

Oct. 29, 1935.

G. RAMSEY

2,018,873

TELEVISION DEVICE

Filed April 15, 1932

3 Sheets-Sheet 1

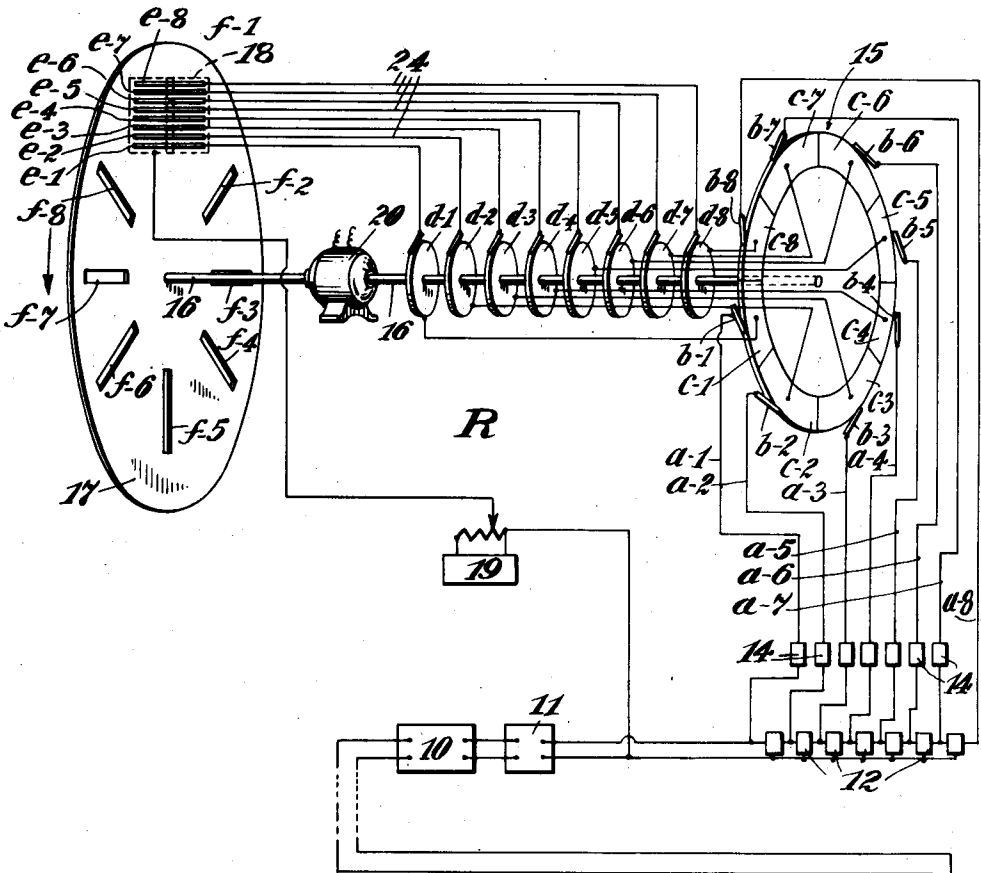


Fig. 1.

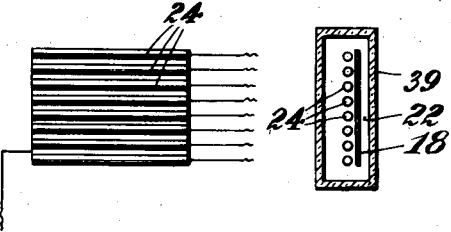
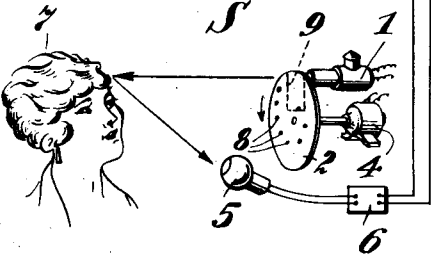


Fig. 3.

