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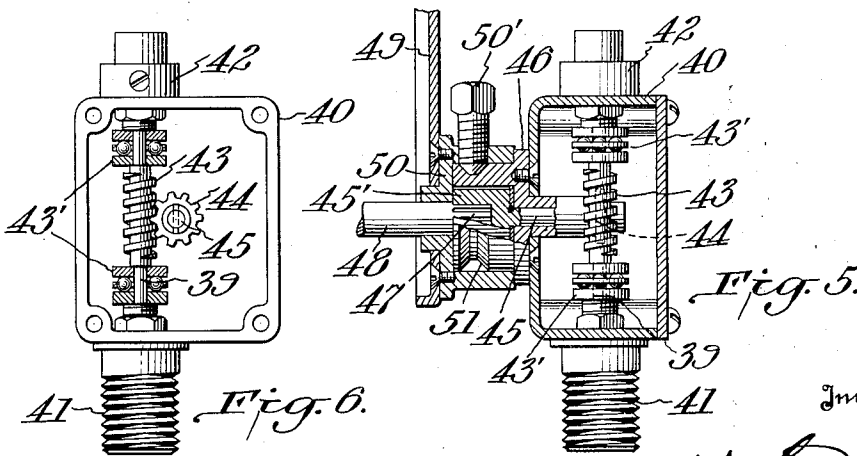
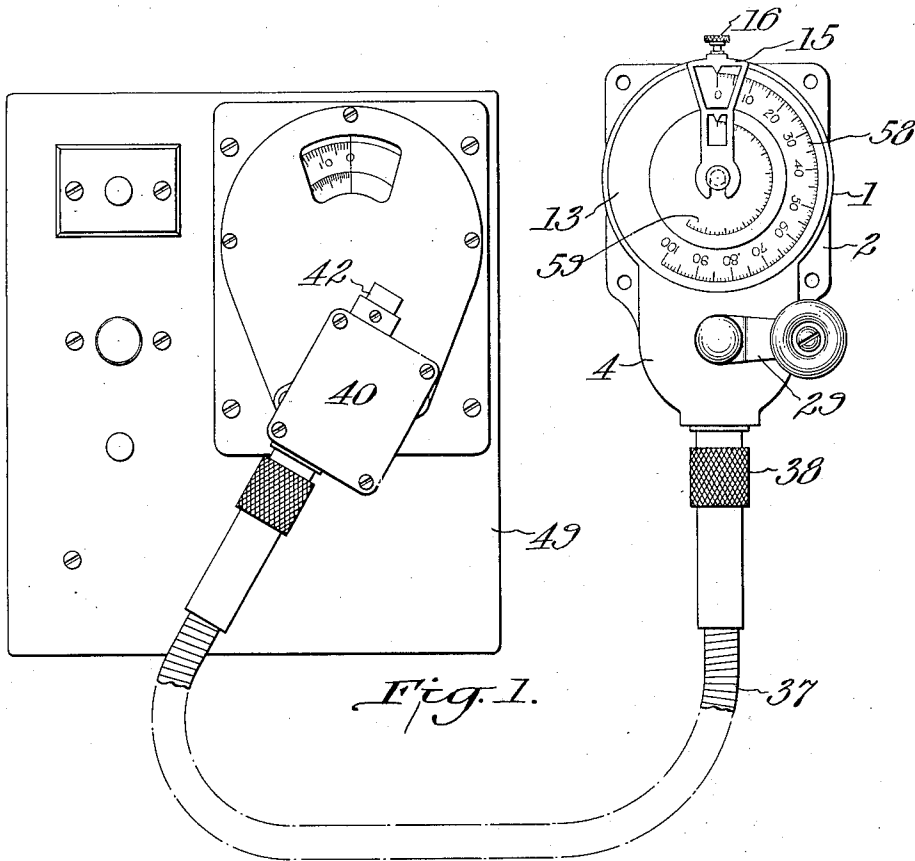
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CONTROL AND INDICATING APPARATUS

