR, THE BHR 3 CIRCUIT DESIGN APPEARS TO BE MORE THOROUGHLY WORKED OUT.

Q. WHAT ARE THE SALIENT DIFFERENCES, IN YOUR VIEW, BETWEEN THE BHR 3 PATENT AND THE RUSCH 2 PATENT, THE PATENT ALLEGED TO BE INFRINGED IN THIS CASE?

A. WELL, AGAIN, THERE'S ONE SIGNIFICANT DIFFERENCE THAT STANDS OUT TECHNICALLY AND THAT IS THAT IN THE RUSCH 2 PATENT, THE METHOD FOR GENERATING THE SPOT VIDEO SIGNALS IS QUITE DIFFERENT THAN IN THE OTHER TWO. IN THE BAER 1 DEVICE AND IN THE BHR 3 DEVICE, THE PREFERRED EMBODIMENT FOR GENERATING SPOTS IS USING MULTI STABLE, MULTI VIBRATORS.

Q. WHAT ABOUT THIS THE RUSCH 2 PATENT?

A. IN THE RUSCH 2 PATENT, THE PREFERRED EMBODIMENT USES A SAWTOOTH WAVE SHAPE WITH WHAT ARE ESSENTIALLY VOLTAGE CAPACITORS DETECTING A PARTICULAR POINT, VOLTAGE POINT ON THE SAWTOOTH. THIS IS A CONSIDERABLY DIFFERENT TECHNIQUE, SO

THAT'S THE PRINCIPAL DIFFERENCES BETWEEN THE DEVICES.

Q. MR. THACKER, HAVE YOU READ THE TRANSCRIPT OF MR. BAER'S TESTIMONY IN THIS TRIAL?

A. I HAVE.

Q. DO YOU RECALL MR. BAER'S TESTIMONY THAT IN MR. BAER'S VIEW, THE CIRCUITRY CONTAINED IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT HAD A STABILITY PROBLEM?

A. YES, I DID.

Q. DO YOU AGREE WITH MR. BAER'S ASSESSMENT?

A. I BELIEVE THAT I DO. IF I UNDERSTOOD WHAT HE MEANT BY STABILITY. IN MANUFACTURING ELECTRONIC CIRCUITS IN VOLUME, IT'S IMPORTANT FOR THE DEVICE TO BE VERY REPEATABLE BOTH FROM UNIT TO UNIT AND OVER TIME.

IN DESIGNING A PRECISE ANALOG CIRCUIT SUCH AS THE SPOT GENERATION CIRCUITS IN THE RUSCH 2 PATENT, THIS WOULD BE SOMEWHAT DIFFICULT BECAUSE TEMPERATURE CHANGES, AGING CHANGES IN THE COMPONENTS AND VOLTAGE CHANGES, THESE WERE POWERED BY BATTERIES, WOULD MAKE IT DIFFICULT TO CONTROL OVER A LONG PERIOD OF TIME THE PRECISE SHAPE AND PERHAPS THE POSITION OF THE SPOTS.

SO I BELIEVE THAT WAS WHAT MR. BAER WAS REFERRING TO AND, YES, I DO AGREE WITH HIM.

Q. MR. THACKER, COULD YOU RETURN TO THE OVERHEAD PROJECTOR?

A. CERTAINLY.

MR. ESCHER: YOUR HONOR, AT THE END OF MR. THACKER'S TESTIMONY IN JUNE HE WAS EXPLAINING THE OPERATION OF THE ATARI 2600 WHICH, WHEN USED THE ACCUSED COMBINATION IN THIS CASE, I BELIEVE THE LAST CHART MR. THACKER WAS USING WAS THE BLOCK

DIAGRAM OF THE ATARI 2600 WHICH HAS BEEN MARKED AS EXHIBIT JE WHICH IS ON THE SCREEN NOW.

Q. I WOULD LIKE YOU TO TAKE A SOMEWHAT CLOSER LOOK AT THE FUNCTIONING OF THE VARIOUS COMPONENTS OF THE COMPUTER SYSTEM AS WE SEE THEM ON THE SCREEN.

COULD YOU PROJECT NOW THE CHART OF THE MICROPROCESSOR COMPONENT MARKED AS EXHIBIT JD AND POINT OUT --

A. THE MICROPROCESSOR IS THE 6507, IT'S THE UNIT ON THE RIGHT OF THE EXHIBITS, THE VERY HIGH DENSITY CIRCUIT.

THE COURT: PARDON ME ONE SECOND.

(OFF THE RECORD.)

THE COURT: WOULD YOU REPEAT WHAT YOU SAID.

THE WITNESS: CERTAINLY. I WAS JUST POINTING OUT THAT IN THIS CHART, YOUR HONOR, THE MICROPROCESSOR IS THE 6507 HERE, AND THAT'S THE -- CORRESPONDS TO THE PHOTOMICROGRAPH ON THE RIGHT. AND THIS CHART WHICH IS EXHIBIT JD IS AN INTERNAL BLOCK DIAGRAM OF THE 6507 MICROPROCESSOR.

MR. ESCHER: Q. MR. THACKER, DID YOU PREPARE THAT CHART MARKED AS EXHIBIT JD?

A. YES, I DID.

Q. ON THE BASIS OF WHAT INFORMATION?

A. THIS CHART WAS PREPARED ON THE BASIS OF INFORMATION DERIVED FROM THE MANUFACTURER'S DATA SHEET FOR THE DEVICE.

Q. MR. THACKER, COULD YOU PLEASE EXPLAIN HOW THE CENTRAL PROCESSING UNIT FOR THE ATARI 2600 WORKS ONCE THE PROGRAM, THE READ-ONLY MEMORY, IS INSERTED INTO THE MACHINE?

A. CERTAINLY. AS SOON AS THE GAME IS BEGUN, THAT IS, THE POWER IS SWITCHED ON AND THE GAME RESET BUTTON IS DEPRESSED,

THE CENTRAL PROCESSOR IN THE 2600 BEGINS EXECUTING THE PROGRAM CONTAINED IN THE READ-ONLY MEMORY CARTRIDGE, AND I THINK I MENTIONED BACK IN JUNE, THE CENTRAL PROCESSOR OF THE COMPUTER HAS 2 MAIN COMPONENTS.

THERE IS A CONTROL COMPONENT, THE PURPOSE OF WHICH IS TO ADDRESS INSTRUCTIONS FROM THE MEMORY AND BRING THEM INTO THE CENTRAL PROCESSOR FOR EXECUTION. THAT HAPPENS OVER AND OVER AGAIN.

AND THEN THE INSTRUCTIONS TELL THE CIRCUITRY IN THE CENTRAL PROCESSOR EXACTLY WHAT TO DO IN THE WAY OF MANIPULATING DATA.

SO, IN THE 6507, THE CONTROL PART INCLUDES THE PROGRAM COUNTER WHICH CONTAINS THE ADDRESSES OF THE CURRENT -- THAT'S -- THE CURRENT BEING EXECUTED INSTRUCTION. AND THE INSTRUCTION BUFFER OR INSTRUCTION REGISTER WHICH CONTAINS THE INSTRUCTION WHEN IT RETURNS FROM THE READ-ONLY MEMORY AND INSTRUCTION DECODER, THE PURPOSE OF WHICH IS TO CREATE ALL OF THESE CONTROL SIGNALS WHICH INDICATE PRECISELY WHAT IS TO BE DONE IN THE COURSE OF EXECUTING THE INSTRUCTION.

Q. EXCUSE ME. LET ME INTERRUPT YOU FOR ONE MOMENT.

IS THERE ANY PHYSICAL RELATIONSHIP BETWEEN THE BLOCK DIAGRAM ON THE CHART MARKED JD AND THE ORGANIZATION OF THE CIRCUITRY ON THE 6507 MICROPROCESSOR AS WE SEE IT IN THE PHOTOMICROGRAPH MARKED AS EXHIBIT HQ?

A. NO, THERE IS NO DIRECT RELATION HERE. THIS CHART SHOWS LOGICAL FLOW OF INFORMATION AND LOGICAL FUNCTIONS. THE LAYOUT OF THE INTEGRATED CIRCUIT IS DONE PRIMARILY TO SAVE SPACE SO IT WILL NOT LOOK THE SAME AT ALL, ALTHOUGH THE VARIOUS

COMPONENTS FOR THE MAJOR BLOCK MAY BE IN CLOSE PROXIMITY ON THE CHIP.

Q. COULD YOU CONTINUE WITH YOUR EXPLANATION?

A. CERTAINLY. AS I WAS SAYING, THE PURPOSE OF THE CONTROL UNIT IS TO ISSUE AN INSTRUCTION ADDRESS AT THE BEGINNING OF THE EXECUTION OF AN INSTRUCTION. IT DOES THAT FROM THE PROGRAM COUNTER WHICH CONTAINS A BINARY NUMBER WHICH INDICATES THE WORD THAT IS TO BE TAKEN FROM THE READ-ONLY MEMORY.

THAT NUMBER IS PASSED OUT OF THE PROGRAM COUNTER THROUGH THIS INTERNAL ADDRESS BUS AND OUT THE MAIN ADDRESS BUS WHICH RUNS ACROSS THE SURFACE OF THE PRINTED CIRCUIT CARD.

IN THE CASE OF THE 6507, IT'S A 13-BIT BINARY NUMBER, WHICH MEANS THAT THE 6507 CAN ADDRESS 2 TO THE 13TH POWER OR 8,192 LOCATIONS. 4,000 OF THOSE ARE CONTAINED IN THE EXTERNAL READ-ONLY CARTRIDGE.

WHEN AN ADDRESS IS OMITTED ON THE ADDRESS BUS, THE READ-ONLY MEMORY CARTRIDGE RETURNS ON THE DATA BUS AND ENTERS THE INSTRUCTION REGISTER, THE DETAIL OF WHICH IS NOT SHOWN ON THIS DRAWING.

THE INSTRUCTION DECODER THEN INSPECTS THE VALUE OF THE NUMBER THAT WAS LOADED INTO IT. THIS IS AN 8-BIT NUMBER AND CORRESPONDS TO ONE OF THE ROUGHLY 200 INSTRUCTIONS THAT THE 6507 CAN EXECUTE. THE VARIOUS CONTROL SIGNALS THAT ARE NECESSARY TO PERHAPS MOVE THE DATA ABOUT INSIDE THE PROCESSOR OR TRANSFER DATA TO OR FROM THE ARITHMETIC UNIT ARE EMITTED ON THE LINES SHOWN DOTTED ON EXHIBIT JD.

Q. MR. THACKER, IS IT FAIR TO SAY THAT THE CENTRAL PROCESSING UNIT IS PROCESSING INSTRUCTIONS WHICH IT IS

RECEIVING FROM THE READ-ONLY MEMORY?

A. THAT'S PRECISELY CORRECT.

Q. APPROXIMATELY HOW MANY INSTRUCTIONS CAN BE PROCESSED BY THE CENTRAL PROCESSING UNIT IN, FOR EXAMPLE, A SECOND?

A. THAT NUMBER DEPENDS ON THE COMPLEXITY OF THE INSTRUCTION. SOME INSTRUCTIONS ARE VERY SIMPLE. THEY SAY, FOR INSTANCE, TO ADD 1 TO THE CONTENTS OF THE ACCUMULATOR REGISTER, THE AC REGISTER HERE IN THE CHART, AND PLACE THE RESULT BACK INTO THE AC REGISTER. AN INSTRUCTION LIKE THAT WOULD EXECUTE VERY RAPIDLY.

MORE COMPLEX INSTRUCTIONS THAT REQUIRE INTERACTION WITH THINGS OUTSIDE THE CHIP MIGHT TAKE LONGER. DEPENDING ON THE COMPLEXITY, THE RATE IS BETWEEN 100 AND 500,000 INSTRUCTIONS PER SECONDS, ROUGHLY.

SO THE PROCESSOR CAN DO THINGS QUITE RAPIDLY, ALTHOUGH THE INDIVIDUAL INSTRUCTIONS ARE QUITE SIMPLE, AS WE'LL SEE.

Q. CAN YOU CONTINUE WITH HOW THE CENTRAL PROCESSING UNIT WORKS?

A. CERTAINLY. THE CONTROL UNIT WHICH WE'VE GONE THROUGH IS CONTROLLING THE ARITHMETIC SECTION AND LOGICAL SECTION OF THE CPU. AND THAT SECTION IN THIS KIND OF A COMPUTER WITH A 6507 OR 6507 FAMILY PROCESSOR CONSISTS OF 3 REGISTERS, ACTUALLY 4 REGISTERS, A Y REGISTER, AN X REGISTER, AN SP OR STACK POINTER REGISTER, AN AC OR ACCUMULATOR REGISTER, AND AN ARITHMETIC UNIT.

NOW, THE LINES IN THIS CHART SHOW THE FLOW OF DATA, AND IF YOU'LL NOTE, THE NORMAL FLOW IS ACCUMULATOR, AN

INTERNAL DATA BUS THROUGH THE UNIT AND BACK INTO THE ACCUMULATOR OR POSSIBLY OUT OF THE CHIP.

IT'S ALSO POSSIBLE FOR DATA TO GO INTO THE CHIP ON THE DATA BUS THROUGH THIS BUFFER CIRCUIT, THE PURPOSE OF WHICH IS TO SIMPLY AMPLIFY THE SIGNALS AND INTO THE REGISTERS.

THE REGISTERS CONTENTS CAN ALSO BE PLACED ONTO THE INTERNAL BUS FOR TRANSFER OFF OF THE CHIP ON THE ADDRESS BUS OR ON THE DATA BUS. THESE BUFFERS ARE BIDIRECTIONAL AS SHOWN BY THE ARROWS.

Q. WHEN YOU REFER TO DATA BEING PROCESSED IN THE CENTRAL UNIT, IN WHAT FORM IS THE DATA?

A. TYPICALLY OF 8 OR 16 BIT BINARY NUMBERS. ADDRESSES IN THE 6500 FAMILY WHICH INCLUDE THE 6502 AND 7 AND SEVERAL MORE ARE 16 BIT, DATA ARE ALWAYS CONTAINED AS 8 BIT QUANTITIES, SO THERE ARE ONLY 256 POSSIBLE DATA VALUES.

Q. MR. THACKER, ARE YOU ESSENTIALLY FINISHED WITH YOUR EXPLANATION?

A. YES, AT THIS LEVEL I THINK THAT PROBABLY ABOUT COVERS IT.

Q. MR. THACKER, COULD YOU EXPLAIN, NOW, THE NEXT CHART MARKED AS EXHIBIT JF? WHAT IS EXHIBIT JF?

A. IT'S A BLOCK DIAGRAM AGAIN SUPPRESSING QUITE A BIT OF MEMORY -- A READ-ONLY MEMORY OF THE SIZE USED IN THE 2600 VIDEO COMPUTER SYSTEM. IT WOULD CORRESPOND, FOR INSTANCE, TO THE SCHEMATIC OF THE READ-ONLY CHIP SHOWN IN THE -- BELOW THE PROCESSOR CHIP.

Q. COULD YOU EXPLAIN THE READ-ONLY MEMORY WITH REFERENCE TO EXHIBIT JF?

A. YES. I BELIEVE THAT IN EARLIER TESTIMONY I DISCUSSED

THAT A MEMORY REALLY IS A FAIRLY SIMPLE DEVICE. IT HAS, IN THE CASE OF A READ-ONLY MEMORY, A STRAIGHTFORWARD FUNCTION. YOU'VE GIVEN AN ADDRESS AND IT RETURNS SOME DATA.

THIS ADDRESS COMES TYPICALLY FROM THE ADDRESS BUS OF THE 2600 FROM -- IN FACT, IT WAS ORIGINATED FROM THE CENTRAL PROCESSOR, THIS TURNS THIS 13-BIT NUMBER INTO A VOLTAGE LEVEL ON ONE OF THESE 4,096 WIRES.

SO IF I SUPPLY AN ADDRESS AT ZERO, FOR INSTANCE, ON THE ADDRESS BUS, THEN THE WIRE HERE CORRESPONDING TO ADDRESS LINE ZERO WILL HAVE A VOLTAGE ON IT AND NONE OF THE OTHERS WILL.

NOW, I HAVE 4,095 WIRES HERE, THEY WOULDN'T FIT. THE ADDRESS LINE THEN PROCEEDS PAST A NUMBER OF POTENTIAL PLACES AT WHICH THERE MIGHT BE TRANSISTORS. IF THERE IS A TRANSISTOR AT ONE OF THE CROSS POINTS AS INDICATED HERE BY THIS SMALL CIRCLE, THEN THE SIGNAL IS COUPLED FROM THE ADDRESS LINE ONTO ONE OF THE DATA LINES, AND THERE ARE 8 SUCH DATA LINES RUNNING THROUGH THE CHIP.

SO WHEN, IN FACT, AN ADDRESS LINE IS ACTIVATED, AN 8 BIT BINARY QUANTITY WILL BE PLACED ON THESE 8 DATA LINES.

NOW, THE PURPOSE OF THE SENSE AMPLIFIER IS TO AMPLIFY -- THESE ARE SMALL SIGNALS AND THEY NEED TO BE BOOSTED IN DRIVE CAPABILITY IN ORDER TO OPERATE THE BALANCE OF THE 2600. SO THESE ARE SIMPLY AMPLIFIERS.

SO THIS DEVICE CAN PRODUCE ANY ONE OF 4,096, 8 BIT BINARY NUMBERS BASED ON THIS ADDRESS, AND IT PRODUCES THEM ON THESE LINES, AND IT DOES SO IN PERHAPS A MATTER OF A FEW TENTHS OF A MILLIONTH OF A SECOND.

NOW, THE AREA WHERE THE TRANSISTORS ARE IS THIS VERY REGULAR AREA IN THE PHOTOMICROGRAPH. SO A ROM IS TYPICALLY A VERY REGULAR STRUCTURE. THE DIFFERENCE BETWEEN ONE ROM AND ANOTHER, FOR INSTANCE, FOR INSTANCE, THE CARTRIDGE USED IN FISHING DERBY AND THE CARTRIDGE USED IN HOCKEY IS ONLY WHETHER OR NOT THESE TRANSISTORS ARE PRESENT OR ABSENT ON THE INTERSECTION POINTS.

AND, IN FACT, IF YOU OBSERVE, YOUR HONOR, THE READ-ONLY MEMORY FOR ONE OF THE OTHER GAMES, YOU WILL NOT BE ABLE TO TELL THE DIFFERENCE BY LOOKING AT IT DIRECTLY BECAUSE THEY'RE BURIED UNDER THE CONDUCTORS THAT MAKE UP THE CHIP.

Q. WHAT EXACTLY IS THE RELATIONSHIP BETWEEN THE READ-ONLY MEMORY AND THE PROGRAM LISTING ITSELF?

A. THE PROGRAM LISTING IS THE BEGINNING POINT FOR THE BINARY NUMBERS THAT ARE CONTAINED IN THE READ-ONLY MEMORY. IN THE COURSE OF DEVELOPING THE PROGRAM, THE PROGRAMMER DEALS WITH INSTRUCTIONS IN A MNEMONIC, M-N-E-M-O-N-I-C, FORMAT RATHER THAN INDIVIDUAL NUMBERS. SO THAT HE, THE PROGRAMMER, CAN REDUCE THE COMPLEXITY OF THINGS THAT HE HAS TO REMEMBER.

IN THE COURSE OF FABRICATING ONE OF THESE DEVICES, THE PROGRAM THAT THE PROGRAMMER PRODUCES IS CONVERTED INTO THE NUMBERS BY ANOTHER PROGRAMMER CALLED -- ANOTHER PROGRAM CALLED AN ASSEMBLER PROGRAM. THAT PRODUCES A TABLE OF NUMBERS THAT ARE THEN SENT TO THE MANUFACTURER OF THE ROM AND USED TO MAKE THE INDIVIDUAL MASK LEVEL IN THE FABRICATION PROCESS THAT DETERMINES WHETHER THE TRANSISTORS WILL BE THERE OR NOT.

SO THE PATTERN STARTS OUT WITH THE PROGRAMMER THINKING ABOUT THE PROGRAM, WRITING IT DOWN, PASSING THROUGH

THE ASSEMBLY PROCESS TO PRODUCE THE NUMBERS AND FINALLY MANUFACTURED AS A TRANSISTOR OR NOT AS EACH BIT IN THE PROGRAM.

Q. MR. THACKER, WOULD YOU EXPLAIN --

MR. ESCHER: MR. HOVER-SMOOTH, IF YOU COULD EXPLAIN THE GAME FISHING DERBY, AND MR. THACKER WILL PLACE THE PROGRAM ON THE BOARD RELATING TO THE GENERATION OF THE FISHERMAN'S HAT IN THE GAME.

THIS CHART OF A PORTION OF THE FISHING DERBY HAS BEEN MARKED AS EXHIBIT JI.

THE CHART MARKED AS EXHIBIT JI REFERS TO THE GENERATION OF THE IMAGE FOR THE FISHERMAN'S HAT THERE ON THE LEFT.

Q. MR. THACKER, WITH REFERENCE TO EXHIBIT JI, COULD YOU PLEASE SHOW US HOW THE PROGRAM AS EMBODIED IN THE READ-ONLY MEMORY CARTRIDGE ACTUALLY WORKS WITH THE ATARI 2600 TO GENERATE AN IMAGE ON THE TELEPHONE SCENE?

A. YES. WE PREPARED THIS CHART, YOUR HONOR, TO GIVE YOU AN APPRECIATION AS TO WHAT EXACTLY GOES ON IN A PROGRAM, AND IN PARTICULAR, IT'S THE PROGRAM THAT GENERATES THIS GAME.

AS I MENTIONED BACK IN JUNE, THIS IS A REAL TIME PROGRAM AND IT HAS -- ITS PRINCIPAL FUNCTION IS TO GENERATE THE VIDEO SIGNALS IN SYNCHRONY WITH THE BEAM SWEEPING FROM THE TOP TO BOTTOM AND BACK AND FORTH VERY RAPIDLY.

THE PORTION OF THE PROGRAM THAT WE'RE GOING TO LOOK AT TODAY IS THE PART OF THE LISTING THAT EXISTS FROM ROUGHLY LINE 287 TO LINE 302, AND THEN ANOTHER SMALL PART OF THE PROGRAM WHICH IS QUITE A BIT LATER IN THE LISTING. IT'S AT LINE 1271.

THESE PARTS OF THE PROGRAM ARE RESPONSIBLE FOR GENERATING THIS SECTION OF THE IMAGE AND NO MORE (INDICATING). THE ENTIRE PROGRAM FOR FISHING DERBY OCCUPIES APPROXIMATELY 1400 LINES OF PROGRAM CODE AND IS -- IT'S THIS LISTING (INDICATING). IT FILLS THE READ-ONLY MEMORY THAT IS USED TO CONTAIN IT. IF IT DIDN'T, THEN PRESUMABLY THE GAME DESIGNER WOULD ADD MORE FEATURES UNTIL IT DID.

SO I WANTED TO GO THROUGH THIS EXAMPLE AT A FAIRLY LOW LEVEL OF DETAIL TO GIVE YOU THE FEELING OF WHAT GOES ON IN THE COURSE OF ONE OF THESE PROGRAMS.

BEFORE THESE INSTRUCTIONS ARE EXECUTED, NOW A TYPICAL INSTRUCTION IS HERE, 1 PER LINE, SO WE'RE ONLY GOING TO LOOK IN DETAIL AT 1, 2, 3, 4, 5 -- 7 INSTRUCTIONS. AND WE WILL SEE FROM THAT HOW THE HAT OF THE FISHERMAN IS GENERATED.

NOW, BEFORE THIS PART OF THE PROGRAM HAS BEEN -- BEGINS TO BE EXECUTED, THE GAME HAS ALREADY BUILT THE SCORE AND PART OF THE SKY, AND IT HAS READ FROM THE SWITCHES AND THE JOYSTICKS ANYTHING THAT'S SUPPOSED TO HAPPEN DURING THIS FRAME OF PLAY.

NOW, THIS PART GENERATES A FIXED DISPLAY, NOTHING THAT THE JOYSTICK CAN'T CHANGE THE WAY THE FISHERMAN'S HAT LOOKS ON THE SCENE, BUT IT'S INSTRUCTED BECAUSE IT SHOWS HOW -- THE PROGRAM USING THE TIA CHIP TO GENERATE THE PICTURE.

SO THE FIRST INSTRUCTION IS THIS INSTRUCTION THAT SAYS LBY, POUND SIGN, 7. IF WE GO BACK TO THE BLOCK DIAGRAM OF THE 6507 WE WILL SEE -- IF YOU RECALL, THERE IS A Y REGISTER IN THE 6507.

THE PURPOSE OF THIS INSTRUCTION IS TO PLACE INTO

THAT Y REGISTER THE CONSTANT Y VALUE 7. AFTER EXECUTING THAT INSTRUCTION, THE LABEL OF WHICH -- NOW, THIS IS A MNEMONIC ADDRESS LABEL.

EVENTUALLY, THIS INSTRUCTION WILL BE PLACED AT SOME PARTICULAR POINT IN THE ROM, SAY, FOR INSTANCE, LOCATION 100, AND AT THAT POINT THE ASSEMBLER PROGRAM WILL ASSIGN A 100 TO THE VALUE OF PEOPLE, SO ANYPLACE IN THE PROGRAM THAT THAT WORD IS REFERENCED IT WILL GET THE VALUE OF 100.

LIKEWISE, PEOPLE ONE HERE IS ONE INSTRUCTION BEYOND THAT ONE SO IT WILL GET THE LOCATION 101, FOR EXAMPLE.

NOW, IF YOU RECALL FROM THE PROCESSOR DISCUSSION, THIS INSTRUCTION IS EXECUTED AND THEN THE NEXT SEQUENTIAL INSTRUCTION IS EXECUTED. NOW, THIS WOULD NORMALLY BE A STORAGE LATER INSTRUCTION. IT WOULD NORMALLY CAUSE THE CURRENT CONTENTS OF THE ACCUMULATOR TO BE TRANSFERRED TO A LOCATION WHOSE NAME IS WSYNC. W-S-Y-N-C. AND THAT LOCATION AGAIN WOULD BE GIVEN SOME NOT VERY IMPORTANT VALUE BY THE ASSEMBLER.

IN THIS CASE, HOWEVER, WSYNC IS A SPECIFIC LOCATION. IT'S A SPECIFIC CONSTANT. IT REFERS TO ONE OF THE REGISTERS INSIDE THE TIA CHIP, AND WHEN THE PROGRAM EXECUTES THIS INSTRUCTION, IT'S NOT FOR THE EFFECT OF STORING THE CONTENTS OF THE ACCUMULATOR INTO THE REGISTER IN THE TIA. THE PURPOSE OF THAT IS -- OF THIS INSTRUCTION IS TO CAUSE THE TIA TO TURN OFF THE CLOCK TO THE CENTRAL PROCESSOR.

THIS WILL CAUSE IT TO STOP EXECUTING INSTRUCTIONS AT ALL UNTIL THE CURRENT SCAN LINE ENDS. AND THIS IS THE METHOD THAT'S USED BY ALL VIDEO GAME PROGRAMS, AT LEAST FOR THE 2600,

TO KEEP IN SYNCHRONY WITH THE MOTION OF THE BEAM.

ALL THAT THE PROGRAM HAS TO BE IS SLIGHTLY FASTER, BE ABLE TO KEEP AHEAD AND EMIT THE INSTRUCTIONS EVERY SCAN LINE, SO IT WILL BE ESSENTIALLY STOPPED UNTIL THE TELEVISION CATCHES UP WITH IT, AND THEN IT'S ALLOWED TO START UP AGAIN.

THE NEXT INSTRUCTION, WHICH WILL BEGIN EXECUTION AS SOON AS THE END OF THE CURRENT SCAN LINE IS REACHED AND THE BEAM FLIES BACK ACROSS THE SCREEN, IS THIS LDT, THALF, Y INSTRUCTION. THIS INSTRUCTION EXTRACTS DATA FROM THE MEMORY AND LOAD ACCUMULATOR.

LDA REFERS TO LOAD ACCUMULATOR. AND THE INTERESTING THING ABOUT THIS INSTRUCTION IS THAT IT INDICATES ONE OF THE VARIABLES THAT THE PROCESSOR LIKE THIS CAN HAVE. THE ADDRESS THAT'S REFERENCED BY THIS LOAD A INSTRUCTION, THAT IS THE ADDRESS IN THE READ-ONLY MEMORY, IS DETERMINED BY 2 THINGS. ONE IS THE CONSTANT VALUE THALF.

NOW, THALF IS, IN FACT, A LOCATION LATER ON IN THE PROGRAM LISTING, IT'S AT LINE 1271. BUT INSTEAD OF JUST REFERENCING THE CONTENTS OF LOCATION 1271 AND LOADED THAT INTO THE ACCUMULATOR, INSTEAD FIRST THE CONTENTS OF THE Y REGISTER IS ADDED TO THIS VALUE WHICH MIGHT BE, FOR INSTANCE, SAY, 3,000 AND THAT LOCATION IS REFERENCED.

NOW, AS WE'LL SEE IN A MOMENT, THAT'S VERY IMPORTANT.

NOW, THIS LINE HERE (INDICATING), IS A STATEMENT THAT TELLS THE ASSEMBLER PROGRAM THAT IS SUBSEQUENTLY GOING TO BE RUN, THAT LOCATION THALF IS TO CONTAIN SOME NUMBER OF BYTES AND HERE ARE THEIR VALUES. THE DOLLAR SIGNS MEAN TO TREAT THE NUMBERS AS HEXADECIMAL CONSTANTS, THAT IS, NUMBERS BETWEEN

ZERO AND 15.

AS YOU CAN SEE, SOME OF THEM HAVE LETTERS AND -- 1 THROUGH 9 AND A THROUGH F. SO THALF STARTS A MEMORY WHICH CONTAINS 8 1-BYTE VALUES. THE FIRST IS 48, 60, 60, 70, 60, F8, AO, AND 80.

NOW, IT'S IMPORTANT FOR THE BIT PATTERN IN HEXADECIMALS, AND I'VE SHOWN THAT BIT PATTERN OUT OF ORDER HERE -- THAT IS BACKWARDS. THIS IS THE -- THIS 80 IS CONTAINED IN LOCATION THALF PLUS 7. THE A0 IS CONTAINED IN THALF PLUS 6, AND I'VE PUT DOTS ON THE PICTURE WHERE THE ONES ARE IN THE BINARY REPRESENTATION OF THE HEXADECIMAL NUMBERS.

AND IF I FILL THEM IN, I THINK YOU WILL BE ABLE TO SEE WHAT'S GOING ON.

WHEN THIS INSTRUCTION IS EXECUTED, IT LOADS THIS PARTICULAR VALUE INTO THE ACCUMULATOR OF THE CENTRAL PROCESSOR, THE AC REGISTER. THE NEXT 2 INSTRUCTIONS ARE STORAGE LATER INSTRUCTIONS. THEY TAKE THE CONTENTS OF THE ACCUMULATOR AND STORE THEM IN THE LOCATION GIVEN HERE.

NOW, LIKE THE LOCATION CALLED WSYNC, GRP 0 AND GRP 1 ARE SPECIAL LOCATIONS. THEY'RE LOCATIONS IN THE TIA CHIP. SO WHEN THE PROGRAM IS EXECUTED, WHEN THE CPU SEES GRP 0'S, IT EMITS IT AS A NORMAL ADDRESS, BUT THE TIA INTERPRETS THAT AS A REGISTER.

WHAT THIS DOES IS LOAD THE BIT PATTERN INTO THE PLAYER ZERO AND THE PLAYER 1 GRAPHICS REGISTER OF THE TIA. AND THE FACT THAT THAT PARTICULAR DATA WAS IN THE ACCUMULATOR REGISTER OF THE CENTRAL PROCESSOR IS NOT REALLY VERY IMPORTANT. IT COMES AND IT GOES. IT'S MAINLY USED JUST AS SORT OF A

SWITCHING STATION OR WAY POINT FOR THE DATA.

THE REAL THING THAT IS GOING ON HERE IS THAT THIS VALUE IS BEING TRANSFERRED FROM A PLACE IN THE READ-ONLY MEMORY TO A REGISTER IN THE TIA.

NOW, THERE ARE OTHER INSTRUCTIONS WHICH I'VE LEFT OUT, 4 AND 5, WHICH HAVE TO DO WITH THE SETTING OF THE COLOR OF THE PEOPLE, AND FOR PURPOSES OF THIS DISCUSSION THEY'RE NOT VERY INTERESTING. IF YOU'LL NOTICE, PERHAPS THE 2 PEOPLE'S HATS ARE DIFFERENT COLORED. THESE INSTRUCTIONS MAKE THAT HAPPEN, BUT THEY'RE NOT IMPORTANT FOR THIS PURPOSE.

LINE 301, WE HAVE A NEW KIND OF INSTRUCTION AND, IN FACT, A NEW THING THAT WE HAVEN'T SAID ANYTHING ABOUT TO DATE. THIS IS A DECREMENT Y INSTRUCTION AND THEN A BPL INSTRUCTION. WHAT THE DECREMENT, D-E-C-R-E-M-E-N-T DOES IS SUBTRACT 1 FROM Y MAKING IT 7 INTO THE 6, MAKE THE 7 INTO THE 6, AND THEN THIS INSTRUCTION TESTS THAT VALUE AND IT SAYS IF IT'S POSITIVE, THE BRANCH THAT CAUSES THE FLOW OF CONTROL TO GO BACK TO THE PROGRAM, GO BACK TO 1, OTHERWISE, GO ON THROUGH TO ANOTHER PART OF THE SCREEN.

SO WHAT HAPPENS IS WHEN THIS INSTRUCTION IS EXECUTED, THE FIRST TIME CONTROL WILL FLOW BACK TO PEOPLE 1, STOPS THE CPU AND THEN DOES THE SEQUENCE OF INSTRUCTIONS AGAIN, EXCEPT THIS TIME RATHER THAN HAVING THE VALUE OF 7, IT WILL HAVE THE VALUE OF 6. AND THAT MEANS WHEN THE LOAD IS EXECUTED, THE LDA THALF RATHER THAN ACCESSING THALF PLUS 7, WE WILL INSTEAD ACCESS THALF PLUS 6 WHICH IS A HEXADECIMAL AO. AND HERE IS ITS BIT PATTERN. AND THE REST OF THE CODE IN THIS AREA IS IDENTICAL.

SO, NOW -- SO THE SAME THINGS WILL HAPPEN AS HAPPENED IN THE EARLIER EXAMPLE.

I'LL SPEED UP NOW AND NOT GO THROUGH IT IN MORE DETAIL. HERE THE DECREMENT SEES THE VALUE OF 6 AND CHANGES IT TO 5, BUT IT'S POSITIVE SO IT GOES BACK. AND WE GO AROUND THIS LOOP WHICH EXISTS FROM HERE TO HERE (INDICATING) 8 TIMES FOR THE VALUE 7, 6,, 5, 4, 3, 2, 1, AND ZERO, AND THEN IT GOES TO ZERO AND FALLS THROUGH AND EXECUTES THE REST OF THE SCREEN.

IN THE COURSE OF DOING THAT, WE WILL TRANSFER THESE BIT PATTERNS FROM THE READ-ONLY MEMORY TO THE TIA, AND AS YOU CAN SEE, YOUR HONOR, THIS IS VERY CLOSE TO, IN FACT, IT'S BETTER THAN EXACT -- WELL, MR. HOVER-SMOOTH --

MR. HOVER-SMOOT: WE SEEM TO HAVE A TECHNICAL DIFFICULTY.

THE WITNESS: WELL, IF YOU REMEMBER, THE LITTLE MAN SITTING ON THE PIER HAD A FUNNY LOOKING HAT AND THIS WAS IT. THE REST OF HIS BODY, THE FISHING POLE AND LINE AND THE FISH COME LATER IN THE PROGRAM.

SO THIS IS WHAT AT THE LOWEST LEVEL OF DETAIL WHAT ONE OF THESE GAME PROGRAMS LOOK LIKE. THEY EXECUTE THESE INSTRUCTIONS VERY RAPIDLY. THIS LOOP TAKES ABOUT TEN-MILLIONTHS OF A SECOND TO GO AROUND ONCE AND THE VARIABLE THAT'S PROVIDED BY CONSTRAINTS OF THE BPL.

TESTING THE DATA ALLOWS THE PROGRAM TO DO A NUMBER OF DIFFERENT THINGS, DEPENDING ON EXACTLY WHAT IS HAPPENING.

SO HERE THE DISPLAY IS ESSENTIALLY STATIC, BUT IN THE REST OF THE PROGRAM IT WILL BE POSSIBLY DYNAMIC. THE LEFT-HAND FISHERMAN AND RIGHT-HAND FISHERMAN DON'T HAVE THE

SAME HAT, BUT ARE MERE IMAGES OF EACH OTHER. THIS IS A FEATURE OF THE TIA.

NORMALLY, WHEN IT PROCESSES A STREAM OF INFORMATION FROM THESE PATTERNS IT SENDS OUT AS VIDEO FIRST THIS BIT THEN THIS ONE, GOING FROM LEFT TO RIGHT, AND THAT'S WHAT WE SEE ON THE LEFT, MORE FISHERMAN.

THE PLAYER 1 GRAPHICS REGISTER HAS BEEN INSTRUCTED EARLIER IN THE PROGRAM TO EMIT THE BITS IN THE OPPOSITE ORDER AND THAT RESULTS IN A MERE IMAGING OF THE PICTURE. ONE IMAGE IS USED TO DISPLAY 2 THINGS, IN FACT, THE WHOLE GAME IS MERELY SYMMETRICAL.

MR. ESCHER: Q. YOU'VE SHOWN US HOW ONE OF THE STATIC IMAGES ON THE FISHING DERBY GAME IS EXPLAINED IN THE CONTENT OF THE PROGRAM. HOW WOULD A PROGRAM FOR A MOVING SPOT BE DIFFERENT?

A. WELL, TYPICALLY, THE WAY IT WOULD CHANGE IS COMMANDS WOULD BE ISSUED TO THE TIA TO ACTUALLY MOVE THE PLACE ON THE SCENE AT WHICH THE PLAYER ZERO GRAPHICS REGISTER BEGAN TO EMIT THESE BIT PATTERNS.

THERE ARE SEPARATE CONTROL REGISTERS IN THE TIA THAT ALLOW THAT TO HAPPEN AND, OF COURSE, THE TIA HAS NUMEROUS THINGS THAT IT CAN DISPLAY, 2 PLAYERS, 2 MISSILES, A BALL, A PLAY FIELD, QUITE A FEW DIFFERENT KINDS OF GRAPHIC OBJECTS CAN BE SHOWN USING THE TIA.

Q. WHAT ABOUT THE PROGRAM ITSELF FOR A MOVING SPOT, HOW WOULD THAT LOOK COMPARED TO THE EXHIBIT THAT YOU HAVE ON THE SCREEN?

A. WELL, IT WOULD BE MORE COMPLEX. THIS WAS A RHETORICAL

EXAMPLE. IT WOULD HAVE PROBABLY MORE BRANCHING AND IT WOULD HAVE SOME OF THESE COMMANDS WITHIN IT TO SET THE POSITION OF THE PLAYER ZERO AND PLAYER 1 GRAPHICS REGISTER RATHER THAN JUST SETTING ITS CONTENTS.

BUT IT WOULD LOOK APPROXIMATELY THE SAME, THAT IS, IT WOULD BE A SEQUENCE OF INSTRUCTIONS ONE AFTER THE OTHER, DIFFERENT INSTRUCTIONS BASED ON EXACTLY WHAT IS SUPPOSED TO HAPPEN. THIS LOAD 8, ET CETERA, ARE AMONG THE ROUGHLY 200 KINDS OF INSTRUCTIONS THAT THE 6507 KNOWS HOW TO EXECUTE. WE'VE NOT SEEN THEM ALL.

