

April 2, 1940.

J. McCARTY

2,195,676

TELEVISION METHOD AND MEANS

Filed Feb. 15, 1937

2 Sheets-Sheet 1

Fig. 1.

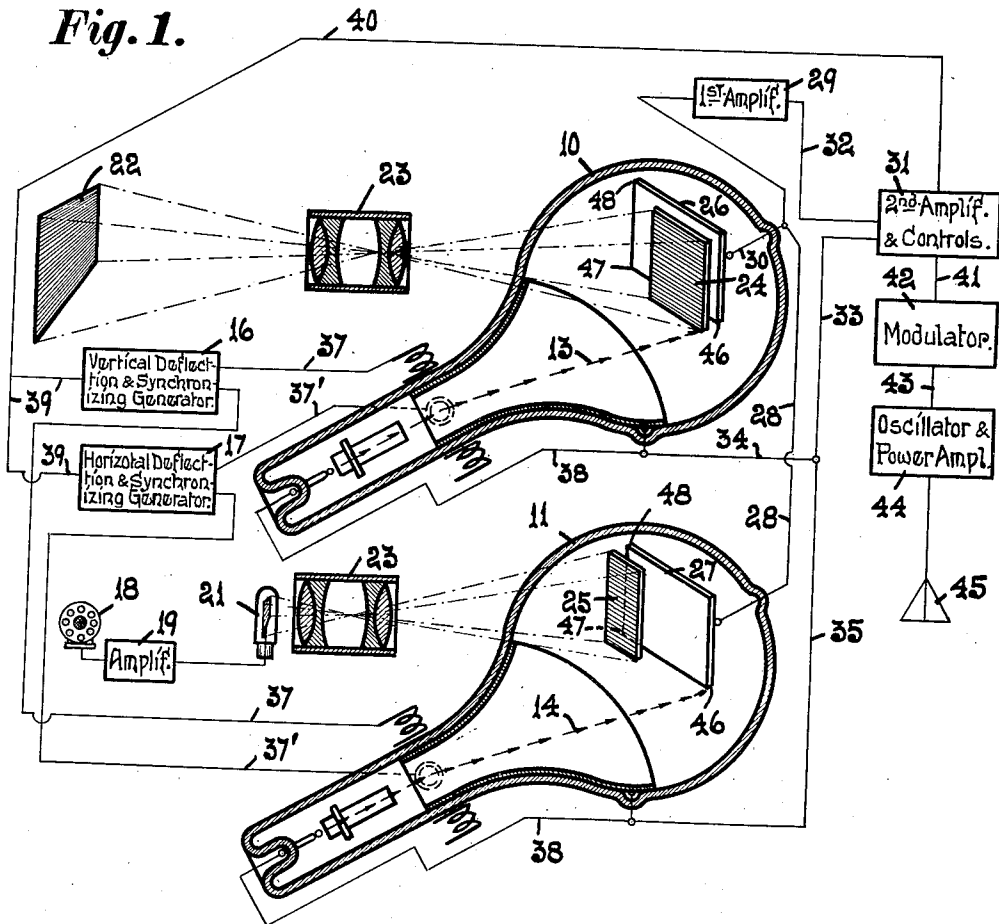
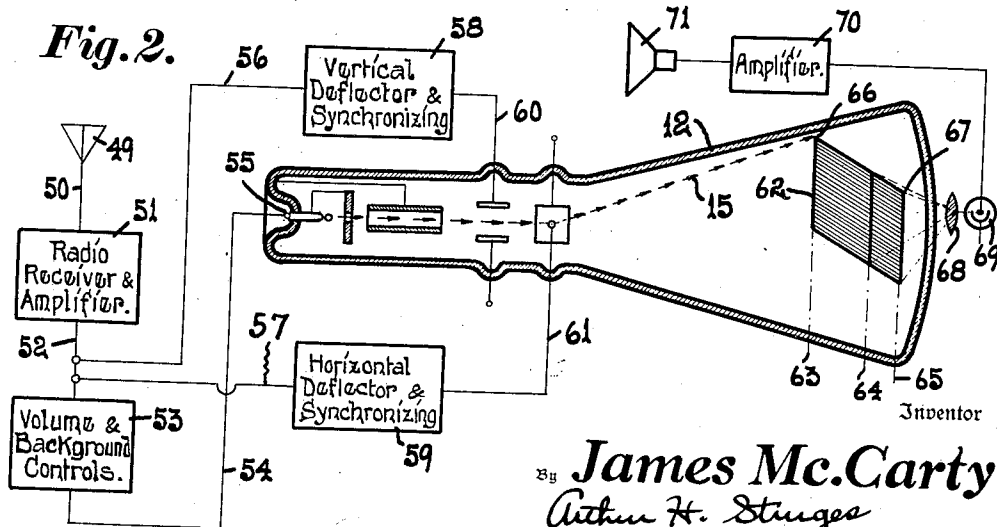


Fig. 2.



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2 Sheets-Sheet 2

Fig. 3.