Fig. 4.

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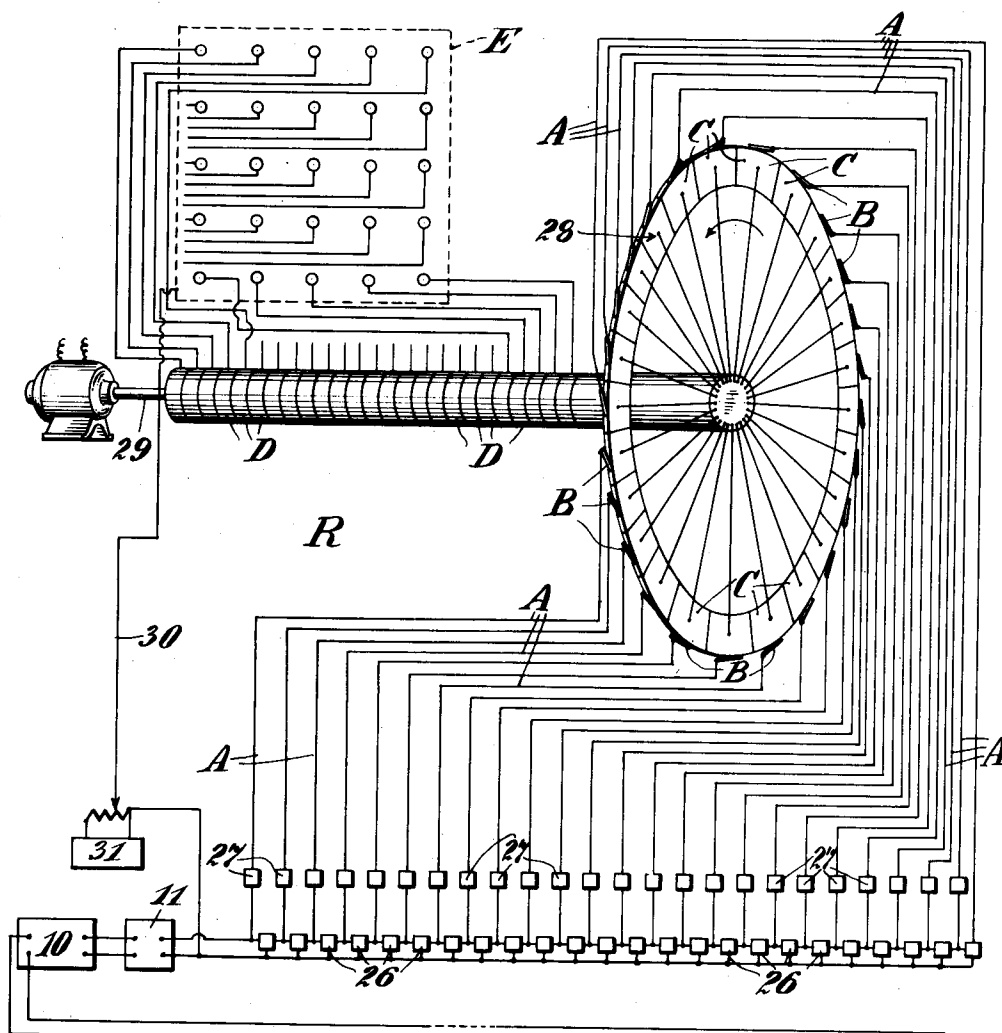
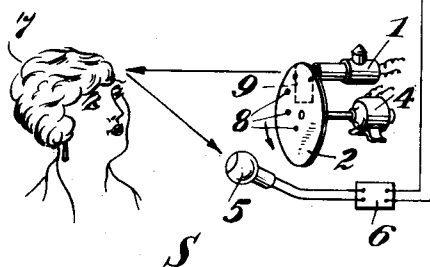


Fig. 2.



