Q-FILE - RANDOM ACCESS MEMORY CONTROL FOR THEATRE AND TELEVISION

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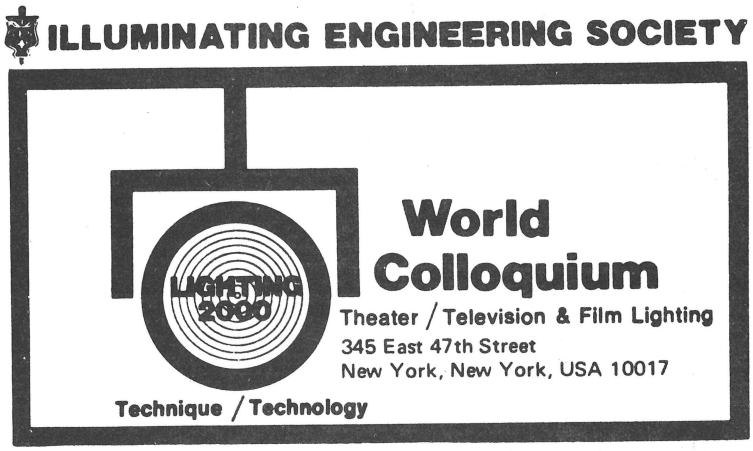

RANDOM ACCESS MEMORY LIGHTING CONTROL

THE "Q-FILE"

A paper to be read at the ILLUMINATING ENGINEERING SOCIETY; THEATRE, FILM and TELEVISION LIGHTING, WORLD COLLOQUIUM, New York City, May 1971

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A few years ago the notion and logic of incorporating data or information retrieval systems within lighting control was contemplated. Now we find that such an exciting prospect is indeed a reality. Leading practitioners in lighting have long since been in agreement upon the need for research that might lead to improvement in lighting control systems; more specifically seeking the centralization of lighting control into a small console, preferably incorporating the ability to preset all controls many times in advance, and encompassed by a single operator.

Some forty odd years ago, Thomas Wilfred, a great practitioner in the art of colored light and inventor of the Clavilux, was to write:

> The finest of our present day lighting units will remain almost useless in the hands of the artist, until we have standardized a light keyboard from which all visual possibilities are ruled by the sweep of a hand over...low voltage keys. That is what I am trying to do. (Theatre Arts Monthly, September, 1928).

Wilfred's statement was written in 1928. The year before, in the first edition of his Syllabus of Stage Lighting the late Stanley McCandless had laid out the guiding principles governing the design of such a lighting control system. McCandless gives us a clarion call for "ease of control" - "centralization" - "physical ease of operation" - "clearness and simplicity" - "flexibility" - "dependability". One is constantly amazed, in re-reading McCandless, to recognize the aptness and clarity of his vision. Indeed, in many ways, and the authors of this paper have had the pleasure of stating this many times, the McCandless switchboard console developed for Severance Hall in Cleveland, Ohio, in 1933, was a most brilliant statement in terms of logic, flexibility and clarity of control. In terms of work done here in the United States at least, this console was not surpassed until very recent times.

The great S. L. Rothafel (Roxy), producer, director, builder of

the Rialto, Capitol and Roxy Theatres here in New York -- a man of tremendous vision and talent -- wrote the following statement which appeared in the Transactions of the Illuminating Engineering Society for May 1923:

> Now what I think we need in the near future more than anything else is better equipment to get better control. That is the thing that is essential in lighting. I made a prophecy...that the lighting of the theatre of tomorrow would be controlled from one unit, the same as the piano.

