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Schmidt

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[54] **MOLDED CONTROL KNOB**

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[73] Assignee: **Bell & Howell Company**, Chicago, Ill.

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[52] **U.S. Cl.** **403/230**; 16/121; 74/553; 292/353; 403/361; 403/383

[51] **Int. Cl.** **F16d 1/06**; F05b 3/00

[58] **Field of Search** 16/118, 121; 74/531, 553; 292/353; 403/361, 383, 230

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[57] **ABSTRACT**

A unitary molded control knob for an irregularly shaped rotatable shaft such as a D-shaft. The knob has a unitarily molded spring ramp element which receives the D-shaft flat and directs and biases the shaft tightly against an opposing shaft receiving wedge shaped wall as the shaft is slid axially into a shaft receiving cavity bounded in part by the spring ramp and wedge shaped wall.

4 Claims, 4 Drawing Figures

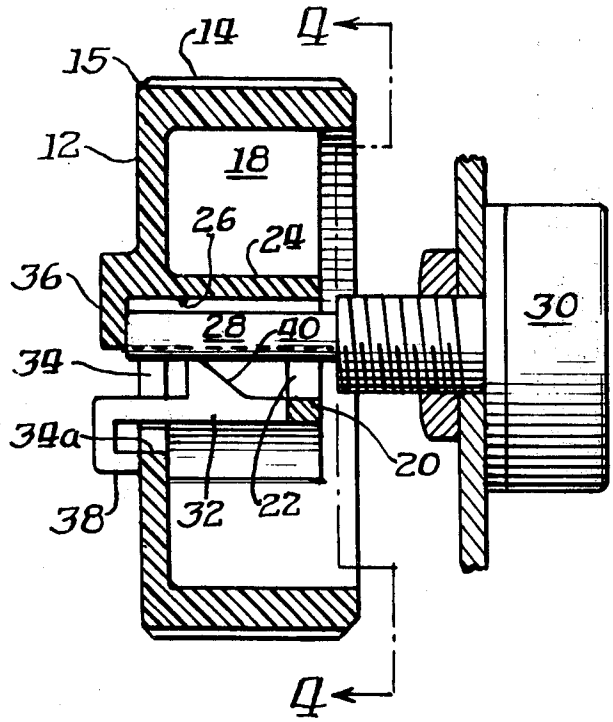


Fig. 1.

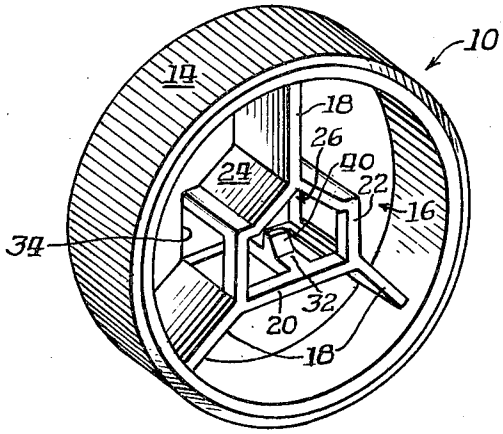


Fig. 2.

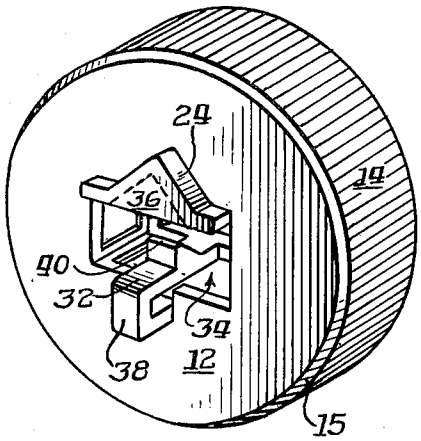


Fig. 3.

