

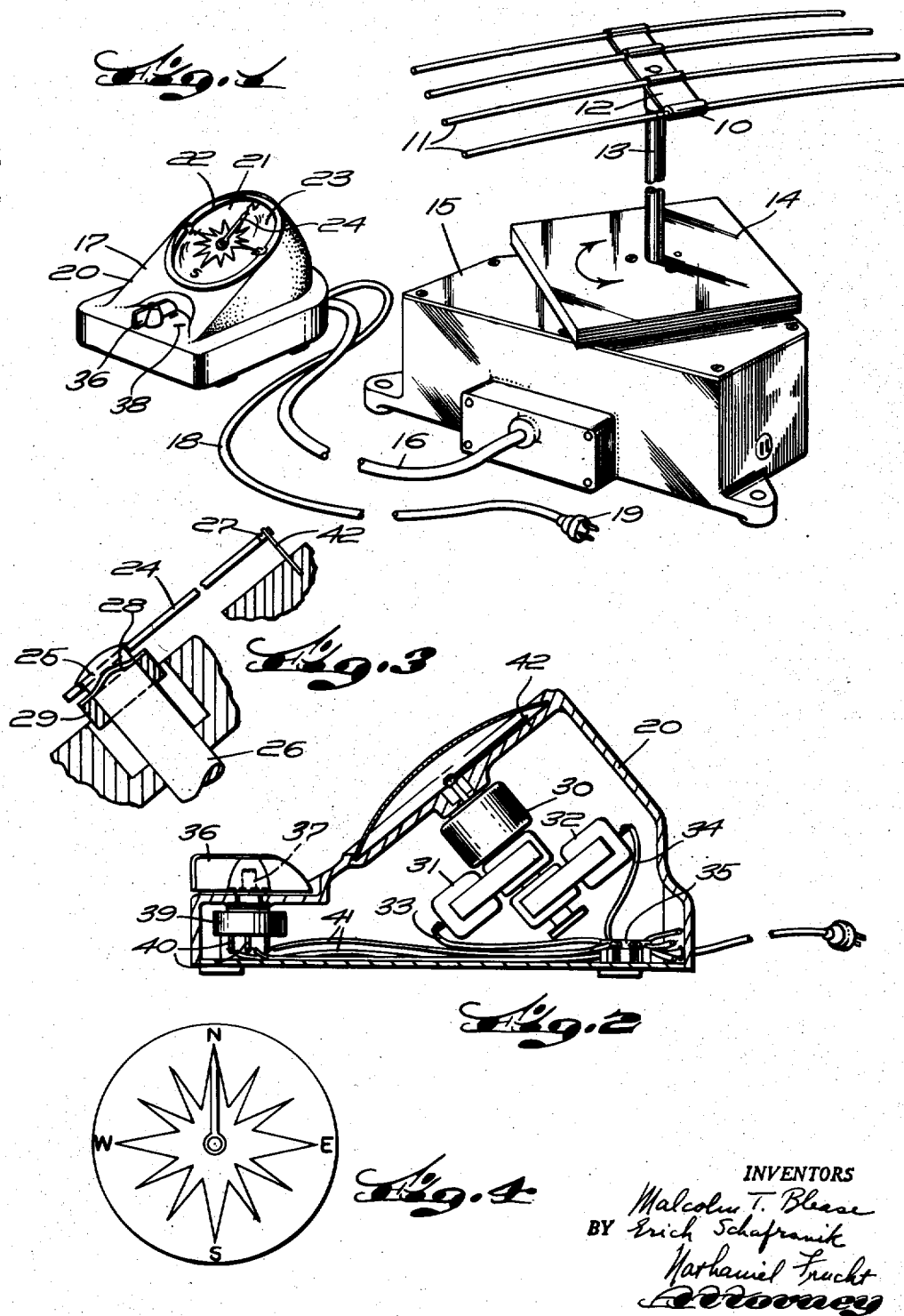
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M. T. BLEASE ET AL
REMOTE-CONTROL SYSTEM