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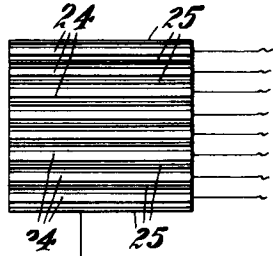


Fig. 5.

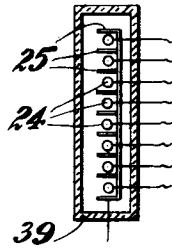


Fig. 6.

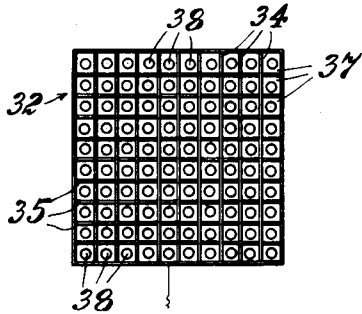


Fig. 7.

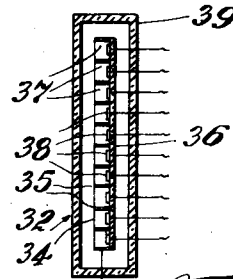


Fig. 8.

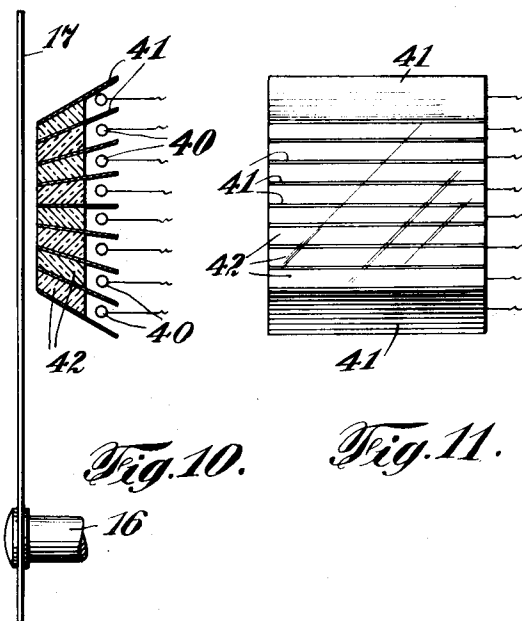


Fig. 10.

Fig. 11.

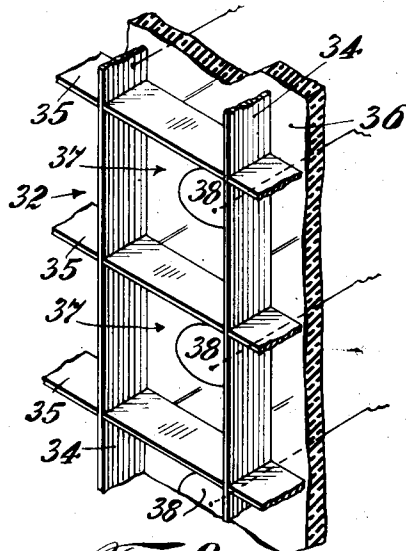


Fig. 9.

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TELEVISION DEVICE

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6 Claims. (Cl. 178-6)

The present invention relates broadly to television and more especially to increasing the persistency of the image at the receiving apparatus.

The present invention overcomes the difficulties of the known art by causing a television signal or group of signals to be repeated in such manner as to increase the available light at the receiving station by producing persisting areas, which may be portions of the received image or unit areas of the image.

The present invention also contemplates the representation of a group of television image signals in such manner that a plurality of individual unit areas in different scanning lines of a television image are simultaneously visible.

The present invention may be embodied in various apparatuses but preferably comprises a receiving apparatus associated with a proper sending apparatus whereby the linear television signals transmitted by the sending apparatus are received and sent through delay circuits which may be associated with a commutator in such manner that delayed signals are always associated with a predetermined light control device, e. g., a light control or lamp, so that these delayed signals are associated persistently with a predetermined part of the received image.

