June 14, 1960 J. BOWMAN 2,940,333

DETENT

Filed May 15, 1958

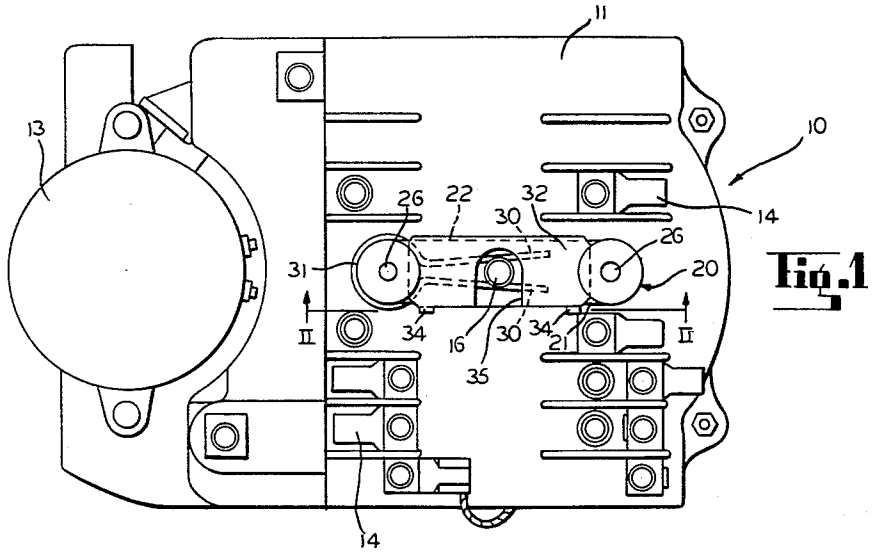

Fig. 1

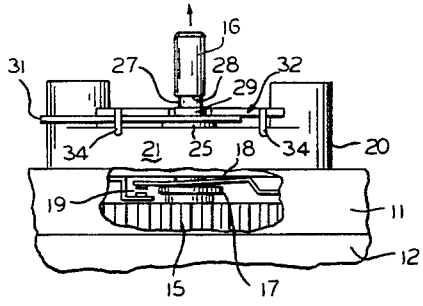

Fig. 2

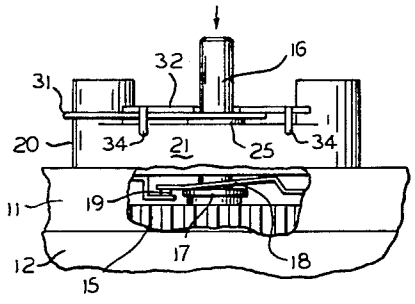

Fig. 3

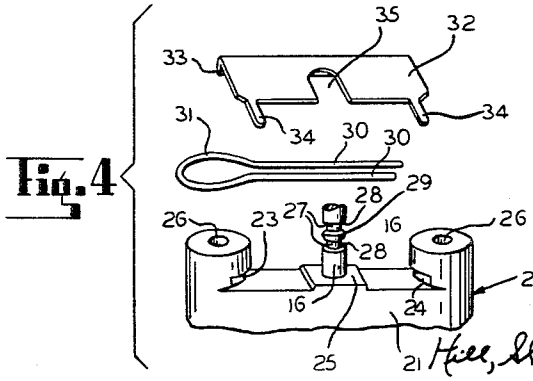

Fig. 4

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DETENT

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3 Claims. (Cl. 74—527)

This invention relates generally to detents, and more specifically to an improved detent for an axially movable shaft.

Although the principles of the present invention may be included in various devices, a particularly useful application is made in a sequence timer wherein the selector knob is connected to a shaft which not only is axially movable, but which is rotatable.

The present invention contemplates the utilization of a spring and a spring retainer with the shaft and the housing which supports the shaft to obtain a detent structure wherein the shaft is securely held in either or two selectable axial positions. In the instant embodiment, a considerable axial detent force is desired so that normal axial forces acting on the shaft will not cause an axial shift thereof.