2,559,339

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3 Sheets-Sheet 1



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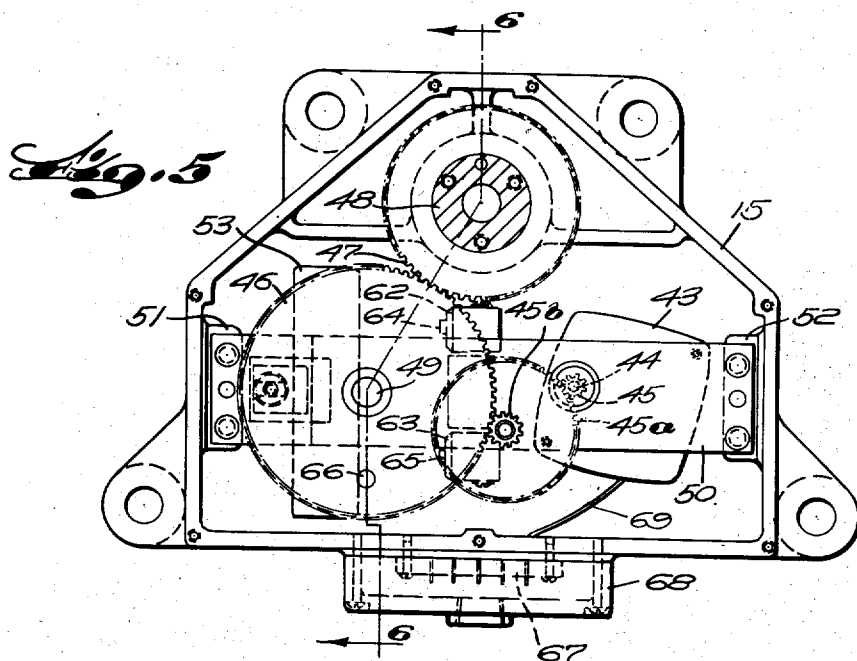
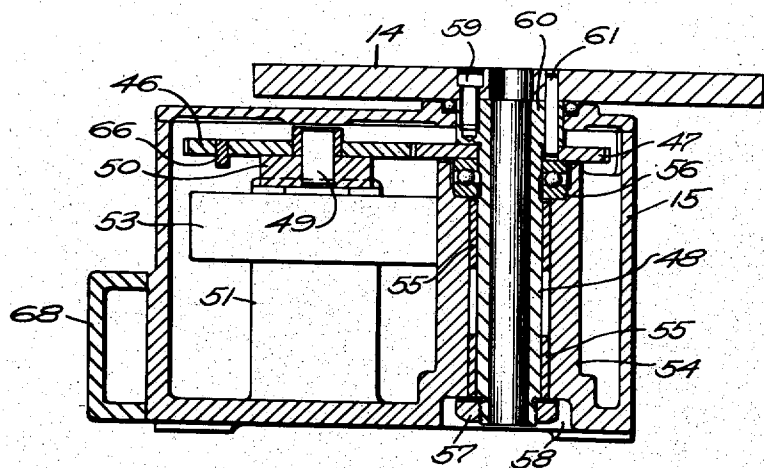
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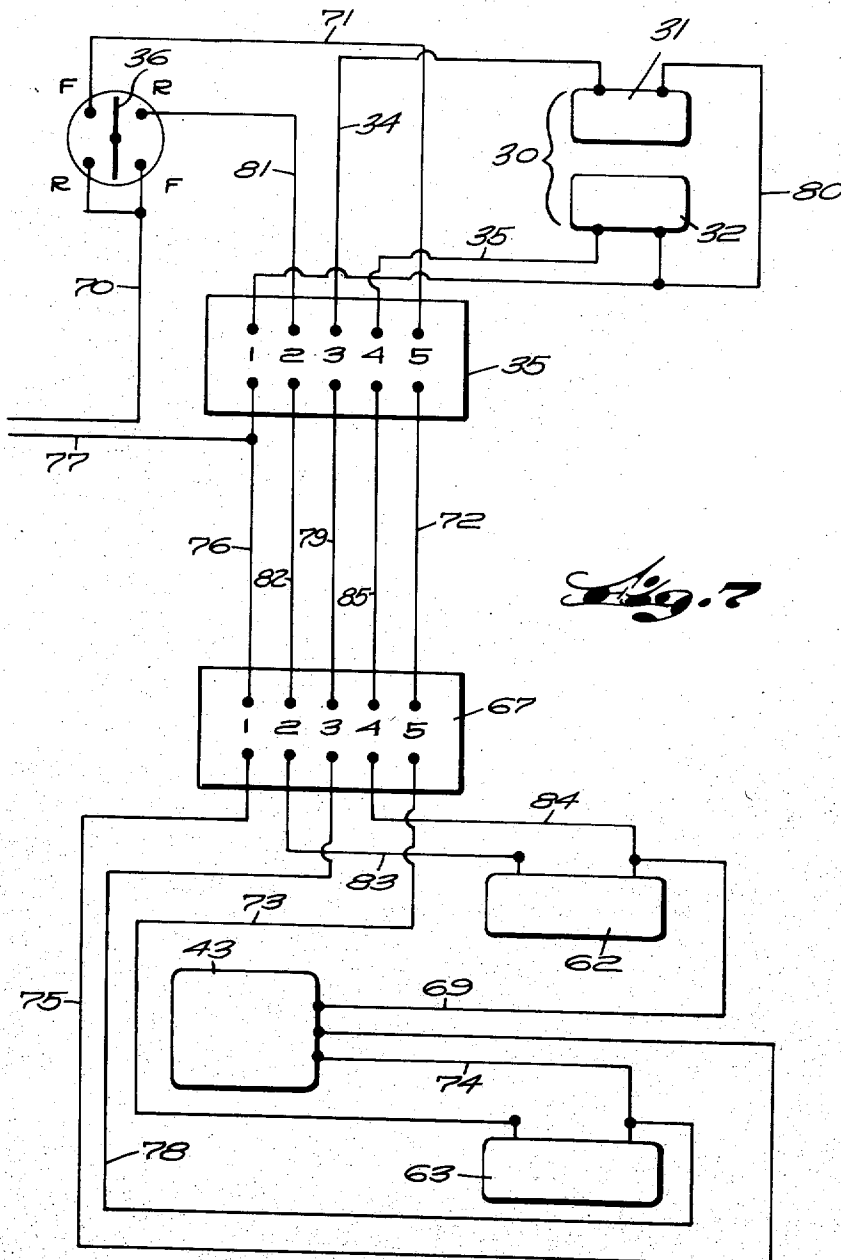


