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CONTROL KNOB AND SHAFT CONNECTION

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Fig. 1

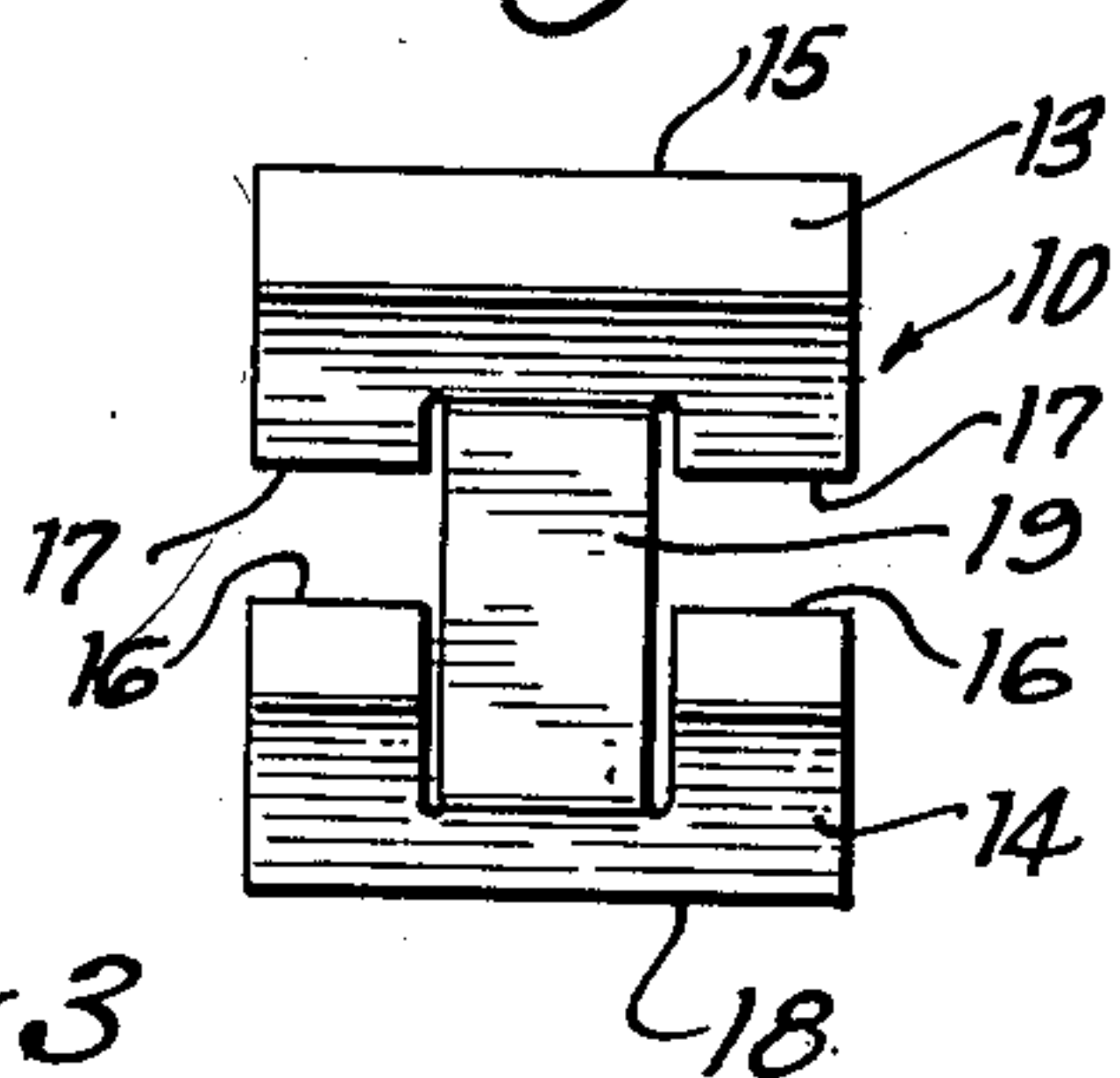


