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CONTROL KNOB MOUNTING ASSEMBLY

Filed April 27, 1961

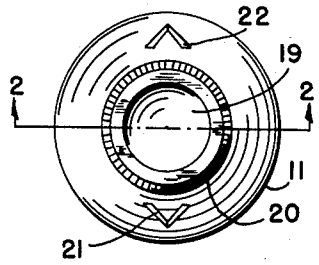


FIG. 1

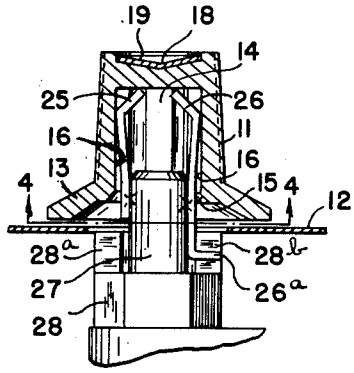


FIG. 3

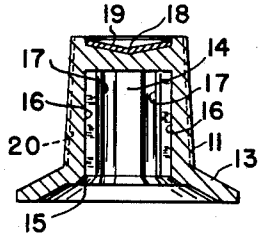


FIG. 2

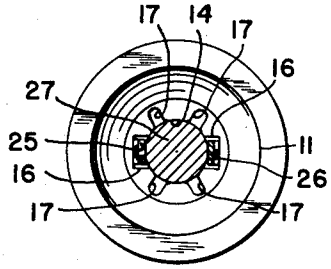


FIG. 4

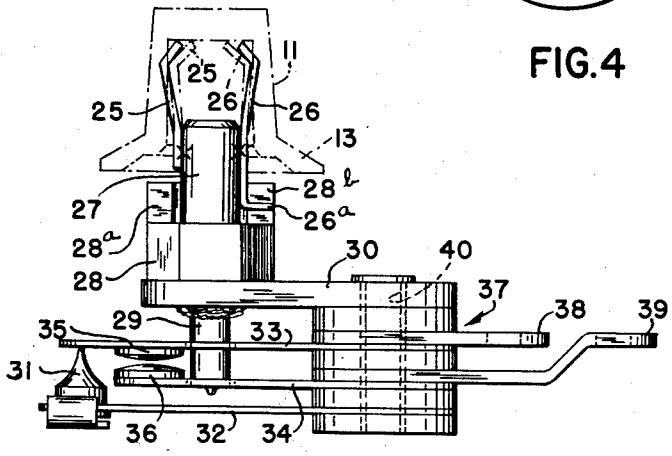


FIG. 5

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CONTROL KNOB MOUNTING ASSEMBLY

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My invention relates to the mounting assembly for control knobs attached to electrical devices, such as switches and thermostats, for controlling the actuation of the same.

An object of my invention is to provide improved mechanism for interconnecting a knob or handle and the shaft extending from the electrical control device which shaft is rotatable to actuate the control device.

Another object is the provision of means for increasing the heat insulation between a molded plastic knob and the metal shaft extending from an electrical control device of an electrical heating appliance.

Another object is the provision of improved means for readily assembling and disassembling a knob of suitable molded resin plastic from a rotatable metal shaft extending from a control device, such as a switch and thermostat, of an electrical appliance.

Another object is the provision of a unique arrangement in a mounting assembly which provides superior results in a novel manner.

Another object is the provision for obtaining both increased heat insulation of a rotatable knob on an electric heating appliance, and also for obtaining a ready means for mounting and dismounting of the knob.

Other objects and a fuller understanding of my invention may be had by referring to the following description and claims taken in conjunction with the accompanying drawings which:

FIGURE 1 is a plan view of a knob used in my invention;

FIGURE 2 is a longitudinal sectional view of the knob shown in FIGURE 1, and taken through the line 2—2 of FIGURE 1;

FIGURE 3 is a longitudinal sectional view of the knob mounted on the shaft of a control device and illustrating the cooperative relationship of the parts;

FIGURE 4 is a cross sectional view taken through the line 4—4 of FIGURE 3 and looking in the direction of the arrows 4—4; and

FIGURE 5 is an elevational view of an electrical control device, in this case a thermostatic device, and showing a knob in broken lines mounted thereon.

In the drawing, a knob made in accordance with my invention is denoted by the reference character 11. The knob body is made of a suitable thermosetting resin or of other material having relative heat insulating and electrical insulating properties. The knob body 11 is adapted to be positioned on the exterior side of panel wall 12 of an electrical device, such as an electrical heater, oven, toaster, or the like. The knob body 11 is positioned over a round hole in the panel wall 12 and in axial alignment with the hole.

