March 19, 1940. A. N. GOLDSMITH 2,193,869

TELEVISION CONTROL

Filed July 9, 1937 2 Sheets-Sheet 1

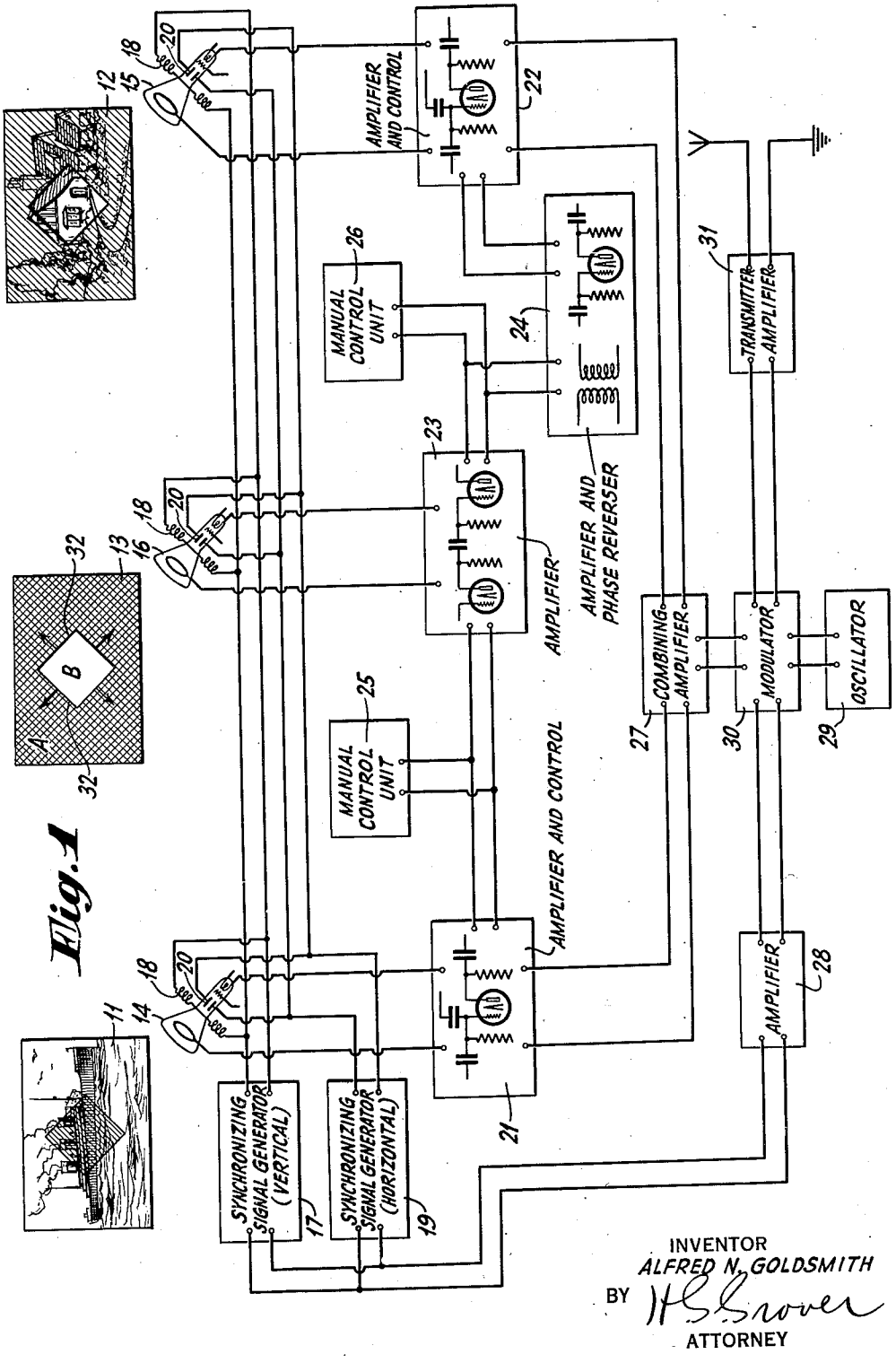


Fig. 1

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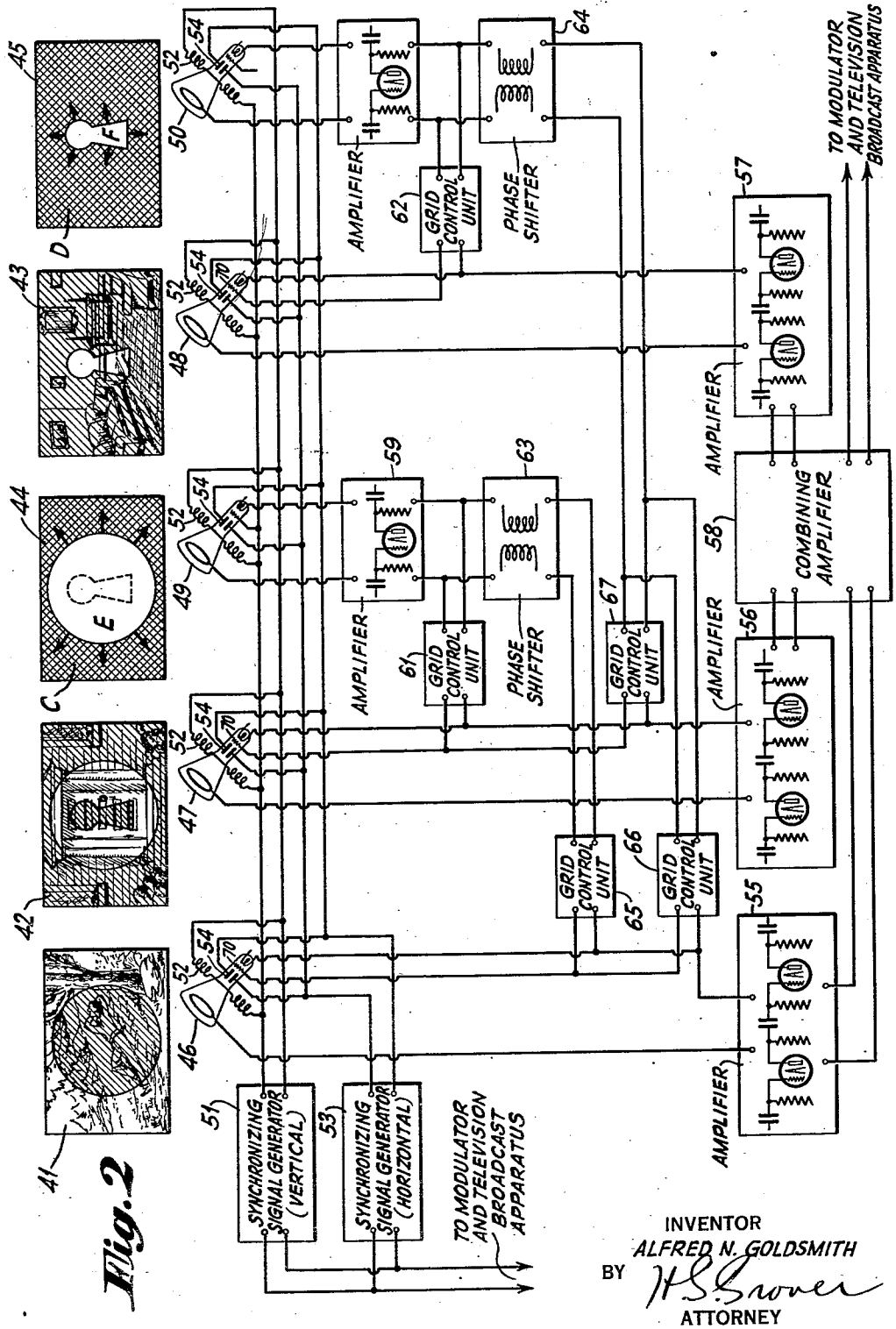


Fig. 2

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TELEVISION CONTROL

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6 Claims. (Cl. 178—7.2)

This invention relates to means whereby the particular subject being transmitted by television may be changed in any particular desired manner or at any desired rate to another subject.

In television picture transmission, as in the projection of motion pictures, it is not desirable to change abruptly from one scene to another since such radical and sudden changes are not particularly pleasing and as a result it is desirable to change gradually from one scene to another, particularly when the scenes are materially different.

The use of various methods for making gradual scene changes in motion pictures is well known and such methods as "fade-outs," "fade-ins," "lap-dissolves," "wipe-outs," etc., are quite common. As a matter of convenience and information such terms as the ones above referred to will be defined.

A "fade-out" is the gradual disappearance of a picture from the screen by reduction of its luminous intensity ending with a completely dark screen.

