

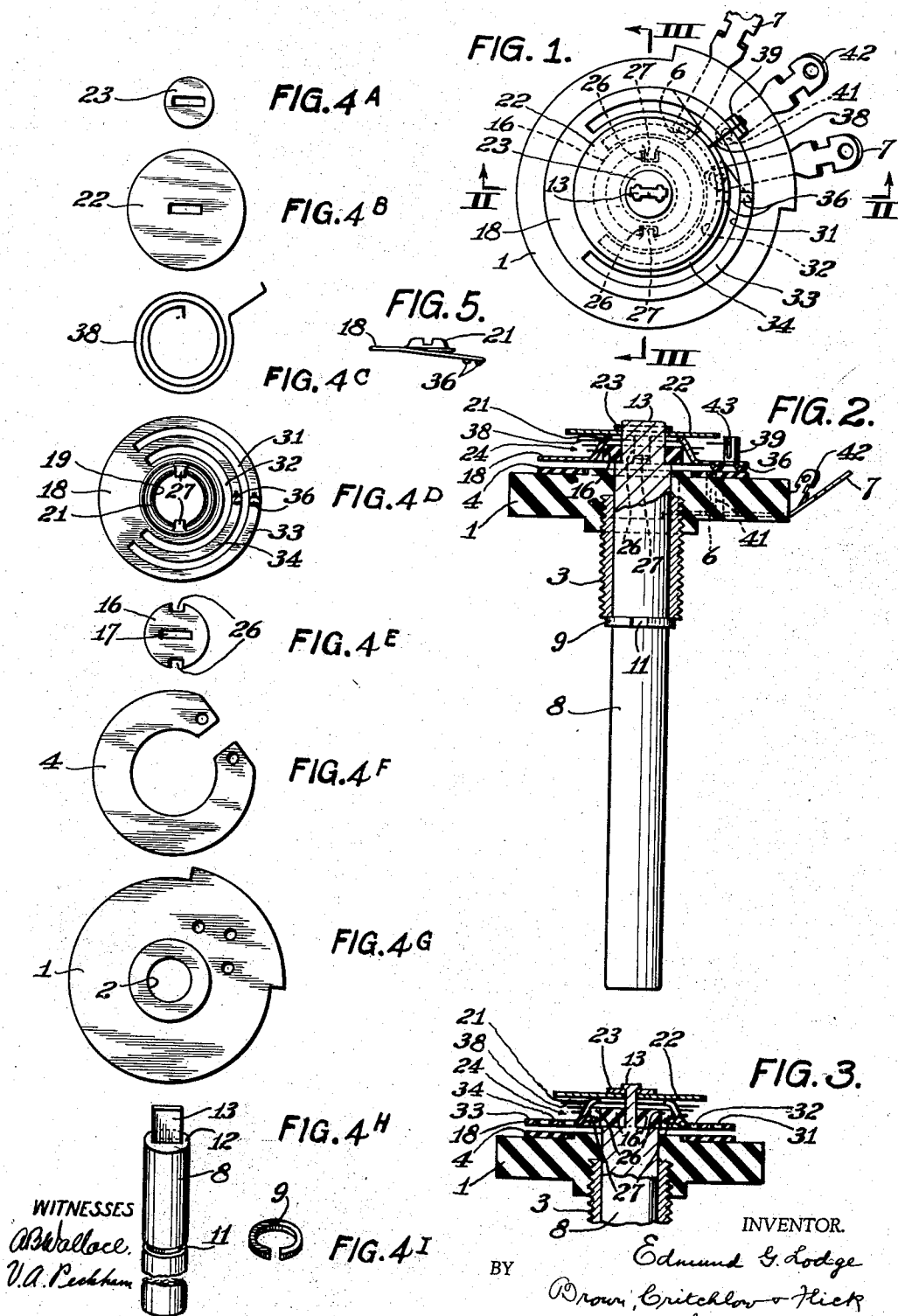
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ELECTRIC CONTROL DEVICE

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ELECTRIC CONTROL DEVICE

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This invention relates to electric control devices, and more particularly to volume controls, switches and the like, and has among its objects the provision of an improved control which is simplified in construction and reduced in cost.

In the highly competitive radio art in which these controls are principally used, the chief problems before the control manufacturers are the production of better controls at less cost and with fewer parts to take up space and get out of order. I believe that the invention disclosed herein solves all of these problems satisfactorily, as controls made in accordance with this invention and rigidly tested show that they can be made of fewer parts and at less cost and will yet perform more dependably than any on the market today.

