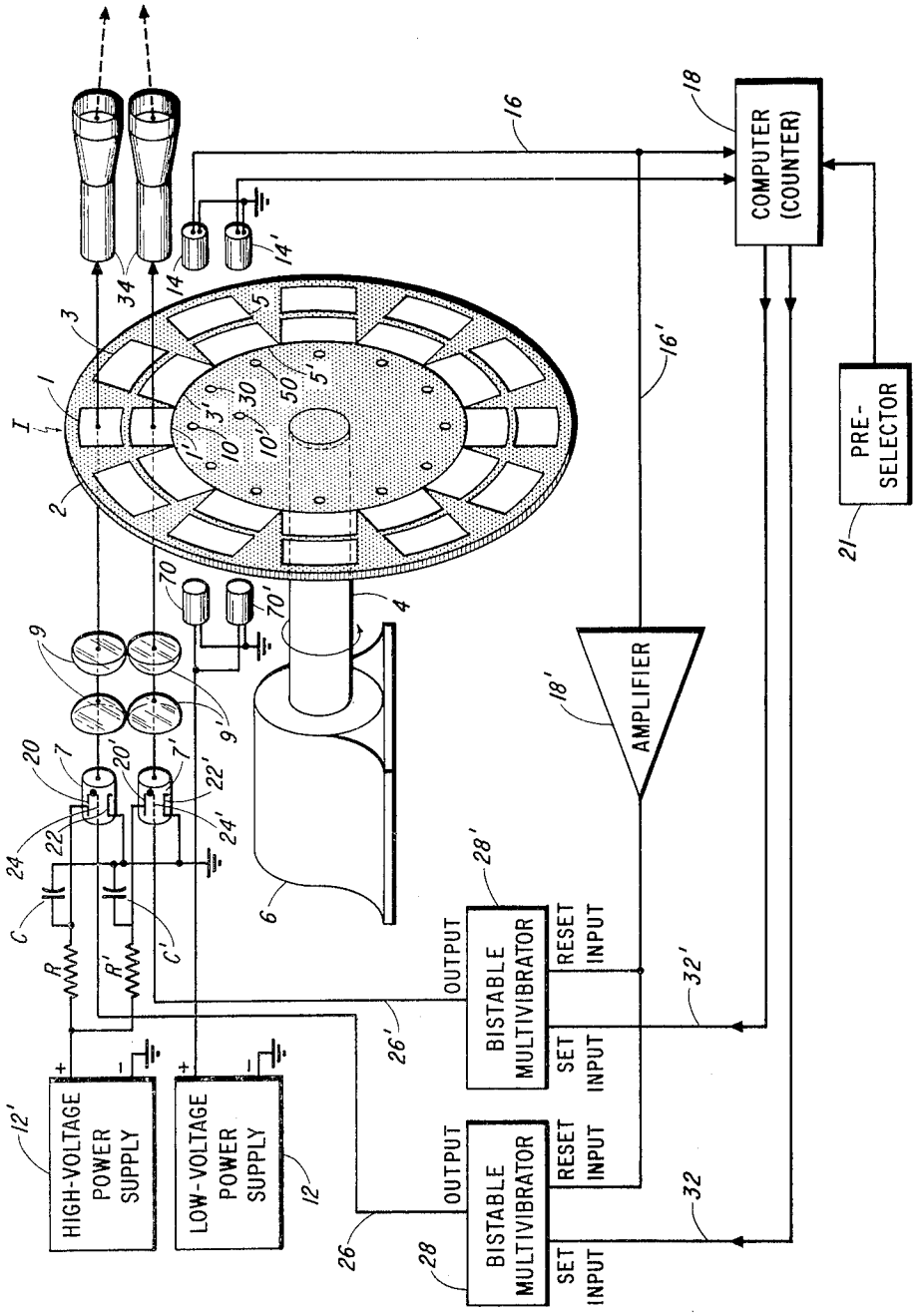
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APPARATUS FOR DISPLAYING COMPOSITE INFORMATION

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APPARATUS FOR DISPLAYING COMPOSITE INFORMATION

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The present invention relates to composite display apparatus and, more particularly, to apparatus for substantially simultaneously producing a composite indication or display of a plurality of informational units, preselected by a computer or other preselecting apparatus.

