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Larson

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[54] **FLUID OPERATED WEB BREAK DETECTOR ASSEMBLY WITH SWITCH ACTUATOR MOTION BLOCKING MEANS**

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[52] **U.S. Cl.** **200/61.18,** 200/61.13

[51] **Int. Cl.** **B65h 25/14,** H01h 3/02

[58] **Field of Search** ..... 200/61.04, 61.07, 61.13, 200/61.18, 168 G, 153 T, 172 R, 172 A; 49/21, 22; 220/42 B, 42 C

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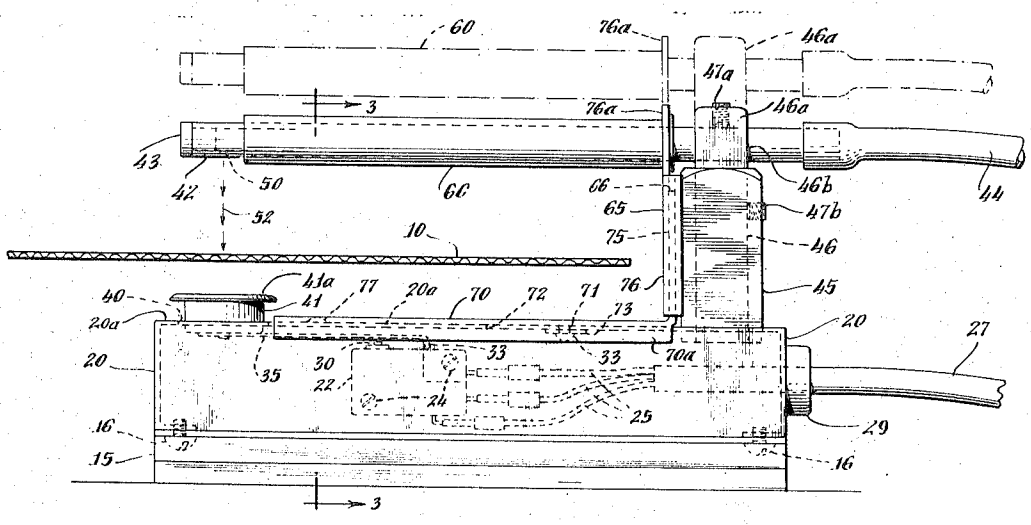
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[57] **ABSTRACT**

In air-stream actuated web-break detectors an air-deflectable cup-like switch actuator is formed with a surrounding lip which shields the partially enclosed switch assembly from incursion of fiber and like particles otherwise tending to obstruct the switching function. In operation an air-stream is projected through an elongated tube having an orifice which faces the switch actuator. For disabling the detector for repair purposes, a single movable assembly slides a sleeve over the tube orifice to interrupt the air-stream and concurrently moves into place a part which blocks the motion of the switch actuator.