The invention also contemplates the method of receiving television images by receiving linear television signals which are divided through a plurality of delay channels and distributed to predetermined portions of the received image.

In carrying out the present invention, a novel illuminating device is provided wherein either unit areas of a television image or portions of the image may be individualized in the receiving apparatus in such manner that different portions of the illuminating device have different light intensities at the same time.

The disclosure herewith is diagrammatic as to elements well known in the art, and it is to be understood this disclosure is illustrative and not to be considered in the limiting sense.

Fig. 1 illustrates diagrammatically a preferred form of television apparatus in accordance with the present invention.

Fig. 2 illustrates diagrammatically another form of television apparatus according to the present invention.

Fig. 3 illustrates a plan view of an illuminating device comprising a gas filled lamp adaptable for use with the form of apparatus illustrated in Fig. 1.

Fig. 4 is a view showing an end elevation of

the device shown in Fig. 3, enclosed in a glass envelope shown in section.

Fig. 5 is a plan view of a modification of the device shown in Fig. 3.

Fig. 6 is a view showing an end elevation of the device shown in Fig. 5 enclosed in a glass envelope shown in section.

Fig. 7 is a plan view of an illuminating device more especially adapted for use with an apparatus such as disclosed in Fig. 2.

Fig. 8 is a view showing an end elevation of the device shown in Fig. 7 enclosed in a glass envelope shown in section.

Fig. 9 is a view showing a detail of a portion of the illuminating device illustrated in Figs. 7 15 and 8.

Fig. 10 illustrates another type of illuminating device more especially adapted for use with the device shown in Fig. 1.

Fig. 11 is a plan view of the device shown in Fig. 10.

Referring now to the drawings forming a part of this specification, Fig. 1 illustrates diagrammatically a television system in which a plurality of linear scanning lines are simultaneously illuminated at the receiving station in accordance with the varying light values of unit areas in such lines at the sending station; and related unit areas in a plurality of these lines are simultaneously exposed at the receiving station. Preferably, the construction is such that the illumination of all of the lines persists at the receiving station so that there is a continuous illumination of the exposed related unit areas in all the lines through scanning slots or synthesizing openings in a revolving shutter. Referring more in detail to the constructions diagrammatically illustrated in Fig. 1, a sending station S is of the usual form comprising a source of light 1, a scanning disc 2 rotated by a synchronous motor 4, a photo-electric cell 5 connected with suitable amplifier 6, which sends out the signals on the line in accordance with the light reflected from the object 7. The scanning disc 2 for purposes of illustration in the present case is shown as having eight openings 8. Of course, it is to be understood in practice, there will be preferably many more than eight openings in the scanning disc. A suitable framing opening 9 is provided as is common in the art.

The signals from the photo-electric cell and the amplifier may be sent out through any well known communicating channel such as wires, radio, cables, etc. These signals are received at the receiving station R in the usual way, and pref-