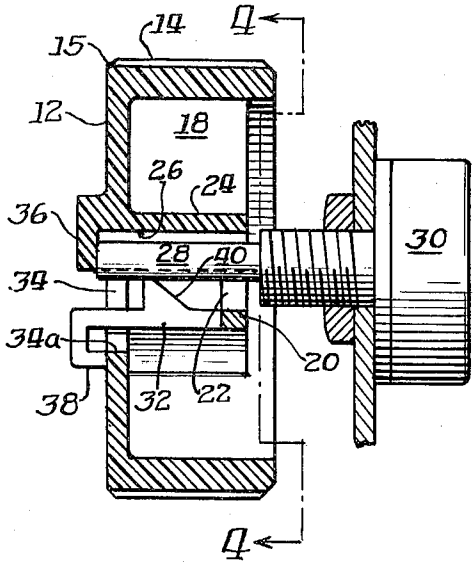
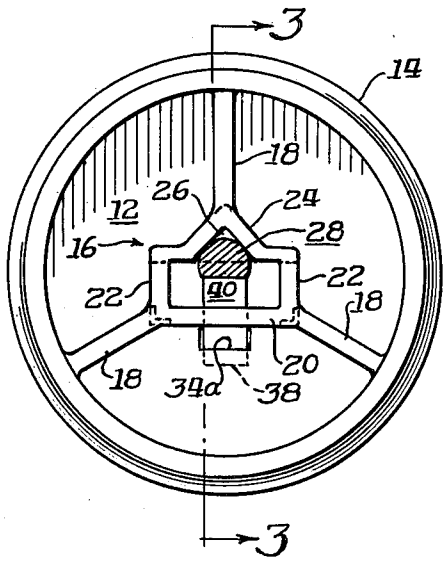


Fig. 4.



MOLDED CONTROL KNOB

FIELD OF THE INVENTION

This invention relates to control knobs for rotary electrical controls and more particularly relates to knobs for irregularly shaped rotatable shafts such as D-shafts.

BACKGROUND AND SUMMARY OF THE INVENTION

Electrical or other controls such as volume controls or switches which control various means in response to rotation of a control shaft have a rotatable manually manipulatable control knob on the end of the shaft. Oftentimes it is desirable to readily removably mount the knob on the end of the shaft while maintaining full rotational force fit between the knob and shaft, e.g., when the knob is disposed on one side of a control panel and the control means on the other side, with the shaft extending through the panel.

The knob preferably is removable axially off of the end of the shaft. Heretofore, the knob was held on to the shaft by a separate spring member, such as a metal leaf spring, which was mounted by other means in or around an aperture in the knob. The separate spring member also has been known to be molded in position within the knob by providing a special molded cavity which receives and positions the spring member prior to molding the knob thereabout. The present invention obviates these multiple parts and multiple molding steps by providing a unitary molded control knob which has a unitarily molded spring ramp element which yieldably receives the control shaft and holds the control shaft by spring biasing against an opposing wedge-shaped wall.

The present invention provides a unitary molded control knob which is capable of releasably receiving a shaft. The knob has a shaft receiver which includes a wall and an opposing guiding spring camming element. As the shaft is slid axially into the receiver, the camming element urges the shaft into tight engagement with a wedge-shaped wall portion of the receiver to hold the shaft.

Advantageously, the camming element may be a ramp member which engages the flat on a D-shaft during axial movement of the shaft. After the knob is mounted on the shaft, the engagement of the ramp with the shaft flat prevents rotational slippage between the knob and shaft and the spring biasing of the ramp against the opposite retainer wall holds the knob on the shaft. In a more specific form, the ramp is located on a somewhat resilient bridge member to provide more positive urging of the ramp against the flat.

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a specific embodiment thereof, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a rear perspective view of a form of knob provided in accordance with this invention;

FIG. **2** is a front perspective view of the knob of FIG. **1**;

FIG. **3** is a vertical section through the knob of FIGS. **1** and **2** along line **3—3** of FIG. **4** and showing the knob mounted on the shaft of an electric control; and

FIG. **4** is a vertical section along line **4—4** of FIG. **3**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring first to FIGS. **1** and **2**, a unitary molded knob **10** has a face plate **12** and a molded cylindrical sidewall **14** which is joined to face plate **12** at a bevelled edge **15**. An internal recess or cavity (FIGS. **1**, **3** and **4**) thereby is formed by face plate **12** and sidewall **14**. Within the cavity is provided a cage structure, generally designated **16**, molded integral with face plate **12** and having opposing open ends. The cage structure **16** is supported by radial strengthening ribs **18** which are also molded integral with face plate **12** and sidewall **14**, as well as with cage **16**.

Still referring to FIGS. **1**, **3** and **4**, the cage structure **16** includes a base or floor brace-like frame **20**, side frames **22** upstanding from base frame **20** and joined to a wedge-shaped wall or roof structure **24**, all of which define an interior shaft receiver **26** for receiving the round surface of a D-shaft **28** (FIGS. **3** and **4**). In the form illustrated, the D-sahft **28** is the control shaft for a volume control in the form of a rheostat **30**, but the knob can be used just as well on numerous other control devices, such as rotary switches or the like.