3 Claims, 5 Drawing Figures



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SHEET 1 OF 2

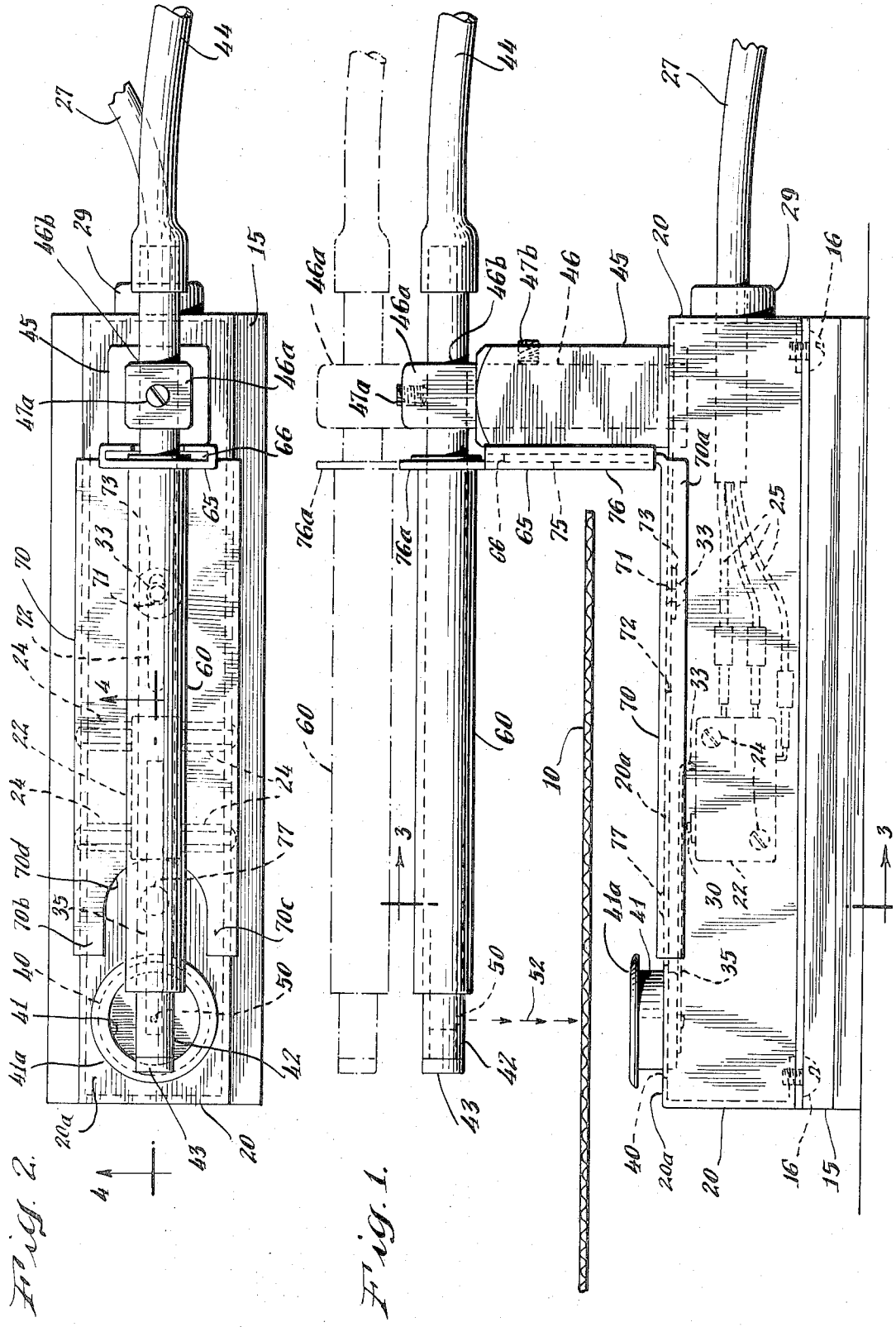


Fig. 2.

Fig. 1.

