

Sept. 6, 1949.

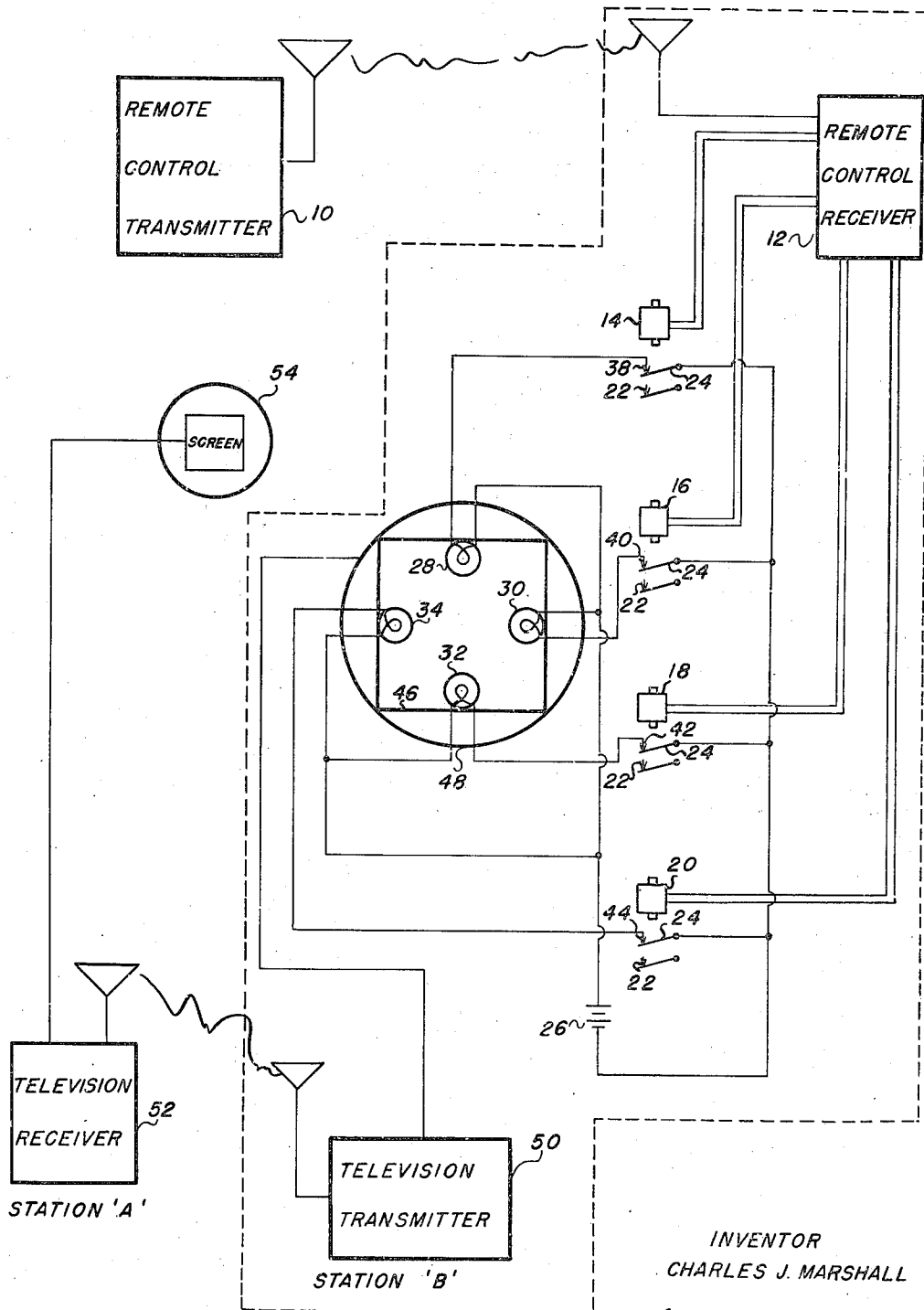
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2,480,868