Accordingly, it is an object of the present invention to provide a detent which is capable of withstanding a considerable force before it allows a shaft to shift axially.

Another object of the present invention is to provide an improved simplified detent.

Yet another object of the present invention is to provide a detent wherein the spring is not easily disassociated and wherein it is impossible for the spring to creep out of its normal operative position.

Many other advantages, features and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and the accompanying sheet of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

On the drawing:

Figure 1 is an elevational view of a timer assembly equipped with a detent provided in accordance with the principles of the present invention;

Figure 2 is a fragmentary view, partially broken away, taken along line II—II of Figure 1;

Figure 3 shows the structure of Figure 2 with the shaft inwardly shifted; and

Figure 4 is an exploded view of the various elements in the detent assembly.

As shown on the drawings:

The principles of this invention are particularly useful when embodied in an electrical timer assembly such as illustrated in Figure 1, generally indicated by the numeral **10**. The timer assembly includes a pair of complementary housings **11, 12** to which is secured a motor **13** which drives a series of cam actuated switches within the housing **11, 12**. Terminals **14** are provided to make electrical connections as required.

Within the housing **11, 12**, there is disposed a rotatable face cam **15** to which there is secured a shaft **16** by means of which the cam **15** may be manually rotated. While the cam **15** and the shaft **16** are corotatable, the shaft **16** may be shifted axially with respect to the cam **15**. The shaft **16** is provided at its inner end with a fixed

ring **17**, one side of which is engageable with the movable blade **18** of an electrical switch. When the shaft **16** is disposed upwardly as shown in Figure 2, the ring **17** raises the blade **18** so that the contacts **19** are disengaged. Typically, these contacts represent the master switch of the appliance which the timer **10** controls. When the shaft **16** is disposed in an inward or downward direction such as shown in Figure 3, the natural resilience of the blade **18** coupled with the inward movement of the ring **17** permits the contacts to engage.

It can be seen that the weight of the shaft **16** and of any knob secured thereto will tend to cause the shaft **16** to shift in one direction or the other depending upon the attitude in which the timer **10** is mounted. Further, vibration of the apparatus to which the timer **10** is mounted also has a tendency to intermittently open or close the contacts **19**.

Accordingly, the detent assembly shown in Figure 4 has been provided for this structure so that the shaft **16** will be positively held in one position or the other wherein the contacts are positively maintained open or positively maintained closed.

The housing **11** is provided with an upstanding portion **20** which has a pair of generally parallel shoulders **21** and **22** disposed on opposite sides of the shaft **16** in generally parallel relation to the axis thereof. Thus also, the housing **11** has an aperture (not shown) through which the shaft **16** extends and in which it may rotate.

As best seen in Figure 4, the upstanding portion **20** of the housing **11** is provided with a pair of spaced slots **23, 24** extending transversely to the shoulders **21, 22** and disposed on opposite sides of the shaft **16**. Thus the sides of the slots **23** and **24** are each defined by one side of the housing and a shoulder spaced therefrom. Intermediate the slots **23, 24** and surrounding the shaft **16** there is a slightly raised portion **25**. It is to be understood that the shaft **16** shown in Figure 4 is partially withdrawn from the housing to illustrate the structure.

The housing may further be provided with a pair of apertures **26, 26** which may be used in the mounting of the timer to an appliance.

The shaft **16** has a pair of recesses **27, 27** each one of which is defined by a square shoulder **28** and an intermediate barrier portion **29** having oppositely directed cam surfaces. Thus the cam surfaces on the barrier **29** may be termed axially oppositely directed cam shoulders.

Within one of the recesses or grooves **27**, at least one of the resilient fingers **30** of the spring **31** is tangentially received. The spring **31** has a natural configuration which extends about a portion of the upstanding part **20** of the housing **11**, and wherein the fingers **30** have a natural or free position with a spacing therebetween which is less than the diameter of the shaft **16**.