A "fade-in" is the gradual appearance of a picture on the screen by increasing its luminous intensity from zero to full or normal brilliancy. A fade-in is therefore the reverse of a fade-out.

A "dissolve" is a fade-out following immediately by a fade-in of a new and different picture on the screen. When the fade-out and the fade-in do not occur separately or follow each other but occur substantially at the same time so that the first picture gradually blends into and becomes, so far as the optical effect is concerned, the second picture to be presented, such change in pictures is commonly called a "lap dissolve."

A "wipe-out" is the passing across the screen of an outline or contour of any desired shape and velocity of motion outside of which one picture exists and inside of which a second picture is presented. The terms "inside" and "outside" in the preceding statement may also be replaced by "right" and "left" or "above" and "below" or by any combination of one or more directions. For example, a right-angle shape (that is, an L) may start at the lower left hand corner of the picture and gradually move toward the upper right hand corner until it passes out of the field of the picture, the old picture being wiped out by the progression of the L-shaped contour and the new picture being brought into view following the movement of this contour line.

A purpose of the present invention is, therefore, to produce, by electrical means, fade-ins, fade-outs, lap dissolves or wipe-outs or any combination of these.

A further purpose of the present invention is to control the contour, motion or any other geometrical or artistic characteristic of the wipe-out area by purely optical means with such mechanical adjuncts as are required to control the motion of the illuminated contours on a screen.

Another purpose of the invention is to provide means for scanning a plurality of scenes, simultaneously, and to permit the transmission of only a part of the resulting signal series from each of the scenes being scanned.

A further purpose of the present invention is to provide means whereby a plurality of pictures may, in succession, be wiped on to and then off from the screen, so that the picture as presented at the television receiver will be that of one view being replaced in succession by others in any desired manner or at any rate of speed.

A still further object of the present invention is to provide means for producing the above described desired results which, at the same time, utilize for the most part only the existing types of television transmission apparatus.

Another object of the present invention is to provide a new method of control and picture presentation which may be readily applied to existing television transmitting systems.

Other objects of the invention are, of course, to provide a system of television which is new and novel in its appeal to the public interest; to provide a system which is relatively simple in its construction and arrangement, and a system which fulfills features now lacking in the technique of producing television image signals which bear the same interest to the observer that the motion picture bears in the motion picture theatre or in connection with portable sound motion picture apparatus.

Further objects of the present invention will become apparent and at once suggest themselves to those skilled in the art by reading the following description of the invention.

The invention may best be understood and described by referring to the drawings, in which:

Figure 1 shows a system for replacing one field of view by another and,

Figure 2 shows a similar system in which a plurality of fields may be caused to be transmitted in succession, each picture replacing the preceding one along any desired contour line.

Referring to Fig. 1, two subjects of object areas which are to be transmitted by television are shown at 11 and 12. In this figure the subject

shown at 11 is the "outgoing" object area, that is, the picture which is being wiped out, whereas the view shown at 12 is the "incoming" picture, that is, the one which is to replace the picture shown at 11. A screen 13 is also shown and it is upon this screen that the desired contour for the wipe-out is projected, or from which the particular control is initiated.

For the purpose of scanning the object areas 11 and 12 and the control area 13, to produce image signals separate and independently, operable scanning systems 14, 15 and 16 are provided. These scanning systems operate to change an optical image into a series of electrical signals and are preferably in the form of cathode ray tube scanning devices, of the type described and disclosed by V. K. Zworykin in the Journal of the Institute of Electrical Engineers (British) vol. 75, number 442 for October, 1933, on page 440 et seq., as well as the Proceedings of the Institute of Radio Engineers for January, 1934, and further illustrated by his Patent Number 2,021,907, assigned to Radio Corporation of America, or the pending application of V. K. Zworykin, Serial No. 732,750. The scanning devices have not been shown in detail, but it is to be understood that each includes a photosensitive mosaic (prepared, for example, as disclosed in U. S. Patents Number 2,020,305 of November 12, 1935, and Number 2,065,570, of December 29, 1936) upon which the object area is projected by appropriate optical means. An electrode is provided adjacent the mosaic for cooperation therewith and from which the electrical impulses or signals are received.

Within each scanner a cathode ray is developed, which is systematically caused to swing across the mosaic. Means for vertically and horizontally deflecting the cathode ray are shown at 18 and 20, respectively, and it is to be understood that electro-magnetic, electrostatic or a combination of electro-magnetic and electrostatic means may be used.

