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ELECTRICAL REMOTE CONTROL SYSTEM

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Fig 1

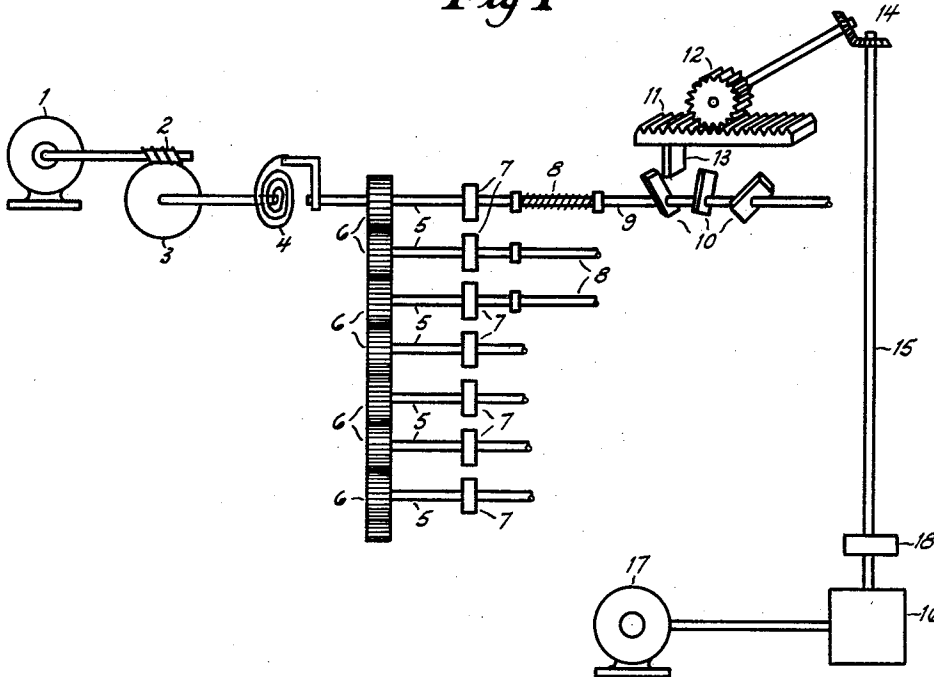


Fig 2

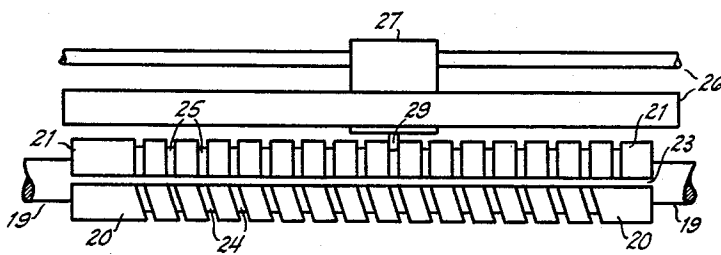
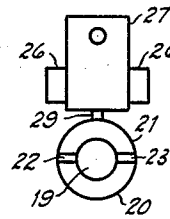


Fig 3



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ELECTRICAL REMOTE CONTROL SYSTEM

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6 Claims. (Cl. 192—139)

This invention relates to electrical remote control systems and more particularly to systems for the remote control of radio transmitters and the like.

5 It is commonly required to change the operating frequency of a radio transmitter from time to time from one to another of a plurality of predetermined different frequencies, i. e., to
10 change over from one "spot wave" to another and the changeover may be required to be effected either locally or by operation of a remote master control. Hitherto, it has been usual to provide a plurality of sets of circuit elements, one set for
15 each of the required "spot waves" of the transmitter, and to select the "spot wave" required at any time by selecting the appropriate set by a solenoid switch system or other relay system. This practice involves multiplication of high frequency circuit elements and the main object of
20 the present invention is to avoid this defect and provide improved control systems whereby selection of the operating frequency may be effected by remotely varying ordinary variable circuit elements such as would normally be provided in a
25 transmitter intended for local manual control only. As will be seen later an important advantage of the invention is that a remote control system in accordance therewith may be applied to an existing normal transmitter designed for local
30 manual control and having the usual adjustment handles projecting from the usual control panel, with a minimum of alteration—indeed the only alteration that may be necessary is the provision of mechanical drive means to said handles.

35 In order to simplify description, the operating handles, shafts, or other movable members whose positions have to be changed to change over a transmitter from one "spot wave" to another will, in the matter which follows, be referred to as the
40 "controlled shafts" of the transmitter.

