April 25, 1939. H. W. RUBINSTEIN 2,156,067

CONTROL DEVICE

Filed April 30, 1937

Fig. 1.

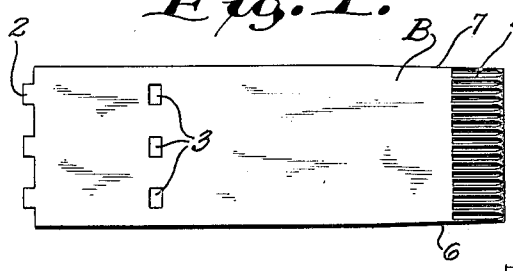
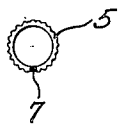


Fig. 2.



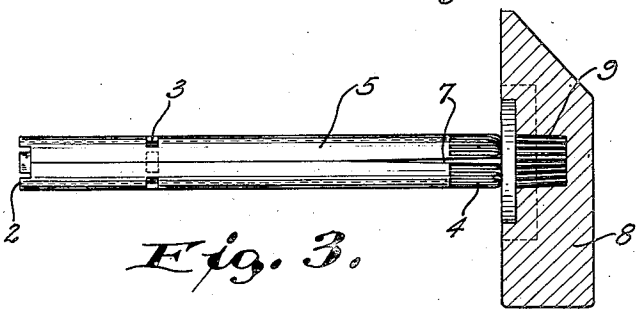


Fig. 3.

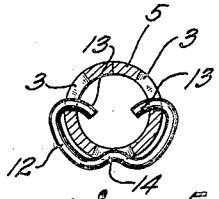


Fig. 5.

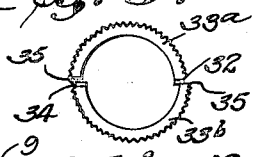


Fig. 13.

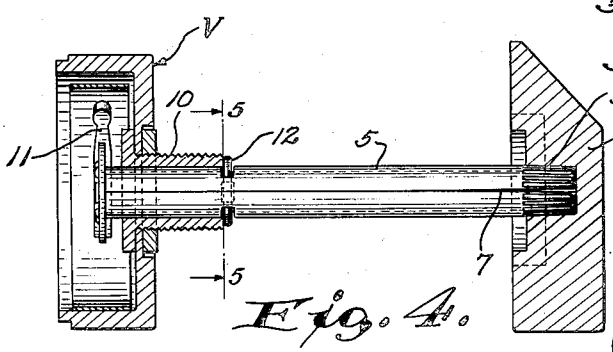


Fig. 4.



Fig. 10.

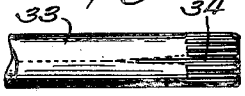


Fig. 11.

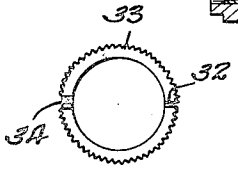


Fig. 12.

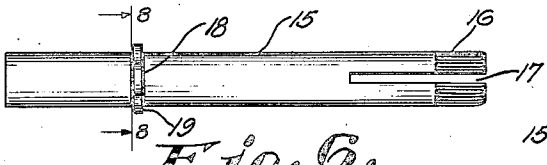


Fig. 6.

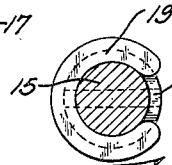


Fig. 8.

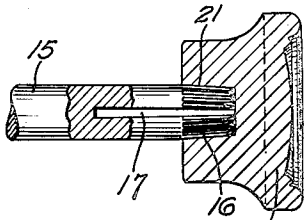


Fig. 7.

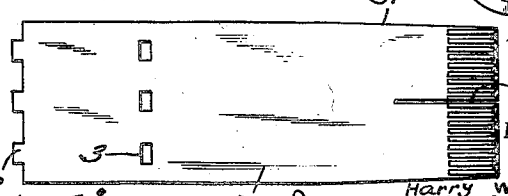


Fig. 9.

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ATTORNEY.

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UNITED STATES PATENT OFFICE

2,156,067

CONTROL DEVICE

Harry W. Rubinstein, Milwaukee, Wis., assignor to Globe-Union Inc., Milwaukee, Wis., a corporation of Delaware

Application April 30, 1937, Serial No. 139,974

2 Claims. (Cl. 287—53)

This invention relates to an improvement in a control or operating device of the type commonly used on electrical apparatus or appliances, as for example on a radio receiver for controlling the volume of the reception or reproduction or for similar purposes.