erably are amplified by a suitable amplifier 10, and then preferably passed through a volume control 11. The circuit from the volume control includes seven delay circuits 12, each of the same value. Eight selector circuits *a*—1 to *a*—8 are connected with the circuit including the delay circuits 12. The first selector circuit *a*—1 is taken off in the front of the first delay circuit 12, the remaining selector circuits are taken off between the delay circuits 12 in such manner that a one-eighth time interval delay occurs for each succeeding delay circuit up to the selector circuit *a*—8. The total delay in these delay circuits is so timed as to correspond to a single normal rotation of the scanning disc 2 at the sending station and the amount of delay for each delay circuit corresponds to the time required for one opening 8 in the scanning disc 2 to pass over the frame opening 9 at the sending station, so that by the time signals corresponding to the scanning line from the terminal opening in the scanning disc 2 have ceased in the selector circuit *a*—8, the signals produced by the initial opening of the scanning disc 2 start to flow into the selector circuit *a*—1. Seven graduated or adjustable attenuators 14 are preferably provided in the selector circuits *a*—1 to *a*—7; the selector circuit *a*—8 being preferably without an attenuator. The volume of current will be weakest in the selector circuit *a*—8 and the attenuators 14 are provided to make substantially uniform the strength of the currents flowing through the selector circuits. The selector circuits *a*—1 to *a*—8 are preferably connected with brushes *b*—1 to *b*—8. These brushes are uniformly separated to cooperate with segments *c*—1 to *c*—8 of a commutator 15 mounted on a shaft 16. The commutator segments *c*—1 to *c*—8 are each respectively connected to rings *d*—1 to *d*—8 mounted on the shaft 16. These rings *d*—1 to *d*—8 are respectively connected with light control means *e*—1 to *e*—8, which may comprise any well known form of light valves, or glow lamps such as illustrated in Figs. 3, 4, 5, 6, 10, and 11 as will be more fully explained. A synthesizing shutter of well known form, such as a disc 17 is provided with slots *f*—1 to *f*—8. The selector circuits and the slots in the shutter are the same in number as the lines of scanning at the sending station.

Where gas lamps are used, the plate 18 of the lamp is preferably connected through a biasing battery 19 to the volume control 11 to form a return circuit. From the foregoing, it will be observed that an incoming group of signals representing the first scanning line will go through the selector circuit *a*—1 to the brush *b*—1 through the segment *c*—1 to the ring *d*—1 and to the light valve or lamp member *e*—1. When the commutator 15 has moved the segment *c*—1 from under the brush *b*—1 into contact with the brush *b*—2, the circuit *a*—2 through the first delay now feeds through brush *b*—2 to commutator *c*—1, ring *d*—1, also to lamp *e*—1. In this circuit *a*—2, the delay has been sufficient to cover the group of signals comprising the first scanning line. Therefore, the lamp or light valve *e*—1 is again re-energized exactly as it was when this group of signals for the first scanning line flowed through selector circuit *a*—1. As the commutator rotates another segment, the segment *c*—1 comes in contact with the brush *b*—3 and the circuit *a*—3 now feeds through the segment *c*—1 to the ring *d*—1 and again re-energizes the glow lamp *e*—1 with this same group of signals. This operation continues entirely around the series of brushes *b*—1

to *b*—8 so that the glow lamp *e*—1 is continually re-energized through each of the selector circuits with the same group of signals corresponding to the first scanning line. That is, the lamp *e*—1 is continuously energized, during the normal time of one complete scanning operation at the sending station, with a repetition of the first line group of signals. This operation of the lamp *e*—1 is repeated each time the first line is scanned at the sending station. Identically the same operation takes place relative to all of the other light valves or lamps *e*—2, *e*—3, *e*—4, etc. It will be noted that each segment of the commutator, during one rotation of the commutator 15, comes in contact successively with each of the eight selector circuits *a*—1 to *a*—8 inclusive. Therefore, since each of these selector circuits contain delays equivalent to the time of scanning a single line and the brush contact with each segment is for the same period of time, it will be seen that each circuit repeats the signals for one line so that each of the light valves *e*—1 to *e*—8 inclusive is continuously supplied with energy corresponding to the modulated energy produced by a corresponding single scanning opening 8 at the sending station. The slotted openings *f*—1 to *f*—8, however, simultaneously expose related unit area portions of all the illuminated lines. The synchronous motor 4 at the sending station and the receiving synchronous motor 20 at the receiving station are synchronized so that the angular motion between the slots *f*—1 to *f*—8 corresponds to the angular motion between the holes 8 in the scanning disc 2 at the sending station. By this system, the effective light energy at the receiving station is multiplied by the number of scanning lines. If the scanning disc 2 at the sending station has one hundred scanning openings producing one hundred scanning lines, the effective light at the receiving station will be multiplied one hundred times over that which would be produced by the use of a scanning shutter cooperating with a single modulated light.