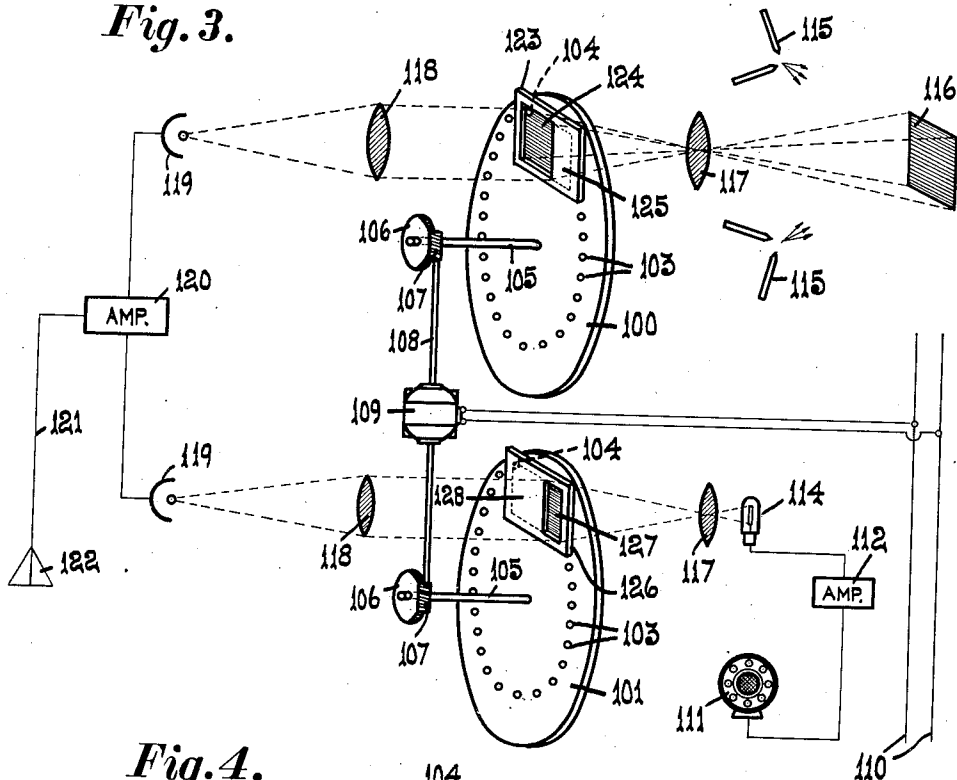


Fig. 4.

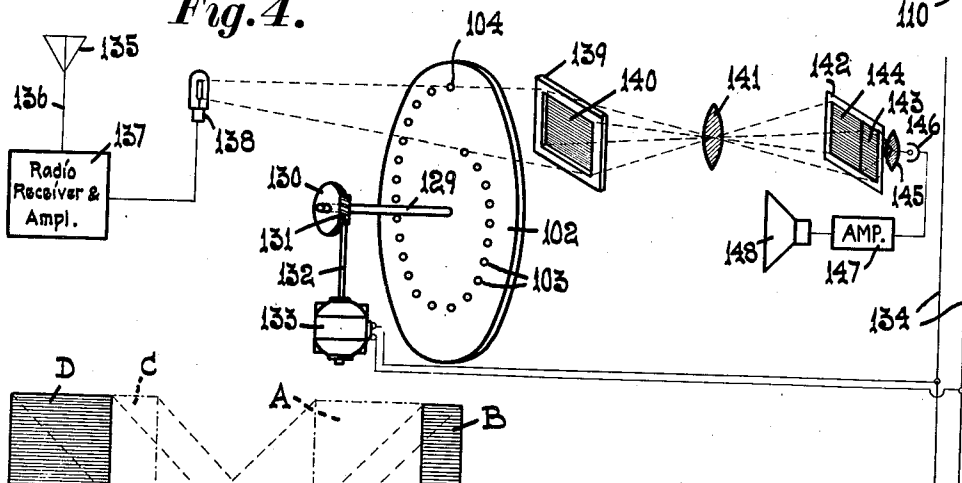
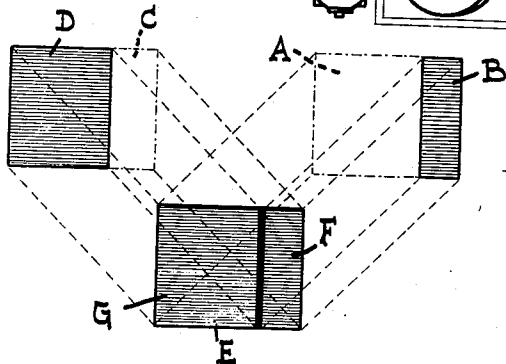


Fig. 5.



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2,195,676

TELEVISION METHOD AND MEANS

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9 Claims. (Cl. 178-5.6)

This invention relates to the television art, and more particularly to transmitting and receiving apparatus connected therewith.

It is an object of the invention to provide a method and means for transmitting or broadcasting from a single antenna or through a single wire or through any suitable single channel of communication, pictures of animated scenes or objects or the like together with preselected sounds, music or speech intimately related to said scenes in properly associated synchronization; to provide means for receiving sound and picture signals for reproducing the initial characteristics of the source of the scenes and related sounds at a remotely disposed receiving station in a manner whereby the cost of transmitting or broadcasting and receiving or translating sounds and pictures is appreciably lessened and synchronization of reception improved.

Other and further objects and advantages of the invention will be understood from the following detailed description thereof reference being had to the accompanying drawings in which:

Figure 1 is a diagrammatic view, partially in section and partly in perspective, of a sound-vision transmitting apparatus embodying the present invention.

Figure 2 is a similar view of a television receiver apparatus employed.

Figure 3 illustrates a modification of the transmitter or broadcasting apparatus shown in Figure 1.

Figure 4 depicts a modification of the receiver illustrated in Figure 2.

Figure 5 is a diagrammatic illustration of operation.

