Oct. 5, 1965 E. KADISEVSKIS ETAL 3,210,507

MOTION-TRANSFER MECHANISMS FOR HERMETICALLY SEALED DIAPHRAGMS

Filed May 8, 1961 4 Sheets-Sheet 1

PRIOR CONSTRUCTION

Fig. 1.

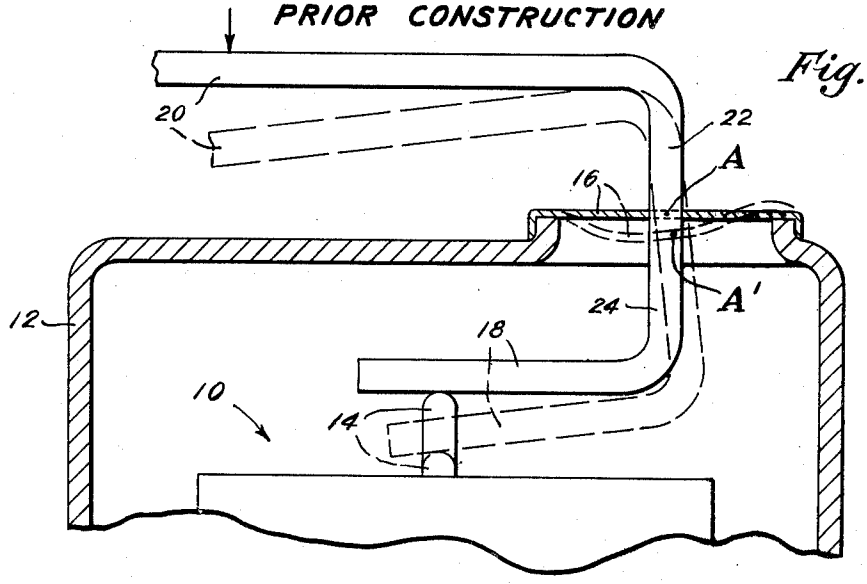
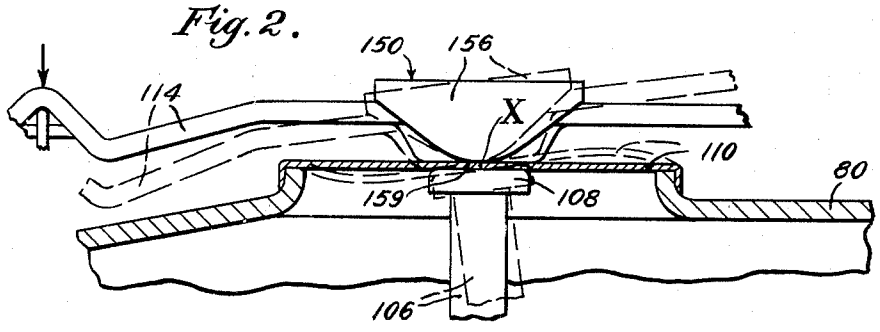


Fig. 2.



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Fig. 3.