Fig. 7

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REMOTE-CONTROL SYSTEM

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1 Claim. (Cl. 177-327)

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The present invention relates to remote control systems, and has particular reference to a novel control indicator for providing a corresponding remote operation.

The principal object of the invention is to provide an indicator for controlling a remote operating mechanism in exact correspondence with the indicator setting.

Another object of the invention is to couple an indicator and a remote mechanism for synchronized operation.

Still another object is to provide an arrangement for periodic resetting of the indicator and the remote mechanism to obtain proper corresponding positions for synchronous operation.

A further object of the invention is to utilize coupled synchronous motors to obtain exact correspondence between a control indicator and remote operating mechanism.

With the above and other objects and advantageous features in view, the invention consists of a novel method of operation and a novel arrangement of parts more fully disclosed in the detailed description following, in conjunction with the accompanying drawings, and more specifically defined in the claim appended thereto.

In the drawings:

Fig. 1 is a perspective view showing the invention as illustratively applied to a remote control system for a rotatable antenna beam;

Fig. 2 is a vertical section through the novel control indicator;

Fig. 3 is a detail section disclosing the mounting of the indicator needle;

Fig. 4 is a plan view of the indicator face;

Fig. 5 is a plan view of the remote operation housing, the cover being removed, and parts being shown in section;

Fig. 6 is a section on the line 6-6 of Fig. 5; and

Fig. 7 is a diagrammatic layout of the electrical wiring.