Fig. 3

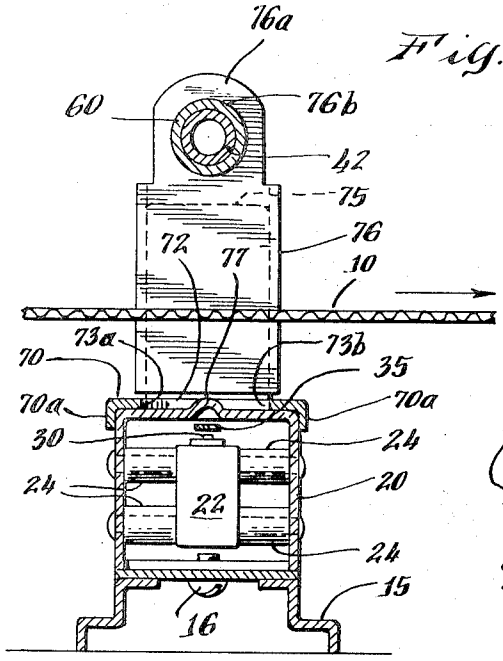


Fig. 4

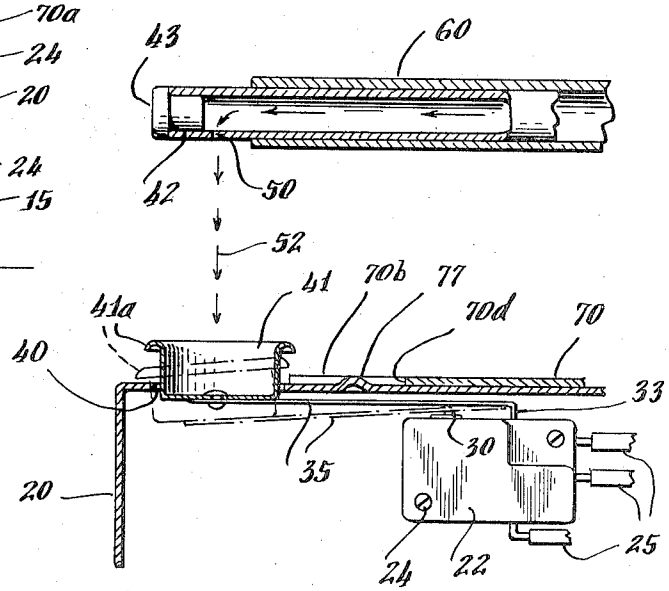
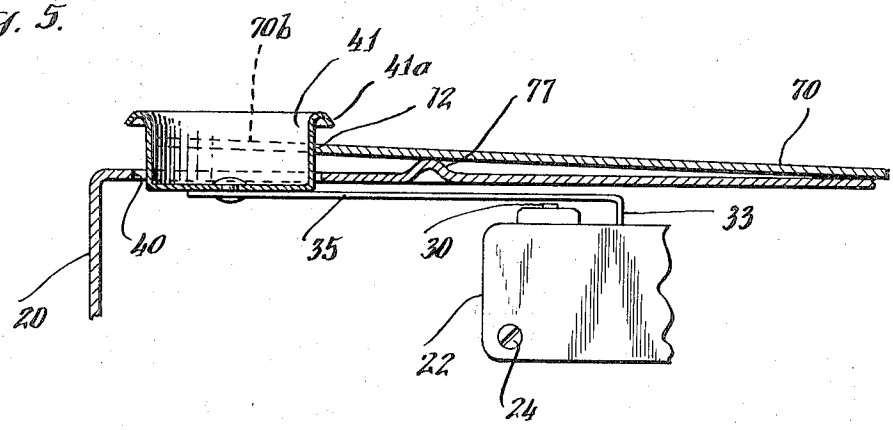


Fig. 5



FLUID OPERATED WEB BREAK DETECTOR ASSEMBLY WITH SWITCH ACTUATOR MOTION BLOCKING MEANS

BACKGROUND OF THE INVENTION

This invention relates to improvements in web-break detectors and more particularly to improvements in the type of detector which, for its operation, depends upon the impingement of a directed air stream or the like upon a control element.

The air-stream actuated type of detector, as such, is known, being described, for example, in U.S. Pat. No. 3,178,527, granted Apr. 13, 1965 in the name of Otha Cooksey and in U.S. Pat. No. 2,405,552, granted Oct. 15, 1968 in the name of Thomas J. Luckett. In application Ser. No. 362,405, filed May 21, 1969 in the name of George W. Bregar, there is described a particular form of detector which combines a deflectable cup-like switch actuator having a surrounding protective lip with an air-stream providing tube having an orifice opposed to the actuator. The present invention is concerned with the provision of means usable in connection with a detector of the kind just described for concurrently interrupting the air stream and blocking motion of the switch actuator, all for the purpose of temporary disablement of the actuator, for example, during a period when normal functioning of the detector is not desired. To this end, the invention provides a single movable assembly, advantageously combined with the main structure of the detector, by which a barrier can be slid over the air orifice while at the same time a blocking part passes under the lip of the deflectable actuator to prevent its downward displacement.

