Oct. 31, 1933. J. O. GARGAN ET AL 1,932,816

REMOTE CONTROL DEVICE

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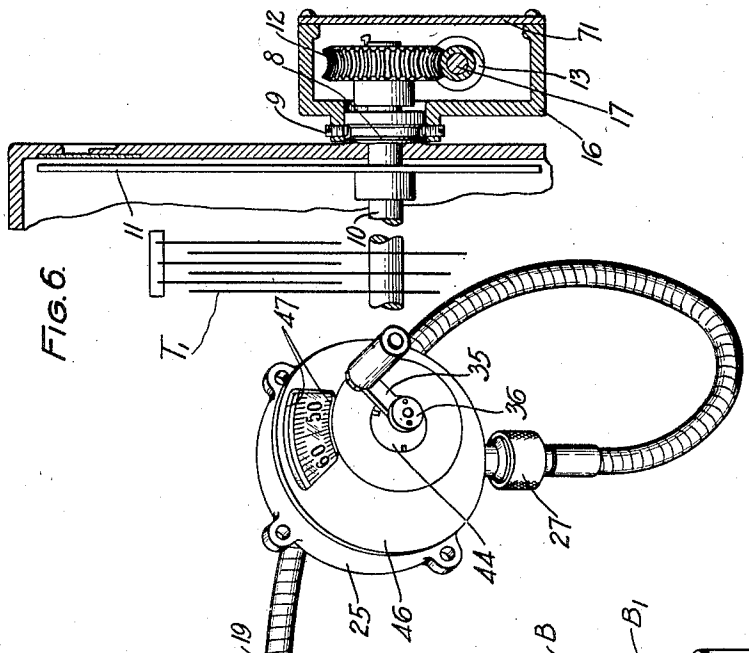
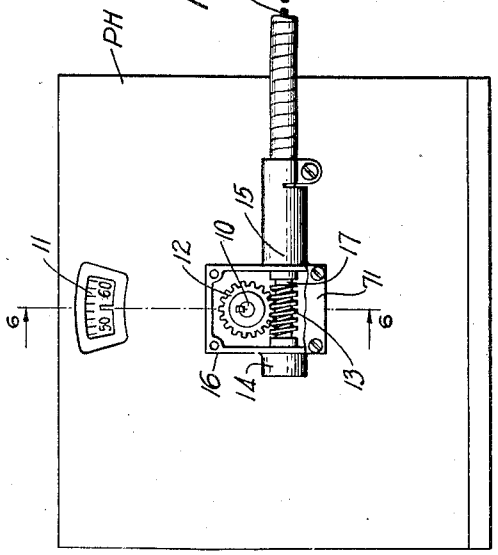


FIG. 6.

FIG. 1.



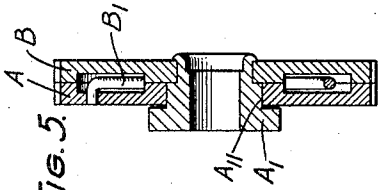


FIG. 5.

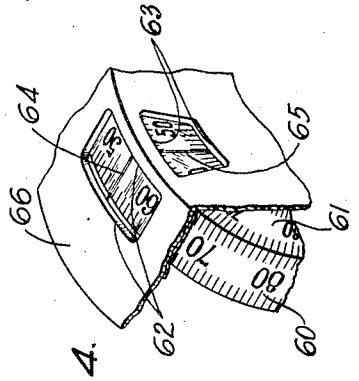


FIG. 4.

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Fig. 3.