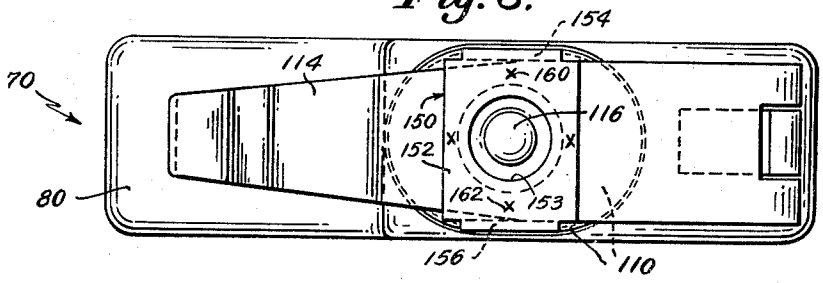


Fig. 4

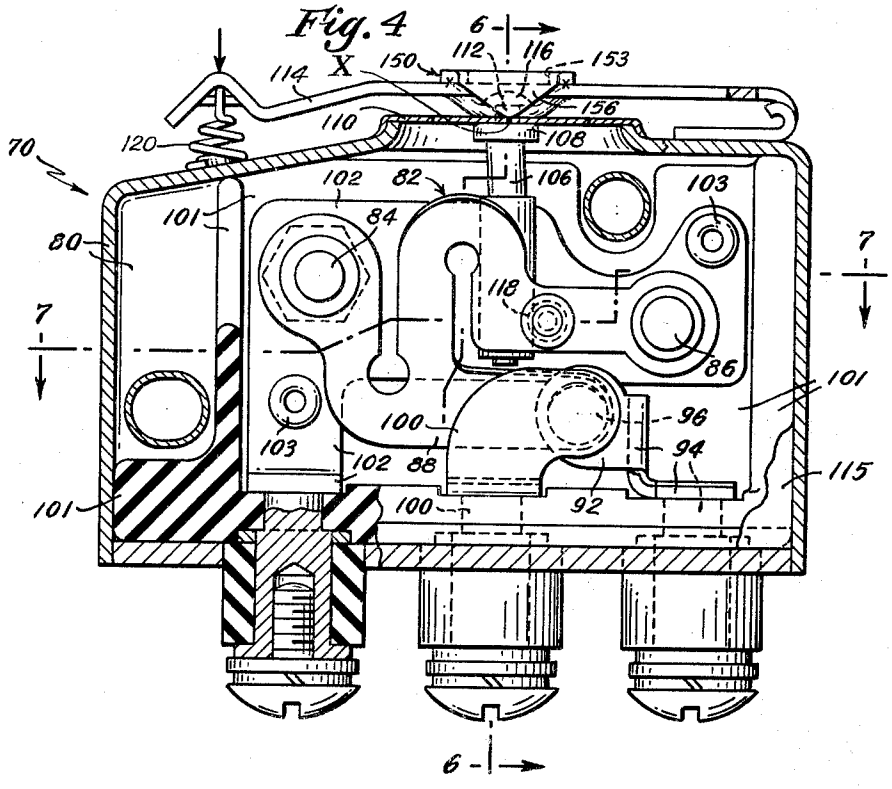
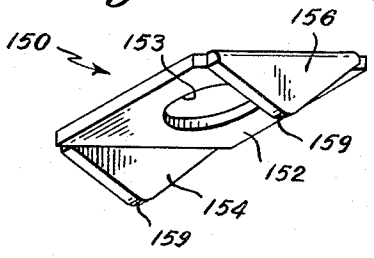


Fig. 5.



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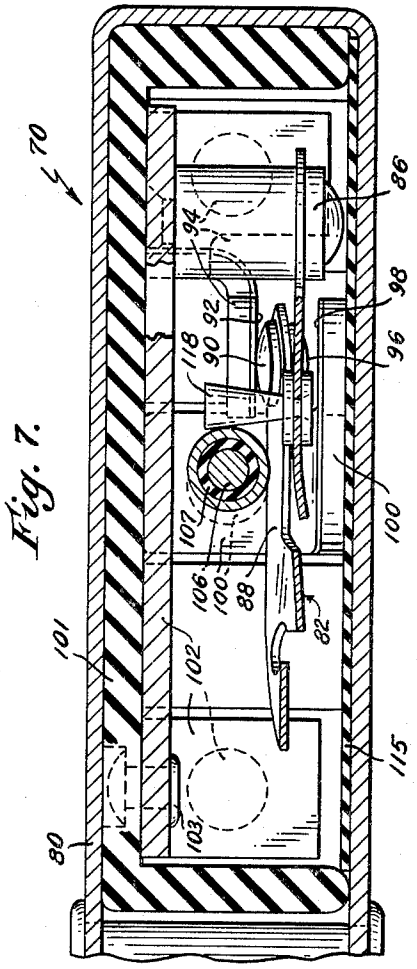


Fig. 7.

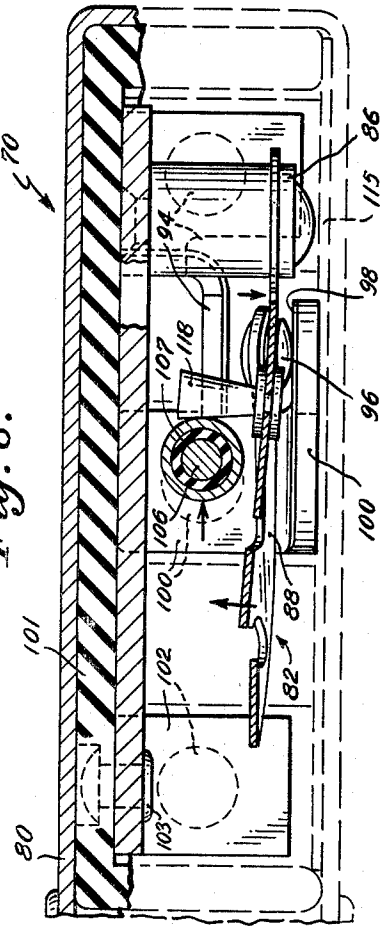


Fig. 8.