In view of the fact it is desirable that the scanning lines at the receiving station shall be close together, the modulated light for each of these lines may be obtained by providing a gas filled lamp 22 such as is illustrated in Figs. 3 and 4 in which the plate 18 is arranged adjacent a plurality of closely spaced wires or conductors 24. All of the wires 24 are connected respectively with the rings *d*—1 to *d*—8 as illustrated in Fig. 1. Figs. 5 and 6 illustrate a modified form of gas filled lamp, such as a neon lamp, wherein the plate 18 is provided with partition members 25 so that each wire 18 is located in a trough and the partitions 25 separate one wire from another so that the varying potentials on adjacent wires have no tendency to interfere with that on the neighboring wires, and in this way, a finely lined or divided source of varied illumination is provided. When the lamp of this type is connected in circuit, in the device illustrated in Fig. 1, the gas around each of the wires 18 is modulated in light intensity in accordance with the electrical signal imposed thereon and this light modulation when viewed through the synthesizing slots *f*—1 to *f*—8 produces a full view image.

Fig. 2 illustrates another embodiment of the invention in which a scanning shutter at the receiving end is not required. In the device in Fig. 2, the sending station S is exactly like that used in connection with the apparatus shown in Fig. 1 with the exception that for the purposes of illustration of the device shown in Fig. 2, the scanning

disc 2 at the sending station is provided with five openings. It is understood, of course, this number is chosen merely for the purposes of illustration and that in practice a large number of openings will be used.

The signals produced through the photo-electric cell 5 goes out at the sending circuit exactly as illustrated in Fig. 1 and are received in a suitable receiving amplifier 10 and passed through a suitable volume control 11. In the device shown in Fig. 2, each unit area of the picture to be produced is represented by a separate circuit and, therefore, if there are five lines with five unit areas in each line, there will be twenty-five unit areas in the receiving image, and there are twenty-five selector circuits A. There are also twenty-four delay circuits 26, or one less than the total number of circuits since the first selector circuit A is a non-delayed circuit. There are likewise twenty-four attenuators 27 in the selector circuits A, since the last circuit has no attenuator. Each of the twenty-five circuits are respectively connected with twenty-five brushes B, which brushes contact with twenty-five segments C on the commutator 28. Each of the segments C are respectively connected with rings D carried on the commutator shaft 29. Each of the rings D is connected in a circuit with an individual spot on the light modulated member E. Where a gas filled lamp is utilized, the plate of the lamp is connected through the circuit 30 with a biasing battery 31 comprising the return to the volume control 11. In the device illustrated in Fig. 2, it will be observed that as the commutator 28 turns under the brushes B, each segment of the commutator is brought successively under brushes in successive selector circuits A which are successively connected through the delay circuits 26 so that since the delay circuits 26 total an interval of time sufficient for one scanning opening in the scanning disc 2 at the sending station to complete a scanning operation, each elemental area lamp E will be supplied with a current modulated according to the elemental area represented by the light intensity of the particular corresponding elemental area on the selected line of the object scanned. Therefore, when the sending station S and the receiving apparatus are being operated synchronously, the entire area represented by the light control members E will be continuously illuminated, each in accordance with the modulated light of the corresponding elemental area on the object being scanned.

The preferred form of light control member for utilization with this apparatus shown in Fig. 2 is illustrated in Figs. 7, 8, and 9, in which a cell-like plate 32 is provided by intersecting plates 34 and 35 (Fig. 9). This open cell plate 32 is preferably mounted adjacent an insulating member 36 such as a plate of glass. With each cell 37, there is provided an electrode 38, which electrode is directly connected with one of the rings D on the shaft 29, so that each cell 38 becomes an individual gas lamp which glows in accordance with the modulated energy supplied to the electrode. This lamp is enclosed in an envelope 39 which may be a continuous envelope of glass and is filled with the proper gas adapted for the purpose, an example of which is neon gas.