Fig. 2

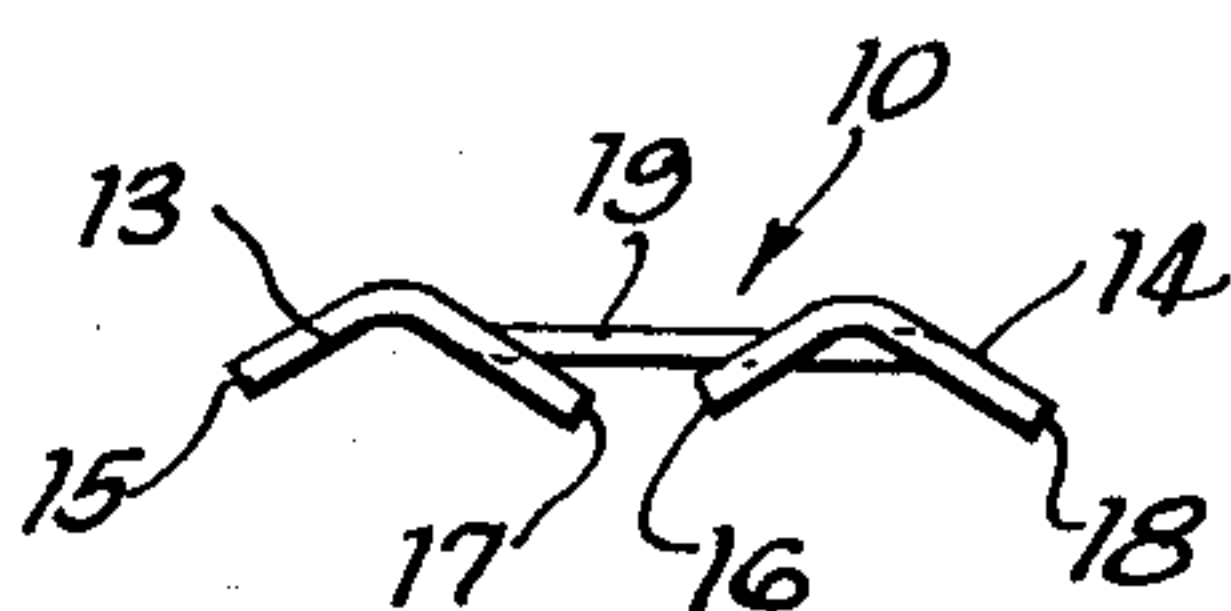


Fig. 3

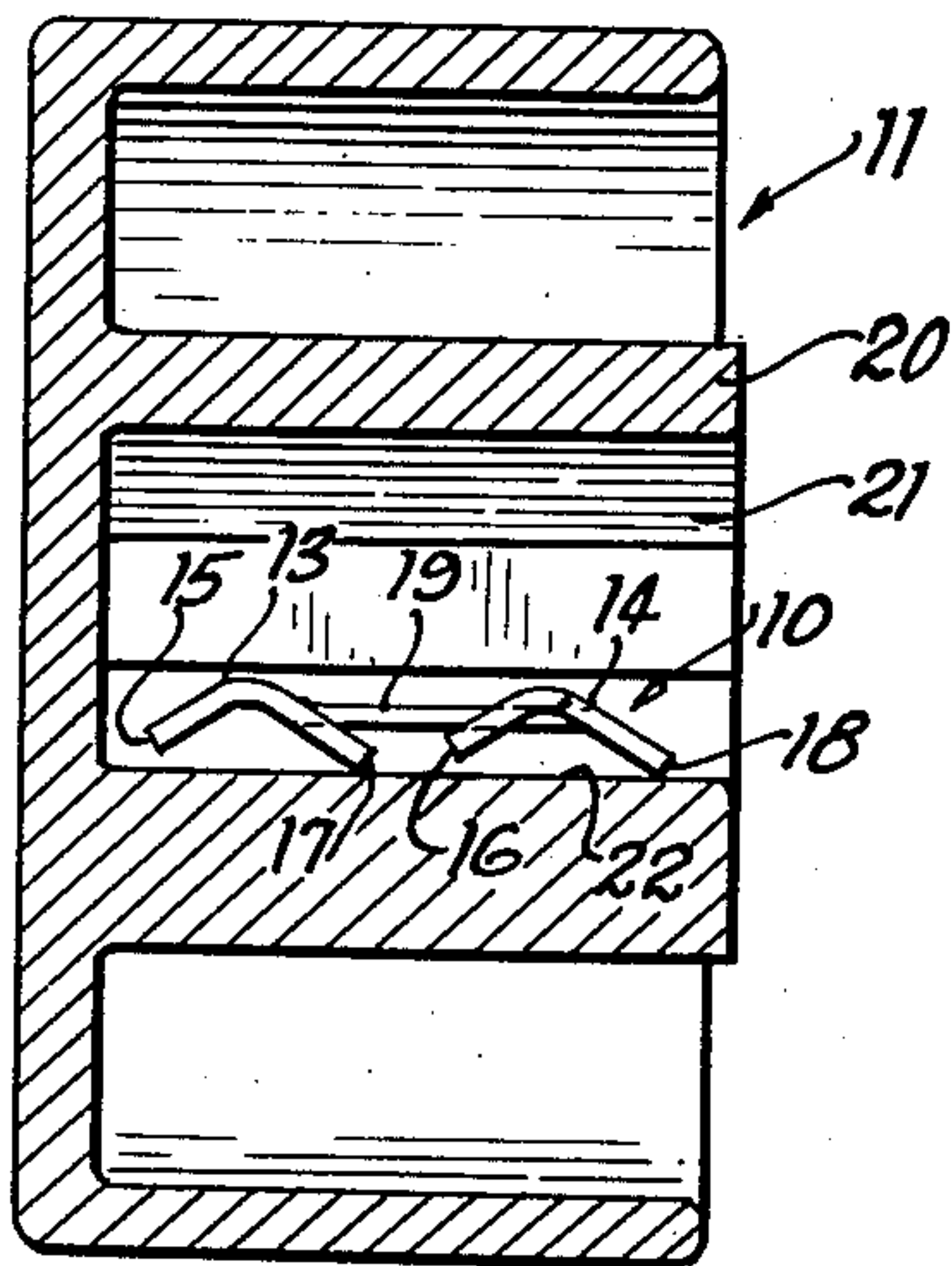


