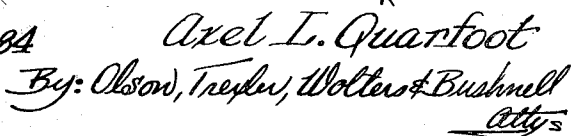


Filed Oct. 16, 1961

REMOTE CONTROL DEVICE

2 Sheets-Sheet 1



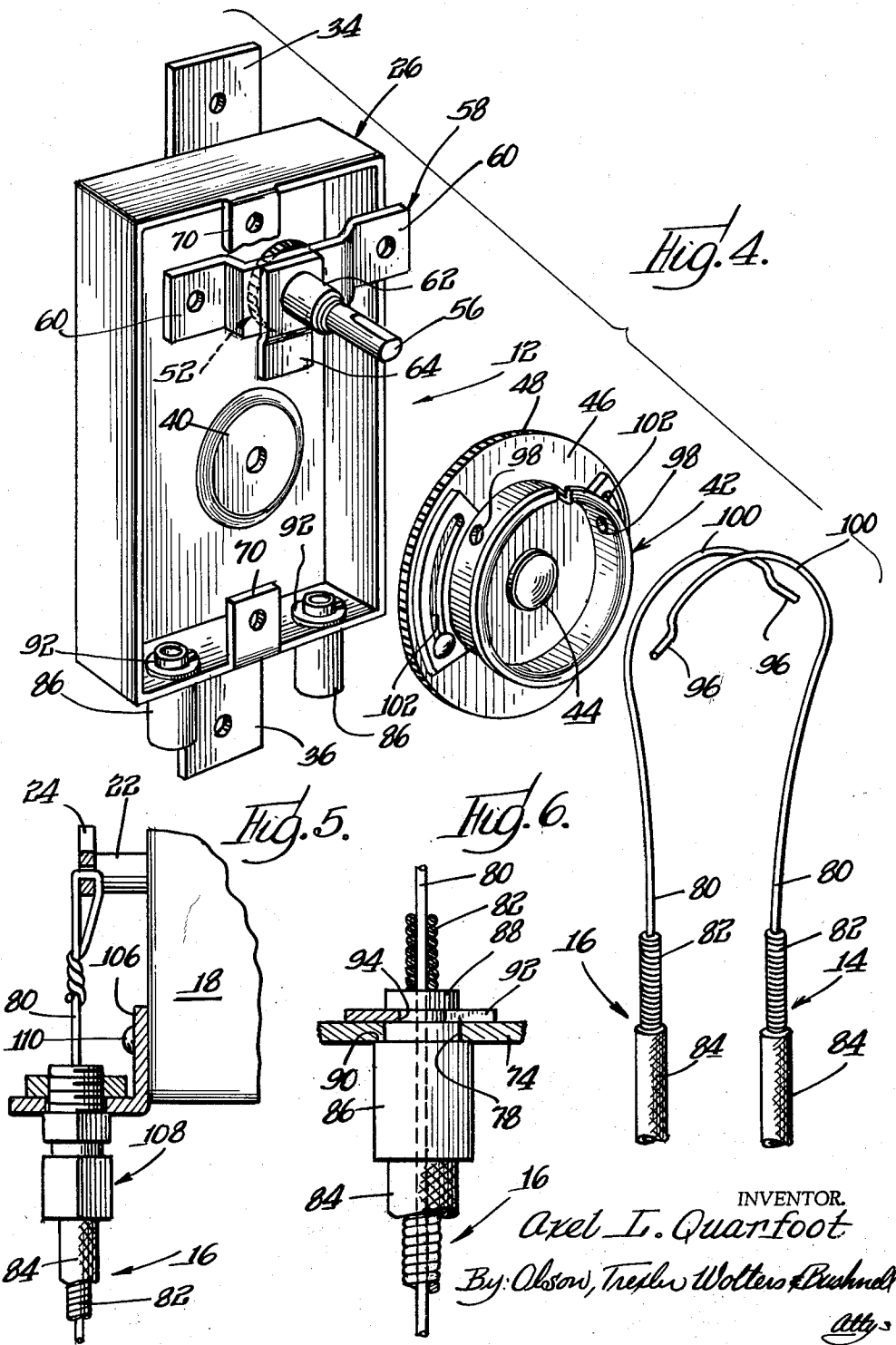
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REMOTE CONTROL DEVICE

3,186,251

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3,186,251

REMOTE CONTROL DEVICE

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This invention relates generally to control devices and especially to devices for controlling a remotely disposed appliance.

Modernly, many appliances such as ventilators, room air-conditioners, and the outlet registers for central air-conditioners are installed in the walls of rooms at a location near the ceiling and above the reach of an ordinary man. While such installations tend to achieve improved temperature regulation, alteration either of the operation of the appliance so disposed or of the air-guiding baffles contained therein is rendered impossible without the employ of a ladder or the like. Much inconvenience and discomfort has resulted.

Therefore, a general object of the present invention is to provide a new and improved device for controlling a remotely disposed appliance.