Figs. 10 and 11 illustrate a modification of the type of illuminating member which may be used and in which individual lamps 40 are separated by partitions 41 between plates of glass or quartz 42 which transmit the light from the lamps 40 to the image field.

From the foregoing, it will be observed that in accordance with the present invention, the linear television signal received first goes through a circuit which is undelayed and then through a series of circuits comprising successive delays and that the energy from these selector circuits is distributed to light modulators in such manner that during one rotation of the scanning disc at the sending station, all of the light members over an entire field are energized. The distribution of the modulated energy may be such as to present a portion of the image at the receiving station such as a scanned line, in which case a scanning disc is used at the scanning station; or the energy may be so distributed as to represent single unit areas, in which case no scanning disc is needed. In both cases, however, the amount of modulated light visible at the receiving station is increased because a plurality of modulated light elements are at all times effective.

The various electrical circuits referred to are well known in the art, and, therefore, the disclosure herewith is diagrammatic, but is sufficient to be clearly understood by any person skilled in the art. It is also to be understood that the scanning and synthesizing operations occur at a speed above the persistencies of vision so that the received image is a persistent image rather than a flickering one.

What I claim is:

1. In a television device, scanning means to scan an object, means to produce an undulating transmission current which varies with the light and shade of the object being scanned; means to establish a transmission channel; a receiving device comprising a group of longitudinally extending glow lamps, a radially slotted disc rotatable over said group of glow lamps to simultaneously expose a portion of all of said lamps through said slots when said disc is rotated, means to rotate said disc in synchronism with said scanning means, a plurality of parallel circuits, a separate delay device in each of said circuits, and a commutator for continuously connecting each glow lamp to one of said parallel circuits.

2. In a television device, scanning means to scan an object, means to produce an undulating transmission current which varies with the light and shade of the object being scanned; means to establish a transmission channel; a receiver comprising a bank of glow lamps, a plurality of parallel delay circuits, commutator means for continuously connecting said delay circuits with all of said lamps to be effective to continuously deliver current through one of said delay circuits to one of said lamps whereby all of said lamps are continuously and simultaneously lighted, and means to rotate said commutator means.

3. In a television device, scanning means to scan an object, means to produce an undulating transmission current which varies with the light and shade of the object being scanned; means to establish a transmission channel; a receiver comprising a group of lighting means, each member of said group of lighting means being individually operated, progressive parallel delay circuits all adapted to receive a current which undulates in accordance with said transmission current, and commutator means to progressively and simultaneously distribute the currents in said delay circuits to individual members of said lighting means to simultaneously operate all of said members of said group of lighting means.

4. In a television device, a receiver comprising a group of lighting members, each member of said

group being individually operated, progressive delay circuits, commutator means connecting an individual delay circuit with an individual lighting member to progressively and simultaneously distribute currents through said delay circuits to individual lighting members to simultaneously operate all of said lighting members, and a common receiving circuit connected to said delay circuits and adapted to simultaneously deliver the same current into all of said delay circuits.

5. In a television device, a receiver comprising a plurality of individually operative lighting members, commutator means, a circuit leading from each member to said commutator means, parallel progressive delay circuits leading to said commutator means, each delay circuit being connected to a single lighting member, a common receiving circuit for all of said delay circuits, said commutator means being constructed to pro-

gressively and simultaneously distribute portions of the current from said receiving circuit to all of said lighting members through said progressive delay circuits to simultaneously and progressively operate all of said lighting members.

6. In a television device, a receiver comprising a group of lighting members, a receiving circuit, circuits connecting said receiving circuit and all of said lighting members, parallel delay circuits in certain of said connecting circuits, and commutator means in said connecting circuits between said receiving circuit and said lamps, said commutator means being effective to continuously receive incoming signals and to at all times connect each circuit with one of said lighting members to simultaneously and progressively light all of said lighting members.

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