GUIDED MISSILE CONTROL SYSTEM

Filed Aug. 28, 1945

2 Sheets-Sheet 1



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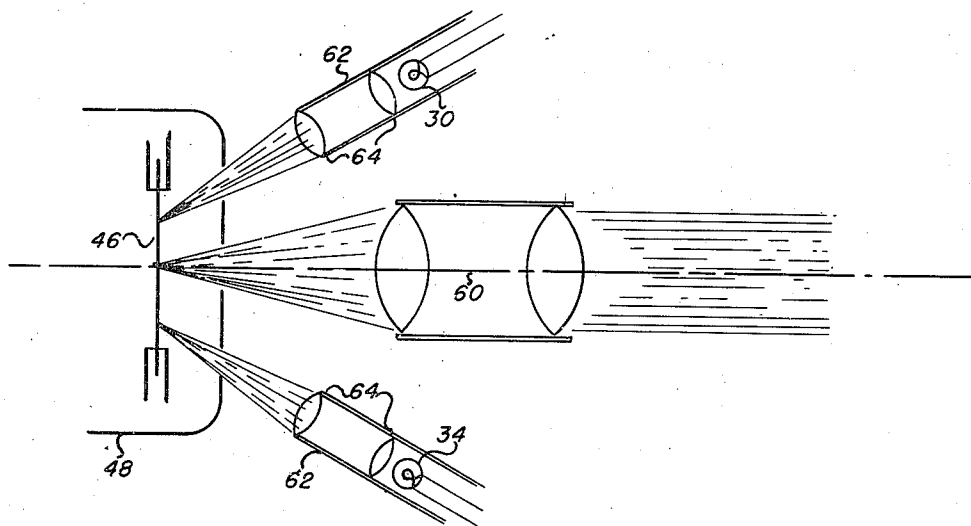


FIG. 2

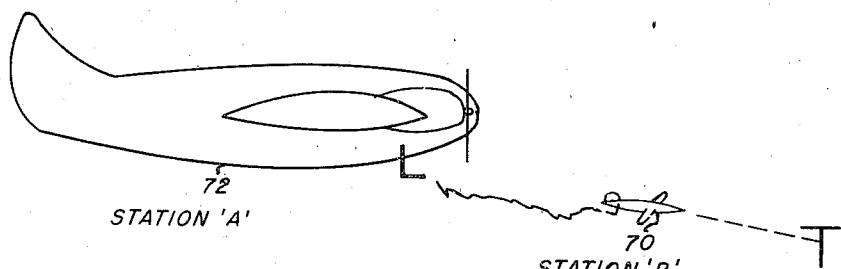


FIG. 3

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2,480,868

GUIDED MISSILE CONTROL SYSTEM

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Application August 28, 1945, Serial No. 613,198

2 Claims. (Cl. 178—6.8)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to communication systems and more particularly to such systems designed to operate with guided missiles.

Remote control systems for use with guided missiles, projectile or self-propelled, have been developed that employ a television pick-up tube or "iconoscope" located in the nose of the guided missile for transmitting to the controller a picture of terrain immediately in front of the missile. In the systems now in use the only indication the operator has that the control signals he transmits are being received by the guided missile is the change in the terrain shown on his television receiver. While this indication is entirely satisfactory in some conditions it is inadequate in others. For example, if research is being performed on a new type of control system it would be valuable to know whether the failure of a missile to respond to a control signal was due to the failure of the missile to receive the control signals or failure of the servo mechanism in the missiles. Another example of the need for more accurate information on the flight of a missile is experienced when the missile apparently goes out of control. In many cases this could be due to the failure of the servo mechanism in the missile or it may be due to spurious signals that are being received by the missile that are of a proper frequency, code, etc., to maneuver the missile. If the latter condition exists, it may be possible to take steps to remove the spurious signal source.

It is an object of the present invention, therefore, to provide means whereby the controller of a guided missile has instantaneous, accurate information as to the signals being received by the control apparatus in the guided missile or object.

It is a further object of this invention to provide a system that makes the maximum use of equipment already employed in guided missiles so that a minimum of additional equipment is required.

For a better understanding of the invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawing in which:

Fig. 1 is a schematic diagram of the invention;

Fig. 2 is a schematic drawing of a portion of the invention located in the guided missile; and

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Fig. 3 is an illustrative drawing showing one application of the invention.

Referring now more particularly to Fig. 1 of the drawing there are shown a remote control transmitter 10 and a remote control receiver 12. Relays 14, 16, 18 and 20 shown connected to receiver 12 are operated by appropriate signals from transmitter 10. Many remote control systems employ such relays and those systems that do not may easily be modified to include these relays. For the purpose of this explanation, it will be assumed that these relays are normally employed in the remote control system and that contacts 22 on various relays are the contacts used to control the servo mechanisms in the guided missile. Contact arms 24 on relays 14, 16, 18 and 20 are all connected to one terminal of a source of electrical energy 26. In this instance, the source of potential is a battery and the contact arms 24 are connected to the negative terminal, but this is not intended to limit the invention to this type of source nor to this particular terminal. A second terminal of source 26, in this case the positive terminal, is connected to one terminal of each of four lamps 28, 30, 32 and 34. A second terminal on lamp 28 is connected to a contact 38 on relay 14. In a similar manner, terminals on lamps 30, 32 and 34 are connected to terminals 40, 42 and 44 on relays 16, 18 and 20, respectively. Lamps 28, 30, 32 and 34 are so placed that each illuminates a small spot on the mosaic screen 46 of a television transmitting tube ("iconoscope") 48. Tube 48 is connected to a television transmitter 50. Tube 48 and transmitter 50 are normally employed in an existing remote control system. A television receiver 52 is provided to receive signals from transmitter 50 and to supply appropriate signals to a television viewing screen 54.

