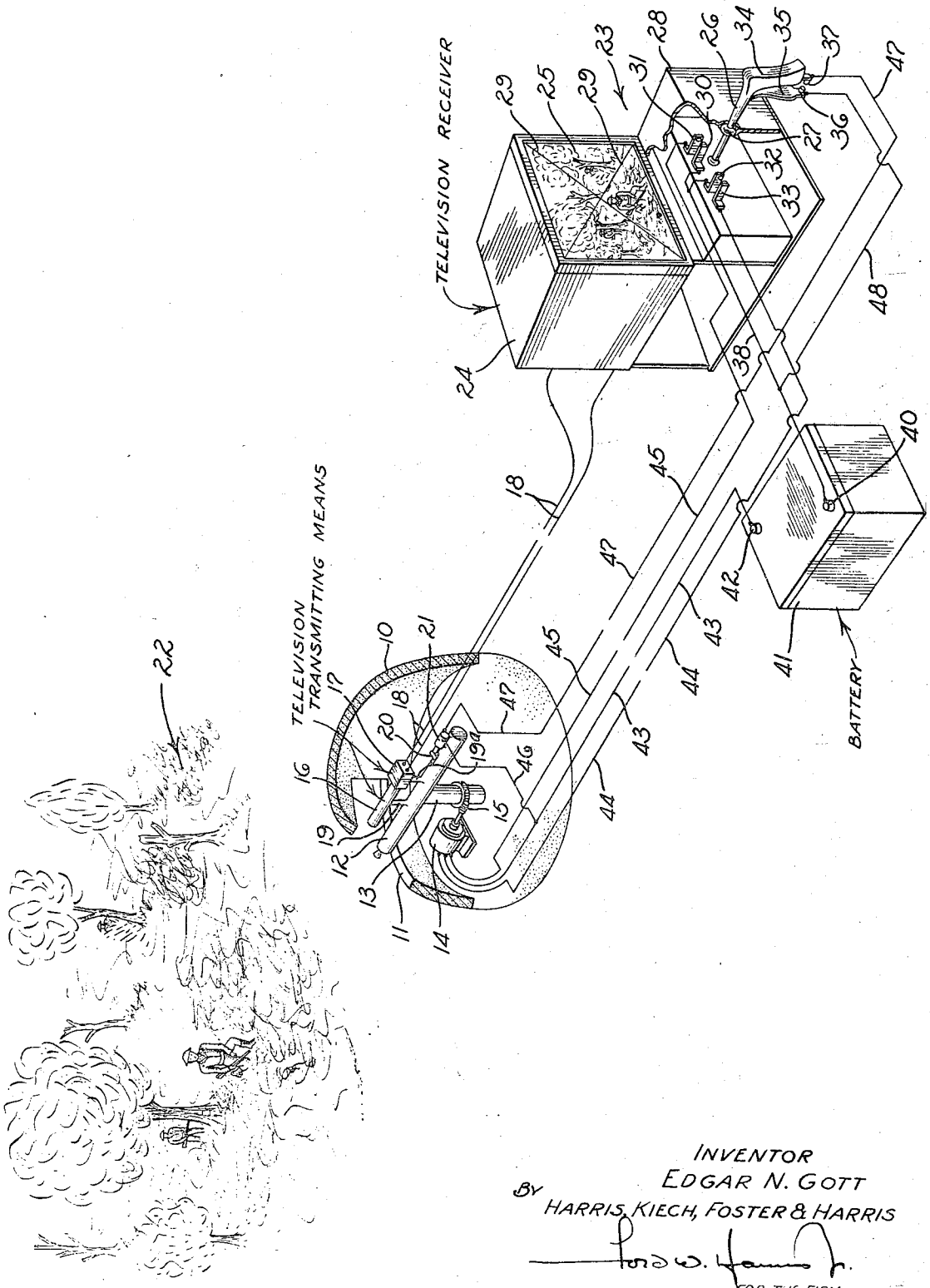
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REMOTE VISUAL CONTROL SYSTEM

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REMOTE VISUAL CONTROL SYSTEM

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This invention relates to a remote visual control system for the control by an operator of an apparatus located at a distance from the operator to permit the operator to operate the apparatus in accordance with the scene presented at the distant location.