The search for lighting control envisioned in such statements as the preceeding has, of course, been a major quest of the last half century. We look back now, with the remarkable hindsight that our present age gives us, to such splendors as the old vertical face houseboard (sometimes twenty to thirty feet long, and complete with its eight operators), the portable resistance dimming road board still the mainstay of our commercial theatre here in the United States, motor-driven autotransformer systems, the saturable core reactor, the thyratron tube systems post World War II mostly here and in England, the short-lived magnetic amplifier systems, and finally on to what is the current standard, the silicon controlled rectifier dimmer. Now throughout all of this development we find one thing which has been particularly consistent, and that is the proliferation of control handles or levers. Indeed, strangely even in some most sophisticated memory systems one still finds these rows of individual controllers. Many of these modern systems still seem to take refuge in the comfort of the past. One might well still pay heed to the words of the British humorist and part time lighting control system designer, whose light organ console work of the mid-thirties in Britain was most original, Frederick Bentham. Bentham is very clear in stating that "the criterion must be need and not tradition." (The Art of Stage Lighting, 1968).

In one way or another and in varying degrees, all of these systems we have mentioned seem to be reminiscent of the past; however, today by incorporating not merely our contemporary technology but coupling it with the artistic requirements of the creative lighting artists we have a most magnificent opportunity to advance the state of our performing arts. We should hopefully remember that that is the reason for our being here today.

It might ordinarily be presumptuous to move directly from theoretical discussion and aesthetic charge to commercial product, but the particular lighting control system which the authors of this paper are discussing has had the benefit of a great deal of approval by some very distinguished practitioners of the arts of scenic and lighting design. Mr. Jo Mielziner, Mr. Donald Oenslager, Mr. Ralph Alswang, Mr. Jules Fisher, Mr. Martin Aronstein, Miss Tharon Musser, Miss Peggy Clark, Mr. John Gleason, Mr. Abe Feder, Mr. Ming Cho Lee, Mr. Gilbert Hemsley, Mr. Hunton Sellman, Mr. Hans Sondheimer, Mr. Imero Fiorentino and many others have

chosen to allow their approval to be quoted in print about a system which is called "Q-File". It is about that system -- originated in London some five short years ago, the father of which was Thorn Electric Company and the Godfather the British Broadcasting Corporation -- it is about that system that we now propose to talk. This is a lighting control system which now has more than twenty-five working installations, each and every one most successful, and another twenty-five or so systems on order. The present operating experience on these systems already totals more than thirty man years.

There are, of course, many different kinds of memory devices that could be and are incorporated in lighting control. There are tape, disc file and drum storage. The basic difficulty with these devices is that they are mechanically actuated, hence, there is always the problem of periodic maintenance, the down time which would be associated with the maintenance interval and the sophistication required on the part of maintenance personnel. Another storage device is the magnetic core which incorporates ferrite core stacks and has no maintenance as there are no moving parts. In addition, the core has thus far proven itself to be the most stable, reliable and rugged memory device to be incorporated within a lighting control system.

We have already discussed the design criteria for a lighting control system. What about the engineering aspects. The circuitry and associated components should reflect what is established, known, proven and reliable. Further, the system should have the ability to interface with any existing electronic dimming device. The system should incorporate circuitry that offers the ability of the device to accept and withstand voltage and current variations without in any way causing alteration or loss of the stored data. Moreover it seems essential to incorporate a modular approach in the design of the system. This, of course, provides for accessibility to all components within the system should maintenance or service be required. The modular approach also offers the opportunity to interchange functions within the system should any problem occur.

What about the operational aspects of our design criteria? It is one thing to grapple with the engineering attendant to storing data, but quite another thing as to what one can and must be able to do with the data once stored. For the test of any memory system is simply stated "Does it improve upon, enhance and advance the state of the art as we know it?" Sometimes systems are developed that reflect a mechanical excellence without taking into consideration what might be achieved in improving the artistic climate. As each decade passes we find increased demands placed upon lighting as an intrinsic element in all of our performing arts. The advent of random access memory should provide us not only accurate recall of storage but new freedoms offered to the lighting designer in the concept and execution of lighting cue sequences which heretofore have either been difficult or impossible to achieve. One must indeed be able to deal with the stage or studio cue sequence as a total unit instead of having to break it down into the bits and pieces of station point operation which have heretofore been traditional.

Figure One: Full view of console

In the development of the Q-File system a deliberate attempt was made to reduce substantially the size of the operating console. As a matter of fact, this system departs rather markedly from what we have associated with respect to lighting control in the past. The operational controls exist in an area of less than three square feet.