As heretofore practiced in the art since speech or audible sound and picture or light frequencies vary appreciably, audible sound frequencies have been broadcast from one transmitting apparatus and the picture-light frequencies from another separate apparatus, the two said apparatuses being often imperfectly synchronized. Heretofore a receiving station has been provided with two separate receiving instrumentalities, one thereof for the reception of sound signals and the other for the reception of light or picture signals, said separate receivers requiring tuning to the proper channel and adjustment to synchronize the reproduced sounds for proper association with related animated scenes, whereby the cost of the dual instruments of the prior art is comparatively excessive, synchronization not perfect and more parts utilized which are susceptible of failure of operation, and it is an object of the present

invention to obviate undesirable prior art practices.

The accompanying drawings are executed partially diagrammatic to omit details non-essential to a differentiation of the present invention from prior practices and several of the conventional devices and actuating electrical circuits known to the art are not depicted.

Referring now to the drawings for a more particular description and first to Figures 1 and 2, two like electronic scanner tubes or envelopes 10 and 11 are employed at the broadcasting or transmitting station and a somewhat similar envelope 12 at the receiving station, each of said envelopes being provided with conventional coils, 15 devices and circuits arranged to produce electronic beams 13, 14 and 15 in the envelopes 10, 11 and 12 respectively and to provide horizontal and vertical deflection of said beams which are indicated in said tubes by dotted lines of arrow heads.

The scanning beams 13 and 14 of the transmitting station during operation are always in the same positions with respect to each other and traverse a like sized rectangular area and also scan a like area except for certain later described masking devices. The beam 15 of the tube 12 also traverses an area which is proportional with respect to the area covered by the beams 13 and 14 but travels in a reverse direction to the beams 13 and 14.

The beams 13 and 14 are maintained synchronized with respect to each other for scanning movements, their like deflection coils being energized from a source of electrical energy common to both, said source being in electrical communication with the vertical deflection and synchronizing generator unit 16 and a horizontal deflection and synchronizing generator unit 17, said units and their operation, being well known, are believed to need no particular description herein.

A microphone 18 is provided for the reception for transmission of audible sounds intimately related to the later described animated scenes or picture, said microphone being in communication with an amplifier 19 for correspondingly effecting the glow lamp 21 and the light intensities emitted thereupon and thereby responsively, whereby the light variations of the intensities of said lamp are responsive to the sound vibrations received by the microphone 18 or a similar phonetic device.

An object or animated scene 22 is suitably illuminated by any desired means and the light in-

tensities from the object 22 together with the light intensities from the glow lamp 21 are focused by means of their respective optical devices or lenses 23 upon their respective mosaic sheets 24 and 25 within the envelopes 10 and 11, respectively, whereby the respective beams 13 and 14 of said envelopes may scan said intensities for transmitting signals.

The sheets 24 and 25 are affixed to their respective back plates 26 and 27, the latter being suspended by means, not shown, within their respective envelopes 10 and 11.

The back plate 27 is provided with a wire 28 in communication with a first stage of amplification unit 29 and the back plate 26 is provided with a wire 30 joined to the wire 28, said unit 29 being in communication with a second stage of amplification and a control unit 31 through a wire 32. A wire 33 leads from the unit 31 to the anodes of the tubes 10 and 11 through the wires 35 and 34 which are joined to the wire 33. Each anode is in electrical communication at times through similar wires 38 with the respective filaments for the scanner beams 13 and 14 and batteries or the like, not shown, may be employed for heating said filaments.

The vertical deflection coils of each envelope are in communication with the unit 16 through like wires 37 and the horizontal deflection coils of the envelopes are in communication with the unit 17 through like wires 37'. The output terminals of the units 16 and 17 are joined by means of a wire 39 and the latter is in electrical communication with the control and amplifier unit 31 through a wire 40.

The unit 31 is in electrical communication through a wire 41 with a telephone wire or a modulator unit 42 and may be placed in communication through a wire 43 with an oscillator and power amplification unit 44, the latter being in communication with an antenna or other suitable selected channel of communication indicated at 45. A greater or lesser number of elements such as the units 29, 44 and 41 may be employed for various purposes as may be desired.

The operation of sheets coated with photo-sensitive particles such as the sheets 24 and 25 are well known to the art, said sheets being clamped to back plates such as or similar to the metallic back-plates 26 and 27.

A conventional mosaic sheet and combined back plate have a surface area of six units of width to five units of height and in the practice of the present invention said width ratio is changed as well as the position of the mosaic sheets 24 and 25 with respect to the "swing" or horizontal travel of their respective beams 13 and 14 while at the same time the proportional distance of travel and the area covered or traversed by the electronic beams 13 and 14 is maintained the same as heretofore. In other words, the electronic beams 13 and 14 cover or traverse an area which is six units of width in proportion to five units of height and during said traversing scan the light intensities cast upon the sheets 24 and 25 as later explained.

The beams 13 and 14 start simultaneously and exactly from the same point or adjacent the lower corners 46 of the plates and swing horizontally to the opposite corners 47 of said plates; whereupon while returning in a direction towards the corners 46 said beams become raised up one line and scan one line while traveling again in a direction toward the corner 47 in a well known

manner, the operation being repeated until the corners 48 of the plates are reached; whereupon the beams become lowered to their initial starting point or the corners 46 and said travel repeated.