It has been found desirable to provide a remote control system which utilizes a control indicator and is connected to operate a remote mechanism in exact correspondence with the indicator setting and indicator movement. To this end, the control indicator is mounted for movement responsive to actuation of a synchronous motor, preferably of the reversible reduction gear type, and the remote mechanism includes a second synchronous motor of corresponding type, the parts being wired so that the synchronous rotation of the motors provides a synchronized movement of the control indicator and the remote operating mechanism. Since the gearing and

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other operating parts may have differing lost motions due to back-lash and the like, we have arranged the apparatus for resetting to corresponding positions for synchronous operation whenever desired.

Referring to the drawings, which disclose the invention as illustratively applied to a movable antenna, the radio beam 10 comprises a number of spaced tubular bars 11 mounted in spaced parallel relation on a cross bar 12 secured on the upper end of an upright rod 13, the rod 13 being set in a movable platform 14. The platform 14 is rotatably mounted for actuation from mechanism in a remote operation housing 15, and is connected by wiring 16 to a control indicator 17 which is supplied with line current through a connection 18 and a contact plug 19.

The control indicator 17 includes a casing 20, preferably shaped as illustrated in Figs. 1 and 2, having a directional guide 21 in a beveled seat 22 protected by a lens or glass 23. A control hand 24 is mounted on the upper end 25 of a shaft 26, and has a pointer end 27 which cooperates with the directional guide 21, the mounting of the control hand including a spring washer 28, see Fig. 3, seated on an end bushing 29 locked to the shaft end 25, the shaft end 25 being headed over as illustrated to lock the parts in place while permitting adjustment movement of the control hand as hereinafter explained.

The shaft 26 is keyed for rotation to a synchronous motor set 30 comprising a forward unit 31 and a reverse unit 32, which are connected by wiring 33, 34 to a contact block 35 mounted in the casing 20, whereby forward or reverse movement of the motor set 30 causes the control hand 24 to rotate clockwise and counterclockwise over the directional guide 21. A manually operable handle 36 is keyed to a shaft 37 extending through the casing 20, and is adapted to be moved to stops 38 which indicate forward, stop and reverse positions, the shaft 37 having a disk 39 keyed thereto and carrying contacts 40 for making desired connections through wirings 41 with the contact block 35 to make and break the electric circuit through the motor wirings. A stop pin 42 is mounted in the casing 20, and extends through the guide 21 to provide an end stop for the pointer end 27 of the control hand 24, as illustrated in Fig. 3, for the purpose of checking and resetting the control hand as hereinafter explained.

The remote operation housing 15 houses the remote operating mechanism. In the embodiment illustrated, a reversible synchronous motor 43 has its shaft 44 provided with an end gear

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45 which meshes with a larger gear 46 through a gear train 45a, 45b, the gear 46 meshing with a gear 47 which is keyed to a hollow vertical shaft 48; the gear 46 is rotatably mounted on a stub shaft 49 positioned on a bridge 50 which extends across the housing and is supported on end bosses 51 and 52, the bridge also supporting a capacitor 53.

The hollow shaft 48 is supported in a vertical shell 54 formed integral with the housing 15 by means of spaced bushings 55 and a roller bearing 56 recessed in the upper end of the vertical shell, the lower end of the hollow shaft 48 having a lock nut 57 which seats in a recess 58 in the lower end of the shell 54. The platform 14 is locked to the upper end of the hollow shaft 48 by bolts 59 which lock in a disk 60 secured to the hollow shaft, an aligning pin 61 being positioned to extend into the platform 14 and to pass through the disk 60 and the gear 47.

Two micro-switches 62, 63 are also supported from the bridge 50, and are normally closed; thin contacts 64, 65 are adapted to be engaged by a pin 66 depending from the gear 46, whereby the switches serve as limit switches to open the operating circuits when the gear 46 rotates to its extreme clockwise and counter-clockwise position, the range of turn being about 270°. The limit switches and the synchronous motor 43 are connected to a switch block 67, positioned in a frame 68 at the side of the housing, by suitable wiring 69.