Three television cameras are shown schematically at 14, 15 and 16, which are used to scan the fields of view 11, 12 and 13 respectively. These television cameras may be of any desired type, the ones shown being cameras in which the well-known cathode ray tube or "Iconoscope" is used for changing an optical image into a series of electrical signals. Alternatively, the fields 11, 12 and 13 may be directly projected on the mosaics of tubes 14, 15 and 16 without the intermediations of projection on screens 11, 12 and 13.

It is essential that all three of the cathode ray tube scanners be operated in synchronism and in order that this may be done, the means for deflecting the cathode ray tube across the mosaic are connected in multiple. A vertical synchronizing signal generator is shown at 17, which is connected to the vertical deflecting means 18 of each of the cathode ray scanners.

The horizontal synchronizing signal generator is shown at 19 and it is connected to the horizontal beam or ray deflecting means 20 of all of the scanners 14, 15 and 16.

The electrical impulses which are the result of the scanning operations in the two scanners or cameras 14 and 15 are amplified by the video frequency amplifier units 21 and 22 respectively. The respective amplified signals are then fed to a combining amplifier 27, the output of which, as well as the output of the horizontal and vertical synchronizing signal generators and an oscillator 29, are fed to a modulator 30 which in turn supplies modulated signals to the television transmitter amplifier 31. The output of the television scanner 16 is amplified and the amplified signals are used to control the amplifiers 21 and 22. When there is no output from the amplifier 23 the amplifier 21 is permitted to function and the electrical signals from the television scanner 14 are therefore amplified and supplied to the television transmitter. When an output signal is present from the amplifier 23 the amplifier 21 of the scanner 14 is blocked so that the signals from this scanner are prevented from reaching the combining amplifier 27. This blocking action may be accomplished by any desired means such as applying appropriate grid bias voltages to one or more of the amplifier tubes in the amplifier 21.

In view of the fact that a phase reverser 24 is connected between the amplifier 23 and the amplifier 22, the absence of signal current in the amplifier 23 prevents the operation of the amplifier 22 which is connected to the television scanner 15 in order that the signals from this scanner may not be supplied to the television transmitting apparatus. The presence of a signal current in the amplifier 23, however, permits the amplifier 22 to function and supply the signals from scanner 15 to the combining amplifier.

In Figure 1 the contour line for the wipe-out is shown as a diamond having sides 32. The inside portion B of the diamond is illuminated whereas the outside portion A remains dark, and as the sides of the diamond expand in the direction of the arrows the entire field 13 is gradually and ultimately fully illuminated.

In the operation of the system it will be assumed that the particular portions of the views 11 and 12 being scanned at the particular instant are at a point corresponding to the outside of the diamond contour, i. e., the dark portion A. Signal impulses transmitted to the combining amplifier 27 will therefore be generated in the television scanner 14 corresponding to that portion of the view 11 that is outside the shaded portion. Signal impulses transmitted to the combining amplifier 27 will also be generated at the television scanner 15 corresponding to that portion of the view 12 that is in the shaded portion. There will be no signal impulses reaching the combining amplifier 27 generated at the television scanner 16 since the area outside the diamond, that is, the portion represented at A, is dark and as a result the signal impulses from the transmitter 14 will be permitted to pass through the amplifier 21 whereas the signal impulses from the transmitter 15 will be blocked and will not be permitted to pass through the amplifier 22. When the scanning operation has proceeded and the beams are at the portions of the views corresponding to the illuminated diamond area B, the control scanner 16 will supply signal impulses which, after being amplified, will prevent the passage of signal impulses through the amplifier 21 but will permit the passage of signal impulses through the amplifier 22.

With this operation it will, therefore, be seen that only the portion of the view 11 corresponding to the shaded or dark portion A in 13 will be transmitted and only the portion of view 12 corresponding to the illuminated portion B in 13 will be transmitted and accordingly the image at the television receiver is one having portions of both of the views. As the illuminated portion B is expanded by any appropriate means the first view 11 will be gradually wiped out and the second view 12 will gradually replace the same.

It is obvious that various contours other than that of a diamond may be used and furthermore, to produce a lap dissolve (in other words, a gradual disappearance of one view and reappearance of another), the entire area 13 may be gradually and increasingly illuminated from darkness as a minimum to full brilliancy as a maximum. Such operation will cause the gradual disappearance of the view at 11 accompanied by the gradual appearance of the view at 12. The differential change in the size or shape of the illuminating area B and the shaded or dark area A of the control area 13 may be produced in any desired manner and a means such as shown, for example, in Figures 1, 1*a* and 1*b* of the patent to Bedford #2,164,297 may well be used.