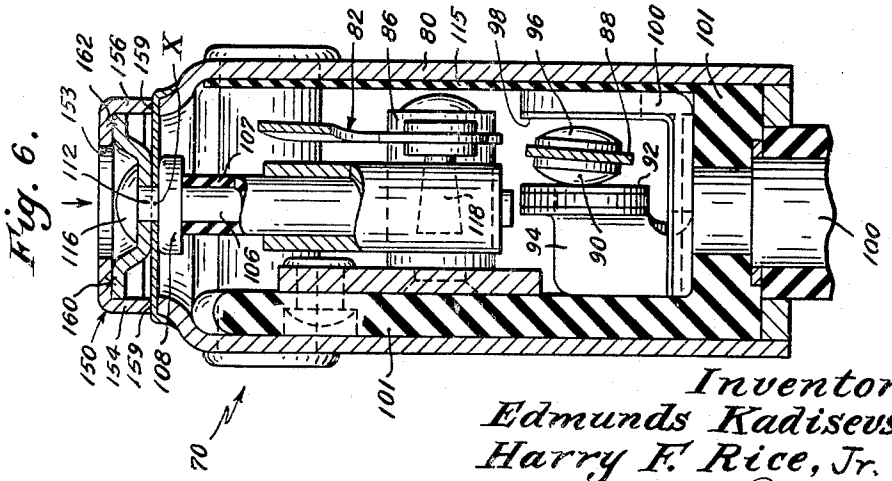


Fig. 6.

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MOTION-TRANSFER MECHANISMS FOR HERMETICALLY SEALED DIAPHRAGMS

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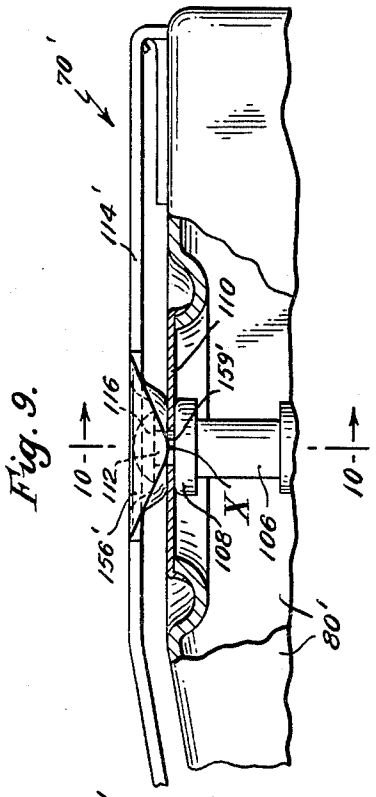


Fig. 9.

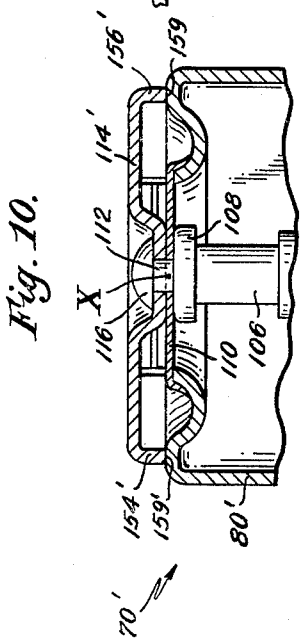


Fig. 10.

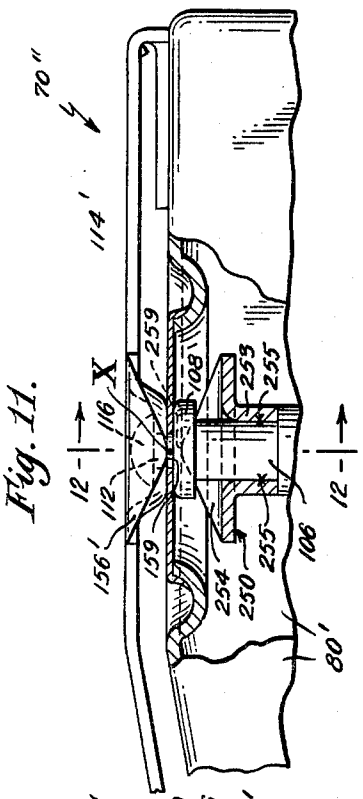


Fig. 11.

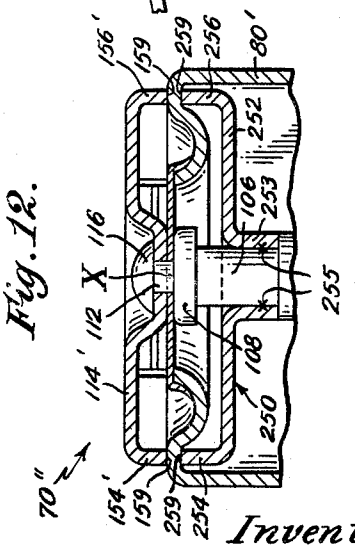


Fig. 12.

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3,210,507
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3,210,507
MOTION-TRANSFER MECHANISMS FOR HERMETICALLY SEALED DIAPHRAGMS

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Filed May 8, 1961, Ser. No. 108,323
5 Claims. (Cl. 200—168)

This invention relates to motion-transfer mechanisms for hermetically sealed devices, which are especially adapted for (though not limited to) hermetically sealed electrical switches.