During the horizontal travel of the beams in the direction from the corner 46 to the corner 47 and for all lines above the first and while traveling in the said direction, the lines of the subject matter or light intensities focused on the mosaic sheets are scanned, the beams impinging against said sheets and when so impinged signals are generated. The arrangement and size of the sheets with respect to each other and the location of each with respect to the axis of the beams is such that when signals are generated with respect to the object 22 source, that no signals are generated with respect to the microphone 18 source and when signals from the latter are occasioned no signals from the object 22 source are broadcast or transmitted nor conveyed to the channel of communication which is common to said signal sources.

As represented by dotted lines in Figure 1, the optical devices 23 focus the lights and shadows or light intensities from their respective subjects exactly on their respective sheets 24 and 25, said sheets being disposed at opposite sides with respect to each other and with respect to the axis of their scanning beams, said beams covering the same portion of their respective fields at the same time and swinging in unison with like timed movements, whereby synchronization is perfect for alternately causing a signal to be broadcast from the subject 22 source and from the subject 21 source.

In practice the sheets 24 and 25 are of the same height but of different width, the proportional area of said sheets being later explained herein, said area of said sheets are also proportional to the area of a fluorescent screen of a radio visor receiver later described, said areas of the sheets 24 and 25 with respect to the area of said fluorescent screen being cooperatively proportionally arranged.

The center of the side surface area of the plates 26 and 27 are in exact axial alignment with the filaments for the beams 13 and 14 respectively. The mosaic sheet 25 is disposed to one side of the axis of its beam 14 and the major portion of the sheet 24 is disposed at an opposite side of the axis of its beam 13 and also at an opposite side with respect to the sheet 25 as shown. The vertical edge of the sheet 24 which is closest to the corner 46 of the plate 26 is in horizontal alignment with the edge of the plate 26 which extends vertically from said corner 46 thereof, said edges of the sheet and plate being in vertical parallelism.

The vertical edge of the mosaic sheet 25 which is closest to the corner 47 of the plate 27 is in horizontal alignment with said edge and in vertical parallelism therewith, whereby as the beams 13 and 14 travel horizontally in a direction from the corners 46 to the corners 47 of their plates, the electronic beam 13 impinging against its mosaic sheet 24 occasions a series of picture-signals which are broadcast from the object 22 source, said series being discontinued when the beam 13 reaches the end of the line or the vertically disposed side edge of the sheet 24 which is furthest from the said corner 46, the beam 13 then not impinging upon any photo-sensitive particles while traveling further towards the corner 47 of the plate 26, signals from the picture source 22 stop

since the beam 13 then contacts with a "blank" or a "masked" area.

As soon as signals from the source 22 stop and resultant from the beam 14 having traversed its blank or masked area at said time, and having at said time, impinged upon the sheet 25 or photo-sensitive particles of the first line thereof, signals are thereby occasioned from the sound source or microphone 18 and more particularly from the light intensities of the neon-glow lamp 21 source, which for the herein purposes may be called sound-signals and which are transmitted or broadcast in alternation with the picture-signals from the object 22 source, whereby said signals from the two said originally different sources are broadcast through a single channel of communication which is common to both, said alternation of said signals being best understood from the diagram, Figure 5, and the example later stated herein in connection with said figure.

In Figure 1 the plates 26 and 27 are depicted with a conventional proportional side surface area of six units of width to five of height in order to facilitate the herein explanation of the "masked areas" and it will be understood that in actual practice the plates 26 and 27 need not be of greater side surface area than their respectively affixed mosaic sheets 24 and 25.

The wires 34 and 35 together with the wires 28 and 30 of the envelopes or tubes 10 and 11 may be joined to any equal number of stages of amplification.

It will be understood that conventional sizes of plates and sheets may be employed, if provided with suitable masks, and that said masking may be consummated in a number of various ways as to said conventional size sheets or that said masking may be consummated by making a suitable portion of each of the optical devices 23 impervious to the penetration or passage of light rays as later mentioned herein.

The remotely disposed receiving station or receiver shown in Figure 2 may include an antenna 49 for pick-up of said broadcast or transmitted signals, said antenna may be included in the single channel of communication or wire 50 for the reception of said signals by the receiver unit 51. The unit 51 is in electrical communication through a wire 52 with a volume and back ground control unit 53 having an output wire 54 which leads to the filament wire 55 within the envelope or tube 12 whereby an electronic beam or stream of electrons represented by the dotted line of arrow heads 15 may be occasioned in a well known manner for use in connection with a fluorescent screen. The wire 52 is provided with tap wires 56 and 57 which are in communication, respectively, with the vertical deflection unit 58 and horizontal deflection unit 59 for the beam 15. The units 58 and 59 are respectively provided with wires 60 and 61 in communication with corresponding deflecting plates for the beam 15, said members 50 to 61 inclusive being conventional are believed to require no particular description.

The fluorescent screen 62 within the envelope 12 is such that televised pictures comprising reproductions or likenesses of the scene or object 22 may be visualized on the back side of that portion of the screen which lies between the dotted lines 63 and 64 and through the glass envelope or a window thereof.

The portion of the screen 62 which is responsive to the electronic beams 15 and 13 for produc-

ing pictures is that portion thereof between the dotted lines 63 and 64 and the portion which is responsive to the beams 15 and 14 for sound-signals is that portion of said screen which lies between the dotted lines 64 and 65. The beam 15 starts to move from the corner 66 of the screen 62 simultaneously with the start of the movement of the beams 13 and 14 from the corners 46 of their respective areas or plates and the beam 15 preferably swings in an opposite direction to the beams 13 and 14 and traverses the area of the fluorescent screen in a reverse direction with respect to the travel of the beams 13 and 14 for producing pictures which are right-side-up which would otherwise be upside-down and in the latter case could be reversed by extraneous lens means. The area of that portion of the screen between the dotted lines 63 and 64 is of a proportional area or size with respect to the area of the sheet 24 within the tube 10 and in an opposite relative position with respect thereto and at an opposite side of the axis of the beam 15 with respect to the axis of the beam 13 for the sheet 24.