Fig. 4

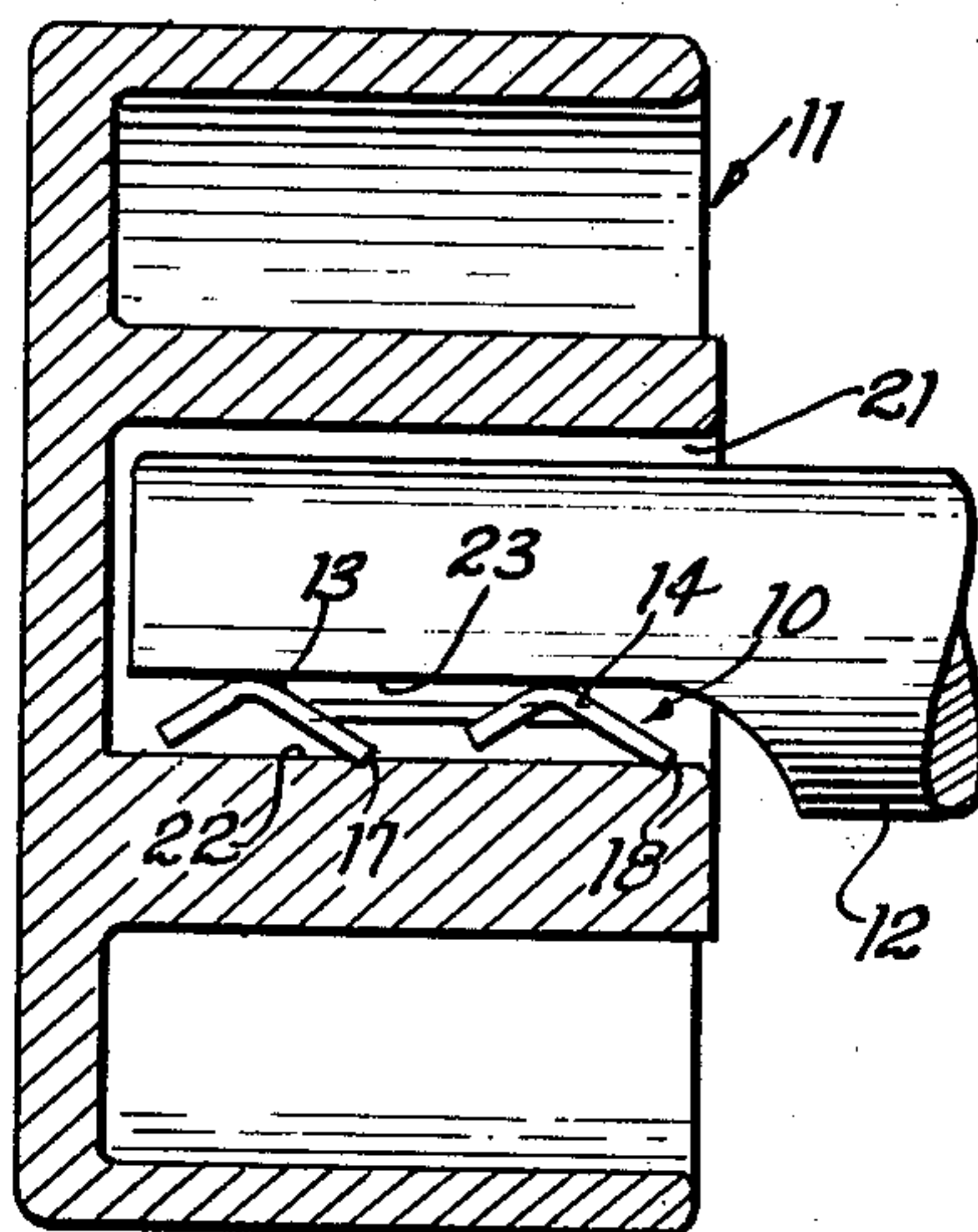
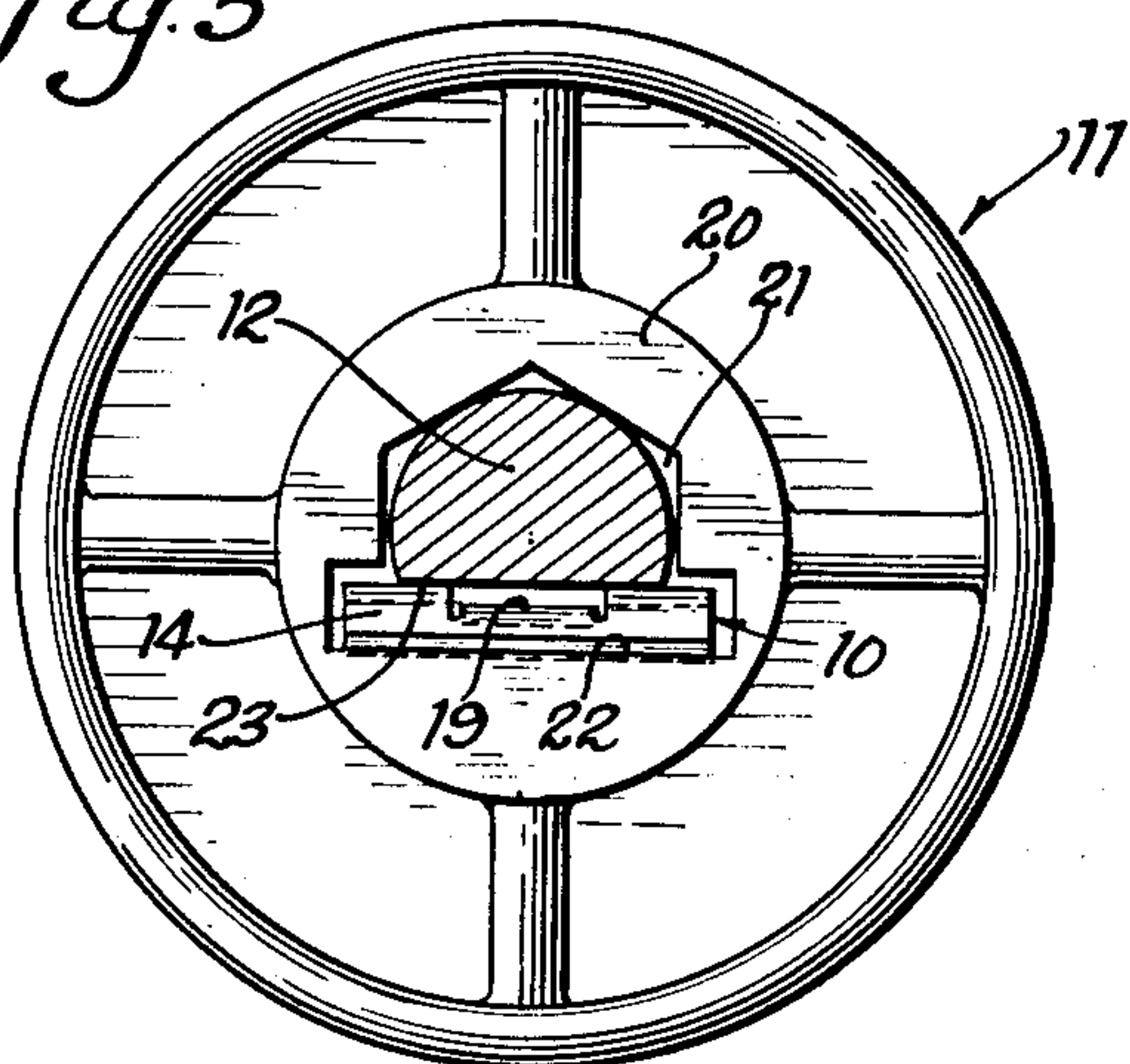