My invention has important applications in the military field and is herein disclosed in connection with one of such uses, but it should be understood that my invention is not limited to its military uses but may be applied in industrial or other fields in which visual control of remote apparatus is important.

It is an object of this invention to provide a system for the control by an operator of an apparatus at a remote location to permit the operator to control the operation of the apparatus in accordance with the scene presented at the remote location.

Another object is to provide a remote visual control system which provides means for controlling the operation of a remote apparatus and in which a television image of the environment of the remote apparatus is provided for guidance in the control of the apparatus.

Another object is to provide a remote visual control system in which a television image of a selected remote scene is presented and means are provided for remote control of the television pick-up device to vary the selected scene.

A further object is to provide a remote visual control system which permits control of an apparatus at a remote location, presents a television image of a scene at the remote location, and varies the televised scene in a manner definitely related to the operation of the apparatus.

Still another object is to provide a remote visual control system for a gun which presents a television image of the region in line with the gun and permits aiming and firing of the gun by remote control.

These and other apparent objects are attained in a manner which will be clear from consideration of the following description taken in connection with the accompanying drawing.

The drawing shows a machine gun mounted within a protective enclosure and connected for remote control by my remote visual control system, various units of the apparatus being shown diagrammatically.

An important application of my invention is in the remote visual control of guns employed for military purposes. By the use of my invention, armored gun stations in the form of "pill boxes," or otherwise, may be located at intervals along a military front line, and the guns contained therein may be unattended and may be operated from one or more control stations located safely in the rear. Thus, the officer commanding that sector can coordinate fire from all of the individual gun stations and can observe the detailed condition of the entire front without endangering his own life or that of any of his men.

In the drawing, the numeral 10 designates a protective enclosure or "pill box," shown in hemispherical shape and provided with a horizontal slot 11. Within the enclosure 10 is a machine gun 12 with its muzzle directed through the slot 11, the machine gun 12 being mounted upon a pedestal 13 which is adapted to be rotated by a reversible electric motor 14 through worm gearing 15. It will be apparent that rotation of the motor 14 in one direction causes the machine gun 12 to rotate in a horizontal plane in a clockwise direction, while rotation of the motor 14 in the opposite direction results in rotation of the machine gun 12 in a counter-clockwise direction, and that by controlling the rotation of the motor 14 the machine gun 12 may be directed at any desired angle. Mounted for rotation with the machine gun 12 is a television finder or "camera" 16 provided with electrical means 17, well known in the art, for transmitting television signals over conductors 18, the mounting means preferably comprising a pair of supporting posts 19 and 19a. The machine gun 12 is equipped with a trigger 20 adapted to be operated upon energization of an electromagnet 21. In the present embodiment, the television finder 16 is directed in the same direction as the machine gun 12 by the posts 19 and 19a in such manner that the television transmitting means transmits an image of the scene 22 toward which the machine gun 12 is directed.

The invention contemplates electrical control of the apparatus within the enclosure 10 by means of control apparatus 23 which may be located at a control station remote from the enclosure 10. In the present embodiment, this electrical control is effected through the medium of electric conductors connecting the apparatus within the enclosure 10 with the control apparatus 23, and which may pass underground between the two stations. The conductors 18 lead to a television receiver 24, which may be of any construction well known in the art, and which is provided with a screen 25, the television transmitting means 16 and 17 and the television receiving means 24 and 25 being adapted to repro-

duce on the screen 25 an image of the scene 22 toward which the television finder 16 and the machine gun 12 are directed. Means are preferably provided for indicating the direction in which the machine gun 12 is aimed relative to the scene 22. This means may take the form of cross hairs 29 located adjacent the screen 25 and intersecting at a point located on the image on the screen 25 corresponding to the point in the scene 22 at which the machine gun 12 is aimed. If desired, the indicating cross hairs may, instead, be suitably located on or in front of the television finder 16 to accomplish the same purpose.