In Fig. 1 the equipment is shown divided between two stations, namely Station A and Station B. Station A in this example is the control station and may be located on the ground, in a ship or in an aircraft. Station B is located in the guided missile.

Fig. 2 shows the preferred means of illuminating the mosaic screen 46 of Fig. 1 with the lamps 28, 30, 32 and 34. Parts in Fig. 2 are numbered to correspond with like parts in Fig. 1. In Fig. 2, lens 60 represents schematically the objective lens normally employed to focus the image of the terrain or field on screen 46. Light shields 62 and lenses 64 are employed to focus the light from the lamps on a small point on screen 46. If four lamps and a rectangular screen 46 are

employed it may be convenient to focus one spot of light near the midpoint of each of the four sides of the rectangle although any other spots may be chosen if desired. The spots of light focused on screen 46 are of very low intensity so as not to obscure the image normally present on this mosaic screen.

For purposes of illustration, assume that this system is to be employed to control a guided missile and that relay 14 controls the "up" movement, relay 16 the "right" movement, relay 18 the "down" movement and relay 20 the "left" movement of the guided missile.

Fig. 3 shows guided missile 70 headed for a target T. The control station is located in an aircraft 72. With no control signal being transmitted to missile 70 the controller will see on viewing screen 54 (Fig. 1) the target T and a portion of the surrounding area. If the controller decides that the missile 70 is headed to the right of the target, he sends a signal to missile 70 to cause it to turn to the left. This signal closes relay 20, Fig. 1, and through contacts 22 energizes the proper servo mechanisms. Closure of relay 20 also lights lamp 34. If the arrangement of lamps suggested above is used, the controller at Station A will see a small point of light appear on the left side of screen 54 indicating to him that a "left" signal has been received by Station B. In a similar manner an "up" signal sent by transmitter 10 causes relay 14 to close and a small point of light to appear at the top of screen 54. "Right" and "down" signals would cause similar spots of light to appear near the right side and the bottom of screen 54.

If no control signals are being transmitted from Station A to Station B, but missile 70 is seemingly operating in response to received signals, a glance at screen 54 will indicate instantly which relays, if any, are closed.

It can be seen from the foregoing description that this invention is not limited to the control of airborne guided missiles. It may easily be adapted for use with remotely controlled missiles for use on land or water or even under water, and the number and arrangement of the lamps may be varied to indicate in the most convenient manner the status of the control elements in the remote missile.

In the foregoing specification and also in the claims the term "missile" has been given its generic meaning; this modern accepted meaning supplies a deficiency in language occasioned by rapid technological development.

While there has been described what is at present considered the preferred embodiment of the invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention.

What is claimed is:

1. An indicator system for use with remote

control equipment comprising a television transmitter including an "Iconoscope" with a mosaic screen, a television receiver including a viewing screen, a remote control transmitter, a remote control receiver, at least four relays having first and second sets of contacts, each of said relays being adapted to close its contacts upon the receipt of a predetermined signal from said remote control receiver, at least four lamps, means whereby each of said relays causes a different lamp to be illuminated when the contacts of said relay are closed, and means for causing the light from each of said lamps to be focused on a separate predetermined spot on a mosaic screen in said television transmitter, said spots of light thereby indicating on the viewing screen of said television receiver the relays that are closed.

2. An indicator system for use with remote control systems comprising a remote control transmitter, a remote control receiver located at a remote point, a plurality of relay means adapted to be operated individually and in combination by said receiver under the control of signals transmitted from said remote control transmitter, a television system including a transmitter located in proximity with said remote control receiver and a receiver located in proximity with said remote control transmitter, a plurality of lamps, means whereby said lamps are illuminated in a manner indicative of the relays that are closed at any particular instant by said remote control receiver, and means whereby the intelligence presented by said lamps is transmitted by said television system to the operator of said remote control transmitter.

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