

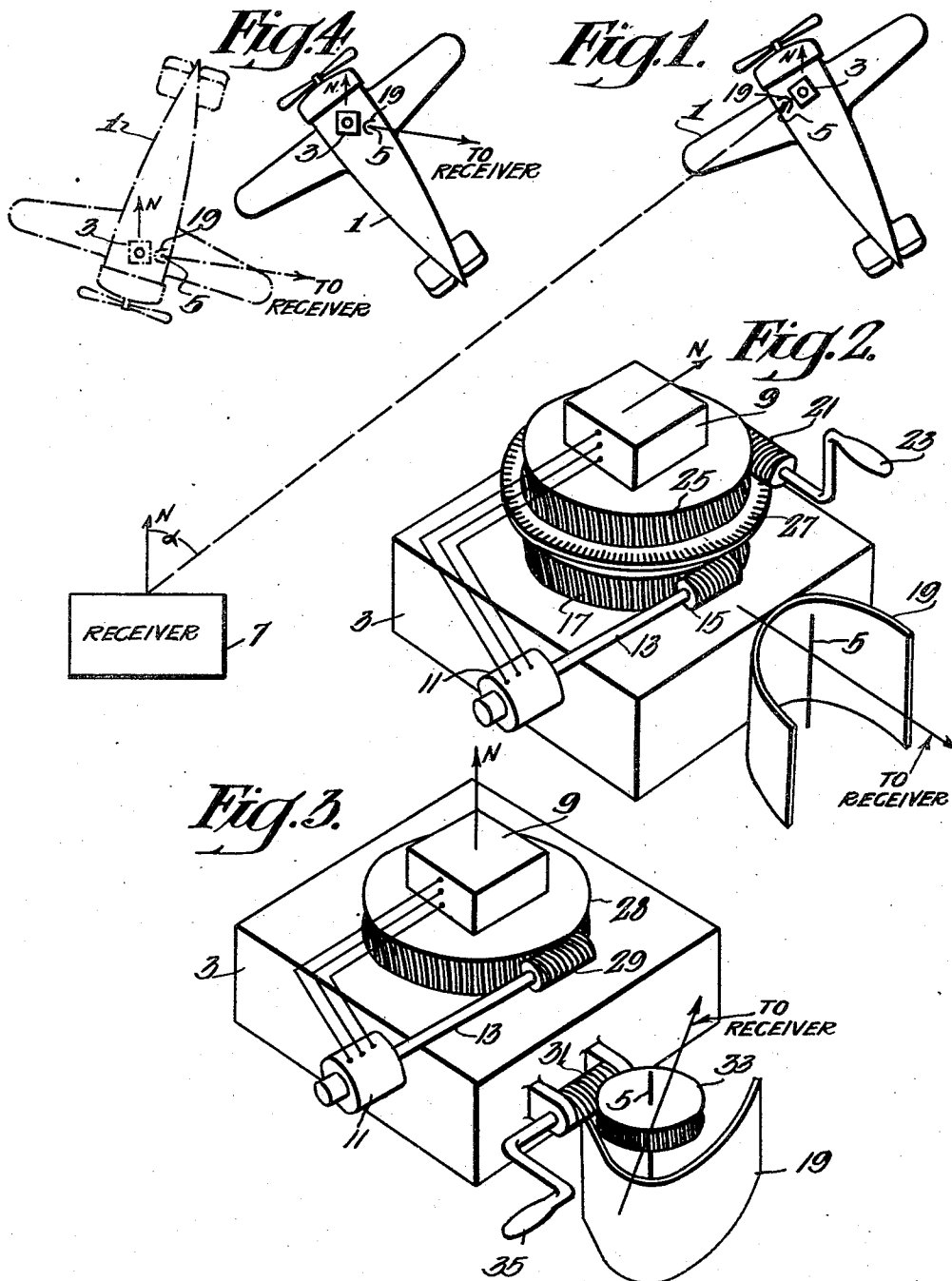
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TELEVISION SYSTEM

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TELEVISION SYSTEM

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This invention relates to television signal transmission systems and more particularly to the transmission of television signals from aircraft and the like, and has for its principal object to provide a method and means for maintaining a predetermined orientation of the transmitted image.

During the course of development work in the application of television to airplanes, it was found that intelligent observation of the received picture as transmitted from the airplane was extremely difficult due to the fact that there was no method available for determining at the receiver the direction of the flight of the aircraft carrying the television transmitter.

Assuming, for example, that an airplane is used to transmit an aerial view of a military objective under artillery bombardment, it would be possible to observe the placement of shells with respect to the target, but no satisfactory method is available for determining the compass relation between the position of the target and the position of the shell burst. The information contained in the aerial view of the target would thus be of little value for correcting the error of the artillery fire.