Figure Two: Servo Fader and Keyboard

We find a single Servo Fader and an associated keyboard. The present keyboard provides access for close to 400 lighting control channels. The Servo Fader provides for intensity setting for either individual or groups of control channels. There are two mode function switches. Depressing SELECT STAGE assigns the Servo Fader and the keyboard to the stage store. That is, the Servo Fader now controls the levels of the dimmer or dimmers on stage. SELECT PRE-SET assigns the Servo Fader and the keyboard to the pre-set store. The Servo Fader incorporates a four phase stepping motor which can drive itself from zero to full in about 6/10 of a second. The Servo Fader provides a variety of functions, but at this juncture we are describing its function as that lever which permits intensity regulation either individually or in groups of pre-selected control channels. The SET-ALL CIRCUITS button takes all dimmers in the mode selected to the level of the Servo Fader at that time, which allows for most rapid setting of bright, dim and intermediate level scenes. CANCEL ALL CIRCUITS switches off all dimmers in the store selected but will not, however, change the levels set in that particular memory store.

Figure Three: Show Condition

Access to memory positions is again by keyboard. In the photograph we show a keyboard with the possibility of 200 memory positions.

There are four faders in the system grouped as follows: A-B with A as up fade control, B as down fade control; C-D with C as up fade control and D as down fade control. These faders are not faders in the normal sense, for we do not manually manipulate on up-down or cross fade process. Rather, they are time controllers. By that we mean that these four controllers are capable of presetting a time interval from one to seventy seconds, or from one to seventy minutes. Associated with the two groups of time controllers are the function switches clearly labeled up-fade and down-fade and cross-fade. Thus, after setting the time controller to a pre-determined time span one presses the appropriate button and the fade proceeds. However, should it be necessary to alter the time, the operator merely pushes the appropriate time controller away from him which accelerates the fade time or pulls the time controller back toward him which slows the fade down. Moreover if required to stop the fade the operator simply pulls the controller all the way back

toward him.

Associated with the four time controllers is a window display. The window display tells the percentage of time that has elapsed once a particular fade or fades have been initiated. Thus it is possible, for example to have four separate fade actions, each having different time spans, start them at four different times, and by observing the percentage of time lapse indicators work with and modulate the time controllers to bring the four different overlapping fade actions out and end together as one simultaneous ending fade process.

To the left we find two master controllers. In tandem they serve as the grand master. Individually one masters the STAGE STORE and the other masters the PRE-SET STORE. By energizing the switch ahead of the two masters identified as MIXED MASTERS one now has in effect a manual standard two scene pre-set system and if one is still so inclined manual cross fades can be performed.

It would also be appropriate at this time to identify the functions of some of the other buttons that you see. There are two buttons that permit RECORD. RECORD in the STAGE MODE simply means that any of the control channels energized upon the stage will be recorded under the selected number assigned by the memory keyboard. Similarly control channels energized in the PRE-SET MODE may also be recorded, again by selecting the appropriate memory file from the keyboard. Thus, it is possible to record pre-sets in an inactive state without affecting lights on stage or studio. This is called BLIND PLOTTING. This means that one may set up and record memories without affecting the lighting in the stage or in the studio. In addition one may add memories to memories or subtract certain memory positions and memorize the group as a composite under another memory file number. Also it is possible in this mode to mirror an existing memory to another memory file number.

In the STAGE STORE section we find the following buttons:
CUT - This button will replace as a switch action the levels and on-off states with those recorded in the memory selected on the keyboard for all control channels.
PLUS - This button will switch any dimmer recorded on in the memory selected to the level recorded in that memory.
MINUS - This button will switch off any control channel which has been recorded in the memory selected on the keyboard.
CANCEL ALL CIRCUITS - This button will switch off all control channels active on the stage or in the studio. In other words, this provides for the blackout function.
UP FADE - This button will start the up-fade process affecting any control channel which is held as ON in the pre-set mode.
DOWN FADE - This button will start the down fade process of any control channels which are on in the selected memory file.