Q. YOU'VE SHOWN US THE METHOD FOR GENERATING THE FISHERMAN'S HAT IN THE GAME ON THE ATARI 2600. IS THIS THE SAME METHOD USED FOR GENERATING THE SPOT USED IN THE SPECIFICATIONS FOR THE RUSCH 2 PACKAGE?

A. NO, IT'S MUCH MORE COMPLEX.

Q. DOES THE ATARI 2600 PRINTED CIRCUIT BOARD INCLUDE A 555 TIMER?

A. YES, IT DOES.

Q. I WAS WONDERING IF YOU COULD POINT THAT OUT ON THE PRINTED CIRCUIT BOARD, PLEASE?

A. CERTAINLY. IT'S THIS SMALL COMPONENT RIGHT HERE, YOUR HONOR, THIS 8 PIN INTEGRATED CIRCUIT. IT'S ADJACENT TO THE LEFT-HAND CONTROL PLAYER PLUG.

Q. WHAT'S A 555 TIMER?

A. A 555 TIMER IS A CIRCUIT THAT'S OFTEN USED TO GENERATE TIME DELAYS IN A WIDE VARIETY OF ELECTRONIC EQUIPMENT.

Q. AND WHAT IS ITS FUNCTION IN THE ATARI 2600?

A. WELL, IN THE 2600, WHAT IT DOES IS GENERATE THE RESET

PULSE THAT IS USED TO INITIALIZE THIS CENTRAL PROCESSOR. IT SETS THE PROGRAM COUNTER TO THE LOCATION OF THE FIRST INSTRUCTION WHICH IS FIXED BY CUSTOM, AND FROM THEN ON IN THE COURSE OF EXECUTION OF THE GAME IT HAS NO FUNCTION WHATSOEVER.

Q. DOES THE 555 TIMER IN THE ATARI 2600 HAVE ANY RELATION TO THE ACTUAL GENERATION OF THE SPOT IMAGE LIKE THE SAWTOOTH WAVE GENERATES IN THE RUSCH 2 PATENT SPECIFICATIONS?

MR. ANDERSON: I'LL OBJECT, YOUR HONOR. THERE IS NO FOUNDATION FOR THAT QUESTION THAT I KNOW OF. I DON'T THINK IT'S UNDERSTANDABLE. THE RELATIONSHIP IS NOT ESTABLISHED AT ALL.

THE COURT: OVERRULED. PLEASE ANSWER.

THE WITNESS: NO, ALTHOUGH THE 555 TIMER IS OFTEN USED -- IT'S NOT USED FOR THIS PURPOSE IN THE 2600 AT ALL.

MR. ESCHER: Q. HAVING GIVEN US YOUR EXPLANATION OF THE INSTRUCTION OF THE 2600 SYSTEM, COULD YOU TURN NOW TO THE STRUCTURE AND FUNCTION OF THE ATARI SYSTEMS WHICH FOLLOWED THE 2600 AND FOR WHICH ACTIVISION DESIGNED SOFTWARE? I WOULD LIKE YOU TO TURN TO THE PRINTED CIRCUIT BOARD FOR THE ATARI 5200.

MR. ANDERSON: I'LL OBJECT YOUR HONOR. I DON'T KNOW THAT THERE IS ANY ISSUE AT ALL INVOLVING THE 5200 OR HOW IT OPERATES, WHAT GAMES ARE USED WITH IT, IF ANY. WE'VE HAD NO PRODUCTION OF DOCUMENTS OR THINGS PRIOR TO BEING ADVISED THIS 5200 IS --

THE COURT: I THOUGHT WE WERE TALKING ABOUT THE 2600.

MR. ESCHER: YOUR HONOR, ONE OF THE ACCUSED MATTERS IS TO HAVE A 2600 ADAPTER TO PLAY ON THE ATARI. THE 2600,

LIKE THE 5200 AND 400, IS A COMPUTER, AND THERE IS NO GOOD REASON FOR DRAWING A DIFFERENTIATION BETWEEN THE 2600 ON THE ONE HAND AND THE ATARI 400 AND THE 5200 ON THE OTHER HAND.

MR. ANDERSON: I OBJECT, YOUR HONOR.

THE COURT: I THINK THE QUESTION AT ISSUE IS VERY REMOTELY RELEVANT TO WHAT WE'RE TALKING ABOUT, BUT FOR PURPOSES OF TIME, IT'S EASIER TO GET THE TESTIMONY IN.

MR. ANDERSON: I DO SUBMIT -- I SUSPECT IT'S GOING TO GO ON FOR SOME LENGTH. THE 5200 IS NOT INVOLVED HERE OR THE 400. IT'S NOT IN ISSUE AND WE'VE NEVER BEEN GIVEN ANY DOCUMENTS, INFORMATION ABOUT THE 400 OR THE 5200 OR CARTRIDGES OR WHATEVER PROGRAMS MIGHT BE USED WITH IT. IT'S NEVER BEEN PLACED BEFORE US FOR EVALUATION OR INFRINGEMENT. IT APPEARS MR. ESCHER IS GOING TO -- IT'S JUST IRRELEVANT AND MISLEADING AND I OBJECT TO IT, YOUR HONOR. I DON'T THINK WE SHOULD FOLLOW THAT EXERCISE.

THE COURT: WELL, WHAT'S THE COMMERCIAL SIGNIFICANCE OF THIS? I MEAN, ARE THE PROGRAMS USABLE ON THE 5200?

MR. ANDERSON: ARE YOU ADDRESSING ME?

THE COURT: NO.

MR. ESCHER: IN CONNECTION WITH THE SPECIFIC DEVICE CALLED AN ADAPTER TO USE THE 2600 CATRIDGE ON THE 5200, IT'S MY UNDERSTANDING THE PLAINTIFFS IN THIS CASE HAD CLAIMED THAT THE USE OF ANY ATARI 2600 CARTRIDGE WITH AN ADAPTER ON A 5200 WAS AN INFRINGING GAME.

MR. ANDERSON: THAT'S A DIFFERENT THING, YOUR HONOR. WHEN YOU PLUG THE ADAPTER INTO THE 5200 YOU BYPASS EVERYTHING BUT THE MODULATOR AND THE POWER SUPPLY. IT HAS NOTHING TO DO

WITH THE 5200 OR THE 400 OR A GAME THAT MIGHT BE USED WITH THE 5200. IT'S PLUGGED INTO AN ADAPTER THAT CREATES A 2600 AND MERELY USES THE POWER SUPPLY AND THE RF MODULATOR OF THE 5200. UNLESS MR. THACKER SAYS ANYTHING ELSE, I THINK IS VERY MISLEADING.

MR. ESCHER: WE AREN'T GOING TO ATTEMPT TO MISLEAD YOUR HONOR IN THE LEAST. THE LINE OF THE TESTIMONY WILL BECOME APPARENT. IT WILL TAKE 10 OR 15 MINUTES TO COMPLETE THE TESTIMONY. WE THINK IT'S VERY SIGNIFICANT THAT THE GAMES FOR THE ATARI 400 AND 5200 WERE NEVER ACCUSED BY THE PLAINTIFFS IN THIS CASE. AND WE WANT TO DEMONSTRATE THAT THOSE GAMES ARE COMPUTER GAMES LIKE THE GAMES IN THE ATARI 2600, AND THE RELEVANCE IS APPARENT WHY THEY CHOSE SOME GAMES AGAINST OTHERS.

MR. ANDERSON: YOUR HONOR, THAT IS SIMPLY A RED HERRING. WE WERE NEVER GIVEN ANY INFORMATION ABOUT THE 400 PROGRAMS OR GAMES OR THE 5200, IF THEY EXIST. WE ASKED FOR GAME INFORMATION THEY GAVE IT TO US. IT DID NOT INCLUDE SUCH THINGS. AND I SUBMIT NOW TO TRY TO TWIST THIS KIND OF EVIDENCE INTO SOMETHING THAT'S TOTALLY INAPPROPRIATE AND IRRELEVANT SHOULD NOT BE PERMITTED. EVEN IF IT ONLY TAKES 10 OR 15 MINUTES.

THE COURT: I'LL SUSTAIN THE OBJECTION. AND I'LL ACCEPT THE STATEMENTS REGARDING WHAT THE PROOF WILL SHOW AND WHAT THE SIGNIFICANCE IS AS AN OFFER OF PROOF.

MR. ANDERSON: THANK YOU.

MR. GLICK: MAY I OFFER A COMMENT AS TO THE EVIDENCE?

THE COURT: YES, SIR.

MR. GLICK: FIRST, MR. ANDERSON -- THIS TURNS OUT, I THINK, TO BE VERY IMPORTANT TO THE EQUIVALENCE ISSUE IN THE CASE. AS TO MR. ANDERSON'S COMMENTS AS TO DISCLOSURE, I HOPE THAT'S NOT A BASIS OF YOUR RULING, YOUR HONOR, SINCE --

THE COURT: NO, TO ME IT'S A RELEVANCY QUESTION.

MR. GLICK: MAY I SPEND ONE MOMENT?

THE COURT: OF COURSE.

MR. GLICK: A CRUCIAL ISSUE IN THE CASE IS WHETHER THE ACCUSED DEVICE IS EQUIVALENT TO THE TECHNOLOGY IN THE 2600, WHETHER THE ACCUSED DEVICE USING THE 2600 IS EQUIVALENT TO THE RUSCH TECHNOLOGY.

AND A GOOD DEAL OF DISPUTE IS PRESENT IN THE CASE AS TO THE TESTIMONY WE'VE OFFERED AS TO THE NATURE OF THE 2600 AND THE ATARI CARTRIDGE AND THEIR TESTIMONY CONCERNING WHAT ABOUT IT CONSTITUTES THOSE ELEMENTS THAT ARE SIMILAR TO THE RUSCH DEVICE.

WE THINK THEY HAVE DRAWN A VERY TENUOUS DIVIDING LINE BETWEEN THIS TECHNOLOGY AND THE TECHNOLOGY THAT THE WITNESS WILL TESTIFY TO. WHAT WE WISH TO DEMONSTRATE IS EVERY SINGLE THING THEIR EXPERT TESTIFIES TO AS TO WHY THIS TECHNOLOGY INFRINGES ON US.

WE BELIEVE THEY HAD THE OPPORTUNITY TO CHARGE THIS AND THEY DIDN'T BECAUSE OF THE PRIOR ART COMPUTER IMPLICATIONS ON THAT. WE BELIEVE IT'S FOR YOUR HONOR TO VIEW THE PLAYING OF ONE OF THESE GAMES AND SEE HOW THE HORIZONTAL AND VERTICAL SYNC WORKS IN THE GAMES.

MR. ANDERSON: YOUR HONOR, I THINK MR. GLICK'S COMMENTS POINT OUT THE IRRELEVANCY. THESE ARE EVENTS THAT

HAVE APPARENTLY OCCURRED RECENTLY. THE 400 AND 5200 WERE SUBSEQUENT TO THE 2600. IT'S IRRELEVANT AS TO WHAT MIGHT HAPPEN TODAY OR NEXT YEAR, ON THE NEW PRODUCTS AS TO WHAT WAS EQUIVALENT IN 1967, WHAT THE 2600 IS IN THE STATUS OR IN THE CONTENTS OF THE RUSCH PATENT. I SUBMIT, YOUR HONOR, THIS WOULD BE MISLEADING. IT'S BASED UPON COUNSEL'S ARGUMENTS ABOUT WHAT WE SHOULD OR SHOULD NOT HAVE ACCUSED, AND I THINK THERE IS NO BASIS FOR THAT. THAT'S THE ONLY BASIS ON WHICH IT COULD POSSIBLY BECOME RELEVANT.

MR. GLICK: THE KEYSTONE AND THE ACTIVISION DECATHLON CARTRIDGES WERE ON THE MARKET AND AVAILABLE ON THOSE MACHINES AT THE SAME TIME THAT THEY, BY INTERROGATORY, DETERMINED WHICH GAMES THEY WOULD ACCUSE ON WHICH MACHINES. SO IT'S CERTAINLY CLEAR FROM THE EVIDENCE THAT HAD THEY WANTED TO DO SO IN THIS LITIGATION, THEY COULD HAVE CHOSEN TO ACCUSE THOSE GAMES.

THE COURT: I'LL SUSTAIN THE COMMENTS. I'LL ACCEPT COUNSEL'S OFFER OF PROOF AS TO WHAT THE TESTIMONY WOULD BE.

MR. ANDERSON: THANK YOU, YOUR HONOR.

MR. ESCHER: Q. MR. THACKER, I'D LIKE YOU TO TURN NOW TO A COMPARISON OF THE ATARI 2600 VIDEO COMPUTER SYSTEM FOR PLAYING ACTIVISION GAMES WITH THE TECHNOLOGY CONTAINED IN THE RUSCH PATENT. IF YOU COULD RETURN TO THE PROJECTOR NOW, PLEASE. I BELIEVE THE NEXT CHART IS MARKED AS DEFENDANT'S EXHIBIT IW.

MR. THACKER, DID YOU PREPARE THIS BLOCK DIAGRAM?

A. YES, I DID.

Q. HOW DID YOU GO ABOUT CREATING IT?

A. THIS DIAGRAM WAS PREPARED BY EXAMINING THE SPECIFICATION AND DRAWINGS OF THE 507 PATENT, THAT IS THE RUSCH 2 PATENT.

Q. COULD YOU EXPLAIN THE CHART, PLEASE?

A. YES. THIS IS THE FIRST OF 3 DRAWINGS. IT SHOWS ONE OF WHAT I CONSIDER THE MAJOR, OR 2 OF THE MAJOR SUBSYSTEMS SHOWN IN THE RUSCH 2 DEVICE.

IT SHOWS THE METHOD FOR GENERATING THE TELEVISION SYNCHRONIZATION SIGNALS, THE HORIZONTAL AND VERTICAL GENERATOR, AND THE SUMMING CIRCUIT AND THE RADIO FREQUENCY OSCILLATOR THAT WOULD BE FOUND IN ANY DEVICE THAT GENERATED STANDARD TELEVISION SIGNALS.

IT ALSO SHOWS IN BLOCK FORM THE SPOT GENERATORS THAT ARE FOUND IN THE RUSCH DEVICE. THERE ARE 3 SUCH SPOT GENERATORS AND THEY ARE IDENTICAL. AND, IN FACT, THEY TAKE 2 VOLTAGES, ONE THAT CONTROLS THE HORIZONTAL POSITIONS OF THE SPOT AND THE OTHER THAT CONTROLS THE VERTICAL POSITION AND THE SAME FOR THE SPOT GENERATOR NUMBER 2. THE THIRD SPOT GENERATOR IS CUSTOMARILY USED IN THE RUSCH DESCRIPTIONS FOR A BALL.

AND SO I'VE LABELED THE INPUTS TO THAT SPOT GENERATOR BALL HORIZONTALLY AND BALL VERTICAL VOLTAGE. THESE SPOT GENERATORS GENERATE, AS YOUR HONOR HAS HEARD IN PREVIOUS TESTIMONY, VIDEO SIGNALS AT A POINT DETERMINED BY THE VALUE OF THESE VOLTAGES, THAT IS, IF THE USER CONTROL IS ADVANCED TO THE RIGHT, THEN THIS VOLTAGE BECOMES -- AND THE SPOT MOVES TO THE RIGHT. LIKEWISE, IF IT WERE POSITIVE THE SPOT MOVES UP.

THE SPOT GENERATOR ACTUALLY DIRECTLY GENERATES THE TELEVISION VIDEO SIGNAL ON THIS LINE, GOES DOWN AND IS COUPLED

TO THE SYNCHRONIZATION SIGNALS TO MAKE THE FINAL OUTPUT. LIKEWISE, FOR SPOT GENERATOR NUMBER 2 AND NUMBER 3.

THESE CIRCUITS ARE THE SAWTOOTH GENERATOR AND COMPARISON CIRCUITS THAT WE'VE HEARD ABOUT IN EARLIER DISCUSSIONS.

THE THIRD THING ON THIS CHART ARE THE COINCIDENCE DETECTORS USED TO DETERMINE THAT. FOR INSTANCE, THE SPOT PRODUCED BY SPOT GENERATOR NUMBER 1 IS OCCURRING AT EXACTLY THE SAME TIME AND, THEREFORE, AT THE SAME PLACE ON THE TELEVISION SCREEN AS THE SPOT GENERATED BY SPOT GENERATOR NUMBER 3.

THE OUTPUT OF THAT COINCIDENCE DETECTOR IS A VOLTAGE SIGNAL WHICH I'VE LABELED SPOT NUMBER 1 HIT, WHICH ESSENTIALLY MEANS COINCIDENCE BETWEEN SPOT NUMBER 1 AND THE BALL SPOT.

SPOT NUMBER 2 AND BALL COINCIDENCE IS ALSO SHOWN BY THE SPOT NUMBER 2 HIT SIGNAL.

THESE -- THE ONLY OTHER REMAINING PART OF THIS PAGE THAT'S INTERESTING IS THE LOWER RIGHT-HAND CORNER, THE RF OSCILLATOR AND THE SIGNAL THAT SAYS, TO TV.

SO THE INPUTS TO THIS SYSTEM ARE THE CONTROL VOLTAGES FOR THE SPOT POSITIONS AND THE COINCIDENCE SIGNALS THAT INDICATE WHETHER THE 2 SPOTS HAVE ACHIEVED THE SAME POSITION ON THE SCREEN.

THESE ARE ALL -- THESE CIRCUITS IN THE SPOT GENERATOR ARE VERY CLEARLY DEFINED IN THE 507 PATENT SPECIFICATION.

Q. COULD YOU TURN TO THE NEXT EXHIBIT WHICH IS DEFENDANT'S IX.

A. YES.

Q. MR. THACKER, WHAT IS THIS A CHART OF?

A. EXHIBIT IX IS ANOTHER BLOCK DIAGRAM OF YET ANOTHER PART OF THE 507 DEVICE. THAT PORTION OF THE CIRCUITRY THAT MAKES ONE OF THE 2 TYPES OF AUTOMATIC MOTION DESCRIBED IN THE 507 PATENT. THIS IS THE REVERSING TYPE OF MOTION THAT TYPICALLY OCCURS IN PING-PONG.

NOW, THIS PART OF THE CIRCUIT TAKES AS INPUT THE SPOT NUMBER 1 AND SPOT NUMBER 2 HIT SIGNALS AND IT PRODUCES AS OUTPUT THE BALL HORIZONTAL VOLTAGE. I'M SHOWING IN THIS SLIDE ONLY THAT PORTION OF THE CIRCUIT THAT HAS TO DO WITH THE HORIZONTAL MOTION OF THE BALL IN THIS GAME. I'VE LEFT OFF SOME CIRCUITRY IN THE PATENT APPLICATION THAT WAS CONNECTED TO THESE 2 POINTS (INDICATING), THAT EMERGE FROM THE FLIP-FLOP.

THE REASON FOR THAT IS THAT PART OF THE CIRCUIT HAS SOMETHING TO DO WHAT IS REFERRED TO AS ENGLISH, WHICH IS A THIRD CONTROL WHICH THE USER COULD USE TO AFFECT THE VERTICAL POSITION OF A SPOT AFTER IT HAD BEEN HIT. AND THAT DIDN'T SEEM TO BE AT ISSUE SO I LEFT IT OUT.

Q. I NOTICE THIS DIAGRAM HAS A BLOCK DIAGRAM FEATURE AND --

A. THIS IS A MIXED DIAGRAM AND, IN FACT, THIS IS PRECISELY THE WAY THE DIAGRAM WAS PRESENTED IN THE 507 SPECIFICATIONS AND IN THE DRAWINGS. THE ACTUAL DETAILS OF THE FLIP-FLOPS TO BE USED ARE NOT CALLED OUT PRESUMABLY BECAUSE FLIP-FLOPS ARE GENERIC CIRCUITS. HOWEVER, THE ACTUAL PART OF THE CIRCUIT THAT CONTROLS THE BALL IS CALLED OUT IN DETAIL.

Q. HOW DID YOU CREATE THIS CHART?

A. I DID THIS CHART FROM EXAMINATION OF THE 507 PATENT.

Q. ARE YOU FINISHED WITH YOUR EXPLANATION OF EXHIBIT IX?

A. I CAN EXPLAIN IN SOME DETAIL WHAT'S GOING ON HERE.

Q. PLEASE DO.

A. IF YOU REMEMBER, IT HAS 2 STABLE STATES. AND LET ME REPRESENT THAT IN THE FOLLOWING WAY.

IN STATE 1, WHICH IS GREEN, ONE SIDE OF THE FLIP-FLOP IS HIGH VOLTAGE AND THE OTHER SIDE IS AT A LOW VOLTAGE. THE OTHER STATE IS EXACTLY THE OPPOSITE. THAT IS, THE VOLTAGE IS ON THE 2 TERMINALS OF THE FLIP-FLOP ARE REVERSED.

WHEN WE'RE IN ONE STATE, THE RED STATE, THIS HIGH VOLTAGE CAUSES CURRENT TO FLOW THROUGH THIS PATH AND NOT THROUGH THIS PATH BECAUSE IT'S BLOCKED BY THESE DIODE ELEMENTS HERE. SO THIS POTENTIOMETER MARKED BALL LEFT DETERMINES THE VOLTAGE AT THIS POINT.

IF THE FLIP-FLOP IS IN THE OTHER STATE, THEN CURRENT FLOW IS THROUGH THESE DIODES BECAUSE -- THROUGH THE DIODES IN THE DOCUMENTATION OF THE ARROW. THEREFORE, THE BALL RIGHT POTENTIOMETER IS AT THE RIGHT HERE. SO IF IT FLIP-FLOPPED BACK AND FORTH, WE WOULD SEE 2 DIFFERENT VOLTAGES.

THOSE ARE FED TO THE BALL HORIZONTAL POSITION OF THE INPUT OF THE CIRCUITRY SHOWN ON THE PREVIOUS PAGE AND SET EFFECTIVELY 2 POSITIONS FOR THE BALL TO BE IN.

THE PURPOSE FOR THIS RESISTOR AND CAPACITOR ARE TO SLOW THAT TRANSITION DOWN SO WHEN THE FLIP-FLOP SWITCHES FROM ONE STATE TO THE OTHER, THE BALL DOESN'T LEAP FROM THAT POSITION TO THE OTHER POSITION, BUT SLIDES TYPICALLY THE WAY A BALL WOULD IN REAL PING-PONG.

NOW, THE FLIP-FLOP IS TRIGGERED FROM ONE STATE TO THE OTHER BY THE HIT SIGNALS, SO IF THE BALL MOVES FROM RIGHT TO LEFT ACROSS THE SCREEN AND THE COINCIDENCE IS ACHIEVED BETWEEN THE BALL AND SPOT NUMBER 1, THE LEFTMOST SPOT THAT WILL CAUSE THE FLIP-FLOP TO FLIP AND THE MOTION WILL REVERSE AND THE BALL WILL BEGIN TO MOVE BACK THE OTHER WAY AND THE OTHER POTENTIOMETER WILL BE IN CONTROL OF THE MOTION.

THE PURPOSE IS TO SWITCH THE POTENTIOMETERS. ONE, CAUSE IT TO MOVE LEFT TO RIGHT, AND THE OTHER FROM RIGHT TO LEFT. THIS IS ONE OF THE 2 KINDS OF CIRCUITRY THAT'S DESCRIBED IN 507.

Q. ARE THERE ELECTRONIC CIRCUITS OTHER THAN THE FLIP-FLOP WHICH WOULD ACCOMPLISH THE SAME FUNCTION IN THE CONTENT OF THE CIRCUITRY IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT?

A. YES, THERE ARE SEVERAL KINDS OF DEVICES THAT DO THAT. ANY THAT HAVE 2 STABLE STATES CORRESPONDING TO THE RED AND GREEN, FOR EXAMPLE, A RELAY COULD BE WIRED UP TO DO THAT.

Q. MR. THACKER, IS THE PING-PONG OR REVERSAL MOTION THE ONLY MOTION DESCRIBED IN THE RUSCH PATENT?

A. NO, THERE IS A SECOND KIND OF MOTION.

Q. AND WHAT IS THAT?

A. WELL, THAT'S ILLUSTRATED BY THIS SLIDE, EXHIBIT IY. THIS KIND OF MOTION IS SOMEWHAT MORE COMPLEX THAN THE REVERSING MOTION. THE IDEA HERE, AND, BY THE WAY, YOUR HONOR, I'VE SHOWN ONLY ONE DIRECTION, THAT IS THE HORIZONTAL PART OF THIS ONE, JUST LIKE I DID ON THE LAST ONE.

HERE THE IDEA IS TO IMPART A VELOCITY TO THE BALL OR THE HIT SPOT THAT IS PROPORTIONAL TO THE VELOCITY OF THE THING

THAT HITS IT. AND IF WE RESOLVE THE VELOCITY INTO THE HORIZONTAL COMPONENT, THIS IS THE CIRCUITRY THAT PERFORMS THAT FUNCTION IN THE 507 DEVICE. THERE ARE 2 SUCH CIRCUITS, ONE FOR THE HORIZONTAL PART AND ONE FOR THE VERTICAL PART.

AND LIKE THE PREVIOUS SLIDE, THIS LITTLE SUBSYSTEM TAKES AS INPUT THE COINCIDENCE SIGNALS, THE SPOT 1 HIT SIGNAL AND THE SPOT 2 HIT SIGNALS, AND IT DELIVERS AS OUTPUT TO THE VOLTAGE CONTROL SPOT GENERATORS THAT WERE ON PAGE 1, THE BALL X POSITION VOLTAGE HERE ON THE RIGHT.

THIS IS THE HORIZONTAL POSITION VOLTAGE, THAT IS, A VOLTAGE THAT DETERMINES WHERE THE BALL IS GOING TO BE ON THE SCREEN. IT ALSO, HOWEVER, HAS AS INPUT 2 THINGS THAT THE PREVIOUS DEVICE DIDN'T HAVE, AND THOSE ARE THE SPOT NUMBER 1 AND SPOT NUMBER 2 HORIZONTAL CONTROL VOLTAGES. THOSE ARE USED TO DECIDE WHAT THE VELOCITY OF THE SPOT THAT'S DOING THE HITTING IS.

THE WAY THIS WORKS IS, AT THE TIME COINCIDENCE OCCURS BETWEEN THE BALL AND ONE OF THE OTHER SPOTS, SPOT 1 OR SPOT 2, THE COINCIDENCE SIGNALS IS GENERATED, THIS ONE SHOT MULTIVIBRATOR MAKES A NARROW PULSE WHICH SAMPLES THE DERIVATIVE OF THE 2 VOLTAGES. THIS IS THE DE/DT VOLTAGE THAT WAS DESCRIBED EARLIER, I BELIEVE.

SO AS SOON AS COINCIDENCE OCCURS, THE SPEED OF THE HITTING SPOT, SPOT 1 OR SPOT 2, IS STORED ACTUALLY ON THIS POINT BY DOING 2 THINGS. THE FIRST IS USING THIS GATE DIFFERENTIATOR AS DESCRIBED IN THE SPECIFICATION TO SELECT WHICH VOLTAGE IS GOING TO BE USED, AND IT'S GOING TO BE THE ONE THAT CAUSED THE COINCIDENCE.

THE SECOND PURPOSE OF THIS SIGNAL IS TO SAMPLE THAT VOLTAGE AND STORE IT RIGHT HERE. SO NOW WE HAVE A VOLTAGE THAT'S PROPORTIONAL TO THE SPEED OF THE HITTING SPOT.

THAT VOLTAGE WILL BE SAVED BY THE SAMPLE BILATERAL GATE CIRCUIT AND BE USED TO RUN AN INTEGRATOR WHICH WILL PRODUCE VOLTAGE THAT VARIES AS THE AMPLITUDE OF THE INPUT VOLTAGE IN SUCH A WAY AS THE BALL WAS MOVING RAPIDLY, THE RESULTING VELOCITY OF THE HIT THING WILL BE RAPID.

THIS CIRCUIT IS, AS I SAY, SOMEWHAT MORE COMPLICATED. IT USES CIRCUITS THAT WE HAVEN'T SEEN BEFORE, DIFFERENTIATORS AND INTEGRATORS. BUT THERE IS NOT A GREAT DEAL OF CIRCUITRY INVOLVED HERE. IN THE DIFFERENTIATORS THERE ARE 4 AND THE BILATERAL GATE IS 2.

SO, ALTHOUGH THIS SEEMS COMPLEX, IT'S ACTUALLY A RELATIVELY SMALL NUMBER OF COMPONENTS WHERE, FOR INSTANCE IN THE BLOCK DIAGRAMS OF THE 2600, ONE OF THESE BLOCKS WOULD BE TENS OF THOUSANDS OF TRANSISTORS.

Q. IN YOUR OPINION, MR. THACKER, IS THE RUSCH 2 CIRCUITRY DISCLOSED IN THE SPECIFICATIONS A STORED PROGRAM DIGITAL COMPUTER?

A. OH, NO, NOT AT ALL. NOT AT ALL.

MR. ESCHER: YOUR HONOR, THIS IS A LOGICAL BREAKING POINT. IF WE COULD HAVE A 5-MINUTE BREAK, I WOULD APPRECIATE IT.

THE COURT: YES.

(RECESS.)

MR. ESCHER: MR. THACKER, COULD YOU RESUME THE STAND, PLEASE.

Q. MR. THACKER, HAVE YOU EVER DESIGNED A COMPUTER PROGRAM?

A. YES, I HAVE.

Q. PLEASE DESCRIBE FOR US THE STEPS IN THE PROCESS OF COMPUTER SOFTWARE DESIGN.

A. CERTAINLY. THE STARTING POINT OF A COMPUTER PROGRAM CAN BE 1 OF 2 THINGS, IT CAN EITHER BE A SPECIFICATION PRODUCED BY, FOR INSTANCE, AN ORGANIZATION PURCHASING THE PROGRAM. THIS IS COMMON IF, FOR INSTANCE, A BANK WANTS A SOFTWARE PACKAGE TO DO SOME PARTICULAR THING.

THE OTHER POSSIBILITY IS THAT THE PROGRAMMER THAT IS GOING TO DESIGN THE PROGRAM HIMSELF PROVIDES THE SPECIFICATION. THIS IS MORE TYPICAL IN THE KIND OF PROGRAMS THAT WE'RE TALKING ABOUT HERE. THE PROGRAMMER IS BOTH THE DESIGNER AND IMPLEMENTER.

GIVEN AN IDEA OF WHAT THE PROGRAM NEEDS TO DO AND WHAT THE CONSTRAINTS ON IT ARE AND, IN THIS CASE OF THESE DEVICES, THEY'RE THE REAL TIME CONSTRAINTS THAT I DISCUSSED EARLIER, THE PROGRAMMER WILL BEGIN TO SKETCH OUT THE PROGRAM AS SORT OF A MAJOR PIECE.

AND IN THIS CASE, OF SOMETHING LIKE FISHING DERBY, IT WILL BE THINGS LIKE DECIDING WHICH OF THE USER'S INPUTS ARE IMPORTANT TO THE PROGRAM, WHICH ONES NEED TO BE READ IN WHAT FORM. DECIDING WHAT THE SHAPE OF THE SCREEN IS GOING TO BE, THAT IS, EXACTLY WHAT IS GOING TO BE DISPLAYED, WHETHER IT'S THE FISHERMAN OR WHATEVER.

AND THEN THE PROGRAMMER WILL WRITE THE INSTRUCTIONS OF THE SORT THAT WE SAW IN THE SLIDE EARLIER TO CARRY THIS OUT.

IN THE COURSE OF DOING THAT, HE WILL WORK TYPICALLY

IN FRONT OF A VIDEO DISPLAY TERMINAL AND TYPE IN THINGS THAT LOOK VERY MUCH LIKE THE PROGRAM LISTING THAT WE SAW.

WHEN THE PROGRAM IS COMPLETE, THAT IS, WHEN THE FUNCTIONS HAVE ALL BEEN IMPLEMENTED IN SECTIONS OF CODE, THE PROGRAM WILL BE TESTED, AND IT'S ALMOST NEVER THE CASE THAT A PROGRAM WORKS THE FIRST TIME. IT'S A VERY ERROR PRONE PROCESS BECAUSE THE AMOUNT OF DETAIL THAT HAS TO BE KEPT IN THE COURSE OF DEVELOPMENT IS VERY HIGH.

SO, TYPICALLY, THERE ARE -- IN CODING A PROGRAM IT OCCUPIES PROBABLY 20 PERCENT OF THE OVERALL DESIGN TIME. THERE WILL BE A CYCLE WHERE THE PROGRAMMER ASSEMBLES THE PROGRAM AND LOADS IT INTO THE DEVICE. IT'S NOT LOADED INTO A READ-ONLY PROGRAM, BUT IT'S LOADED INTO A RANDOM ACCESS READ-WRITE MEMORY THAT CAN BE EASILY CHANGED.

IT WILL BE TESTED AND MODIFIED BY THE PROGRAMMER, AGAIN AT THE VIDEO DISPLAY TERMINAL, AND THAT LOOP WILL OCCUR SEVERAL TIMES UNTIL FINALLY ALL OF THE ERRORS AND BUGS IN THE PROGRAM HAVE BEEN REMOVED AND THE FEATURES THAT ARE DESIRED ARE PRESENT.

AT THAT POINT, THE PROGRAMMING IS ESSENTIALLY COMPLETE, AND BEYOND THAT POINT IT'S THE MANUFACTURING OF THE READ-ONLY MEMORY THAT CONTAINS THE PROGRAM. AND IN THE CASE OF PEOPLE WRITING SYSTEMS FOR BANKS, FOR INSTANCE, SENDING THE PROGRAM TO THE CUSTOMER ON A MEGA TAPE.

Q. MR. THACKER, I TAKE IT YOU HAVE DESIGNED A NUMBER OF DISCRETE ELECTRONIC SYSTEMS?

A. YES, I HAVE.

Q. HOW WOULD YOU COMPARE THE PROCESS OF SOFTWARE DESIGN FOR

A VIDEO GAME WITH THE PROCESS OF DESIGNING DISCRETE ELECTRONIC CIRCUITS SUCH AS THOSE IN THE RUSCH 2 PATENT SPECIFICATIONS?

A. WELL, THE PROCESS IS QUITE A BIT DIFFERENT. FIRST OF ALL, IT'S CARRIED OUT BY 2 DIFFERENT PEOPLE, KINDS OF PEOPLE. THEY ARE BOTH ENGINEERS, BUT SOFTWARE AND HARDWARE ENGINEERS WILL GO THROUGH DIFFERENT COURSES IN SCHOOLS, FOR INSTANCE, AND LEARN DIFFERENT THINGS.

THE HARDWARE ENGINEER IS INTERESTED IN ARRANGING THE ELECTRONIC COMPONENTS IN THE RIGHT WAYS TO PROVIDE THE FUNCTION OF THE SPECIFICATION THAT HE HAS, AND HE WILL BE MORE CONCERNED WITH ISSUES OF MANUFACTURING COST, FOR INSTANCE, WHICH IS NOT A SIGNIFICANT ISSUE IN THE DEVELOPMENT OF SOFTWARE.

ISSUES OF RELIABILITY AND THE KIND OF STABILITY ISSUES THAT WE HEARD ABOUT EARLIER WILL ALSO BE IMPORTANT TO THE HARDWARE DESIGNER. THESE THINGS ARE NOT IMPORTANT TO THE SOFTWARE DESIGNER, ALTHOUGH HIS JOB IS MORE COMPLEX BECAUSE OF THE THINGS THAT HE WORKS WITH ARE FUNDAMENTALLY MORE COMPLICATED. HE HAS A LOT MORE BALLS IN THE AIR TO MAKE THE PRODUCT WORK MOST RELIABLY, MAKE IT REPAIRED RAPIDLY, THERE ARE A LARGE NUMBER OF ISSUES THAT ARE FOREIGN TO THE SOFTWARE DESIGNER.

Q. GIVEN YOUR EXPERTISE IN THE ELECTRONIC ENGINEERING AND COMPUTER SCIENCE, COULD YOU BUILD OR DESIGN FROM SCRATCH A MASTER CONSOLE LIKE THE ATARI 2600 VIDEO COMPUTER SYSTEM?

A. WELL, I COULD CERTAINLY DESIGN SUCH A THING AND I COULD BUILD IT, PROVIDING THE COMPONENTS ARE AVAILABLE.

Q. MR. THACKER, WOULD THE CIRCUITRY CONTAINED IN THE

SPECIFICATIONS OF THE RUSCH 2 PATENT TEACH YOU ANYTHING ABOUT HOW TO DESIGN THE ATARI 2600 FROM SCRATCH?

A. NO, NOTHING WHATSOEVER.

Q. MR. THACKER, NOW THAT WE'VE GONE THROUGH THE CIRCUITRY DESCRIBED IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT AND THE ATARI 2600 VIDEO COMPUTER SYSTEM, I'D LIKE YOU TO SUMMARIZE WHAT, IN YOUR OPINION, ARE THE SALIENT DIFFERENCES BETWEEN THE RUSCH 2 PATENT SPECIFICATIONS AND THE ATARI 2600 VIDEO COMPUTER SYSTEM.

A. WELL, THERE ARE A NUMBER OF SMALL DIFFERENCES, AND THERE IS A MAJOR DIFFERENCE, AND I'LL NEED MY NOTES FOR THIS.

IF WE LOOK AT THE 2600 AND THE TECHNOLOGY DESCRIBED IN THE 507 PATENT, THE 507 USES A SAWTOOTH RAMP VOLTAGE AND A COMPARER FOR THE SPOT GENERATION FUNCTION. THIS IS AN ANALOG CIRCUIT.

IN THE 2600, THE SPOTS ARE, IN THE FIRST PLACE, NOT SIMPLE SPOTS, THEY'RE PATTERNS, THEY'RE DIGITALLY GENERATED, BASICALLY BY A PROCESS OF SHIFTING OUT BINARY BITS AS VIDEO, AND THERE ARE NO SAWTOOTH WAVE FORMS GENERATED IN THE 2600.

IN THE 507 TECHNOLOGY, THE SPOT SHAPES ARE VERY SIMPLE, SQUARES, RECTANGLES, STARS, BUT NO LITTLE MEN AND NO HORSES AND NO COMPLEXITY. THE 2600 CAN DO ALL OF THOSE FOR ITS SPOTS.

IN THE 507 TECHNOLOGY, THE SPOT MOTION IS DEFINED AND CIRCUMSCRIBED PRECISELY BY THE ELECTRONIC CIRCUITRY CONTAINED IN THE DEVICE.

THE 2600 CAN PROVIDE LITERALLY AN INFINITE VARIETY OF MOTION. THE SPOT CAN'T JUMP OUT OF THE SCREEN OR ANYTHING.

IN THE 507 TECHNOLOGY, THE GAMES THAT CAN BE PLAYED WITH IT ARE QUITE LIMITED, LIMITED BY RECONFIGURATION OF THE WIRING OF THE DEVICE, WHEREAS, IN THE 2600 THE VARIETY OF THE GAMES THAT CAN BE PLAYED ARE REALLY LIMITED ONLY BY THE INGENUITY OF THE PROGRAMMERS THAT WRITE THE PROGRAMS THAT ARE EFFECTIVELY THE GAMES.