According to my invention, a base member is provided with an opening through which a rotatable shaft extends and around which current-conducting means, such as a resistance element or switch contacts, is mounted. A control head for engaging the conducting means is provided with an enlarged opening surrounding the shaft and in which a spacing element, rigidly mounted on the shaft, is disposed. This element and the control head are locked together for rotation, preferably by a tang projecting from the wall of the control head opening and into a peripheral notch in the spacing element. The wall of the control head opening preferably extends outwardly along the shaft and is turned inwardly over the edge of the spacing element to limit inward axial movement of the head relative to the spacer, and to provide an annular space between the body of the control head and a retaining element mounted on the end of the shaft where it is secured in any suitable manner. To provide a positive, as distinguished from a sliding, connection between an outside terminal and the control head, a coil of resilient wire encircles the wall of the control head opening in the annular space just mentioned. The outer end of this wire is connected to an outside terminal, while its inner end is connected to the control head, preferably to the tang that projects into the notch in the spacer. The control head itself is most conveniently made of metal with a portion of it cut from the body and bent to exert yielding pressure on the current-conducting means. A very simple and inexpensive but durable control is thus provided.

The preferred embodiment of the invention is illustrated in the accompanying drawing, in which Fig. 1 is a plan view of my electric con-

trol; Figs. 2 and 3 are sections taken on the lines II—II and III—III of Fig. 1; Fig. 4 is a disassembled view of the principal parts of my control, Figs. 4A to 4G being respectively plan views of my retaining washer, insulating washer, spiral lead, control head, spacing element, resistance element and insulating base, Fig. 4H being a perspective view of the control shaft, and 4I being a perspective view of a spring washer; and Fig. 5 is a reduced side view of the control head as it appears before assembly.

Referring to Figs. 2 and 4 of the drawing, a base member 1, preferably made of Bakelite or some other suitable insulating material, is provided with a central opening 2 in which one end of an externally threaded metal bushing 3 is molded. Mounted on the opposite face of the base member is an arcuate carbonaceous resistance element 4 the ends of which are connected by rivets 6 to terminals 7 (Fig. 1) disposed in radial slots in the opposite face of the base. Extending through the bushing and base member is a rotatable shaft 8 inward movement of which is limited in any suitable manner, such as by a C-washer 9 pressed in an annular groove 11 in the shaft at the outer end of the bushing. A short distance from the opposite face of the base the end portion of the shaft is reduced to form a shoulder 12, the reduced portion 13 preferably being of generally rectangular shape in cross-section.

It is a feature of this invention that there is mounted on this reduced end a non-conducting spacing element 16 having an opening 17 therein of substantially the same shape as the reduced end 13 of the shaft so that it can not turn thereon. This spacer extends outwardly beyond the periphery of the shaft and carries a metal control head 18 which it spaces and insulates from the shaft. For this purpose the control head is provided with a central opening 19 that receives the spacer, and its wall preferably extends outwardly along the shaft with its outer end turned inwardly a slight amount to form a flange 21 that overlies the edge of the spacer and thereby prevents the control head from moving axially inwardly relative to the shaft. To hold the control head against the spacer, an insulating washer 22 is mounted on the reduced end of the shaft in engagement with the control head flange 21 against which it is tightly pressed by a metal element 23 disposed on the end of the shaft where it is retained in any suitable manner, such as by upsetting the shaft end. Insulating washer 22 is considerably larger than

spacer 16 in order to provide an annular recess 24 between it and the body portion of the control head for a purpose about to be described.

To lock the control head and spacer together for rotation in unison by the control shaft, the spacer is preferably provided with a pair of diametrically opposite peripheral notches 26, and a pair of inwardly projecting tangs 27 are struck out of the wall of opening 19 and project into the notches, as shown in Figs. 1, 3 and 4. The engagement of the tangs with the central portion of the spacer and the contact of flange 21 with one face of the spacer results in a firm connection between the two elements.

In accordance with this invention, the control head 18 is preferably provided with a pair of concentric arcuate slots 31 and 32 extending a considerable distance around it, and terminating at each end in a common radius of the head, in order to form a pair of arcuate spring portions 33 and 34. Midway between the ends of these springs each is provided with an inwardly projecting rounded contact point 36 struck out of the metal of the spring for sliding engagement with resistance element 4. These two springs are bent inwardly in substantially the same inclined plane, as shown in Fig. 5, so that they both exert substantially the same amount of pressure on the resistance element when distorted outwardly thereby. The provision of two such sliding contacts instead of one insures smoother and more dependable operation of the control.