This invention is particularly useful for precision type, hermetically sealed, mechanically snap-acting, electrical switches of the type which are actuated through the application of an externally applied force, which in turn is transmitted to a switching element disposed in a hermetically sealed housing.

Among the objects of this invention are the provision of new and improved motion-transfer mechanisms and devices employing such mechanisms; the provision of such motion-transfer mechanisms which are dependable in operation and economical to construct; the provision of such motion-transfer mechanisms which can transfer motion resulting from externally applied forces to the interior of a container which is otherwise hermetically sealed from the circumambient atmosphere; the provision of motion-transfer mechanisms which employ a deformable diaphragm member, which does not depend upon lateral deflection thereof for actuation of the hermetically sealed device with which it is employed; the provision of such motion-transfer mechanisms which, when employed with a hermetically sealed, electrical switching device, render the operation of that device relatively insensitive to ambient or external pressure conditions; and the provision of such motion-transfer mechanisms which employ a deformable diaphragm member which provides for increased life of the diaphragm member and provides for greater reliability and predictable precision operating characteristics of a hermetically sealed device with which it is employed.

Other objects will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated:

FIG. 1 is a side elevational fragmentary view, partly in section, illustrating the operation of an example of prior constructions;

FIG. 2 is a fragmentary elevational view, partly in section, illustrating relative movement between parts, according to applicants' invention;

FIG. 3 is a top plan view of an electrical switch embodying one form of the instant invention;

FIG. 4 is an elevational view of the unit shown in FIG. 3, with parts broken away and partly in section, showing interior portions of the switch mechanism;

FIG. 5 is an isometric view of one of the parts according to the present invention;

FIGS. 6 and 7 are sectional views, with parts broken away, taken respectively along lines **6—6** and **7—7** of FIG. 4;

FIG. 8 is a view similar to FIG. 7 showing relative movement between parts;

FIG. 9 is a fragmentary view similar to FIG. 4, according to another form of the instant invention;

FIG. 10 is a sectional view taken on line **10—10** of FIG. 9;

FIG. 11 is a view similar to FIG. 9 of yet another form of the instant invention; and

FIG. 12 is a sectional view taken on line **12—12** of FIG. 11.

Dimensions of certain of the parts as shown in the drawings have been modified for the purposes of clarity of illustration.

Similar reference characters indicate corresponding parts throughout the several views of the drawings.

It is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

When actuating hermetically sealed selectrical switches by means of externally applied forces, it is important that the actuating forces be transmitted to the switching element without disrupting the hermetically sealed integrity of the switch. It has been proposed, in the past, to employ diaphragm members as part of the hermetic sealing enclosure, and to employ relatively stiff motion-transmitting means inside the hermetically sealed enclosure between the diaphragm member and the switching mechanism, to transmit externally applied actuating forces. Such diaphragm members are generally located with respect to the actuating switch button or member (which is hermetically sealed within the switch housing) so that moments will be created and transmitted to the actuating button. These arrangements tend to minimize the amount of lateral deflection of the diaphragm member required for actuation of the switching mechanism which has the advantage of increasing the operating life of the diaphragm. Minimizing the lateral deflection required of the diaphragm member also permits employing smaller diaphragms leading toward miniaturization of the switches. An example of such prior constructions is schematically illustrated in FIG. 1, wherein dimensions and movements of parts are exaggerated for purposes of clarity of illustration. The prior construction, for example, illustrated in FIG. 1 comprises an electrical switch **10**, which may, for example, be of the mechanical snap type which is disposed within a hermetically sealed housing **12**, switch **10** and housing **12** being shown in fragmentary sectional form.

Switch **10** includes a button **14** normally disposed in the solid line position shown in FIG. 1 which, when depressed to the dashed line position, will actuate the element of switch **10**. Hermetically sealed housing **12** includes a deformable diaphragm member **16** disposed to one side of button **14** and sealed about its periphery (as by welding) to the housing **12** to maintain the hermetically sealed integrity of the casing **12**. The arrangement