Filed Dec. 15, 1930

2 Sheets-Sheet 1



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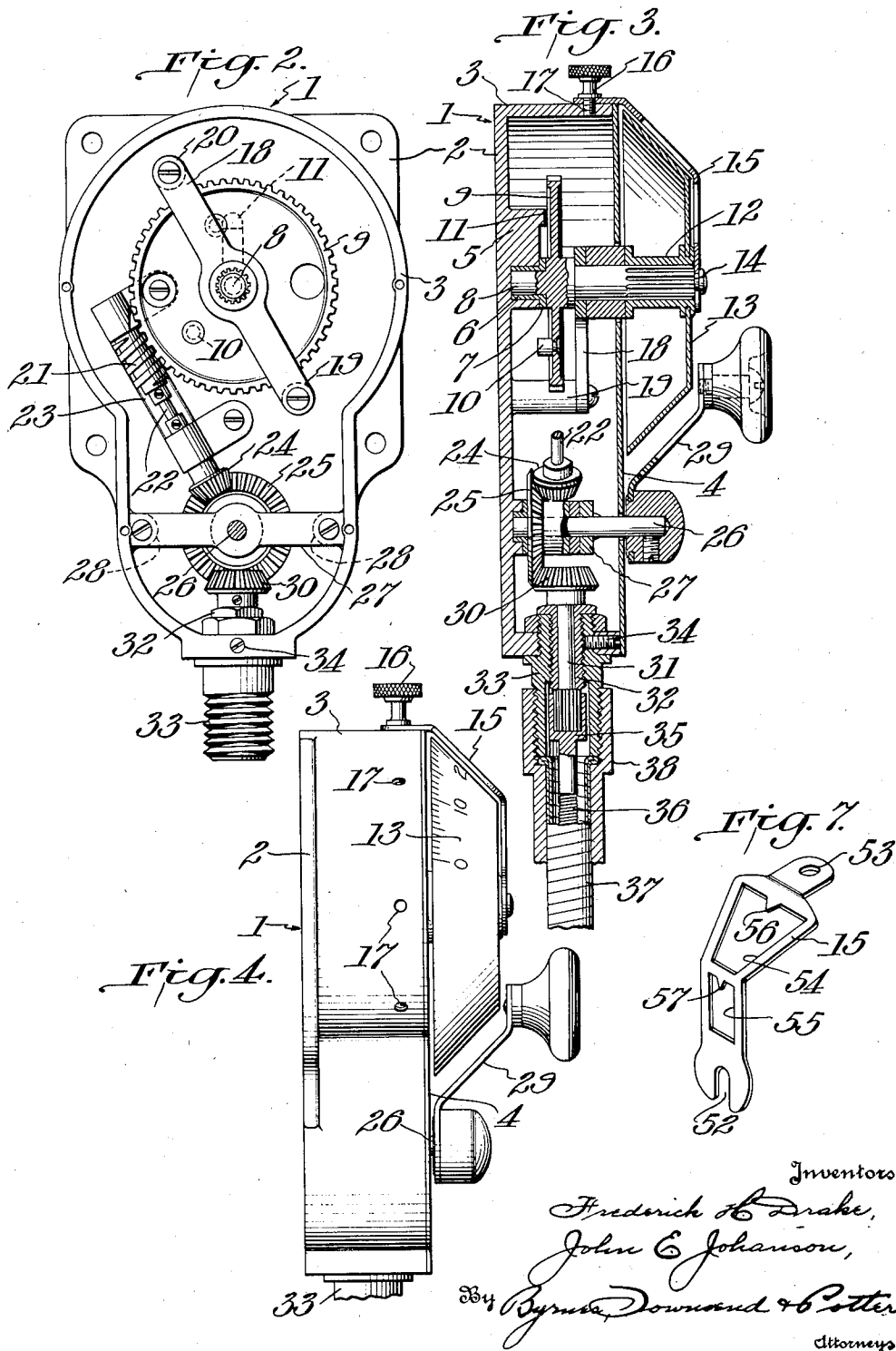
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UNITED STATES PATENT OFFICE

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CONTROL AND INDICATING APPARATUS

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9 Claims. (Cl. 250—40)

This invention relates to control and indicating apparatus, and more particularly to control apparatus adapted to be located at some distance from radio equipment, such as a transmitter or receiver.