In the disclosed embodiment, the means for controlling the movement of the machine gun 12 and television finder 16 and for controlling the firing of the machine gun 12 are shown comprising a lever 26 pivotally mounted at 27 in a housing 28 so as to be rotatable in a horizontal plane. The inner end of the lever 26, located within the housing 28, terminates in a knob which is adapted, upon clockwise rotation of the lever 26 through a horizontal plane, to engage a spring contact 30 and move it into contact with an electrical contact 31, and which is adapted, upon counter-clockwise rotation of the lever 26 through the horizontal plane, to engage a spring contact 32 and move it into contact with an electrical contact 33. The outer end of the lever 26 terminates in a handle or hand grip 34 whereby an operator may, by a swinging motion, selectively move the inner end of the lever 26 to close either the contacts 30 and 31 or the contacts 32 and 33. Adjacent the handle 34 is a resilient trigger 35 adapted to be enclosed by the fingers of the hand gripping the handle 34. The trigger 35 carries an electrical contact 36 adapted to contact an electrical contact 37 when the trigger 35 is moved toward the handle 34 by a squeezing action of the hand.

The electrical connections between the various parts are as follows: The contacts 30 and 32 are electrically connected together and through a conductor 38 to one terminal 40 of a battery 41 or other suitable source of electrical current. The other terminal 42 of the battery 41 is connected to the common terminal of the electric motor 14 through conductor 43. One of the other terminals of the reversible motor 14 is connected to the contact 33 through a conductor 44, and the third terminal of the motor 14 is connected to the contact 31 through a conductor 45. One terminal of the electromagnet 21 connects with the conductor 43 through a conductor 46, and the other terminal of the electromagnet 21 connects with the contact 37 through a conductor 47. The contact 36 is connected to the terminal 40 of the battery 41 through a conductor 48 and the conductor 38.

In operation, assuming an enemy army advancing toward the pill-box 10 and presenting the scene 22, it will be found that the scene 22 is reproduced on the television receiver screen 25 in the control station. If the machine gun 12 is in such a position, as indicated by the location of the intersection of the cross hairs 29 relative to the scene image, that the gun is aimed at an object desired to be fired upon, the machine gun 12 may be fired by squeezing the trigger 35 toward the handle 34 to make contact between the contacts 36 and 37 and energize the trigger operating electromagnet 21. Releasing the trigger 35 will break the circuit through the electromagnet 21 and cause the machine gun to cease firing.

If the machine gun 12 is not oriented in such a direction as to be aimed at the object desired to be fired upon, the gun may be rotated into position where it is so aimed by swinging the handle 34 of the lever 26 in either one direction or the other depending upon the direction in which the machine gun is to be moved. The internal connections within the reversible electric motor 14 are such that when the conductors 43 and 45 are energized, the motor 14 rotates in such a direction as to cause the machine gun 12 to rotate in a clockwise direction as seen from above, and that when the conductors 43 and 44 are energized, the motor 14 rotates in such a direction as to cause the machine gun 12 to rotate in a counter-clockwise direction as seen from above. It will be evident then that when the lever 26 is swung in a clockwise direction about the pivotal point 27, the end of the lever 26 will move the contact 30 into electrical contact with the contact 31 and energize the motor 14 so as to cause the machine gun 12 to rotate in the same direction in which the lever 26 is rotated, namely, in a clockwise direction as seen from above. When the lever 26 is brought back to the normal position shown in the drawing, the contacts 30 and 31 are disconnected and the machine gun 12 immediately stops rotating. If the lever 26 is swung in a counter-clockwise direction, the contacts 32 and 33 are brought into connection, energizing the conductors 43 and 44 and causing rotation of the electric motor 14 in such a direction as to cause the machine gun 12 to again rotate in the same direction as the lever 26, namely, in a counter-clockwise direction as seen from above.

As the machine gun 12 rotates, it carries with it the television finder 16, and the televised scene appearing on the screen 25 is continually changed, always corresponding with the scene presented in the direction in which the machine gun 12 is aimed. Thus, by watching the screen 25 and by manipulating the handle 34 in one direction or the other, the machine gun 12 may be moved into such a position that, as indicated on the screen 25, it is aimed at the object upon which it is desired to fire. The handle 34 may then be moved back to normal, the trigger 35 squeezed, and the gun fired. It will be apparent that I have provided means for viewing at a remote location the scene corresponding to any selected angle of view and for controlling the angle of view, as well as providing means for controlling the operation of a gun or other apparatus at a remote location in accordance with the scene presented in its environment.

The control apparatus disclosed is for illustrative purposes only, and it will be understood that other and different control apparatus may be employed to control the apparatus at a remote location, all within the spirit of the invention. While I have shown a machine gun mounted to be moved only in a horizontal plane, it is obvious that the machine gun might be mounted so as to also be tilted at angles to the horizontal, and that similar control apparatus may be provided for controlling the vertical movement of the gun in such a manner that the gun may be turned in any desired direction by manipulating the controls at the remote controlling station.