IN THE 507 DEVICE THERE IS ONE SPOT GENERATED FOR EACH SPOT GENERATOR, THAT IS, EACH OF THE BLOCKS AND SLIDES THAT WE SAW EARLIER WILL GENERATE ONE AND ONLY ONE SPOT.

IN THE 2600, WE CAN HAVE DOZENS OF SPOTS ORIENTED IN MANY WAYS.

IN THE 507, AND I THINK WE'RE BEGINNING TO GET TOWARDS WHAT I THINK OF US AS THE MORE SALIENT DIFFERENCES RIGHT NOW, THE SPOT MOTION IS A DIRECT FUNCTION OF THE PLAYER CONTROLS AND THE CIRCUITRY IN THE GAMES. THAT IS, THE PLAYER MOVES A KNOB AND IT LEADS TO A VERY DIRECT CHANGE IN WHAT HAPPENS ON THE SCREEN.

IN THE 2600 THERE IS INDIRECT CONTROL, THAT IS, THE CHANGE IN THE USER'S CONTROL DOESN'T REALLY DO ANYTHING TO THE TELEVISION PICTURE, INSTEAD, THAT CHANGE MUST BE READ BY THE COMPUTER PROGRAM, INTERPRETED BY IT AND PROCESSED, AND THEN FINALLY THE VIDEO IS GENERATED UNDER CONTROL OF THAT COMPUTER.

SO THERE IS A LEVEL OF INDIRECTION THERE THAT DOES NOT EXIST IN THE 507 DEVICE WHATEVER. ALSO, THE 507 IS -- IS BY NO MEANS CONSIDERED A PROGRAM AND IS NOT A STORED COMPUTER.

THE 2600 HAS A STORED PROGRAM. THE COINCIDENCE BETWEEN THE SPOTS IS DEFINED BY THE DISPLAYED IMAGE, AND IN THE 2600, ALTHOUGH THAT'S ONE OF THE WAYS OF DOING IT, IT WILL

ALSO BE DEFINED BY CALCULATION. THAT CANNOT HAPPEN IN THE 507 DEVICE.

FINALLY, THE COMPLEXITY OF THE 2 DEVICES IS QUITE DIFFERENT. IF WE LOOK AT THE ELECTRONIC CIRCUITRY OF THE 507, IT HAS APPROXIMATELY 50 TRANSISTORS. THE COMPLEXITY OF THE 2600 IS, OF COURSE, MUCH HIGHER. IT HAS ON THE ORDER OF 50,000 TRANSISTORS. AND ALL OF THESE DIFFERENCES GROW FROM ONE, I THINK, FUNDAMENTAL DIFFERENCE, AND THAT IS THAT THE 507 IS AN EARLIER DEVICE AND IS NOT A COMPUTER. AND THE 2600 JUST SIMPLY IS. AND THAT'S THE MAIN DIFFERENCE.

Q. MR. THACKER, IS THE CIRCUITRY FOR GENERATING A HITTING SYMBOL IN THE ATARI 2600 ACTIVISION SOFTWARE COMBINATION THE SAME AS THE CIRCUITRY FOR GENERATING A HITTING SYMBOL IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT?

A. NOT AT ALL. IT'S QUITE DIFFERENT.

Q. IS THE CIRCUITRY FOR GENERATING A HIT SYMBOL IN THE ATARI 2600 ACTIVISION SOFTWARE COMBINATION THE SAME AS THE CIRCUITRY FOR GENERATING A HIT SYMBOL IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT?

A. NO.

Q. IS THE CIRCUITRY FOR ASCERTAINING COINCIDENCE IN THE 2600 THE SAME AS THE CIRCUITRY FOR ASCERTAINING COINCIDENCE IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT?

A. NO, IT IS NOT.

Q. IS THE CIRCUITRY FOR IMPARTING A DISTINCT MOTION IN THE ATARI 2600 ACTIVISION SOFTWARE COMBINATION THE SAME AS THE CIRCUITRY FOR IMPARTING A DISTINCT MOTION IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT?

A. NO, IT'S QUITE DIFFERENT AS WELL.

Q. MR. THACKER, THERE HAS BEEN A FAIR AMOUNT OF DISCUSSION OF THE PATENT LAW CONCEPT OF EQUIVALENCE IN THIS CASE. IS IT YOUR UNDERSTANDING THAT EQUIVALENCE IN THE PATENT LAW REQUIRES SUBSTANTIAL SIMILARITY OF MEANS AND PRINCIPLE AS WELL AS EQUIVALENCE OF RESULT?

MR. ANDERSON: I OBJECT TO ANY INQUIRY ABOUT THIS WITNESS'S UNDERSTANDING OF THE PATENT LAWS UNLESS THERE IS A FOUNDATION.

THE COURT: IT MAY, INDEED, BE A LEGAL QUESTION, BUT I'LL PERMIT THE WITNESS TO ANSWER WHAT HIS UNDERSTANDING IS.

MR. ANDERSON: I WOULD LIKE IT READ.

THE COURT: WOULD YOU PLEASE REREAD THE QUESTION.

MR. ESCHER: Q. MR. THACKER, THERE HAS BEEN A FAIR AMOUNT OF DISCUSSION OF THE PATENT LAW QUESTION OF EQUIVALENCE IN THIS CASE. IS IT YOUR UNDERSTANDING OF EQUIVALENCE IN THE PATENT LAW REQUIRES SUBSTANTIAL SIMILARITY OF MEANS AND PRINCIPLE AS WELL AS EQUIVALENCE OF RESULT?

A. THAT IS MY UNDERSTANDING.

Q. IN YOUR OPINION, DOES THE ATARI 2600 WITH AN ACCUSED ACTIVISION CARTRIDGE ACHIEVE SUBSTANTIALLY THE SAME RESULT AS THE CIRCUITRY DESCRIBED IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT?

A. TO THE EXTENT THAT IT IS POSSIBLE WITH THE 2600 TO DISPLAY SPOTS ON THE SCREEN OF A TELEVISION, PLAY VIDEO GAMES, YES, IT ACHIEVES THE SAME RESULTS.

Q. I'D LIKE TO TURN NOW TO THE CONCEPT OF THE DOCTRINE OF EQUIVALENCE RELATING TO THE 2600 ACTIVISION COMBINATION AS A

WHOLE AS COMPARED TO THE APPARATUS OF THE SPECIFICATIONS DESCRIBED IN THE RUSCH 2 PATENT.

MR. THACKER, IN YOUR OPINION DOES THE ATARI 2600 WITH AN ACTIVISION CARTRIDGE EMPLOY SUBSTANTIALLY THE SAME PRINCIPLE AS THE CIRCUITRY DESCRIBED IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT?

MR. ANDERSON: I'M SORRY. MAY I HAVE THAT REREAD.

MR. ESCHER: CERTAINLY.

Q. MR. THACKER, IN YOUR OPINION, DOES THE ATARI 2600 WITH AN ACTIVISION CARTRIDGE EMPLOY SUBSTANTIALLY THE SAME PRINCIPLE AS THE CIRCUITRY DESCRIBED IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT?

A. NO. IN THE RUSCH 2 PATENT, THE UNDERLYING PRINCIPLES OF THE DEVICE ARE THE PRINCIPLES OF ELECTRONIC ENGINEERING. IN THE ATARI 2600, COUPLED WITH THE ACTIVISION CARTRIDGE, YES, THE PRINCIPLES OF ELECTRONIC ENGINEERING ARE THERE, THEY'RE USED IN THE IMPLEMENTATION OF THE CIRCUITRY, BUT THE CRUCIAL ISSUE AND THE CRUCIAL SET OF PRINCIPLES, IN MY VIEW, THAT UNDERLIE THE 2600 ARE THE PRINCIPLES OF COMPUTER SCIENCE AND PROGRAM.

Q. NOW, IN YOUR OPINION, DOES THE ATARI 2600 VIDEO COMPUTER SYSTEM WITH ACTIVISION SOFTWARE EMPLOY SUBSTANTIALLY THE SAME MEANS AS THE CIRCUITRY DESCRIBED IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT?

A. NO, FOR THE REASONS THAT I GAVE ABOUT THE PRIMARY DIFFERENCES BETWEEN THE DEVICES, THE MEANS ARE QUITE DIFFERENT.

Q. MR. THACKER, DO YOU THINK THAT THE ACCUSED ACTIVISION GAMES ARE EQUIVALENT UNDER THE DOCTRINE OF EQUIVALENCE TO ANY

OF THE CIRCUITRY DESCRIBED IN THE RUSCH 2 PATENT SPECIFICATIONS?

MR. ANDERSON: I'LL OBJECT UNLESS WE KNOW WHAT THIS WITNESS UNDERSTANDS BY THE DOCTRINE OF EQUIVALENCE. AND I THINK THAT WILL BE PERHAPS SOMEWHAT OF AN ISSUE.

THE COURT: WELL, HASN'T HE SAID THAT IT --

MR. ESCHER: I BELIEVE THE QUESTION THAT I ASKED ABOUT THAT WAS OBJECTED TO BY PLAINTIFFS' COUNSEL, BUT HE DID ANSWER.

THE COURT: I'LL OVERRULE YOUR OBJECTION.

MR. ANDERSON: THANK YOU, YOUR HONOR.

THE WITNESS: COULD YOU GIVE ME THE QUESTION AGAIN?

MR. ESCHER: CERTAINLY.

Q. MR. THACKER, DO YOU THINK THAT THE ACCUSED ACTIVISION GAMES ARE EQUIVALENT UNDER THE DOCTRINE OF EQUIVALENCE TO ANY OF THE CIRCUITRY DESCRIBED IN THE RUSCH 2 PATENT SPECIFICATIONS?

A. I DO NOT.

Q. AND WHAT IS THE REASON FOR YOUR OPINION?

A. THE REASONS THAT I JUST GAVE, ALTHOUGH THE RESULTS ARE -- CERTAINLY CAN BE THE SAME, ALTHOUGH THE RESULTS CAN HAVE A MUCH BROADER -- THE UNDERLYING PRINCIPLES ARE DIFFERENT AND THE MEANS BY WHICH THOSE PRINCIPLES ARE MANIFESTED IN THE DEVICE ARE DIFFERENT.

Q. MR. THACKER, WOULD YOUR ANSWERS TO MY QUESTIONS REGARDING THE DOCTRINE OF EQUIVALENCE BE THE SAME FOR THE MATTEL IN TELEVISION AND COLECO MASTER CONSOLES AS FOR THE ATARI 2600?

A. YES, THEY WOULD.

Q. AND FOR THE SAME REASONS?

A. THAT'S RIGHT.

Q. MR. THACKER, I'M NOW GOING TO ASK YOU SOME QUESTIONS THAT RELATE DIRECTLY TO THE CONCEPT OF EQUIVALENCE IN CONNECTION WITH CONSTRUING THE FUNCTION PATENT SUCH AS THE RUSCH 2 PATENT.

NOW, AS A MATTER OF SPECIFIC CIRCUITRY, DO YOU FIND ANYTHING IN THE ATARI 2600 ACTIVISION PROGRAM COMBINATION WHICH IS THE EQUIVALENT OF THE CIRCUITRY FOR GENERATING A HIT SPOT IN THE RUSCH 2 PATENT SPECIFICATIONS?

A. NO, THEY'RE QUITE DIFFERENT.

MR. ANDERSON: I HAVE TO OBJECT, YOUR HONOR. I WANT TO KNOW -- HE'S USING THE SAME DEFINITION OF EQUIVALENCE NOW AS HE DID EARLIER.

THE COURT: I DON'T THINK HE IS.

MR. ANDERSON: I DON'T KNOW WHAT STANDARD HE'S USING.

MR. ESCHER: IT'S SECTION 112 EQUIVALENCE IS THE WAY I PHRASED THE QUESTION.

MR. ANDERSON: BUT, YOUR HONOR, THAT'S THE BASIS OF THE OBJECTION. HE'S NOW STATED EARLIER HIS UNDERSTANDING OF EQUIVALENCE. IS HE USING THAT SAME DEFINITION FOR EQUIVALENCE IN TALKING ABOUT EQUIVALENCE UNDER THIS QUESTION THAT'S NOW BEING ASKED OF HIM OR IS IT A DIFFERENT DEFINITION?

THE COURT: WELL, PLEASE DO LAY A FURTHER FOUNDATION. YOU'VE TALKED ABOUT MEANS PLUS PRINCIPLE AS A BASIS FOR EQUIVALENCE, AND NOW YOU'RE TALKING ABOUT MEANS PLUS FUNCTION. LAY A FOUNDATION FOR THE DISTINCTION.

MR. ESCHER: Q. MR. THACKER, IS IT YOUR UNDERSTANDING THAT EQUIVALENCE IN CONNECTION WITH THE LITERAL

SCOPE OF A MEANS PLUS FUNCTION PATENT UNDER SECTION 112 OF THE PATENT CODE INVOLVES AN EXAMINATION OF SUBSTANTIAL SIMILARITY OF RESULT, PRINCIPLE, AND MEANS OF SPECIFIC COMPONENTS OF THE MEANS PLUS FUNCTION PATENT?

A. THAT IS MY UNDERSTANDING, YES.

Q. MR. THACKER, AS A MATTER OF SPECIFIC CIRCUITRY, DO YOU FIND ANYTHING IN THE ATARI 2600 ACTIVISION PROGRAM COMBINATION WHICH IS THE EQUIVALENT OF THE CIRCUITRY FOR GENERATING A HIT SPOT IN THE RUSCH 2 PATENT SPECIFICATIONS?

A. NO, I DO NOT. I'VE ANALYZED BOTH CIRCUITS AND, IN FACT, TO THE EXTENT THAT THE CIRCUITRY IS THE THING THAT IS DOING THE GENERATION, THEY ARE QUITE DIFFERENT.

FOR INSTANCE, IT WOULD MAKE NO SENSE, FOR INSTANCE, TO TAKE THE CIRCUITRY FROM THE 2600 AND TRY TO USE IT IN A DEVICE BASED ON THE RUSCH PATENT. AND VICE VERSA, THAT IS, THE SPOT GENERATORS, FOR INSTANCE, WHICH ARE THE MEANS, WOULD NOT MAKE SENSE IN THE 2600. IT DOES THAT WHOLE TASK IN A VERY DIFFERENT WAY.

Q. COULD YOU REMOVE THE SPOT GENERATION MEANS FROM THE ATARI 2600 AND INTERCHANGE IN ITS PLACE THE SPOT GENERATION MEANS DISCLOSED IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT?

A. NO, NO.

Q. NOW, AS A MATTER OF SPECIFIC CIRCUITRY, IN YOUR OPINION, IS THERE ANYTHING IN THE ATARI 2600 ACTIVISION PROGRAM COMBINATION WHICH IS THE EQUIVALENT OF THE CIRCUITRY FOR GENERATING A HITTING SPOT IN THE RUSCH 2 PATENT SPECIFICATIONS?

A. NO, AND FOR THE SAME REASON, HIT AND HITTING SPOTS ARE ESSENTIALLY THE SAME.

Q. AND, IN YOUR OPINION, IS THERE ANY SPECIFIC CIRCUITRY IN THE ATARI 2600 ACTIVISION PROGRAM COMBINATION WHICH IS THE EQUIVALENT OF THE CIRCUITRY FOR ASCERTAINING COINCIDENCE IN THE RUSCH 2 PATENT SPECIFICATIONS?

A. THAT IS -- THAT'S ACTUALLY A LITTLE HARDER. AND THE REASON THAT'S A HARDER QUESTION IS THAT IN THE 507 PATENT, THE MEANS FOR GENERATING THE SPOTS ARE VERY CLEARLY ELABORATED IN THE DRAWINGS AS WELL AS IS THE MEANS FOR IMPARTING THE MOTION. THEY ARE THE DRAWINGS THAT WE SAW IN THE EARLIER SLIDES. THE MEANS FOR ASCERTAINING COINCIDENCE IS NOT DONE THAT WAY, IT'S TREATED AT THE SAME LEVEL AS THE FLIP-FLOP IN THE REVERSAL TYPE MOTION.

NOW, I BELIEVE THAT PRESUMABLY WHAT THEY DID IN THAT DEVICE WAS USE AN ANG GATE, A-N-G, GATE. I KNOW OF NO OTHER WAY TO DO THAT. THE PROBLEM IS TO DETERMINE WHEN 2 ELECTRICAL SIGNALS ARE COINCIDENT IN TIME, AND THAT'S WHAT AN ANG GATE DOES, BUT IT'S NOT SPELLED OUT WITH NEARLY THE CLARITY OF THE OTHER THINGS. I CAN'T ANSWER YOUR QUESTIONS PRECISELY.

Q. WHAT'S THE MEANS FOR ASCERTAINING COINCIDENCE IN THE ATARI 2600?

A. WELL, THERE ARE 2 WAYS. IN THE 2600 HARDWARE ITSELF THERE IS AN AREA OF CIRCUITRY CALLED THE COLLISION LATCHES AND, IN FACT, IT DOESN'T JUST NOTE COLLISION BETWEEN 2 SPOTS, THERE ARE, IN FACT, I BELIEVE 15 DIFFERENT COLLISIONS THAT CAN BE DETECTED IN THE 2600, AND THESE ARE STORED DURING THE TIME THE PICTURE IS BEING GENERATED AND THEY'RE AVAILABLE FOR READ-OUT BY THE PROGRAM AS THE PROGRAM DOES ITS CALCULATION HAVING TO DO WITH GENERATING THE NEXT FRAME WHILE THE BEAM IS FLYING

BACK FROM TOP TO BOTTOM.

SO IT'S CERTAINLY THE CASE THOSE CAPABILITIES ARE NOT INTERCHANGEABLE, BUT AS I SAY, SINCE THE EXACT DETAILS OF THE CIRCUITRY ARE NOT SPELLED OUT IN THE 507, IT'S DIFFICULT TO BE PRECISE.

Q. AND, MR. THACKER, IN YOUR OPINION, IS THERE ANY SPECIFIC CIRCUITRY IN THE ATARI 2600 ACTIVISION PROGRAM COMBINATION WHICH IS THE EQUIVALENT OF THE CIRCUITRY FOR IMPARTING A DISTINCT MOTION IN THE RUSCH 2 PATENT SPECIFICATIONS?

A. NO. AS WE SAW EARLIER IN THE 2 EXHIBITS THAT DESCRIBE THE CIRCUITRY USED TO GENERATE MOTION IN THE RUSCH DEVICE, THAT CIRCUIT IS VERY WELL SPELLED OUT IN THE DRAWINGS AND SPECIFICATION IN 507. THERE IS NO SUCH CIRCUITRY IN THE 2600 WHATSOEVER.

Q. AND WOULD THE MEANS FOR IMPARTING A DISTINCT MOTION IN THE RUSCH 2 PATENT SPECIFICATIONS BE INTERCOMPATIBLE WITH ANYTHING IN THE ATARI 2600 ACTIVISION PROGRAM COMBINATION?

A. NO.

Q. HAVE YOU READ THE TRANSCRIPT OF DR. RIBBENS' TESTIMONY IN WHICH HE STATED THAT, IN HIS OPINION, THE CIRCUITRY DISCLOSED IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT IS EQUIVALENT TO THE ATARI 2600 USED WITH ACTIVISION SOFTWARE?

MR. ANDERSON: ARE YOU READING FROM THE RECORD?

MR. ESCHER: I'M GOING TO IN A MOMENT.

MR. ANDERSON: DO YOU WANT TO GIVE US A REFERENCE?

MR. ESCHER: I BELIEVE IT'S ON PAGES -- IT'S IN VOLUME 5 OF THE TRANSCRIPT AND IT'S AROUND PAGES 90 THROUGH A HUNDRED.

Q. THE ANSWER IS YES?

A. I'VE READ THAT PART OF THE TESTIMONY, YES.

Q. I WOULD LIKE YOU TO FOCUS ON THE EXPRESS RATIONALE OF DR. RIBBENS' TESTIMONY THAT, QUOTE, AND I'M READING NOW FROM PAGES 96 AND 97 OF VOLUME 5 OF THE TRANSCRIPT.

THE QUESTION WAS, WHAT IS YOUR OPINION?

ANSWER: I BELIEVE THAT THEY ARE EQUIVALENT.

QUESTION: PLEASE EXPLAIN THE REASONS FOR THAT.

ANSWER, AND I'M QUOTING NOW, THEY ARE EQUIVALENT IN THAT BOTH SYSTEMS FUNCTION TO GENERATE VIDEO SIGNALS FOR CAUSING A SIGNAL TO APPEAR ON THE SCREEN OF THE TELEVISION PICTURE TUBE AT A POINT WHICH IS DETERMINED BY THE TIME RELATIONSHIP TO THE HORIZONTAL AND VERTICAL SYNC ANALYZING PULSES, END QUOTE.

MR. THACKER, ARE YOU AWARE OF ANY SYSTEM FOR DISPLAYING A MOVING IMAGE ON A TELEVISION SCREEN WHICH WOULD NOT BE COVERED BY DR. RIBBENS' STATEMENT?

A. NONE.

Q. WOULD A CABLE TV SYSTEM, QUOTE, GENERATE VIDEO SIGNALS FOR CAUSING A SIGNAL TO APPEAR ON THE SCREEN OF THE TELEVISION PICTURE TUBE AT A POINT WHICH IS DETERMINED BY THE TIME RELATIONSHIP TO THE HORIZONTAL AND VERTICAL SYNC ANALYZING PULSES?

A. YES, THAT WOULD COVER IT, TOO.

Q. HOW ABOUT BROADCAST TELEVISION?

A. THE SAME.

Q. WHAT ABOUT THE ATARI 400 AND THE ATARI 5200?

A. THE SAME.

MR. ANDERSON: OBJECT, YOUR HONOR. THE QUESTION IS -- I MOVE TO STRIKE THAT ANSWER.

THE COURT: YES, THE MOTION MAY BE GRANTED.

MR. ESCHER: Q. WHAT ABOUT THE TECHNOLOGY OF THE SPIEGEL PATENT?

A. YES, THAT WOULD BE THE SAME. ESSENTIALLY, ANY --

MR. ANDERSON: I'LL OBJECT TO THIS, TOO. THIS IS GETTING INTO PRIOR ART. I HAVE NO OBJECTION TO THAT PROVIDED WE'RE NOT GOING TO HAVE ANOTHER WITNESS COME IN AND TESTIFY ABOUT PRIOR ART.

THE COURT: LET'S HEAR THE QUESTION FIRST.

MR. ESCHER: YOUR HONOR, OUR INTENTION WAS TO PRESENT THE PRIOR ART, FOUNDATION EVIDENCE AFTER MR. THACKER'S TESTIMONY AND THEN TO RECALL MR. THACKER TO DISCUSS THE PRIOR ART WITH THAT BACKGROUND IN MIND. WHAT ABOUT THE GENERAL --

MR. ANDERSON: I WOULD LIKE TO OBJECT TO THAT PROCEDURE. I DON'T THINK IT'S NORMAL TO LEAPFROG YOUR WITNESSES, EXPERT WITNESSES IN PARTICULAR, TO BUILD ON ONE TESTIMONY AND THEN THE --

THE COURT: I'LL OVERRULE THE OBJECTION. IF IT BECOMES DUPLICATIVE OR INCONSISTENT, I'LL RULE ON IT AT THAT TIME.

MR. ESCHER: Q. MR. THACKER, LET ME TRY RE-POSING THE QUESTION.

A. SURE.

Q. IN YOUR VIEW, WOULD THE GENERAL ELECTRIC NASA SCENE GENERATOR, QUOTE, GENERATE VIDEO SIGNALS FOR CAUSING A SIGNAL TO APPEAR ON THE SCREEN OF A TELEVISION PICTURE TUBE AT A

POINT WHICH IS DETERMINED BY THE TIME RELATIONSHIP TO THE HORIZONTAL AND VERTICAL SYNC ANALYZING PULSES?

MR. ANDERSON: YOUR HONOR, THERE IS NO FOUNDATION FOR THIS QUESTION. NOW, MR. ESCHER SAYS HE'LL CALL A WITNESS AND THEN RE-CALL THIS WITNESS. IF HE'S GOING TO RE-CALL THE WITNESS, LET'S LEAVE IT UNTIL --

THE COURT: IT'S ALL RIGHT. HE'S PRESENTING TESTIMONY AND ARGUMENT AS TO WHAT DR. RIBBENS HAD TO SAY AND THAT IT COVERED TOO MUCH TERRITORY. HE'S TRYING TO POINT OUT EXAMPLES OF WHERE IT MAY OR MAY NOT HAVE OCCURRED.

MR. ANDERSON: DR. RIBBENS DID NOT TALK ABOUT THE NASA. IT'S MEANINGLESS AT THIS POINT.

THE COURT: I UNDERSTAND THEY'RE TAKING IT AS STATEMENT AND TRYING TO APPLY IT AS A SITUATION.

MR. ANDERSON: THERE IS NO FOUNDATION THAT THIS WITNESS HAS THE KNOWLEDGE, BUT THANK YOU, YOUR HONOR. I'M SORRY.

MR. ESCHER: Q. PERHAPS I COULD TRY RE-POSING THE QUESTION ONCE MORE.

A. I WOULD APPRECIATE THAT, YES.

Q. MR. THACKER, IN YOUR VIEW, WOULD THE GENERAL ELECTRIC NASA SCENE GENERATOR GENERATE VIDEO SIGNALS FOR CAUSING A SIGNAL TO APPEAR ON THE SCREEN OF A TELEVISION PICTURE TUBE AT A POINT WHICH IS DETERMINED BY THE TIME RELATIONSHIP TO THE HORIZONTAL AND VERTICAL SYNC ANALYZING PULSES?

A. YES, AS WOULD ESSENTIALLY ANY DEVICE THAT GENERATED AN IMAGE ON A RAPID SCAN DISPLAY.

Q. INCLUDING THE CIRCUITRY IN THE BAER 1 PATENT?

A. INCLUDING THAT.

Q. WOULD THE COMPOSITION VIDEO WAVE FORM FOR ALL THE VARIOUS METHODS OF DISPLAYING SPOTS ON A SCREEN BE ESSENTIALLY IDENTICAL ON AN OSCILLOSCOPE?

MR. ANDERSON: I OBJECT, YOUR HONOR --

THE COURT: FIRST OF ALL, I DON'T UNDERSTAND YOUR QUESTION AT ALL.

MR. ANDERSON: THAT'S TWO OF US.

THE COURT: SINCE I'M THE ONE YOU HAVE TO EXPLAIN THIS TO, YOU BETTER REPHRASE THE QUESTION IF ONLY FOR THAT PURPOSE.

MR. ESCHER: Q. MR. THACKER, DOES AN OSCILLOSCOPE SHOW A PATTERN OF A VIDEO WAVE FORM?

MR. ANDERSON: I'LL OBJECT, YOUR HONOR. UNDER SOME CONDITIONS, MAYBE, UNDER MOST CONDITIONS, NO, AN OSCILLOSCOPE IS A PIECE OF --

THE COURT: LET HIM TESTIFY.

MR. ESCHER: Q. MR., THACKER COULD YOU RESPOND TO THE QUESTION?

A. YES. IT'S A PIECE OF LABORATORY TEST EQUIPMENT USED FOR MEASURING THE VOLTAGE OF A SIGNAL AS A FUNCTION OF TIME. WHEN YOU LOOK AT THE SCREEN OF THE OSCILLOSCOPE, WHAT YOU SEE IS A DOT THAT SWEEPS ACROSS THE SCREEN FROM LEFT TO RIGHT, AND IT SWEEPS AT A FIXED RATE, AND THE RATE IS ADJUSTABLE.

SO SOMETIMES IF IT'S SWEEPING RAPIDLY IT WILL, IN FACT, LOOK LIKE A LINE, BUT DISTANCES ALONG THE LINE ARE PROPORTIONAL TO TIME AND THE VERTICAL DEFLECTION OF THE SPOT IS PROPORTIONAL TO THE VOLTAGE SO, YES, IT'S A LABORATORY

INSTRUMENT FOR MEASURING VOLTAGE AGAINST TIME.

Q. CAN YOU MEASURE A COMPOSITE VIDEO WAVE FORM ON AN OSCILLOSCOPE?

THE COURT: I DON'T KNOW WHAT YOU MEAN BY A COMPOSITE --

MR. ESCHER: I'LL ASK THE WITNESS.

Q. MR. THACKER, WHAT IS A COMPOSITE VIDEO WAVE FORM?

A. IT GENERALLY, IN TELEVISION ENGINEERING, IT'S USED TO MEAN A WAVE FORM THAT CONTAINS BOTH THE VIDEO SIGNAL THAT IS THE SIGNAL THAT DETERMINES HOW BRIGHT A PARTICULAR ELEMENT OF THE PICTURE WILL BE PLUS THE SYNCHRONIZATION SIGNALS, THE TIMING SIGNALS THAT DETERMINE VERTICAL AND HORIZONTAL SYNCHRONY BETWEEN THE CAMERA AND RECEIVER, THE THINGS THAT WE HEARD DR. RIBBENS DISCUSS BACK IN JUNE.

NOW, THE ADVANTAGE OF A COMPOSITE WAVE FORM IS THAT IT IS POSSIBLE, IF YOU WANT TO LOOK AT ONE, FOR INSTANCE, ON AN OSCILLOSCOPE, TO SEE BOTH THE VIDEO SIGNALS AND THE SYNCHRONIZATION SIGNALS AS PART OF THE SAME DISPLAY, AND SO ONE CAN MAKE VERY PRECISE MEASUREMENTS, FOR INSTANCE, OF THE EXACT POSITION IN TIME OF A PARTICULAR ELEMENT OF A PICTURE ON AN OSCILLOSCOPE SCREEN BY LOOKING AT THE COMPOSITE WAVE SHAPE.

Q. MR. THACKER, CAN YOU MEASURE ON AN OSCILLOSCOPE A COMPOSITE VIDEO WAVE FORM FOR THE IMAGE DISPLAYED ON AN ATARI 2600?

A. CERTAINLY.

Q. AND CAN YOU MEASURE THE COMPOSITE VIDEO WAVE FORM FOR AN IMAGE DISPLAYED BY MEANS OF CABLE TELEVISION?

A. YES.

Q. AND BY BROADCAST TELEVISION?

A. YES.

Q. AND BY THE GENERAL ELECTRIC NASA SCENE GENERATOR?

MR. ANDERSON: I OBJECT, YOUR HONOR. THERE IS NO FOUNDATION FOR THAT AT ALL.

THE COURT: WELL, I HAVE A MORE FUNDAMENTAL PROBLEM WITH THIS. I DON'T SEE WHAT YOU'RE AIMING AT. I DON'T SEE WHAT THE PURPOSE OF THIS LINE OF INQUIRY IS.

MR. ESCHER: THE PURPOSE OF THE LINE OF INQUIRY IS TO DEMONSTRATE THE COMPOSITE VIDEO WAVE FORM FOR ANY METHOD OF DISPLAYING A SIGNAL ON THE SCREEN IS GOING TO END UP LOOKING THE SAME.

MR. ANDERSON: BUT THERE IS NOT ALWAYS A COMPOSITE VIDEO WAVE FORM. THAT'S A SPECIAL CASE. AND THERE IS NO FOUNDATION THAT THE PRIOR ART THAT WE'RE ASKING CONCLUSIONARY QUESTIONS ON WITH NO FOUNDATION AT ALL HAVE THE THINGS THAT MR. ESCHER ASSUMES THEY HAVE. THE QUESTION ASSUMES CERTAIN THINGS THAT ARE NOT IN EVIDENCE. THAT WAS MY ORIGINAL OBJECTION.

THE COURT: WHAT YOU'RE SAYING, THIS IS NOT TESTING MR. RIBBENS' OPINION ON THE EQUIVALENCE AS MUCH AS AS IT IS DISCUSSING THE PRIOR ART, AND WE HAVE TO HAVE MORE FOUNDATION FOR THE PRIOR ART.

MR. ANDERSON: ABSOLUTELY. DR. RIBBENS DID NOT TESTIFY TO THIS OR THE PRIOR ART.

THE COURT: I THINK THE OBJECTION IS WELL TAKEN.

MR. ESCHER: WE CAN RESERVE THIS UNTIL THE PRIOR ART TESTIMONY, YOUR HONOR.

THE COURT: ALL RIGHT.

MR. ESCHER: Q. MR. THACKER, IF YOU VIEWED EQUIVALENCE AS BEING LIMITED TO EQUIVALENT RESULT, WOULD YOU CONSIDER THE ATARI 2600 ACTIVISION COMBINATION AS BEING EQUIVALENT TO THE RUSCH 2 PATENT SPECIFICATIONS?

A. IF I DID THAT, IF I VIEWED IT AS RESULTS ONLY, I WOULD HAVE TO, YES.

Q. JUST SO THE RECORD IS CLEAR, IS IT STILL YOUR TESTIMONY THAT THE ATARI 2600 ACTIVISION SOFTWARE COMBINATION IS NOT EQUIVALENT TO THE CIRCUITRY DISCLOSED IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT?

A. IT IS.

MR. ESCHER: YOUR HONOR, I DON'T HAVE ANY FURTHER QUESTIONS FOR MR. THACKER ON DIRECT EXAMINATION ON THE SUBJECT OF EQUIVALENCE, NON-EQUIVALENCE, AND INFRINGEMENT, BUT WE INTEND TO CALL HIM BACK TO THE STAND TO OFFER HIS OPINION ON THE ISSUE OF PATENT AND VALIDITY BECAUSE OF OBVIOUSNESS IN LIGHT OF THE PRIOR ART AFTER ACTIVISION HAS INTRODUCED ITS EVIDENCE ON PRIOR ART.

MR. ANDERSON: YOUR HONOR, AGAIN, I OBJECT. UNLESS -- WELL, THE PROCEDURE IS IRREGULAR. I OBJECT TO INTERRUPTING THIS WITNESS'S TESTIMONY, I OBJECT TO WHAT APPEARS TO BE THE PLAN TO HAVE BOTH MR. SHOUP AND MR. THACKER GIVE THESE OPINION TESTIMONIES. AND THAT'S WHAT WE MOVE -- YOUR HONOR RULED THIS MORNING, AND WE'RE HEADED IN THAT DIRECTION, AND IT'S VERY FORESEEABLE.

THE COURT: PARDON ME?

MR. ANDERSON: WE'RE HEADED IN THAT DIRECTION VERY

CLEARLY, AND I THINK THAT WE SHOULD FINISH WITH THIS WITNESS. IF HE KNOWS THE PRIOR ART, I DON'T THINK HE SHOULD PREMISE ANY OPINION ON PRIOR ART BASED ON SOMETHING MR. SHOUP IS GOING TO GIVE AS TESTIMONY. IF THIS WITNESS HAS THE KNOWLEDGE, PUT IT IN, AND LET'S NOT USE THE OTHER WITNESS. IF THIS WITNESS --

THE COURT: THEN YOU'RE OBJECTING ON LACK OF FOUNDATION BECAUSE CERTAIN THINGS HAVEN'T BEEN SAID. I'M GOING TO ACCEDE, BUT IF, AFTER I HEAR THE TESTIMONY AND MR. THACKER TAKES THE STAND AGAIN, WE'LL HAVE TO DEAL WITH WHAT HE HAS TO SAY AGAIN.

MR. ANDERSON: I'D LIKE TO RESERVE MY CROSS-EXAMINATION.

MR. ESCHER: I WOULD LIKE TO MOVE NOW FOR THE INTRODUCTION OF EXHIBITS JD --

THE COURT: HANG ON HERE FOR A MINUTE.

(PAUSE.)

MR. ANDERSON: NO OBJECTION, YOUR HONOR.

THE COURT: WHAT EXHIBITS?

MR. ESCHER: EXHIBITS JD, JF.

MR. ANDERSON: NO OBJECTION, YOUR HONOR.

(PAUSE.)

THE COURT: JD IS ADMITTED INTO EVIDENCE. JF IS ADMITTED INTO EVIDENCE.

MR. ESCHER: JI IS THE FISHING DERBY BLOCK DIAGRAM.

MR. ANDERSON: NO OBJECTION, YOUR HONOR.

MR. ESCHER: IW.

THE COURT: ALL RIGHT. ONE MOMENT.

(PAUSE.)

THE COURT: MAY BE ADMITTED INTO EVIDENCE.

MR. ESCHER: FINALLY IX AND IY.

MR. ANDERSON: NO OBJECTION, YOUR HONOR.

THE COURT: IT MAY BE ADMITTED INTO THE EVIDENCE.

MR. ESCHER: THANK YOU, YOUR HONOR.

MR. GLICK: YOUR HONOR, IN LIGHT OF THE DECISION NOT TO CROSS-EXAMINE MR. THACKER AT THIS TIME, IT MAKES A CHANGE ON WHAT WE HAD ANTICIPATED THE SCHEDULE MIGHT BE. IF YOU WILL GIVE US A 10-MINUTE BREAK, WE CAN SET UP EQUIPMENT FOR SOME DEMONSTRATIONS.

THE COURT: THAT'S FINE. IF WE REACH A POINT, HOWEVER, TODAY WHERE YOU'RE NOT READY WITH ANOTHER WITNESS BECAUSE YOU HAD ANTICIPATED MR. ANDERSON TAKING AN HOUR OR TWO WITH MR. THACKER, I MAY ASK MR. ANDERSON TO GO AHEAD AND ENGAGE HIS CROSS-EXAMINATION ON WHAT WE'VE COVERED ALREADY JUST TO USE THE TIME.

WE'LL TAKE A 10-MINUTE RECESS AT THIS TIME.

MR. GLICK: THANK YOU, YOUR HONOR.

(RECESS.)

THE COURT: BE SEATED.

MR. GLICK: YOUR HONOR, THIS WILL BE A CONVENIENT TIME TO DO A GOOD DEAL OF HOUSEKEEPING, IF WE MIGHT.

OUR NEXT WITNESS TO TESTIFY WILL BE HERE AFTER LUNCH, BUT WE'LL FILL THE TIME DEALING WITH A NUMBER OF EVIDENTIARY PROBLEMS AND INTRODUCTION OF TRANSCRIPTS AND OTHER MATTERS.

THE COURT: OKAY.

MR. GLICK: LET ME BEGIN BY MOVING INTO EVIDENCE A LIST OF ITEMS FROM OUR LAST SECTION WHICH I DIDN'T MOVE INTO

EVIDENCE AT THAT TIME. I HAVE PROVIDED A LIST OF THOSE THIS MORNING TO MR. ANDERSON AND MR. WILLIAMS, BUT I'M SURE THEY'LL COMMENT IF THEY FEEL THEY HAVE HAD AN ADEQUATE OPPORTUNITY TO RE-FOCUS ON THEM.

MR. ANDERSON: I BELIEVE WE HAVE NOW BEEN THROUGH THEM ALL AND BEEN IN A POSITION TO RESPOND.

THE COURT: DO YOU HAVE TO DO IT ONE BY ONE OR, MOST YOU AGREE, AND --

MR. ANDERSON: A FEW, WE DON'T.

MR. GLICK: WHY DON'T I CALL THE NUMBER, AND IF I NEED TO ELABORATE, PERHAPS MR. ANDERSON WILL TELL ME.

MR. ANDERSON: ALL RIGHT.

MR. GLICK: THE FIRST ONE IS EXHIBIT DN.

MR. ANDERSON: NO OBJECTION.

THE COURT: ADMITTED.

MR. GLICK: THE NEXT IS FU.

MR. ANDERSON: YOUR HONOR, THAT'S, I BELIEVE, A KEYSTONE CAPER EQUIPMENT OR CARTRIDGE AND/OR MANUAL. IS THAT FOR THE 2600?

MR. GLICK: YES.

MR. ANDERSON: NO OBJECTION.

THE COURT: ADMITTED.