Fig. 5



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CONTROL KNOB AND SHAFT CONNECTION

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This invention relates to retaining springs, more particularly to springs for firmly retaining a control knob on a shaft during ordinary usage while permitting ready removal of the control knob by the exertion of an axial force of greater than normal magnitude, and the invention has for an object the provision of improved springs of this character.

In various types of apparatus, such as radio receivers, for example, the control shafts which extend through apertures in the cabinet are provided with control knobs which must be removed from the shafts in the event it becomes necessary to remove the controlled apparatus, such as the receiver chassis, from the cabinet for repair purposes. It is desirable, therefore, not only that the control knobs be firmly positioned on the shafts during ordinary usage so that there will be no rocking or slipping of the knobs on the shafts, but also that the knobs be readily removable. The use of set screws has been found generally unsatisfactory and various expedients have been proposed for causing the knobs to be frictionally held on the shafts by means of springs or similar resilient elements while permitting axial removal of the knobs merely by the exertion of abnormal axial forces. Such expedients have not in most cases been entirely satisfactory, and it is accordingly a further object of the invention to provide knob retaining spring structure which is effective securely to hold the knob on the shaft, which may be readily manufactured at low cost, which is adaptable to various existing knob constructions, and which is effective to retain itself in the socket of the control knob when the knob is removed from the shaft.