shown in FIG. 1 also includes an internal motion-transfer and transmitting means in the form of an L-shaped lever **18**. Lever **18** is fixed to the diaphragm member **16** in a central portion thereof, represented in FIG. 1 by a point labeled A. Also provided is an externally disposed L-shaped lever **20**, the short leg **22** of which is fixed to the diaphragm member **16**, and to the short leg **24** of internal motion-transfer member **18**, as at point A, whereby the internal motion-transfer member will rotate and move in response to rotation and movement of lever **20** upon the application of an externally applied force, as suggested by the arrow in FIG. 1. A characteristic of the prior construction example in FIG. 1 is that under an externally applied force (as suggested by the arrow in FIG. 1) lever **20**, internal motion-transfer means **18** and diaphragm **16** will respectively move and twist and deform from the solid to the dashed line position shown in FIG. 1, and in so doing, will cause button **14** to be depressed from the solid to the dashed line position shown in FIG. 1 to actuate the switch **10**. It should be noted that point A of diaphragm member **16**, the point of connection between lever **20** and motion-transmitting means **18** and the diaphragm member, also moves laterally to point A', when the parts move from the solid line to the dashed line positions shown in FIG. 1. Thus when lever arm **20** is depressed, both a lateral and a rotational movement is imparted to the internal motion-transfer or motion-transmitting means **18**, in addition to causing a lateral deflection of the diaphragm member **16**.

Applicants have found that in hermetically sealed devices of the type described, that when actuation of the mechanism, e.g. an electrical switch, depends at least in part upon lateral deflection of the diaphragm member, there is an increased chance or tendency of inadvertent actuation of the switch which would take place by forces other than predetermined applications of mechanical forces. For example, nuisance or inadvertent actuation can take place by changes in ambient pressure conditions in such arrangements.

According to applicants' invention, a construction is provided whereby actuation of the hermetically sealed device does not depend upon lateral deflection of the diaphragm, thereby rendering operations of the device substantially insensitive to ambient or external pressures. This construction also provides for greater reliability and predictable precision operating characteristics of the hermetically sealed device.

Referring now to FIGS. 3–8, a motion-transfer mechanism according to the instant invention has been illustrated in combination with an exemplary, hermetically sealed electrical switch, generally referred to by numeral **70**. Switch **70** includes a housing or casing **80** formed, for example, of stainless steel and is hermetically sealed from the circumambient atmosphere. Disposed within hermetically sealed casing or housing **80** is a snap-acting element **82** of the type fully described in U.S. Patent No. 2,630,504 to L. W. Burch et al. For the details of the structure and function of this type of snap-acting element, reference is made to this patent Snap-acting element **82** is supported in tension at two spaced points by posts **84** and **86**, respectively. With element **82** so supported, it is warped to the conditions shown in FIGS. 4, 6 and 7, at which an arm **88** carrying an electrical contact **90** is biased into the position at which the latter contact is disposed in electrically conductive engagement with a stationary contact **92** carried by a terminal **94**. Snap-acting element **82** is snappable, by means later to be described, to the condition shown in FIG. 8, at which another movable contact **96** carried by arm **88** is disposed in electrically conductive engagement with a stationary contact **98**, the latter being carried by a terminal **100**. Posts **84** and **86** are carried by a terminal-providing member **102** mounted in a base member **101**, by means such as rivets **103, 103**. Member **101** is formed of electrically insulating material, such as for example, a moldable phenolic resinous or a ceramic material, and is fixedly disposed in casing **80**. All three terminals **94, 100** and **102** provide extensions projecting exteriorly of hermetically sealed housing **22** for connection to external circuits. The externally projecting portions of terminals **94, 100** and **102** are arranged in a conventional manner so as not to disrupt the hermetically sealed integrity of housing or casing **80**. Switch **70** also includes a layer of electrical insulation **115** disposed between element **82** and casing **80**, as shown.

Disposed within casing **80** is an internal motion-transfer or transmitting means in the form of a pivotal arm **106**. Pivotal arm **106** is provided with a flange **108** which bears against a portion of a flexible diaphragm member **110**, which is firmly secured and hermetically sealed, as by welding, to casing **80** and forms a part thereof. This portion of the diaphragm member **110** is represented by a point labeled X in the drawing. Arm **106** further includes a reduced diameter portion **112** extending successively through interfitting apertures in the portion X of the flexible diaphragm member **110** and in a pivotally mounted lever **114** disposed externally of hermetically sealed casing **80**. Pivotal arm or motion-transfer member **106** is headed over, as at **116**, to tightly secure the contiguous portions of motion-transfer member **106**, the aforementioned portion X of the flexible diaphragm member **110** and **114** together, and soldered to maintain the hermetically sealed integrity of casing **80**.

The motion-transfer mechanism according to our invention further includes a stop means which, in the embodiment of FIGS. 3–8, takes the form of a U-shaped bracket, generally referred to by numeral **150**, as best seen in FIG. 5. Bracket **150** includes a bight portion **152** and a pair of spaced, substantially parallel, projecting arms **154** and **156**, which may be formed integrally with bight portion **152**. Arms **154** and **156** are of a generally triangular shape (as best seen in FIG. 5) and include rounded, pointed portions **159** at the free ends thereof providing rigid pivot points.