MR. GLICK: THE NEXT IS FZ, THAT'S THE FREEWAY GAME CARTRIDGE.

MR. ANDERSON: WE OBJECT TO THE FREEWAY, YOUR HONOR. THAT'S NOT ONE OF THE ACCUSED GAMES.

THE COURT: HANG ON ONE MINUTE. I'M NOT GOING TO RULE ON THE OBJECTION, BUT I'LL TAKE THEM DOWN AND TAKE

THE CAPABILITY OF THE EQUIPMENT THAT IS ACCUSED OF BEING EQUIVALENT TO THE RUSCH 2 PATENT. THE NEXT IS --

MR. ANDERSON: THE BRIDGE IS NOT AN ACCUSED GAME.

THE COURT: I UNDERSTAND.

MR. ANDERSON: BUT IT IS FOR THE 2600?

MR. GLICK: YES.

THE COURT: ALL RIGHT.

MR. GLICK: IA WAS A LETTER FROM MR. ETLINGER, E-T-L-I-N-G-E-R, TO MR. MARTIN WHICH CONTAINED SOME NEW GAME IDEAS FOR MR. BAER, INCLUDING A NEW IDEA FOR A GAME ENTITLED SPACE WAR.

MR. ANDERSON: I'LL POINT OUT FOR THE RECORD THAT BY THE VERY STATEMENT IN THE LETTER, IT'S NOT THE SPACE WAR WE'RE TALKING ABOUT IN ANY SENSE OF THE WORD.

THE COURT: I'D READ IT AND IT MAY BE ADMITTED INTO EVIDENCE.

MR. GLICK: IB, DR. RIBBENS' NOTES.

THE COURT: ADMITTED.

MR. GLICK: IC, MEMORANDUM FROM MR. MIKE WILSON TO MR. STAUP, S-T-A-U-P.

THE COURT: ADMITTED.

MR. GLICK: ID IS AFFIDAVIT FROM MR. MAYER, AN ATTORNEY FOR NORTHERN AMERICAN.

MR. ANDERSON: NO OBJECTION.

THE COURT: ADMITTED.

MR. GLICK: IO, LETTER TO MR. LEVY TO MR. MEINKEN, M-E-I-N-K-E-N, WITH MAGNAVOX.

MR. ANDERSON: NO OBJECTION.

THE COURT: MAY BE ADMITTED.

MR. GLICK: JG IS A JULY 26, 1976 MEMORANDUM FROM MR. BRIODY, B-R-I-O-D-Y.

MR. ANDERSON: WE OBJECT TO THAT, YOUR HONOR. THAT WAS ATTEMPTED TO BE SHOWN TO MR. BUSHNELL AS SOME SORT OF LEADING BASIS FOR QUESTIONS. I OBJECTED TO IT, IT WAS WITHDRAWN, AND I OBJECT TO IT NOW. THERE IS NO FOUNDATION FOR PUTTING IT IN.

THE COURT: RELEVANCE FOUNDATION?

MR. ANDERSON: YES, SIR.

MR. GLICK: I'LL COMMENT AT THE POINT THAT YOU INDICATE TO ME THAT I SHOULD.

THE COURT: I DON'T HAVE THE MEMO IN FRONT OF ME.

MR. GLICK: IT'S A MEMO FROM MR. BRIODY, WHO IS AN OFFICIAL OF MAGNAVOX. IT NEEDS NO FURTHER FOUNDATION. THE FACT THAT IT'S IN ADMISSION, IT RELATES TO THE ISSUE OF WHETHER OR NOT MAGNAVOX RECEIVED FROM THE ATARI SETTLEMENT THE KNOW-HOW WHICH THEY CLAIMED WAS A PART OF THE SETTLEMENT WHICH RELATES TO THE COMMERCIAL SUCCESS ISSUE PRESENT IN THIS CASE AND IT BOLSTERS MR. BUSHNELL'S TESTIMONY ON THAT POINT.

MR. ANDERSON: I TAKE EXCEPTION TO THE COMMENT.

THE COURT: I'LL RESERVE RULING ON THAT UNTIL I READ THE DOCUMENT AGAIN.

MR. GLICK: THAT'S WHAT I TERM GROUP 1 OF EXHIBITS, YOUR HONOR. THERE IS A SECOND AND SMALLER GROUP THAT I SUSPECT AS TO MOST THERE WILL BE NO OBJECTION.

EXHIBIT DM IS THE COLECO AGREEMENT WITH MAGNAVOX AND THE RESOLUTION OF THEIR LITIGATION WITH MAGNAVOX.

MR. ANDERSON: NO OBJECTION.

THE COURT: ADMITTED.

MR. GLICK: "DO" IS THE SIMILAR AGREEMENT FROM SEEBURG, S-E-E-B-E-R-G.

MR. ANDERSON: B-U-R-G.

THE COURT: S-E-E-B-U-R-G.

MR. ESCHER: SORRY.

THE COURT: ADMITTED.

MR. GLICK: EC.

MR. ANDERSON: NO OBJECTION, YOUR HONOR. THAT'S THE APF.

MR. ESCHER: COUNTERCLAIM. AND EG, THE APF-MAGNAVOX SETTLEMENT AGREEMENT.

MR. ANDERSON: NO OBJECTION.

THE COURT: BOTH ADMITTED.

MR. GLICK: FO IS THE STIPULATION AND COVENANT NOT TO SUE ON THE 480 PATENT ON FILE IN THIS CASE.

MR. ANDERSON: NO OBJECTION.

THE COURT: ADMITTED.

MR. GLICK: GU WAS THE JOYSTICK ITSELF THAT WAS TESTIFIED TO OR ABOUT IN THIS ACTION.

MR. ANDERSON: WE OBJECT TO THAT, YOUR HONOR. IT'S IRRELEVANT, BEARS NO RELATIONSHIP TO ANY ISSUE.

MR. GLICK: THE JOYSTICK IS THE SEPARATE COMPONENT, YOUR HONOR, MANUFACTURED BY JOYSTICK MANUFACTURERS WHO MANUFACTURED THAT COMPONENT WHICH MAY BE ATTACHED TO AN ATARI 2600 AND USED IN THE PLAYING OF GAMES.

MR. ANDERSON: IT HAS NOT BEEN ATTACHED TO ANY OF

THE EXHIBITS TO THE ATARI 2600 HERE. IT'S IRRELEVANT, YOUR HONOR, AND BEARS NO RELATIONSHIP TO ANY ISSUE. IT'S NOT A PRODUCT OF THE ATARI, APPARENTLY, AND --

THE COURT: IS THIS AN OBJECT OR DIAGRAM?

MR. GLICK: IT'S AN OBJECT.

THE COURT: I'LL WITHHOLD RULING ON THAT, TOO.

MR. GLICK: EXHIBIT G -- I'M SORRY. JH, YOUR HONOR, YOU DO NOT HAVE AT THIS MOMENT, AND I WOULD LIKE TO HAVE IT -- IT IS MARKED AND I WOULD LIKE TO PRESENT IT TO THE COURT AT THIS TIME.

MR. ANDERSON: NO OBJECTION, YOUR HONOR. WE DO HAVE A COPY.

MR. GLICK: I WOULD, UNDER THE COURT'S PREVIOUS INSTRUCTIONS TO US AS TO HOW TO HANDLE DOCUMENTS, TAKE HALF A MOMENT AND INDICATE TO YOU THAT WHAT THESE ARE ARE 3 RECORDINGS FROM THE BOOK OF MINUTES OF THE ACTIVISION CORPORATION RELATING TO DISCUSSION BY THE BOARD OF THE ISSUES RAISED IN THIS LITIGATION. YOU WILL RECALL AT THE END OF THE SESSION LAST TIME, YOUR HONOR, YOU DIRECTED US TO SEARCH FOR THESE, AND I MAILED THEM SOME TIME AGO TO MR. ANDERSON AND MR. WILLIAMS.

MR. ANDERSON: NO OBJECTION.

THE COURT: JH MAY BE ADMITTED INTO EVIDENCE.

MR. GLICK: EXHIBIT -- WE'VE NOT RE-MARKED AS A DEFENDANT'S EXHIBIT, BUT IT'S PLAINTIFFS' EXHIBIT 140, A LETTER --

MR. ANDERSON: 40 OR 140?

MR. GLICK: 140. I'M SORRY.

THE COURT: 140.

MR. GLICK: LETTER FROM ALTEST TO ROBERT GOODMAN, JUNE 10, 1982.

MR. ANDERSON: NO OBJECTION TO PLAINTIFFS' EXHIBIT 140, YOUR HONOR.

THE COURT: ADMITTED INTO EVIDENCE.

MR. GLICK: THAT COVERS THE EXHIBITS, YOUR HONOR, AND I THEN MOVE ON TO OUR NEXT ITEM. AND THAT WOULD BE, WE WISH TO -- HAVING REVIEWED THE RECORD, WE THINK THERE MAY BE AMBIGUITY ON THE JUDICIAL NOTICE AS TO WHETHER OR NOT THEY HAVE OR HAD NOT HAD JUDICIAL NOTICE TAKEN TO THEM, AND MS. MILLER WILL ADDRESS THE COURT ON THESE SO WE CAN CLARIFY THE RECORD.

MS. MILLER: YOUR HONOR, IN GOING BACK TO THE RECORD FROM THE FIRST DAY, YOU TOOK JUDICIAL NOTICE OF PAPERS FILED IN PRIOR COURT PROCEEDINGS. WE HAD ON OUR REQUEST FOR JUDICIAL NOTICE A TOTAL OF 13 ITEMS. I'D LIKE TO CLARIFY NOW THAT 1 THROUGH 7 ON THAT LIST OF REQUEST FOR JUDICIAL NOTICE ARE, IN FACT, BASED ON PAPERS FILED IN PRIOR COURT PROCEEDINGS.

THE COURT: ALL RIGHT. WELL, I'M GOING TO HAVE TO GO BACK AND READ THEM AGAIN. LET ME MAKE A NOTE HERE.

(PAUSE.)

THE COURT: ALL RIGHT.

MS. MILLER: NUMBERS -- NUMBER 8 IS THE REQUEST FOR JUDICIAL NOTICE OF PATENT OFFICE APPLICATION STATISTICS, WHICH WE'VE REQUESTED THE COURT TAKE JUDICIAL NOTICE OF PURSUANT TO THE CUSTOM BY GOVERNMENT ENTITIES.

THE COURT: AGAIN, I'M GOING TO -- ANY ONES THAT ARE

OBJECTED TO, I'LL TAKE IT UNDER SUBMISSION AND LET YOU KNOW.

MR. ANDERSON: YOUR HONOR, WE DID HAVE A DIALOGUE ON ALL OF THESE AT THE OPENING OF TRIAL, AND I DON'T KNOW THE PURPOSE OF -- I'M NOT PREPARED REALLY TO GO INTO THIS AT THIS POINT. IT COMES AS A SURPRISE.

THE COURT: WELL --

MR. ANDERSON: THERE IS ONE THAT THE COURT DID TAKE JUDICIAL NOTICE, AND I BELIEVE THAT WAS THE DEFINITION OF FLIP-FLOP, AS I RECALL.

MS. MILLER: YES, YOUR HONOR, I BELIEVE YOU TOOK JUDICIAL NOTICE OF ITEM 13, WHICH WAS THE DEFINITION FROM WEBSTER'S DICTIONARY. WE WANTED TO CLARIFY THAT, AS I SAID --

THE COURT: 1 THROUGH 7.

MS. MILLER: 1 THROUGH 7.

THE COURT: BECAUSE OF STATEMENTS ON PRIOR COURT PROCEEDINGS.

MR. ANDERSON: THAT WAS MY UNDERSTANDING, YOUR HONOR.

MS. MILLER: AND TO MAKE CLEAR THE REASONS FOR A FEW OF THE OTHER REASONS AND TO FORMALLY WITHDRAW ONE ITEM.

THE COURT: LET'S GO THROUGH THE NUMBERS.

MS. MILLER: 1 THROUGH 7 WE'VE GONE THROUGH.

NUMBER 8 IS THE PATENT OFFICE STATISTICS.

NUMBER 9 AND 10 ARE REQUESTS THAT THE COURT TAKE JUDICIAL NOTICE OF LEGISLATIVE HISTORY.

NUMBER 11 IS REQUEST THAT THE COURT TAKE JUDICIAL NOTICE OF THE PATENT AND TRADEMARK OFFICE, AND, AGAIN, THIS IS PURSUANT TO THE CUSTOM OF TAKING JUDICIAL NOTICE OF REGULATIONS AND PROCEDURES OF PUBLIC AGENCIES.

12, WE WILL WITHDRAW AT THIS TIME.

AND NUMBER 13, AS YOUR HONOR INDICATED, WAS JUDICIALLY NOTICED LAST JUNE.

THE COURT: I'LL ASK MR. ANDERSON TO PLEASE, WHEN HE HAS TIME, TO COMMENT ON 8 THROUGH 11, AND THEN I WILL RULE AFTER I GO BACK AND REVIEW THIS.

MS. MILLER: THANK YOU, YOUR HONOR.

MR. GLICK: YOUR HONOR, MY LEGAL ASSISTANT --

MR. ANDERSON: YOUR HONOR, BEFORE WE GO ON. WITH RESPECT TO PARAGRAPHS 1 THROUGH 7, IT'S MY UNDERSTANDING THAT THE COURT WILL TAKE JUDICIAL NOTICE OF THOSE PROCEEDINGS AND THOSE PUBLISHED DOCUMENTS, BUT NOT TAKE JUDICIAL NOTICE OF WHAT -- HOW THEY'RE CHARACTERIZED IN THIS PARTICULAR DOCUMENT AND WHAT'S SAID ABOUT THEM.

THE COURT: IT'S THE PIECES OF PAPER THEMSELVES.

MR. ANDERSON: AND ONLY THOSE?

THE COURT: THAT'S RIGHT.

MR. ANDERSON: THANK YOU, YOUR HONOR.

THE COURT: BUT YOU'RE GOING TO COMMENT ON 8 THROUGH 11?

MR. ANDERSON: YES, I WILL, AS SOON AS WE'VE HAD A CHANCE TO REVIEW THEM, YOUR HONOR.

THE COURT: GO AHEAD.

MR. GLICK: YOUR HONOR, AS I WAS SAYING, MS. LINTLOP CALLED TO MY ATTENTION WE INTRODUCED MOST OF THE PATENT AND EXCERPTS FROM PATENT, THERE WERE 9 THAT I NEGLECTED TO MENTION TO THE COURT EACH TIME. THESE ARE PATENT OR EXCERPTS FROM THE 284, 285 OR 798 PATENT OR FILE WRAPPER. I'LL IDENTIFY THE

NUMBERS AND GIVE COUNSEL TIME TO TELL ME WHETHER MY REPRESENTATION ARE ACCURATE.

THERE ARE CR, CS, CT, CU, CV, CW, CX, CY, AND DB. AND I WOULD MOVE THE ADMISSION OF THOSE EXHIBITS AT THIS TIME SUBJECT TO AN OPPORTUNITY FOR COUNSEL TO RESPOND.

THE COURT: MR. GLICK, COULD I ASK TO YOU RUN THOSE BY AGAIN?

MR. GLICK: CERTAINLY. THEY BEGIN AT CR AND PROCEED WITH S, T, U, V, W, X, AND Y IN THE C SERIES IN A ROW THERE, AND THE LAST ONE IS DB.

THE COURT: THANK YOU. WE'RE GOING TO GIVE MR. ANDERSON AN OPPORTUNITY TO COMMENT ON THOSE.

MR. ANDERSON: FROM A QUICK REVIEW, I THINK WE HAVE NO OBJECTION TO ANY OF THEM, YOUR HONOR. SOME ARE PART OF OTHER DOCUMENTS, BUT WE WON'T OBJECT ON THAT BASIS.

THE COURT: THEY MAY THEN BE ADMITTED INTO EVIDENCE.

MR. GLICK: WE NEXT PROCEED, YOUR HONOR --

THE COURT: JUST A SECOND. I HAVE TO GET MY PAPER WORK DONE HERE.

(PAUSE.)

THE COURT: ALL RIGHT.

MR. GLICK: WE'LL PROCEED NEXT TO THE EXCERPTS OF DEPOSITIONS WHICH ACTIVISION HAD DESIGNATED DURING THE PROCEDURES BEFORE TRIAL THAT WOULD BE INTRODUCED DURING THE CASE, AND, FIRST, YOUR HONOR, WE HAVE THE NOTEBOOKS, WE'VE PROVIDED ONE TO PLAINTIFFS, AND I WOULD LIKE AT THIS TIME TO PROVIDE ONE TO YOUR HONOR.

THE COURT: NOW, AM I SIMPLY RECEIVING THOSE OR ARE

THERE OBJECTIONS BY THE PLAINTIFF THAT WE HAVE TO RULE ON?

MR. GLICK: I THINK YOU JUST NEED TO RECEIVE THEM FOR THE MOMENT.

THE COURT: OKAY.

MR. GLICK: YOUR HONOR, AGAIN TO FOLLOW THE PROCEDURE WE DISCUSSED AT THE SIDE BAR, I WOULD LIKE TO TAKE A MOMENT WITH 4 OF THESE TO INDICATE TO YOUR HONOR THE MATTERS THAT THEY'RE OFFERED FOR. AND THEN PERHAPS IF THERE ARE COUNTERDESIGNATIONS OR OBJECTIONS, WE CAN HEAR THEM IN DUE COURSE. THE FIRST DEPOSITION IN THE GROUP IS THE DEPOSITION OF WILLIAM HARRISON, H-A-R-R-I-S-O-N.

MR. ANDERSON: NO OBJECTION, YOUR HONOR, AND NO COUNTERDESIGNATION.

THE COURT: OKAY.

MR. GLICK: MR. HARRISON'S DEPOSITION, YOUR HONOR, IS INDICATED TO INDICATE --

THE COURT: SO I UNDERSTAND WHAT YOU'VE DONE HERE, I'M WORKING OFF A LIST AND THE LIST CUES INTO THE BLACK BINDERS THAT CONTAINS THOSE PORTIONS OF THE TRANSCRIPT?

MR. GLICK: THAT'S CORRECT.

THE COURT: OKAY.

MR. GLICK: MR. HARRISON, YOUR HONOR WILL RECALL, WAS THE ENGINEER WHO WORKED WITH MR. BAER ON THE TELEVISION GAMES PROJECT AT SANDERS ASSOCIATES, AND THE LIMITED DEPOSITION EXCERPTS YOU HAVE ARE OFFERED TO SHOW WHEN MR. RUSCH BEGAN WORK AND CAME ON BOARD, TO SHOW THAT THE CAR RACE GAME THAT THERE WAS TESTIMONY ABOUT WAS DONE AND, QUOTE, TESTED AND PERFORMED AS INTENDED IN MAY OF 1967, TO SHOW THAT

MR. HARRISON STUDIED THE BOOK ON COLOR TELEVISION THAT MR. BAER GAVE HIM, AND MR. HARRISON DID A, QUOTE, RANDOM PULSE GENERATOR TO RANDOMLY MOVE THE TARGET IN THE TARGET SHOOTING GAME.

THE NEXT DEPOSITION OFFERED IS THE DEPOSITION OF LOUIS ETLINGER, E-T-L-I-N-G-E-R.

MR. ANDERSON: NO OBJECTION AND NO COUNTERDESIGNATION, YOUR HONOR.

MR. GLICK: THE EXCERPTS FROM MR. ETLINGER CONTAIN 3 PAGES AS TO WHO HE IS AS A PATENT LAWYER FOR SANDERS AND A 2-PAGE EXCERPT WHICH INDICATES THAT HE AND MR. BAER CONSIDERED THE POSSIBILITY OF EDUCATIONAL USE AND TRAINING AID FOR THE MILITARY FOR THE BAER DEVICE. THE THIRD INDIVIDUAL IS MR. ROBERT MAYER, M-A-Y-E-R.

MR. ANDERSON: NO OBJECTION AND NO COUNTERDESIGNATION, YOUR HONOR.

MR. GLICK: MR. MAYER'S EXCERPTS, YOUR HONOR, INDICATE HIS BACKGROUND AS A PATENT ATTORNEY WITH U.S. PHILLIPS AND HIS REPORTING RELATIONSHIP TO MR. BRIODY, THAT IN THE COURSE OF SETTLEMENT NEGOTIATIONS WITH APF, MAGNAVOX VALUED THE SPIEGEL PATENT AT $200,000 WHEN THEY ACQUIRED IT, THAT THEY NEVER TRIED TO COLLECT OR CHARGE INFRINGEMENT BASED ON THEIR OWNERSHIP OF THE SPIEGEL PATENT, NOR EVER INVESTIGATED FOR INFRINGEMENT OF THAT PATENT.

IT ALSO PROVIDES TESTIMONY THAT MAGNAVOX DID NOT -- DOES NOT POSSESS SOFTWARE LICENSES FROM ANY SOFTWARE ONLY MANUFACTURER, SAVE HIS BELIEF THAT MILTON BRADLEY IS SUCH A MANUFACTURER. AND INDICATES THAT THERE WERE NO ATTEMPTS TO

OBTAIN LICENSES FROM A MAGIC, PARKER BROTHERS, AND SOME OTHER SOFTWARE MANUFACTURERS THAT I WON'T LIST HERE.

MR. ANDERSON: I WOULD ONLY MENTION, YOUR HONOR, THAT THE SPIEGEL PATENT THAT MR. GLICK REFERS TO, IT HAD ALREADY EXPIRED AT THE TIME THE TRANSACTION THAT WE'RE DEALING WITH OCCURRED.

THE COURT: ALL RIGHT.

MR. GLICK: THE NEXT DEPOSITION IS THE DEPOSITION OF MARTIN LIPPER, L-I-P-P-E-R.

MR. ANDERSON: NO OBJECTION AND NO COUNTERDESIGNATION, YOUR HONOR.

MR. GLICK: MR. LIPPER WAS THE TREASURER AND BOARD MEMBER OF APF, AND HIS TESTIMONY DEALS WITH HIS FEELING THAT THE SPIEGEL PATENT WAS VERY IMPORTANT AND THAT APF ACQUIRED IT.

NOW, THE OTHER DEPOSITION TRANSCRIPTS WHICH YOUR HONOR HAS IN FRONT OF YOU WE WILL GO INTO MOMENTARILY AS WE GO INTO THE PIECES OF PRIOR ART WITH SOME OF THE FILMS.

BEFORE I DO THAT, THERE IS ONE OTHER ITEM THAT WE SHOULD DEAL WITH AND THAT IS A SEPARATE SET OF PRIOR TESTIMONY WHICH WE HAVE TERMED ADMISSIONS, THAT IS PRIOR TESTIMONY FROM THE PLAINTIFFS OR AGENTS. AND THERE ARE SOME 8 OF THOSE WHICH WERE ON A LIST TO ENSURE A MORE SPEEDY DEALING WITH I MAILED 2 OR 3, 4 WEEKS AGO TO MR. WILLIAMS, AND PERHAPS WE CAN FIND OUT IF THERE ARE ANY OBJECTIONS TO THEM AND, IF SO, TO WHICH ONES AND THEN I CAN DEAL WITH THOSE.

(PAUSE.)

MR. GLICK: FOR THE RECORD, WE HAVE MARKED THIS BOOK AS EXHIBIT JV, IS THAT CORRECT?

THE COURT: JL.

MR. GLICK: JL, WITH EACH OF THE SEGMENTS THEREIN WITH THE NUMBERS JL-1 TO 8.

(PAUSE.)

THE COURT: LET'S HOLD THAT FOR A MOMENT.

MR. GLICK: FINE. WE CAN RETURN TO THESE AFTER LUNCH, YOUR HONOR.

THE COURT: LET'S GIVE MR. ANDERSON A CHANCE TO FIND THEM.

MR. GLICK: SURE.

MR. ANDERSON: WE'VE NOW FOUND IT AND WE HAVE NO OBJECTION. THAT'S THE BAER EXCERPTS.

MR. GLICK: THERE ARE 8 EXCERPTS. LET ME BRIEFLY, THEN, YOUR HONOR, TRACE THEM AT THIS TIME. ITEM 1 --

THE COURT: FIRST OF ALL, JL MAY BE ADMITTED INTO THE EVIDENCE.

MR. GLICK: THANK YOU, YOUR HONOR. ITEM 1 IS THE STATEMENT FROM -- IS AN EXCERPT FROM AN OPENING STATEMENT IN ONE OF THE PRIOR TRIALS INDICATING THAT THE 598 WERE THE SUPERIOR CIRCUITS AND INDICATING THE DRAWBACKS OF THE SLICER CIRCUIT.

ITEM 2 WAS THE MATELL ACTION LIMITED TO INFRINGEMENT ONLY.

ITEM 3 WAS TESTIMONY OFFERED BY A SPECIAL PATENT PROCEDURE EXPERT NAMED KAYTON, K-A-Y-T-O-N, WHO WAS CALLED BY MAGNAVOX TO, AMONG OTHER THINGS, GIVE TESTIMONY THAT BY MENTIONING 480 IN THE BODY OF THE 507 PATENT, MAGNAVOX AND SANDERS ADMIT AS A MATTER OF PATENT OFFICE PROCEDURE, THAT THE

480 IS PRIOR ART IN REGARD TO THE 507.

ITEM 4 IS A DECLARATION OR AFFIDAVIT FROM MR. BAER IN WHICH HE ASSERTS THAT SUCCESS IN THE TELEVISION GAMES INDUSTRY WAS DUE TO HIS INVENTION. I DON'T WANT TO MISCHARACTERIZE, YOUR HONOR, I THINK YOU SHOULD REVIEW IT.

THE COURT: YES, I CAN READ IT.

MR. GLICK: BUT THAT'S THE POINT TO WHICH IT'S OFFERED. AND I BELIEVE MR. BAER SAYS, TO MY INVENTION AND OTHER INVENTIONS.

ITEM 5 IS A STATEMENT MADE IN THE PROCEEDINGS ON THE 480 PATENT BY MAGNAVOX PATENT ATTORNEY OR SANDERS ATTORNEY, MR. SELIGMAN, S-E-L-I-G-M-A-N, IN WHICH HE STATES THAT THE 507 AND 589 ARE IMPROVEMENT PATENTS DEVELOPED AFTER MR. BAER'S INVENTION.

THE FINAL 3, WHICH I'LL NOT REVIEW IN DETAIL WITH THE COURT AT THIS MOMENT, WERE BASICALLY COVERED IN MR. BAER'S DIRECT TESTIMONY, BUT ARE OFFERED TO CLARIFY WHAT I FOUND IN REVIEWING THE TRANSCRIPT THAT MAY BE CONCEIVABLE AREAS OF MISUNDERSTANDING IN THE THRUST OF THAT TESTIMONY.

WE WOULD PROCEED, YOUR HONOR, AT YOUR PLEASURE, TO THE FIRST FILM OR DO THAT --

THE COURT: HOW LONG DO YOU THINK IT IS?

MR. GLICK: 10 TO 15 MINUTES.

THE COURT: LET'S TAKE IT NOW, THEN. DO YOU NEED THE LIGHTS DOWN?

MR. HOVER-SMOOT: I DON'T THINK SO, YOUR HONOR.

MR. GLICK: YOUR HONOR, IT WOULD BE WELL, SINCE THIS FILM DEPENDS FOR ITS UNDERSTANDING ON THE DEPOSITIONS THAT

WERE TAKEN IN HOUSTON IN THIS ACTION OF MR. LAWRENCE AND MR. SMITH, AND I BELIEVE THE DEPOSITION IN UTAH OF MR. SCHUMACHER, THAT WE WOULD OFFER AT THIS TIME THE DEPOSITION EXCERPTS WHICH YOUR HONOR HAS FROM THOSE 3 INDIVIDUALS.

THE COURT: NOW, WHICH ONES?

MR. GLICK: LAWRENCE, SMITH, AND SCHUMACHER, S-C-H-U-M-A-C-H-E-R.

MR. ANDERSON: YOUR HONOR, WE HAVE NO OBJECTION, AND WE HAVE PREPARED A COUNTERDESIGNATION WHICH WE WILL HAND UP LATER TODAY WITH RESPECT TO LAWRENCE AND SMITH.

THE COURT: ALL RIGHT.

MR. GLICK: I SHOULD SAY FOR THE RECORD THAT THE SCHUMACHER THAT WE'RE TALKING ABOUT IS ROBERT. THERE WERE TWO INDIVIDUALS THAT WERE DEPOSED IN THIS ACTION AND THOSE DEPOSITIONS ARE SOME DURATION, YOUR HONOR, AND I SOLELY POINT OUT THAT THE THRUST OF THAT TESTIMONY IS TOWARD OUR PROPOSED FINDINGS 25 THROUGH 31.

THE COURT: THAT'S ON ALL 3?

MR. GLICK: THE 3 TAKEN TOGETHER, ALONG WITH THE FILM.

THE COURT: ALL RIGHT.

MR. GLICK: MR. HOVER-SMOOT WILL PLAY THE FILM AND GIVE A NARRATION BASED ON THE READING OF THE RELEVANT TESTIMONY FROM THE DEPOSITION.

THE COURT: OKAY.

MR. ANDERSON: WHAT'S THE EXHIBIT NUMBER ON THE FILM?

MR. HOVER-SMOOT: BZ.

MR. ANDERSON: YOUR HONOR, I UNDERSTAND WITH RESPECT

TO THIS FILM, WE RAISED AN OBJECTION AFTER WE SAW IT, IN THAT THE PORTIONS WE OBJECTED TO HAVE BEEN EXCISED SO THAT THE NEW EXHIBIT THAT YOU'LL SEE AND WILL BE THE EXHIBIT IN THIS CASE IS WITHOUT THE PORTIONS TO WHICH WE TOOK EXCEPTION AND, THEREFORE, WE'LL WITHDRAW THE OBJECTION.

THE COURT: ALL RIGHT. LET'S NOTE THAT BZ IS ADMITTED INTO EVIDENCE. GO AHEAD.

MR. HOVER-SMOOT: THE MOVIE WE'RE GOING TO SEE IS A COMPOSITE FROM THE DEPOSITIONS OF JIM SMITH AND MR. LAWRENCE IN HOUSTON. THE ORIGINALS ARE MARKED AS BR, BS, AND BT, THOSE ARE THE ORIGINALS OF THE FILMS. THOSE DOCUMENTS WERE IDENTIFIED AND STIPULATED TO IN THE AUTHENTICITY STIPULATION. IN PARTICULAR, I'LL BE READING FROM EXCERPTS FROM JIM SMITH'S DEPOSITION TESTIMONY AS HE VIEWED THESE FILMS AND THE --

THE COURT: IN OTHER WORDS, AT THE DEPOSITION YOU SHOWED HIM THE FILMS AND WHAT WAS TAKEN DOWN WAS A TRANSCRIPT OF HIS STATEMENT ABOUT IT?

MR. HOVER-SMOOT: YES, SIR. I'M NOT GOING TO READ ALL OF IT BECAUSE SOME OF IT IS HARD TO MATCH PRECISELY TO WHAT IS ON THE FILM. I'LL REFER BACK TO THE UNDERLYING EXHIBIT FILMS AS WE GO THROUGH.

THE FIRST SCENE IS FROM EXHIBIT BR, DEFENDANT'S EXHIBIT BR. AND IT'S A PICTURE ON A TELEVISION SCREEN OR MONITOR. THE FIRST SHOT IS OF THE ENTIRE MODEL OF THE LUNAR EXCURSION MODULE. THAT'S THE SHOT FROM THE MONITOR OF THE LUNAR EXCURSION MODULE. THE YELLOW PARTS ON THE SIDES REPRESENT FUEL TANKS. THE 2 TRIANGLES THAT YOU'LL SEE IN A MINUTE ARE WINDOWS. THIS IS THE WAY IN WHICH THE MODEL WAS

BUILT UP. THERE'S ONE OF THE 2 FUEL TANKS --

MR. ANDERSON: ARE YOU READING THIS? I THINK YOU'RE EXTEMPORIZING.

MR. HOVER-SMOOT: I'LL STOP EXTEMPORIZING. THE YELLOW PARTS ON THE SIDE REPRESENTS FUEL TANKS, THE 2 TRIANGLES IN FRONT ARE WINDOWS FOR THE PILOT TO LOOK OUT. ON THE TOP OF THE MODULE IS A 6-SIDED BLACK FIGURE WHICH DOCUMENTS THE DOCKING PORT. THERE IS AN ANTENNA JUST ABOVE THE 2 WINDOWS AS THE MODEL DEVELOPS. AS YOU CAN SEE, THE MODULE CAN BE MOVED AROUND USING A HAND CONTROL, AND THAT TESTIMONY IS OUT OF JIM SMITH'S DEPOSITION AT PAGE 38 THROUGH 40.

MR. ANDERSON: YOU'RE NOT READING THE TESTIMONY NOW, YOU'RE EXTEMPORIZING.

MR. HOVER-SMOOT: THAT'S IS OUT OF THE DEPOSITION. I JUST COPIED IT FOR MY CONVENIENCE ON A PIECE OF PAPER. LET ME STOP THIS FOR A MOMENT AND BACK UP.

THE SECOND SCENE SHOWS BOTH THE LUNAR EXCURSION MODULE AND THE COMMAND AND SERVICE MODULE OR CSM. READING FROM MR. SMITH'S DEPOSITION, IT IS FLOWN BY A PERSON SITTING AT THE CONTROL STATION FOR THE ELECTRONIC SCENE GENERATOR.

IF I MAY EXTEMPORIZE FOR A MOMENT, WHAT YOU WILL SEE IS THE COMMAND AND SERVICE MODULE AND THE LUNAR EXCURSION MODULE BOTH MOVING AND FLOWN BY A PERSON SITTING AT THE CONTROL STATION. AND THE TESTIMONY IS FROM PAGE 65 OF SMITH'S DEPOSITION STARTING AT LINE 11.

(PAUSE.)

MR. HOVER-SMOOT: THE THIRD SCENE IS A PICTURE OF

THE LUNAR LANDSCAPE. YOU HAVE A READING FROM MR. SMITH'S DEPOSITION AT PAGE 43, STARTING AT LINE 21. YOU HAVE A VERY LARGE TEXTURED GROUND PLANE ON WHICH YOU CAN PLACE PLANARS, P-L-A-N-A-R-S, WE CALLED IT, AND THEN ON TOP OF THAT WE CAN PLACE 3-DIMENSIONAL OBJECTS. WE CALL THEM CRATERS OR MOUNTAINS.

THE SHIP'S OWN SHADOW IS THE SMALL QUADRILATERAL THAT YOU SEE NEAR THE MIDDLE, BLACK IN COLOR. THIS SIMPLY REPRESENTS THE LANDING AREA. THE SIMULATION REPRESENTS THAT YOU CAN LAND ON ONE COLOR AND NOT ON THE OTHER. THIS WILL MAKE MORE SENSE WHEN IT IS SHOWN.

(PAUSE.)

MR. HOVER-SMOOT: THE DESCRIPTION OF THE LUNAR LANDING IN THE DEPOSITION AND IN THE PROPOSED FINDING OF FACT.

(PAUSE.)

MR. HOVER-SMOOT: EXTEMPORIZING FOR THE MOMENT, THESE FIGURES ARE TO REPRESENT MOUNTAINS, THAT IS TO REPRESENT A CRATER, AND THAT IS THE SHADOW TO WHICH THE DEPOSITION REFERS (INDICATING).

(PAUSE.)

MR. HOVER-SMOOT: THE FOURTH SEQUENCE IS A SIMULATION OF AN AIRPORT LANDING. READING FROM MR. SMITH'S DEPOSITION AT PAGE 48, STARTING AT LINE 24, IT HAS THE ALMOST WHITE AND GREEN TEXTURED GROUND PLANE THAT RUNS INFINITELY AND SOME GREEN PATCHES, SINGLE-COLORED PATCHES ON IT REPRESENTING THE AREA AROUND THE AIRPORT.

SKIPPING THE QUESTION AND READING THE ANSWER ON LINE 5, PAGE 49 OF HIS DEPOSITION, IT IS ONE RUNWAY, IT WOULD BE

RUNWAY 10. THERE IS 2 HANGAR BUILDINGS AND HELIPORT AND CONTROL TOWER. THE TOP OF THE BUILDINGS ARE ALMOST BLACK, SO IS THE COLOR OF THE RUNWAY EXCEPT FOR CENTER MARKINGS.

LINE 13, I'M SITTING AT A CONSOLE AGAIN WITH A HAND CONTROLLER, GENERATING, ORIGINATING THE SIGNALS WHICH ARE USED TO DRIVE YOU AROUND THIS ENVIRONMENT.

LINE 19, WHAT YOU SEE IS WHAT YOU WOULD SEE IF YOU WERE FLYING A RUNWAY AROUND OVER THIS AIRPORT AND IN FOR A LANDING, EVEN THOUGH THERE IS NOT A PLANE MODEL HERE, YOU ARE JUST FLYING YOUR EYE.

(PAUSE.)

MR. HOVER-SMOOT: AT THIS POINT DURING THE MOVIE, MR. SMITH TESTIFIED READING FROM PAGE 50, STARTING AT LINE 6, TAXIWAYS ARE THE SAME COLOR AS THE RUNWAY, ALMOST BLACK. THE LARGE HANGAR AREA ON THE RIGHT IS INSIDE THE BLUE. 2 COLORS OF YELLOW, 2 COLUMNS SUPPORTING THE ROOF OF THAT HANGAR WHICH ARE RED.

WE'LL PROCEED TO GO INSIDE THAT HANGAR, STOP, AND THEN TURN TO YOUR LEFT AND LOOK BACK OUT THROUGH THE DOORS IN WHICH IT CAME IN. THE TOP OF THAT HANGAR IS THE LIGHTEST COLOR YELLOW. YOU CAN SEE THE BLUE SKY MODEL OUTSIDE. THE LIGHTEST COLOR BLUE THERE REPRESENTS A SKY WHICH IS A CONTROL TOWER WITH ONE BLACK WINDOW IN IT. IT'S -- THE CONTROL TOWER IS YELLOW AND ON THE TOP OF IT IS ANOTHER OBJECT. THE PILOT WILL FLY RIGHT OUT OVER THE HANGAR.

(PAUSE.)

MR. HOVER-SMOOT: THE LAST 2 SEQUENCES ARE REFERRED TO AS TRACING FIRE OR TRACER TANK PROGRAM. THE WHITE DOTS

THAT YOU WILL SEE ARE TRACER BULLETS AS FIRED BY A GUNNER ON THE BOTTOM OF A SIMULATED AIRCRAFT. I'M READING FROM PAGE 51 OF SMITH'S DEPOSITION.

CONTINUING WITH PAGE 52, THERE ARE 2 CONTROLLERS, ONE GUY TAKES ONE CONTROLLER AND FLIES THE AIRCRAFT OVER THIS TERRAIN. THE SECOND PERSON HAS A CONTROLLER WHICH SIMULATES A TURRET ON THE BOTTOM OF THAT AIRCRAFT, AND AS THE PILOT FLIES OVER THE SIMULATED TANK, THE GUNNER SQUEEZES A TRIGGER ON THE HAND CONTROLLER AND CAUSES WHITE LOOKING LIGHT, WHICH WE CALL TRACING BULLETS, TO STREAM OUT ON THE ENVIRONMENT. WHEN ONE OF THEM IMPACTS THE SIMULATED TANK, IT EXPLODES INTO AN INVERTED PYRAMID SHAPE OF SMOKE. THE OUTSIDE OF IT IS BLUE AND THE INSIDE RED.