The knob body 11 has a skirt portion 13 extending outwardly in a slope at its base. A bore or cylindrical opening 14 extends inwardly of the knob body 11 from the end thereof surrounded by the skirt portion 13. This bore or opening 14 has a wall which is concentric with the axis of the knob body 11 and of the opening 14 therein.

Extending longitudinally of the knob 11 are two oppositely disposed slots 16. These slots extend radially outwardly from the cylindrical wall of the bore or opening 14 on diametrically opposite sides of the axis of the bore 14. At the juncture of the inner wall of the skirt portion 13 and the bore 14 the wall is chamfered at 15 to provide an introduction port to the bore 14 and to the

slots formed therein. As is seen in the drawing, the slots 16 extend from the open end of the knob to the inner end of the bore 14.

In addition to the two slots 16 there are longitudinal slots or recesses 17 extending radially outwardly from the cylindrical wall of the bore 14 intermediate of the slots 16. These additional slots 17 provide additional space within the knob for accommodating air which acts as additional insulation within the knob. The slots 16 are wider than are the four slots 17.

At the outer end of the knob 11 there is a small dwell or recess 18 centrally located in the knob 11. Positioned in this recess 18 and held therein by a press fit is a disc 19 of metal which bears suitable indicia, such as directions or gradation marks. Around the outer cylindrical surface of the knob 11 is provided knurling 20 to provide a better grip on the knob for manual turning of the same. On diametrical sides of the knob there are arrow indicia 21 and 22 molded into the plastic of the knob and used for relating the position of the knob to reference points on the wall 12 of the appliance, such as a reference point for "on" or the reference point for "off."

In the drawing and description here given, the electrical control device used for purposes of illustration is a thermostat which has parts for turning electric current on and off, and also which incorporates bimetals for adjusting the amount of current to flow in relationship to the heat obtained and the setting for desired heat by manipulation of the thermostat.

Extending from the thermostat control device is a shaft 27, which upon rotation sets the position of the thermostat to desired condition. Rotation of the shaft 27 actuates the thermostat control device to obtain the required operation.

Mounted to the stub end of shaft 27 are metal prong 25 and metal prong 26 which are welded to the metal shaft 27 on diametrically opposite side thereof adjacent to its end. The prongs 25 and 26 are made of spring steel and are resiliently yieldable. Prong 26 is longer than prong 25, and has an extension 26–*a* which extends radially outward from the axis of the shaft 27. The prongs 25 and 26 in their normal and unrestrained condition are biased to diverge from each other as they extend out and beyond the end of the shaft 27. The extreme free ends of the prongs 25 and 26 are bent back toward each other as illustrated. The bias of the prongs 25 and 26 is such that they may be resiliently pressed toward each other, that is, toward the axis of the shaft 27, and they readily flex under such radial pressure. However, upon being flexed toward each other the energy stored in the prongs 25 and 26 tends to force the prongs 25 and 26 outwardly away from each other and back to their normal unflexed and unrestrained condition.

Mounted on the supporting plate 30 of the thermostat body 37 is a threaded bushing 28 which threadably interengages with the shaft 27 inwardly of the threaded bushing 28. There are diametrically opposed stop portions 28–*a* and 28–*b*. These stop portions 28–*a* and 28–*b* are disposed in a plane extending longitudinally of the bushing 28 and coinciding with the axis thereof. The extension portion 26–*a* of the prong 26 is adapted to abut at its extreme limits of movement, at stop portions 28–*a* and 28–*b*. Upon rotation of the shaft 27, the extension portion 26–*a* swings in an arc from a position adjacent to the stop portion 28–*b* to a position adjacent to the stop portion 28–*a*.

Slidably carried by the bushing 28 and in axial alignment with the shaft 27 is a ceramic pin or rod 29. This pin or rod 29 provides both heat and electrical insulation. The inter-engagement of the shaft 27 and pin or rod 29 is such that upon turning of the shaft 27 in one direction it pushes the pin or rod 29 in one axial direction,

and upon turning of the shaft in an opposite rotative direction it permits the pin or rod 29 to move axially in the opposite direction, thus rotative motion of the shaft 27 is translated into longitudinal movement of the pin or rod 29.

The thermostat device 37 is a cylindrical body made up of plates and ceramic insulating elements stacked together in the usual manner. An opening 40 extending through the thermostat body is adapted to receive a bolt for mounting of the thermostat in position within an electric appliance. Extending from the body of the thermostat 37 are terminal members 38 and 39 adapted to be connected to electrical conductors, which in turn are adapted to be connected to a source of electrical energy.