The more detailed aspects of the invention are specified in the following description taken in connection with the accompanying drawing. In the drawing:

FIG. 1 is a side elevation of a preferred embodiment of the invention;

FIG. 2 is a top view of the embodiment of FIG. 1;

FIG. 3 is a section taken on line 3—3 of FIG. 1;

FIG. 4 is a fragmentary break-away view of a segment of FIG. 1; and

FIG. 5 is a view similar to FIG. 4, but showing some of the parts in an altered relationship.

FIG. 1 offers a side view of apparatus applying the present invention, such apparatus being shown in its intended working relationship with a web 10 (e.g., of paper or fabric) which is assumed to be moving either into or out of the plane of the paper. Only an edge portion of the web is shown, and the means employed for supporting and driving the web are not illustrated, being well-known in the art, as exemplified by Cooksey U.S. Pat. No. 3,178,527. The web-break detecting apparatus in connection with which the present invention is employed includes a base plate 15 by which the apparatus may be assumed to be mounted in the appropriate relationship to the surface of web 10. Surmounting the base and attached to it by securing means 16 located near its extremities is a housing 20 which, with the base plate, constitutes a substantially complete enclosure for a microswitch assembly of which the switch-containing component is indicated at 22. As is shown in FIG. 3, this assembly is supported laterally from the housing 20 by support members 24 and includes (FIG. 1) conventional external circuit connections 25 which are adapted for connection with an appropriate control system through an extended cable 27. The cable 27 in turn is supported by and carried through the end wall of the housing 20 by means of a grommet 29.

The microswitch 22 is further provided with a movable actuating element (i.e., a depressable rod) 30 which protrudes above its upper surface and which, when depressed, (depending upon whether the switch is designed to be of the normally "on" or normally "off" variety) opens or closes switch contacts contained within the switch housing 22. The element 30 is in its turn subject to actuation by a flexible spring arm 35 which is supported in cantilever fashion at its right end by being attached to the upper surface of the switch enclosure 22, as indicated at 33. The working relationship between the actuating element 30 and the spring arm 35 is shown more clearly in FIG. 5, in which Figure it is apparent that when the spring arm 35 is in its uppermost or normal position it has no engagement with the element 30. On the other hand, when it is deflected into its "activated position" as indicated in dotted outline in FIG. 4, it engages the element 30 so as to depress that element and actuate the switching elements contained within the microswitch 22. Depending upon the nature of the control system employed, this actuation may serve either to open or close the associated switch contacts, but in either case the normal effect of actuation would be to de-energize the machinery driving the web 10 and to produce any other control action appropriate to shutting down the system as a whole so that repair operations might be undertaken.

As clearly appears in FIGS. 1 and 2, the upper surface 20*a* of the enclosure 20 has near one end a circular opening 40 within which a cup-like member 41 is supported by attachment to the underlying extremity of the deflectable spring arm 35. Such attachment may, of course, be by brazing, by screw connection or otherwise. The function of the cup-like member 40 may best be understood by referring to the further apparatus part 42 which, as appears most clearly in FIGS. 1 and 2, is supported above it and has a center line that perpendicularly intersects the vertically projected center line of the member 40. The part 42 is a hollow elongated tube of metal or other structurally rigid material which is closed at the end nearest the cup-like member 40 by a cap 43, and which at its other end, is connected to a flexible tube 44 through which, in the intended use of the apparatus, it will be supplied with compressed air or other actuating fluid. The part is held in fixed relation to the enclosure 20 by means of a rigid bridging column 45 which extends between the two and which encloses in telescoping relation a slidable shaft 46 which terminates at its upper end in an exposed extension 46*a*. This extension in turn has a circular opening 46*b* which loosely engages the part 42 so that that part may be positioned in its desired relationship to the cup-like member 41. Moreover, the telescoping relationship of the shaft 46 and the surrounding column 45 permits the former to be moved up and down to a limited degree in order that the distance between the parts 41 and 42 can be varied to suit the conditions of use of the apparatus. Set-screws 47*a* and 47*b* are provided to lock the parts 42 and 46 in their preferred locations.