PAGE 53, THE SIMULATED TANK WAS PROGRAMMED TO MOVE SOMEWHAT RANDOMLY OVER THE TEXTURED SURFACE, BUT IF YOU WATCHED IT LONG ENOUGH, YOU WILL FIND IT WILL EVENTUALLY RETURN AND RETRACE ITS TRACKS FROM THE PREVIOUS RUNNING. THE SIMULATED TRACER BULLETS, WHITE OR GREEN COLOR, WHEN THEY ARE ACTUALLY DETERMINED TO BE ON THE SAME SPOT OF THE SCENE OR TANK, OR PENETRATED THE TANK, THE TANK WOULD BLOW UP.

(PAUSE.)

MR. HOVER-SMOOT: THE WHITE DOTS THAT YOU SEE ARE THE TRACERS REFERRED TO. AND THE PYRAMID THAT YOU SEE IS THE CHANGE IN SHAPE.

(PAUSE.)

MR. HOVER-SMOOT: AGAIN, YOU CAN SEE THE TANK MOVING AS DESCRIBED IN THE DEPOSITION. AND YOU CAN SEE THE RED INSIDE THE PYRAMID SHAPE.

(PAUSE.)

MR. HOVER-SMOOT: THE PILOT JUST PERFORMED AN OUTSIDE LOOP.

(PAUSE.)

MR. HOVER-SMOOT: YOU CAN SEE THE TANK AGAIN (INDICATING).

(PAUSE.)

MR. HOVER-SMOOT: TO PUT THIS BACK IN CONTEXT, YOUR HONOR, WHAT THIS WAS, AS I INDICATED INITIALLY, WAS A FILM FOOTAGE OF SCENE GENERATED ON A PICTURE TUBE, A MONITOR, AND THE IMAGES WERE GENERATED BY THE NASA SCENE GENERATOR, THE GE NASA SCENE GENERATOR. AND THERE IS MORE EXTENSIVE TESTIMONY AND DESCRIPTION OF HOW THAT OPERATED AND ITS CAPABILITIES IN THE DEPOSITIONS OF MR. SMITH, LAWRENCE, AND SCHUMACHER.

THE COURT: OKAY. THANK YOU.

MR. ANDERSON: I WOULD ONLY COMMENT, YOUR HONOR, IN ADDITION TO THE COMMENTS THAT WERE MADE, THAT IN THAT FIRST SCENE WHERE THE LUNAR MODULE AND THE COMMAND MODULE ARE APPROACHING ONE ANOTHER, THE RECORD SHOWS THAT THE OPERATOR DECIDED WHEN TO LOCK THEM TOGETHER AND THROUGH A SWITCH, AND AS FAR AS THIS RECORD SHOWS THERE WAS NO DETECTION OF ANY COINCIDENCE OR ANY PHENOMENON AFTER A DETECTION OF COINCIDENCE. IT WAS THE OPERATOR'S DECISION TO HOLD THEM TOGETHER.

THE COURT: ALL RIGHT. WE'LL TAKE A RECESS AT THIS TIME UNTIL 1:30.

(LUNCH RECESS.)

AFTERNOON SESSION - 1:32 P.M.

MR. GLICK: YOUR HONOR, IF WE MAY PROCEED BRIEFLY WITH THE DEPOSITION EXCERPTS AT THIS TIME, THE NEXT EXCERPT TO BE OFFERED WOULD BE TESTIMONY OF MR. BROWN, WHO TESTIFIES ABOUT THE MICHIGAN POOL GAME, AND HIS TESTIMONY RELATES TO FINDING 16.

MR. ANDERSON: WE HAVE COUNTERDESIGNATIONS ON MR. BROWN WHICH WE'LL HAND UP EITHER BY THE END OF THE DAY TODAY OR FIRST THING IN THE MORNING.

THE COURT: ALL RIGHT.

MR. ANDERSON: OTHERWISE, WE HAVE NO OBJECTION.

MR. GLICK: YOUR HONOR, THE NEXT DEPOSITION EXCERPTS REFER TO THE DRUMHELLER POOL, D-R-U-M-H-E-L-L-E-R, POOL, P-O-O-L. THERE ARE 2 DEPOSITIONS, THE DEPOSITION OF MR. DRUMHELLER AND MR. MULLARKY, M-U-L-L-A-R-K-Y, AND THESE DEPOSITIONS RELATE TO PROPOSED FINDINGS 32 AND 33.

MR. ANDERSON: WITH RESPECT TO DRUMHELLER AND MULLARKY, YOUR HONOR, WE HAVE NO OBJECTION, BUT WE HAVE COUNTERDESIGNATIONS.

MR. GLICK: THE NEXT DEPOSITION EXCERPTS ARE THE EXCERPTS OF MR. MARISON, M-A-R-I-S-O-N, AND MR. GREEN, G-R-E-E-N, AND THAT RELATES TO FINDING 20, THAT THE GAME SPACE WAR WAS PLAYED AT SANDERS.

MR. ANDERSON: NO OBJECTION, YOUR HONOR, AND NO COUNTERDESIGNATION.

MR. GLICK: THE NEXT OFFERING WOULD BE EXHIBIT -- THE ALTHOUSE PATENT EXHIBIT. IS THAT EXHIBIT F -- D. EXHIBIT D. A-L-T-H-O-U-S-E.

MR. ANDERSON: DOES THAT COMPLETE ALL OF YOUR --

MR. GLICK: NO, I HAVE THE RCA ONES LAST. I HAVE 2 PATENTS HERE, THE ALTHOUSE AND SPIEGEL PATENTS MARKED EXHIBIT D AND G.

MR. ANDERSON: WE HAVE NO OBJECTION.

MR. GLICK: BD, YOUR HONOR, I'M SORRY.

THE COURT: BD. BD IS SPIEGEL.

MR. GLICK: YOUR HONOR. ALTHOUSE IS D.

THE COURT: ALL RIGHT.

MR. ANDERSON: NO OBJECTION TO EITHER OF THOSE PATENTS, YOUR HONOR.

THE COURT: THEY MAY BE ENTERED INTO EVIDENCE.

MR. GLICK: THOSE RELATED TO PROPOSED FINDING 22, 23, AND 24. AND LAST, WE HAVE A CASSETTE TO PLAY FOR YOUR HONOR, THE RCA POOL DEPOSITION EXCERPTS WHICH ARE FROM MR. LECHNER, L-E-C-H-N-E-R, MR. COOK, C-O-O-K, AND MR. TEGER, T-E-G-E-R. THEY RELATE TO FINDING 34.

MR. ANDERSON: WE DO HAVE COUNTERDESIGNATIONS ON LECHNER AND ON COOK AND ON TEGER, T-E-G-E-R.

THE COURT: ALL RIGHT.

MR. GLICK: THOSE HAVE BEEN RECEIVED, YOUR HONOR?

THE COURT: FINE, THEY MAY BE RECEIVED IN EVIDENCE.

MR. GLICK: THEN WE MAY PROCEED TO THE FILM. I SAY FILM, IT'S A CASSETTE.

THE COURT: LET THE RECORD SHOW THE CASSETTE IS BEING PLAYED ON A TELEVISION SCREEN.

MR. HOVER-SMOOT: IT'S TEGER EXHIBIT 9, YOUR HONOR, FROM TEGER'S DEPOSITION, AND THE CASSETTE IS EXHIBIT CL.

SWORN, TESTIFIED AS FOLLOWS.

THE COURT: WOULD YOU PLEASE STATE YOUR NAME FOR THE RECORD AND SPELL YOUR LAST NAME?

THE WITNESS: MY NAME IS CARL NIELSEN, N-I-E-L-S-E-N.

DIRECT EXAMINATION

MR. ESCHER: Q. GOOD AFTERNOON, MR. NIELSEN --

MR. ANDERSON: THEN THE DEPOSITION IS ADMITTED NOW, YOUR HONOR?

MR. ESCHER: I DON'T BELIEVE WE HAD ANY OBJECTIONS TO IT PREVIOUSLY.

MR. ANDERSON: THANK YOU.

THE COURT: WHAT IS HIS DEPOSITION FOR IDENTIFICATION PURPOSES? HAS IT GOT AN EXHIBIT NUMBER?

MR. ANDERSON: YES, YOUR HONOR.

MR. ESCHER: I BELIEVE IT'S NUMBER 264, YOUR HONOR.

MR. WILLIAMS: NO, IT'S NOT.

THE COURT: YOU WILL GIVE IT TO ME WHEN YOU HAVE A MOMENT.

MR. WILLIAMS: IT'S 272.

MR. ESCHER: Q. MR. NIELSEN, WHAT IS YOUR PRESENT AGE?

A. I AM 47 YEARS OLD.

Q. COULD YOU MOVE THE MICROPHONE CLOSER TO YOU FOR US, PLEASE. AND WHERE DO YOU LIVE?

A. I LIVE IN SARATOGA, CALIFORNIA.

Q. AND WHAT IS YOUR PRESENT OCCUPATION?

A. I'M A SELF-EMPLOYED CONSULTING ENGINEERING IN LSI AND SIMILAR TECHNIQUES.

Q. WHAT IS THAT?
A. LARGE SCALE INTEGRATED CIRCUITS.
Q. WHERE ARE YOU FROM, MR. NIELSEN?
A. I'M BORN IN DENMARK.
Q. AND WHEN DID YOU COME TO THE UNITED STATES?
A. I CAME IN 1966.
Q. COULD YOU PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND FOR THE COURT?
A. I HAVE A MASTER'S DEGREE IN ELECTRONICS FROM THE TECHNICAL UNIVERSITY OF COPENHAGEN, I HAVE SPENT 2 YEARS IN THE NAVY, I'VE BEEN TO THE NAVY RESERVE OFFICERS TRAINING, THIS IS IN DENMARK. I LEFT THE NAVY AS A FIRST LIEUTENANT IN THE RESERVES. I'VE TAKEN MANY COURSES LATER IN ORDER TO KEEP MYSELF CURRENT THE TECHNICAL DISCIPLINES.
Q. COULD YOU PLEASE DESCRIBE YOUR CAREER HISTORY AFTER YOU LEFT THE DANISH NAVY?
A. I WAS FIRST EMPLOYED 2 YEARS IN THE CONSULTING COMPANY IN COPENHAGEN. I THEN CAME TO CALIFORNIA. I WORKED 3 AND A HALF YEARS FOR GARRET, G-A-R-R-E-T, AIR RESEARCH IN TORRANCE, CALIFORNIA.
Q. WHAT WAS YOUR JOB THERE?
A. I WAS AN ENGINEER, ELECTRONIC ENGINEER. I THEN WENT TO AMI, AMERICAN MICROSYSTEMS, INCORPORATED, IN SANTA CLARA.
Q. WHAT YEAR WAS THAT?
A. 1969. AND I WORKED WITH AMI UNTIL JANUARY OF 1976.
Q. WHAT WAS YOUR JOB AT AMI?
A. I HAD VARIOUS JOBS. AT THE END I WAS A SENIOR ENGINEER.
Q. WERE YOU EVER EMPLOYED BY ATARI?

A. YES, IN JANUARY 1976 I GOT EMPLOYED BY ATARI AS MANAGER OF LSI TESTS.

Q. WAS ATARI AN ESTABLISHED COMPANY AT THAT TIME IN 1976?

A. JUST BARELY.

Q. AND WHAT WERE YOUR JOB RESPONSIBILITIES AT ATARI?

A. I GOT EMPLOYED AS MANAGER OF LSI TESTS, LATER I GOT PROMOTED TO DIRECTOR OF LSI DESIGN, AND I MAINTAINED THE RESPONSIBILITY OF THE TEST GROUP.

Q. SO YOU WERE IN CHARGE OF THE TESTING AND DESIGN OF LARGE SCALE INTEGRATED CIRCUITS USED IN THE ATARI MACHINES?

A. THAT'S CORRECT.

Q. DID YOUR JOB RESPONSIBILITIES CHANGE OVER THE TIME OF YOUR EMPLOYMENT OTHER THAN BEING PROMOTED TO BEING IN CHARGE OF DESIGN AS WELL AS TESTS?

A. WELL, WHEN I STARTED OFF, I WAS JUST IN CHARGE OF MYSELF, BUT MY EMPLOYMENT CULMINATED IN '82 OR '83, I GUESS I HAD ABOUT 5 ENGINEERS WORKING FOR ME.

Q. MR. NIELSEN, DID YOU WORK ON THE ATARI 2600 VIDEO COMPUTER SYSTEM DURING YOUR TIME WITH ATARI?

A. YES, I DID.

Q. AND WHAT WAS THE NATURE OF YOUR WORK ON THE ATARI 2600?

A. IN THE BEGINNING DURING THE DESIGN, I WAS RESPONSIBLE FOR THE TEST PROGRAMS FOR TESTING THE LSI THAT REALLY ARE THE BRAINS OF THE 2600.

Q. DID YOU PERSONALLY INTRODUCE ANY INNOVATIONS INTO THE DESIGN OF THE ATARI 2600?

A. YES, AT A LATER DATE I HAD 2 PATENT FOR EXPANDING THE MEMORY FOR THE 2600.

Q. WHAT ATARI PRODUCTS DID YOU WORK ON PRIOR TO WORKING ON THE 2600 VIDEO COMPUTER SYSTEM?

A. AMONG OTHERS, PONG AND SUPER PONG, P-O-N-G.

Q. COULD YOU GENERALLY DESCRIBE THE DIFFERENCES BETWEEN THE PONG AND SUPER PONG HOME GAMES AND THE ATARI 2600 VIDEO COMPUTER SYSTEM?

A. BASICALLY, THE PONG AND SUPER PONG BELONG TO A GROUP OF GAMES THAT WE CALL DEDICATED GAMES AS OPPOSED TO THE 2600, WHICH IS A COMPUTER BASED GAME.

Q. MR. NIELSEN, HAVE YOU PERSONALLY REVIEWED THE RUSCH 2 PATENT THAT'S AT STAKE IN THIS CASE?

A. YES, I HAVE.

Q. DURING YOUR WORK ON THE DESIGN OF THE ATARI 2600 VIDEO COMPUTER SYSTEM, DID YOU EVER REFER TO THE RUSCH 2 PATENT AS A TECHNICAL SOURCE?

A. NO, I DID NOT. IT DOES NOT APPLY TO THE 2600, AS FAR AS I CAN SEE.

Q. NOW, GIVEN YOUR EXPERIENCE WITH THE ATARI 2600 AND YOUR ELECTRICAL ENGINEERING AND COMPUTER SCIENCE BACKGROUND, COULD YOU BUILD OR DESIGN FROM SCRATCH THE ATARI 2600 TODAY?

A. YES, I BELIEVE SO.

Q. AND WOULD THE CIRCUITRY CONTAINED IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT TEACH YOU ANYTHING ABOUT HOW TO DESIGN THE ATARI 2600 FROM SCRATCH?

A. NO, THE RUSCH PATENT HAS TO DO WITH AN ANALOG WAY OF DESIGN, THE 2600 USES A DIGITAL COMPUTER TECHNOLOGY.

Q. MR. NIELSEN, DO YOU CONSIDER THE ATARI 2600 TO BE A STORED PROGRAM DIGITAL COMPUTER?

A. YES.
Q. COULD YOU EXPLAIN THE REASONS FOR THAT?
A. THE 2600 HAS THE COMPONENTS NORMALLY USED TO DESIGNATE A COMPUTER, MAINLY CENTRAL PROCESSING UNIT, INPUT, OUTPUT CAPABILITIES, READ-ONLY MEMORY FOR STORING PROGRAMS AND RANDOM ACCESS MEMORY.
Q. DID YOU CONSIDER THE ATARI HOME GAMES SUCH AS PONG AND SUPER PONG TO BE COMPUTERS?
A. NO.
Q. MR. NIELSEN, ARE YOU FAMILIAR WITH A DEVICE KNOWN AS AN ADAPTER FOR PLAYING ATARI 2600 READ-ONLY MEMORY CARTRIDGES ON AN ATARI 5200?
A. YES, IT'S BASICALLY A DEVICE THAT YOU CAN ATTACH TO THE 5200 IN ORDER TO ALLOW OWNERS OF THE 5200 TO PLAY CARTRIDGES THAT ARE MADE FOR THE 2600.

MR. ESCHER: MR. NIELSEN, I DON'T HAVE ANY FURTHER QUESTIONS FOR YOU AT THIS TIME.

DO YOU HAVE ANY FURTHER QUESTIONS ON REDIRECT, MR. ANDERSON?

MR. WILLIAMS: JUST A MINUTE, IF YOU WOULD.

(PAUSE.)

MR. ANDERSON: JUST A COUPLE OF QUESTIONS.

CROSS-EXAMINATION

BY MR. WILLIAMS: ONE QUESTION, I BELIEVE.
Q. MR. NIELSEN, GOOD AFTERNOON. IT'S BEEN A WHILE.

MR. NIELSEN, YOU SAID THAT THE 2600 YOU CONSIDERED TO BE A STORED PROGRAM DIGITAL COMPUTER AND THAT IT INCLUDED ROM. AM I CORRECT THAT THE 2600 HAS NO READ-ONLY MEMORY IN IT

ITSELF AND --

A. IN ORDER TO GET THE 2600 UNIT TO FUNCTION, YOU NEED TO ATTACH THE ROM. IT'S COMMONLY DONE BY A CARTRIDGE AND THE MAIN FEATURE OF THE 2600 IS THAT YOU CAN EXCHANGE THAT ROM.

Q. AND THE ROM IS IN THE VIDEO GAME CARTRIDGE THAT THE USERS INSERT INTO THE SLOT?

A. THAT'S CORRECT.

MR. WILLIAMS: WE DON'T HAVE ANYTHING FURTHER.

THE COURT: THANK YOU, MR. NIELSEN. YOU MAY STEP DOWN. THANK FOR COMING TO TESTIFY. WHAT IS HIS DEPOSITION AND THE EXHIBIT NUMBER?

MR. WILLIAMS: EXHIBIT 272, YOUR HONOR.

THE COURT: I HAVE THAT AS BEING ADMITTED INTO THE EVIDENCE BY VIRTUE OF DR. RIBBENS' TESTIMONY.

MR. WILLIAMS: I THINK IT WAS ADMITTED DURING THE TIME MR. ROBBENS WAS ON THE STAND.

THE COURT: ALL RIGHT.

MR. GLICK: YOUR HONOR, OUR NEXT WITNESS IS WILLIAM HIGINBOTHAM. WE NEED 3, 4, 5 MINUTES TO SET UP FOR IT.

THE COURT: I SEE YOU'RE HAVING A HARD TIME -- OFF THE RECORD.

(OFF THE RECORD.)

THE COURT: WOULD YOU STEP UP HERE, PLEASE, SIR.

THE WITNESS: OH, SURE.

WILLIAM HIGINBOTHAM,

CALLED AS A WITNESS BY THE DEFENDANT HEREIN, BEING FIRST DULY SWORN, TESTIFIED AS FOLLOWS.

THE COURT: STATE YOUR FULL NAME FOR THE RECORD AND

SPELL YOUR LAST NAME.

THE WITNESS: WILLIAM ALFRED HIGINBOTHAM, H-I-G-I-N-B-O-T-H-A-M.

DIRECT EXAMINATION

BY MR. GLICK: Q. DR. HIGINBOTHAM, WHERE DO YOU RESIDE, SIR?

A. BELLPORT, NEW YORK, LONG ISLAND.

Q. COULD YOU TELL US YOUR EDUCATIONAL BACKGROUND SINCE HIGH SCHOOL?

A. I HAVE A BACHELOR'S DEGREE FROM WILLIAMS COLLEGE RECEIVED IN 1932, MAJORED IN PHYSICS. I SPENT ABOUT 8 YEARS IN GRADUATE SCHOOL IN PHYSICS AT CORNELL WORKING ON A PH.D. WHICH WAS NOT COMPLETED BECAUSE IN THOSE DAYS I HAD VERY LITTLE INCOME. I SPENT MOST OF MY TIME STAYING ALIVE, AND JUST BEFORE I FINISHED THAT I WAS INVITED TO GO TO MIT TO WORK ON RADAR, SO THAT SORT OF ENDED MY POSTGRADUATE WORK.

Q. DO YOU HOLD ANY HONORARY DEGREE?

A. YES, FROM WILLIAMS COLLEGE IN 1964.

Q. FOR WHAT IS THAT DEGREE?

A. DOCTOR OF SCIENCE.

Q. FOR WHAT PARTICULAR WORK?

A. THAT WAS FOR 2 THINGS, FOR MY CONTRIBUTIONS TO NUCLEAR INSTRUMENTATION AND ALSO FOR MY CONTRIBUTION TO ARMS CONTROL.

Q. IF YOU WOULD PULL THE MICROPHONE CLOSER, I THINK WE'LL BE ABLE TO HEAR YOU BETTER.

A. YES.

Q. WOULD YOU BRIEFLY DETAIL FOR US YOUR EMPLOYMENT AFTER THE CORNELL EDUCATIONAL EXPERIENCE?

A. I WENT TO MIT IN JANUARY 1941 TO WORK ON RADAR, AND I WAS THERE UNTIL DECEMBER OF 1943 WHEN I TRANSFERRED TO LOS ALAMOS, WHICH AT THAT TIME WAS A SECRET LABORATORY OF THE MANHATTAN DISTRICT PROJECT. TO BEGIN WITH I WAS, I GUESS, A JUNIOR SCIENTIST OR SOMETHING OR OTHER IN THE PHYSICS DEPARTMENT, BUT AFTER A FEW MONTHS I BECAME HEAD OF THE ELECTRONICS DIVISION IN LOS ALAMOS, AND REMAINED UNTIL AFTER THE END OF THE WAR.

IN DECEMBER 1945, I WENT TO WASHINGTON ON BEHALF OF THE ATOMIC SCIENTISTS TO TRY TO HELP EDUCATE THE PUBLIC ON THINGS HAVING TO DO WITH THE DEVELOPMENT OF NUCLEAR WEAPONS, AND I STAYED FOR 2 YEARS IN THE GENERAL EDUCATION AND PUBLIC RELATIONS WORK ON BEHALF OF A VOLUNTARY ORGANIZATION CALLED THE FEDERATION OF AMERICAN SCIENTISTS.

DECEMBER 1947 I WAS OFFERED A NUMBER OF JOBS, AND OF THOSE I SELECTED TO GO TO BROOKHAVEN NATIONAL LABORATORY, A NEW NATIONAL LABORATORY ON LONG ISLAND AT THAT TIME, AND I WAS HEAD OF THE INSTRUMENTATION DIVISION FOR, I CAN'T REMEMBER EXACTLY HOW LONG, BUT I GUESS IT WAS 1951 OR '52 THAT I BECAME HEAD OF THE DIVISION.

I WAS HEAD OF THE INSTRUMENTATION DIVISION AT BROOKHAVEN UNTIL JULY OF 1968 WHEN I TRANSFERRED TO THE NUCLEAR ENERGY DEPARTMENT, AND HAD BEEN INVOLVED IN APPLICATIONS OF INSTRUMENTATION ON BEHALF OF WHAT'S CALLED NUCLEAR MATERIAL SAFEGUARDS, DOMESTIC AND INTERNATIONAL, SINCE THEN.

Q. YOU MENTIONED THAT AT MIT YOU WORKED ON RADAR. DID THAT INCLUDE WORK ON RADAR DISPLAYS?

A. YES, I WAS IN THE DISPLAY CATHODE TUBE AND PARTS. THE

RADAR SYSTEM CONSISTED OF A TRANSMITTER AND A RECEIVER AND THEN THE ANTENNAS FOR SCANNING, AND THINGS LIKE THAT, AND THEN THE RECEIVED INFORMATION, THE DISPLAY IN RECEIPT IS PROPORTIONAL TO DISTANCE, THE ANGLE, OF COURSE, DEPENDS ON WHERE THE ANTENNA IS AIMED, AND FROM THAT WE GENERATE DISPLAYS FOR AIR-TO-AIR NIGHT FIGHTERS FOR AIR-TO-SEA SEARCH AGAINST SUBMARINES AND SHIPS, FROM GROUND TO AIR TO SHOOT DOWN AIRCRAFT.

Q. NOW THOSE WERE NOT RASTER, R-A-S-T-E-R SCAN DISPLAYS, WERE THEY?

A. THE ANSWER IS, NO.

Q. ARE YOU FAMILIAR WITH RASTER SCAN DISPLAYS?

A. YES.

Q. SKETCH BRIEFLY HOW YOU BECAME FAMILIAR WITH THEM.

A. DO I HAVE TO REMEMBER EXACTLY? LET ME TRY TO MAKE SOMEWHAT OF A DISTINCTION, WHAT I DID FOR RADAR DISPLAYS AND WHAT THE PURPOSE OF TV IS.

IN THE CASE OF RADAR, YOU HAVE A CERTAIN LIMITED AMOUNT OF INFORMATION. IN GENERAL, YOU KNOW WHERE YOUR SOURCE IS AND, THEREFORE, YOUR THINGS ARE WELDED TO WHERE THE ANTENNAS ARE LOCATED.

IN THAT CASE, YOU'RE WORKING PRIMARILY WITH TUBES WHERE YOU CONTROL THE SPOT EITHER BY ELECTROSTATICS OR ELECTROMAGNETIC DEFLECTION, AND BECAUSE YOU'RE INTERESTED IN DISPLAYING RANGE WHICH IS ALSO TIME, YOU USE LINEAR SWEEPS AND CHANGE THE ANGLE IN VARIOUS WAYS DEPENDING ON HOW YOU WANT TO DISPLAY THE INFORMATION.

IN THE THE CASE OF TV, YOU WISH TO DISPLAY A FULL

PICTURE AS VIEWED BY THE EYE OF SOME SCENE WHICH MEANS THAT YOU WANT TO FILL IN THE WHOLE THING. IN A RADAR SET, YOU DON'T WORRY ABOUT IT. IN THE CASE OF A TV SET YOU WANT THE SKY, WHETHER THERE ARE BIRDS IN THE SKY, YOU WANT THE PEOPLE AND ALL OF THOSE THINGS.

SO THAT FOR TV IT WAS NECESSARY TO SCAN THE OBJECT IN SOME MEANS. ORIGINALLY IT WAS MECHANICAL IN THE 1930'S, AND EVENTUALLY ELECTRONICALLY, AND SO THAT YOU CANNOT ELECTRONICALLY DISPLAY, AS YOUR EYE DOES, THIS WHOLE REALM OF THINGS ALL SIMULTANEOUSLY.

SO WHAT YOU HAVE TO DO IS YOU HAVE TO SET UP A PATTERN THAT WILL SCAN IN A LOGICAL FASHION ALL THE YX COORDINATES IN FRONT OF YOU. THE RESOLUTION OF THIS IS TO HAVE A FAST HORIZONTAL SCAN AND MOVE THAT BY THE VERTICAL SCAN TO COVER THE WHOLE YX AREA WHICH IS ENCOMPASSING THE PICTURE.

Q. DOCTOR, IN TERMS OF YOUR OWN WORK, DID YOU HAVE FAMILIARITY WITH USING -- LET ME START OVER.

IN CONNECTION WITH YOUR WORK, DO YOU HAVE OCCASION TO USE COMPUTERS WHICH HAVE RASTER SCAN DISPLAYS IN THE COURSE OF THAT WORK?

MR. WILLIAMS: OBJECTION. I THINK IT SHOULD BE FIXED AS TO TIME WHEN THIS OCCURRED.

MR. GLICK: Q. LET'S START WITH EVER, AND I'LL BE HAPPY TO FIX A TIME.

A. I'M NOT SURE YOU'RE INTERESTED IN MY SITUATION TODAY OR 1958 OR WHEN.

Q. GIVE US YOUR EXPERIENCE IN THAT REGARD. YOU DON'T HAVE TO BE PRECISE AS TO THE EXACT DATE, BUT IN GENERAL.

A. WELL, I GUESS PERHAPS WHAT'S RELEVANT IS THAT MY GROUP, LIKE MANY OTHERS AT UNIVERSITIES AND GOVERNMENT INSTITUTIONS, WAS INVOLVED IN DESIGNING AND BUILDING DIGITAL CONVERTER COMPUTERS, DIGITAL COMPUTERS IN THE 1950'S, AND MY GROUP DESIGNED AND BUILT ONE WHICH WAS FAIRLY MODERN FOR THAT TIME, AND IT WAS COMPLETED PROBABLY IN 1959 OR '60, I DON'T REMEMBER EXACTLY. IT FILLED A ROOM WITH VACUUM TUBES AND THINGS LIKE THAT.

BUT AN IMPORTANT THING WAS TO HAVE A DISPLAY. HOWEVER, THAT DISPLAY WAS NOT A RASTER SCAN AT THAT TIME. LATER ON, IN ORDER TO DISPLAY THINGS FOR THE PHYSICISTS WHICH HAD TO DO WITH CLOUD CHAMBER TRACKS, WHAT'S IMPORTANT TO THE HIGH ENERGY PHYSICISTS IS THAT IT GENERATES TRACKS IN THESE PICTURES, AND HE WANTS TO KNOW WHEN IT HITS SOMETHING HOW MANY PARTICLES DO THEY BREAK UP IN, DO THEY GO IN A STRAIGHT LINE, DO THEY SEPARATE HEAVY FROM LIGHT CHARGE PARTICLES.

ANYWAY, THE SAME SYSTEM WAS USED TO DISPLAY THINGS FOR THE CHEMISTS AND BIOLOGISTS WHO WERE INTERESTED IN LOOKING AT PICTURES OF MOLECULES OR -- EITHER THEORETICAL OR ANALYZED MOLECULES. SO FOR A NUMBER OF PURPOSES WE DESIGNED A SYSTEM WHICH, IN FACT, USED A RASTER DISPLAY AND CONVERTED, THEN, WHATEVER KIND OF PICTURE WE WANTED TO BE DISPLAYED ON THAT.

SO IF YOU'RE REFERRING TO THAT, THAT'S ONE WHERE I WAS VERY INVOLVED IN COMPUTER GENERATION OF PICTURES OF VARIOUS SORTS AND THEN IN DISPLAYING THEM ON CATHODE -- RASTER SCAN.

Q. WHEN WAS THAT?

A. 1960. 1960 TO 6263.

MR. WILLIAMS: WE OBJECT TO THIS TESTIMONY IF IT'S OFFERED AS PRIOR ART. IT WAS NOT INCLUDED IN THE SECTION.

MR. GLICK: IT'S NOT. I'M INDICATING THE BACKGROUND AND QUALIFICATIONS OF THIS WITNESS, I'M NOT OFFERING THAT AS PRIOR ART. THE ONLY PRIOR ART IS HIS OWN, TENNIS GAME.

Q. YOU'VE MENTIONED A FIRST EXPERIENCE WITH RASTER SCAN DISPLAY. DO YOU CONTINUE TO BE FAMILIAR WITH THAT SORT OF DISPLAY ON THE USE OF COMPUTERS?

A. YES.

Q. WHEN DID YOU GO TO BROOKHAVEN, APPROXIMATELY?

A. DECEMBER 1947.

Q. AND WHAT WAS BROOKHAVEN WHEN YOU FIRST WENT THERE IN 1947 AND '48?

A. WELL, I GUESS THE WAY TO EXPLAIN THIS IS AT THE END OF THE WAR, IT WAS VERY CLEAR TO SCIENTISTS ALL OVER THAT THE TYPE OF REACTORS WHICH WERE DEVELOPED IN ORDER TO BREED PLUTONIUM WOULD BE USEFUL FOR RESEARCH BECAUSE THEY PRODUCED NEUTRONS. THESE WERE NEW PARTICLES AND COULD BE PRODUCED IN LARGE NUMBERS SO WE COULD STUDY THEIR CHARACTERISTICS, WHICH IS AN EXTREMELY OF GREAT INTEREST TO PHYSICISTS, TO CHEMISTS.

IT ALSO IS EXTREMELY IMPORTANT TO BIOLOGISTS IN MEDICINE TO UNDERSTAND THE EFFECT OF NEUTRONS, THINGS WHICH CAN BE PRODUCED BY THEM, SUCH AS TRACER TYPE ATOMS AND THINGS LIKE THAT. IT HAS A WIDE VARIETY OF INTERESTS FOR ALL KINDS OF BASIC RESEARCH.

SO THE UNIVERSITIES ALL SAID, WE HAVE TO HAVE A REACTOR, BUT THE DIRECTOR OF THE PROJECT SAID, YOU CAN'T HAVE REACTORS EVERYWHERE.

SO 9 UNIVERSITIES IN THE NORTHEAST GOT TOGETHER AND FORMED AN ORGANIZATION CALLED THE ASSOCIATED UNIVERSITIES, INCORPORATED.

THEY POOLED MONEY AND MADE A PROPOSAL AND SAID, WE WOULD LIKE TO HAVE A REACTOR BUILT FOR US SOMEWHERE IN THE NORTHEAST, AND EVENTUALLY THE DECISION WAS TO BUILD IT AT WHAT WAS AT THAT TIME CAMP UPTON PROPERTY BELONGING TO THE U.S. GOVERNMENT IN WORLD WAR I AND II.

THE FIRST THING THAT WAS BUILT WAS THE REACTOR AND THEN THE PHYSICS DEPARTMENTS, AND THE IDEA WAS AND STILL IS THIS SHOULD BE A FACILITY WHICH WOULD BE EXTREMELY USEFUL, NOT SOLELY OR PARTICULARLY FOR THE PEOPLE WHO ARE THERE, BUT MAINTAINED ON BEHALF OF THE OTHER RESEARCH INSTITUTIONS AND, IN FACT, IN MANY CASES OF THE INDUSTRIES, FIRST FROM ALL OVER THE COUNTRY AND NOW AT THE PRESENT TIME, SINCE THERE ARE MORE OF THESE TYPES OF FACILITIES, PRIMARILY FOR THOSE IN THE NORTHEAST. I'M NOT SURE HOW FAR YOU WANT TO GO.

Q. AND THAT BECAME BROOKHAVEN?

A. THAT'S THE WAY IT GOT STARTED, AND IT'S CONTINUED PRETTY MUCH TO BE LIKE THAT.

Q. AND SHORTLY AFTER YOU ARRIVED THERE, I BELIEVE YOUR TESTIMONY WAS YOU BECAME HEAD OF THE ELECTRONIC INSTRUMENTATION THERE?

A. I WAS ASSOCIATE AT THE DIVISION FROM THE BEGINNING AND THEN I ULTIMATELY BECAME HEAD OF THE DIVISION AFTER 2 OR 3 YEARS.

Q. NOW, HAVE YOU BEEN A MEMBER OF ANY SOCIETIES?

A. YES.

Q. WOULD YOU DETAIL A FEW OF THOSE FOR THE COURT, PLEASE?
A. I'M NOT ONLY A MEMBER OF, BUT A FELLOW IN THE FOLLOWING SOCIETIES. THE AMERICAN PHYSICS SOCIETY, AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, THE INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS, AMERICAN NUCLEAR SOCIETY, AND THE INSTITUTE OF NUCLEAR MATERIALS MANAGEMENT.
Q. DO YOU ALSO HAVE A POSITION WITH THE JOURNAL OF THE INSTITUTE OF NUCLEAR MATERIALS MANAGEMENT?
A. I'VE BEEN TECHNICAL EDITOR SINCE 1972.

MR. GLICK: YOUR HONOR, AT THIS TIME, RATHER THAN GO THROUGH IN GREAT DETAIL HIS RESUME, WHICH WOULD TAKE A VERY LONG TIME, PERHAPS I MIGHT MARK IT AND INTRODUCE IT. I BELIEVE YOU HAVE A COPY OF MR. HIGINBOTHAM'S RESUME.

(PAUSE.)

MR. GLICK: DOES THE COURT HAVE EXHIBIT JM?

THE COURT: I DON'T KNOW IF I DO OR NOT.

(PAUSE.)

MR. HOVER-SMOOT: I DON'T BELIEVE YOU DO, YOUR HONOR.

(PAUSE.)

MR. GLICK: Q. DR. HIGINBOTHAM, I'VE PUT EXHIBIT JM BEFORE YOU. CAN YOU IDENTIFY IT, PLEASE?
A. YES.
Q. IS THIS YOUR RESUME?
A. YES, IT IS.
Q. I NOTE ON THE RESUME THAT IT REFERS TO A FIRST ANNUAL AWARD FOR CONTRIBUTIONS TO NUCLEAR INSTRUMENTATION FROM THE I TRIPLE E SCIENTIST GROUP. WHAT DOES THAT STAND FOR?
A. INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS. PRIOR

TO 1962 THERE WERE 2 SUCH ORGANIZATIONS. THE INSTITUTE OF RADIO ENGINEERS AND THE INSTITUTE OF ELECTRICAL ENGINEERS. FINALLY, THEY ALL GOT TOGETHER AND FORMED THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS. IT HAS AN ACTIVE MEMBERSHIP OF CLOSE TO A HUNDRED THOUSAND, PRIMARILY ELECTRICAL ENGINEERS.

Q. YOU MENTIONED THAT YOU WERE A FELLOW AS OPPOSED TO A MEMBER OF SOME OF THE GROUPS. HOW DO YOU BECOME A FELLOW, JUST IN GENERAL?

A. WELL, IN THE CASE OF THE PHYSICAL SOCIETIES, BECAUSE THEY CHARGE THE FELLOWS MORE MONEY THAN THEY GOT OUT OF THE REGULAR MEMBERS.

THE COURT: SOUNDS LIKE THE AMERICAN BAR ASSOCIATION.

THE WITNESS: YES. WELL, BUT REALLY, I'M NOT AT ALL SURE I'M VERY KEEN ON HAVING SUCH A DISTINCTION, BUT SOME PEOPLE ENJOY IT. IN EVERY CASE, AS FAR AS NOMINATIONS REVIEWED BY A COMMITTEE AND I KNOW THAT THE -- THAT YOU MUST BE AGREEMENT, CONSENSUS AMONG YOUR PEERS THAT YOU HAVE MADE A CONTRIBUTION IN YOUR PARTICULAR FIELD.

MR. GLICK: Q. THERE IS ALSO CONTAINED IN YOUR RESUME A REFERENCE TO A NUMBER OF GOVERNMENT AND NON-GOVERNMENT PANELS AND STUDIES YOU WERE INVOLVED IN. I WISH TO ASK YOU JUST A LITTLE BIT ABOUT A COUPLE.

ONE IS THE ARMY PROJECT, VISTA STUDY IN 1951. CAN YOU GIVE US A 2- OR 3-SENTENCE, A SHORT STATEMENT OF WHAT THAT INVOLVED?

A. I THINK I MAY COMBINE 2. THE ARMY IN 1972 WANTED THE -- I'M SORRY, 1951, VISTA WAS '51. AND THE NAVY IN 1954 AND '55,

IN BOTH CASES THESE WERE DEPARTMENT OF ENERGY STUDIES TO TRY TO UNDERSTAND WHAT WOULD BE THE ROLE OF THE ARMED SERVICES OR VARIOUS PARTS THEREOF IN VIEW OF THE DEVELOPMENT OF NUCLEAR WEAPONS AND THE DRAMATIC CHANGES THAT MAKES.

MY ASSIGNMENT TO THE VISTA PROJECT HAD TO DO PRIMARILY WITH COMMUNICATIONS AND THE USE OF, EMPLOYMENT OF RADAR IN THIS NEW ENVIRONMENT. AND IN THE CASE OF THE SECOND ONE, THE NAVY STUDY, I HAD TO DO WITH, AGAIN, COMMUNICATIONS AND TRYING TO INTEGRATE ALL OF THE SENSORS, THAT IS, RADAR AND SONAR AMONG ALL THE VESSELS IN THE FLEET.