The spacing between projecting arms **154** and **156** is slightly greater than the width of lever member **114**, as best seen in FIG. 6. Bight portion **152** provides an aperture **153** which is disposed directly over and is substantially larger than headed portion **116**, to provide access thereto for assembly purposes. Bracket member **150** is disposed about lever member **114** in the area of its connection to portion X of diaphragm member **110**, as best seen in FIGS. 4 and 6. Bracket member **150** is secured to lever **114**, as by welding, as at **160** and **162**, as best seen in FIG. 6, and when so connected, provides a stop means wherein legs **154** and **156** serve as a pair of projecting rocker members which provide rigid pivot points **159** externally of the switch **70**. When so arranged, rigid pivot points **159** engage the outer side of diaphragm member **110** adjacent its support with casing member **80**. Whereby projecting rocker arm members **154** and **156** are positioned for pivotal supportive engagement with respect to the supporting casing member **80**, as best seen in FIG. 6. When an external force is applied to the left-hand end of lever arm **114**, as suggested by the arrow in FIG. 4, lever arm **114** will pivot or rotate about the rigid pivot points **159** and impart a rotational or torsional movement to the diaphragm member **110** to twist or rotate the latter from the solid line to the dashed line position, as shown in FIG. 2. This rotational or pivotal movement of lever arm **114** will also impart a rotational or pivotal movement to internal motion-transfer means **106** to move the lower portion thereof to the right (as seen in FIG. 4 and suggested by the arrow in FIG. 8) against a pin **118** fixedly carried by snap-acting element **82**, to snap the latter from the position shown in FIG. 7 to the position shown in FIG. 8. When the externally applied force, as suggested by the arrow in FIG. 4, is released or sufficiently diminished,

the lower end of arm **106** will pivot or move to the left (as seen in FIG. 4) permitting the snap-acting element **82** to snap back to the position shown in FIGS. 6 and 7 under the resilient bias built up in the snap-acting element **82** and the flexible diaphragm **110**. Motion-transmitting means **106** is disposed in electrically insulated relation to pin **118**, as by means of electrically insulating sleeve **107** disposed about means **106**, as shown. The left-hand end of lever **114**, as viewed in FIG. 4, is urged for movement upwardly by compression spring **120**, which is interposed between casing **80** and lever **114**, and maintained therebetween by suitable means, as shown. The pivotal or torsional movement of lever **114**, diaphragm member **110** and pivotal arm **106** described above, is permitted by the rocking or pivotal action of rocker arm legs **154** and **156** about its supportive engagement with respect to the casing **80**. The stop means **150** through its supportive engagement and co-operation with casing **80**, is effective to permit lever **114** to impart rotational or torsional movement to diaphragm **110** and means **106**, and to prevent or inhibit lateral or downward (as seen in FIGS. 2 and 4) deflection of portion X of the diaphragm member and of motion-transmitting means **106**. The term "lateral deflection" as employed throughout the specification and claims, refers to movement or deflection in a direction which is transverse to, or which intersects the plane of, the diaphragm member **110**, as seen for example, in FIGS. 2 and 4, and for example, as suggested by the arrow in FIG. 6. An example of the type of lateral deflection which the present invention avoids is illustrated by the movement of point A from the solid line position to the dashed line position at A' in the exemplary prior construction shown in FIG. 1.

Referring now to FIGS. 1 and 2, which respectively illustrate the operation of the motion-transfer means according to an exemplary prior construction, in contrast to that of the instant invention, it can be seen that as lever member **114** (which is fragmentarily shown in FIG. 2) is moved from the solid to the dashed line positions when an external force is applied thereto, bracket member **150** and internal transfer means **106** will rotate from the solid to the dashed line positions shown therein.

It will be noted that as lever **114** and internal member **106** rotate from the solid to the dashed line positions shown in FIG. 2, the diaphragm member **110** will be deformed or twisted from the solid to the dashed line positions shown therein, but that no lateral deflection of portion X of the diaphragm takes place, in contrast to the lateral deflection of point A to point A' of the prior constructions, illustrated in FIG. 1, which takes place when lever **20** is rotated to actuate switch or device **10**.

It is to be understood that the motion and deflections which are illustrated in FIGS. 1 and 2 have been considerably exaggerated for purposes of illustration. Stop means **150**, in co-operating with the switch casing, lever arm, diaphragm member and motion-transmitting means, in the manner described above, not only assures that downward or lateral deflection of portion X of the diaphragm will be prevented (which might otherwise result upon the application of a mechanical force to lever **114**) but also assures that such deflection or lateral movements will not take place due to other pressures or forces, for example, external ambient pressures. The arrangement according to our invention thereby renders the operation of switch **70** relatively insensitive to ambient pressure conditions, and assures that actuation will take place only upon the application of a predetermined, externally applied force to lever **114**.

