April 19, 1955 J. M. BOWMAN 2,706,774

CONTROL APPARATUS

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FIG. 1.

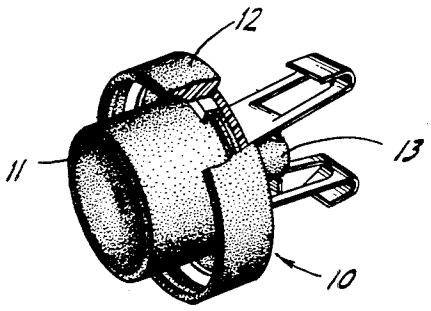
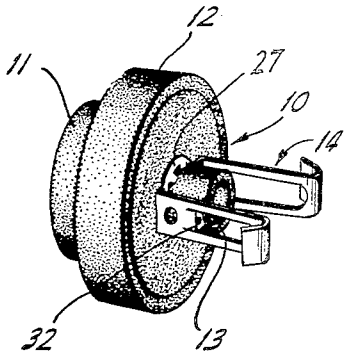


FIG. 2.



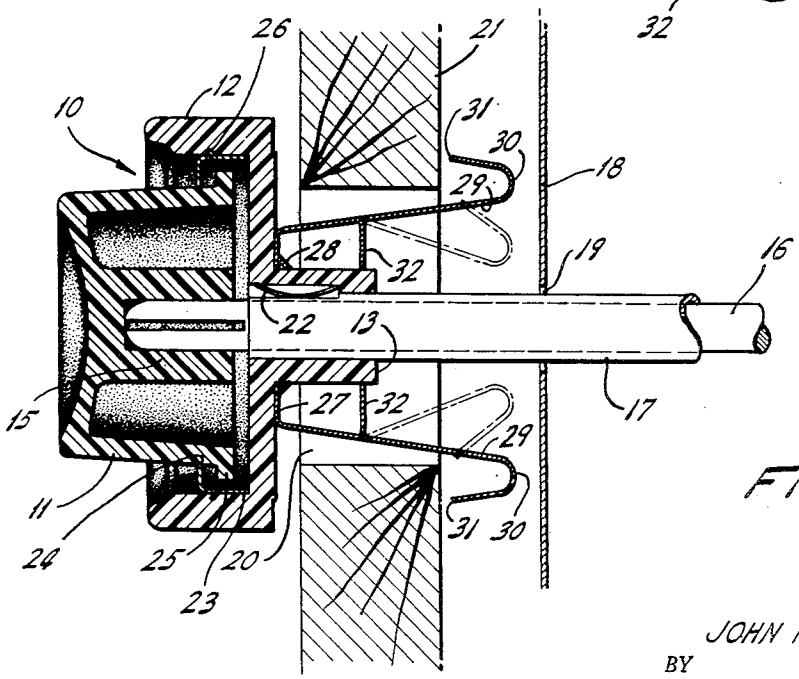


FIG. 3.

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CONTROL APPARATUS

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2 Claims. (Cl. 250—16)

My invention has to do with detachable coupling means and is especially concerned with control knob and shaft assemblies of the type commonly used in electrical apparatus and which provide for control, from the outside of a cabinet, of circuit elements housed within the cabinet. More particularly, the invention relates to knob and shaft assemblies of the kind in which a shaft extending from a cabinet is normally maintained at a substantial potential difference with respect to ground, and the knob is of electrically non-conductive material and serves both as a means for driving the shaft and as an electrical insulator.

While of broader applicability, the apparatus of the present invention is particularly adapted for use with radio and television receivers. In such equipment it is frequently advantageous to utilize circuit arrangements which maintain the chassis of the receiver, as well as the shafts provided to control elements of the circuitry, at a substantial potential difference with respect to ground. This practice, however, results in a shock hazard, and necessitates so housing the chassis, and other equipment within the cabinet, as to eliminate all possibility of having any exteriorly accessible portions thereof at an elevated potential.

With the foregoing in mind it is the principle object of my invention to provide, in novel combination with control shaft means extending through a cabinet wall, non-conductive knob structure associated with the shaft means and being of such a character as to make impossible release and removal of the knob structure from the shaft means by manipulations effected from the outside of the cabinet. To this general end, my invention contemplates the use of latch means secured to the non-conductive knob structure and extending inwardly of the cabinet, through the aperture which accommodates the shaft means, to a position such that a portion of the latch means confronts interior surface portions of the cabinet wall structure and serves to prevent removal of the knob structure from the outside of the cabinet. It is a feature of the invention that the latch means is releasable from within the cabinet to permit withdrawal of the same through the aperture and consequent disassociation of the knob structure from the shaft means. In one aspect of the invention it is also an object to provide an improved radio control knob device.