Another object of the invention is to provide a control device which incurs positive drive of the controlled element in both of two opposite directions.

Still another object of the invention is to provide a control device which is easy to operate.

A further object of the invention is to provide a control device which achieves a fine degree of control.

Additional objects and features of the invention pertain to the particular structure and arrangements whereby the above objects are attained.

A structure in accord with the invention includes control means disposed at a remote location; a rotatable member disposed at an accessible location spaced apart from the remote location; and flexible shaft means connected between the control means and the rotatable member, a portion of the flexible shaft means being coiled on the rotatable member to be progressively lengthenable upon rotation of the member in one direction and progressively shortenable upon rotation of the member in the opposite direction, the lengthening and shortening of the shaft means operating the control means.

In order that the principle of the invention may be readily understood, a single embodiment thereof applied to the control of an air-conditioner, but to which the application is not to be restricted, is shown in the accompanying drawings wherein:

FIG. 1 is a perspective view of a control device constructed in accordance with the invention, shown operating an air-conditioning appliance;

FIG. 2 is a central cross-sectional view taken in side elevation of the wall box unit of the control device of FIG. 1;

FIG. 3 is a view taken through the section 3-3 of FIG. 2;

FIG. 4 is an enlarged exploded perspective view of the wall box unit and the corresponding ends of the flexible shaft means used in the present invention;

FIG. 5 is an enlarged view taken through the section 5-5 of FIG. 1; and

FIG. 6 is an enlarged view taken through the section 6-6 of FIG. 3.

Referring now in detail to the drawings, specifically to FIG. 1 a control device indicated generally by the numeral 10 will be seen to include a wall box unit 12 having flexible shafts or cables 14 and 16 extending therefrom. The flexible shafts 14 and 16 are connected between the wall box unit 12 and an air-conditioning appliance 18 disposed at a remote location, such as for example in the wall of a room adjacent the ceiling thereof.

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The air-conditioning appliance 18 includes an adjustable louver assembly 20 to which a rotatable shaft 22 is connected, rotation of the shaft 22 being arranged to alter the angulation of the individual blades in the louver assembly 20. A lever 24 is mounted at its center to the outer end of shaft 22 in order to define a pivotal control element for cooperation with the device 10. The specific nature of this cooperation will be described more fully hereinbelow.

Turning to FIGS. 2-4 inclusive, the wall box unit 12 will be seen to include a rectangular housing 26 which is fastened to an appropriate structure such as a wall 28 by a mounting plate 30 or other suitable means. When the mounting plate 30 is employed, it is advantageously affixed to housing 26 by rivets 32 of other conventional fasteners. Moreover, the plate 30 includes an upper strap 34 and a lower strap 36 which extend respectively above and below the border of housing 26, the straps 34 and 36 being suitably apertured to pass wood screws 38 or equivalent elements into aggressive engagement with wall 28.

The housing 26 is provided with a boss 40 which projects into the interior of the housing; and a cup-shaped member 42 is rotatably mounted to the boss 40 by a loosely fitting rivet 44, rivet 44 passing through aligned apertures in the member 42 and in the boss 40. In order to facilitate the transmission of rotative force to the member 42, a flange 46 is affixed to the member to extend radially outwardly thereof. Flange 46 is advantageously formed integrally with member 42 and is additionally fashioned with peripheral teeth 48. The teeth 48 mesh with cooperating teeth 50 peripherally formed in a gear 52 which is rigidly connected to a manual operating knob 54 by means of an interconnecting shaft 56.

The shaft 56 is mounted in the housing 26 by a bracket 58, bracket 58 having offset leg portions 60 which are riveted or otherwise suitably secured to the backwall of housing 26. The shape and construction of bracket 58 is best shown in FIG. 4. Forwardly of bracket 58, the shaft 56 is surrounded by a bushing 62; and turning to FIG. 2, a tongue 64 will be seen disposed between bushing 62 and bracket 58, tongue 64 being offset at its lower end in order to contact the front face of flange 46 whereby to insure meshed engagement of the teeth 50 and the teeth 48. So as to be most effective for this purpose, tongue 64 is rigidly affixed to bracket 58 in order to prevent rotation with shaft 56.

In accordance with a feature of the invention, the gear 52 is arranged to be of considerably smaller diameter than the gear defined by flange 46. Thus, the force which is manually applied to knob 54 is multiplied in its transmission to the member 42. This arrangement has been found to render operation of the control device 10 easy and effortless and also has been found to facilitate the making of fine changes in the position of the controlled element, for example in the control lever 24 of the presently illustrated embodiment.

The shaft 56 passes freely through an aperture 66 fashioned in a cover plate 68; and in order to mount the cover plate 68 over the open face of housing 26, flanges 70 are formed at the front edges of the top and bottom of housing 26 in order to receive screws 72 which pass through the cover plate 68 into progressive engagement with holes drilled in the flanges 70.