AND I'M NOT SURE I PUT IT IN HERE, BUT I WAS WITH A SMALL GROUP WHICH AT THAT TIME CONCEIVED THE IDEA OF WHAT'S BECOME SINCE THEN THE NAVY TACTICAL DATA SYSTEM, WHICH IS, BY MEANS OF COMMUNICATIONS, PERMITS THE TRANSFER OF THIS INFORMATION FROM MANY DIFFERENT SOURCES TO MANY DIFFERENT SHIPS WITHIN THE FLEET TO MAKE MAXIMUM USE OF THE INFORMATION THEY HAVE.

Q. I REFER TO PAGE 2 OF YOUR RESUME THAT WAS PREPARED IN THIS CASE. IT REFERS TO VARIOUS PATENTS ON WORK THAT YOU DID, IS THAT CORRECT?

A. YES, IT IS.

Q. AND YOU'LL NOTE THAT ALL THE PATENTS WERE ULTIMATELY ASSIGNED TO THE UNITED STATES GOVERNMENT, IS THAT RIGHT?

A. ABSOLUTELY. YOU KNOW, IN EVERY CASE, ALL MY LIFE I'VE WORKED FOR ORGANIZATIONS WHICH HAD PATENT AGREEMENTS WITH THE UNITED STATES, SO ANY PATENTS THAT I'VE HAD BELONGED TO THE GOVERNMENT.

Q. THE FIRST PATENT WHICH IS CALLED THE BOOTSTRAP SAWTOOTH

GENERATOR --

A. IT MEANS THAT YOU PULL YOURSELF UP BY YOUR BOOTSTRAPS, WHICH IS MY PICTURE OF HOW THIS PARTICULAR CIRCUIT WORKS.

Q. COULD YOU GIVE US JUST A SHORT SUMMARY OF THAT DEVICE?

A. THE PURPOSE OF THIS INVENTION WAS TO DESIGN A CIRCUIT WHICH WOULD REDUCE HIGHLY LINEAR WAVE FORMS FOR DISPLAY ON CATHODE FORMS. THE OSCILLOSCOPE, WHICH I HOPE YOU'RE FAMILIAR WITH, WAS PRETTY CRUDE, AND THE SO-CALLED SWEEP CIRCUITS SO YOU CAN PRESENT EVENTS IN TERMS OF TIME WHICH TRAVEL HORIZONTALLY ACROSS THE TUBE WERE PART OF THE EXPOTENTIAL TUBES.

IN THE CASE OF THE RADAR DISPLAYS, WE HAD TO HAVE SIMILAR TYPES OF RADAR WAVE FORM GENERATED, AND THE OBJECT IN THIS CASE WAS BY THE SIMPLE MEANS TO GENERATE A MUCH MORE LINEAR SWEEP WHICH WOULD BE ALSO OVER A WIDE VOLTAGE RANGE. I WANTED TO GIVE IT -- WELL, IT DOESN'T MAKE ANY DIFFERENCE. IT CONCERNS THE LIMITATIONS OF ELECTRONICS IN THOSE DAYS. I'M NOT SURE WHETHER IT'S ON HERE, BUT I WENT ON.

THIS, INCIDENTALLY, IS NOT A FREE RUNNING SYSTEM, IT WAS TO BE TRIGGERED. ANY TIME IT WAS TRIGGERED, IT WOULD GENERATE A SWEEP OF THE SET IN DESIGN, AND THERE WERE KNOBS AND CONTROLS IN ORDER TO DECIDE HOW FAST OR SLOW, OR WHATEVER, YOU WANTED TO HAVE IT BE, AND IT'S DESIGNED TO BE, NO MATTER HOW MANY TIMES IT'S TRIGGERED, IT WILL GO OFF AT THE RIGHT SPEEDS.

IN ADDITION, I INVENTED LATER ON, BECAUSE OF ADDITIONAL NEEDS FOR OUR DISPLAYS, I WANTED TO MAKE THE SPEED OR -- OF THE SPOT MOVEMENT OR THE RATE AT WHICH THE SPOT

TRAVELED ACROSS THE TUBE PROPORTIONAL TO AN EXTERNAL APPLIED SIGNAL, SO THAT I DESIGNED SWEEP GENERATORS WHICH WERE EXTERNALLY CONTROLLED TO GO AT ANY SPEED FROM ZERO UP TO A MAXIMUM, AND ALSO TO GO BOTH POSITIVE AND NEGATIVE UNDER AN EXTERNAL CONTROL.

Q. IT REFERS TO IN ITS NAME, SAWTOOTH GENERATOR, DID IT MAKE A SAWTOOTH WAVE? WAS, IN FACT, A SAWTOOTH WAVE GENERATED?

A. I HOPED I JUST EXPLAINED IT. THE OBJECT IS TO CAUSE THE SPOT ON THE CATHODE TUBE TO MOVE AT A CONTINUOUS RATE ACROSS THE DISPLAY. IT'S ALSO USED FOR A GREAT MANY OTHER PURPOSES, BECAUSE IF YOU HAVE A LINEARLY INCREASING ANALOG SIGNAL AND A VOLTAGE COMPARATOR, THEN ONE CAN USE IT TO DETERMINE TIMES OR TO GENERATE TIMES ARBITRARILY UNDER EXTERNAL CONTROLS. MANUAL OR COMPUTER OR WHATEVER YOU WANT.

Q. REFERRING TO NUMBER 4, THE FAST IMPULSE CIRCUITS PATENTS, IT REFERS TO BI-STABLE, B-I DASH S-T-A-B-L-E, ELECTRONIC CIRCUITS.

A. HISTORICALLY, THE FIRST BI-STABLE WAS CALLED THE ECCLES, E-C-C-L-E-S, DASH, JORDAN, J-O-R-D-A-N TRIGGER CIRCUIT. THAT'S SOMETHING LIKE 1924, AND THAT'S A BI-STABLE ELECTRONIC CIRCUIT WHICH HAS 2 STATES. AND BY EXTERNAL MEANS IT CAN CAUSE TO BE TRANSFERRED FROM STATE A TO B OR FROM B BACK TO A.

AND I GUESS I'M THE PERSON WHO INVENTED THE TERM FLIP-FLOP FOR THIS IN ABOUT 1941 BECAUSE IT SOUNDED LIKE THIS DEVICE EITHER FLIPS OR IT FLOPS.

SO THE PROBLEM WAS THIS, WAS TO GET IT ALWAYS TO FLIP FROM STATE A TO STATE B AND FROM STATE B BACK TO STATE A RELIABLY WHENEVER YOU PUSHED THE BUTTON OR GAVE IT THE SIGNAL

TO DO THAT.

IT'S AN EXTREMELY IMPORTANT APPLICATION IN COUNTING THE CYCLES OF A FREQUENCY OR IN REDUCING HIGH FREQUENCY TO A LOWER FREQUENCY BY DIVIDING IT, AND IN THE CASE OF RANDOMLY OCCURRING SIGNALS THAT YOU HAVE WITH RADIATION DETECTORS TO COUNT PULSES WHICH OCCUR AT A RANDOM RATE, BUT AT A RANDOM HIGH RATE, AND TO COUNT THOSE OVER A PERIOD OF SECONDS, A HUNDRED SECONDS OR WHATEVER TO GET THE AVERAGE RATE OF OCCURRENCE OF PULSES.

FOR THAT YOU NEEDED SOMETHING THAT WOULD DIVIDE WHAT THIS IS DOWN. SO THE STANDARD WAY TO DO THAT IS TO HAVE A BI-STABLE STATE AND EVERY PULSE THAT COMES IN FLIPS IT OVER, THE NEXT FLIPS IT BACK, SO IT DIVIDES BY 2.

BY PUTTING A GREAT MANY OF THESE IN SERIES YOU CAN COUNT DOWN FROM THE HIGHEST FREQUENCY TO SOMETHING THAT YOU CAN PUT INTO PERHAPS A MECHANICAL DEVICE.

SO THIS GREAT INVENTION HAD TO DO WITH TRYING TO SOLVE A PROBLEM WHICH MANY BRIGHT PEOPLE WORKED ON, BUT WERE NOT SUCCESSFUL, AND THAT IS TO DESIGN A 2 CIRCUIT BASED ON A FLIP-FLOP IN SUCH A WAY THAT TRIGGERED RANDOMLY, IT WOULD BEHAVE PROPERLY, OR IF THE 2 PULSES CAME TOO CLOSE TOGETHER, IT WOULD DECIDE NOT TO DO ANYTHING. THAT ALWAYS GETS STUCK THERE.

THE PREVIOUS THINGS WERE VERY POOR IN TERMS OF THE FACT THAT, FIRST OF ALL, THE SHAPE OF THE TRIGGER PULSES HAD TO BE TAILORED TO WORK AT ALL AND, SECONDLY, IT WOULD FLIP OVER AND FLIP BACK OR IT WOULD COUNT BY ZERO AND 2 AND IT'S SUPPOSED TO COUNT BY 1 AT A TIME, AND SO ON.

SO HAVING COME FROM MIT, AS SOON AS I SAW THIS THING THAT PEOPLE WERE PLAYING WITH 4 OR 5 YEARS BEFORE AND NO PROGRESS, I FELT ALL THE TRICKS THAT I HAD LEARNED, I MUST BE ABLE TO THINK OF A WAY.

ABOUT 2 DAYS OF VERY INTENSIVE THOUGHT, I USED DIODES. RECOGNIZING THIS DEVICE IN STATE A, I CAN CONNECT TO IT AND GIVE IT AN IMPULSE OF THE 2 DIODES AND IT WILL ALWAYS PUT THE SIGNAL IN THE RIGHT SIDE TO GO FROM A TO B. IF IT'S IN B, IT'S THE REVERSE. THE DIODES TELL IT WHERE TO PUT THE SIGNAL TO DO THE MOST GOOD.

IT WAS VERY SUCCESSFULLY EMPLOYED THERE AND BECAME THE STANDARD AFTER WORLD WAR II AND, IN FACT, DIODE STEERING OF SOME FORM OR ANOTHER IS INVOLVED IN EVERY FLIP-FLOP AND EVERY COMPUTER CHIP IN THE WORLD STILL.

Q. WAS THAT CALLED THE HIGINBOTHAM SEALER CIRCUIT?

A. THAT'S WHAT IT IS.

Q. ON THE LAST PAGE OF THE DOCUMENT, WHICH IS YOUR RESUME, ARE SOME PUBLICATIONS. ARE THESE ALL YOUR PUBLICATIONS?

A. NO, INDEED. I JUST PICKED OUT SOME OF THE HIGHLIGHTS.

Q. LET ME THEN TURN TO YOUR EXPERIENCE AT BROOKHAVEN WITH ELECTRONIC GAMES. DID YOU MAKE OR CAUSE TO HAVE MADE ANY ELECTRONIC GAME?

A. YES.

Q. WHAT SORT OF GAME WAS IT?

A. IT WAS A TENNIS GAME.

Q. WHEN WAS THAT DONE?

A. THAT WAS 1958.

Q. WAS THAT REPEATED AGAIN IN 1959?

A. YES, IT WAS.

Q. WHY DID YOU MAKE AN ELECTRONIC TENNIS GAME?

A. FROM THE TIME BROOKHAVEN WAS FOUNDED IT WAS VERY OBVIOUS THAT IT WAS OF IMPORTANCE TO TRY TO TELL PEOPLE WHAT WE WERE DOING, AND I SUPPOSE BY THE END OF THE SECOND YEAR OR SO WE ARRANGED TO HAVE VISITORS' DAYS. THIS WOULD BE LATE IN AUGUST OR EARLY SEPTEMBER.

AND WE HAD ARRANGED TYPICALLY 3 DAYS, ONE FOR COLLEGE STUDENTS, ONE FOR HIGH SCHOOL STUDENTS, AND ONE FOR THE GENERAL PUBLIC. AND FOR THIS, EVERYBODY WOULD BE INVITED TO COME, WE WOULD TAKE THEM AROUND THE LABORATORY IN BUSES AND SHOW THEM A FEW MOVIES BY THE TIME WE GOT THEM.

AND THEN IN THE GYMNASIUM WE SET UP A LOT OF EXHIBITS. AND THE INSTRUMENTATION GROUP WHERE I WAS, AMONG OTHERS, HAD SET UP EXHIBITS, AND I THOUGHT THIS WAS REALLY PRETTY DULL IF PEOPLE CAME IN AND SAW BIG MAGNETS WHICH WEREN'T VERY MEANINGFUL OR PICTURES OF CLOUD CHAMBER TRACKS, WHICH ALSO WEREN'T VERY IMPRESSIVE EXCEPT TO PHYSICISTS. THEY MIGHT BE INTERESTED IN THE MICE THAT THE BIOLOGISTS HAD, BUT I THOUGHT WE SHOULD HAVE SOMETHING THAT WAS MOVING WHICH, HOPEFULLY, THEY COULD INTERACT WITH.

SO THIS GREAT IDEA HIT ME. I LOOKED AROUND AND SAID, WHAT DO WE HAVE. WE HAVE OSCILLOSCOPES, LOTS OF THEM, USE THEM ALL THE TIME. WE HAPPENED TO HAVE SOME OPERATIONAL AMPLIFIERS AVAILABLE, A LOT OF RELAYS AND OTHER DOODADS. SO I THOUGHT IT WOULD BE A GOOD IDEA TO MAKE A TENNIS GAME, SO I DID.

Q. NOW, YOU MENTIONED MEMBERS OF THE PUBLIC THAT WERE

INVITED AND UNIVERSITIES RECEIVED INVITATIONS, IS THAT CORRECT?
A. PARDON ME?
A. THE UNIVERSITIES ALSO RECEIVED INVITATIONS TO THE OPEN HOUSES?
A. YES.
Q. APPROXIMATELY HOW MANY PEOPLE ATTENDED THE OPEN HOUSES?
A. WELL, ON A GIVEN DAY WOULD BE SEVERAL HUNDRED, 2- OR 300, AND THEN THE TOTAL OF 3 DAYS IT WENT WAY OVER A THOUSAND.
Q. WAS THAT TRUE OF BOTH THE YEARS?
A. OH, YES, BOTH YEARS.
Q. AND AS TO THESE EXHIBITS THEY WERE ENTIRELY PUBLIC, IS THAT CORRECT? THERE WAS NO SECRECY SURROUNDING YOUR TENNIS GAME EXHIBIT?
A. OH, NO. WE HAVE HAD VERY FEW CLASSIFIED PROJECTS AT BROOKHAVEN EVER. IT'S RUN BY UNIVERSITIES, AND THE INTENT IS TO PERFORM BASIC RESEARCH AND IS NOT CLASSIFIED.
Q. WERE VISITORS ALLOWED TO ASK QUESTIONS ABOUT THE TENNIS GAME AND OTHER EXHIBITS?
A. YES.
Q. AND THEIR QUESTIONS WERE ANSWERED?
A. WELL, YES. THE ANSWER IS YES. IF YOU WANT TO KNOW IF THEY WERE ALL ANSWERED CORRECTLY, I'M -- NO, WE TRIED. IN ADDITION, I MIGHT SAY THAT IN THOSE DAYS, YOU ALWAYS HAD WHAT WAS CALLED A SET OF WISE MEN. IF YOU COULDN'T GET YOUR QUESTIONS ANSWERED, YOU WOULD WORK ON THE WISE MEN. I WAS AT THE WISE MEN'S TABLE BECAUSE I WAS GREAT AT THINKING OF ANSWERS TO THE CRAZY QUESTIONS. THE ANSWER IS YES.
Q. I WOULD LIKE YOU TO STAND DOWN TO THE CHART, AND I THINK

WE SHOULD TILT IT SO COUNSEL AND EVERYBODY WILL BE ABLE TO SEE OVER TO MY LEFT.

PROCEED AND TRY TO TALK SLOWLY SO THE COURT REPORTER WILL BE ABLE TO TAKE DOWN THE INFORMATION.

A. YES.

Q. GO AHEAD AND, IF YOU WOULD, USING THE CHART, DESCRIBE TO THE COURT HOW YOUR TENNIS GAME PLAYED FROM THE EYE OF THE VIEWER, NOT AT THIS POINT FROM THE INSIDE OF THE MACHINE, BUT HOW IT LOOKED AND WHAT HAPPENED.

A. SURE. IT'S PRESENTED ON A CATHODE RAY TUBE ON A LABORATORY OSCILLOSCOPE. WHAT I WANTED TO DO AND WHAT I, IN FACT, DID WAS TO HAVE A TENNIS GAME AS VIEWED FROM THE SIDE SO THAT ON THE TUBE I DISPLAYED WHAT I CALLED THE COURT, THE TENNIS COURT, AND I ALSO HAD A LINE IN THE CENTER WHICH REPRESENTED THE NET OVER WHICH ONE HAS THE BOUNCE THE BALL.

AND TO START WITH, I PLACED THE BALL ON ONE SIDE. THIS IS WAITING TO BE SERVED, IT'S RIGHT STRAIGHT ABOVE -- SHOULD BE AT THE END OF THE COURT. THE LENGTH OF THE COURT, BY THE WAY, IS GOING TO BE IMPORTANT. THEN I HAVE -- I HAD CONTROLS, HAD A BOX WHICH HAD A KNOB WITH AN ARROW AND A PUSH BUTTON, AND I HAD 2 OF THESE BOXES SO YOU COULD HAVE 2 PLAYERS.

SO LET'S SAY THAT THE BALL IS OVER HERE (INDICATING) AND THIS PERSON IS GOING TO SERVE. WHAT HE WOULD DO IS SELECT AN ANGLE WITH HIS KNOB AND PUSH THE BUTTON. NOW, THE ANGLE SELECTS THE DIRECTION IN WHICH THE BALL STARTS OUT AND THEN THE BALL WENT OVER AND POSSIBLY BOUNCED HERE (INDICATING).

AND NOW I'M GOING TO HAVE TO GO THE TO THE NEXT SHEET AND SHOW YOU ALL THE OPTIONS FOR THE SERVICE. BUT THE

IMPORTANT THING IS I WANT TO SIMULATE THE SIDE VIEW, I SET THE BALL UP IN POSITION FOR SERVE. THE SERVER SETS THE ANGLE, PUSHES THE BUTTON AND THE BALL TAKES OFF. THERE ARE 3 POSSIBLE THINGS FOR HIM TO DO.

MR. GLICK: WE'LL MARK THIS AS EXHIBIT JN, YOUR HONOR.

THE WITNESS: NUMBER ONE, IS THIS GOOD POSSIBILITY HERE (INDICATING). AND THAT IS THE BALL IS PROPERLY AIMED, IT WENT OVER THE NET, IT BOUNCED ON THE COURT AND BOUNCED OUT AGAIN. SO IT'S A FAIR, PROPER SERVE.

ANOTHER POSSIBILITY IS THAT THE SERVE, THE ANGLE IS PICKED WRONG AND THE BALL GOES LIKE THIS, BOUNCED BACK, AND BOUNCED BACK TOWARD THE SERVER. THAT'S NUMBER 2. THAT'S THE SECOND POSSIBILITY.

THE THIRD POSSIBILITY IS TO PICK THE ANGLE TOO HIGH AND IT WENT OFF THE END OF THE COURT. NOW, THE NEXT QUESTION IS WHAT DOES THE SECOND PLAYER DO BECAUSE AS SOON AS THE BALL PASSES -- THIS IS NUMBER 3 UP HERE. NUMBER 1 IS A SUCCESSFUL SERVE, NUMBER 2 IS HIT THE NET, AND NUMBER 3 IT WENT BEYOND THE OUTSIDE OF THE COURT ON THE OTHER SIDE. SO UNLESS THIS FELLOW IS STUPID ENOUGH TO PLAY IT, THE SERVER WOULD HAVE WON THE POINT. NOW, THE --

Q. WOULD HAVE LOST THE POINT, THE SERVER WOULD HAVE LOST?

A. YES. THE SERVER LOSES THE POINT ON 2 AND 3. NOW, THE -- ONE OF THE THINGS I HAD TO SENSE WAS AFTER THIS IS SERVED, I WANT TO TRANSFER CONTROL TO THE RECEIVER ON THIS SIDE OF THE NET, BUT I DON'T WANT HIM TO PLAY UNTIL IT GETS OVER THE NET, OF COURSE, SO I HAVE A CIRCUIT WHICH SENSES THAT AND ONCE THE

BALL IS PAST THE NET, THE RECEIVER CAN NOW PLAY.

AGAIN, HE SETS HIS ANGLE AND HE HAS A PUSH BUTTON AND DECIDES WHEN TO PLAY THE BALL. SO THERE ARE A WHOLE PILE OF POSSIBILITIES AS YOU CAN SEE, BUT THEY'RE ESSENTIALLY THE SAME AS THOSE FOR THE SERVER. HE CAN PLAY THE BALL ANY TIME IT'S HERE, HE COULD PLAY IT HERE. AFTER IT'S BOUNCED HE COULD PLAY IT HERE WHEN HE SHOULDN'T HAVE, BUT HE CAN STILL PLAY IT.

I'M TRUSTING IN THIS CASE THAT THE PLAYERS KNOW HOW TO PLAY TENNIS SO THEY'RE GOING TO DECIDE IF THE RECEIVER PLAYS THE BALL BACK WHEN HE SHOULDN'T HAVE, WHY, THAT'S HIS FAULT. AND I'M NOT GOING TO PUT ALL THAT STUFF INTO THE ELECTRONICS.

THE OPTIONS ARE EXACTLY THE SAME FOR THE RECEIVER. ONCE IT IS ON HIS SIDE OF THE COURT, HE CAN PLAY AT ANY ANGLE THAT HE DECIDES AND THE SAME THINGS CAN HAPPEN TO HIM. HE CAN HIT THE NET -- HIT IT OVER THE NET PROPERLY, HIT IT BEYOND THE COURT AND SO ON.

NOW, THE OTHER THING IS WE HAVE TO END THIS PLAY SOMEHOW. IF THE RECEIVER DOESN'T PLAY THE BALL, ESPECIALLY, FOR EXAMPLE, IN CASE 3, AS SOON AS THAT HIT THE GROUND IT HIT THIS LEVEL, IT'S OUTSIDE THE COURT, I HAVE SOMETHING THAT SENSES IT'S OUTSIDE THE COURT. WHAT IT DOES IS SAY THE GAME IS STOPPED AND SO WE FLIP IT BACK AND AT THAT POINT -- MAYBE I OUGHT TO HAVE ANOTHER COLOR HERE.

AT THAT POINT THE BALL WOULD GO BACK INTO A SERVE POSITION, BUT THIS TIME ON THIS SIDE OF THE COURT. NOW, DEPENDING ON WHERE YOU ARE IN THE GAME, IT MIGHT BE THAT'S THE WRONG SIDE OF THE COURT TO HAVE IT RESTORED TO. SO AS AN

EXTRA BUTTON ON THE BOX, THAT'S TO TRANSFER THE SERVE FROM ONE SIDE TO THE OTHER IF, ACCORDING TO THE PLAYER, IT'S IN THE WRONG PLACE. THAT'S THE GAME. I'M NOT SURE IF YOU HAVE OTHER QUESTIONS ON THAT.

Q. YES, I HAVE SOME AND I'M SURE HIS HONOR WILL HAVE SOME AND THE OTHER SIDE IN DUE COURSE.

IN THE CASE OF THE RECEIVER, COULD THE RECEIVER PLAY THE BALL IN THE AIR BEFORE IT BOUNCED?

A. YES, HE CAN PLAY IT HERE, PLAY IT HERE, YOU KNOW, ANYWHERE ON THIS SIDE OF THE COURT.

Q. IF THE BALL HIT THE NET, IT WOULD BOUNCE. IN WHAT FASHION DOES THAT BOUNCE APPEAR TO THE VIEWER?

A. I GUESS WE HAVE TO PUT ARROWS ON HERE. IT HITS THE NET --

Q. THAT'S A LEFT TO RIGHT DIRECTION.

THE COURT: RIGHT TO LEFT.

MR. GLICK: YES, RIGHT TO LEFT.

THE WITNESS: THIS IS RIGHT TO LEFT ON MY DRAWING. AND IF IT HITS THE NET, WHAT HAPPENS IS -- AND THIS IS JUST LIKE IT WOULD BE IN THE REAL WORLD -- THE BALL IS GOING TO CONTINUE TO FALL, BUT YOU REVERSE THE HORIZONTAL DIRECTION SO IT GOES BACK TOWARD THE SERVER IN THAT CASE. OR IF IT WAS THE RECEIVER, IT WOULD HAVE BEEN THE OPPOSITE FROM THE OTHER SIDE OF THE COURT. SO IT REVERSES THE HORIZONTAL DIRECTION, DOES NOT AFFECT THE VERTICAL DIRECTION.

Q. WERE THE PHYSICS OF THAT SIMILAR TO THE WAY THE BALL WOULD BOUNCE IN REAL LIFE?

A. YES, QUITE. THE -- I GUESS I DON'T QUITE REMEMBER WHY I

DID THIS. WHEN I THOUGHT IT THROUGH, I THOUGHT, WELL, IT WILL COME BACK. I'LL SIMPLY REVERSE THE HORIZONTAL VELOCITY. THE MORE I THOUGHT ABOUT IT, THAT'S NOT TOO REALISTIC AND SO MAYBE I'LL MAKE IT HAVE LESS OF BOUNCE. THE FACT IS IT BOUNCES BACK MORE SLOWLY THAN WHEN IT WAS HIT. IT IS REDUCED ABOUT 10 PERCENT, I THINK.

Q. IS THAT ALSO TRUE OF THE BOUNCE IF THE BALL HIT ON THE OTHER SIDE SUCCESSFULLY IN YOUR EXAMPLE 1 AND CONTINUED TO MOVE FROM RIGHT TO LEFT?

A. WELL, IF IT'S ALL RIGHT WITH YOU, WE'LL STAY WITH LINE 2 BECAUSE IT'S OVER HERE, TOO. IT BOUNCES OFF THE NET, HITS THE COURT AND BOUNCES AGAIN. IN THAT CASE, I REVERSED THE VERTICAL DIRECTION BECAUSE IT WAS GOING DOWN AND NOW I WANT IT TO GO UP AGAIN, BUT I DID NOT REVERSE THE HORIZONTAL DIRECTION.

AND AGAIN, YOU ASKED ABOUT WHETHER THE ELASTICITY WAS PERFECT AND THE ANSWER IS NO. THE VERTICAL WAS REVERSED, BUT NOT QUITE AS BIG A VERTICAL COMPONENT AS IT WAS BEFORE, SO I LOST ABOUT 10 PERCENT FROM THE REBOUND AND ABOUT 5 PERCENT ON THE REBOUND ON THAT ONE.

ALSO AS A FRILL, I HAVE A FEELING THAT IT HAPPENED BY MISTAKE, BUT THE HORIZONTAL VELOCITY WAS GOING TO BE CONSTANT WHEN I FIRST CONCEIVED IT. THERE IS A VERY IMPORTANT THING AND YOU SHOULD HAVE ASKED ME ABOUT THAT. WHEN -- THIS YX COMPONENT WILL SET THE ANGLE. IF I HAVE TO INCREASE THE HORIZONTAL COMPONENT, I GOT TO DECREASE THE VERTICAL AND VICE VERSA.

IT SHOULD BE THE SQUARE ROOT OF THE SUM OF THE SQUARES AND I WAS LAZY AND HAD 2 POTS. SO I DECREASED THE

OTHER COMPONENT. BUT THE FACT IS ON THE SCALE AND SO ON IT WAS VERY REALISTIC, YOU WOULDN'T NOTICE THAT IT WAS QUITE PERFECT FROM A THEORETICAL POINT OF VIEW. SO THE ANSWER IS -- AND NOW TO FINISH OFF TO MAKE SURE, THE THING IS THESE THINGS ARE REBOUNDS AND I HAVE TO SENSE A COINCIDENCE THAT THIS, IN FACT, AS THE HORIZONTAL POSITION IS AT THE CENTER OF THE COURT AND THAT THE VERTICAL POSITION IN THIS PARTICULAR CASE IS BELOW THE TOP OF THE NET AND IN THIS CASE IT'S ABOVE.

SO ONLY IN THAT CASE DO I INITIATE THIS LITTLE ACTION, RELAY WHICH REVERSED THIS DIRECTION BY DUMPING A CHARGE FROM ONE CAPACITOR TO ANOTHER. THE SAME THING HAPPENS HERE AT THE SERVE OR RETURN. I'M CHANGING ALL THE THINGS. ONE SET OF CONDITIONS TO ANOTHER ONE. I'M CHANGING ANGLES IN AN ARBITRARY FASHION SELECTED BY THE KNOB HERE.

Q. THE PLAYER'S CONTROL KNOB?

A. YES.

Q. WHEN THE PLAYER ON THE RIGHT HAS SERVED THE BALL AND BEFORE IT HAS REACHED THE NET TO GIVE CONTROL TO PLAYER 2, CAN PLAYER 1 DO ANYTHING TO FURTHER CONTROL THAT SHOT THAT HE HAS LAUNCHED?

A. NO. ONCE HE'S DONE THAT, NOTHING CAN HAPPEN. HE CAN'T PUSH ANY BUTTONS AND GET ANYWHERE.

Q. DURING THAT PERIOD THE BALL IS UNDER THE MACHINE'S CONTROL --

A. TRUE.

Q. -- UNTIL PLAYER B ELECTS TO HIT THE BALL WHEN HE HAS CONTROL OF IT, IS THAT RIGHT?

A. YES.

Q. ALL RIGHT. NOW, IF WE CAN -- LET ME MAKE THIS CLEAR. AND THEN THE PLAY OF THE GAME CAN CONTINUE UNTIL THE PLAYERS ARBITRARILY DECIDE THE GAME IS OVER, IS THAT RIGHT?

A. YES, YOU MAKE A DECISION THAT SOMETHING IS GOING TO BE OUT OR IS OUT SO ONE OF THE 2 PLAYERS STOPS PLAY AND, AS I SAY -- THE MACHINE CAN'T KNOW THEY STOPPED PLAYING. WHAT IT SENSES IS THAT IF IT WAITS LONG ENOUGH, THAT THE BALL FALLS DOWN BELOW THE GROUND LEVEL WHETHER INSIDE OR OUTSIDE THE COURT MAKES NO DIFFERENCE. THE GAME IS OVER, RESET, SET IT UP FOR THE NEXT SERVICE.

Q. VISITORS WERE ALLOWED TO PLAY THIS GAME?

A. YES.

Q. HOW WAS THE GAME RECEIVED?

A. VERY WELL. MOST POPULAR THING AT THE DEMONSTRATION.

Q. HOW LONG DID IT TAKE TO PUT YOUR TENNIS GAME TOGETHER?

A. WELL, TO CONCEIVE OF THE IDEA AND LOOK AROUND TO SEE IF I HAD THE RIGHT COMPONENTS TO PUT IT TOGETHER WITHOUT MUCH TROUBLE, THAT PROBABLY TOOK CERTAINLY LESS THAN HALF A DAY.

Q. THEN DID YOU HAVE THE ASSISTANCE OF A TECHNICIAN?

A. YES, HIS NAME WAS -- WELL, YOU DON'T NEED THE NAME. ANYWAY, A RELATIVELY COMPETENT TECHNICIAN. I TOOK HIM THE DRAWINGS, WHICH WERE ROUGH, AND SAID, HERE ARE SOME OF THE PARTS, NOW GET THE REST OF IT, WIRE IT UP AND WE'LL SEE HOW IT WORKS.

SO IT PROBABLY TOOK HIM 2 OR 3 DAYS TO GET THAT ALL PUT TOGETHER AND, IN FACT, HE HAD -- THERE IS SOMETHING WHICH I'LL COME TO LATER, AND THAT IS THESE -- THE BALL MOTION AND THE NET AND THE BASE LINE HERE, THE COURT WERE GENERATED

SEPARATELY.

SO I HAD -- HE HAD TO WIRE UP SOME SPECIFIC HARDWIRE -- ACTUALLY TRANSISTOR CIRCUITS. IT TOOK HIM PROBABLY THE BETTER PART OF A WEEK. THEN IT DIDN'T WORK RIGHT BECAUSE I DIDN'T DRAW SOME OF THE THINGS QUITE RIGHT AND THE RELAYS WEREN'T WIRED QUITE RIGHT, BUT CERTAINLY IN NOT MORE THAN A FEW HOURS, IT WAS WORKING RIGHT AND IT WAS MARVELOUS.

IT TURNED OUT IT WAS SO EASY AND IT WAS JUST BEAUTIFUL. THERE WASN'T A THING THAT I HAD TO CHANGE ON IT. OBVIOUSLY, CERTAIN THINGS ARE ADJUSTABLE LIKE THE SIZES OF THESE AND THE RELATIVE WIDTHS AND THINGS LIKE THAT, BUT WITH A VERY FEW MINUTES AND MUCH MORE HELP THAT I EVER NEEDED.

Q. LET'S TURN TO THE -- TO AN ELECTRONIC ANALYSIS HOPEFULLY AS CLOSE TO A LAY UNDERSTANDABLE LEVEL AS POSSIBLE AS TO HOW YOU GENERATED THE POSSIBLE PARTS OF THE GAME.

FOR THE RECORD, WE'LL TURN TO ANOTHER CHART AND THAT WILL BE JO AND, YOUR HONOR, WE OFFER JN INTO EVIDENCE AT THIS TIME.

THE COURT: IT MAY BE ADMITTED.

THE WITNESS: I HAVE TO DO THIS IN SEVERAL STEPS. LET ME START OFF BY SAYING THAT I NEED TO GENERATE SOME WAVE FORMS WHICH ARE GOING TO BE APPROPRIATE FOR THE PATH OF THE BALL. AND I SHOULD EXPLAIN WITH ALL DUE MODESTY, I HAD SEEN A LOT OF THESE THINGS DONE ON ANALOG GAMES BEFORE. NOT THE TENNIS THINGS, BUT I WASN'T STARTING FROM SCRATCH AND I WAS USING STANDARD, I THINK, FOR THAT PERIOD OF TIME ANALOG TECHNOLOGY.

FIRST OF ALL, I WANTED TO GENERATE A HORIZONTAL

MOTION, THAT'S THE THING TO GET THE BALL FROM LEFT TO RIGHT AND RIGHT TO LEFT. SO FOR HORIZONTAL I WANT SOMETHING WHICH IS GOING TO BE -- IN TIME WOULD BE A PLOT OF X AND TIME. THAT'S WHAT WE REFERRED TO EARLIER AS LINEAR SWEEP FOR THAT STANDARD THING TO DO.

AND I DID THIS WAY BACK IN -- IN THE 1940'S, 1941-42 WHEN I WAS IN RADAR. IT TURNS -- EVERY ELECTRONIC ENGINEER KNOWS THE CURRENT EYE IS EQUAL TO THE CAPACITOR C TIMES THE CURRENT IS EQUAL TO THE CAPACITANCE MULTIPLIED BY THE RATE OF CHANGE OF VOLTAGE WITH RESPECT TO TIME. IT'S CALLED THE DERIVATIVE, BUT YOU DON'T NEED THAT.

SO TO REVERSE THIS THING, VOLTAGE IS EQUAL TO -- PROPORTIONAL, LET'S SAY, TO THE INTEGRAL FROM ZERO TO IDT. YOU COULD SAY THAT. THE INTEGRAL FROM ZERO TO T OF IDT. AND SO THE EASY WAY TO GENERATE A LINEAR WAVE FORM LIKE THIS IS TO HAVE AN INTEGRATING DEVICE, AN INTEGRATING CIRCUIT, AND I PUT A CONSTANT CURRENT INTO THAT AND I'M GOING TO GET OUT A VOLTAGE WHICH IS GOING TO HAVE THAT FUNCTION.

THE VOLTAGE IS A FUNCTION OF TIME AND THAT'S WHAT I WANT FOR LINEAR. NOW, I WANT SOMETHING ELSE FOR VERTICAL. FOR VERTICAL, I WANT TO HAVE SOMETHING WHICH NOT ONLY GOES UP, BUT, IN FACT, IS GOING TO GO BACK DOWN AGAIN BECAUSE I HAVE THE FORCE OF GRAVITY WORKING ON IT. I'LL SUBTRACT THE GRAVITATIONAL PORTIONS. I DON'T THINK WE NEED TO GO INTO THIS BECAUSE EVERYBODY WHO KNOWS THIS ART UNDERSTANDS.

WHAT YOU DO IS INTEGRATE, BUT YOU DON'T INTEGRATE A CONSTANT. FOR THAT I INTEGRATE A FUNCTION WHICH GOES FROM POSITIVE TO ZERO TO NEGATIVE AND THAT SAYS I GOT A POSITIVE

SLOPE, A ZERO SLOPE, NEGATIVE SLOPE AND THAT GIVES ME THE COORDINATES. WITH THE LINEAR, IF I COMBINE THAT, I HAVE THE PARABOLA WHICH IS THE TRAJECTORY WHICH I'M TRYING TO GENERATE.

THE NEXT THING I HAVE TO KNOW AND, IN FACT, WE CAN NOW CALL THIS THE HORIZONTAL DEFLECTION AND THIS THE VERTICAL, THAT'S THE BALL MOTION. AND NOW I HAVE TO DO A NUMBER OF THINGS.

FIRST OF ALL, I HAVE TO HAVE THE STARTING CONDITION AND THAT IS I HAVE TO SET SOMEHOW ARBITRARILY WHERE THE BALL IS GOING TO BE ON ONE SIDE OF THE SCREEN BEFORE YOU PUSH THE BUTTON AND IT'S READY FOR SERVICE. I DO THIS ARBITRARILY, BUT IF YOU GO BACK TO THIS PICTURE, THE COORDINATES, IN FACT, THIS IS ZERO ZERO, SO I START OFF WITH THE BALL AT VERTICAL ZERO AND AT MINUS SOMETHING OR OTHER IN THE HORIZONTAL POSITION.

SO THAT'S A STARTING POINT AND ALL MY CIRCUITS, MY INTEGRATING CIRCUITS ARE LOCKED FOR -- THE ONES FOR THE VERTICAL AND HORIZONTAL. WHEN YOU PUSH THE PUSH BUTTON IT PREVENTS IT FROM STARTING OFF IN THIS DIRECTION.

NOW I HAVE TO SENSE SEVERAL THINGS. ONE IS WHEN IT GETS TO THE POSITION WHERE THE NET IS IN THE CENTER OF THE SCREEN, IS IT ABOVE OR BELOW THE TOP OF THE NET. SO I HAVE 2 CIRCUITS WHICH SENSE THAT. ONE, IT SENSES IT'S RIGHT AT THE CENTER AND, SECONDLY, IT SENSES WHETHER IT'S ABOVE OR BELOW THE NET. SO I NEED TO COMBINE 2 THINGS FOR THAT.

SECONDLY, REGARDLESS OF WHERE THIS IS, HOW HE AIMS IT, I HAVE TO KNOW WHEN IT HITS THE BASE LINE. I HAVE TO KNOW WHETHER IT'S WITHIN OR OUTSIDE OF THE COURT. AS A MATTER OF FACT, I DON'T CARE. THE PLAYER MAKES THAT DECISION. I WANT

TO KNOW IF IT GOES BELOW THE BASE LINE. SO I HAVE A VOLTAGE COMPARATOR WHICH OPERATES WHENEVER THE BALL FALLS BELOW THIS LEVEL AND TELLS IT IT SHOULD BOUNCE OR IN THE CASE THE GAME IS OVER, START ALL OVER AND RESET THE BALL FOR THE NEXT SERVICE.

I THINK RATHER THAN WANDERING ON, I'LL STOP AND SEE HOW MUCH YOU THINK I OUGHT TO ADD TO THIS. DON'T FORGET I HAVE TO GENERATE THE REST OF THE DISPLAY.

