June 14, 1932. J. O. GARGAN 1,862,569

REMOTE CONTROL DEVICE

Filed Oct. 4, 1929

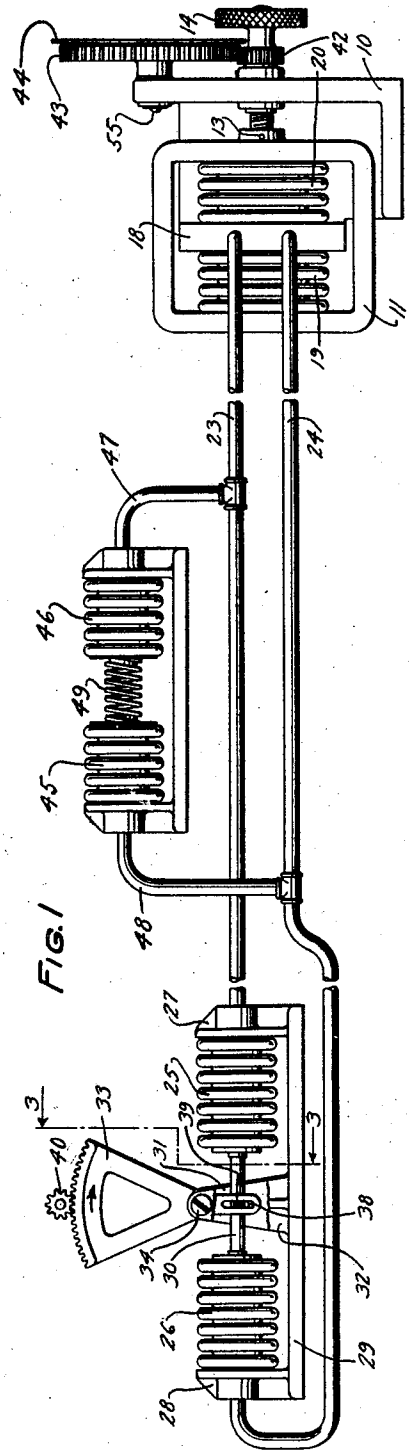

FIG. 1

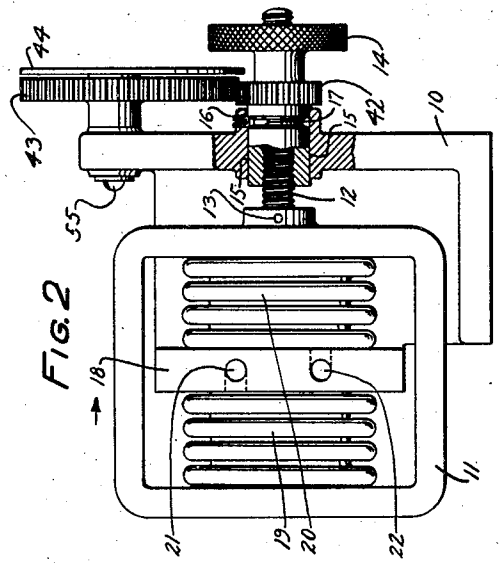

FIG. 2

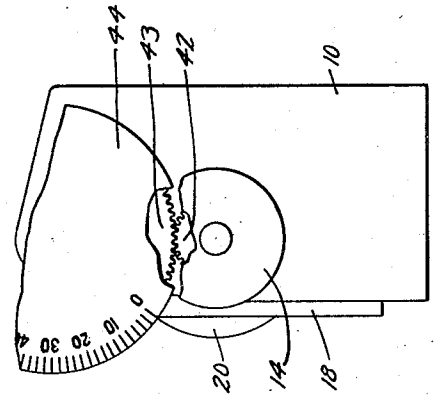

FIG. 4

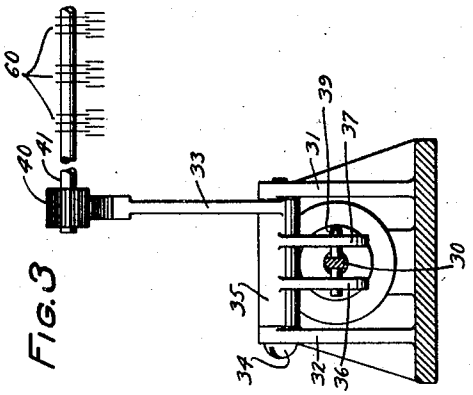

FIG. 3

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UNITED STATES PATENT OFFICE

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REMOTE CONTROL DEVICE

Application filed October 4, 1929. Serial No. 397,259.

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 indicates 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 element is moved in adjusted position in a simple and positive manner.

According to this invention, a hydraulic system is provided whereby the movement of a screw under control of a manually operable knob at the operator's position is effective to simultaneously expand and contract cooperating members in the form of metallic bellows for changing their volume and thereby causing a differential pressure in similar members connected thereto through a piping arrangement. These members form the remote end of the control and are disposed in coaxial alignment relative to each other with their adjacent ends connected to a rod. This rod is operatively connected to a gear sector which imparts movement to a pinion provided for actuating the tuning element of the set in response to the contraction and elongation of these members due to similar contraction and elongation of the driving members at the operator's end of the control. A dial is provided for indicating the movement of the tuning element and thereby indicating the wave length at which the radio signals are received or sent. A pressure compensating device in the form of two auxiliary expansible and contractible members which are acted upon by a compression spring and connected to the piping arrangement of the operating members is provided for compensating for variable pressure due to temperature changes and thereby maintaining equalized pressure in both sides of the system.