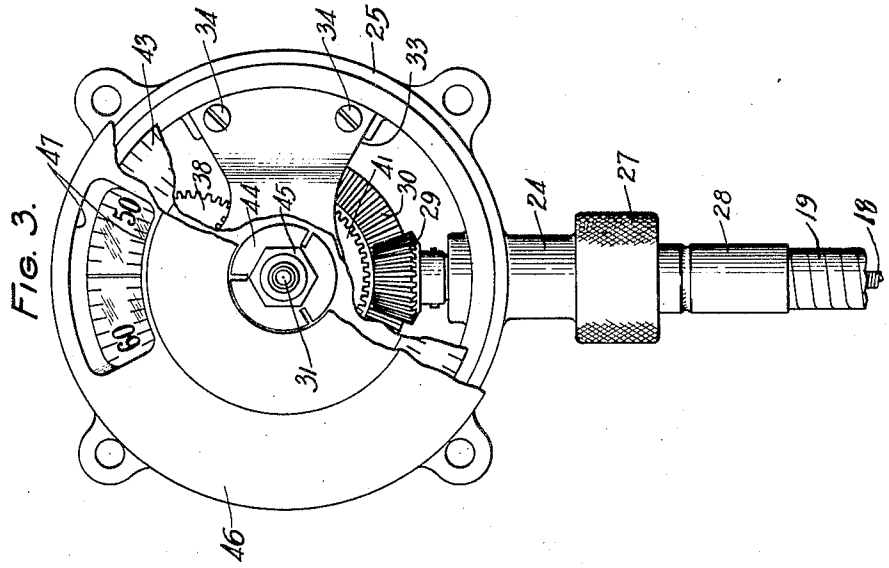
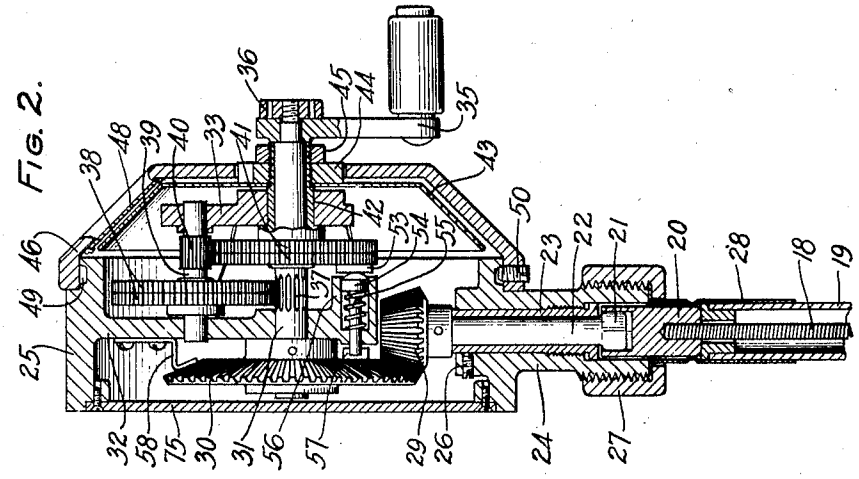


Fig. 2.



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REMOTE CONTROL DEVICE

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Serial No. 393,296

3 Claims. (Cl. 74—7)

This invention relates to remote control devices.

In radio receiving and transmitting apparatus of the type used in airplanes, for example, where the set is placed at a considerable distance from the operator, a remote control mechanism actuated by the operator is provided for moving the tuning element of the set in adjusted position with respect to marks on a dial which indicate the wave length at which it is desired to receive or send signals.

The object of this invention is to provide a remote control arrangement of this character which will be efficient in operation, cheap to manufacture, and wherein the tuning elements are moved in adjusted position in a simple and positive manner.

According to this invention a mechanical remote control arrangement is provided whereby the movement of a gearing mechanism under control of a manually operable crank arm is effective to actuate a flexible shaft for actuating a second gearing mechanism which is in turn connected to the tuning element of the set.

It has been found that due to the tortional elasticity of the flexible shaft, the positive operation of the tuning element of a radio set placed at a relatively great distance from the operator was most satisfactorily accomplished by providing a gearing mechanism by which the shaft is rotated at a relatively great number of turns relative to the adjusting movement of the tuning element actuated thereby and providing a reduction gear mechanism at the other end of the shaft. Best results have been obtained by providing a gearing mechanism at the operator's position in the ratio of substantially 1 to 4 and the gear mechanism at the remote end of the flexible shaft in the ratio of substantially 264 to 1. It also was found that the use of a flexible shaft for imparting movement to the tuning element greatly facilitates the mounting of the remote control on aircraft and that without interfering with the aircraft controlling mechanism.