Another feature of this invention is that the movable control head is connected to an outside terminal by a flexible wire rigidly secured to the head and terminal so that the disadvantages of a sliding contact are avoided. Accordingly, a spiral coil of spring wire 38 encircles the wall of control head opening 19 in recess 24 where it is retained by insulating washer 22. The outer end of the wire is rigidly connected to an upstanding lug 39 secured to the base member by a rivet 41 extending through the base and holding a terminal 42 against the opposite side of the base as shown in Fig. 2. The lug is preferably provided with a longitudinal slot 43 through which the wire extends with its outer end bent at right angles and electrically welded to the outer face of the lug. This type of connection prevents the movements and the pull of the wire from reaching and loosening the joint. Electric welding is preferred to soldering as it does not heat the adjoining portion of the wire to such an extent as to change its molecular characteristics and thereby weaken it. The inner end of the spring wire is welded in a similar manner to the control head, the location of the weld preferably being on top of one of the tangs 27 that projects into one of the washer notches, as shown in Fig. 3. A weld in this location does not interfere in any way with the tightening and loosening of the wire coil as the control head is manipulated.

An electric control device constructed in accordance with this invention has only a few parts when compared with many similar controls on the market today. Furthermore, the various parts are very simple and inexpensive to make, and can be quickly assembled with a minimum amount of labor. In addition to this, the control is constructed in such a manner as to give exceptionally long and dependable service because the parts are so simply but firmly connected together, and because the electrical connections are direct and positive.

According to the provisions of the patent stat-

utes, I have explained the principle and construction of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as illustrated and described.

I claim:

1. An electric control device comprising a base member provided with an opening therethrough, current-conducting means mounted on said base, a rotatable shaft extending through said opening, a control head for engaging said conducting means and provided with an opening having a wall surrounding the adjacent end portion of said shaft and spaced therefrom, a spacing element rigidly mounted on said end portion of the shaft and disposed in said control head opening, said head and element being provided with interengaging portions locking them together for rotation, the wall of said control head opening extending outwardly axially of the shaft and being turned radially inwardly at its edge to form a flange overlying the edge of the spacing element to limit inward movement of the head thereon, and means for holding said flange against the spacing element.

2. An electric control device comprising a base member provided with an opening therethrough, current-conducting means mounted on the inner face of said base, a rotatable shaft extending through said opening with its inner end reduced to form a non-circular end portion and a shoulder, a control head for engaging said conducting means and provided with an opening having a wall surrounding the inner end portion of said shaft and spaced therefrom, a spacing element having an opening registering with said reduced end of the shaft, said element abutting against said shoulder and being disposed in said control head opening, said head and element being provided with interengaging tangs and notches locking them together for rotation, the wall of said control head opening extending outwardly axially of the shaft and being turned radially inwardly at its edge to form a flange overlying the edge of the spacing element to limit inward movement of the head thereon, and means for holding said flange against the spacing element, inward movement of said head and spacing element being restrained by said shoulder.

3. An electric control device comprising a base member provided with an opening therethrough, current-conducting means mounted on the inner face of said base, a rotatable shaft extending through said opening with its inner end reduced to form a non-circular end portion and a shoulder, a control head for engaging said conducting means and provided with an opening having a wall surrounding the inner end portion of said shaft and spaced therefrom, a spacing element having an opening registering with said reduced end of the shaft, said element abutting against said shoulder and being disposed in said control head opening, said head and element being provided with interengaging portions locking them together for rotation, the wall of said control head opening extending outwardly axially of the shaft and being turned radially inwardly at its edge to form a flange overlying the edge of the spacing element to limit inward movement of the head thereon, an insulating washer mounted on said reduced end of the shaft in engagement with said flange, and means secured to said end of the shaft

and pressing against said washer for holding said flange against the spacing element.

4. An electric control device comprising a base member provided with an opening therethrough, current-conducting means mounted on said base, a rotatable shaft extending through said opening, a control head for engaging said conducting means and provided with an opening having a wall surrounding the adjacent end portion of said shaft and spaced therefrom, a spacing element rigidly mounted on said end portion of the shaft and disposed in said control head opening, said spacing element being provided with a peripheral notch and the wall of said control head opening being provided with a tang projecting into the notch for locking said head and element together for rotation, a coil of resilient wire encircling said shaft adjacent said control head with its inner end projecting into said notch and secured to said tang, the outer end of said wire being connected to an outside terminal, and means for restraining movement of the control head longitudinally of the shaft.