The beam 15 starting from the corner 66 and moving towards the corner 67 of the fluorescent screen 62 first traverses a line between the dotted lines 63 and 64 responsive to the beam 13 in the tube 10 scanning a corresponding line of the sheet 24 and when the beam 15 reaches an alignment with the dotted line 64 of the fluorescent screen 62 the beam 15 no longer is responsive to signals occasioned by the beam 13, the latter having at said time reached a masked portion of its line of travel and at said instant the beam 15 continuing its travel towards the corner 67 of the screen 62 is then responsive to the beam 14 of the tube 11 which at said instant has started to scan the first line of the sheet 25. The operation being repeated said beam 15 being responsive to the signal series alternately broadcast or transmitted.

The light intensities from the back side of the screen 62 which are generated responsive to the sound-signals of the microphone 18 source are made audible at the receiving station, the preferred means therefor including an optical device or lens 68 so arranged with respect to that area of the screen 62 which is between the dotted lines 64 and 65, that said lens focuses said light intensities onto the photo-sensitive cell or electric eye 69 for effecting the latter responsively and accordingly, said eye being in communication with an amplifier unit 70 having an output in communication with the sound reproducer 71 which is actuated correspondingly, said phonetic device consisting of a dynamic speaker, ear phones or the like.

To avoid any possible mixing of the picture-light-effects and the sound-light-effects on the fluorescent screen 62 at or adjacent to the dotted line 64, said mixing being possibly caused by the shifting of "lines" from that portion of the screen 62 which is between the dotted lines 63 and 64 into that portion of the said screen which is between the dotted lines 64 and 65, said shifting being possibly caused by infinitesimal changes in the frequency, it is advisable to have the operative area or combined surface areas of the sheets 24 and 25 slightly smaller proportionally than the total area of the fluorescent screen 62, whereby the latter is provided with a "blank" or non-responsive portion in alignment with the dotted line 64 and which is represented in Figure 2 by a black line and which is that portion of the screen 62 where the alternation of the signal characteristics occur whereby when the beam 15

traverses said "blank" no light intensities are generated on the back side of the screen 62 and said possible "jumbling" is thereby prevented. If so proportioned a black line will actually appear at one side of the reproduced picture, however, said line is so minute as to be negligible in effect but useful for correcting shifting of the reproduced picture in a well known manner.

In actual practice the ratio of the area of the mosaic sheet 24 with respect to the sheet 25 is preferably substantially or about 5.99 units of width for the picture-signal sheet 24 to 0.01 unit of width for the sound-signal sheet 25, depending on the height of audio frequencies desired to insure clear sound reproduction, said sheets 24 and 25 being of the same height.

The width of the fluorescent screen 62 is of a proportional area with respect to said sheets 24 and 25 and that portion thereof which lies between the dotted lines 64 and 65 is substantially 0.01 unit of width and that portion thereof which lies between the dotted lines 63 and 64 is 5.99 units of width, the height of the said screen portions being 5 units of height to a total width of 6 units for both portions of said screen. The total area of all portions of the screen 62 may be many times greater than the combined areas of the sheets 24 and 25 provided said proportions are maintained.

It being desirable to send signals alternately from the two different sources, the heretofore specifically described form and arrangement of the sheets 24 and 25 may be varied from.

If desired, two mosaic sheets of the same size may be employed instead of the sheet 25, said modified sheets being comparatively narrow and oppositely disposed with a comparatively wide space between them, their outer vertical edges being respectively in horizontal alignment with the vertical edges of the plate 27 which extend from the corners 46 and 47 of said plate, whereby a masked area is provided between such modified sheets. In this arrangement the exact median or center of the sheet 24 within the envelope 10 is disposed in exact axial alignment with the electronic gun or filament for the beam 13, said sheet having an area which is of substantially the same size as the masked portion between the two above mentioned modified sheets for the tube 11, whereby said medially disposed sheet is provided with a masked area disposed on each of its vertical side edges and between said edges and the vertical edges of the plate 26 which would extend respectively from the corners 46 and 47 of the plate 26 in such modification and in this arrangement the fluorescent screen 62 of the receiver is arranged accordingly whereby the picture-light intensities will be occasioned adjacent the medial portion of the screen 62 and the sound-light effects adjacent both vertical edges of the screen 62, whereby the incoming alternately transmitted signals occasion sounds related to pictures in alternation as heretofore described, it being also necessary that in such modified arrangement that two lenses 68 be employed. By the employment of either of the foregoing described arrangements of masks for the electronic scanners, sound signals may be generated in alternation with picture signals and reproduced at a receiving station.

A further modification of "masking" arrangement may consist of providing both lens devices 23 with an opaque portion whereby light intensities from the lamp 21 and the scene or object 22 are correspondingly emitted upon and provide

a masked area for conventional sizes of mosaic sheets within the tubes 10 and 11.

Imaginary scanned lines or lines of the subjects are represented by the lines disposed across the object 22, the sheets 24 and 25 together with the screen 62.