According to this invention an electrical remote control system for remotely controlling a radio transmitter or the like comprises a drive motor or its equivalent, means including friction
45 drive means for driving the controlled shafts from said drive motor, a plurality of abutment members upon or driven with each controlled shaft, the abutment members associated with each shaft being in different (preferably individually adjustable) angular positions with respect
50 thereto, a plurality of movable stop means associated with the abutment members, a second motor or its equivalent, means for transmitting drive from the second motor to the stop means,
55 and switch control means for the two motors,

the abutment members and stop means associated with each controlled shaft being so arranged that, in one position (the zero position) of rotation of said shaft, the associated stop means can travel
5 over its whole range of movement without striking an abutment member while the possible rotation of said shaft is limited in dependence upon the position of the stop means by abutment of
10 one of the abutment members (which one is determined by the position of the stop means) with the stop means, the switch control means for the
15 motors being such that first the driving motor rotates all the controlled shafts to their zero positions, then the second motor moves the stop
20 means into positions dependent upon the positions of the controlled shafts ultimately required, and then the driving motor rotates sufficiently
25 far to bring an abutment member on each shaft against the associated stop means, the friction drive slipping for movement of the driving motor
30 beyond that necessary to bring the shaft abutment members against the stop means. Preferably the drive from the driving motor to the controlled shafts includes spring coupling means
35 so that when the said motor finally stops, stress previously imparted to the spring will hold the various abutment members firmly against their associated stop means and thus eliminate troubles
40 due to mechanical backlash.

The invention is illustrated in the accompanying drawing in which Fig. 1 shows, in purely
45 schematic manner, one embodiment and Figs. 2 and 3 show a detail modification.

Referring first to Fig. 1, an electric motor 1 (the driving motor) drives through irreversible
50 gearing—e. g., a worm and worm wheel 2, 3, one end of a spring coupling 4, the other end of which drives a plurality of first motion shafts 5 all of which are geared together by gears 6. There are as many first motion shafts 5 as there are controlled
55 shafts. Each first motion shaft drives through a friction clutch 7 and a suitable flexible drive shaft 8 one of the controlled shafts 9. On each controlled shaft (only one is shown) is a plurality of abutment members 10 arranged close
60 together at different points along the length thereof, said abutment members projecting radially from the shaft. These abutment members may be, as shown, each at a different angle so that in end view the abutment members on each
65 shaft will appear something like the treads of a so-called spiral staircase when seen in plan. The abutment members 10 on each shaft 9 do not extend right round it but a gap is left, i. e., it is as though the spiral staircase was of rather less

than one turn. By the side of each controlled shaft is a rack 11 and pinion 12 the rack 11 carrying a stop member 13 and being so arranged that upon rotation of the pinion 12, the stop member 13 can (if permitted by abutment members 10) move longitudinally over that part of the controlled shaft upon which the abutment members are located. The abutment members 10 are preferably individually adjustable in radial position—and, if desired, in longitudinal position also—on the controlled shafts 9. When any controlled shaft is in what is herein termed the zero position, the line of travel of the associated stop member 13 passes through the gap in the abutment member arrangement so that the said stop member can move over its whole travel without striking an abutment member. The rotation of any controlled shaft is limited in dependence upon the position of the associated stop member 13, for, when a certain amount of rotation has occurred, one of the abutment members 10 (which one depends on the position of the associated stop member 13) will strike the said stop member 13 rendering further rotation in the same direction (the forward direction) impossible and any further rotation of the driving motor beyond this point will only slip the appropriate friction clutch 7. It will further be seen that, since the drive from the driving motor includes irreversible gearing 2, 3, and a spring coupling 4 any abutment member 10 which has struck a stop member 13 will, even after the motor stops, be held firmly against it by the stress which will have been imparted to the spring in the coupling 4.

The pinions 12 driving the racks 11 are themselves driven through suitable gearing 14 from a shaft 15 driven through gearing 16 by a second electrical motor 17. This shaft 15 also drives a switch system indicated merely by the rectangle 18 and which may be of any suitable type, e. g., of the type comprising a contact or operating belt traversing a series of contacts.

Any suitable pre-selectable control circuits (not shown) are provided for securing the following sequence of operations:

- (1) The driving motor 1 is rotated in a backward direction to bring all the controlled shafts 9 to their zero positions.
- (2) The driving motor 1 stops and the second motor 17 is driven in one direction or the other until the stop members 13 (only one is shown) are brought into desired positions depending upon which "spot wave" is to be selected, i. e., the ultimately desired positions of the controlled shafts. The circuit of the second motor 17 is then broken by the switch system 18 driven thereby and the said motor is then stopped and, if required, held by a brake (not shown) of the magnetic pull on type whose circuit is also controlled by the switch system.

(3) The driving motor 1 then re-starts in the forward direction and rotates all the controlled shafts 9 until an abutment member 10 on each is stopped by the associated stop member 13. The motor runs further than is necessary to do this, the further movement being taken up by the friction clutches but serving to keep the spring "wound up" in the spring coupling 4. The motor 1 then stops, leaving the spring coupling "wound up" the reaction being taken by the irreversible worm gear 2, 3.