At a point directly above the center of the cup-like member 41 the tubular part 42 is provided with a small opening or orifice 50 through which compressed air (or other gaseous fluid received from the tube 44) can be

directed against the upper surface of the web **10** as suggested by the directed dash line **52.** Under the conditions just postulated and as long as the web **10** is maintained intact and in normal tension in the position indicated, the air stream **52** will simply be deflected by the web and will not impact on or otherwise influence the cup-like member **41.** However, upon breakage of the web **10** in the area between the opening **50** and the member **41,** the air stream **52** will immediately impinge on the latter member, as indicated in FIG. **4,** driving it in a downward direction with resulting deflection of the flexible spring arm **35.** Similar deflection of the member **41** will also occur if the web break is elsewhere than in the immediate vicinity of the member, because, under these conditions, the web will go slack and the impinging air stream **52** (as well as the force of gravity) will cause it to bear down upon the member **41** with resultant downward deflection of the spring arm **35.** In either of these cases, the switch-actuating element **30** will be moved by the spring arm **35,** and the control contacts of the microswitch **22** will be actuated with the result that the web-driving machinery will be shut down before damage to either the web or the machinery can occur.

By use of the invention of the previously mentioned application of George W. Bregar, the illustrated apparatus realizes a significant improvement over earlier constructions in its provision of more effective means for protecting the working elements of the switch-actuating mechanism **22** from fouling or obstruction by dust, lint or fibrous particles. In many conditions of operation of the apparatus, such particles tend to be driven into the interior of the enclosure **20** because of the continuous movement of the web **10** in close proximity to the opening **40.** The illustrated construction largely overcomes this difficulty by providing in connection with the cup-like part **41** an annular outwardly extending lip **41**a which overhangs the bounding edge of the opening **40.** This lip partially shields the opening during normal web movement but, more importantly, engages in a closure shielding relationship the upper perimeter of the opening '**40** M — as most clearly shown in FIG. **4** — when the member **41** is driven into its depressed or activated position by impingement of the air stream **52** or by engagement with the web **10.** The effect of this interaction between the lip **41** and the upper surface of the enclosure **20** is twofold. First, it prevents the cup from being depressed so far toward the interior of the enclosure that dust and lint may be swept over the edge of the cup into the enclosure and second, as clearly appears in FIG. **4,** it tends to provide a partial seal around the periphery of the opening **40.** The conjoint result of these effects is a significant extension of the period of reliable operation of the apparatus.

It will be noted also that the apparatus shown in the drawings includes, in addition to the features already described, a sleeve part **60** which is slidingly positioned on the outer surface of the tubular part **42** in such a way that it may be moved axially to cover the orifice **50** and thus shut off the air stream **52** for the purpose of temporarily disabling the web-break detection function. While this feature is not new in itself, it is, in accordance with the present invention, combined with additional structure in a novel and especially useful way. More specifically, by means of a bridging assembly shortly to be described, the sleeve **60** is coupled with a generally rectangular sliding member **70** which rides on the upper surface of the enclosure **20** with its depending lips **70***a* overlapping the side walls of the enclosure. This member is attached to the enclosure by a pin **71** which passes through a slot **72** formed in the enclosure surface and which is held in the slot by an attached flexible and spring-like washer or plate **73** large enough to overlie the edges of the slot. Sufficient lateral flexibility is incorporated in the part **73** that the member **70** may be lifted slightly above the surface of the enclosure **20** against the resilient restraint which the part **73** provides.