In the case of tuned radio equipment installed on aircraft, it is usually impractical to locate the receiver or transmitter within reach of the operator due to the fact that the space adjacent the operator is very limited and, in general, is occupied by the apparatus used in operating the aircraft, hence it is necessary to place the radio equipment at some distance from the operator and to provide a remote control mechanism for location on the instrument panel within easy reach of the operator.

Considerable difficulty has been encountered in the design of remote control equipment for use on aircraft. The efficiency of the radio equipment is considerably reduced if the remote control device cannot be readily set to predetermined positions of adjustment and, if there is backlash or play in the device, the radio equipment may be practically inoperative as the operator has no assurance that the tuning element of the radio equipment has been adjusted to the desired position. Furthermore, radio equipment for aircraft is frequently adjustable for operation of a number of frequency ranges and the remote control should preferably be of such design as to permit a quick interchange of the indicating dials for the individual frequency ranges. In addition to the requirements imposed by radio equipment, the remote control device should be free from liability to damage from vibration and should be of minimum size and weight.

An object of the invention is to provide remote control apparatus which is simple and rugged in construction and which is certain and accurate in operation, whereby desired settings of a radio tuning mechanism may be quickly and easily obtained even though the mechanism is located at a point remote from the operator.

Another object of the invention is the provision of remote control apparatus which is small and light, which has but few parts and is not easily damaged by shocks and vibration, whereby the device is particularly adapted for use on vehicles, especially in aircraft.

Another object of the invention is the provision of apparatus of the above type wherein any desired setting of the tuning mechanism may be made quickly and easily, the setting being indicated at the remote control point by an indicator which is at all times in full view of the operator.

Another object of the invention is the provision of apparatus of the above type, having a readily replaceable indicator for indicating the setting of the tuning mechanism whereby another indicator having a different wave length range may be substituted.

Another object of the invention is the provision of apparatus of the above type, having an adjustable fiducial mark which may be positioned to facilitate the setting of the tuning mechanism, irrespective of the angular position of the control device.

Another object of the invention is the provision of apparatus of the above type, having an indicator provided with several indicating scales which may be used concurrently and a fiducial member having a fiducial mark corresponding to each scale, whereby the indicator may be made to read in two or more sets of units, such as frequency and station letters.

Other objects of the invention will appear from the following description and accompanying drawings, wherein:

Fig. 1 is a front elevational view showing the remote control apparatus and a radio receiver;

Fig. 2 is a front elevational view of the control device with the casing cover removed;

Fig. 3 is a longitudinal cross-sectional view of the control device;

Fig. 4 is a side elevational view showing the control device;

Fig. 5 is a longitudinal cross-sectional view showing the transmission mechanism;

Fig. 6 is a front elevational view showing the transmission mechanism with the cover removed; and

Fig. 7 is a perspective view of the dial-attaching clip.

The apparatus comprises in general, three principal elements, a control device disposed near the operator, a transmission mechanism attached to the casing of the receiver or other apparatus which is to be adjusted, and a cable connection for transmitting the movement of the elements of the control device to the transmission mechanism.

In the particular embodiment of the invention which is illustrated, a casing 1 having a flat base 2, an integral wall 3 upstanding therefrom in the form of a circle having an arched depending portion and a cover plate 4 secured to the wall 3, constitutes housing and mounting means for the elements of the control device. Formed integrally with the base is an upstanding recessed boss 5 in which is pressed a bushing 6 having a flange 55

7 on its upper end overlying the top surface of the boss 5 to form an end bearing. Journalled in the bushing 6 is a shaft 8, formed integrally with a large spur gear 9 to which gear is secured a stop pin 10, arranged to strike against an extending portion 11 of the boss 5 to thereby limit the rotation of the gear 9.