In the case of a volume control, it is customary to have the operating shaft for the movable contact of the variable resistance embodied in such a control provided at its outer end with an operating knob, the knob having a socket receiving the outer end of the shaft and detachably fastened thereto.

The present invention aims to improve and simplify the knob and shaft structure and to accomplish this in such a way that the knob may be securely although releasably applied to the outer end of the shaft. When these parts are assembled they are positively interfitted so that accidental angular shifting of the knob relative to its shaft is precluded. However, the arrangement provides for easy relative adjustment of the knob angularly or circumferentially with respect to the shaft merely by pulling the knob off the shaft, rotating it in one direction or the other until the desired angular relation is obtained and then pressing the knob back on the shaft.

Another object of the invention is to provide a control device of this character which is capable of economical production on a quantity basis and by means of facilities ordinarily available to a plant engaged in the manufacture of devices of this general character.

Other objects and advantages reside in certain novel features of the construction, arrangement, and combination of parts which will be hereinafter more fully described and particularly pointed out in the appended claims, reference being had to the accompanying drawing forming a part of this specification, and in which:

Figure 1 is a view in top plan showing a blank of sheet metal which has been cut or stamped and also knurled or embossed preliminary to its formation into a hollow shaft;

Figure 2 is a view in end elevation of a shaft constructed from the blank shown in Figure 1;

Figure 3 is a view partly in side elevation and partly in transverse vertical section showing one type of operating knob assembled with the shaft shown in Figure 2;

Figure 4 is a similar view showing how such a knob and shaft are assembled with a volume control, only a portion of the volume control device being illustrated;

Figure 5 is a view in transverse section taken on line 5—5 of Figure 4;

Figure 6 is a view in side elevation illustrating how the invention may be embodied in a construction employing a solid shaft;

Figure 7 is a fragmentary view partly in side elevation and partly in central longitudinal cross section showing a knob applied to the knurled end of a shaft of the construction shown in Figure 6;

Figure 8 is a view in cross section taken on line 8—8 of Figure 6;

Figure 9 is a top plan view showing a blank of sheet metal which has been cut and stamped to provide the longitudinal spline formation preliminary to the formation of the blank into a hollow shaft;

Figure 10 is a fragmentary view in side elevation illustrating the blank of Figure 9 formed up into a shaft but showing the slotted end prior to the lateral or transverse displacement of the sections of the shaft on the upper side of the slots;

Figure 11 is a view similar to Figure 10 but showing the sections on the opposite sides of the slots laterally or transversely displaced;

Figure 12 is a view in end elevation looking toward the left hand end of the shaft shown in Figure 10;

Figure 13 is a similar view of the shaft shown in Figure 11.

Referring to the drawing and more particularly to Figure 1 it will be seen that the present invention proposes to punch or stamp out a blank B from a flat sheet of resilient metal and form lugs 2 at one end of the sheet, rectangular perforations 3 in an intermediate portion of the sheet, and knurls, that is, small, closely spaced, parallel ridges or splines 4 in the end of the sheet opposite the lugs 2. The sheet after being punched and knurled in the manner described is then rolled or bent up or otherwise machined to provide a hollow shaft designated at 5 in Figures 2 to 5 inclusive. During the punching or stamping operation the edges of the sheet or blank adjacent the knurled end 4 are tapered as indicated at 6 so that when the blank is rolled up to provide the shaft 5 its knurled end is provided with a slit 7.

A knob designated at 8 is provided and is formed with a rearwardly opening socket 9, the inner peripheral or cylindrical wall of which is knurled, that is, provided with small, parallel, closely spaced ridges or splines corresponding to the ridges 4 of the shaft.

The internal diameter of the knurled socket 9 is slightly less than the external diameter of the knurled end of the shaft so that when the knurled end of the shaft is pressed into the socket it will be compressed or contracted thereby causing the knurls of the shaft and socket to interfit frictionally and tightly. This results in the knob being securely held on and positively interlocked or interfitted with the shaft. Consequently when the knob is turned the shaft will be constrained to turn therewith and slipping or relative shifting of the knob with respect to the shaft is precluded. However, by pulling the knob forcibly outwardly it may be detached from the end of the shaft 5 when it is desirable to remove the knob from the shaft to adjust it angularly relative thereto in order to obtain the desired angular relation between the knob and the shaft. If desired the socket may be tapered inwardly as shown, although this is not essential. When the knob is assembled with the shaft and the shaft compressed or contracted the edges of the slit 7 are moved toward each other.