A still further modification of the foregoing described electronic scanners may consist of the employment of but one envelope at the sending station. In this modification the sheets 24 and 25 are assembled side by side in one envelope. The light intensities from the object 22 being focused onto the sheet 24 as heretofore described and the light intensities from the glow lamp 21 focused onto the sheet 25. In this modification an opaque divisional wall between said sheets is necessary, said wall extending toward the filament of the envelope a distance sufficient to prevent the light intensities from the glow lamp 21 impinging on the sheet 24 and obstructing the picture-light intensities from the object 22 source and also to prevent the latter intensities from spreading over any portion of the sheet 25. In this modification the back plates of the sheets 24 and 25 are each provided with a wire, such as the wires 28 and 30 leading to the amplifier 29 as heretofore described and but one electronic beam such as the beam 13 is employed, said beam impinging on said sheets alternately for effecting sound-signals in alternation with respect to picture-signals, the method remaining the same and the above mentioned divisional wall being comparatively very thin having no electrical connection with said sheets.

Referring now to methods and means which employ other than electronic scanner and particularly to Figures 3 and 4, two like scanner discs 100 and 101 may be employed at the broadcasting or transmitting station and a like scanner disc 102 at the receiving station, each of said discs being provided with a like series of pin hole apertures 103 arranged to provide a convolute configuration in plan. Each of said series also includes an aperture 104 which are closest to the perimeters of said discs. Each disc and the apertures thereof are in the same relative position during use.

The discs 100 and 101 are maintained synchronized with respect to each other for revoluble movements, their respective axles 105 being provided with like worm wheels 106, each of which are in mesh with like worm threads 107 mounted on their common shaft 108, the latter being driven by a motor 109 for serving both discs. The motor is in communication with a suitable source of electrical energy through the wires 110, whereby said discs are rotated in perfect synchronization by a driver common to both.

The number of the pin hole apertures are equivalent to the number of scanned lines and the discs are rotated at a speed equal to the number of pictures or portions of the object desired per second of time. The conventional number of pictures per second is twenty and moving picture films conventionally have twenty-four pictures per second. The aspect ratio of the field of view of the object is conventionally six units of width to five of height and the scanner discs have the same aspect ratio whereby they are adapted to scan the same area of their respective fields of vision alike except for later mentioned masks.

A microphone 111 is provided for receiving sound vibrations, the latter being preferably amplified by means of the unit 112 for corres-

pondingly effecting the light intensities emitted by a glow lamp 114, whereby said sound vibrations cause variations in said intensity responsively.

5 Arc lights 115 may be employed for illuminating the animated scene or object 116 and the light intensities from the object and the light intensities from the lamp 114 are focused by means of their respective lenses 117 upon their
10 respective revolving scanner discs and more particularly through the apertures thereof for scanning said intensities which, as permitted by certain later described masking devices, penetrate through said apertures. Said intensities from
15 the lamp 114 and object 116 are gathered by their respective optical devices or lenses.

118 which focus the said respective light beams upon their respective photo-electric cells 119 for correspondingly effecting the latter for generating signals accordingly. The signals may be
20 amplified in the unit 120 which is common to both of the cells 119. The member 120 is provided with an output wire or single channel of communication 121 for each of said signal
25 sources, the latter including the initial source 116 and the initial source 111, and said channel may include the antenna 122, whereby two carrier waves of like amplitude are broadcast or transmitted, each of said waves being respectively
30 modulated by one of the said different initial signal sources. By this means the audible frequencies are modulated to equivalent mean frequencies with respect to the object 116 for providing the same radio carrier frequency for each
35 source for transmission through or over said common channel.

It will be understood that the members 119 and 114 together with other parts herein mentioned may be provided with any suitable conventional circuits and the like which are not
40 shown or described herein.

The disc 100 is rotated in a clock-wise direction for reducing the pictures of the object 116 into numerous portions and the disc 101 is similarly rotated for a like purpose with respect to
45 portioning the pictures of the light intensities of the glow lamp 114.

A masking frame 123 is provided for the disc 100 having a rectangular opening 124 so arranged
50 that the pin hole apertures of the disc can be rotated into alignment therewith successively, said frame having an opaque masking portion 125.

A masking frame 126 of the same size as the frame 123 is provided for the disc 101. The frames are in the same relative positions in use. The frame 126 is provided with a rectangular opening 127 which is smaller in area than the
55 said opening 124 said frame 126 also being provided with an opaque portion or mask 128 which is of greater area than the masking portion 125 of the frame 123, said opaque portions or masks lessen the field of view of their respective scanner discs, being disposed between the latter and their
60 respective lenses 118.

The mask 125 is disposed to one side of an imaginary vertical line taken through the axle of the disc 100 whereby only the light intensities from the object 116 which are focused to the left
70 side of said mask through the aperture 124 are operative. The major portion of the mask 123 is disposed to one side of an imaginary vertical line through the axle of the disc 101 and obstructs light intensities from the glow lamp 114
75 whereby only the light intensities focused

through the aperture 127 are operative. The masks are disposed at opposite sides with respect to each other.