The other end of the shaft 8 extends through the cover plate 4 and is splined for cooperation with a splined bushing 12 to which is secured a dial member 13 having the form of a frustum of a cone. Formed on the outer end of the shaft 8 adjacent the splined portion, is a circumferential groove 14 into which is fitted the forked end of a doubly bent clip 15 which closely overlies the dial member 13 and which is secured at its other end to the side wall 3 of the casing 1 by a screw 16 threaded into one of a number of tapped holes 17 arranged along the side wall of the casing 1. A yoke member 18 having its ends resting upon and secured to the upper ends of a pair of pillars 19, 20, upstanding from the base 2, is fitted over the shaft 8 and bears against the top surface of the hub of the gear 9 to retain the end of the shaft 8 in the bushing 6.

Meshing with the large gear 8 is a worm 21 carried on a connecting shaft 22 which extends parallel to the base 2 and which is journalled in a bearing member 23, screwed to the base 2. A portion of the upper bearing is cut away to permit closer spacing of the bearings and perforations are provided in the large gear to permit access to the screw which secures the bearing member to the base. The shaft 22, which extends obliquely into the lower portion of the casing, carries a bevel gear 24 in mesh with the main driving gear 25 secured on the operating shaft 26 which extends through a bearing plate 27 resting on shoulders 28 formed in the casing wall 3, and through the cover plate 4. Secured on the outer end of the operating shaft 26, is a doubly bent crank arm 29 having such a length that in its upright position it does not extend beyond the axis of the dial.

A second bevel gear 30 meshing with the main driving gear 25 is carried by a transmission shaft 31 that is journalled in a bushing 32 threaded in a collar 33 that extends through the wall 3 of the depending portion of the casing 1. The collar 33 is threaded into the casing wall 3 and locked in place by a set screw 34, thus permitting adjustment of the bevel gears 25 and 30 by turning the bushing 32 within the collar 33. The other end of the transmission shaft 31 is splined to receive a splined coupling element 35 on the end of a flexible drive shaft or coiled cable 36. The cable 36 is protected by a flexible conduit 37 on which is secured coupling member 38 that is internally threaded to engage the outer end of the threaded collar 33.

The other end of the flexible cable 36 is provided with a similar splined coupling member for engagement with the splined end of a shaft 39 mounted in a reduction gear box 40, the flexible conduit 36 being similarly provided with a coupling member for securing the conduit 37 to the threaded collar 41 which provides one journal bearing for the shaft 39. The other end of the shaft 39 is mounted in an adjustable journal bearing 42 that is mounted in the opposite wall of the gear box 40.

The shaft 39 carries a worm 43 which meshes with a worm wheel 44 mounted on a connecting shaft 45 that extends perpendicularly to the first shaft 39 and is journalled in a member 46 which

is secured to the rear wall of the gear box 40 and projects outside the same to form a coupling member. Ball thrust bearings 43' are located between the worm 43 and the ends of the journal bearings 41 and 42, respectively, to prevent axial movement of the shaft 39 and worm 43.

The connecting shaft 45 is provided with an enlarged and internally splined head 45', the shaft being retained against axial movement within the member 46 by the worm wheel 44 and the enlarged head 45' that seat against radial surfaces on the member 46.

A tuning shaft 48 on the receiver has a splined end, complementary to the splined end 45' of coupling shaft 45, which projects from the receiver casing 49 and has its other end operatively connected to the tuning elements (not shown) of the receiver. A socket 50 is mounted on the receiver casing to form a housing for the splined end of shaft 48, the socket carrying a set screw 50' for engagement in a groove 51 in the coupling member 46 of the reduction gear box when the latter is positioned to bring the splined head 45' into engagement with the tuning shaft 48.