Applicants' construction, by rendering the operation of the motion-transfer means independent of any requirement for lateral deflection of the diaphragm member, provides a number of other advantages which include: permitting the use of smaller diaphragm members to afford device miniaturization; increasing the operating life of the diaphragm member; and eleminiating problems such as maintaining the lateral spring rate of the diaphragm members constant from device to device and permitting the use of lower cost mass production techniques, while assuring that the devices so produced will have substantially uniform operating characteristics.

Stop means **150**, with its rigid rocker arms **154** and **156**, may be formed integrally with lever arm **114** or with whatever type of external motion-transfer means is employed.

The modification of FIGS. 9 and 10 illustrates an arrangement **70'** wherein stop means comprising rocker arm members **154'** and **156'** are formed integrally with a lever arm **114'** corresponding to lever arm **114** of the FIGS. 3–8 embodiment. In the FIGS. 9 and 10 embodiment, like numerals designate parts like those shown in the FIGS. 3–8 embodiment, further verbal description in which respect is unnecessary. Lever arm **114'** is secured to diaphragm member **110** and internal motion-transmitting means **106** (fragmentarily shown in FIGS. 9 and 10) in a manner identical to that described above for switch **70**.

Except for being formed integrally with lever member **114'**, projecting rocker member portions **154'** and **156'** are substantially identical to their counterparts of stop means **150**, described above.

The rigid pivot points **159'** provided by each of rocker members **154'** and **156'** are disposed for direct supportive engagement with respect to portions of casing member **80'**, as clearly shown in FIG. 10. In this regard, it is to be noted that the surface portions of casing member **80'** which supportively engage the rigid pivot points **159'** are disposed substantially at the same level and in a substantially coplanar relationship with the upper surface of the diaphragm member **110** in the unstressed condition, to assure that when an external force is applied to lever member **114**, that no downward lateral deflection of portion X of the diaphragm will take place.

The embodiments shown in FIGS. 3–8 and 9–10 precludes lateral deflection of portion X of the diaphragm member and of the internal motion-transmitting means in at least one direction, namely downwardly, as seen in FIGS. 2, 4 and 10, toward the interior of the casing **80** and **80'**. There may be situations in which it is desired to prevent lateral deflection or movement of these parts in an opposite direction, namely in an upward direction, away from the casings, as shown in FIGS. 4, 10 and 12. Such opposite lateral deflection might be caused by conditions where the internal pressure in the hermetically sealed package is greater than the external pressures, as might be the case where the hermetically sealed unit is subjected to a vacuum or high temperature conditions. In accordance with another embodiment shown in FIGS. 11 and 12, means are provided for preventing lateral deflection or movement of these parts in each of two opposite directions.

Referring now to FIGS. 11 and 12, there is shown another embodiment of this invention, generally referred to by numeral **70'**, in which like numerals designate parts like those shown in the embodiments of FIGS. 3–8 and 9–10, further verbal description in which respect is unnecessary.

The point of departure in the FIGS. 11 and 12 embodiment from those preceding embodiments, is in the provision of an internally arranged diaphragm stop member generally referred to by numeral **250**, which is somewhat similar to U-shaped bracket member **150**, shown in FIG. 5. Stop member **250** is U-shaped in form, and includes a bight portion **252** which provides a cylindrical flanged hollow portion **253**, the internal diameter of which closely approximates that of the upper portion of internal motion-transfer means **106**. The cylindrical portion **253** of bracket member **250** is telescopically disposed about mo-

tion-transfer member **106**, and is fixedly secured thereto, as by welding at **255**, as shown. Bracket member **250** further provides a pair of projecting rocker arm members **254** and **256** which are or may be substantially identical respectively to projecting rocker arm members **154** and **156** of stop means **150**. Each of projecting rocker arm members **254** and **256** includes a rigid pivot point **259** disposed at its free end, and positioned for pivotal supportive engagement with casing **80'**, as best seen in FIG. 12. Bracket member **250** permits motion-transmitting means **106** to pivot or rotate in a manner described above in connection with the embodiment of FIGS. 3–8, and also prevents upward lateral movement or deflection of motion-transmitting means **106** and of portion X of the diaphragm (as seen in FIGS. 11 and 12). Except for preventing lateral movement of parts in an upward direction, as seen in FIGS. 11 and 12, stop means **250** function substantially in the manner described above for stop means **150**. The FIGS. 9 and 11 embodiments operate in a manner similar to that described above for the FIGS. 3–8 embodiment, and include substantially all of the advantages of the FIGS. 3–8 embodiment described above.

The FIGS. 11 and 12 embodiment provides a simple and inexpensive arrangement for transferring substantially pure rotary motion through an external wall of a hermetically sealed enclosure.

It should be understood that while a flat type of diaphragm member has been illustrated in each of the embodiments described above, other types and configurations of diaphragm members may be employed within the purview of this invention.