In order that the sliding member **70** and the tubular sleeve **60,** previously described, may be moved in unison, they are interconnected by a bridging assembly which includes, in the first instance, a tongue **75** which is integrally joined to the end of member **70** but turned to be perpendicular to it. The tongue **75** in turn is slidably engaged in telescoping fashion by a metal form **76** bent around it and terminating at its upper end (FIGS. **1** and **3**) in a rounded end part **76***a*. This is provided with a hole **76***b* of such size as snugly to engage the tubular sleeve **60,** which is rigidly fixed in the hole, for example, by a combination of peening and brazing. The telescoping arrangement of the parts **75** and **76** permits the bridge which they jointly create between the slidable member **70** and the sleeve **60** to be maintained, whether the sleeve is in either the lower or the upper of the two positions in which it is shown in FIG. **1.** Accordingly, the bridge can be manually grasped to move it — and with it the parts **60** and **70** — to the left of the position shown in FIGS. **1** and **2,** irrespective of the relative separation between these parts. As previously explained, such motion closes the air stream opening **50.**

It next needs to be noted (by reference to FIG. **2**) that the part **70** has a U-shaped cutout **70***d* which, as **70** is moved to the left (along with the sleeve **60**), will embrace and engage the outer periphery of the part **41.** It will readily be seen that when the part **70** is relocated to the left as just indicated, its terminal extensions **70***b* and **70***c* will underlie the lip **41***a* (see FIG. **5**) in such fashion as to limit downward deflection of the cup by any force which may be brought to bear upon its upper surfaces. This is with the object that microswitch **22** shall not be unintentionally activated while the apparatus is supposedly in disabled condition as the result of the movement of the tubular part **60** to the position in which it cuts off the air vent opening **50.** Therefore, the sleeve **60** and the plate **70** conjointly provide means by which, upon their simultaneous displacement in the left hand direction, both the air stream **52** and the deflectable arm **35** can be concurrently disabled from performing their normally intended functions. The blocking effect of the part **70** is made still more positive in the arrangement of FIGS. **1** through **4** by providing on the upper surface **20***a* of the housing **20** a small protrusion or embossment **70** which operates as a camming means to lift the plate **70** as the plate moves to the left in such a way that its terminal parts **70***b* and **70***c* will more closely underlie the lip **41***a* of the cup-like member **41** as indicated in FIG. **5,** thus reducing its range of possible downward movement to a few millimeters.

While the invention has been described by reference to a particular embodiment, it will be understood that the following claims are intended to cover all variations

and equivalents which fall within its true spirit and scope.

What I claim as new and desire to secure by Letters Patent is:

1. In an apparatus which is to be mounted in proximity to a moving web for detecting breaks and voids in the web, and which is of the type that includes:

A. an extended tube for receiving pressurized fluid, said tube having

1. a lateral orifice by which such fluid can be directed against one side of the web, and

2. an external part slidable along the tube so as either to cover the orifice or to leave it uncovered;

B. a control structure to be positioned in facing relation to, but on the opposite side of the web from said tube, said structure comprising

1. a deflectable part operable when deflected to actuate a switching element for stopping movement of the web,

2. a housing at least partially enclosing the deflectable part and having an opening directed toward the normal path of the web surfaces,

3. a cup-like member mounted on said deflectable part and movable when subjected to deflect the deflectable part, said member having

a. its lateral wall portion projecting through said opening with the open face of the member directed toward the web path, and

b. its open face at least partially surrounded by a peripherally extending lip which overhangs the edge of the opening;

the improvement which comprises:

C. a movable member supported on the surface of said housing and slidable thereon to become interposed between said lip and the housing so as to block control-actuating motion of the cup-like member; and

D. means joining the said slidable part and the said movable member for sliding them concurrently so as simultaneously to cover the said orifice and block motion of the cup-like member.

2. The improvement of claim 1 in which the joining means comprises a bridging assembly constituted of mutually telescoping elements for maintaining joinder of the slidable part and the movable member while permitting variation in the relative separation between them.

3. The improvement of claim 1 in which a camming means provided on the surface of the housing that supports the said movable member serves to lift that member as it is slid into its blocking position, thereby causing it to closely underlie the lip of the cup-like member.

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