The problem of providing rapid access to photographically stored or similar information, as for use in computer operations and the like, has long plagued the art. In random access supply projectors, a matrix of photographic units is explored by a relative movement between the matrix and an illumination source, enabling the selection of one and perhaps two desired stored photographic images at substantially the same time. Another prior-art apparatus has involved stacks of photographic units which are operated upon to try to withdraw or otherwise select the desired unit. In all such cases, however, there has been limitation upon the speed of access and serious restriction with regard to providing substantially simultaneous access to a plurality of preselected photographic units. Inherent, also, in such previous devices has been the restriction that a static and not a dynamic display of units is produced.

An object of the present invention, accordingly, is to provide a new and improved information access apparatus of the character described that shall not be subject to any of the disadvantages above discussed, but that, to the contrary, shall provide for extremely high access speeds to, for example, photographically stored information and the like, together with the flexibility for substantially simultaneous display of a plurality of units and with the added provision for dynamic or moving displays.

A further object is to provide a new and improved display apparatus of more general utility, as well.

Other and further objects will be explained hereinafter and will be more particularly pointed out in connection with the appended claims.

In summary, however, the invention contemplates an apparatus for displaying an apparently composite pattern having, in combination, a plurality of informational units of the type that may be rendered visible upon illumination, the units being disposed along a predetermined path. A source of flash illumination comprising flash lamp means is located along the path and is provided with means for applying electrical impulses for flashing the flash lamp means at predetermined instants of time. Means is further provided for relatively moving the flash lamp means and the said units at a speed sufficient to cause successive units to become successively presented for display or viewing. A computation circuit produces electrical impulses at preselected instants of time during the successive presentation corresponding to the different instants at which at least two preselected units of the plurality of informational units become so available for viewing or display. Connections are provided between the computation circuit and the flash illumination source to enable flashing of the flash lamp means at the said preselected instants to render visible or otherwise display an apparently composite pattern substantially simultaneously containing at least the said two informational units. Preferred details are hereinafter set forth.

The invention will now be described in connection with the accompanying drawing, the single figure of which is a

combined isometric view and schematic circuit diagram of a preferred embodiment of the invention.

Referring to the drawing, a plurality of informational units, such as photographic transparencies or the like, is shown provided at 1, 3, 5, etc., along the periphery of a disc 2 that may be rotated in the direction of the arrow by a shaft 4 driven from a motor 6. More than one array or plurality of stored photographic units may be carried by the disc 2, such being schematically illustrated by the provision of a substantially concentric array or plurality of units 1', 3', 5', etc.

The general concept underlying the invention resides in illuminating preselected units of the array 1, 3, 5, etc., and/or the array 1', 3', 5', etc., as those units pass or scan a predetermined point or region, such as the uppermost region I, and combining the thusly illuminated units to effect a composite indication or display which may, for example, comprise a superposition of units.

It should be clear that the units 1, 3, 5, etc., need only be of a type that is susceptible of being rendered visible upon illumination, whether as a result of projection-type illumination or reflected illumination or other process, and that the units may be formed in many different ways, as by etching, printing, or the strictly photographic processes; all of which, for the purposes of the present invention, shall be generically termed "illuminable informational units."

The problem of providing rapid access to predetermined informational units and producing an indication or display of a plurality of such units may arise in many different areas and under different conditions; but in all cases there is an underlying common operational concept which may be readily illustrated by way of a particular preferred application of the invention. It is therefore to be understood that the subsequent description of the invention in its application to a particular computer system problem is by way of illustration only, and that the same apparatus and operational steps may readily be adapted to the solution of related problems.

For the purposes of the illustrated embodiment, the illuminable informational units 1, 3, 5, etc., 1', 3', 5', etc., assume the form of photographic transparencies or the like which are respectively to be rendered illuminable by a source of flash illumination comprising, for example, a pair of gaseous discharge flash tubes 7 and 7', respectively disposed to project flash illumination by means of an appropriate condenser lens system 9 and 9' to the regions of the disc 2 at which the units of the respective arrays 1, 3, 5, etc., and 1', 3', 5', etc., pass or scan by the predetermined region I. More or less flash lamps or other shutter-control illumination devices may obviously be employed for this purpose, including other sources of modulated light, such as Kerr cells and the like. The requirement as to the source of illumination is that it be enabled, at an accurately controlled instant of time, to produce a flash of illumination for illuminating a preselected one of the units 1, 3, 5, etc., and/or 1', 3', 5', etc., at the times that those units pass the predetermined region I. Obviously, these flashes must be of short and determinable time duration for high scanning speeds of operation of the disc 2.