My invention also contemplates the transmission of the television image from the gun station to the control station through the medium of

radio waves and by the use of apparatus well known in the art. The control of the apparatus at the gun station may likewise be effected by radio and suitable controls at the controlling station. My invention is not limited to the employment of any particular type of television transmitting or receiving apparatus, and any such apparatus suitable for the purposes of the invention may be used.

It will be understood that the disclosure herein of apparatus for control of a machine gun in pill box is for illustrative purposes only, for my invention may be applied in many other situations and be put to many different uses.

These uses are only a few to which my invention may be put, it being contemplated that there are many industrial applications to which the advantageous control features of my invention particularly adapt it. It will be understood that in adapting my invention to its many uses, a wide variety of changes and modifications may be made without departing from the spirit and scope of the appended claims.

I claim as my invention:

1. In combination: a gun located at a gun station; means at said gun station for moving said gun to change the line of fire; television transmitting means at said first location, including a finder disposed with its line of vision substantially the same as said line of fire, and adapted to move in correspondence with said gun; television receiving means at a control station, said television transmitting and receiving means being adapted to reproduce at said control station the scene presented to said finder, and said gun and said finder being mechanically separate from said control station; and remote control means for controlling from said control station the operation of said first-mentioned means.

2. In combination: a movable gun mounted at a gun station; means at said gun station for moving said gun to change the direction in which said gun is aimed; means at said gun station for firing said gun; television transmitting means at said gun station, including a finder adapted to move in correspondence with said gun; television receiving means at a control station, said television transmitting and receiving means being adapted to reproduce at said control station the scene presented to said finder, and said gun and said finder being mechanically separate from said control station; means cooperating with said television transmitting and receiving means for indicating at said control station the direction in which said gun is aimed relative to the scene presented; and remote control means for controlling from said control station the operation of said gun moving means and said gun firing means.

3. In a device of the character described, the combination of: an apparatus located at a first location and designed to operate to perform a function of directional character; actuating means at said first location for changing the direction of said apparatus; control means at a second location; electric wiring electrically connecting said control means and said actuating means whereby said control means may be operated to electrically energize said actuating means; television transmitting means at said first location, including a finder; television receiving means at said second location, said television transmitting and receiving means being adapted to reproduce at said second location the scene presented at said first location; and means maintaining the direction of vision of said finder in substantial parallelism to said direction of operation of said apparatus.

4. In a device of the character described, the combination of: an apparatus located at a first location and designed to operate to perform a function of directional character; actuating means at said first location for changing the direction of said apparatus; control means at a second location; electric wiring electrically connecting said control means and said actuating means whereby said control means may be operated to electrically energize said actuating means; television transmitting means at said first location, including a finder; television receiving means at said second location; electric wiring electrically connecting said transmitting means and said receiving means whereby said receiving means is adapted to reproduce at said second location the scene presented at said first location; and means maintaining the direction of vision of said finder in substantial parallelism to said direction of operation of said apparatus.

5. In a device of the character described, the combination of: a supporting member positioned at a first location; a device movably mounted on said supporting member and adapted to move relative thereto; actuating means associated with said device and adapted to be electrically actuated to move said device relative to said supporting member; control means at a second location remote from said first location; electrical connecting means connecting said control means and said actuating means, whereby said control means is operable to actuate said actuating means; television transmitting means, including a finder, associated with said device and adapted to move therewith; and television receiving means at said second location, said transmitting and receiving means being adapted to reproduce at said second location the scene presented at said first location so as to assist an operator at said second location to operate said control means.

6. In a device of the character described, the combination of: a supporting member positioned at a first location; a device movably mounted on said supporting member and adapted to move relative thereto; actuating means associated with said device and adapted to be electrically actuated to move said device relative to said supporting member; control means at a second location remote from said first location; electric wiring electrically connecting said control means and said actuating means, whereby said control means is operable to actuate said actuating means; television transmitting means, including a finder, associated with said device and adapted to move therewith; television receiving means at said second location; and electrical wiring electrically connecting said transmitting means and said receiving means, said transmitting and receiving means being adapted to reproduce at said second location the scene presented at said first location so as to assist an operator at said second location to operate said control means.

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