Q. YOU USED SOME CIRCUITS FROM THE DONNER ANALOG COMPUTER?

A. YES.

Q. DID YOU USE THE COMPUTING POWER?

A. NO.

Q. WHAT DID YOU USE FROM IT?

A. THAT PARTICULAR AND A GOOD MANY MUCH MORE EXPENSIVE ANALOG COMPUTER WAS A PILE OF WHAT WE CALL OPERATIONAL AMPLIFIERS. THERE WERE 10 AND A LOT OF OTHER COMPONENTS WHICH COULD BE HOOKED TOGETHER TO SOLVE THE PARTICULAR ANALOG PROBLEMS WHICH THEY'RE DESIGNED TO DO. ALL I USED WAS THE OPERATIONAL AMPLIFIERS.

I KNEW FROM THE BEGINNING THAT I HAD TO PERFORM THESE INTEGRATIONS WHICH I DESCRIBED OVER HERE. ACTUALLY, I USED 2 OPERATIONAL AMPLIFIERS AS INTEGRATORS. I USED 2 MORE AS BUFFERS BECAUSE I HAD TO FEED SOME SIGNALS INTO THOSE WHICH I HAD TO CONTROL IN SOME FUNNY WAYS.

IN PARTICULAR, I HAD TO GENERATE THIS SORT OF A WAVE FORM FOR ONE OF THEM. SO I USED 4 OF THOSE AMPLIFIERS FOR THAT. ALL THE REST WERE USED AT THE CENTER OF THE COURT, ABOVE OR BELOW THE NET, LEFT AND RIGHT AND ABOVE OR BELOW THE BASE LINE. SO I USED UP ALL 10 OPERATIONAL AMPLIFIERS WHICH

IS WHAT THEY HAPPENED TO HAVE AND IT TURNED OUT TO BE EXACTLY RIGHT FOR WHAT I HAD TO DO.

Q. IS IT ACCURATE TO SAY THAT YOU BORROWED THOSE 10 OPERATIONAL AMPLIFIERS FROM THAT SOURCE AS OPPOSED TO PUTTING TOGETHER YOUR OWN OPERATIONAL AMPLIFIERS WHICH YOU COULD HAVE DONE?

A. WELL, THE ANSWER IS, OF COURSE, THAT I COULD VERY WELL HAVE BUILT MY OWN. IF YOU LOOK BACK AT SOME OF THE -- ONE OF MY PATENTS IN 1942 OR '43, IT HAS TO DO WITH -- ACTUALLY IT'S A -- TAKING A DERIVATIVE BUT, IN FACT, IT HAS AN OPERATIONAL AMPLIFIER IN IT. SO I'VE BUILT OPERATIONAL AMPLIFIERS AND STUDIED THEIR FEATURES FOR MANY YEARS BEFORE THIS AND, OF COURSE, THEY'VE IMPROVED IN SOME RESPECTS, BUT THE OPERATIONAL PRINCIPLES ARE IDENTICALLY THE SAME. THEY HAVE TO EXIST AND NOBODY COULD FIGURE OUT WHAT TO DO WITH THE BOX, AND SO I SAID I'LL USE IT RATHER THAN BUILDING MY OWN. IF I TALK TOO LONG, TURN ME OFF.

Q. I'LL TRY TO DO THAT, BUT WE'RE IN TESTIMONY THAT IS QUITE RELEVANT TO THIS ACTION.

HOW DID YOU ACHIEVE BOUNCING THE BALL BACKWARD OFF THE NET IN YOUR GAME ELECTRONICALLY? FIRST OF ALL, DID YOU SENSE COINCIDENCE BETWEEN THE BALL AND NET WHEN THE BALL WAS HIT TOO LOW TO CLEAR THE NET?

A. I HAVE TO SOMEHOW SENSE THAT I NEED TO PERFORM AN OPERATION. SO I HAVE A CIRCUIT WHICH TELLS ME IN A VERY SHORT INTERVAL THAT THE BALL IS AT THE CENTER OF THE COURT. IT GIVES A SIGNAL ONLY FOR THAT TIME. IN SERIES WITH THAT, I HAVE ANOTHER ONE WHICH SAYS THAT -- TELLS ME WHETHER OR NOT

THE POTENTIALS ON THE BALL AT THIS TIME, IN FACT, THE VERTICAL, IS ABOVE THE NET TOP OR BELOW THE NET TOP. IT CAN'T BE BELOW BECAUSE THIS ONE GETS IT.

SO I HAVE 2 CIRCUITS SIMULTANEOUSLY WHICH BOTH OPERATE RELAYS -- NO, THEY OPERATE ONE RELAY BETWEEN THEM. THAT, IN FACT, IS WHAT YOU WOULD CALL A VOLTAGE -- IT SENSES THAT 2 VOLTAGES ARE THE SAME. IT SENSES AN X HORIZONTAL VOLTAGE FOR THAT POSITION AND A Y FOR THAT ONE. IT'S THE SAME AS THE VERTICAL AND HORIZONTAL COMPONENTS OF THE BALL AND, THEREFORE, WE HAD TO DO SOMETHING.

NOW, YOU WANT TO KNOW WHAT I DO. I HAD TO CHANGE THE CONDITION OF ONE OF THE ELEMENTS IN MY INTEGRATING CIRCUIT. IF YOU WANT TO GO INTO THAT IN DETAIL, WE CAN DO THAT.

Q. IS IT ACCURATE -- LET'S SEE IF WE CAN GET RIGHT TO THE POINT.

IS IT ACCURATE TO SAY THAT YOUR OPERATIONAL AMPLIFIER DETECTED COINCIDENCE TO THE NET, WAS HOOKED TO A RELAY WHICH TRIGGERED TO REVERSE THE HORIZONTAL DIRECTION OF THE BALL?

A. YES, IT DOES THAT AND IT ONLY HAS TO MAKE A MOMENTARY CONTACT. I'LL TELL YOU, I ASSUME YOU'RE GOING TO GIVE DRAWINGS TO THE COURT AND IT SEEMS TO ME ANYBODY WHO KNOWS ELECTRONICS, WITH THE BACKGROUND WHICH I'VE EXPLAINED AND SAY WITH NOT MUCH MORE PROMPTING, CAN SEE HOW I DID THIS. IN EFFECT, WHAT I'M DOING IS I HAVE -- I'LL DRAW IT -- LET'S GET A CLEAN PIECE OF PAPER HERE.

ALL OF THESE INTEGRATORS CONSIST OF AN OPERATIONAL AMPLIFIER, ONE TERMINAL, ONE INPUT TERMINAL HOOKED TO THE

GROUND AND A CAPACITOR HOOKED BETWEEN THE OUTPUT AND THE OTHER TERMINAL. AND THEN I WANT TO INTEGRATE A FUNCTION SO, IN FACT, I PUT A RESISTOR HERE AND IF I HAVE A VOLTAGE, V3 TO DISTINGUISH IT FROM EVERYTHING ELSE, THIS VOLTAGE DETERMINES THE CURRENT. THIS POINT STANDS STILL. IT HAS NEGATIVE FEEDBACK.

WHAT IT DOES IS TO PRODUCE OUT HERE THE INTEGRAL OF THAT CURRENT. THAT'S WHAT I WANTED TO GET. AND -- BUT IF I WANT TO REVERSE DIRECTION, WHAT I DO, IN FACT, IS FLIP THAT CAPACITOR OVER. I DIDN'T REALLY DO THAT. AND IF YOU LOOK AT MY DRAWING, YOU'LL SEE I USED A TRICKY WAY. IT'S AS IF I USED THE CAPACITOR WHICH CHANGED THE INTEGRATION AND ALL THAT. IS THAT RIGHT? I'VE GOT TO THINK ABOUT THIS. I'M SORRY. NO. I DON'T -- I BETTER BE CAREFUL. I GOT TO DO IT ON THE ONE AHEAD OF TIME.

WHAT I HAVE TO DO IS REVERSE THE DERIVATIVE. I DON'T WANT TO CHANGE THE OUTPUT BECAUSE THAT WOULD CHANGE THE BALL POSITION. I INVERTED THE INPUT SIGNAL, WHATEVER IT WAS. IT'S DIFFERENT IN THE HORIZONTAL AND IN THE VERTICAL CASES.

Q. THERE IS A SECOND KIND OF REVERSAL OF THE BALL AND THAT'S WHEN THE PLAYER ON THE OTHER SIDE HAS CONTROL OF THE BALL AND PUSHES THE BUTTON?

A. RIGHT. BUT IN THAT CASE AGAIN, NOW -- FIRST OF ALL, WHILE THE BALL IS SITTING -- REGARDLESS OF WHAT'S COMING -- WHEN I GOT THE BALL SET UP BEFORE SERVICE, IT'S STANDING STILL IN A LOCATION. SO, IN FACT, WHAT I DO IS PUT AN ADJUSTABLE BATTERY ACROSS HERE WHICH DETERMINES -- AND SINCE THIS STANDS STILL, THAT IS WHAT THE OUTPUT WILL BE AND THAT'S THE POSITION

OF THE X OR THE Y COORDINANT FOR THE SERVICE.

WHAT I DO IS WHEN THE PLAYER PUSHES THE BUTTON, I TAKE THAT OUT AND NOW IT'S STILL HOLDING THAT AND I SWITCH A NEW VALUE IN HERE, (INDICATING), BECAUSE HE'S JUST SET UP ON HIS KNOBS WHICH WAY HE WANTS IT TO GO. IT'S REPEATED AGAIN AND IT'S THE SAME KIND OF GAME FOR THE X, TOO. THIS IS HORIZONTAL AND THIS IS VERTICAL. IT'S THE SAME OPERATION IN BOTH CASES.

WHAT I'M DOING IS SWITCHING THINGS OUT FRONT, BUT I HOLD THOSE FOR THE SERVICE, I HOLD THEM FIXED AND IGNORE WHAT'S GOING ON OUT HERE BECAUSE EVERYBODY HAS DRIFTED OFF, NOBODY IS PLAYING. WHEN THE PERSON SELECTS THE RANGE PUTS IN NEW VALUES HERE, IT'S A FIXED VALUE FOR THE VERTICAL. AS I TOLD YOU, IT'S GOING TO INTEGRATE, SO IT'S GOING TO INTEGRATE A WAVE FORM WHICH GOES LIKE THAT IN TIME.

Q. TO CREATE THAT HORIZONTAL REVERSAL, DID YOU USE A DEVICE CALLED A RATCHET RELAY?

A. THE ANSWER IS YES. NOW YOU WANT TO KNOW WHAT THAT IS. THIS IS AN ELECTROMECHANICAL DEVICE WHICH HAS 2 STABLE STATES AND WHEN A CIRCUIT IS CLOSED, IT TRANSFORMS IT FROM ONE STATE TO THE OPPOSITE STATE. IT'S A MECHANICAL DEVICE WHICH HAS ALL THE PROPERTIES OF BI-STABLE AND CONNECTED TO IT WERE A VERY LARGE NUMBER OF CONTACTS OF DOUBLE THROW SWITCHES.

THERE ARE 2 REASONS I SELECTED THAT. FIRST OF ALL, IN THIS OPERATION I NEED, I THINK IT'S 8 DOUBLE PULL, DOUBLE PULL SWITCHES IN THE PARTICULAR WAY I DID THIS, AND THAT'S A LOT TO GET AND WIRE UP AND THEY HAPPENED TO BE ON THIS MACHINE.

SECONDLY, I HAD TO BE INTRIGUED WITH THIS MECHANICAL

MONSTER. I WOULD NEVER USE IT AGAIN, BUT IT WAS AVAILABLE AND I USED IT.

Q. IT WAS A MECHANICAL BI-STABLE DEVICE?

A. MECHANICAL BI-STABLE DEVICE.

Q. AND A FLIP-FLOP IS THE SAME, BUT IS ELECTRONIC?

A. YES.

MR. GLICK: YOUR HONOR --

THE WITNESS: DO WE NEED THE DRAWINGS MARKED?

MR. GLICK: I DON'T BELIEVE SO. I THINK YOU CAN RETURN TO THE STAND.

YOUR HONOR, I BELIEVE WE'VE PREMARKED THE SCHEMATICS WHICH ARE EXHIBITS E AND F. I TAKE IT THERE IS NO DISPUTE THESE ARE THE SCHEMATICS FOR THE GAME. I'LL SHOW THEM TO THE WITNESS.

THE WITNESS: NO DOUBT. AND THE INITIALS STAND FOR ROBERT V. DVORAK, WHO WAS THE TECHNICIAN, AND ALEX ELIA WAS THE DRAFTSMAN.

Q. CAN YOU SPELL THOSE NAMES FOR THE COURT REPORTER?

A. ROBERT DVORAK, D-V-O-R-A-K. I'M SORRY TO SAY HE DIED ABOUT 10 YEARS AGO. AND ALEX ELIA, E-L-I-A, IS THE CHIEF DRAFTSMAN IN THAT GROUP OF MINE THAT'S STILL THERE.

MR. GLICK: WE WOULD OFFER THOSE 2 EXHIBITS INTO EVIDENCE YOUR HONOR.

THE COURT: THEY WILL BE ADMITTED.

THE WITNESS: WE HAVEN'T FINISHED THE DESCRIPTION. THE INSTRUMENTATION REQUIRES ONE MORE IMPORTANT PART AND THAT IS TO GENERATE THE NET AND THE COURT LINE. AND I'M SURE I DIDN'T MENTION THIS, BUT -- I WANT TO POINT OUT THAT WAS A

SEPARATE SET OF CIRCUITS WHICH, IN FACT, I DREW UP SPECIFICALLY FOR THIS PURPOSE THAT MADE USE OF TRANSISTOR BI-STABLE CIRCUITS AND TRANSISTORS FAST ELECTRONIC SWITCHES IN ORDER TO PROVIDE THE TIME SHARING SO I COULD GO BACK AND FORTH FROM THE POSITION OF THE BALL AND NET OF THE COURT ON THE FLICKER RATE ON THE OSCILLOSCOPE.

MR. GLICK: ONE MOMENT, YOUR HONOR.

(PAUSE.)

THE WITNESS: I THINK -- WHAT ARE THE LETTERS ON THAT?

MR. GLICK: THAT'S JP, YOUR HONOR. THAT WOULD BE THE LAST CHART AND WE MOVE THE ADMISSION OF EXHIBIT JP.

THE WITNESS: DESCRIPTION OF THE OPERATIONAL AMPLIFIER.

MR. GLICK: I WOULD ALSO MOVE AT THIS TIME THE ADMISSION OF JM, THE RESUME, AND JO THE FIRST DRAWING.

THE COURT: YOU DID ONE, BUT NOT THE OTHER. THEY MAY BE ADMITTED INTO EVIDENCE.

MR. GLICK: THANK YOU.

THE COURT: I MISSED WHAT YEAR THIS WAS, THE YEAR THAT HE DID THIS.

THE WITNESS: MAYBE I SHOULD ANSWER. THE YEARS ON THE DRAWINGS IS 2 DIFFERENT YEARS. 1958 AND 1959. 1958 IS THE FIRST DRAWING WHICH SHOWS ALL OF THE ANALOG CIRCUITS AND THE DRAWING WHICH IS DATED 1959 IS OF THE CONTROL CIRCUITS FOR THE TIME SHARING AND THOSE HAD TO BE USED TOGETHER.

IT JUST HAPPENED THAT I GUESS THE SECOND DRAWING HAD TO EXIST IN 1958, I'M SURE NOTHING WAS CHANGED ON THAT, BUT I

GUESS IT WAS SITTING AROUND ON SOME PIECE OF PAPER. IT WASN'T, IN FACT, DRAWN UP UNTIL 1959.

MR. GLICK: Q. THE 2 OPEN HOUSES WERE IN '58 AND '59?

A. YES.

Q. DID YOU REVIEW THE BAER 1 480 PATENT AND RUSCH 2 507 PATENT?

A. YES, I HAVE.

Q. IN THE COURSE OF YOUR WORK IN 1968, I CALL YOUR ATTENTION TO THE YEAR 1968, DID YOU HAVE CONTACT WITH ELECTRONIC ENGINEERS OF A VARIETY OF EDUCATIONAL EXPERIENCE?

A. YES, OF COURSE.

Q. IN 1967, IF SOMEONE HAD ASKED ANY ELECTRONIC ENGINEER THAT CONTACTED YOU TO SIMULATE A TENNIS OR PING-PONG TYPE GAME ON A TELEVISION SET, GIVEN THE TEACHING OF THE 480 PATENT AND YOUR TENNIS GAME, WOULD SUCH A TASK HAVE BEEN DIFFICULT?

MR. WILLIAMS: I OBJECT. I THINK THE DEFENDANT IS GOING TO CALL ANOTHER WITNESS ON THE QUESTION OF VALIDITY AND OBVIOUSNESS AND I THINK THIS WOULD BE CUMULATIVE TO THAT.

THE COURT: I THINK HIS TESTIMONY IS RELEVANT. YOU MAY ANSWER.

THE WITNESS: WELL, I HAVE TO MAKE ONE QUALIFICATION. I THINK YOU INCLUDED ALL CONCEIVABLE LEVELS OF ENGINEER, BUT CERTAINLY I COULD THINK OF SEVERAL IN MY GROUP WHO COULD HAVE DONE IT IN 1967 THROUGH -- EXTREMELY EASILY. IT'S VERY OBVIOUS WHAT TO DO.

MR. GLICK: LET'S PAUSE FOR ONE MOMENT, YOUR HONOR.

MR. WILLIAMS: WE WOULD LIKE THE LAST QUESTION AND ANSWER READ BACK, PLEASE.

(PAUSE.)

MR. GLICK: Q. I HAD ONE QUESTION ABOUT YOUR ANSWER.

WAS YOUR ANSWER THAT IT WOULD HAVE BEEN OBVIOUS TO ONE OF THE ENGINEERS OF YOUR GROUP ALSO APPLY TO ANY ENGINEER AT THAT TIME WHO HAD RECEIVED A BACHELOR'S IN ENGINEERING AND HAD SOME EXPERIENCE IN ELECTRONIC COMPONENTS?

A. I WOULD CERTAINLY THINK SO.

MR. GLICK: NO FURTHER QUESTIONS.

THE COURT: LET'S TAKE A SHORT RECESS, 10 OR 15 MINUTES.

(RECESS.)

CROSS-EXAMINATION

MR. WILLIAMS: Q. MR. HIGINBOTHAM, DURING YOUR DIRECT TESTIMONY YOU DREW WHAT HAS BEEN MARKED AS DEFENDANT'S EXHIBIT JN TO SHOW THE TENNIS GAME AS IT APPEARED TO SOMEBODY WHO IS USING IT.

IS IT CORRECT THAT THE ONLY THINGS THAT WERE DISPLAYED ON THE CATHODE RAY TUBE WERE THE COURT, THE NET, AND THE BALL?

A. YES.

Q. IS IT ALSO CORRECT THERE WAS NO SYMBOL ON THE FACE OF THE SCREEN WHICH REPRESENTED A PADDLE OR A PLAYER OR A RACQUET OR ANYTHING OF THAT NATURE?

A. THEY WERE NOT REPRESENTED.

Q. IS IT TRUE THERE WAS NO SYMBOL ON THE SCREEN OF THE OSCILLOSCOPE WHICH WAS MOVED DURING THE PLAY OF THE GAME BY THE PLAYER?

A. WELL, I GUESS THAT'S TRUE, YEAH.
Q. IS IT ALSO TRUE THERE WAS NO CIRCUITRY IN YOUR GAME FOR DETECTING ANY KIND OF COINCIDENCE BETWEEN THE BALL AND ANY SYMBOL WHICH WAS MOVED BY THE PLAYER?
A. TRUE.
Q. IS IT ALSO TRUE THERE WAS NO CIRCUITRY FOR IMPARTING ANY MOTION TO THE BALL AS THE RESULT OF ANY COINCIDENCE BETWEEN THE BALL AND ANY SYMBOL CONTROLLED BY THE PLAYER?
A. I GUESS I'M NOT QUITE SURE WHAT YOU MEAN BY -- WHEN YOU REFER TO --
Q. LET ME ALTER THE QUESTION.

IS IT TRUE THERE WAS NO CIRCUITRY IN YOUR GAME FOR IN ANY WAY CHANGING THE MOTION OF THE BALL AS THE RESULT OF ANY COINCIDENCE BETWEEN THE BALL AND A SYMBOL WHICH WAS CONTROLLED BY THE PLAYER?
A. YEAH, THAT'S TRUE.
Q. IS IT CORRECT THAT THE GAME AS YOU CONSTRUCTED IT IN 1957 AND 1958 WAS NOT USEFUL WITH THE TV SET OR A TV MONITOR AS YOU CONSTRUCTED IT?
A. WELL, I THINK THAT IS NOT POSSIBLE TO ANSWER THAT QUESTION SIMPLY.
Q. WELL, DID YOU HAVE ANY PROVISION FOR HORIZONTAL OR VERTICAL SYNCHRONIZATION IN THE CIRCUIT THAT YOU BUILT?
A. NO.
Q. DID THE OSCILLOSCOPE ON WHICH YOU DISPLAYED THAT GAME HAVE A HORIZONTAL SWEEP CIRCUIT?
A. THE OSCILLOSCOPE HAD THAT, BUT WE DIDN'T USE THAT.
Q. SO YOU ACTUALLY DISABLED THAT?

A. THE POINT IS YOU DISCONNECTED IT AND USED THE HORIZONTAL AMPLIFIER FOR MY HORIZONTAL POSITION.

Q. SO YOU DIDN'T USE THE HORIZONTAL SWEEP CIRCUIT?

A. THAT'S CORRECT.

Q. IF THERE WERE NO HORIZONTAL AND VERTICAL SYNCHRONIZATION SIGNALS IN YOUR CIRCUIT, I ASSUME THAT THE CIRCUITRY FOR GENERATING THE BALL, THE NET, AND FLOOR WERE NOT IN ANY WAY CONNECTED TO CIRCUITS FOR GENERATING HORIZONTAL AND VERTICAL SYNCHRONIZATION SIGNALS?

A. THE ANSWER IS THEY WERE NOT.

Q. YOU TESTIFIED ON DIRECT THAT, I BELIEVE EXHIBIT E, DEFENDANT'S EXHIBIT E IS THE SCHEMATIC DIAGRAM OF THE CIRCUIT FOR GENERATING THE SYMBOLS ON THE SCREEN IN YOUR GAME, IS THAT CORRECT?

A. YES.

Q. IN THE LOWER RIGHT-HAND CORNER, THERE ARE 2 SETS OF 3 CIRCLES. ARE THOSE REPRESENTATIVE OF A SWITCHING SYSTEM?

A. WELL, I THINK I KNOW WHAT YOU MEAN. ARE YOU CONNECTING THE THINGS WHICH ARE THE ARROWS THAT SAY VERTICAL AND HORIZONTAL?

Q. CORRECT.

A. THE SO-CALLED CIRCLES ARE AN INDICATION OF THE SWITCH OF 3 POSITIONS. ONE IS CONNECTED TO THE VERTICAL AND THE OTHER ONE IS CONNECTED TO THE HORIZONTAL BELOW IT, AND THAT SHOWS IN SCHEMATIC FORM THE ELECTRONIC SWITCHES WHICH, IN FACT, ARE REPRODUCED ON THE SECOND DRAWING, THE MEANS BY WHICH I PRESENTED IN SEQUENCE THE BALL POSITION, THE NET LINE, AND THE COURT LINE.

Q. NOW, EACH ONE OF THOSE SETS OF 3 CIRCLES, ONE IS LABELED NET. AND THERE IS A LINE WHICH COMES OFF THAT CIRCLE?

A. YES.

Q. DO THE COMPONENTS WHICH ARE RESPONSIBLE FOR GENERATING THE NET IN YOUR GAME, ARE THOSE THE ONES THAT ARE ATTACHED TO THE LINES LABELED NET?

A. I HAVE TO THINK ABOUT THIS.

(PAUSE.)

A. OH, OH, I SEE WHY I DID THAT. WHAT'S YOUR QUESTION?

Q. SEE IN THE LOWER RIGHT-HAND CORNER THERE IS A SET OF 3 CIRCLES AND ONE IS LABELED NET?

A. RIGHT.

Q. AND THERE IS A LINE WHICH LEADS FROM THAT CIRCLE TO, WHAT IS THAT, A POTENTIOMETER?

A. YES. AND THE TOP SWITCH HOOKS TO THE POTENTIOMETER WHICH IS CONNECTED TO AN AC VOLTAGE SOURCE, 50 VOLTS AC.

Q. ARE THOSE 2 COMPONENTS RESPONSIBLE FOR GENERATING THE NET ON THE SCREEN?

A. THAT'S ONE. THAT MAKES THE SPOT OSCILLATE ALONG A LINE IN THE VERTICAL DIRECTION AND HORIZONTALLY POSITION IT. AND THAT'S WHY THERE IS ANOTHER POSITION NET DOWN IN THE LOWER SWITCH, 3 POSITION SWITCH, AND THAT'S CONNECTED TO A POTENTIOMETER WITH A DC VOLTAGE WHERE I PUT THE HORIZONTAL LOCATION OF THE NET IN THE PROPER POSITION.

Q. AND THE LOWER SET OF 3 CIRCLES, THERE IS A LINE LABELED COURT, AND THAT GOES OFF TO A POTENTIOMETER TRANSFORMER, IS THAT RIGHT?

A. YES. THE COURT, AGAIN, I NEEDED TO GENERATE TO MOVE MY

SPOT IN THIS CASE BACK AND FORTH SO THAT GOES TO A POTENTIOMETER CONNECTOR AND AC VOLTAGE.

Q. THEY'RE LABELED 50 K AND 17 VAC?

A. YES.

Q. AND IN THE UPPER SET OF 3 CIRCLES THERE IS A SYMBOL WHICH APPEARS TO BE LABEL PLUS DC COURT?

A. TRUE. AGAIN, I HAVE TO PUT THE HORIZONTAL LINE WHICH REPRESENTS THE COURT AND THE PROPER LOCATION VERTICALLY ON THE SCREEN. THE AV WAS SELECTED TO MAKE IT LONG ENOUGH TO MAKE IT THE RIGHT LENGTH TO CORRESPOND TO THE SIGNALS GENERATED BY THE MAIN PART OF THE THING ON EXHIBIT E.

Q. ARE THOSE 2 SETS LABELED COURT, ARE THOSE THE COMPONENTS LABELED WHICH GENERATE THE COURT LINE ON YOUR GAME?

A. YES, THEY ARE.

Q. IS THE CIRCUITRY INCLUDED IN YOUR GAME FOR DETERMINING WHEN THE BALL HIT THE NET OR THE BALL HIT THE COURT BE ANY WAY CONNECTED TO THOSE 2 SETS OF COMPONENTS WHICH GENERATE THE COURT AND NET AS YOU JUST DESCRIBED IT?

A. NO.

(PAUSE.)

Q. IF YOU WERE TO DISCONNECT THE CIRCUITRY FOR GENERATING THE NET IN THE COURT IN YOUR TENNIS GAME, WOULD THE NET AND THE COURT HAVE APPEARED ON THE SCREEN?

A. OF COURSE NOT.

Q. IN YOUR TENNIS GAME, IF YOU HAD DISCONNECTED THAT CIRCUITRY, WOULD THE BALL STILL HAVE APPEARED TO BOUNCE OFF THE POSITION WHERE THE NET AND COURT WERE PREVIOUSLY DISPLAYED?

A. YES, IT WOULD.

MR. WILLIAMS: I HAVE NO FURTHER QUESTIONS, YOUR HONOR.

MR. GLICK: NO QUESTIONS, YOUR HONOR.

THE COURT: THANK YOU VERY MUCH, DR. HIGINBOTHAM. THANK YOU FOR COMING TO TESTIFY.

THE WITNESS: MY PLEASURE.

MR. ESCHER: YOUR HONOR, WE'D LIKE TO CALL MR. THACKER BACK TO THE STAND NOW, PLEASE.

THE COURT: MR. THACKER.

(PAUSE.)

CHARLES H. THACKER,

RE-CALLED AS A WITNESS BY THE DEFENDANT HEREIN, HAVING BEEN PREVIOUSLY DULY SWORN, TESTIFIED FURTHER AS FOLLOWS.

FURTHER DIRECT EXAMINATION

MR. ESCHER: Q. GOOD AFTERNOON, MR. THACKER. YOU UNDERSTAND THAT YOU'RE STILL UNDER OATH?

A. I DO.

Q. HAVE YOU PERSONALLY EVER REVIEWED THE CONTENTS OF THE BAER 1 PATENT AS WELL AS THE RUSCH 2 PATENT?

A. YES, I'VE REVIEWED THEM BOTH.

Q. HAVE YOU REVIEWED THE CIRCUITRY SET OUT IN THE PATENT SPECIFICATIONS OF THE BAER 1 PATENT?

A. I HAVE.

Q. MR. THACKER, IF YOU COULD RETURN TO THE PROJECTOR NOW FOR A BIT AND DISPLAY FOR US THE NEXT 2 EXHIBITS, WHICH I BELIEVE ARE EXHIBITS IU AND IW, ONE OF WHICH HAS ALREADY BEEN SHOWN TO THE COURT. THIS EXHIBIT IS EXHIBIT IU?

A. CORRECT.

Q. COULD YOU IDENTIFY THIS, PLEASE?

A. THIS IS A BLOCK DIAGRAM REPRESENTATION OF THE DEVICE DESCRIBED IN THE 480 THAT IS THE BAER 1 PATENT. THIS, UNLIKE THE BLOCK DIAGRAM FOR THE 570 -- 507, SHOWS THE ENTIRE DEVICE.

Q. MR. THACKER, DID YOU CREATE THE CHART MARKED AS EXHIBIT IU?

A. YES, I DID.

Q. AND ON THE BASIS OF WHAT INFORMATION?

A. THIS CHART WAS CREATED BASICALLY BY READING AND ANALYZING THE CIRCUITRY DESCRIBED IN THE SPECIFICATION PATENT.

Q. WITH REFERENCE TO EXHIBIT IW, COULD YOU PLEASE EXPLAIN THE DIFFERENCES BETWEEN THE TEACHINGS OF THE BAER 1 PATENT AND THE RUSCH 2 PATENT?

A. CERTAINLY. WELL, IF WE START WITH BAER 1, THAT IS THIS SLIDE, WHAT WE HAVE IS 2 SPOT GENERATORS WHICH ARE PLAYER CONTROLLED, AND WE HAVE THE COMMON THING THAT RUNS THROUGH ALL OF THESE DEVICES SINCE THEY ARE PLAYED ON TELEVISION SETS, THE HORIZONTAL SYNCHRONIZATION GENERATOR, THE VERTICAL SYNCHRONIZATION GENERATOR, SUMMING CIRCUIT, AND THE VIDEO PRODUCED BY THE SPOT GENERATORS TO PRODUCE A COMPOSITE VIDEO SIGNAL WHICH IS FED TO A RADIO FREQUENCY OSCILLATOR AND THENCE TO A STANDARD TELEVISION SET.

THE 480 PATENT INCLUDED A DEVICE WHICH I'VE SHOWN ON THIS SLIDE, BUT I DON'T THINK IS REALLY TERRIBLY MATERIAL. IT'S THIS CHROMA GENERATOR IN THE LEFT CORNER, AND IN 480, THERE WAS, IN THE DRAWINGS, AT LEAST, NO PARTICULAR CHANGE THAT HAPPENED WHEN COINCIDENCE OCCURRED BETWEEN THE 2 PLAYER CONTROLLED SPOTS.

THE SPOT 1-SPOT 2 COINCIDENCE DETECTOR OPERATED A CROWBAR CIRCUIT, WHICH IS A KIND OF CIRCUIT WHOSE PURPOSE IS TO SHORT OUT SOMETHING, AND IN THIS CASE, STOP FURTHER PLAY.

NOW, WHAT HAPPENED IN AT LEAST ONE VERSION DESCRIBED IN THE PATENT WAS THAT THE CHROMA CIRCUIT CHANGED THE COLOR OF THE BACKGROUND, SO I'VE SHOWN THAT HERE, BUT I DON'T THINK IT'S REALLY MATERIAL.

Q. WHAT'S THE MECHANISM USED FOR SPOT GENERATION IN SPOT GENERATOR NUMBER 1 AND 2 IN THE 480 BLOCK DIAGRAM?

A. THERE WERE SEVERAL METHODS DESCRIBED IN THE CIRCUITS IN THE DRAWINGS, THE SPOT GENERATORS WERE ESSENTIALLY CURRENT CONTROLLED MULTIVIBRATORS, ONE SHOT MULTIVIBRATORS.

THIS IS ONE OF THE GENERIC CIRCUITS THAT I DESCRIBED IN THE EARLIER TESTIMONY THAT HAS THE PROPERTY THAT IT NORMALLY SITS IN ONE STATE, IS CAPABLE OF BEING FLIPPED INTO ANOTHER STATE, AND THEN AT SOME TIME LATER, DETERMINED BY EITHER ITS COMPONENTS OR THE WAY IT'S BUILT, IS FLIPPED BACK, UNLIKE THE FLIP-FLOP WHICH STAYS PERMANENTLY, MONOSTABLE, ONE STABLE STATE.

IN THIS CASE, THE TIME THAT WAS REQUIRED FOR THE FLIP-FLOP -- FOR THE MONOSTABLE TO FLIP BACK IS DETERMINED BY CURRENT INJECTED INTO ONE POINT IN THE CIRCUIT AND THAT CURRENT COMES FROM A VARIABLE RESISTOR THAT'S CONNECTED TO THE USER CONTROL. THERE ARE OTHER VERSIONS DESCRIBED IN THE SPECIFICATIONS THAT PROVIDE FOR VOLTAGE CONTROL INSTEAD OF CURRENT CONTROL.

Q. WHAT IS THE SPOT NUMBER 1 VOLTAGE -- EXCUSE ME -- SPOT NUMBER 1 HORIZONTAL VOLTAGE AND SPOT NUMBER 1 VERTICAL VOLTAGE

THAT'S REFERRED TO IN THE 480 BLOCK DIAGRAM?

A. THESE ARE DRAWN TO THE SPECIFICATION OF THE PATENT. THESE ARE HOOKED TO THE USER CONTROL. IN ALL OF THE 3 PATENTS IN THIS SERIES THERE ARE VARIOUS WAYS OF INJECTING CURRENT INTO THE SPOT GENERATORS TO CONTROL THE POSITION.

I THINK WHAT'S REALLY -- ONE OF THE WAYS TO VIEW THIS, I THINK I SAID -- I MENTIONED THIS MORNING AND MAYBE IT'S WORTH REPEATING, A WAY TO THINK ABOUT THESE DEVICES IS THEY CONTAIN 2 PARTS. ONE IS A VOLTAGE CONTROL SPOT GENERATOR OR A CURRENT CONTROL SPOT GENERATOR AND THAT'S ONE SET OF CIRCUITRY.

THEN ANOTHER SET OF THINGS THAT HAS TO DO WITH HOW THE VOLTAGES THAT MOVE THE SPOT AROUND ON THE SCREEN ACTUALLY GET GENERATED. SOME ARE VERY STRAIGHTFORWARD MEANS. IN OTHER CASES, LIKE SHEETS 2 AND 3 OF THE 507 DEVICE, THEY'RE GENERATED IN A MORE COMPLICATED WAY THAT I DESCRIBED THIS MORNING.

BUT THERE ARE 2 FAIRLY INDEPENDENT THINGS GOING ON, ONE IS VOLTAGE OR CURRENT CONTROL SPOT GENERATION AND, SECONDLY, HOW DO THE VOLTAGES GET MADE.

Q. WHAT ABOUT THE COINCIDENCE DETECTOR BLOCK IN THE 480 BLOCK DIAGRAM?

A. THE COINCIDENCE DETECTOR HERE IS ESSENTIALLY AN AND GATE. IT TAKES THE 2 VIDEO SIGNALS PRODUCED BY THE SPOT 1 GENERATOR, SPOT 2 GENERATOR, AND WHEN THOSE 2 THINGS ARE COINCIDENT IN TIME WHICH MEANS, OF COURSE, THAT THE POSITION OF THE 2 SPOTS ARE COINCIDENT PHYSICALLY ON THE SCREEN, THEN THE COINCIDENCE DETECTOR PRODUCES AN OUTPUT, POSSIBLY A LITTLE BLIP.

AND IN THE CASE OF THE 480 DEVICE IT'S USED TO TRIP THE CROWBAR CIRCUIT AND CHANGE THE COLOR OR THE BACKGROUND OR WHATEVER. THE ANALOGOUS SYMBOL IN THE SLIDE THAT I SHOWED THIS MORNING IS THE SPOT 1 HIT SIGNAL AND THE SPOT 2 HIT SIGNAL WHICH COMES FROM THE 507 DEVICE, THAT DETECT THE COINCIDENCE FROM THE BALL AND HIT OR HITTING SPOT. HERE IT'S JUST 2 USER CONTROL SPOTS.

Q. IS THE COINCIDENCE DETECTOR CIRCUITRY IN THE 480 BLOCK DIAGRAM, IS THAT DISCLOSED IN THE 480 PATENT SPECIFICATIONS?

A. I BELIEVE IT IS IN THE DRAWINGS, YES. I'M -- I DON'T QUITE REMEMBER.

Q. COULD YOU TURN NOW TO THE --

A. I COULD CHECK IF YOU LIKE. I COULD LOOK AT THE PATENT.

Q. WE CAN DO THAT LATER.

COULD YOU TAKE -- COULD YOU PUT UP ON THE SCREEN NOW THE BLOCK DIAGRAM OF THE RUSCH 2 PATENT WHICH IS MARKED AS EXHIBIT IW?

A. CERTAINLY. THIS IS IW.

Q. WOULD YOU DESCRIBE WHAT, IN YOUR VIEW, ARE THE IMPORTANT SIMILARITIES AND DIFFERENCES BETWEEN THE 480 AND THE 507?

A. WELL, AS YOU CAN SEE, THEY ARE VERY SIMILAR. THEY CONTAIN AT LEAST AT A BLOCK LEVEL AND, IN FACT, THIS LEVEL COULD WELL BE PRESERVED DOWN TO THE COMPLEMENT LEVEL, MANY OF THE SAME ELEMENTS. THERE IS THE STANDARD ELEMENT FOR GENERATING HORIZONTAL AND VERTICAL SYNCHRONIZATION, SUMMING THAT WITH VIDEO SIGNALS AND DRIVING AN RF OSCILLATOR WHICH OPERATES THE TELEVISION SET.

THE PRINCIPAL DIFFERENCES ARE THAT IN THE CASE OF

THE 507 DEVICE, THERE ARE MORE THAN 2 SPOT GENERATORS. THERE ARE, IN FACT, 3 IN MOST OF THE APPLICATIONS SHOWN IN THE PATENT. AND THERE ARE MORE THAN -- THERE IS MORE THAN ONE COINCIDENCE DETECTOR, THAT IS, THERE IS A COINCIDENCE DETECTOR THAT DETECTS COINCIDENCE BETWEEN WHAT ARE USUALLY REPRESENTED AS PADDLES IN THE PATENT AND THE THING THAT IS USUALLY -- THE SPOT THAT'S USUALLY REPRESENTED AS THE BALL.

OF COURSE, THE SPOTS LOOK PRETTY MUCH ALL THE SAME. THEY'RE LITTLE DOTS. NOW, THE OTHER THING THAT WE CAN'T SEE AT THIS LEVEL IS THAT IN THE 507 DEVICE, THE METHOD OF SPOT GENERATION IS QUITE DIFFERENT.