CROSS FADE - The initiation of the cross fade button will start both UP FADE and DOWN FADE simultaneously operating. It is interesting to note that the buttons labeled CROSS FADE, UP FADE, and DOWN FADE are alternate action buttons, which is to say, that one may start a fade and stop a fade of any mode by simply depressing the appropriate action button.

A feature of this system which is a most unique and useful tool is the RECORD IN 99 feature. This is a temporary scratch pad memory which can override any or all of the dimmer channels. Its function principally is to offer to the operator the ability to temporarily modify or delete control channels which for a variety of reasons could be causing problems during a production. The energizing of the button AUTOMATIC ADD 99 in no way affects the original data stored. Lighting control intensities of any channel or channels will be automatically either raised or lowered as against the recorded data at any time when this feature has been actuated.

Figure Four: Mimic Display Panel.

The Q-File system offers a variety of ancillary features. The first, as we see here, is a MIMIC or STATUS DISPLAY PANEL. it effectively tells the operator two things: first the control channels which are energized in the stage mode; and second, the control channels which are energized in the holding or pre-set mode. If one wishes to ascertain, either in stage or preset, the intensity of a particular channel we simply select that channel on the keyboard (the channel control keyboard) and the Servo Fader positions itself to the "now" reading of that selected channel.

Figure Five: Peg Matrix.

This is a patching control channel matrix which provides for the random assignment of any control channel or channels to any one of the auxiliary control masters.

Figure Six: Auxiliary Controllers

In this photograph we show an assembly of ten auxiliary controllers, a typical number.

The auxiliary controllers offer the following functions. One, utility functions such as work lights, house light, pit lights, etc. Second, special effect functions such as incandescent follow spots, camera eye lights in television, effect motors and the like. Third, these controllers function as manual group masters. We may assign control channels to these master controllers as functions of light. In the theatre that might be such items as warm sides, cool sides, front lights, back lights, etc; or in television such items as base, key, fill, eye, etc. The auxiliary section has its own separate power supply and as such, is in pile-on configuration;

moreover, the auxiliaries operate totally independent from the memory mode aspect.

Figure Seven: Portable Remote

Another auxiliary is a remote or sub-station control unit.

This is a small box approximately one foot square which contains all of the functions, that is, buttons and Servo Fader necessary to set up, memorize and even play back lighting compositions. Which is to say that we not only can select and set intensity of individual or groups of channels and memorize them; but we are afforded the ability to add, and, should it be desired, subtract memory positions and record such efforts as composite actions. This portable box with its umbilical cable moves directly onto the studio floor or the stage and auditorium thus saving the unnerving use of headphones or squawk box between designer and electrician.

Figure Eight: Library Devices

A variety of compatible devices are available for use with the system that provide complete storage of memory information. This is particularly useful in repertory theatre situations where productions are recalled periodically and the various cues with associated intensity information must therefore also be close at hand. Of course, it is needless to reassemble the stored data by laboriously writing out cue sheets from the production and re-reading this into the memory. A standard tape cassette is shown in the photograph with some special programming features that allow one to start or stop the memory readout or reprogramming at selected intervals. Of course, teletypewriter printed sheet readout is available for those who in transferring productions to other stages or studios must have a printed record since these other spaces might not have been equipped with the Q-File system.

Figure Nine: Portable System

It should be noted that Q-File is available as a completely portable system. The authors of this paper have, for example, had the pleasure of traveling with such a Q-File system throughout the past six months. The complete system, and of course accompanying production has been toured by truck and van, now over some more than twenty-thousand miles, and the system has survived such debacles as earthquakes, clouds of Nujol fog, 108 degree performance temperatures, sub-zero weather, and high humidity conditions. One might also mention several hundred performances, and a few thousand invited guests, many of whom have seen fit to punch any and all buttons as their whims dictated. It is no small tribute to the reliability and inherent design of the system that it has survived all of this and operates beautifully intact, as delivered, to the present day.