In the drawing, Fig. 1 is a side assembly view of the remote control; Fig. 2 is an enlarged view of the driving unit of this control with a number of operating parts shown in section; Fig. 3 is a sectional view taken approximately on line 3—3 of Fig. 1; and Fig. 4 is a front end view of the actuating mechanism with portions of the dial and actuating knob cut away.

In Figs. 1 and 2 of the drawing, 10 is an upright support on which a square shaped frame 11 is mounted. This frame carries a screw 12 which is secured thereon by a pin 13 and the screw extends in threaded engagement with an actuating knob 14, in turn rotatably mounted in the bearing portion 15 of support 10. The knob 14 is held against axial movement in the bearing 15 by a screw 16 engaging a groove 17 in the hub or bearing portion of the knob.

Upright support 10 is provided with a lug portion 18 extending at right angles with respect to the longitudinal axis of screw 12 and on its opposite faces are mounted the adjacent ends of two metallic bellows 19 and 20, the other ends of these bellows being secured to the inner sides of the frame 11 as shown in Figs. 1 and 2. The lug 18 of support 10 is provided with holes 21 and 22 which connect the pipes 23 and 24 to bellows 19 and 20 respectively.

The pipe 23 at the remote end of the control is connected to bellows 25 and pipe 24 to bellows 26, these bellows being disposed in coaxial alignment and supported on upright supports 27 and 28 formed integrally with a base 29. The adjacent ends of bellows 25 and 26 are securely connected to each other by a rod 30 shown in Figs. 1 and 3. Base 29 is provided with a pair of centrally disposed upright supports 31 and 32 which are provided for supporting a pivot 34 on which a gear sector 33 is mounted. This gear sector is provided with a hub portion 35 having depending arms 36 and 37 in the form of a fork which straddle the connecting rod 30. Arms 36 and 37 are each provided with a slot such as 38 shown in Fig. 1 for engagement with pin 39 carried by the rod 30. Gear sector 33 meshes with a pinion 40 keyed on the shaft 41 which may be connected to the tun-

ing element of a radio receiving or sending set such as the rotor plates of condenser 60 in any well known manner.

The actuating knob 14 at the operator's end of the control carries a pinion 42 which operatively engages a gear 43 rotatably mounted on stud 55 in turn secured on support 10; gear 43 being provided for actuating a dial 44 for indicating the position of the driven shaft 41 and the tuning element carried thereby with respect to the movement of knob 14.

At a point intermediate the driving unit at the operator's position, and the driven unit at the remote end of the control, there is provided a pair of auxiliary bellows 45 and 46. Bellows 46 is connected to pipe 23 by a small length of pipe 47 and bellows 45 is connected to the pipe 24 by pipe 48, and a spring 49 interposed between the adjacent ends of bellows 45 and 46 is provided for compensating for the different pressures of the fluid in the bellows and conduits of the control due to temperature changes.

In operation, the axial movement of screw 12 under control of the knob 14 is effective to impart a movement to the frame 11 in the direction indicated by the arrow for compressing the fluid in bellows 19. The fluid from this bellows is forced through pipe 23 into the bellows 25 connected thereto and causes this bellows to expand. The movement of frame 11 in the direction above specified causes the bellows 20 to expand, which in turn causes the contraction of bellows 26 due to the negative pressure caused therein by the expansion of bellows 20 under the movement of frame 11. Upon the elongation of bellows 25 and the simultaneous contraction of bellows 26, the pin 39 carried by the rod 30 moves the gear sector 33 and angular distance proportional to the movement of knob 14 and thereby sets driven shaft 41 in adjusted position, which position is indicated by the dial 44 operatively connected to the knob 14 through gears 42 and 43. Similarly, a movement of the frame 11 in direction opposite to that indicated by the arrow is effective to move the driven shaft in adjusted position in a reverse direction in the same manner as above described.

In this system any change of temperature which would tend to affect the normal fluid pressure in this control is automatically compensated by the spring 49 acting on bellows 45 and 46, the spring 49 being so tensioned as to maintain a pressure in the control many times that of the torque required for positively moving the tuning element in adjusted position. The pipes have an inside diameter of substantially ⅛ of an inch and the system may be filled with a mixture of 50% castor oil and 50% grain alcohol. The bellows 19 and 20 have a diameter of approximately 1½" and the bellows 25 and 26 approximately 1" in order to reduce the angular movement of knob 14 with respect to that of the tuning element.

What is claimed is:

1. In a hydraulic remote control, a plurality of pairs of expansible and contractible members, one of said pairs being of larger diameter than the other pair, conduits connecting said members, a manually operable device for actuating the larger pair of said members to cause a pressure difference in the other members for actuating them with a differential movement with respect to the other pair, a mechanism actuated by the expansion and contraction of the last mentioned members, an auxiliary pair of expansible and contractible members connected to said conduits disposed in coaxial alignment one with respect to the other and a spring interposed between the last mentioned members and automatically operating for compensating for the difference of pressure due to temperature changes in said members and said conduits.

2. In a hydraulic remote control, a plurality of pairs of expansible and contractible members, one of said pairs being larger than the other pair, conduits connecting said members, a manually operable device for actuating the larger pair of said members to cause a pressure difference in the other members for actuating them with a differential movement with respect to the other pair, a mechanism actuated by the expansion and contraction of the last mentioned members, an auxiliary pair of expansible and contractible members connected to said conduits and disposed in coaxial alignment one with respect to the other, means interposed between the last mentioned members and automatically operating for compensating for the difference of pressure due to temperature changes in said members and said conduits, and means operable for indicating the operation of said device in relation to the operation of the larger pair of said members.

In witness whereof, I hereunto subscribe my name this 1st day of October, 1929.

JOHN O. GARGAN.