As illustrated in Figure 4 the inner portion of the shaft is rotatably supported in the bushing 10 of a volume control device, portions of which are designated generally at V. The inner end of the shaft 5 projects beyond the bushing 10 and its lugs 2 are fitted in openings of the hub of the movable contact 11 of the volume control device and upset into permanent engagement therewith. In order to limit the inward movement of the shaft a spring wire stop designated at 12 is provided. The stop has hooks or inwardly curved ends 13 which extend into two of the openings 3 and has its central portion 14 inwardly depressed to seat or engage in the other opening 3. This stop 12 bears against the outer end of the bushing 10 to perform its intended function.

In the form of the invention shown in Figures 6 to 8 a solid shaft designated generally at 15 is provided. The shaft 15 is first turned and then has one end knurled or splined as indicated at 16. The knurled end of the shaft is then formed with a slit or slot 17. The slot 17 may be milled in the shaft. Adjacent its inner end the shaft 15 is also provided with a groove 18 to receive a resilient split washer 19. The extreme outer end of the knurled portion 16 may be slightly beveled.

Assembled with the shaft is a knob 20 having an internal knurled socket 21 of cylindrical form. When the knurled end of the shaft is pressed into the socket and the knurled or closely spaced, small, parallel ridges of the shaft and socket are positively and frictionally interfitted to securely though releasably hold the knob in place.

The relative dimensions of the shaft and socket are as before so that in the assembly the plit and knurled end of the shaft is compressed or contracted against its inherent resiliency to enhance the frictional contact and improve the securing action.

Should the split and knurled end of the shaft be of such size as to tend to loosely fit in the socket of the knob it can be adapted to effect a secure and tight fit by spreading the portions of the shaft on the opposite sides of the split apart. If too large, such portions may be pressed together.

In the form of the invention shown in Figures 9 to 13 inclusive a blank B2 is punched and stamped to provide the end lugs 2 and perforations 3 as before. The end of the blank opposite the lugs 2 not only has its edges tapered as at 31 but is also provided with a centrally disposed longitudinally extending slot or slit 32. The blank shown in Figure 9 is first formed up into a hollow shaft 33 as shown in Figures 10 and 16 with the slit or slot 32 diametrically opposite the slit or slot 34 defined by the adjacent tapered edges 31 of the blank. The sections 33*a* and 33*b* of the shaft on the opposite sides of the slits or slots 32 and 34 are then displaced transversely or laterally, as clearly indicated in Figure 13, so that the sharp edges 35 and 36 are presented, which are designed to bite into and interlock with the peripheral wall of the socket of a knob to hold the shaft end in its socket and to coact with the knurled formation to prevent angular shifting of the knob with respect to the shaft.

While I have shown and described several constructions in which the invention may be advantageously embodied, it is to be understood that these constructions have been selected merely for the purpose of example and that various changes in the size, shape and arrangement of the parts may be made without departing from the spirit of the invention or the scope of the subjoined claims.

The invention claimed is:

1. A device of the character described comprising a shaft having one end thereof split and provided on its surface within the region of said split with a plurality of longitudinally extending splines, a knob having a socket to receive said split end portion of the shaft, integral longitudinally extending splines on the inner peripheral wall of the socket corresponding to the splines of the peripheral surface of the shaft, the diameter of said socket being slightly less than the external diameter of said split end portion of the shaft, the shaft sections on opposite sides of the split being adapted to be pressed toward each other against the inherent resiliency of the shaft when forced into the socket whereby to establish a positive driving connection between said knob and shaft and to releasably hold the knob against axial displacement on the shaft.

2. A control device of the character described comprising a hollow shaft constructed of sheet metal and having a diametrical slot extending out through one end of the shaft, longitudinally extending splines on the peripheral surface of the shaft sections disposed on opposite sides of the slot, the sections of the shaft on opposite sides of the slot being offset substantially parallel to the plane of the slot and in opposite directions to expose a longitudinally extending edge of the slot at each end thereof, a knob having a socket to receive the slotted end portion of the shaft, the wall of said socket being provided with integral longitudinally extending splines corresponding to the splines on the shaft, said socket being slightly less in diameter than the diameter of the shaft, said shaft sections on opposite sides of the slot being adapted to be displaced against their inherent resiliency when the shaft is forced into the socket to cause the splines of the shaft to interfit with the splines of the socket and the exposed edges of the slot to bite into the walls of the socket whereby to secure the shaft and knob against relative rotation and to prevent axial displacement of the knob with respect to the shaft.

HARRY W. RUBINSTEIN.