The flexibility that is afforded to the lighting designer with the Q-File system is quite remarkable.

a) Dimmer channels can be read-out directly by Servo Fader as well as by composite "on stage" and "preview" tell-tales or mimic pilot lamp groupings

b) Four time variable faders are available as well as two manual faders allowing fades within fades within fades as required; two speeds of upfade and two speeds of downfade are always available simultaneously, as well as two manual faders

c) Fade times are automatically carried out once initiated by operator but may be adjusted at will whenever required even while a fade is in progress

d) Lighting intensity changes unique to one performance may be recorded in a special memory, automatically altering the intensities for that performance but without affecting the memory information previously recorded

e) Fades may be proportional, overlapping, lap dissolving, etc., at the will of the operator

f) New memories may be added into a fade process at any time and there is no limit to the number of up fades or down fades that can take place simultaneously

g) Practical lamps with their associated fill lights may be switched on or off at any time during a fade sequence

h) Memories may be previewed without affecting the lighting which is on stage; in addition new lighting plots may be set up and recorded, or existing ones modified, again without affecting the actual performance lighting

i) The system provides instantaneous fully random or sequential recording or recalling of cues

j) Manual modification of recorded individual dimmer settings for performance effect, cue setting change or development of new cues is always instantly available

k) Variable combination of any two or more previously recorded cues for performance effect or recording of such combinations as a new cue is easily achieved.

1) Interface capability for automatic transfer of recorded material to and from teletypewriter or magnetic tape for long-term storage and retrieval

In conclusion then, the lighting control system described in this paper provides and reflects design principles of a remarkable level of sophistication and innovation. The system is totally compatible with theatre and television facilities on the educational, professional and commercial levels. Since the system makes possible cue structure and fading sequences heretofore unobtainable it has the possibility of introducing a new horizon in lighting and allows a new creative impact upon the performing arts.