5. An electric control device comprising a base member provided with an opening therethrough, current-conducting means mounted on said base, a rotatable shaft extending through said opening, a control head for engaging said conducting means and provided with an opening having a wall surrounding the adjacent end portion of said shaft and spaced therefrom, a spacing element rigidly mounted on said end portion of the shaft and disposed in said control head opening, said head and element being provided with inter-engaging portions locking them together for rotation, the wall of said control head opening extending outwardly axially of the shaft and being turned radially inwardly at its edge to form a flange overlying the edge of the spacing element to limit inward movement of the head thereon, a resilient wire in the form of a spiral encircling the outwardly extending wall of the control head opening with its inner end connected to said head and its outer end connected to an outside terminal, and means for holding said flange against the spacing element.

6. An electric control device comprising a base member provided with an opening therethrough, current-conducting means mounted on said base, a rotatable shaft extending through said opening, a control head for engaging said conducting means and provided with an opening having a wall surrounding the adjacent end portion of said shaft and spaced therefrom, a spacing element rigidly mounted on said end portion of the shaft and disposed in said control head opening, said spacing element being provided with a peripheral notch and the wall of said control head opening being provided with a tang projecting into the notch for locking said head and element together for rotation, the wall of said control head opening extending outwardly axially of the shaft and being turned radially inwardly at its edge to form a flange overlying the edge of the spacing element to limit inward movement of the head thereon, a coil of resilient wire encircling said wall with its inner end projecting into said notch and secured to said tang and with its outer end connected to an outside terminal, and means for holding said flange against the spacing element.

7. An electric control device comprising a base member provided with an opening therethrough, current-conducting means mounted on said base, a rotatable shaft extending through said opening, a control head for engaging said conducting

means and provided with an opening having a wall surrounding the adjacent end portion of said shaft and spaced therefrom, a spacing element rigidly mounted on said end portion of the shaft and disposed in said control head opening, said spacing element being provided with a peripheral notch and the wall of said control head opening being provided with a tang projecting into the notch for locking said head and element together for rotation, the wall of said control head opening extending outwardly axially of the shaft and being turned radially inwardly at its edge to form a flange overlying the edge of the spacing element to limit inward movement of the head thereon, a coil of resilient wire encircling said wall with its inner end projecting into said notch and secured to said tang and with its outer end connected to an outside terminal, an insulating washer mounted on said reduced end of the shaft and holding said coil of wire in position, and means for pressing the washer against said flange for holding it against the spacing element.

8. An electric control device comprising a base member provided with an opening therethrough, current-conducting means mounted on said base, a rotatable shaft extending through said opening, a disc-like control head for engaging said conducting means and provided with an opening surrounding the adjacent end portion of said shaft, said control head being formed of resilient metal and being provided with a pair of concentric slots extending a substantial distance around it to form a pair of arcuate spring arms, said arms being provided midway of their ends with contacts for engaging said current-conducting means along its radius, the outer of said arms being initially bent toward said base a greater distance than the inner arm for exerting substantially the same pressure as said inner arm against said conducting means, and insulating means connecting the control head to the shaft for rotation therewith.

9. A volume control comprising an insulating base member provided with an opening therethrough, an arcuate resistance element mounted on the inner face of said base, a rotatable metal shaft extending through said opening, means for limiting inward movement of said shaft, a metal control head provided with a contact for engaging said resistance element and provided with an opening having a wall surrounding the adjacent end portion of said shaft and spaced therefrom, said end portion of the shaft being reduced to form a non-circular portion and a shoulder, an insulating spacing element provided with an opening registering with said reduced portion, said spacing element abutting against said shoulder and disposed in said control head opening, the wall of said control head opening extending outwardly axially of the shaft and being turned radially inwardly at its edge to form a flange overlying the edge of the spacing element to limit inward movement of the head thereon, said spacing element being provided with a peripheral notch and said wall of the control head being provided with a tang projecting into the notch for locking said head and element together for rotation, an insulating washer mounted on said reduced end of the shaft and engaging said flange, said washer extending outwardly beyond said control head wall to thereby form an annular recess between the washer and head, means for holding said washer against said flange, a coil of resilient wire encircling said wall in said recess with its inner end extending into said notch and connected to

said tang, and means for connecting the outer end of the wire to an outside terminal.

10. An electric control device comprising a base member provided with an opening therethrough, current-conducting means mounted on said base, a rotatable shaft extending through said opening, a disc-like control head for engaging said conducting means, means for connecting said head to said shaft for rotation therewith, a disc-

like member secured to said shaft at a point spaced axially from the control head to form with the head a spool, and a coil of resilient wire encircling said shaft between said head and disc-like member, the inner end of said wire being connected to the head and its outer end being connected to an outside terminal, and said spool holding the coil of wire in position.

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