The retaining clip **32** is received in the housing slots **23, 24** with the spring **31** disposed between the clip **32** and the raised housing portion **25**. With this arrangement, shifting of the spring **31** in the direction of the axis of the shaft **16** is thereby precluded. The retaining clip **32** has an angularly directed flange portion **33** and a pair of deformable finger portions **34, 34**. The angularly directed portion becomes disposed against one of the shoulders **21, 22**, while the portions **34, 34** after assembly, are angularly deformed against the other of such housing shoulders. The portions **33, 34** thus function to prevent removal of the clip **32** from the housing. The clip **32** also is slotted as at **35** to provide a clearance for the shaft **16**.

When the shaft **16** is in its innermost position, and an outwardly directed force is applied thereto, the outer cam surface of the barrier **29** acts to cause the fingers **30** of the spring **31** to yield radially of the shaft. The clip **32**

acting on the upper or outer surface of the spring **31**, and backed up by the outer shoulder defining the slots **23**, **24**, serves to prevent movement of the spring **31** in the direction of shaft movement.

When the fingers **30** clear the outer diameter of the barrier **29**, they reengage in the other groove or recess **27** to hold the shaft in a second axial position.

It can be seen that when an opposite force is applied to an outwardly disposed shaft, the opposite cam surface of the barrier **29** acts to spread the fingers **30** which are backed up by the raised housing portion **25**, until the outer diameter of such barrier is again cleared

By this structure, the shaft **16** is positively held in either of two axial positions, which can easily be detected by the operator who applies an axial force to the shaft, and therefore the contacts **19** are positively held in the desired position. It is apparent that this structure permits free rotation of the shaft **16** in either of its axial positions.

Although various minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted hereon all such embodiments as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A detent assembly comprising in combination: a housing having a shaft aperture extending through a side thereof, said housing having a pair of generally parallel shoulders directed away from each other and disposed on opposite sides of said aperture, and a pair of spaced slots extending transversely to said shoulders; a shaft reciprocably disposed in said aperture and having at least one axially directed cam shoulder defining a circumferentially directed recess; a spring having at least one resilient finger tangentially receivable in said recess, said finger being yieldable radially of said shaft in response to axial movement thereof; and a retaining clip received in said housing slots for retaining said spring, said clip having portions extending generally parallel to said shaft beyond said slots, at least one of which portions is bendable, said clip portions receiving said housing shoulders therebetween and embracingly engaging said housing shoulders for retaining said clip.

2. A detent assembly comprising in combination: a housing having a shaft aperture extending through a side thereof, said housing having a pair of generally parallel shoulders directed away from each other and lying in planes generally parallel to the axis of said aperture, said shoulders being disposed on opposite sides of said aperture, said housing having means remote from said shoulders defining a pair of spaced open-ended slots extending transversely to said shoulders and disposed therebetween; a shaft reciprocably disposed in said aperture and having a pair of circumferentially directed grooves each defined by an axially oppositely directed cam shoulder and another shoulder; a spring having at least one resilient finger tangentially receivable in one of said grooves, said finger being yieldable radially of said shaft in response to axial movement thereof; and a retaining clip received in said housing slots for retaining said spring, said clip having portions remote from said slots, at least one of which portions is bendable, said clip portions receiving said housing shoulders therebetween and embracingly engaging said housing shoulders for retaining said clip.

3. A detent assembly comprising in combination: a housing having a shaft aperture extending through a side thereof; said housing having a pair of generally parallel shoulders directed away from each other and disposed on opposite sides of said aperture; a pair of posts on said housing each intermediate and adjacent to both of said housing shoulders and disposed on opposite sides of said aperture, said posts each having a slot extending transversely to said shoulders; a shaft reciprocably disposed in said aperture and having at least one axially directed cam shoulder defining a circumferentially directed recess; a generally U-shaped spring having its closed end extending over 180° about one of said housing posts, and a pair of resilient fingers tangentially receivable in said recess, said fingers being yieldable radially of said shaft in response to axial movement thereof; and a retaining clip received in said post slots for retaining said spring in cooperation with said one post, said clip having at least one bendable portion extending generally parallel to said shaft and past said spring into engagement with one of said housing shoulders at a point remote from said post slots for retaining said clip.

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