A unitarily molded bridge **32** is integral with base frame **20** and extends as a span from base frame **20** at the bottom of cage **16** beyond the front of cage **16**, through an opening **34** in frame plate **12** under a gable **36** forming the front end of the roof structure **24**. Bridge **32** then terminates in a hook shape at **38** having its reverse turned end merging and molded integral with face plate **12** at the bottom edge **34***a* of the opening **34**. By extending the ramp through the opening **34**, a greater length thereof is provided with greater resiliency therefor.

It will be seen that as D-shaft **28** is inserted axially into the rear of knob **10** (to the left in FIG. **3**) and into the cage **16**, the flat of the D-shaft rides up and over the top of ramp **40** as bridge **32** yields slightly. Ramp **40** supports and guides and shaft flat and urges the round of the shaft against the inside surface of the wedge-shaped roof structure **24**. Finally once the D-shaft **28** is fully inserted the shaft end abuts the inside of a gable **36**. D-shaft **28** will then rotate or turn with knob **10** and the slightly flatened upper edge of ramp **40** which supports the flat of the D-shaft prevents slippage between knob **10** and the D-shaft when the knob is turned.

The entire knob **10** is advantageously molded as a unitary or integral member as will be evident from its design with special reference to FIG. **3**. The molding can take place in a single operation with the mold halves separating to the left and right as viewed in FIG. **3**.

I claim:

1. A unitary knob for turning a D-shaft of an electrical control comprising a body having a front face and a cylindrical gripping portion, a receiver within said body having a floor portion which includes a resilient bridge spanning the receiver in the direction of shaft insertion, said bridge member extending from said receiver through said front face and having a hook shape with the reverse turned end of the hook shape formed integral with said face, a roof portion, and a rear open-

ing for axially receiving the D-shaft and a stationary ramp element on said floor portion for receiving the flat portion of a D-shaft and directing the D-shaft during axial insertion into said receiver to press the cylindrical portion of the D-shaft against said roof portion and maintain the D-shaft in engagement with the roof portion whereby the shaft turns with the ramp preventing slipping.

2. A knob for turning a shaft comprising a unitary molded body which includes a front face and a receiver opening at the rear of the knob, said receiver having a floor, side frames extending from said floor for receiving the outer axial surface of a shaft, with a space adjacent said side frames from which the shaft may be moved radially against said side frames, a roof portion attached to said side frames, and cam means attached to a resilient bridge of said floor in said receiver for directing said shaft from said adjacent space into tight engagement with said roof portion as the shaft is moved axially into the receiver, said resilient bridge extending from said receiver and having a hook shape at the exterior of said receiver which joins with said front face of said knob.

3. A unitary molded knob for turning the D-shaft of a rotary electrical control comprising a face plate portion and a cylindrical sidewall portion joining said face plate portion and defining an open cavity within said knob, a central portion in said face plate portion, a cage structure in said cavity having opposite open ends, the first open end being in registry with said portion, rib means integral with said cage structure, face plate portion and cylindrical sidewall and supporting said cage structure portion within said cavity, said cage structure having a base frame portion and a pair of side frame portions upstanding therefrom and jointed to one end of a roof structure portion which has a gable at its other end above said port, a bridge member extending from said base frame portion through said port and having a hook shape at the exterior of said cavity turned back with the turned end of the hook shape joined to the front surface of said face plate portion at the base of said port, and a ramp element on said bridge member for receiving the flat of a D-shaft and camming the D-shaft during axial insertion into said cage through the second open end thereof to press the cylindrical portion of the D-shaft against the bottom of said roof structure before the end of the D-shaft moves into abutment with the inner surface of the gable, said bridge member being sufficiently resilient to maintain a bias on said ramp against the D-shaft flat and thereby maintain the D-shaft in tight engagement with the roof structure and interlock the knob with the D-shaft for rotary movement therewith.

4. A knob for turning a shaft comprised of a unitary molded body defining a front face and a receiver section which includes a ramp, a resilient bridge of a floor frame attached to said ramp, a roof section, side frames attaching said roof section to said floor frame, a gable attached to said roof section on said front face of said knob, ribs located within said knob for positioning said receiver section, said ramp prohibiting rotation of said shaft relative to said knob and urging said shaft against said roof section of said receiver, and said gable limiting axial movement of said shaft into said receiver.

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