It should be further understood that by the term "illumination" or the term "light" is meant not only radiation that is visible to the eye, but also radiations in invisible portions of the spectrum which may be detected by appropriately sensitive screens or other detectors; this process being referred to as the displaying of a composite pattern of illuminable informational units.

In accordance with the preferred embodiment of the invention, a synchronization is effective between the rotation of the disc 2 and the flashing of the flash tubes 7, 7'

that enables a more jitter-free presentation of a composite display than could otherwise be attained. This type of synchronization involves the production of a signal from the monitoring of the position of the disc 2 that controls the actual triggering of the flash tubes 7 and 7'. This monitoring is shown effected by optical means, although it will be readily apparent that magnetic or other types of rotating-disc position pick-up devices may readily be employed. A plurality of apertures 10, 30, 50, etc. is circumferentially provided in the disc 2, one corresponding to each of the concentric informational units 1, 1', 3, 3', 5, 5', etc. A fixed lamp or other illumination source is shown at 70, energizable from a low voltage power supply 12, to project light against the uppermost portion of the disc 2, defined by the ring of openings 10, 30, 50, immediately below the region I, as illustrated in connection with the aperture 10. In line with the lamp 70 and this uppermost region, shown occupied by the aperture 10, is a photo-cell or other transducer or pick-up device 14 which will produce an electrical signal each time one of the apertures 10, 30, 50, etc., passes the region I. Such electrical pulses may be fed by conductor 16 to a decision-making apparatus such as a digital computer or the like that may embody an impulse counter circuit or circuits schematically illustrated at 18 for counting the number of apertures 10, 30, 50, etc., that pass the region I, corresponding to the respective units 1, 1', 3, 3', 5, 5', etc., that simultaneously pass the region I.

Alternatively, as is well known, the disc 2 could be encoded to provide a similar plurality of electrical impulses that enable identification of the particular units 1, 1', etc., that pass the region I.

In the illustrated embodiment, a second lamp 70' is shown cooperating with a second photo-cell pick-up 14' to provide a frame reference impulse when a reference aperture 10' passes the region I, thereby to reset or otherwise cycle the counter 18 for the counting of impulses received by the photo-cell 14, corresponding to the passage of the successive units 1, 1', etc., past the region I.

The flash tubes 7 and 7' are provided with respective anode electrodes 20 and 20', grounded cathode electrodes 22 and 22', and trigger electrodes 24 and 24', voltage being stored between the anode and cathode electrodes by respective storage capacitors C and C', respectively charged through charging resistors R and R' from a high-voltage power supply source 12'. Each of the trigger electrodes 24 and 24' of the flash tubes 7 and 7' is supplied with a triggering voltage impulse fed by way of respective conductors 26 and 26' from the output of respective multivibrator circuits 28 and 28'; the triggering impulses enabling the discharge of the respective capacitors C and C' through the gaseous medium within the envelopes 7 and 7' between the anodes and cathodes 20–22, 20'–22', producing accurately controlled pulses or flashes of illumination of predetermined time duration.

While the reaching of a particular count by the counter 18, corresponding to a particular predetermined unit or units 1, 3, 5, etc., as preselected by the selecting member 21 associated with the counter 18, may be used directly to flash the flash tubes, if, as before stated, the actual flashing is effected under the control of a signal from the photo-cell 14, more jitter-free operation can be attained. To this end, the output 16 of the photo-cell pick-up 14 is also shown fed by the conductor 16' through amplifier 18' to one of the inputs labelled "reset input" of each of the multivibrators 28 and 28'. The output of the counter 18, as applied by respective conductors 32 and 32' to the "set input" connections of the respective multivibrators 28 and 28', will keep the multivibrators 28 and 28' in a particular state, the switching of which to another state will not provide a triggering output at 26 or 26'. When the preselection effected at 21 indicates that a preselected unit 1, 1', etc. is about to enter the region I, however, the counter output or other output of the decision-making apparatus 18 will set the multivibrators 28 and 28' to that state the complementing of which will result in a triggering output along conductors 26 and 26' for the respective flash tubes 7 and 7'.