Housing 26 includes a bottom or floor 74; and the floor 74 is provided with spaced apertures 76 and 78 which pass the ends of the flexible shafts 14 and 16 respectively as is shown in FIG. 3. The apertures 76 and 78 are advantageously disposed in tangential alignment with the peripheral edge of the cup-like member 42; and as is indicated generally throughout the figures, each of the flexible shafts 14 and 16 comprises a flexible wire operating ele-

ment 80 and a helically coiled wire member 82 which surrounds the element 80. A protective braid 84 may be situated about the coiled wire member 82 if desired.

In order that they may function properly, the coiled wire elements 82 are rigidly connected to the housing 26; and as is particularly well shown in FIG. 6, this rigid connection is achieved by means of a ferrule element 86. The ferrule 86 is swaged, crimped or otherwise made rigid with the element 82; and a reduced diameter head portion 88 of the ferrule is passed through the respective aperture 76 or 78 in the floor 74 of the housing until the bottom surface of the floor 74 is contacted by a shoulder 90 of the ferrule 86. Completion of the attachment of the flexible shaft to the housing is achieved by a C-washer 92 which is assembled into a groove 94 fashioned in the ferrule beneath the head portion 88 thereof. With the coiled wire elements 82 rigidly connected to the housing 26, the wire operating elements 80 can be moved slidably through the coiled wire element 82 for purposes of transmitting control motions.

As is particularly well shown in FIG. 4, the ends of the straight wire elements 80 which are disposed within the wall box unit 12 are bent to define offset tip portions 96; and these tip portions 96 are assembled respectively to radial apertures 98 formed in the sidewall of member 42. While it is advantageous to arrange the apertures 98 at approximately a 90° spacing as is shown in FIG. 3, these apertures may also be spaced diametrically and in other suitable relationships.

Inwardly from the tip portions 96, the operating wire elements 80 are curved slightly at portions 100 in order to facilitate wrapping or coiling of these portions over a part of the exterior surface of member 42. With the operating wire elements of the flexible shafts 14 and 16 thus arranged, rotation of the member 42 in any given direction progressively lengthens one of the flexible shafts and progressively shortens the opposite shaft. Reverse rotation of the member 42 achieves a reverse alteration in the lengths of the shafts 14 and 16.

In order to control the angular movement of member 42 and thereby limit the amount of lengthening or shortening of the shafts 14 and 16, the flange 46 is fashioned with arcuate slots 102; and as is shown in FIG. 3, abutment means such as the screws 104 are adapted to pass through the slots 102 fixedly to engage the backwall of housing 26, the shanks of screws 104 thus ride in the slots 102 to define stop means cooperating with the ends of the slots 102 for purposes of arresting angular movement of the member 42.

With reference now to FIG. 5, the remote ends of the flexible shafts, particularly the coiled wire elements 82 thereof, are mounted to a bracket 106 by means of fittings 108, bracket 106 being secured to the side of appliance 18 by screws 110 or other suitable fasteners. The straight wire elements 80 of flexible shafts 14 and 16 extend through the fittings 108 to be threaded through apertures formed in the lever 24 with the free end of each element 80 being thereafter wrapped back around the immediately preceding portion thereof as is shown in the figure. Considering FIG. 1, the straight wire elements 80 of the flexible shafts 14 and 16 will be seen connected

to the lever 24 on opposite sides of the pivot defined by shaft 22. So arranged, the reversible, progressive lengthening and shortening of the flexible shafts incurs a pivoting of lever 24 and a concomitant rotation of shaft 22 for purposes of controlling the position of the individual blades in louver assembly 20. Since, during any given actuation of lever 24, two forces are applied by the shafts 14 and 16, one pulling and the other pushing, a positive drive of the lever is incurred in either direction of its rotation.

Operation of the control device 10 will be apparent from the above descriptions.

The specific example herein shown and described should be considered as illustrative only. Various changes in structure may occur to those skilled in the art; and these changes are to be understood as forming a part of this invention insofar as they fall within the spirit and scope of the appended claims.

The invention claimed is as follows:

20 1. A control device comprising: a pivotal control lever; a rotatable member spaced apart from said lever; a manual operating knob; force-multiplying gear means acting between said knob and said rotatable member, including a first gear fixed to said knob for rotation therewith and a second gear meshing with said first gear and coupled to said rotatable member; means for maintaining said gear means in meshing alignment, including a plate member fixed in a plane parallel to the plane of one of said gears and slidably contacting a face of the other of said gears to restrain said other gear against axial movement away from said one gear and out of meshed engagement therewith; first flexible shaft means connected between said rotatable member and a location on said lever on one side of the pivot thereof, a portion of said first shaft means being coiled on said member in one direction; and second flexible shaft means connected between said rotatable member and a location on said lever on the opposite side of the pivot thereof, a portion of said second shaft means being coiled on said member in an opposite direction, said first and second shaft means being progressively lengthenable and shortenable respectively upon rotation of said member in said opposite direction by the manipulation of said knob and vice versa.

45 2. A control device according to claim 1 which additionally comprises a housing for said rotatable member and for said gear means and which further comprises slot means and cooperating abutment means acting between said rotatable member and said housing, said abutment means cooperating with the ends of said slot means to arrest angular movement of said rotatable member.

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