The installation of the apparatus may be readily accomplished. The receiver 49 and tuning unit or control box 1 are mounted at convenient positions on the aircraft or other vehicle. The flexible cable 36 and conduit 37 are cut to appropriate length and the ends are provided with splined and threaded coupling elements 35, 38, respectively. One end of the cable and conduit member is connected to the tuning unit 1 and the other end is connected to the reduction gear box 40. The coupling element 46 is slipped into socket 50 to engage the connecting shaft 45 with the tuning shaft 48 of the receiver and the set screw 50' is tightened to lock the reduction gear box to the receiver. Particular attention is directed to the fact that the shaft 45 is automatically coupled to shaft 48 by securing the reduction gear box 40 to the receiver.

The clip 15 which is shown in detail in Fig. 7, serves both as a means for retaining the dial 13 on the shaft 8 and as a fiducial marker for the dial. The clip 15 is formed with an open slot 52 in one end, a circular opening 53 in the other, and two sight openings 54, 55 with pointers 56, 57. Transverse bends of approximately 45° are made between the circular opening 53 and the adjacent sight opening 54 and between the two sight openings 54, 55, whereby when the clip is in its position on the casing 1 it closely overlies the dial 13. The two sight openings 54, 55 and pointers 56, 57 are provided in order that two scales 58, 59 may be marked upon the dial 13, one the usual numerical scale 58 and the other a scale 59 on which station call letters or other significant data may be inscribed by the operator. To permit the operator to place his own marking upon the dial, which is preferably formed of metal, the surface may be oxidized, enameled or otherwise provided with a coating which may be scratched through or engraved to reveal the metallic surface of the dial.

The operation of the apparatus is as follows: The rotation of the crank arm 29 about the axis of the shaft 26, turns the latter which effects rotation of the main driving gear 25. The bevel gear 25 rotates bevel gear 30 and the transmission shaft 31, and this movement is transmitted by the flexible cable 36 to the shaft 39 in the gear box 40. The rotation of this shaft 39 is transmitted through the worm 43 and worm 75

wheel 44 to the connecting shaft 45 and thence to the tuning shaft 48 of the radio receiver.

The movement of the main driving gear 25 is also imparted to the connecting shaft 22 by the bevel gear 24 and the worm 21 is thereby rotated, to turn the large spline gear 9 and shaft 8, thus rotating the dial 13 in accordance with the movement of the crank arm 29. The setting of the tuning condensers is indicated on the dial 13.

The proper relationship between the tuning shaft 48 and dial 13 may be secured by placing shaft 48 at one limit of its range of adjustment and setting dial 13 at the corresponding position, when the reduction gear box 40 is separated from the receiver or the drive cable is disconnected from the reduction gear box. After thus setting the parts, the driving connection is established as described above, the gear box 40 being adjusted angularly on the receiver socket 50 and/or the worm shaft 39 being turned, if necessary to permit engagement of the splined coupling members.

As it may be impractical to mount the tuning unit 1 in vertical position, as shown in Fig. 1, the clip 15 which bears the fiducial marks may be placed in approximately upright position for any particular mounting of the tuning unit by inserting the fastening screw 16 in the proper threaded opening 17. Although the stop members 10, 11 limit the angular movement of the dial shaft 8 to something less than 360°, the pitch of the splines on the dial bushing 12 is such that, for any position of the fiducial marks, the dial may be properly set upon shaft 8 to movement of the entire set of scale graduations past the fiducial marks as the crank 29 is turned to vary the setting of the receiver tuning elements.

Receivers installed on aircraft are frequently designed for operation over different frequency ranges by means of plug-in coils or transformers. Where this is done, it is desirable to replace the dial on the remote control device by a dial marked to correspond with the particular frequency range over which the receiver is to be operated. In the present invention, the dial is changed in a very simple manner. The screw 16 is removed and the bifurcated end of the clip 15 drawn out of engagement with the end of the shaft, thus permitting the splined bushing 12 to be slid off the shaft 8. Another dial is slid into the end of the shaft 8, and the clip 15 is then replaced and secured by the screw 16.

As will be seen from Fig. 1, the crank arm 29 is so positioned and of such length that when it is in its uppermost position, it does not extend to the axis of the dial 13. Thus, the crank arm 29 does not obscure the dial in any of the positions which it may assume in the operation of the control device.