IF YOU RECALL, YOUR HONOR, IN THE PREVIOUS SLIDE, THE SPOT GENERATOR IS JUST SHOWN AS TAKING IN AS ITS INPUTS SOMETHING FROM THE HORIZONTAL SYNCHRONIZATION GENERATOR. IN THIS CASE IT'S A PULSE AND SOMETHING FROM THE VERTICAL SYNCHRONIZATION GENERATOR, LIKEWISE A PULSE, AND THEN 2 INPUTS WHICH DETERMINE THE POSITION ON THE SCREEN, THE VOLTAGE INPUT.

THE 507 IN THIS CASE, THE THINGS THAT COME FROM THE SYNCHRONIZATION GENERATORS ARE NOT PULSES, THEY ARE THE SAWTOOTH RAMP SIGNALS THAT WE'VE HEARD QUITE A BIT ABOUT IN THE TESTIMONY SO FAR.

THE SPOT GENERATOR ACTUALLY SERVES TO CONVERT THESE VOLTAGES, THE HORIZONTAL AND VERTICAL SPOT 1 OR, IN FACT, THE SPOT 2 OR THE BALL VOLTAGES INTO TIME BY USING THEM TO OPERATE A COMPARATOR THAT DETECTS A PARTICULAR POINT ON THAT RAMP, AND AS THE VOLTAGE GOES UP THE POINT GETS LATER IN TIME AS THE RAMP GETS HIGHER. SO ALL THE SPOT GENERATORS ARE A GENERAL FORM OF WHAT YOU MIGHT CALL A VOLTAGE TO TIME CONVERTER, BUT

THE METHOD IS DIFFERENT IN THIS CASE.

Q. IS THE ADDITIONAL DETECTOR IN THE 507 NECESSITATED BY THE EXISTENCE OF THE ADDITIONAL SPOT GENERATOR?

A. I WOULDN'T SAY IT'S NECESSITATED BY THAT. MORE THAT IT'S NECESSITATED IF YOU WANT TO PLAY A GAME THAT DETECTS COINCIDENCE BETWEEN 2 PADDLES AND ONE BALL, YOU NEED 2 COINCIDENCE DETECTORS, 1 FOR EACH PADDLE.

Q. IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT, IS THERE ANY INDICATION AS TO THE SCHEMATICS OF THE COINCIDENCE DETECTORS?

A. NO, THEY ARE, IN FACT, STRANGELY MUTE ON THAT. AS I THINK I SAID THIS MORNING, I BELIEVE THAT IT WOULD PROBABLY BE DONE WITH AN AND GATE IN ROUGHLY THE SAME MANNER THAT IT'S DONE IN THE OTHER 2 PATENTS, BUT THERE IS NO DIRECT INDICATION THAT IT'S DONE THAT WAY. THEY'RE REFERRED TO AS COINCIDENCE DETECTORS. AND GATES USED TO BE CALLED COINCIDENCE GATES.

Q. NOW, IN THE 507 PATENT SPECIFICATIONS, DOES IT SET OUT THE SCHEMATICS OF THE 3 SPOT GENERATORS?

A. YES, THE SPOT GENERATORS ARE VERY CLEARLY DESCRIBED AND, IN FACT, THERE ARE 2 SEPARATE METHODS DESCRIBED IN THE 507 FOR SPOT GENERATION. THE PRIMARY ONE THAT WE'VE BEEN DISCUSSING AND A VARIANT THAT IS DESCRIBED AS WHAT I BELIEVE IS THE LAST FIGURE IN THE FIGURE SECTION OF THE PATENT, ALTHOUGH IT'S NOT EXPLAINED VERY MUCH IN THE TEXT.

Q. IS THE TECHNOLOGY OF SPOT GENERATION DISCLOSED FOR THE RUSCH 2 PATENT THE SAME FOR EACH OF THE 3 SPOT GENERATORS?

A. I DON'T BELIEVE THERE IS A RESTRICTION THAT THAT BE THE CASE. ONE OF THE MAJOR DIFFERENCES IN THIS AREA, AND IT'S CLEARLY STATED IN THE TEXT OF THE PATENT, WAS THAT THE OBJECT

OF THE SPOT GENERATION METHOD WAS TO PROVIDE DIFFERENT SHAPES OF SPOTS WHEREAS THE PREVIOUS DEVICE, THE 480 DEVICE COULD ONLY PRODUCE SQUARE OR RECTANGULAR SPOTS. SO I DON'T KNOW. THE ANSWER IS NO, THERE IS NO PARTICULAR STATEMENT IN THE PATENT THAT ALL THE SPOT GENERATORS HAVE TO BE THE SAME.

Q. BUT THEY COULD ALL BE THE SAME?

A. THEY COULD ALL BE THE SAME, OF COURSE.

Q. COULD YOU TURN NOW TO THE -- 2 ADDITIONAL SHEETS OF BLOCK DIAGRAMS, EXHIBITS IX AND THEN IY?

A. SURE. THIS IS IX. THIS IS THAT PART OF THE 507 CIRCUITRY THAT PRODUCES THE RECIPROCATING BACK AND FORTH MOTION TYPICAL OF PING-PONG.

Q. AND EXHIBIT IY, WHAT DOES THAT SHOW?

A. IY SHOWS -- WHOOPS. SORRY. IY SHOWS AGAIN AT BLOCK LEVEL THE CIRCUITRY NECESSARY TO PRODUCE THE MORE COMPLEX MOTION TYPICAL OF HOCKEY. WE SEE THE DIFFERENTIATOR CIRCUITS TO DO THAT. AND THE INTEGRATOR CIRCUITS TO DO THAT.

Q. I THINK WE'RE FINISHED WITH THE PROJECTOR FOR RIGHT NOW. YOU CAN RETURN TO THE WITNESS STAND, PLEASE.

(PAUSE.)

Q. MR. THACKER, IN YOUR VIEW DOES THE RUSCH 2 PATENT ADD ANYTHING TO THE TEACHINGS OF THE BAER 1 PATENT?

A. YES, IT DOES.

Q. AND WHAT DOES IT ADD?

A. WELL, IT SHOWS ONE THING VERY CLEARLY, WHICH IS A DIFFERENT WAY OF GENERATING SPOTS, THIS RAMP METHOD AS OPPOSED TO THE MULTIVIBRATOR METHOD. THE OTHER THING THAT IT DOES IS ADDS A VERY CLEAR DESCRIPTION OF THE 2 THINGS THAT WERE IN

EXHIBITS I -- THE LAST 2 SLIDES.

Q. IX AND IY, I BELIEVE?

A. IX AND THE IY. THOSE THINGS HAD BEEN HINTED AT IN THE TEXT OF THE 480 PATENT, BUT THEY HAD NEVER -- THEY HAD NOT BEEN CLEARLY DESCRIBED IN THE CIRCUITRY THAT WAS PRESENTED IN THAT PATENT.

Q. MR. THACKER, I'M GOING TO SHOW YOU A COLLEGE TEXTBOOK FROM THE YEAR 1960 ENTITLED WAVE GENERATION AND SHAPING, WHICH HAS BEEN MARKED AS EXHIBIT GY. IF YOU COULD TURN TO PAGE 257, PLEASE.

A. I HAVE IT.

Q. WHAT IS THE DIAGRAM ON THAT PAGE OF?

A. THE DIAGRAM ON THIS PAGE IS THAT OF A FLIP-FLOP MULTIVIBRATOR, IN FACT, USING DIODE STEERING. THIS IS FIGURE 9.9 ON THE PAGE.

Q. MR. THACKER, IF YOU COULD HAND EXHIBIT GY TO THE COURT, PLEASE.

A. CERTAINLY. IT'S THE CIRCUIT RIGHT THERE.

Q. MR. THACKER, WERE YOU PERSONALLY AWARE OF THE FLIP-FLOP CIRCUITS IN THE YEARS 1967 AND 1968?

A. CERTAINLY.

Q. MR. THACKER, I'D LIKE TO DRAW YOUR ATTENTION NOW TO AN ITEM WHICH HAS BEEN MARKED AS EXHIBIT M TO ACTIVISION'S REQUEST FOR JUDICIAL NOTICE. IT'S THE DICTIONARY DEFINITION OF A FLIP-FLOP AND I'M GOING TO READ IT TO YOU NOW AND ASK YOU WHETHER YOU AGREE.

THE FLIP-FLOP CIRCUIT AND ELECTRONIC CIRCUIT WITH 2 PERMANENTLY STABLE CONDITIONS, PARENS, AS WHEN ONE ELECTRON

TUBE IS CONDUCTING WHEN THE OTHER IS CUT OFF SO THE CONDUCTION IS SWITCHED FROM ONE TO THE OTHER BY SUCCESSIVE PULSES.

DO YOU AGREE WITH THAT DEFINITION, MR. THACKER?

A. YES, I DO.

Q. IS A FLIP-FLOP CIRCUIT THE MEANS FOR IMPARTING A DISTINCT REVERSAL TYPE MOTION IN THE RUSCH 2 PATENT SPECIFICATIONS?

A. THE FLIP-FLOP CONTROLS A SMALL NUMBER OF AUXILIARY COMPONENTS, BUT IT'S CERTAINLY THE PRIMARY METHOD, CONTROLS AS WE SAW IN THE SLIDE FOR, I BELIEVE, IY, THERE ARE 4 DIODES AND 2 POTENTIOMETER IN ADDITION TO THE CIRCUITRY OF THE FLIP-FLOP THAT AFFECTS THAT MOTION, PLUS ANOTHER RESISTOR AND A CAPACITOR BUT, BASICALLY, YES, IT IS.

Q. MR. THACKER, DO YOU VIEW A FLIP-FLOP AS A TYPE OF GENERIC CIRCUIT?

A. ABSOLUTELY.

Q. AND WAS THE EXISTENCE OF A FLIP-FLOP CIRCUIT COMMON KNOWLEDGE AMONGST THOSE WORKING IN THE ELECTRONIC ENGINEERING FIELD IN THE YEARS 1967, 1968?

A. YES, OF COURSE, IT CLEARLY WAS. I BELIEVE DR. HIGINBOTHAM TESTIFIED THEY WERE ADMITTED IN THE '20S. I DIDN'T KNOW THAT, BUT THEY WERE COMMON KNOWLEDGE AND IN WIDE USE BY THE '60'S.

Q. MR. THACKER, ARE YOU FAMILIAR WITH THE HIGINBOTHAM TENNIS GAME DESCRIBED IN PROFESSOR HIGINBOTHAM'S TESTIMONY EARLIER THIS AFTERNOON?

A. YES, I AM.

MR. ANDERSON: I OBJECT, YOUR HONOR. UNLESS THIS IS JUST WITH RESPECT TO WHAT HE'S LEARNED HERE, THERE HAS BEEN NO

INDICATION HE HAD PRIOR KNOWLEDGE PRIOR TO 1967.

MR. ESCHER: Q. HOW DID YOU BECOME FAMILIAR WITH THE HIGINBOTHAM TENNIS GAME?

A. AS PART OF PREPARATION FOR TESTIMONY IN THIS TRIAL I READ AN ARTICLE THAT DESCRIBED MR. HIGINBOTHAM'S ACTIVITIES, AND I REVIEWED THE SCHEMATIC OF THE GAME.

Q. AND YOU LISTENED TO HIS TESTIMONY EARLIER THIS AFTERNOON?

A. OF COURSE I LISTENED TO HIS TESTIMONY EARLIER TODAY.

MR. ANDERSON: YOUR HONOR, CAN WE SEE THE ARTICLE IF HE'S BASING TESTIMONY ON IT?

MR. GLICK: I'LL GET IT TO YOU.

MR. ANDERSON: IS IT AN EXHIBIT?

MR. GLICK: YES, IT WAS MARKED AT SOME POINT.

(PAUSE.)

MR. ESCHER: WOULD IT BE BEST TO GO FORWARD WITH THE TESTIMONY NOW?

THE COURT: WELL, IS THE ARTICLE MARKED AS AN EXHIBIT?

MR. GLICK: APPARENTLY IT IS NOT, YOUR HONOR. WE NEED TO CONFER WITH THE WITNESS. THERE WERE SEVERAL ARTICLES WRITTEN THAT I KNOW I REVIEWED, AND AS TO EXACTLY WHICH ONE MR. THACKER MIGHT HAVE LOOKED AT AS PART OF HIS PREPARATION, I WOULDN'T KNOW. I HAVE TO ASK HIM. AND THEN WE CAN FIND IT IN THE MASTER LIST OF THE DOCUMENTS PRODUCED IN THE CASE. WE MIGHT BE LUCKY AND HIT IT IN A MINUTE OR IT MIGHT BE LONGER.

THE WITNESS: THE ARTICLE HAD VERY LITTLE CONTENT. IT WAS ONLY BACKGROUND.

MR. ESCHER: Q. DO YOU RECALL WHAT THE SOURCE OF

THE ARTICLE WAS?

A. IT WAS A MAGAZINE ARTICLE, LIKE, WHO REALLY INVENTED THE VIDEO GAME.

THE COURT: DO YOU HAVE THAT?

MR. GLICK: WE BELIEVE WE DO.

THE COURT: LET'S HOLD IT ONE MINUTE, THEN.

MR. ESCHER: Q. MR. THACKER, I'D LIKE TO HAND YOU NOW THE ARTICLE WHICH HAS BEEN MARKED AS EXHIBIT JQ, AND IF YOU COULD IDENTIFY IT FIRST AND THEN WE'LL MAKE IT AVAILABLE TO THE COURT AND OPPOSING COUNSEL.

(PAUSE.)

A. YES, THIS IS THE ARTICLE. IT'S LISTED AS THE OCTOBER 1982 ISSUE OF CREATIVE COMPUTING MAGAZINE.

Q. MR. THACKER, IS IT YOUR UNDERSTANDING -- WHAT IS YOUR UNDERSTANDING AS TO HOW THE HIGINBOTHAM TENNIS GAME ACCOMPLISHED THE BOUNCING EFFECT OF THE BALL SYMBOL?

A. WELL, AS WE HEARD THIS MORNING OR THIS AFTERNOON, IT BASICALLY WORKED BY REVERSING AN INTEGRATE AND THAT WAS THE METHOD THAT WAS INCLUDED IN THE SCHEMATIC THAT I REVIEWED.

MR. ANDERSON: YOUR HONOR, I OBJECT TO THIS WITNESS TESTIFYING ABOUT HOW A THING WORKED BASED ON TESTIMONY THAT HE HEARD TODAY. I THINK THAT'S INAPPROPRIATE AND HE HAS NO PERSONAL KNOWLEDGE.

MR. ESCHER: HE'S AN EXPERT WITNESS.

THE COURT: DON'T WE DO THAT ALL THE TIME IN LITIGATION? HE EXPRESSES AN OPINION ON WHAT HE'S HEARD.

MR. ANDERSON: THE WITNESS -- MR. HIGINBOTHAM EXPLAINED HOW IT WORKS.

THE COURT: I'M SURE WHAT HE'S TALKING ABOUT HERE IS SOMEWHAT FOUNDATIONAL AND IS EXPRESSING AN OPINION HOW IT'S SIMILAR OR DIFFERENT FROM 480 AND 507 AND THE REST. I THINK IT'S PROPER EXAMINATION. I'LL OVERRULE YOUR OBJECTION.

MR. ESCHER: Q. MR. THACKER, DID THE HIGINBOTHAM TENNIS GAME USE A FLIP-FLOP TYPE CIRCUIT TO ACCOMPLISH THE BOUNCING EFFECT OF THE BALL SYMBOL?

MR. ANDERSON: I'M SORRY, YOUR HONOR. I UNDERSTAND, BUT I DON'T SEE HOW THIS WITNESS CAN SAY ANY MORE THAN DID MR. HIGINBOTHAM SAY IT WORKED THAT WAY. HE CAN'T SAY DID THE HIGINBOTHAM TENNIS GAME IN 1957 WORK IN A CERTAIN WAY. THAT'S THE QUESTION.

THE COURT: ISN'T YOUR POINT COMMON FEATURES OR DIFFERENT FEATURES?

MR. ESCHER: ABSOLUTELY.

THE COURT: THEN STATE THE ASSUMPTIONS AND ASK A QUESTION BASED ON THE ASSUMPTIONS RATHER THAN ASKING THE WITNESS TO REPEAT THE COMPONENT ELEMENTS OF WHAT DR. HIGINBOTHAM SAID. I'VE PROBABLY THROWN YOU OFF.

MR. ESCHER: YES, YOU CERTAINLY HAVE.

THE COURT: WHAT I MEAN -- WHY DON'T YOU ASK HIM WHAT HE THINKS THE POINTS OF SIMILARITY OR POINTS OF DIFFERENCES ARE BETWEEN HIGINBOTHAM'S GAME AND EITHER 408, 507 OR THE 2600, WHATEVER YOU WANT.

MR. ESCHER: Q. MR. THACKER, WHAT DO YOU THINK ARE THE SALIENT SIMILARITIES BETWEEN THE HIGINBOTHAM TENNIS GAME AND THE RUSCH 2 PATENT?

A. WELL, IN THE DRAWINGS THAT I REVIEWED THAT DESCRIBE THE

GAME, THERE ARE QUITE A FEW DIFFERENCES, ACTUALLY. ALTHOUGH DR. HIGINBOTHAM'S GAME WAS NOT DESIGNED TO BE PLAYED ON A RASTER SCAN TELEVISION BUT WAS, INSTEAD, TO BE DESIGNED TO BE PLAYED ON AN OSCILLOSCOPE. AS I SAID A FEW MINUTES AGO, IF ONE DIVIDES -- WE'VE BEEN CALLING LOOSELY THE 408 OR 507 TECHNOLOGY INTO THE 2 PARTS THAT I DID, THAT IS, VOLTAGE CONTROL SPOT GENERATORS AND THEN METHODS OF GENERATING THE SPOTS, THE THING THAT DR. HIGINBOTHAM BUILT OR -- I BEG YOUR PARDON. I MISSPOKE.

THE THING IN THE DRAWINGS THAT I REVIEWED IN PREPARATION FOR THIS TRIAL DESCRIBE THINGS IN THE CATEGORY OF THE LATTER, THAT IS, THINGS THAT WOULD GENERATE THE VOLTAGES WHICH COULD THEN BE FED TO ANY DEVICE WHICH WAS CAPABLE OF BEING A VOLTAGE CONTROLLED SPOT GENERATOR AND AN OSCILLOSCOPE IS ONE SUCH DEVICE. PART OF THE CIRCUITRY IN BOTH 480 AND 507 ALSO HAVE THAT PROPERTY.

IN FACT, THE CIRCUITRY THAT I REVIEWED THAT WAS THE DRAWING OF THE HIGINBOTHAM DEVICE PRODUCED MOTION THAT WAS SIMILAR, BUT NOT IDENTICAL TO THE MOTION IN 507. IT HAD A REVERSAL MECHANISM. IN THIS CASE IT WAS A LATCHING RELAY RATHER THAN AN ELECTRONIC FLIP-FLOP, BUT IT CERTAINLY HAD MANY OF THE CHARACTERISTICS OF THE EXHIBIT IX DEVICE, THE FLIP-FLOP PLUS -- I BELIEVE I GOT THAT EXHIBIT NUMBER CORRECT.

Q. I BELIEVE YOU DID.

A. I'M NOT SURE. SO THEY'RE VERY SIMILAR IN THAT RESPECT. THEY'RE QUITE DIFFERENT, OF COURSE, IN THE FACT THAT THE HIGINBOTHAM DEVICE COULDN'T RUN A TELEVISION SET.

Q. NOW, MR. THACKER, YOU'VE READ MR. BAER'S TESTIMONY IN

THIS CASE, CORRECT?

A. YES, I HAVE.

Q. IN YOUR OPINION, WHAT IS THE APPLICABLE ART FOR A PERSON WORKING ON THE DESIGN OF THE CIRCUITRY DESCRIBED IN THE SPECIFICATIONS OF THE RUSCH 2 PATENT BACK IN THE YEARS 1967 AND '68?

A. WELL, I WOULD THINK THAT THE ART WOULD INVOLVE THE ART OF ELECTRONIC ENGINEERING, OF COURSE, PERHAPS TELEVISION ENGINEERING, AND IF YOU TELL ME THAT YOU'RE GOING TO INCLUDE IN THE CLASS OF GAMES THAT YOU'RE TALKING ABOUT THE COMPUTER GAMES, THEN I WOULD SAY COMPUTER TECHNOLOGY AND COMPUTER SCIENCE, ALTHOUGH COMPUTER SCIENCE WAS NOT REALLY A SCIENCE IN 1967.

Q. WHAT IS YOUR UNDERSTANDING OF THE PROBLEM ADDRESSED BY MR. RUSCH IN HIS WORK LEADING TO THE RUSCH 2 PATENT?

A. WELL, AS I UNDERSTAND THE CHRONOLOGY, MR. RUSCH JOINED THE PROJECT AFTER MR. BAER HAD DONE MOST OF THE ORIGINAL WORK ON THE DEVICES DESCRIBED IN THE 480 PATENT, AND I BELIEVE THAT IT WAS MR. RUSCH'S TASK TO MAKE IMPROVEMENTS UPON THAT, AND THOSE IMPROVEMENTS -- SO HIS PROBLEM WAS TO ESSENTIALLY IMPROVE THIS DEVICE AND HE CHOSE OR WAS DIRECTED, I DON'T KNOW, SEVERAL AREAS OF IMPROVEMENT IN WHICH TO WORK.

ONE AREA WAS TO IMPROVE THE METHOD OF SPOT GENERATION, THAT IS, TO MAKE MORE PLEASING SPOTS THAN JUST RECTANGLES, AND THAT IS CLEARLY SHOWN IN THE 507 PATENT, THE SPOT GENERATION OCCUPIES A LARGE FRACTION OF THE DESCRIPTION.

AND THE OTHER AREA THAT HE -- I'M PRESUMING WANTED OR AT LEAST DID IMPROVE ON, IS THE AREA OF ONE PLAYER GAMES IN

WHICH THE PLAYER PLAYS AGAINST THE MACHINE IN WHICH THE MACHINE ESSENTIALLY CONTROLS THE SPOTS. I BEG YOUR PARDON. THAT'S INCORRECT. THAT'S REALLY INCORRECT. THAT WAS LATER. LET ME RECOLLECT A BIT.

(PAUSE.)

A. THE ADDITION IS, OF COURSE, THE IX AND IY ADDITIONS WHICH WERE MOTION CONTROL ADDITIONS.

Q. THIS IS ADDING A DISTINCT MOTION UPON COINCIDENCE, IS THAT CORRECT?

A. YES, IN THOSE TERMS.

Q. NOW, MR. THACKER, PLACING THE PERSON WITH ORDINARY SKILL IN THE ART IN THE POSITION OF MR. RUSCH WITH MR. RUSCH'S PROBLEM IN MIND, IN YOUR OPINION, WAS MR. RUSCH'S SOLUTION TO THIS PROBLEM OBVIOUS IN LIGHT OF THE TEACHINGS OF THE EXISTING BEAR TECHNOLOGY AND THE HIGINBOTHAM TENNIS GAME?

A. I THINK THE ANSWER IS, YES. I THINK -- WHEN I LOOK AT IT, WHAT I SEE IS VOLTAGE CONTROLLED SPOTS WERE FROM BAER. AND BOUNCING MOTION WAS CLEARLY DONE IN THE HIGINBOTHAM DEVICE. SO, YES, I WOULD HAVE TO SAY THAT I THINK THAT THOSE THINGS ARE OBVIOUS.

Q. MR. THACKER, ARE YOU FAMILIAR WITH THE SPIEGEL PATENT?

A. YES, I AM.

Q. AND HOW DID YOU LEARN ABOUT THE SPIEGEL PATENT?

A. I REVIEWED IT IN PREPARATION FOR TESTIFYING IN THIS CASE.

Q. COULD YOU PLEASE DESCRIBE THE SUBJECT MATTER OF THE SPIEGEL PATENT?

A. YES, THE SPIEGEL PATENT WAS A TRAINING DEVICE THAT WAS DEVELOPED BY A MAN IN GERMANY. THE IDEA WAS TO SHOOT A

SIMULATED MISSILE AT A TANK AND THE TANK APPEARED ON THE -- ESSENTIALLY, ON THE HORIZON, AND THE TASK OF THE OPERATOR WAS, BY MANIPULATING AND CONTROL, TO CAUSE THE SPOT OR SPECK, AS HE REFERRED TO IT IN THE PATENT, TO INTERCEPT THE TARGET, AT WHICH POINT IT WOULD -- THE SCREEN WOULD FLASH AND THE SCREEN WOULD ALSO FLASH IF THE USER DID NOT KEEP THE MISSILE ABOVE THE GROUND LINE DURING ITS FLIGHT, THAT IS, IF HE FLEW IT INTO THE GROUND.

IT WAS ESSENTIALLY A TRAINING DEVICE FOR THE MILITARY, I BELIEVE.

Q. NOW, HAVE YOU REVIEWED THE PATENT EXAMINER'S DECISION DENYING REISSUE OF THE BAER 1 PATENT ON THE GROUND OF INVALIDITY IN LIGHT OF THE SPIEGEL PATENT AND SPACE WAR?

MR. ANDERSON: I OBJECT. FIRST OF ALL, I THINK THE QUESTION MISSTATES THE FACT. THE PATENT OFFICE DOES NOT HOLD PATENTS INVALID OR EVEN LOOK AT THE ISSUE OF INVALIDITY. IT'S IRRELEVANT, IT'S THE 480 PATENT, IT'S NOT IN ISSUE HERE.

THE COURT: WHAT IS THE RELEVANCE ISSUE?

MR. ESCHER: I WAS GOING TO -- THE NEXT QUESTION IS, DO THE TEACHINGS OF THE SPIEGEL PATENT AFFECT YOUR OPINION AS TO THE OBVIOUSNESS OF THE RUSCH PATENT.

THE COURT: I THINK YOU CAN ASK THAT WITHOUT THE FOUNDATION THAT YOU'VE LAID. SO THE OBJECTION TO THE PRIOR QUESTION IS SUSTAINED, BUT YOU MAY ASK THIS ONE.

MR. ESCHER: Q. DO THE TEACHINGS OF THE SPIEGEL PATENT AFFECT YOUR OPINION AS TO THE OBVIOUSNESS OF THE RUSCH 2 PATENT?

A. I THINK SO. I FOUND IT FAIRLY DIFFICULT TO DISCERN ANY

SIGNIFICANT DIFFERENCE BETWEEN WHAT WAS DONE IN THE SPIEGEL DEVICE AND WHAT WAS DONE IN THE BAER DEVICE AND, THEREFORE, THEY BOTH SERVED AS FOUNDATIONS FOR WHAT WAS DONE IN 507. AND I SPEAK TECHNICALLY, OF COURSE. IT MAY WELL BE THAT INDIVIDUAL WORDS ARE DIFFERENT HERE AND THERE, BUT THE MAJOR INTENT OF THE DEVICE, ALL THE COMMON PROPERTIES ARE THERE.

MR. ESCHER: YOUR HONOR, ACTIVISION HAS CONSISTENTLY TAKEN THE POSITION IN THIS CASE THAT ITS COMPUTER SOFTWARE IS NOT WITHIN EVEN THE BROADER AMBIT OF THE RUSCH 2 PATENT. HOWEVER, THE PLAINTIFFS HAVE URGED THAT THE PATENT COVERED THE TECHNOLOGY, ACTIVISION MUST SAY, POINT OUT THE COMPUTER PRIOR ART WHICH MAKES THE RUSCH 2 PATENT OBVIOUS, IF IT'S DEEMED TO EXTENDED TO COMPUTER GENERATED IMAGES SUCH AS THE ATARI 2600 SOFTWARE ACTIVISION COMBINING SYSTEM.

MR. ANDERSON: I DISAGREE WITH THE CHARACTERIZATION.

THE COURT: I THINK HE'S SAYING HE'S NOT WAIVING ANYTHING.

MR. ANDERSON: YES, YOUR HONOR.

MR. ESCHER: Q. MR. THACKER, HAVE YOU REVIEWED ANY EXAMPLES OF COMPUTER PRIOR ART TO THE RUSCH 2 PATENT IN PREPARATION FOR YOUR TESTIMONY TODAY?

A. WELL, I, OF COURSE, SAW THE FILM OR THE TAPE THAT WE ALL SAW EARLIER TODAY. I'VE REVIEWED DESCRIPTIONS OF SPACE WAR, I'VE SEEN SPACE WAR PLAYED, I'VE PLAYED SPACE WAR. I'VE REVIEWED THE POOL GAMES, I HAVE WRITTEN SIMILAR POOL GAMES FOR A MACHINE THAT I BUILT IN 1972. YES, I THINK SO, ALTHOUGH THAT'S, OF COURSE, NOT PRIOR ART.

Q. MR. THACKER, COULD YOU START BY DESCRIBING THE TEACHINGS

OF THE COMPUTER POOL GAMES AND COMPARING THEM WITH THE RUSCH 2 PATENT, PLEASE?

A. COMPARING THEM WITH RUSCH 2. THAT'S A LITTLE BIT DIFFICULT. TYPICALLY, THE WAY THOSE GAMES WORK, AND THEY ARE ALL FAIRLY SIMILAR, THE PROGRAM THAT ACTUALLY EMBODIES THE GAME IS IN 3 PARTS. ONE IS THE PART THAT RECEIVES INPUT FROM THE USER AND THE PROGRAM READS THE INPUT AND IN THE TAPE THAT WE SAW THE INPUT DEVICE WAS LIGHT PEN WITH WHICH THE USER POINTED AT THE BALL AND CAUSED IT TO BEGIN MOTION. THERE WAS A BUTTON ON THE LIGHT THAT CAUSES THAT TO HAPPEN.

THE SECOND PART OF THOSE PROGRAMS IS THE COLLECTIVE THAT COMPUTES WHERE THE BALLS WILL GO BASED -- BY ESSENTIALLY SIMULATING THEM.

MR. ANDERSON: YOUR HONOR, THE STATEMENTS BEING MADE ABOUT COMPUTER PROGRAMS AS PRIOR ART I DON'T UNDERSTAND. THERE IS NO PROGRAM FOR ANY POOL GAME THAT I KNOW OF THAT'S IN EVIDENCE BY EITHER SIDE IN THIS CASE. AND I DO MOVE TO STRIKE THE ANSWER BECAUSE IT'S UNSUPPORTED AND I GUESS NOT RESPONSIVE TO THE QUESTION. IT BECOMES A NARRATIVE. AND IT'S WITHOUT FOUNDATION.

THE COURT: IT SEEMS TO ME HE'S NARRATING AND YOU'VE LOST ME ON WHAT YOU'RE TRYING TO ESTABLISH. YOU WERE ASKING HIM TO TESTIFY ABOUT PRIOR COMPUTER ART, COMPUTER PROGRAMMING.

MR. ESCHER: I WAS ASKING HIM ABOUT THE COMPUTER PRIOR ART WHICH WOULDN'T NECESSARILY BE EXCLUSIVELY LIMITED TO PROGRAMS. WHAT I WAS ASKING HIM TO DO WAS TO DESCRIBE THE TEACHINGS OF THE COMPUTER BASED POOL GAMES WHICH HAVE BEEN NOTICED AS PRIOR ART IN THIS CASE AND COMPARE THOSE TEACHINGS

WITH THE RUSCH 2 PATENT.

THE COURT: WELL, YOU MAY GO AHEAD AND ANSWER.

MR. ANDERSON: IT'S SO VAGUE AND AMBIGUOUS AS TO NOT BE HELPFUL TO THE COURT. IF WE'RE TALKING ABOUT SOME POOL GAME, IF IT'S RCA POOL OR WHOEVER IT IS, I THINK WE SHOULD KNOW WHAT POOL GAME THIS WITNESS IS REFERRING TO. AND THEN DO IT ONE AT A TIME.

MR. ESCHER: LET'S TALK ABOUT THE RCA POOL GAME FIRST.

Q. COULD YOU PLEASE DESCRIBE THE TEACHINGS OF THE RCA POOL GAME AND COMPARE THEM WITH THE RUSCH 2 PATENT, PLEASE?

A. CERTAINLY. THE PRINCIPAL TEACHINGS OF THAT ARE HOW TO WRITE PROGRAMS FOR SIMULATING THE REAL WORLD. WHAT THE PROGRAM DOES IS IT SIMULATES BALLS ON A POOL TABLE. IT COMPUTES FOR EACH BALL THE POSITION AND VELOCITY OF THE BALL AND THEN IT HAS A SECTION OF THE PROGRAM THAT CAUSES THOSE POSITIONS AND THE VELOCITIES TO BE REPRESENTED ON THE SCREEN.

MR. ANDERSON: WHAT PROGRAM, YOUR HONOR? I DON'T KNOW OF A PROGRAM THAT THIS WITNESS HAS SEEN OR THAT WE'VE SEEN AND IT'S NOT IN EVIDENCE AS FAR AS I KNOW AND I OBJECT.

THE COURT: HAVE YOU REVIEWED THE PROGRAM?

THE WITNESS: I HAVE WATCHED A PROGRAM AND I'VE READ DESCRIPTIONS OF IT. I HAVE NOT READ THAT PARTICULAR PROGRAM, NO, SIR.

THE COURT: WELL, I THINK HE'S TESTIFIED TO IT. YOUR OBJECTION IS WELL TAKEN, BUT I THINK THEY GO TO THE WEIGHT RATHER THAN THE ADMISSIBILITY.

MR. ANDERSON: ONE STEP FURTHER. WHEN THE WITNESS

SAYS HE WATCHED THE PROGRAM, ARE YOU TALKING ABOUT THE FILM WE ALL SAW TODAY?

THE WITNESS: THAT FILM, YES.

MR. ANDERSON: YOUR HONOR, THAT JUST IS NOT A PROGRAM, BUT I WILL REST.

THE COURT: I THINK PERHAPS THE WITNESS IS QUALIFIED TO TAKE A RATIONAL STEP FROM WHAT HE'S OBSERVED, HIS EXPERIENCE IN THE FIELD AND KNOWING HOW IT WOULD HAVE TO BE PUT TOGETHER. YOUR OBJECTION HAS MERIT, BUT I THINK IT REALLY GOES TO THE WEIGHT OF THE TESTIMONY.

MR. ANDERSON: THANK YOU, YOUR HONOR.

MR. ESCHER: Q. COULD YOU CONTINUE WITH YOUR DESCRIPTION OF THE RCA POOL GAME, MR. THACKER?

A. I'M SORRY. I --

Q. LET ME ASK YOU THIS QUESTION AND TRY -- IT'S PROBABLY MY FAULT MORE THAN ANYONE ELSE'S.

MR. THACKER, WAS THERE ANY MOTION IMPARTED TO THE VARIOUS BILLIARD BALLS DISPLAYED ON THE SCREEN UPON COINCIDENCE WITH THE POOL BALL IN THE RCA GAME?

A. OF COURSE.

Q. AND WHAT WOULD HAPPEN TO THE BALL AFTER COINCIDENCE WITH THE CUE BALL. WHAT WOULD DETERMINE ITS MOTION?

A. THE LAWS OF PHYSICS.

Q. WOULD THE LAWS OF PHYSICS BE EMBODIED IN ALGORITHMS IN A COMPUTER PROGRAM?

A. THE PROGRAM ACTUALLY SIMULATES WHAT HAPPENS. THAT IS THE MOMENTUM IN AND EQUAL TO THE MOMENTUM OUT. THAT'S A COMPUTABLE THING. IT'S FIRST YEAR PHYSICS. IT TELLS YOU WHAT

HAPPENS ON A POOL TABLE. AND THE PROGRAM EMBODIES THAT IN ORDER TO COMPUTE THE POSITION OF THE BALLS JUST AS SPACE WAR DID THE SAME THING TO COMPUTE THE POSITION OF THE SHIPS AND THE MISSILES AND WE HEARD TESTIMONY FROM MR. RUSSELL ABOUT THAT.

Q. IS THAT THE SAME PHENOMENON GOING ON IN THE ATARI 2600?

A. IN SOME CASES, YES AND IN SOME CASES, NO. IN SOME CASES THERE ARE REALLY SIMULATIONS OF WHAT'S HAPPENING. FOR INSTANCE, IN TENNIS THE PROGRAM ACTUALLY SIMULATES THE SAME EQUATIONS OF MOTION THAT WOULD OCCUR ON A TENNIS COURT AS DR. HIGINBOTHAM'S GAME DID. IN SOME OF THE GAMES, NO, THE COLLISIONS ARE NOT REALISTIC, SO THERE, IT'S NOT A SIMULATION.

Q. FROM THE STANDPOINT OF THE COMPUTER PROGRAMMER FOR A GAME LIKE RCA POOL, DOES IT MAKE ANY DIFFERENCE WHETHER THE POOL GAME IS DISPLAYED ON RASTER GAME DISPLAY OR A VECTOR GRAPHIC DISPLAY?

A. IT MAKES SOME DIFFERENCE IN TERMS OF THE EXACT INSTRUCTIONS THAT ARE WRITTEN TO OPERATE THE DISPLAY. I DOUBT THAT THE PROGRAMMER THINKS OF IT AS A SIGNIFICANT DIFFERENCE.

Q. WOULD THAT BE TRUE FOR THE POOL GAMES OTHER THAN THE RCA POOL GAME?

MR. ANDERSON: YOUR HONOR, I OBJECT TO WHAT THIS WITNESS THINKS THE PROGRAMMER BACK IN THE 1960'S DID OR THOUGHT UNLESS HE HAS SOME SPECIFIC KNOWLEDGE OR WAY OF KNOWING.

THE COURT: WELL, HE'S TESTIFYING AS AN EXPERT, SO I'LL ALLOW IT TO STAND. AGAIN, YOUR OBJECTION GOES TO THE WEIGHT OF THE TESTIMONY.

MR. ANDERSON: FURTHERMORE, THERE IS NO SHOWING, YOUR HONOR, THAT THERE WAS A RASTER SCAN INVOLVED, SO IT'S IMPOSSIBLE TO EVEN SAY WHAT THAT MAN WOULD HAVE DONE UNLESS THERE IS FOUNDATION THAT HE HAD THAT AVAILABLE FOR HIM TO LOOK AT.

THE COURT: THAT'S A VALID CROSS-EXAMINATION QUESTION. WHAT'S THE DATE OF THE RCA PROGRAM?

THE WITNESS: I'M SORRY, I DON'T RECALL.

MR. ANDERSON: 1967, YOUR HONOR.

MR. ESCHER: Q. DID YOU REVIEW ANY POOL GAMES OTHER THAN THE RCA POOL GAME?

A. I READ ABOUT THE DRUMHELLER POOL GAME, BUT NOT IN DETAIL.

MR. ESCHER: YOUR HONOR, THIS IS A NATURAL BREAKING POINT. WE COULD STOP NOW AND FINISH UP IN THE MORNING WITH MR. THACKER.

THE COURT: HOW MUCH MORE DO YOU HAVE?

MR. ESCHER: 30 OR 35 MINUTES.

THE COURT: WHAT SUBJECT WILL YOU BE COVERING?

MR. ESCHER: COVERING THE SUBJECT OF THE PRIOR ART.

THE COURT: STILL ON PRIOR ART?

MR. ESCHER: CORRECT.

THE COURT: THAT'S FINE. WE CAN RECESS NOW. RECESS UNTIL 9:00 O'CLOCK TOMORROW MORNING.

MR. ANDERSON, DO YOU STILL WANT A DISCUSSION OF THE WITNESS AND TIME AND ALL?

MR. ANDERSON: I WOULD APPRECIATE THAT.

(OFF THE RECORD.)

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