The size or area of the mask 125 is preferably substantially the same size as the rectangular opening 127 of the frame 126 and the mask 128 is of a like area with respect to the rectangular opening 124 of the frame 123.
5

Imaginary scanned lines of the subjects are represented by the lines disposed across the rectangular apertures 124 and 127 and indicate the operative area of the field of view of the scanner discs 100 and 101.
10

The discs 100 and 101 are alike and synchronized for uniform movements, their pin hole
15 apertures 104 of their respective series of apertures 103 being in the same relative positions during operation, whereby said respective apertures 104 become horizontally aligned with the like edges of their respective masking frames at
20 the same time and the disc 100 begins to scan its subject first since the aperture 104 of the disc 100 reaches an alignment with the rectangular aperture 124 first and before the aperture 104 of the disc 101 becomes in horizontal
25 alignment with the rectangular aperture 127 resultant from the mask 128 for the disc 101 preventing the same at said time. The photo-electric cell for the disc 101 is inoperative until the aperture 104 of the said disc becomes rotated
30 into a horizontal alignment with the rectangular opening 127 and past the mask 128, at which time the aperture 104 of the disc 100 becomes in horizontal alignment with the mask 125 whereby the photo-electric cell which is in alignment
35 with the object 116 becomes inoperative, resultant from the pin hole aperture 104 of the disc 100 becoming masked whereby no signals are occasioned from the object 116 source at said time from light passing through the said aperture 104 of the disc 100.
40

By means of said masks, first a scene signal or a short series of the same is broadcast from the object 116; whereupon said signals cease resultant from the mask 125 causing the same
45 and at said instant when said picture-signals cease, a speech or sound signal or a portion of the same or a short series of sound-signals which are intimately associated with the object 116 is then transmitted or broadcast from the microphone 111 source, whereby the scene-signals and the sound-light-signals are transmitted alternately and in a proper relative timing of the sound-signals with respect to the scene-signals, said alternation being continuously repeated for
50 pickup by a remotely disposed radio visor or television receiver tuned to the radio carrier frequency of said signals.

Referring to Figure 4, the construction of the disc 102 of said visor has heretofore been
60 partially described, said disc being fixed to an axle 129 having a worm wheel 130 and worm threads 131 which are of like size and type as those heretofore mentioned. The shaft 132 is driven by a motor 133, the latter being energized
65 through the wires 134 from a suitable source of electrical energy. The heretofore mentioned line wires 110 and the wires 134, if desired, may be energized from the same source or from sources of like type and value.
70

The said broadcast signals are picked up by the antenna 135 or received by the wire 136 for said single channel of communication and delivered to the radio receiver and amplifying member 137 for correspondingly effecting and
75

modulating the light intensities of the glow lamp 138. The received signals from the two said initially different signal sources, being transmitted at the same amplitude or mean light frequency as modulated by the variations of intensity at the sending station cause corresponding variations in the light intensities of said receiving lamp for conversion into pictures and sounds at the receiver responsively.

The varying light intensities from the receiving lamp 138 are projected through the pin hole apertures 103 of the disc 102 as the latter revolves. A frame 139 having a rectangular opening 140 is employed to confine the light rays which penetrate through the apertures of the disc 102 to said aperture 140 whereby the lens or optical device 141 focuses said rays correctly and proportionately upon the surface of a screen 142 which may be of conventional ground or frosted glass. The area of the flat plate in the lamp 138 determines the size of the field to be scanned by the disc 102 and the latter is so spaced from said plate that all of the available glow surface of the plate is utilized for maintaining the proper width to height ratio of five units of height to six units of width for the screen 142.

The glass screen 142 has a portion 143 which collects light intensities of the lamp 138 responsively with respect to sound-signals originating initially at the microphone 111, having a juxtaposed or aligned portion 144 which collects light intensities from the lamp 138 responsively with respect to the signals which originate initially from the picture or object 116.

The pictures from the source 116 are visualized at the receiving station upon the back side of the portion 144 of said glass screen.

The light intensities from the back side of the screen-portion 143 are focused by means of the lens or optical device 145 onto a photo-electric cell 146 in communication with an amplifier unit 147 and a phonetic device 148 which may be a loud speaker, ear phones or the like, whereby the sound signals originating from the microphone 111 are reproduced by said phonetic device at the receiving station.

The intensities from the glow lamp 138 are scanned by the disc 102, said scanned lines being represented by the lines disposed across the opening 140 of the frame 139 and further represented by the lines across the screen 142 and it will be understood that to transmit picture-light and sound-light signals of the same amplitude or mean frequency as heretofore described that a higher number of lines per second must be transmitted than the highest audible sound vibration frequency.

The operation of the instrumentalities shown in Figures 3 and 4 may be readily understood from the diagrammatic illustration Figure 5 wherein A represents the mask 128 for the scanner disc 101 and B the rectangular aperture 127 of the frame 126; C represents the mask for the disc 100 and D the area of the rectangular aperture 124 of the frame 123. It will be noted that at times when light intensities pass through B that similar intensities are prohibited from passing through C and similarly when such intensities pass through D intensities are prohibited from passing through A, whereby light intensities are alternately communicated to the screen E, the portion F thereof receiving the sound-signal intensities for a reproduction of the original sound in alternation with respect to the re-

ception of the portion G of the picture-light-signal intensities from the object 116 source for a reproduction of said pictures.

In actual practice it is advisable to so proportion the masks 125 and 128 that the combined areas of B and A and the combined areas of C and D are slightly less than the total area of the screen E to prevent the heretofore mentioned "jumbling" of signals whereby a blank or non-operating space is provided on the screen represented by a black vertical line thereon in Figure 4 and in the diagram Figure 5.

Obviously the herein specifically described form and arrangement of masks may be substituted for masks provided on or painted on the lenses 117.

It will be understood that certain features and sub-combinations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is therefore to be understood that my invention is not to be limited to the specific details shown and described.