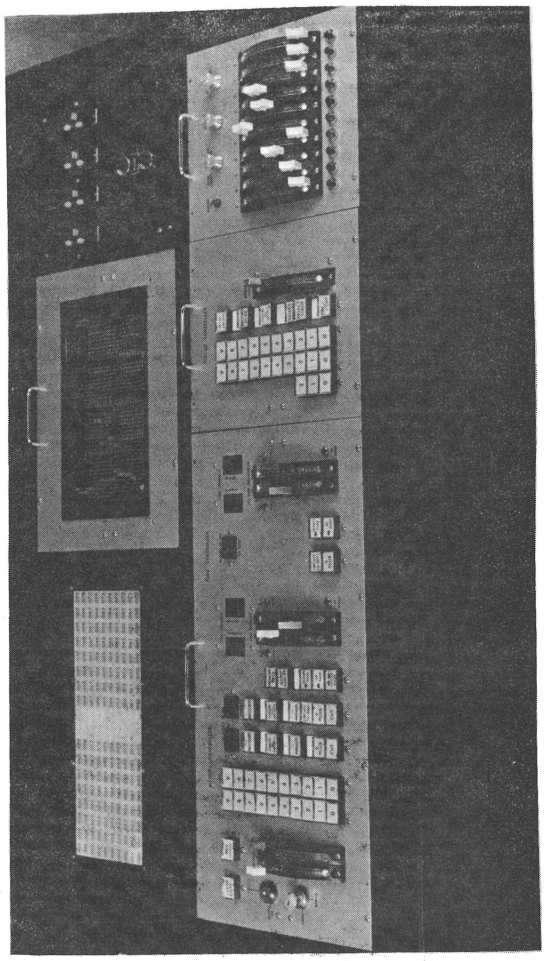

FIG. 1

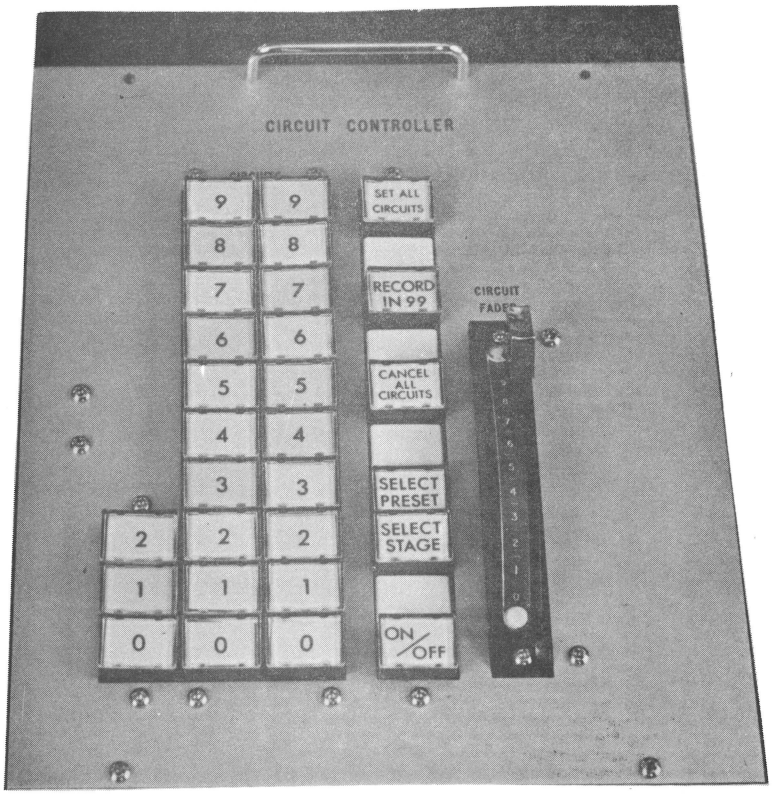

FIG. 2

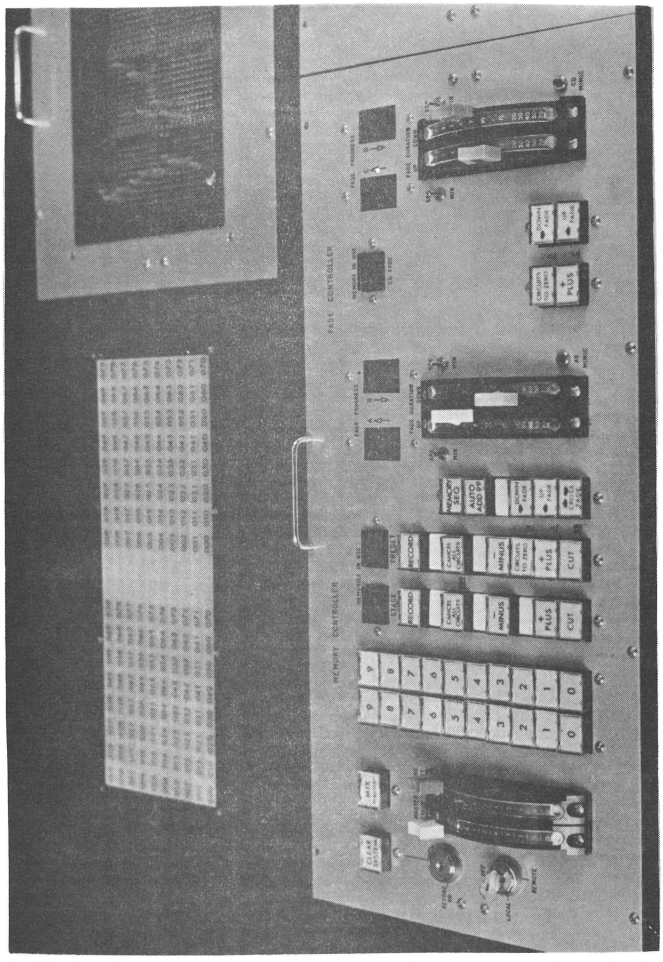