Manual operation means 25 and 26 are shown in the figure and these may be used when it is desired to cause one view to fade out without bringing another view on the screen. Normally, however, these manual operation units will not be used, the change from one view to another being done entirely by electrical means except for whatever mechanical or optical means as are necessary to cause the gradual expansion, contraction or movement of the particular contour line or shape selected.

Figure 2 shows a system for performing functions similar to those described in connection with Figure 1. In this figure are shown three views, 41, 42 and 43, the first of which is the outgoing field, the second an intermediate field, and the third the incoming field. With this system it is possible to cause a wipe-out followed by a brief view of an intermediate field and this in turn followed by the scene to be next transmitted by television.

Three television camera scanners 46, 47 and 48 are used to scan the views 41, 42 and 43 respectively in a manner similar to that described in connection with Figure 1. Two other television scanners 49 and 50, are provided for scanning the control field areas 44 and 45. As in Figure 1, it is necessary that all of these scanners be operated in synchronism and as a result the horizontal and vertical deflecting means 54 and 52 are connected to the horizontal and vertical synchronizing signal generators 53 and 51 respectively. The outputs of the television scanners 46, 47 and 48 are amplified by the amplifiers 55, 56 and 57 respectively and the outputs of these amplifiers are connected to a combining amplifier 58 which in turn supplies signal impulses which cause modulation and are amplified by the television transmitting apparatus.

In each of the cathode ray scanners 46, 47 and 48 is a grid control element 70 to control the intensity of the cathode rays from the source or emitter in a manner taught, for instance, in the patent to Nicholson, #1,470,696. Connected to the control grid 70 and the emitter of each of the scanners 46, 47 and 48 are grid control units 61, 62, 65, 66 and 67 as shown in the drawings. These units may include one or more stages of amplification and operate to control the grid bias voltage of their respective scanners in order to control the beam intensity in the particular cathode ray tube. The control electrodes 70 of scanners 46, 47 and 48 are normally maintained negative by the grid control units associated therewith in an amount sufficient to produce beam cut-off. When this negative bias is relieved by all of grid control units associated with a particular grid, a cathode ray beam is produced in the corresponding tube.

The outputs of the scanners 49 and 50 are amplified by the amplifier units 59 and 60, respectively. The output of the amplifier 59 is connected to a grid control unit 61 of the television camera scanner 47 and the output of the amplifier 60 is connected to a grid control unit 62 of the television camera scanner 48. A phase shifter or reversor 63 is also connected to the amplifier 59, the output of which is connected to a grid control unit 65 of the television camera scanner 46. A phase shifter 64 is also connected with the amplifier 60, the output of which is connected to the grid control units 66 and 67 of the television camera scanners 46 and 47 respectively. When there is a signal output from the scanner 49, the presence of this signal output at the grid control unit 61 produces a bias on the grid 70 sufficient to permit operation of the scanner 47. Due to the presence of this phase shifter 63, however, the presence of signal current at the grid control unit 65 from the scanner 49 produces a bias on the grid 70 of the subject scanner 46 sufficient to prevent the production of a cathode ray therein. When there is an output from the scanner 50 the presence of these signal impulses at the grid control unit 62 permits the operation of cathode ray tube scanner 48, but due to the presence of the phase shifter 64 the control grids 70 of scanners 46 and 47 are so biased as to prevent the operation of these devices.

In the operation of the system, it will be assumed that the particular portions of the views 41, 42 and 43 being scanned at the particular instant correspond to the shaded portion C of the control view shown at 44. At this time there is no signal output from either of the cameras 49 or 50 since the portion of the control view 45 being scanned is also in the shaded portion D. As a result, signal impulses from the scanner 46 are supplied to the television transmitting apparatus, whereas, because of the grid control units 61 and 62 and their effect on the bias of the grids 70 of scanners 47 and 48, these scanning devices are prevented from supplying signal impulses to the transmitter. As the scanning beams progress to a position corresponding to the portion represented by the lighted area E in 44, but still in the portion represented by the shaded area D in 45, the presence of signal current in scanner 49 permits the operation of scanner camera 47 but, because of the phase shifter 63 and the grid control unit 65 a potential is applied to the grid 70 of scanner 46 such as to prevent operation of this device. The scanner 48 is also prevented from operating because of the fact that no signal impulses are being supplied by the scanner 50. During this time, therefore, signal impulses corresponding to that portion of the view 42 that is unshaded are being transmitted.

