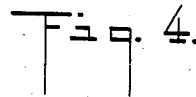
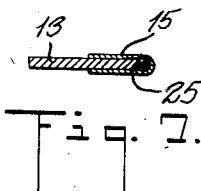


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SENSITIVE DOOR EDGE DEVICE

3 Sheets-Sheet 2



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SENSITIVE DOOR EDGE DEVICE

2,610,268

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3 Sheets-Sheet 3

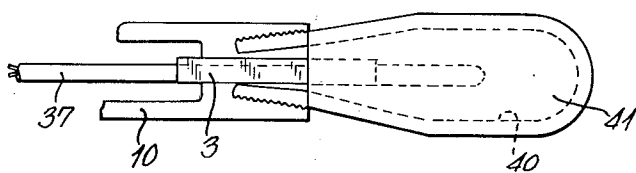
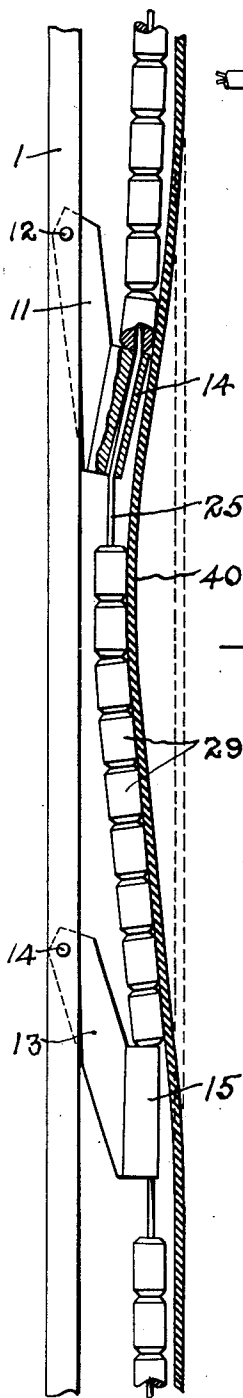


Fig. 8.

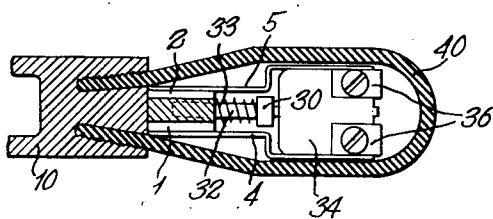


Fig. 9.

Fig. 12.

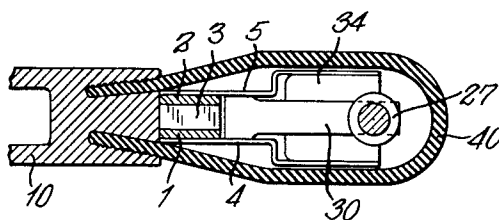


Fig. 10.

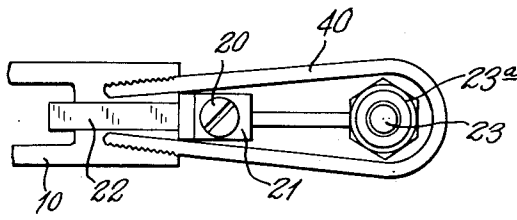


Fig. 11.

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SENSITIVE DOOR EDGE DEVICE

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4 Claims. (Cl. 200—54)

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This invention relates to improvements in the design and construction of sensitive door edge devices.

One of the objects of this invention is to provide a substantially unitary construction for such a device which may be easily attached to and removed from the edge of the door on which it is used without disturbing the adjustment of the device or any parts of the door.

A further object of this invention is to provide a sensitive edge device whose sensitivity is completely independent of normal temperature changes in the direction of the door length with changes in ambient temperature.

A further object of this invention is to provide a sensitive edge device employing a pressure deflected cable for actuating it in cooperation with cable supporting members which increase the deflection of the cable member when pressure is applied thereto to increase the overall sensitivity of the device and to sharply increase the sensitivity of the device at these supporting members.

Other and more detailed objects of the invention will be apparent from the following description of the embodiment thereof illustrated in the attached drawings.

This invention resides substantially in the combination, construction, arrangement and relative location of parts, all as will be described in detail below.

In the accompanying drawings,

Figure 1 is a side elevational view of the upper end of the device of this invention showing a portion of the door and some parts in cross-section;

Figure 2 is a vertical, elevational view of the structure of Figure 1 showing the shoe or outer flexible housing in cross-section;

Figure 3 is a cross-sectional view taken on the line 3—3 of Figure 1;

Figure 4 is a view similar to Figure 1 of an intermediate section of the device;

Figure 5 is a view similar to Figure 1 of the lower end of the device and the door, wherefore Figures 1, 4 and 5 together are representative of all of the features of construction of the complete device in side elevation with the flexible housing in cross-section;

Figure 6 is a cross-sectional view taken on the line 6—6 of Figure 5;

Figure 7 is a cross-sectional view taken on the line 7—7 of Figure 4;

Figure 8 is a plan view of the device and the edge end of the door;

Figure 9 is a cross-sectional view taken on the line 9—9 of Figure 1;

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Figure 10 is a cross-sectional view taken on the line 10—10 of Figure 1;

Figure 11 is a bottom view of the device and the edge portion of the door; and

Figure 12 is a view of the parts shown in Figure 4 and shows the position assumed by these parts when the door edge meets an obstacle.