Other objects of this invention are to provide a directional transmission system for more efficient transmission of television signals from aircraft and the like and to provide, in combination, an oriented television camera with a directional antenna system adapted to direct a radio beam at a predetermined receiving station.

According to this invention, an apparatus and method of operation are provided for maintaining the desired orientation of the television camera. Associated with such apparatus are a directional transmitting antenna and means for maintaining a predetermined angular relation between the camera and the antenna.

Other and incidental objects of the invention will be apparent to those skilled in the art from the following specification considered in connection with the accompanying drawing, in which

Figure 1 is a diagram showing the employment of one form of this invention;

Figure 2 is a plan view showing certain details of the invention;

Figure 3 is a plan view showing another form of this invention; and

Figure 4 is an explanatory diagram relating to the operation of the invention.

Referring now to Fig. 1, there is shown an air-

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plane 1 carrying a television camera 3 with an attached directional antenna transmitting system 5 which directs a television signal toward a receiving station 7.

The television camera 3 may be of any of the well known types such, for example, as that shown and described in an article entitled "Iconoscopes and kinescopes in television" by V. K. Zworykin, printed in the RCA Review for July 1936. The directional antenna system 5 may be one such as that shown and described in Gerth et al. Patent 1,939,345 of December 12, 1933.

In this particular embodiment of my invention, the relative angular position between the antenna transmitting system and the camera 3 is maintained fixed and the camera 3 is rotatable such that when the airplane 1 changes its direction of travel, means are provided for maintaining the desired orientation of the camera 3. This may be of the manual type, but according to a preferred form of this invention, an automatic means is provided for maintaining the desired orientation of the television camera 3.

In Fig. 2 there is shown one automatic means for maintaining the desired orientation of the television camera 3. A magnetic means 9 is provided to control a motor drive 11 which is coupled, through shaft 13 and worm gear 15, to gear 17 which is fixed to the camera 3. The magnetic control means 9 may be of the type which is shown and described in the Sjostrand Patent No. 2,080,511 of May 18, 1937, or may be of the gyroscopic type which is shown and described in the patent to Dearing No. 2,173,228 of September 19, 1939.

The directional antenna 5 is provided with a reflector element 19, the combination of which is fixed to the television camera 3 such that when the television camera 3 is properly oriented, the antenna will also be similarly oriented. It is, therefore, necessary that the camera 3 and the transmitting antenna 5 be oriented such that the direction of the receiver is in the direction to which the directional antenna system is most effective. Therefore, it follows that the orientation of the television camera will be different for each different direction of the televised area from the receiving station. The receiving station may then easily determine the direction of rotation of the well known means of direction finding.

The automatic orientating means are usually designed to maintain a predetermined direction, such as magnetic north. It is, therefore, necessary to provide a means for changing the rela-

tive angular position between the orientating means 9 and the camera 3. This is provided by the adjustable coupling including the worm gear 21 having attached thereto a crank 23 for manual operation and whose axis is fixed to the television camera 3. The worm gear 21 is adapted to engage a gear 25 which is fixed to the automatic orientation means 9. This provides an adjustable angular position between the camera 3 and the orientating means 9. An angular scale 27 is mounted on the gear 25 such that the angle between the automatic orientating means 9 and the camera 3 may be adjusted.

In Fig. 3 there is shown still another modification of this invention in which the automatic orientation means 9 is coupled directly to the television camera 3 and wherein there is mounted a gear 28 which is engaged by a worm gear 29 driven by the motor 11 which is controlled by the automatic orientation means 9.

It will be seen from this modification that the camera is always oriented in the same direction regardless of the direction of flight of the airplane carrying the camera and therefore it becomes necessary in any one particular location to orient the transmitting antenna such that the radio beam transmitted therefrom will be in the general direction of the receiving station. This is accomplished by the engagement of the worm gear 31 and the gear 33. The worm gear 31 is fixed to the television camera and is rotated by a crank 35 and adjusted by the operator for any particular direction of transmission. The reflector 19 and its associated antenna element 5 is thus orientated in the general direction of the receiving station regardless of the direction of flight.

It is also possible for the operator to continually adjust the antenna such that it will be pointed directly at the receiving station regardless of movement of the plane over a certain designated area but practically speaking this will not be necessary if the television pickup is at a remote distance from the receiving station because the angle of error will be very small and the width of the radio beam will be sufficiently broad to cover such an angle of error.