FIG. 4 AND 5

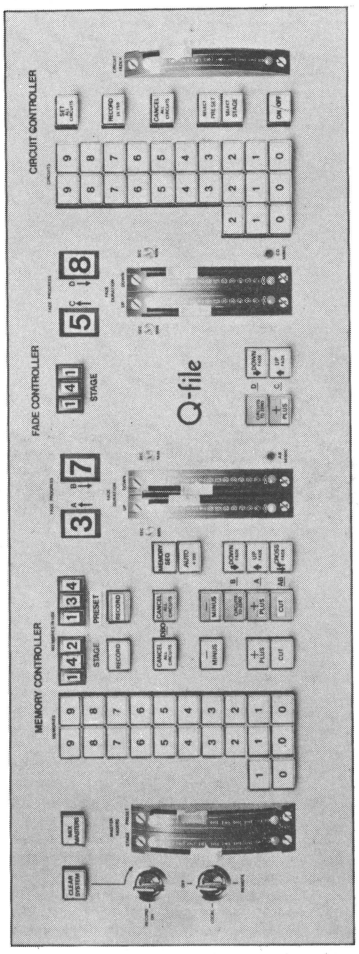

FIG. 3

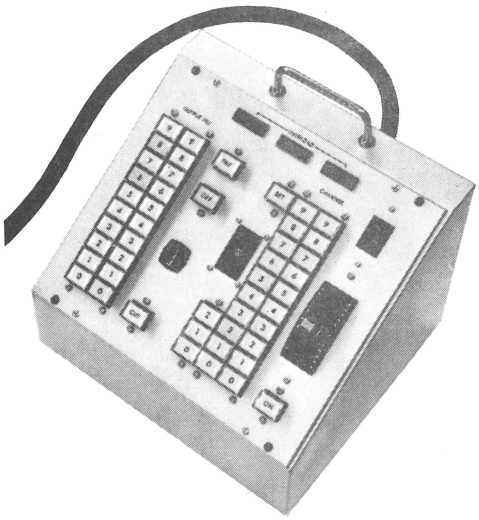

FIG. 7