It will be noted that due to the particular arrangement of elements, both the control device and the transmission mechanism are unusually small and compact, which feature is of great importance in radio apparatus intended for use on aircraft. The small number of parts employed in the construction of the apparatus and the sturdy nature thereof, are also of importance as they minimize the possibility of the apparatus being rendered inoperative by the shocks and vibration inherent in the operation of aircraft and facilitate the repair and/or replacement of worn or damaged parts. All of the shafts are adequately supported by sturdy bearings and adjustable thrust bearings are provided for the

transmission shafts of the control box. Backlash may be substantially eliminated and, due to the rugged construction, there will be but little or no tendency for wear or vibration to destroy the original adjustment of the parts.

It should be noted that the term "dial" is used in the specification and claims in the sense in which it is commonly used in the art and is to be read as any member having graduations, scales or other indications for the purpose of indicating the setting of the tuning element.

We claim:

1. A remote control tuning unit for radio equipment and the like comprising a housing, a pair of parallel shafts rotatably supported in said housing and having end portions extending to the exterior thereof, a handle for rotating one shaft, a drive shaft geared to the said shaft, gearing connecting the said parallel shafts, a dial exterior to said housing and mounted on the other parallel shaft and a fiducial marker securing said dial to its shaft.

2. A remote control tuning unit for radio equipment and the like comprising a housing, a pair of parallel shafts rotatably supported in said housing and having end portions extending to the exterior thereof, a handle for rotating one shaft, a drive shaft geared to the said shaft, gearing connecting the said parallel shafts, a dial exterior to said housing and mounted on the other parallel shaft, a fiducial marker securing said dial to its shaft and means on said housing for securing said marker thereto in any one of a plurality of positions.

3. In remote control apparatus for radio equipment, a base, a crank, a shaft mounted on said base and carrying said crank and a bevel gear, a dial, a second shaft on said base and carrying said dial and a spur gear, a fiducial marker securing the dial to its shaft, a connecting shaft extending substantially parallel to said base and carrying a bevel gear meshing with said first bevel gear and a worm meshing with said spur gear.

4. In remote control apparatus for radio equipment and the like the combination with a base of a shaft mounted therein, a dial carried on said shaft and means including a clip overlying said dial adapted to be fixed with relation to said dial in any one of a plurality of positions for retaining said dial on said shaft said clip being formed so as to constitute a fiducial member for the dial.

5. In remote control apparatus for radio equipment the combination with a base, of a shaft mounted therein, a dial carried on said shaft and means including a clip overlying said dial for retaining said dial on said shaft, said clip being formed so as to constitute a fiducial member for said dial.

6. In remote control apparatus for radio equipment and the like the combination with a casing including a base of a shaft mounted in said base, a dial carried on said shaft and means including a clip overlying said dial adapted to be fixed with relation to said dial in any one of a plurality of positions for retaining said dial on said shaft, said clip having one end thereof engaging the end of said shaft and the other end thereof secured to said casing and an opening in said clip to expose a portion of the dial therethrough.

7. In remote control apparatus for radio equipment, the combination with a casing, of a dial, means rotatably mounting said dial at the exterior of said casing, a fiducial member disposed over said dial and means for securing said mem-

ber to said casing in any one of several different positions.

8. In remote control apparatus for radio equipment, the combination with a casing, of a shaft mounted on said casing, a dial carried on said shaft, a fiducial member overlying said dial and having one end engaging said shaft to retain said dial thereon and means for securing the other end of said fiducial member in any one of a plurality of positions.

9. In a remote control for radio equipment, the combination with a housing, a dial exterior to said housing and mounted on a shaft rotatably

supported in said housing, a fiducial mark co-operating with said dial and adapted to be fixed in any one of a plurality of positions, and a stop for limiting the range of angular movement of said shaft, said shaft and said dial having complementary splined coupling elements for securing the dial to said shaft, the pitch of the splines permitting said dial to be so positioned on said shaft that the full scale of said dial co-operates with said fiducial mark irrespective of the particular adjustment thereof.

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