Turning now to Fig. 4, there is shown a practical example of the installation of one form of this invention in accordance with the equipment shown and described in Fig. 3. It will be noticed that regardless of the direction of flight of the airplane the television camera 3 is maintained in the desired orientation. While the airplane is flying in the northwesterly direction one edge of the television camera will be, for example, to the right front and, should the airplane change its direction, such as to fly in a southwesterly direction, as shown by the dotted lines in Fig. 4, the same edge of the television camera as formerly pointed to the right front now points to the right rear. It will also be noted that the transmitting antenna maintains its general direction east-southeast which, for this example, is the general direction in which the receiving station is located.

By the use of either of the above forms as set forth in detail, it is not necessary for the operator to continually adjust the equipment but it is only necessary for him to adjust the relative angular position between the camera and the transmission antenna.

However, it may become desirable in the arrangement of Fig. 2 to maintain the orientation of the television camera such that the top of the

received image will represent the terrain farthest away from the receiving station, and the transmission beam will be pointed always in the direction of the receiver. This may be done by the operator by monitoring continuously a direction indicator in the aircraft which is actuated by an auxiliary radio beam from the receiving station. Such modification would provide the observer at the receiving station with an image which would be the same as if he were at a high altitude above the receiving station and observing the televised area through a powerful telescope.

If it is necessary to continuously orientate the transmitting antenna such that the radio beam will be pointed continuously at the receiving station, it is only necessary for the operator to manually adjust the orientation of the transmitting antenna through the crank member 33 in Fig. 2 or the crank member 35 in Fig. 3.

In still another form of this invention, the deflection coils of the image pickup tube are oriented. In this form of the invention, the scanning is maintained in a predetermined compass direction while television equipment may be fixed stationary in the aircraft.

While several systems for carrying this invention into effect have been indicated and described, it will be apparent to one skilled in the art that this invention is by no means limited to the particular organization shown and described, but that many modifications may be made without departing from the scope of this invention as set forth in the appended claims.

We claim as our invention:

1. In a television transmission system of the type adapted for the transmission of television signals from aircraft and the like comprising in combination a television camera, means for maintaining the orientation of said camera in a predetermined compass direction independent of the orientation of said aircraft, a radio beam transmitter, a reflector attached to said transmitter, and means for maintaining a desired relation between the orientation of said camera and that of said transmitter.

2. In a television transmission system of the type adapted for the transmission of television signals from aircraft and the like comprising in combination a television camera, a radio beam transmitting antenna attached to said camera, and means for continuously maintaining a desired orientation of said camera in a predetermined compass direction independent of the orientation of said aircraft.

3. In a television transmission system of the type adapted for the transmission of television signals from aircraft and the like comprising in combination a television camera, a radio beam transmitting antenna, means for adjusting the angular position of said antenna to said camera, and automatic means for maintaining a desired orientation of said camera in a predetermined direction independent of the orientation of said aircraft.

4. In a television transmission system of the type adapted for the transmission of television signals from aircraft and the like comprising in combination a television camera, magnetic means for maintaining a desired compass direction orientation of said camera independent of the orientation of said aircraft, and a radio beam transmitting antenna whose relative angular position to said television camera remains substantially the same.

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5. In a television transmission system of the type adapted for the transmission of television signals from aircraft and the like comprising in combination a television camera including a light-sensitive mosaic, an electron beam producing means, means for causing said electron beam to scan said mosaic, a radio beam transmitting antenna, means for adjusting the angular position of said antenna to said camera, and means for maintaining a desired orientation of said scanning independent of the orientation of said aircraft.

6. In a system for the transmission of television signals from an aircraft flying over a target area or the like of comparatively small width as compared with its distance from a receiver that is to receive said signals, a television camera on said aircraft, said camera being so mounted that it is directed toward said target area for transmitting a picture thereof, and compass means for automatically maintaining the orientation of said camera in a predetermined direction independent of the orientation of said aircraft.

7. In a system for the transmission of television signals from an aircraft flying over a target area or the like of comparatively small width as compared with its distance from a receiver that

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is to receive said signals, a television camera on said aircraft, said camera being so mounted that it is directed toward said target area for transmitting a picture thereof, compass means

5 for automatically maintaining the orientation of said camera in a predetermined direction independent of the orientation of said aircraft, a radio beam transmitting antenna located on said aircraft, and means including said compass means
10 for directing said beam toward said receiver so long as the aircraft remains substantially over said area.

8. In a system for the transmission of television signals from an aircraft flying over a target
15 area or the like of comparatively small width as compared with its distance from a receiver that is to receive said signals, a television camera on said aircraft, said camera being so mounted that it is directed toward said target area for transmitting a picture thereof, and compass means
20 for automatically maintaining the orientation of said camera substantially in the same direction as that of the aircraft with respect to said receiver so long as the aircraft remains substantially over
25 said area.

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