With the exception of the removable cap all of the structure comprising this invention forms a single unitary structure of which the parallel bars 1 and 2 form the base. These bars extend downwardly from the plates 4 and 5 (Fig. 1) to a point adjacent the bottom edge of the door, as shown in Figure 5. Secured between these bars at their upper end and telescoping with them to a point adjacent the member 7 is a hook shaped fixture 3 which is secured between the bars by means of the rivets 6 which also attach a pair of plates 4 and 5 to the opposite sides of the bars (see Figs. 9 and 10). The thickness of the hook member 3 is such as to properly space the bars 1 and 2. Also secured between the bars adjacent the lower end of the hook member 3 is a bracket 7 which is secured therebetween by means of the rivets 8 and which bracket has a terminal cylindrical guide portion 9 having a concentric passage therethrough.

The bars are secured together at their longitudinal points with the levers 11 and 13 pivotally mounted between the bars. The lever 11 is provided with an end face 11^b which terminates at its upper end in a rounded corner 11^a (see Fig. 4) and is enclosed by means of a U-shaped strap 14 welded to the sides thereof, as is shown in detail in Figure 7 in connection with lever 13. As will be seen from Figure 4, for example, the longitudinal end face of the levers such as the levers 11 and 13 has a substantial length and the straps 14 and 15 hold the cable 25 against these faces, so that as will be apparent later, and as illustrated in Figure 12, when the cable is deflected sharp bends will be formed in the wire magnifying its effective reduction in length to thereby insure positive operation of the control device 34 even on slight deflections of the cable.

Lever 13 is of a shape similar to lever 11 having the end face 13^b and the rounded corner 13^a is provided with the U-shaped clip 15 secured to the sides thereof, as shown in Figure 7. Pivotally and loosely mounted on a facing and securing pivot pin 17 is a bell crank lever 16, one end of which engages a similar facing and securing rivet 18 which forms a stop for counterclockwise rotation of the lever 16. Secured between the lower ends of the bars 1 and 2 as by welding or the like, is a spacing block 19 having a threaded pas-

sage therethrough to receive the end of a screw 20 which passes slidably through a bracket 21 secured to the hook shaped fastening plate 22. A compression spring 53 is mounted on the screw 20 and lies between its head and the bracket 21. A fixture 23 in the form of a rod is provided with an enlargement 24 which has a longitudinal surface slot, as shown in Figure 6, in which the edge of the other arm of lever 16 lies. At the end of this arm the bell crank lever 16 is provided with a cylindrical sleeve 16^a through which the rod 23 passes. The lower end of rod 23 is threaded and a nut 23^a secures it in the sleeve 16^a.

Extending between the rod 23 and a rod 26 (see Figs. 1 and 2) is a cable 25 of suitable size and of a material having the same or approximately the same co-efficient of thermal expansion as bars 1 and 2. Its lower end 25' (see Fig. 5) is secured in the end of rod 23 and its upper end is similarly secured in the lower end of rod 26. Rod 26 is provided with an integral collar 27 and lying between it and the sleeve 9 through which rod 26 passes is a compression spring 28. From this construction it will be seen that the cable 25 is stretched between the rods 23 and 26 under a tension provided by spring 28 which can be properly proportioned to hold the cable by means of adjusting nut 23^a. Substantially throughout the length of the cable are a plurality of beads 29 strung thereon. The cable passes through the straps 14 and 15 of the levers 11 and 13, as is clear from Figures 4 and 7.

Secured between the plates 4 and 5 is a suitable switch 34 which may be of the type known commonly as a microswitch. This switch is provided with an operating button 35 positioned to be actuated by a bell crank lever 30 pivotally mounted on the pivot pin 31 extending between the plates 4 and 5. One arm of the bell crank 34 engages the upper end of rod 26. The other end engages a longitudinally adjustable screw 32 threadedly mounted in the hook member 3. A compression spring 33 bears on the bell crank lever 30 tending to urge it in a clockwise direction (Fig. 1). The switch 34 is provided with a pair of terminal clips 36 to which the conductors of a cable 37 are secured. The conductor 37 lies in the suitable groove in the top edge of the door 10, as indicated in Figures 1 and 3.