In the embodiments described above, the external mechanical force transmitting means has been illustrated in the form of a lever **114** or **114'**. It should be understood that rotational actuating movement can be imparted to internal motion-transfer means **106** in response to an externally applied mechanical force, by other means which could, for example, take the form of a rotating cam member.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings, shall be interpreted as illustrative and not in a limiting sense, and it is also intended that the appended claims shall cover all such equivalent variations as come within the true spirit and scope of the invention.

We claim:

1. In combination; a support having an aperture therein; a diaphragm member secured adjacent its periphery to said support to seal said aperture; motion-transmitting means disposed to one side of said diaphragm member and connected to a portion thereof; lever means disposed on the other side of said diaphragm member and secured at a part thereof spaced from one end thereof, to said portion of said diaphragm member and said motion-transmitting means; said lever means being adapted to impart rotational movement to said portion of said diaphragm member and said motion-transmitting means in response to an externally applied force to said lever means; and means secured to and movable with said lever means and having pivot points thereon pivoting on a point adjacent said support whereby said lever means imparts rotational movement to said portion of said diaphragm and motion-transmitting means and prevents lateral movement thereof in at least one direction.

2. In combination; a support having an aperture therein; a diaphragm member secured adjacent its periphery to said support to seal said aperture; motion-transmitting means disposed to one side of said diaphragm member and connected to a portion thereof; a lever member disposed on the other side of said diaphragm member and secured at a part thereof intermediate its ends to said portion of said diaphragm member and to said motion-transmitting means; said lever member being arranged for imparting rotational movement to said portion of said diaphragm member and said motion-transmitting means in response to an applied force to said lever member; and stop means comprising a U-shaped bracket member with a pair of spaced projecting rocker members forming the legs of said U-shaped bracket member, the bight portion of said U-shaped bracket member being secured to said lever member as by welding, said rocker members having a pair of pivot points thereon pivoting on a point adjacent said support whereby said lever member imparts rotational movement to said portion of said diaphragm member and motion-transmitting means and prevents lateral movement thereof in at least one direction.

3. In combination; a support having an aperture therein; a diaphragm member secured adjacent its periphery to said support to seal said aperture; motion-transmitting means disposed to one side of said diaphragm member and connected to a portion thereof; a lever member disposed on the other side of said diaphragm member and secured at a part thereof intermediate its ends to said portion of said diaphragm member and to said motion-transmitting means; said lever member being arranged for imparting rotational movement to said portion of said diaphragm member and said motion-transmitting means in response to an applied force to said lever member; stop means comprising a pair of spaced projecting rocker members on said lever member; said stop means having pivot points thereon pivoting on a point adjacent said support whereby said lever member imparts rotational movement to said portion of said diaphragm and motion-transmitting means and prevents lateral movement thereof in at least one direction; and further stop means disposed to said one side of said diaphragm member and engaging said support; said further stop means being connected to and movable with said motion-transmitting means and operative to prevent lateral movement of said portion of said diaphragm and motion-transmitting means in a direction opposite to said one direction.

4. In combination; a support having an aperture therein; a diaphragm member secured adjacent its periphery to said support to seal said aperture; motion-transmitting means disposed to one side of said diaphragm member and connected to a portion thereof; lever means disposed on the other side of said diaphragm member and secured at a part thereof spaced from one end thereof, to said portion of said diaphragm member and said motion-transmitting means; said lever means being adapted to impart rotational movement to said portion of said diaphragm member and said motion-transmitting means in response to an externally applied force to said lever means; and stop means comprising a pair of spaced projecting rocker members secured to said lever member for movement therewith and having pivot points thereon pivoting on said support whereby said lever member imparts rotational movement to said portion of said diaphragm and motion transmitting means and prevents lateral movement thereof in at least one direction.

5. In combination; an enclosure hermetically sealed from the circumambient atmosphere; motion-transfer means disposed within said enclosure and operatively associated with a device also disposed within said hermetically sealed enclosure for actuation thereof in response to rotational movement of said motion-transfer means; said enclosure including a diaphragm member forming a part thereof; said motion-transfer means being connected to a portion of said diaphragm member; a lever member disposed exteriorly of said enclosure and connected at a part thereof spaced from one end thereof with said portion of said diaphragm member and said motion-transfer means; said lever member being arranged for imparting rotational movement to said portion of

said diaphragm member and said motion-transfer means in response to an externally applied force to said lever member; stop means comprising a pair of spaced projecting rocker members on said lever member and having pivot points thereon pivotally engaging the exterior of said enclosure whereby said lever member imparts rotational movement to said portion of said diaphragm and to said motion-transfer means and prevents lateral movement thereof in at least one direction.

References Cited by the Examiner

UNITED STATES PATENTS

2,748,220	5/56	Lung	200—168
2,757,688	8/56	Klingler	74—18 X

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