When the scanning beams have reached a position corresponding to the illuminated portion F of 45, the television camera scanner 48 is permitted to supply signal impulses while the scanners 46 and 47 are prevented from supplying signal impulses because of the grid bias applied to the grids of these tubes as a result of the operation of the phase shifter 64 and the grid control units 66 and 67, respectively.

From the above it will therefore be seen that one view may be gradually wiped out and another view wiped in while a third view is interposed between the two. This rate of change may

be controlled by the rate at which the contour line of the illuminated portion in 44 or 45 is expanded or contracted and the shape of the particular contour line may of course be chosen to suit the particular desires (Bedford Patent #2,164,297 supra).

In Figure 1 the control of the television cameras is by way of appropriate biases on the amplifiers of the particular cameras whereas in Fig. 2 the control is by way of applying appropriate voltages to the control grids of the cathode ray tubes or "Iconoscopes." It is to be understood, however, that these two methods of control may may be interchangeably used or that any other appropriate method for cutting in or out a television camera may of course be employed.

It is also to be understood that the systems shown may be expanded to accommodate as many successive views as are desired and that the invention is in no way limited to two or three object views. Furthermore, the light-emitting portions of the control areas may be illuminated in any desired manner, directly or indirectly.

Many other modifications and changes of the invention and application to other fields of use will, of course, become apparent to those skilled in the art and it is therefore intended that the invention shall be construed in a broad scope and read upon all modifications such as fall fairly within the spirit and scope of the hereinafter appended claims.

I claim:

1. A wipe-out system for television comprising separate means to scan synchronously and simultaneously a plurality of object areas and a plurality of control areas to produce from each scanning an independent series of signal impulses, means to suppress the signal impulses from all but one of the object areas in accordance with the signal impulses from the control areas, and means to assemble the unsuppressed impulses from the object areas into a single composite series of signal impulses.

2. A wipe-out control system for television comprising separate means to simultaneously and synchronously scan three object areas and two control areas to produce independent series of signals, said control areas comprising high and low light value portions each of which may be differentially varied in size, means for suppressing the signals from one of the object areas when the high light value portion of one of the control areas is being scanned, means for suppressing the signals from another object area when the low light value portion of said one control area and the high light value portion of another control area are being scanned, means for suppressing the signals from still another object area when the low light value portion of said another control area is being scanned and means for combining the unsuppressed signals.

3. A wipe-out control system for television comprising separate means to synchronously and simultaneously scan an outgoing object area, an intermediate object area, an incoming object area, a first control area and a second control area to produce independent series of signals, said control areas comprising high and low light value portions each of which may be differentially varied in size, means for suppressing the signals from the out-going object area when the high light value portion of the first control area is being scanned, means for suppressing the signals from the intermediate object area when the low light value portion of the first control area and the high light value portion of the second control area are being scanned, means for suppressing the signals from the incoming object area when the low light value portion of the second control area is being scanned and means for combining the unsuppressed signals from the object areas.

4. A control system for television comprising separate means to simultaneously and synchronously scan n object areas and $n-1$ control areas to produce independent series of signals where n represents a number greater than two, said control areas comprising high and low light value portions each of which may be differentially varied in size, means for suppressing the signals from $n-1$ object areas in accordance with the light values of the portions of the control areas being scanned at a predetermined instant and means for combining the unsuppressed signals.

5. The method of producing wipe-out effects in television image signals which comprises independently, synchronously and separately scanning a plurality of object areas and a plurality of control areas to produce from each scanning a series of signals, utilizing the signals produced from the control areas to obscure and manifest the signals produced from the object areas according to a predetermined pattern, combining the remaining signals to produce a composite series of signals and varying the light values of the different control areas to alter the composite series of signals.

6. In a television system the method steps which comprise simultaneously, separately and synchronously scanning a plurality of object areas to produce separate series of signals, simultaneously, separately and synchronously scanning a plurality of control areas having high and low light value portions, varying the size of the portions in each control area, selectively reducing the effective signal intensities from all of the object areas except one in accordance with the scanned control area signals and combining the unaffected signals to form a single series of signals representative of parts of one or more of the object areas.

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