This conditioning or setting of the multivibrators thus readies the same for such complementing action upon the feeding of the next impulse from the photo-cell 14, by way of the amplifier 18', as the preselected unit 1, 1', etc., passes to the region I.

It should thus be evident that such preselection and operation will enable the flashing of the tubes 7 and 7' at pluralities of preselected instants of time during the rotation of the disc 2, which will result in the illumination of a plurality of units, the composite pattern of the assemblage of which may, for example, be projected by projection lenses 34, as for the purpose of providing a superimposed display, a side by side display, or some other substantially simultaneous composite indication. The simultaneity is insured by an operation at a frequency in excess of the flicker limit of the eyes, in the case of visual observation, or within the integrating action of whatever other indicating or display device may be used.

Further modifications will also occur to those skilled in the art and all such are considered to fall within the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. Apparatus for displaying a composite pattern having, in combination, an array of illuminable informational units disposed along a predetermined path provided with a predetermined display region, illumination-producing means for providing illumination for the units, means for scanning the array of units to enable successive illumination of the same from the illumination-producing means, a computation circuit for producing electrical impulses at preselected instants of time only during the scanning corresponding to different time instants at which a plurality of preselected informational units are to be illuminably displayed at the said predetermined display region, and means for connecting the said circuit to the illumination-producing means to cause illumination of the same at the said preselected instants in order to produce at the said display region a composite illuminated display of the said preselected informational units only.

2. Apparatus as claimed in claim 1 and in which the said units are transparency units and the illumination-producing means is disposed to transmit illumination therethrough.

3. Apparatus as claimed in claim 1 and in which the said illumination-producing means comprises an electrically-operated flash-illumination device.

4. Apparatus as claimed in claim 1 and in which projection means is provided for projecting the said composite display.

5. Apparatus as claimed in claim 1 and in which the said array comprises a two-dimensional array.

6. Apparatus as claimed in claim 1 and in which the said predetermined path is an arc.

7. Apparatus as claimed in claim 1 and in which the said predetermined path comprises a pair of substantially concentric arcs.

8. Apparatus for displaying a composite pattern having, in combination, an array of illuminable informational units disposed along a predetermined path provided with a predetermined display region, illumination-producing means for providing illumination for the units, means for scanning the array of units to enable successive illumination of the same from the illumination-producing means, means operable during the scanning for producing successive signals corresponding to the successive units, a computation circuit responsive to the said signals and provided with selectable means for producing electrical impulses at preselected instants of time only during the scanning corresponding to different time instants at which a plu-

rality of preselected informational units are to be illuminably displayed at the said predetermined display region, and means for connecting the said circuit to the illumination-producing means to cause illumination of the same at the said preselected instants only in order to produce at the said display region a composite illuminated display of the said preselected informational units only.

9. Apparatus as claimed in claim 8 and in which the said signal-producing means comprises transducer means cooperative with signal indicia associated with the array and corresponding to the units thereof.

10. Apparatus as claimed in claim 9 and in which the transducer means comprises photo-cell pick-up means.

11. Apparatus for displaying a composite pattern having, in combination, an array of illuminable informational units disposed along a predetermined path provided with a predetermined display region, illumination-producing means for providing illumination for the units, means for relatively moving the informational units and illumination-producing means along the said path, a computation circuit for producing electrical impulses at preselected instants of time only during such movement corresponding to different time instants at which a plurality of preselected informational units reach and are to be illuminably displayed at the said predetermined display region, and means for connecting the said circuit to the illumination-producing means to cause illumination of the same at the said preselected instants only in order to produce at the said display region a composite illuminated display of the said preselected informational units only.

12. Apparatus as claimed in claim 11 and in which the array is mounted upon a rotatable member.

13. Apparatus as claimed in claim 12 and in which the array is disposed about the periphery of the member.

14. Apparatus as claimed in claim 12 and in which indicia are provided upon the member corresponding to each unit and means is provided for producing successive signals corresponding and in response to the said indicia.

15. Apparatus as claimed in claim 14 and in which the said indicia are illumination-transmitting apertures and the said signal-producing means comprises photo-cell means connected to the said computation circuit.

16. Apparatus as claimed in claim 15 and in which trigger-circuit means is provided connected between the said computation circuit and the illumination-producing means and responsive to the signal-producing means for flashing the illumination-producing means at the said preselected instants of time.

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