The operating structure is supported on the forward edge of the door 10 by cutting a complementary shaped groove in the top edge of the door at its forward end to receive the hook member 3 and a similar groove in the bottom edge to receive the attaching member 22. Thus the structure is hooked into the top recess of the door so that it hangs down along the front edge thereof, the hook 22 is inserted in the bottom edge of the door and the screw 20 with the spring 53 thereon is passed through the bracket 21 and threaded into the block 19 and brought up so that spring 53 is compressed. Thus the entire structure is very easily attached to the edge of the door and removed therefrom by these operations, making it unnecessary to remove the flexible shoe 40 from the door 10.

The entire structure is enclosed within a collapsible shoe 40 such as is commonly used with such devices and which frequently comprises a rubberized fabric or rubber sheeting of the proper stiffness. The fabric of the shoe 40 is folded around the structure into a channel shape, as shown in Figure 9, and the edges are either attached to the side faces of the door, or in the case of a metal door, as illustrated in the draw-

ings, they may be swaged into longitudinal grooves in the front edge of the door, as clearly indicated in Figures 8 to 11 inclusive. The upper end of the housing thus formed is closed by means of a suitably shaped plug 41 which may consist of a flanged body which can be forced down into the tubular space formed by the housing and held in place simply by friction, as illustrated in Figures 1 and 2. The tension on the cable 25 can be adjusted by means of the nut 23^a (as previously mentioned) against the resistance of spring 28. The enlarged portion 24 of the rod 23 engages the lever 16 at the slot in the portion 24 for the purpose of preventing the rod 23 from turning when the nut is turned. Screw 32 is adjustable to properly position the bell crank lever 30 with respect to the operating button 35 and the switch 34 so that they will be in proper operational relation.

Aside from the structural features of the device which are now apparent it is desired to emphasize the cooperation of the cable 25 with the lower corners 11^b and 13^b of the straps 14 and 15 respectively and the rounded upper corners 11^a and 13^a of the levers 11 and 13 respectively. As is well understood, when the door strikes an object in closing the collapsible housing 40 is depressed, as shown in Figure 12, so that the pressure is transferred to the beads 29 and thence to the cable 25 which causes it to be deflected towards the door edge. Immediately upon deflection, the cable 25 engages the rounded corner 11^a or 13^a of the levers 11 and 13 et al., depending upon the vertical position and the pressure applied to the device, and continued deflection causes the wire to bend around these corners and the corners 11^b and 13^b and thereby form an abrupt temporary offset in the wire, causing its tendency to shorten to be magnified, as shown in Figure 12. This enhanced shortening of the wire causes a swift and sure downward movement of the rod 26 against the resistance of spring 28, releasing the bell crank lever so that spring 33 may cause it to rotate clockwise (Fig. 1) and operate the switch 34.

Switch 34, of course, as is well known, is in a circuit through the wire 37 which controls the motor device which is closing the door to reverse it to cause it to open, and/or to operate a warning device such as a bell or light, to signify that the door has encountered an obstacle.

Referring to Figure 5, it can be seen that when the device is installed screw 20 is screwed into the block 19 to the full extent of its thread. A gap is left between bracket 21 and the lower end of the bars 1 and 2. This gap is greater than any relative change of length between the door 10 and the bars 1 and 2, which would be caused by differential expansion. It can be seen that by means of the spring 53, the bars 1 and 2 are kept under tension at all times. Variations in relative length of the door and the bars cause this gap to increase or decrease. Since the cable 25 is made of a material having substantially the same co-efficient of thermal expansion as the bars 1 and 2, their respective lengths do not vary substantially with relation to each other at different temperatures, thereby maintaining a uniform sensitivity of the device.

It can also be seen that this type of construction has the additional advantage of being able to compensate for variations in length due to manufacture.

From the above description it will be apparent to those skilled in the art that the subject matter of this invention is capable of some me-

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chanical variation, and I do not, therefore, desire to be strictly limited to the illustrative example herein given, but rather only as required by the claims granted me.

What is claimed is:

1. In a sensitive door edge device, the combination comprising a single support adapted to be attached at the leading edge of a door, a flexible cable, means for mounting said cable on said support under tension, a control device mounted on said support to be actuated when said cable is deflected under pressure, a plurality of levers pivotally mounted on said support and straps attached to the ends of said levers and enclosing the adjacent portions of said cable, said support and cable being made of materials having substantially the same coefficient of thermal expansion.

2. In the combination of claim 1, said means for supporting the cable under tension comprising a bracket for slidably supporting the end of said cable adjacent said control device, and a pivoted arm to which the other end of said cable is attached, said plurality of levers being pivotally mounted between said bracket and said arm.

3. In the combination of claim 1, said plurality of levers having flat ends lying parallel to said

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cable and said straps confining the cable for at least the full length of said flat lever ends.

4. In the combination of claim 1, means for attaching said support to the leading edge of the door, comprising an integral yoke engaging the top edge of the door, a separate yoke for engaging the lower edge of the door, and resilient means for attaching said second yoke to the lower end of said support.

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