In the drawings Fig. 1 is an assembly view of the remote control; Fig. 2 is a side assembly view of the actuating mechanism shown with the casing in section; Fig. 3 is a front view thereof showing portions of the casing and dial cut away to show the gearing mechanism more clearly; Fig. 4 is a perspective view of the dial used in this remote control modified; Fig. 5 is a sectional view of a back lash take-up gear used in this device; and Fig. 6 is an enlarged side view of the gear mechanism housing shown in Fig. 1.

In the remote control device of this invention the tuning element T_1 of the set shown in Fig. 6 in the form of a variable condenser is enclosed in a protecting housing PH. The rotor plates of this condenser may be operatively connected to the inner end of driven shaft 10 in any suitable manner. Shaft 10 is journaled in a collar 8 integrally formed with housing PH and on the outwardly extending end of this shaft is mounted a worm gear 12 which is operatively connected to worm 13 carried by shaft 17. This shaft is journaled in bearing portions 14 and 15 of a casing 16 in turn mounted on the hub portion 8 of housing PH. The casing 16 is provided with a cover 71 and is held in adjusted position on the hub portion by a number of screws 9 engaging a circular groove 8, this groove being provided to facilitate the adjustment or orientation of the casing 16 with respect to the general direction of flexible shaft 18.

One end of shaft 17 is provided with an ordinary coupling portion (not shown) for engagement with an associated clutch portion carried by the flexible shaft 18. Similarly, the other end of the flexible shaft 18 carries a coupling portion 20 which engages with an associated clutch portion 21 carried by a spindle 22. This spindle is journaled in a sleeve or bushing 23 which is adjustably mounted in projection 24 of a casing 25, the bushing being held in adjusted position therein by a set screw 26.

The coupling portions 20 and 21 are retained in engaged relation through a connecting nut 27 bearing on the flange portion of a sleeve 28 in turn secured at the end of a flexible protecting tubing 19 disposed around the flexible shaft 18. Spindle 22 carries a pinion 29 which meshes with a bevel gear 30 keyed on one end of shaft 31. The bushing 23 is made adjustable in order to easily secure the proper intermeshing adjustment of these gears. Shaft 31 is journaled in a partitioning flange 32 of casing 25 and in a bushing 42 in turn rotatably mounted in a bracket 33 which is secured in casing 25 by a number of screws 34 as shown in Fig. 3. On the outwardly projecting end of shaft 31 there is mounted a crank arm 35 which is held securely thereon by nut screw 36.

The shaft 31 is provided with a gear toothed portion 37 which is engaged by gear 38 of a construction shown in Fig. 5 and which will be hereinafter described in detail. This gear is mounted on a counter-shaft 39 journaled in the partition

flange 32 and in bracket 33. This shaft carries a pinion 40 which meshes with a gear 41 secured on the end of a sleeve 42 and on the other end of this sleeve is mounted a dial 43 which is held securely thereon by nut screw 44 and counter-nut 45.

The back of casing 25 is provided with a cover 75 and on the front end of this casing is mounted a cover 46 which is provided with an aperture 47 to permit the visual observation of dial 43 with respect to a hair-line mark disposed across a shield 48 of transparent material. Casing 25 is provided with a peripheral V-shaped groove 49 in which the reduced end of screws 50 fit for holding the cover 46 in position thereon and to permit the adjustment of the hair-line with respect to the marks on dial 48.