Extending from the body of the thermostat 37 are bimetal leaves 33 and 34 carrying contact buttons 35 and 36, respectively. A ceramic stop member 31 is carried on the outer end of a plate 32 which extends outwardly from the body of thermostat 37. Reciprocation of the pin or rod 29 which extends through an aligned opening in the leaf 33 presses the leaf 34 in one direction away from leaf 33 and permits the leaf 34 to move toward the leaf 33 on reciprocation pin 29 in an opposite direction. In short, the pin 29 by its movement along its axis determines the setting of the thermostat for both the degree of heat desired, and also for the turning on and off of the current through the thermostat. Other electrical control devices, such as a switch, may be actuated with mechanism incorporating my invention.

After the control device has been mounted in position in the appliance with the stub end of the shaft 27 and the prongs 25 and 26 protruding outwardly from the opening in the panel wall 12, the knob 11 is mounted to the outer end of shaft 27 and the prongs 25 and 26. This is done by moving the knob 11 axially toward the panel wall 12 with the axis of the knob in alignment with the axis of the shaft 27 and with the prongs 25 and 26 aligned with the respective slots 16. By reason of the chamfered surface 15 and the bent in ends of the prongs 25 and 26, at their extreme free ends, movement of the knob 11 toward the panel wall 12 causes the chamfered wall 11 to cammingly press the prongs 25 and 26 toward each other against the bias thereof. Continued axial movement of the knob 11 toward the panel wall 12 causes the prongs 25 and 26 to slide along in the respective slots 16 with the outer surface of the prongs 25 and 26 tightly pressing the bottom opposite facing walls of the slots 16. By reason of the spacing of the bottom walls of the slot 16, the prongs 25 are restrained when confined within the knob 11, and the bias of the prongs 25 and 26 is such as to press the prongs 25 and 26 outwardly against the inner wall of the slot 16. This provides a firm frictional inter-engagement between the prongs 25 and 26 on the one hand on the knob 11 on the other hand. As seen in the drawing, the shaft 26 extends only sufficiently far into bore 14 as to center the knob 11 relative to the shaft 27. The outer cylindrical wall of the shaft 27 engages the cylindrical wall of the bore 14 at locations other than the slots 16 and 17. This provides a proper centering co-action between the parts and at the same time provides for a relatively large air space within the knob 11 between the end of the shaft 27 and the inner end of the bore 14 within the knob. Also, the additional slot 17 provides still more space for air within the knob 11, both around the shaft 27 and the area between the end of the shaft 27 and of the inner end of the bore. It has been found that heat transference to the knob 11 from the metal parts of the thermostat and particularly through shaft 27 and prongs 25 and 26 is radically reduced by the arrangement shown and described.

It is thus seen that by the unique structure and arrangement here illustrated that the mechanism provides both superior heat insulating qualities and also provides a convenient and economical connecting means for mounting a knob on the rotatable shaft of an electrical control device.

The present disclosure includes that contained in the appended claims, as well as that of the foregoing description.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

What is claimed is:

1. In a control knob mounting assembly, the combination of a knob body of molded plastic material having an open space extending axially thereof from an end thereof, said open space having a closed end wall and side walls concentric with the axis of the knob body and having oppositely disposed slots formed in said side walls extending parallel to the axis of the knob body, said slots each leaving an inner wall facing radially inward toward the inner wall of the other slot, a rotatable metal shaft extending from an electric control device to be controlled by rotation of the shaft, and a pair of prongs mounted to said shaft on opposite sides thereof and having free end portions extending beyond the end of said shaft, said open space in the knob body extending substantially beyond the end of said shaft and intermediate said extending prongs to immerse the free end portions of said prongs in the air in said open space, said prongs being steel leaf springs biased to diverge from each other and from the axis of said shaft and yieldable to flex in opposition to said bias, said prongs being positioned in said slots, respectively, to key said shaft to said knob body and said shaft extending into said open space in engagement with said concentric side walls to center the knob body in respect to said shaft, the walls of said slots engaging and flexing the spaced free end portions of said prongs, respectively, in opposition to the bias thereof to provide for resiliently yieldable pressure of said prongs against the said inner walls of the respective slots to frictionally retain the knob body in position relative to said shaft, at least one of said prongs abutting said closed end wall of said open space to limit movement of said knob body toward said shaft.

2. In a control knob mounting assembly, the combination as defined in claim 1, and in which the said knob body has formed in the concentric wall of said open space intermediate of said slots recesses for increasing the space within said knob body for air forming insulation against heat transference between said shaft and said knob body.