In carrying out the invention in one form, a retaining spring is provided which comprises a pair of elongate arms of curvilinear cross section, each having an open side, and a connector member extending therebetween for supporting the arms in spaced parallel relation. The relation of the connector member to the arms is such that one of the edges defining the open sides of the arms is disposed at a different level than the other edges of the open sides. Accordingly when the spring is positioned within the shaft receiving socket of a control knob the lowermost edges of the arms will engage a flat surface of the socket and the other edges of the arms will be free of the surface to permit transverse flexure of the arms when the upper surfaces thereof are engaged by a surface of the control shaft. It is preferably the rear edge of each open side that is disposed at a lower level, and accordingly when the knob is withdrawn from the shaft these lower edges of the arms tend to bite into the surface of the shaft receiving socket, thereby to retain the spring in the socket.

For a more complete understanding of the in-

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vention reference should now be had to the drawing, in which:

Fig. 1 is a plan view of a spring embodying the present invention, on a greatly enlarged scale;

Fig. 2 is a side elevational view of the spring shown in Fig. 1;

Fig. 3 is an elevational sectional view taken through a conventional control knob and showing the spring of Figs. 1 and 2 located therein before the knob is positioned on a shaft;

Fig. 4 is an elevational cross-sectional view similar to Fig. 3 but showing the control knob positioned on the end of a shaft; and

Fig. 5 is a rear elevational view of the control knob of Figs. 3 and 4 showing the shaft in cross section.

Referring now to the drawing, the invention is shown as embodied in a spring 10 formed of suitable spring material such, for example, as spring steel or bronze, and adapted to be employed for positioning a control knob 11 on a control shaft 12. As shown, the spring 10 is formed to provide a pair of elongate arms 13 and 14 which are substantially curvilinear or V-shaped in cross section to provide open sides respectively defined by a pair of forward edges 15 and 16 and a pair of rear edges 17 and 18. These edges are preferably substantially parallel to each other, and arms 13 and 14 preferably extend transversely of shaft 12. Formed integrally with the arms 13 and 14 and extending therebetween is a connector member 19, the arms 13 and 14 being respectively cut away, as shown in Fig. 1, so that the connector member 19 engages each of the arms at a point adjacent the respective rear edges 17 and 18. The connector member 19 serves to maintain the arms 13 and 14 in substantially parallel relation with the rearward edges 17 and 18 at a lower level than the forward edges 15 and 16.

The control knob 11, as shown in Figs. 3 and 5, has a rearwardly facing hub portion 20 in which is formed a shaft receiving socket 21 having at least one substantially flat side wall surface 22 adapted to be engaged by the spring 10 when the spring is inserted into the socket and, as shown in Fig. 3, the spring 10 rests in the socket 21 prior to insertion of the shaft 12 therein with the open sides of arms 13 and 14 facing, and with the rear edges 17 and 18 engaging, the flat socket surface 22 and with the forward edges 15 and 16 in spaced relation to the surface 22 so that the arms 13 and 14 are free to flex and provide a true spring action when the respective apices thereof are engaged by a surface of the shaft 12. The control knob 11 may be positioned on the end of the shaft 12 merely by forcing the knob over the shaft, the shaft preferably being provided, in accordance with conventional practice, with a flat surface 23 which is adapted to engage the apices of the spring arms 13 and 14

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and cause the arms to flex transversely, whereby the upper surfaces of the shaft 12 are held in frictional engagement with the corresponding upper surfaces of the socket 21, as shown best in Fig. 5.

Since the forward edges 15 and 16 of the arms 13 and 14 are in spaced relation to the socket surface 22, substantially all of the spring pressure will be exerted through the rear edges 17 and 18 of the arms 13 and 14, thus causing these rear edges to tend to bite into the surface 22, thereby effectively to retain the spring in the socket 21 when the control knob is withdrawn from the end of the shaft. By reason of the two-point engagement of the spring 10 with the shaft and socket surfaces 22 and 23, the knob will be firmly held against rocking movement on the shaft and yet may be readily removed from the shaft merely by the exertion of an abnormal axial pull on the knob, the biting action of the forward edges 17 and 18 of the spring serving, as heretofore mentioned, to retain the spring in the socket 21.