The present invention also has as an important object the provision of apparatus in which the knob structure can be applied to the shaft means from the outside of the cabinet without the necessity of the assembler or service man having access to the interior of said cabinet. This advantageous result is achieved by utilizing latch means which may be displaced, during attachment of the knob structure, in such a way as to permit introduction of the latch means through the apertured wall of the cabinet, and consequent interfitting of the knob and shaft parts. In the embodiment illustrated the latch means has sufficient inherent resilience to permit such displacement movement.

My invention is also featured by the provision of apparatus in which a pair of independently operable control knobs may be drivingly associated with a pair of concentric control shafts, it being impossible to remove either of the knobs from its associated shaft by manipulations effected from the outside of the cabinet.

The invention further contemplates certain novel constructional features hereinafter described, and illustrated in the accompanying drawing, in which:

Figure 1 is a view, in perspective, illustrating a knob structure embodying the principles of the present invention;

Figure 2 is a perspective view illustrating the shaft-engaging and cabinet-latching portions of the knob structure; and,

Figure 3 is a sectional view, on an enlarged scale, showing a knob structure, of the kind illustrated in Figures 1 and 2, drivingly associated with control shafting, and showing the manner in which the latch means serves to prevent inadvertent or unauthorized removal of the knobs.

Now making more detailed reference to the drawings, and particularly to Figures 1 and 2 thereof, there is illustrated a compound knob structure or assembly 10 comprised of inner and outer independently operable knob elements 11 and 12, respectively. The knob elements are concentrically related and the outer thereof includes an annular flange or body portion within which is received one end of the inner knob. The outer knob is further provided with a shaft-engaging boss 13 to which is secured the latch means of the invention, indicated generally by the reference numeral 14. As more fully set forth in what follows, provision is made to insure that the latch means remains fixedly secured to the boss 13 when the apparatus is in use.

Now making reference to Figure 3, in which the knob structure and associated latch means are shown in use, it will be seen that the inner knob 11 also includes a central boss 15 apertured to receive, frictionally, the outer end portion of the inner one of a pair of concentric control shafts, the inner shaft being shown in the drawing at 16 and the outer shaft at 17. It will be understood that each of these shafts is drivingly associated with circuit controlling elements not illustrated, for example the shafts may be utilized to actuate volume and tone control devices. The devices or elements controlled would be carried by a metal chassis an upstanding wall of which appears at 18 and is apertured at 19 to accommodate the shafts.

As indicated hereinabove the shafts 16 and 17, which extend through an aperture 20 provided in a portion of the non-conductive wall structure 21 of the cabinet, are so connected with the apparatus which they control that the shafts are at an elevated potential with respect to ground. The desirability of preventing disassociation of the knobs from the shafts, by manipulations effected from the outside of the cabinet, will be understood without further description, and reference will now be made to the constructional features by means of which this result is achieved.

Each of the knob elements 11 and 12 is, as aforesaid, drivingly associated with a corresponding one of the two shafts to be driven, this result being achieved through the agency of a friction fit, as respects the inner shaft 16 and its knob element 11. Drive of the outer shaft 17 is accomplished in known manner by the use of a small spring member 22 carried by the boss 13 of knob element 12 and engaging a "flat" provided at the outer end of shaft 17. The shafts serve, of course, to define the axis of rotation of the knobs.

In particular accordance with the present invention, means is provided to prevent, firstly, removal of the knob 12 from the shaft and cabinet and, secondly, disassociation of the knob 11 from the knob 12. As shown at 23 in Figure 3 of the drawing, knob 12 carries a circular washer having an annular edge 24 which bears against the outer conical surface of knob 11 and is adapted to cooperate with a flange 25, extending peripherally about one end of knob 11, in such manner as to prevent removal of the inner knob from the outer. The washer 23 has a cylindrical portion received within the knob 12 and this cylindrical portion carries a plurality of resilient prongs 26 which serve to prevent movement of the washer with respect to the knob.

Now considering the latch means 14 in greater detail, it will be seen, particularly from Figures 2 and 3, that this latch means comprises an annular washer-like portion 27

having prongs 28 which secure the same to boss 13. A pair of resilient arm portions 29—29 are secured to washer 27 and extend inwardly through the aperture 20, each of these arms being reversely bent as at 30 to provide a hook-like member the free end 31 of which confronts adjacent portions of the inner surface of the cabinet wall 21, when the apparatus is assembled. In such assembled relation, and as will be understood without further description, any attempt to withdraw either of the knobs from the shafting results in the end portion 31 being brought into contact with the inner surface of the cabinet wall 21. Consequently, removal of the knobs from the outside of the cabinet is not possible.