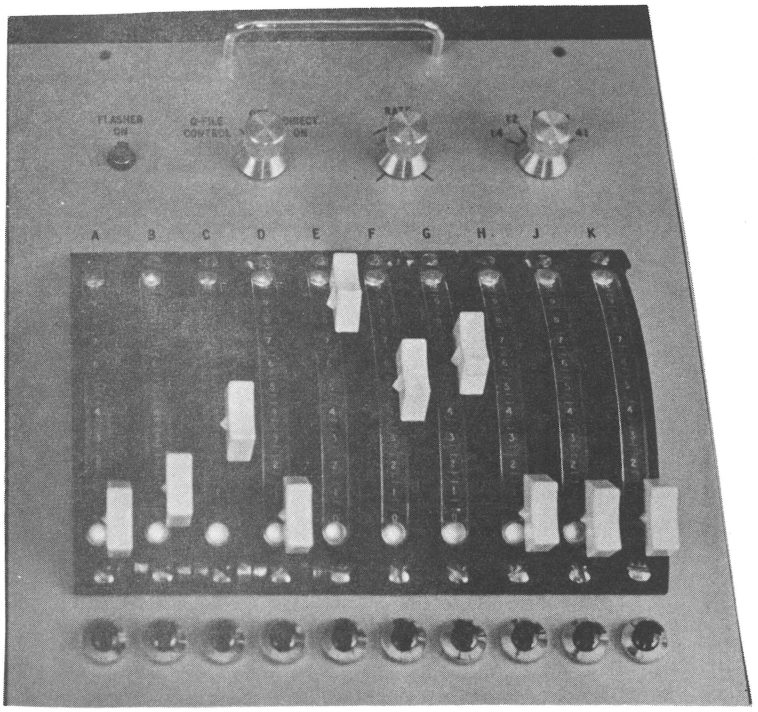

FIG. 6

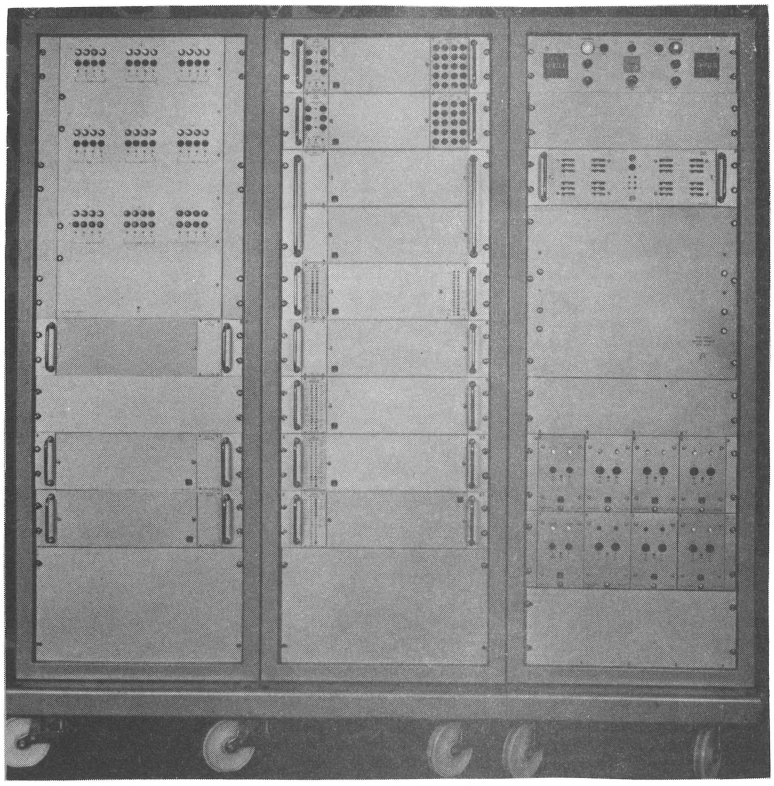

FIG. 9

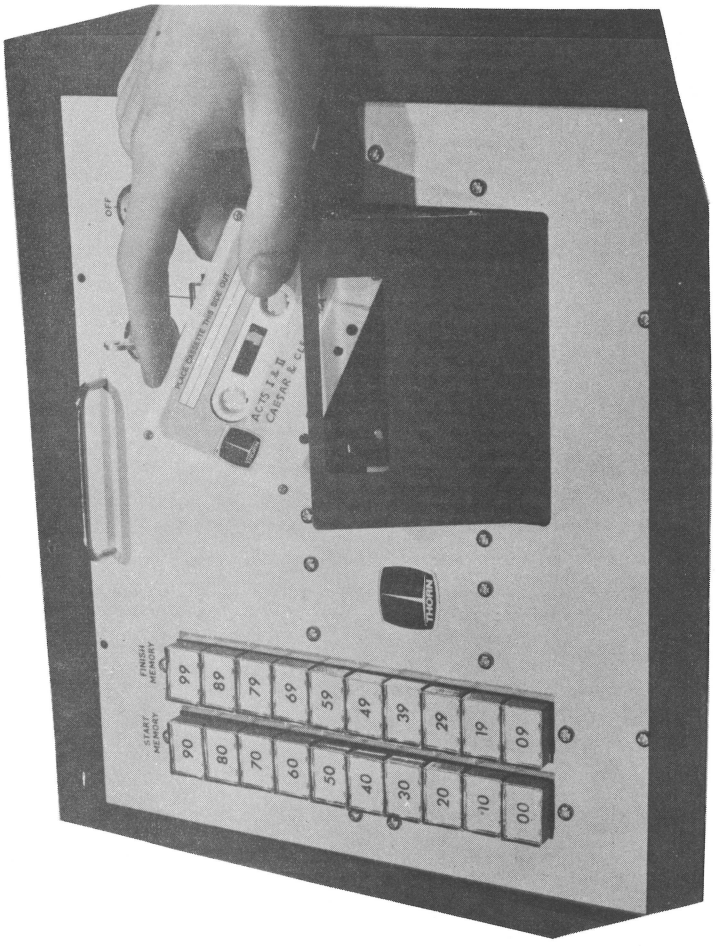

FIG. 8