The preferred wiring for the illustrative control illustrated in Figs. 1 to 6 is shown in Fig. 7. The handle 36 is manually movable to forward, stop and reverse positions; the forward position connects the line 70 through wiring 71 through contact #5 of the block 35, wiring 72, contact #5 of the block 67, wiring 73 to the normally closed limit switch 63; from limit switch 63 wiring 74 leads to the synchronous motor 43, and return wiring 75 leads to contact #1 of block 67, and through wiring 76 back to the line wire 77. Also, wiring 78 leads from the limit switch 63 to contact #3 of block 67, through wiring 79 to contact #3 of block 35, through wiring 34 to the synchronous motor unit 31, and back through wiring 80 to contact #1 of block 35 and to the line wire 77.

When the handle 36 is moved to reverse, the line 70 is connected through wiring 81 to contact #2 of block 35, through wiring 82 to contact #2 of block 67, through wiring 83 to limit switch 62, and from switch 62 through wiring 69 to synchronous motor 43 and back to the line wire 77; wiring 84 also leads from the limit switch 62 to contact #4 of block 67, through wiring 85 to contact #4 of block 35, and through wiring 35 to the synchronous motor unit 32 and back through contact #1 of block 35 to the line wire 77.

It is thus clear that setting the control indicator handle to either forward or reverse simultaneously operates both the control indicator and the remote operating mechanism in absolute synchronism, as the two synchronous motor units are coupled in parallel, and that setting the control indicator handle to stop position stops both synchronous motors, the movement of the indicator hand and the movement of the antenna being through identical angles. When the movement of the antenna reaches its upper or its lower limit, the corresponding limit switch is opened to stop the simultaneous rotation. Although movement of the actuating gear 46 is through a 270° range as illustrated, the use of the

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smaller gear 47 provides a 360° movement of the remote control shaft, so that full corresponding angular movement of the control indicator and the remote control apparatus is obtained.

Since the remote operating gearing may have some backlash, it is sometimes desirable to check and reset the indicator hand to exactly correspond to the position of the operating mechanism. This is accomplished by causing the antenna to revolve to a fixed point, such as due north. The control indicator hand also revolves to due north, but is stopped by the stop pin 42, while the spring washer 28 permits the shaft 26 to overtravel, thus resetting both the indicator and the remote operating gearing into alignment. Both movements may be reversed to again align at due north, if the setting error is in the reverse direction.

The above described construction for a remote control system has been disclosed as applied to an antenna rotator, but this is merely illustrative. The invention, which is based on the coupling of two synchronous motor arrangements, may be applied to other types of remote control mechanisms, and the control indicator may be modified to provide an initial setting at a predetermined point, and the line switch then closed to cause the control indicator parts and the remote operating parts to move until the initial setting is reached.

Examples of other types of remote control mechanisms to which the described system may be applied include gate moving apparatus for dams, gun movements, ship rudder movements, and similar devices wherein it is desired to obtain a controlled movement of a moving part in exact correspondence with movement of a control indicator, to a predetermined point.

While we have described a specific method of operation and a specific arrangement of parts, it is obvious that changes in the mode of control, in the manner of setting the movement to be made, and in the size, shape, arrangement and operation of the parts may be made to suit the requirements for particular remote control operations, without departing from the spirit and the scope of the invention as defined in the appended claim.

We claim:

A control indicator for a remote control system, comprising a casing, a shaft rotatably mounted in said casing and extending therethrough, a hand frictionally mounted on said shaft, a stop pin on said casing engageable by said hand to limit rotation of the hand to 360°, a reversible synchronous motor in said casing for rotating said shaft, wiring for said motor, and a manually operable handle for selectively making and breaking an electric circuit through said wiring to start and stop the motor.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
70 2,403,098	Lear	July 2, 1946

FOREIGN PATENTS

Number	Country	Date
466,281	Great Britain	May 26, 1937
75 298,078	Germany	Sept. 21, 1920