To prevent any possibility of moving the latch arms 29 inwardly toward the shafting, for example, by the use of a screwdriver or the like inserted from the outside of the cabinet, each of the arms is further provided with a tongue 32 which extends from the arm into engagement with boss 13.

When it is desired to disassociate the knob structure from the shafting it is necessary that access first be had to the interior of the cabinet and, since this operation is to be performed only by qualified service personnel who are familiar with the shock hazard aforesaid and with the necessity of disconnecting the equipment from the source of power, the latch means may safely be released by moving the latch arms 29 inwardly toward the shafting, to the position illustrated in dotted lines. In this position, and as will be readily understood from the drawing, it is possible to disassociate the knob structure from the shafting, withdraw the latch arms through the aperture 20, and remove the chassis from the cabinet.

Although the described apparatus effectively prevents unauthorized or inadvertent removal of the knobs and consequent exposure of the shafts, it is to be noted that the knobs may be readily applied from the outside of the cabinet. This is accomplished by moving the arm portions 29 toward the shafting, after which the reversely bent end portions may be introduced within the aperture 20 and the knob structure moved toward the shafts. When the knobs have been moved sufficiently to the right, as the apparatus is shown in Figure 3, the arms 29 spring outwardly and occupy the position shown in full lines, in which position removal of the knobs is prevented, as above described.

While the invention is preferably embodied in apparatus of the illustrated type, in which concentric shafts are driven by a pair of knobs associated as shown in the drawing, it is to be understood that important advantages of the invention may be achieved by the use of apparatus in which a single knob, similar to the knob 12, is utilized to drive a single shaft.

I claim:

1. In combination with a cabinet for radio apparatus or the like having walls of non-conductive material enclosing electrical apparatus normally maintained at a substantial potential difference with respect to ground, a wall portion of said cabinet being provided with an aperture: metallic shaft means so associated with said apparatus as also to be maintained at a substantial potential difference with respect to ground and extending outwardly through the aperture; electrically non-conductive knob structure adapted for driving association with said shaft means; and means permitting application of said knob structure to said shaft means from outside the cabinet and preventing release and removal of said knob structure from said shaft means by manipulations effected from outside the cabinet, said last means comprising; a latching device secured to and extending from said knob structure inwardly of said aperture and having a detent portion normally spaced from the rotational axis of said knob structure a distance such that when said knob structure is mounted upon said shaft means said detent portion is disposed to engage the interior surface of the wall surrounding said aperture, the construction and arrangement being such that when said knob structure is moved outwardly of said aperture along said shaft means said detent portion engages the mentioned interior surface of the wall prior to disassociation of said knob structure from said shaft means, said latching device being displaceable toward the rotational axis of said knob structure to a position permitting introduction of said device through said aperture and into the cabinet and application of the knob structure to the shaft means from outside the cabinet, said latching device further including stop means so disposed as to make it impossible to effect the mentioned displacement movement by manipulations effected from the outside of the cabinet when the knob structure has been applied to said shaft means.

2. In combination with a cabinet for radio apparatus or the like having walls of non-conductive material enclosing electrical apparatus normally maintained at a substantial potential difference with respect to ground, a wall portion of said cabinet being provided with an aperture: metallic shaft means so associated with said apparatus as also be maintained at a substantial potential difference with respect to ground and extending outwardly through the aperture; electrically non-conductive knob structure adapted for driving association with said shaft means; and means permitting application of said knob structure to said shaft means from outside the cabinet and preventing release and removal of said knob structure from said shaft means by manipulations effected from outside the cabinet, said last means comprising; a latching device secured to said knob structure inwardly of said aperture and having a pair of spread portions normally spaced a distance greater than the maximum lateral dimensions of the aperture, the spread portions of said latching device being displaceable to a position such that the spacing therebetween is less than the maximum lateral dimension of the aperture, whereby to permit introduction of said spread portions within the cabinet through the aperture and mounting of the knob structure upon the shaft means, said spread portions having such inherent resilience as to cause the same, when introduced within the cabinet, to assume their maximum spread and to overlie interior surface portions of the wall surrounding said aperture, the construction and arrangement being such that when said knob structure is moved outwardly of said aperture along said shaft means said spread portions engage the mentioned interior surface portions of the wall prior to disassociation of said knob structure from said shaft means, and said latching device further including stop means disposed to bear against said knob structure to prevent reduction in the spacing between said spread portions by manipulations effected from the outside of the cabinet.

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