The spring means for eliminating backlash effects (the coupling 4) may be inserted anywhere in the drive to the controlled shafts, e. g., there

may be a spring coupling in each first motion shaft drive 5.

There will now be described with reference to Figs. 2 and 3 (which are mutually perpendicular views) a second and preferred form of mechanical device for translating rotary motion into longitudinal motion and which can be used in substitution for the rack-and-pinion drives 12—11 to the stop members 13 in the embodiment of Fig. 1. In place of rotating a plurality of pinions 12 one for each stop-member rack 11, the second motor 17 (not shown in Fig. 2 or 3) rotates a plurality of shafts 19, one for each stop member. On each shaft 19 (only one is shown in Figs. 2 and 3) are fixed two approximately semi-cylindrical members 20, 21, which together constitute a sleeve having two diametrically opposite grooves 22, 23, running parallel to the axis of the shaft. The semi-cylindrical member 20 is grooved with a series of helical half turns 24, i. e., it is like one half of a sleeve which has been cut with a two-start helical groove and then divided into two halves in a diametrical plane passing through its axis. The other semi-cylindrical member 21 is grooved with a series of equally spaced grooves 25 each in a plane perpendicular to the shaft axis. The pitch of these grooves 25 is the same as that of the helical half turns 24 and the two semi-cylindrical members are assembled on the shaft in such manner that one end of any helical half turn 24 on one member is opposite one end of a groove on the other 25, and the other end of said half turn 24 is opposite one end of the next groove 25 on the other. Parallel to the shaft 19 is a guide rail arrangement 26 on which is slidably mounted a carriage 27 carrying a stop member 13 (not shown in Figs. 2 and 3) and also carrying a pin 29 which engages the grooving on the semi-cylindrical members. Thus, for alternate half revolutions of the shaft 19 the carriage 27 will be stationary while for the other half revolutions the carriage 27 will be moved rapidly longitudinally. The main advantage of this mechanism over the racks and pinions of Fig. 1 is greater freedom from backlash and more easily obtainable accuracy of positioning.

The main advantages of control systems in accordance with this invention are

(a) The control system is independent, in essentials, of the transmitter design.

(b) The control system may be arranged as a separate unit and may be readily attachable to and detachable from a transmitter.

(c) Contact troubles such as arise in relay switch control systems are avoided.

(d) One general design of control system may be standardized for many different designs of transmitter.

What is claimed is:

1. An electrical remote control system for remotely controlling a radio transmitter or the like comprising a drive motor or its equivalent, means including friction drive means for driving the controlled shafts from said drive motor, a plurality of abutment members upon or driven with each controlled shaft, the abutment members associated with each shaft being in different (preferably individually adjustable) angular positions with respect thereto, a plurality of movable stop means associated with the abutment members, a second motor or its equivalent, means for transmitting drive from the second motor to the stop means, and switch control means for the two motors, the abutment members and stop means associated with each controlled shaft be-

ing so arranged that, in one position (the zero position) of rotation of said shaft, the associated stop means can travel over its whole range of movement without striking an abutment member while the possible rotation of said shaft is limited in dependence upon the position of the stop means by abutment of one of the abutment members (which one is determined by the position of the stop means) with the stop means, the switch control means for the motors being such that first the driving motor rotates all the controlled shafts to their zero positions, then the second motor moves the stop means into positions dependent upon the positions of the controlled shafts ultimately required, and then the driving motor rotates sufficiently far to bring an abutment member on each shaft against the associated stop means, the friction drive slipping for movement of the driving motor beyond that necessary to bring the shaft abutment members against the stop means.

2. A system as claimed in claim 1 wherein the drive from the driving motor to the controlled shafts includes spring coupling means such that, when the said motor finally stops, stress previously imparted to the spring will hold the various abutment members firmly against their associated stop means.

3. In combination with radio tuning apparatus, a remote control system comprising a ro-

tatable shaft, means frictionally and resiliently coupled to said shaft for driving the same, a plurality of radially disposed abutment members mounted on said shaft, each of said members occupying a separate orbital plane normal to the axis of said shaft, a bumper engageable with different ones of said abutment members, means for moving said bumper selectively into a predetermined one of said orbital planes, and remotely controlled means for actuating the bumper-moving means and the shaft driving means successively.

4. The combination according to claim 3 and including a spiral spring whereby the first said means is resiliently coupled to said shaft.

5. The combination according to claim 3 and including a plurality of control shafts geared one to another and operable with said rotatable shaft to effect simultaneous adjustment of different units of said control apparatus.

6. The combination according to claim 3 and including a rotatable grooved shaft in said bumper-moving means, and a tracer lug movable in the groove of said shaft and adapted to be selectively positioned lengthwise of said shaft, said tracer lug and said bumper being mechanically interlinked.

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