Gears 38 and 41 shown in detail in Fig. 5 each comprises two substantially similar sections A and B. Section B of each gear, for example is secured to the hub A_1 and the other section loosely mounted on the bearing portion A_{11} of the hub. A spring B_1 has one end hooked to gear section A as shown and the other end hooked to the section B in a similar manner. The spring B_1 is then tensioned by imparting a rotary movement of one gear with respect to the other gear and the two sections mounted in engagement with their associated pinions 37 and 40. This arrangement eliminates any back lash between these gear sections and the pinions with which they mesh and permits great accuracy in the operation of the dial 48.

Gear 41 carries a cam 53 disposed in engageable relation with a plunger 54 normally held in retrated position by a spring 55. This plunger is slidably mounted in a bearing portion 56 in the casing partition 32 and extends in engageable relation with a stop 57 carried by gear 30 for arresting the movement of the crank arm 35 as will be hereinafter described in detail. On one side of the casing partition is mounted a leaf spring 58 which is tensioned against the teeth of gear 30 to serve as a brake for holding the crank arm 35 and the mechanism actuated thereby in adjusted position.

The modified dial shown in Fig. 4 comprises a rim 60 combined with a disc 61. The face of the rim and the disc are each provided with cooperating marks which appear through respective aperture 62 and 63 provided with hair-line 64 and 65 in shield 66. This arrangement permits the accurate reading of the dials through an angle of substantially 90° with respect to the plane of rotation of the combined dials.

In operation the movement of the crank arm 35 is effective to rotate the shaft 31 and the bevel gear 30 for imparting movement to the flexible shaft through the rotation of pinion 29, the spindle 22 in turn connected to the flexible shaft by the coupling members 21 and 20. The movement of flexble shaft 18 in turn is imparted to the driven shaft 10 to which the tuning element and the dial 11 are operatively connected through the worm 13 and worm gear 12 keyed on the shaft 10. Upon the movement of the tuning element from its normal operated position to its maximum operated position the movement of gear 41 and the cam 53 carried thereby is effective to position the plunger 54 in the path of stop 57 carried by the bevel gear 30 and thereby stopping the movement of the crank arm 35 to prevent damaging the tuning element of the radio set controlled thereby.

The use of such a gearing arrangement, that is, the gear ratio at which the tuning element is moved with respect to the speed of the crank arm, the small torsional deformation of the flexible shaft having a length of about 35 feet is ineffective to prevent the accurate positioning of the tuning element in synchronism with the movement of the dial 43 at the driving end of the remote control mechanism. In actual use it has been found that the position of the tuning element with respect to the dial does not deviate more than a few seconds of a degree and is therefore negligible.

What is claimed is:

1. In a remote control mechanism, a driven shaft, a gearing mechanism, a flexible shaft operatively connecting the driven shaft to said mechanism, a crank arm for actuating said mechanism, a camming member, means in said mechanism for actuating said member, a plunger actuated by said member, and means in said mechanism cooperating with said plunger for limiting the movement of said crank arm.

2. In a remote control device, a driven shaft having a bevel gear at one end, a driving shaft, a crank arm and a bevel gear keyed on said driving shaft engaging the first mentioned bevel gear, a pinion carried by said driving shaft, an auxiliary shaft, a gear carried by said auxiliary shaft engaging said pinion, a pinion carried by said auxiliary shaft, a gear rotatably mounted on said driving shaft and engaging the last mentioned pinion, a cam carried by the last mentioned gear, a stop carried by the second mentioned bevel gear, a plunger actuated by said cam for engaging said stop for limiting the movement of said driven shaft and a device for retracting said plunger upon the reverse movement of said driving shaft.

3. In a remote control mechanism, a driving shaft, a flexible shaft, a gearing mechanism operatively connecting the first and second mentioned shafts, means carried by said driving shaft for actuating said mechanism, another gearing mechanism actuated by said driving shaft, a stopping mechanism controlled by the conjoint operation of said gearing mechanisms for defining the angular movement of said driving shaft, and means positioned by the operation of the second mentioned gearing mechanism for indicating the position of said driving shaft with respect to said driven shaft.

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