I claim:

1. In an electronic television system, a microphone for reception of sounds, a glow lamp, means for causing the lamp to emit light of varying intensity responsive to sound vibrations received by the microphone for producing sound-light intensities, means for developing picture-light intensities, a pair of synchronized electronic scanners adapted to scan their respective fields simultaneously alike, means for focusing said picture-intensities onto one of said scanner's field and sound-light-intensities onto the other scanner's field, means for causing a portion of each of said fields to be inoperative to produce complementary fields completing the plan of a larger field, energizing means for causing each scanner to scan the operative portion of its field for developing a series of picture-signals responsive to the picture-light intensities and a series of sound-signals responsive to the sound-light-intensities in alternation with said series of picture-signals, a single output channel of signal transmission, means for transmitting said dual series in alternating wave periods through said channel, reproducing apparatus and framing apparatus forming part of said receiving station for effecting respectively reproducing and framing actions thereat, means including a fluorescent screen corresponding in area to the said larger field and forming a part of the receiving station for rectifying one of the received synchronizing waves to develop pictures on part of its area during the picture-wave period and sound-light intensities on the other part of its area during the sound wave period, and means including a focusing-device, a photo-sensitive cell and a sound reproducing device and forming a part of said receiving station for modulating said sound-light intensities to develop audible sounds during the sound-wave period.

2. In an electronic television signal receiver, a device responsive to phase angle between two voltages comprising in combination with means delivering two alternating-current voltages having frequencies of substantially the same order of magnitude, an exhausted envelope, means therein for producing a stream of electrical particles, means for varying the intensity of said

stream in response to one of said voltages and to a received signal, and means for deflecting said stream to either side from a mean path in response to the other of said voltages, two fluorescent screens having different surface areas intercepting said stream of electrical particles on either side of the axis of said mean path, and means including a lens, a photo-sensitive cell and a sound reproducer responsive to said interception by the screen of lesser area and to said signal for translating light intensities emitted from said lesser area screen into audible sound.

3. In a television transmitter a mosaic, means for throwing a scene directly upon said mosaic, means for scanning said mosaic and for converting light intensities into electrical frequencies, a second mosaic complementary in shape to the first named mosaic, said two mosaics shaped to complete the plan of a larger mosaic, means for converting sound into light intensities, means for throwing said light intensities directly upon said second mosaic, means for scanning said second mosaic and for converting light intensities into electrical frequencies, synchronizing means for said two scanning means whereby said two scanning means scan the complementary mosaics alternately line by line, and means for transmitting the two sets of electrical frequencies through a single output channel.

4. In a television transmitter, an electronic scanner for a scene, a screen for limiting the field of said scanner, means for converting light passing through said scanner into electrical frequencies, means for converting sounds into light intensities, a second electronic scanner similar to the first said scanner for said light intensities, a screen complementary to the first named screen for limiting the field of the second scanner, said two limited fields completing the plan of a larger field, means for converting light passing through said second scanner into electrical frequencies, means for synchronizing said scanners to scan the two complementary fields alternately, and means for transmitting the two series of electrical frequencies through the same output channel.

5. In an electronic television receiver for the reception of signals alternately corresponding to picture and sound intensities, means for converting said signals into light intensities, a screen divided into picture reproduction and sound-light receiving sections, an electronic scanner for directing the light intensities onto said screen synchronized with said signals to direct the alternate picture and sound light intensities to the respective sections of the screen, said picture-light intensities producing on the screen an image of the picture, and means for reconverting the sound-light intensities on the screen to sound.

6. In a television transmitter, means for picking up sound impulses, means for transforming said sound impulses into light intensities, separate and similar synchronized electronic means for directly scanning picture-light and related sound-light and transforming them into electrical frequencies, said scanning means operating to

scan similar areas simultaneously and including means for locating picture-light and sound-light in separate complementary parts of said similar areas, and means for transmitting the two sets of electrical frequencies through a single output channel whereby signals of frequencies corresponding alternately to picture-light and sound-light are transmitted.

7. In an electronic television system, an electronic scanner for a scene, a screen for limiting the field of said scanner, means for converting light passing through said scanner into electrical frequencies, means for converting sounds into light intensities, an electronic second scanner similar to the first said scanner for said light intensities, a screen complementary to the first named screen for limiting the field of the second scanner, said two limited fields completing the plan of a larger field, means for converting light passing through said second scanner into electrical frequencies, means for synchronizing said scanners to scan the two complementary fields alternately, means for transmitting the two series of electrical frequencies through the same output channel, and a receiver for said transmitted series including means for converting the frequencies into light of corresponding intensities, a scanner synchronized with the first said two scanners, a screen to receive the light from the last said scanner and corresponding in area to the plan of said larger field, said screen receiving light corresponding to the scene on a portion of its field and the light corresponding to the sound on the other part of its field according to the plan by which said fields were limited, and means for reconverting the light corresponding to sound on said screen to sound.

8. In an electronic television system a receiver for signals alternately corresponding to picture-light and related sound-light, comprising means including a scanner for translating said signals into light and for locating said light upon a field in distinct areas of picture-light and sound-light, the scanner being synchronized and the field being proportioned according to the occurrence of the two types of signals, the pictures being displayed upon the picture-light area of the field, and means for translating the sound-light of the field into sounds related to the pictures.

9. In an electronic television receiver for the reception of signals alternately corresponding to picture and sound intensities, means for converting said signals into light intensities, a screen divided into picture reproduction and sound-light receiving sections, said sound-light receiving section being relatively small with respect to the picture reproduction section, a scanner for directing the light intensities onto said screen synchronized with said signals to direct the alternate picture and sound light intensities to the respective sections of the screen, said picture-light intensities producing on the screen an image of the picture, and means for reconverting the sound-light intensities on the screen to sound.

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