3. The combination of a knob body having an axially disposed bore extending therein from an end thereof, said bore having an end wall and opposed walls concentric with the axis of said bore, a pair of opposed slots extending longitudinally of the knob body along opposite sides of said bore, said slots having oppositely disposed walls facing the axis of the bore, a stub shaft extending from a control device operable by rotation of said shaft to varied rotative positions, a pair of prongs secured to said shaft and having free end portions extending beyond the end of the shaft in diverging paths, said bore in the knob body extending substantially beyond the end of said stub shaft and intermediate said prongs to expose the free end portions of the prongs to the air in said bore, said prongs being resiliently biased in said diverging paths and yieldable against said bias, said prongs extending into said slots, respectively, and engaging said oppositely disposed walls thereof, said oppositely disposed walls being spaced relative to each other to press and flex said prongs toward the axis of the bore in opposition to said bias and to provide frictional engagement between said oppositely spaced walls and said prongs, said shaft extending into

said bore in engagement with said concentric opposed walls to center the knob body relative to said shaft, the said prongs keying the shaft to said knob body and yieldably retaining the knob-body to said shaft, the free end of at least one of said prongs abutting said end wall of the bore to limit inward movement of the stub shaft relative to the knob body.

4. The combination as defined in claim 3 and in which said slots extend from said end of the knob body, and in which the free ends of said prongs are bent from said divergent paths toward each other to facilitate the introduction of said prongs into the respective slots from said end of the knob body.

5. The combination as defined in claim 3, and in which the wall of said bore at locations intermediate of said slots is relieved to increase the space for heat-insulating air within said knob body in the vicinity of said shaft and prongs.

6. The combination of a control knob and a stub shaft extending from a control device of an electrically heated appliance, said shaft having a pair of leaf spring members extending out from and beyond the end thereof on opposite sides of the axis of the shaft, said leaf spring members being biased to extend radially outwardly in a gradual slope in extending from said shaft and being resiliently flexible to extend toward the axis of said shaft, said control knob having a central opening for accommodating said shaft therein in engagement with said control knob axially aligning the knob with said shaft, said central opening extending beyond the end of said shaft and intermediate said spring members extending beyond said shaft to free the leaf spring members from radially inward confinement, said knob having oppositely disposed slots in the wall of said central opening for accommodating said leaf spring members and keying the shaft to said knob, said slots having oppositely facing walls engaging and restraining said leaf spring members and resiliently flexing the same toward the axis of said shaft, said slots opening radially inward into said open space, the engagement of said walls and leaf spring members, respectively, opposing the bias of said leaf spring members to yieldably retain said knob to said shaft by said leaf spring members, the free end of at least one of said leaf spring members engaging said control knob at the inner end of said central opening to limit axial movement of the control knob relative to said shaft.

7. The combination defined in claim 6 and including grooves in the wall of said central opening intermediate of said slots and extending longitudinally of said central opening for increasing the space for heat-insulating air within said knob and intermediate said shaft and the interior of said knob.

8. The combination defined in claim 7 and including chamfered end portions on the free ends of the leaf spring members, respectively, for cammingly flexing said leaf spring members toward the axis of said shaft upon introduction of the leaf spring members into said slots.

9. In a knob mounting of the kind described, the combination of shaft means, knob means axially aligned with the shaft means, said knob means having a bore extending axially thereof from one end and terminating in an end wall spaced inwardly from said one end and defining a peripheral side wall, resilient prong means extending forwardly and outwardly of the shaft means beyond the free end thereof and resiliently engaging the said side wall of the bore beyond the free end of the shaft means to hold said knob means to said shaft means, said prong means beyond the free end of the shaft means being unconfined radially inward of the prong means to be free to flex toward the axis of the knob means in opposition to the restraint of the side wall of said bore, said knob means and prong means non-rotatively engaging at said side wall to key the knob means to the shaft means, said prong means beyond the free end of the shaft means being surrounded radially outwardly of the axis of the shaft means by said knob means, said knob means engaged by said side wall compressing said prong means in opposition to the bias thereof to yieldably urge the prong means in firm engagement against the side wall to retain the knob means to the shaft means, said prong means including abutting means extending beyond the engagement of the prong means with said side wall and engaging the said end wall of the bore for limiting inward movement of the shaft means axially of the knob means.

10. The combination defined in claim 9, and including air space means in said bore intermediate the free end of said shaft means and said end wall radially inward of the shaft means, and intermediate the prong means and said side wall radially outward of said shaft means for providing heat insulation therebetween.

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