While a particular embodiment of the invention has been shown, it will be understood, of course, that the invention is not limited thereto since many modifications may be made, and it is therefore contemplated by the appended claims to cover any such modifications as fall within the true spirit and scope of the invention.

What is claimed and desired to be secured by Letters Patent is:

1. In combination, a control knob having a shaft receiving socket including a flat side wall surface, a shaft received in said socket and having a flat surface facing said flat socket surface, and spring means engaging said surfaces comprising a pair of elongate arms of curvilinear cross section extending transversely of said shaft, each of said arms having an open side facing said socket surface and an apex engaging said shaft surface, and a connector member extending between and interconnecting said arms longitudinally of said shaft for maintaining said arms in spaced relation such that certain of the edges of said arms are substantially parallel to each other.

2. In combination, a control knob having a shaft receiving socket including a flat side wall surface, a shaft received in said socket and having a flat surface facing said flat socket surface, and spring means engaging said surfaces comprising a pair of elongate arms extending transversely of said shaft and of substantially V-shaped cross section with the opened sides of said arms facing said socket surface, and a connector member extending between and interconnecting said arms for maintaining said arms in spaced relation such that certain of the edges of said open sides are substantially parallel to each other, said shaft surface engaging the apices of said arms to flex said arms transversely upon insertion of said shaft into said socket.

3. In combination, a control knob having a shaft receiving socket including a flat side wall surface, a shaft received in said socket and having a flat surface facing said flat socket surface, and spring means engaging said surfaces comprising a pair of elongate arms of curvilinear cross section extending transversely of said shaft, each of said arms having an open side facing said socket surface and an apex engaging said shaft surface, and a connector member extending between and interconnecting said arms for maintaining said arms in spaced relation with

rear edges of said arms below the forward edges thereof but with certain of said edges parallel to each other.

4. In combination, a control knob having a shaft receiving socket including a flat side wall surface, a shaft received in said socket and having a flat surface facing said flat socket surface, and spring means engaging said surfaces comprising a pair of elongate arms of curvilinear cross section extending transversely of said shaft, each of said arms having an open side facing said socket surface and an apex engaging said shaft surface, and a connector member extending between and interconnecting said arms for maintaining said arms in spaced relation, with certain edges of said arms substantially parallel to each other but with the rear edges of said arms below the forward edges thereof, whereby said rear edges rest on said socket surface and said forward edges are spaced from said socket surface prior to assembly of said knob on said shaft thereby to permit transverse flexure of said arms by said shaft.

5. In combination, a control knob having a shaft receiving socket including a flat side wall surface, a shaft received in said socket and having a flat surface facing said flat socket surface, and spring means engaging said surfaces comprising a pair of elongate arms extending transversely of said shaft and of substantially V-shaped cross section with the open sides of said arms facing said socket surface, and a connector member extending between and interconnecting said arms for maintaining said arms in spaced relation, with at least one edge of said V being substantially parallel to a corresponding edge of the other said V, the rear edge of each V being at a lower level than the forward edge thereof, whereby said rear edges engage said socket surface and said arms are free to flex transversely upon engagement of said shaft surface with the apices of said arms.

6. In combination, a control knob having a shaft receiving socket including a flat side wall surface, a shaft received in said socket and having a flat surface facing said flat socket surface, and spring means engaging said surfaces comprising a pair of elongate arms extending transversely of said shaft and of substantially V-shaped cross section with the open sides of said arms facing said socket surface, and a connector member extending between said arms for maintaining said arms in spaced relation, with certain of the edges of said V's substantially parallel but with the rear edge of each V at a lower level than the forward edge thereof whereby said rear edges engage said socket surface and said arms are free to flex transversely upon engagement of said shaft surface with the apices of said arms, said connector member being connected with each of said arms adjacent said rear edges to permit full freedom of flexure in the portions of said arms forwardly of the points of engagement of said connector member.

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