Jan. 22, 1957 R. TOLLEFSEN 2,778,896

AUTOMATIC CONTROLLABLE "G" IMPACT SWITCH

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FIG. 1.

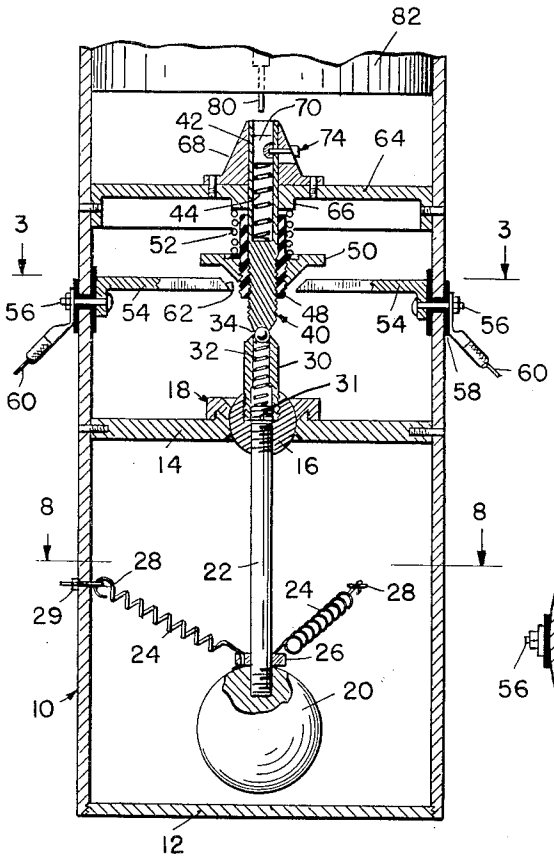


FIG. 2.

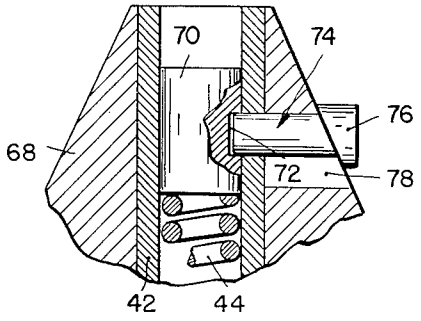


FIG. 3.

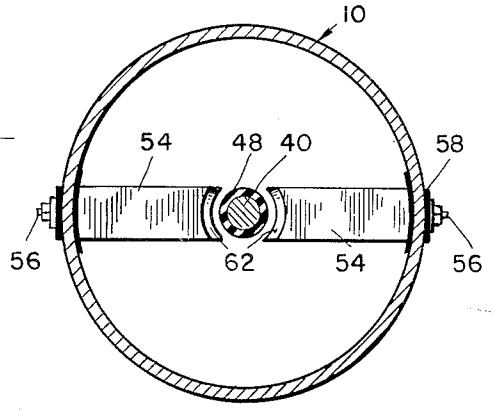
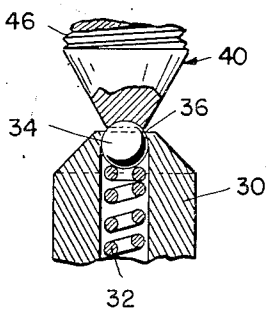


FIG. 4.



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FIG. 5.

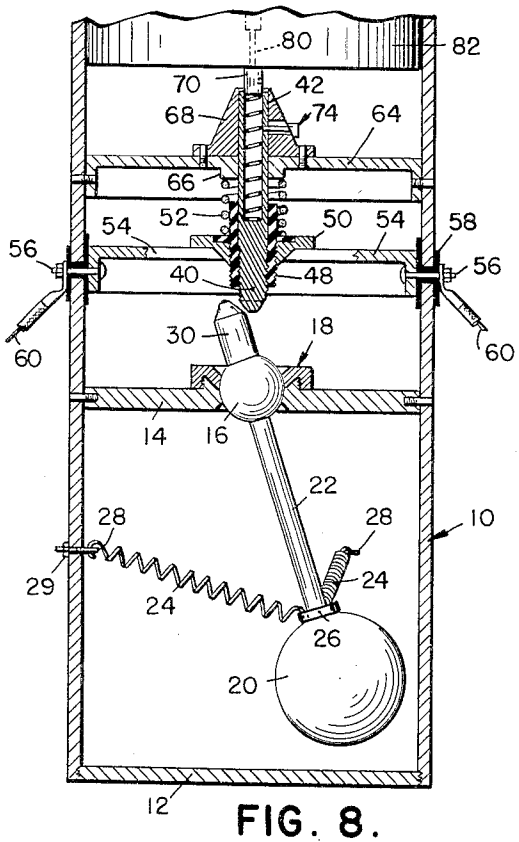


FIG. 6.

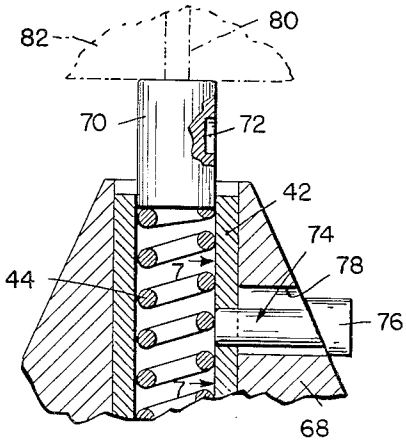


FIG. 7.

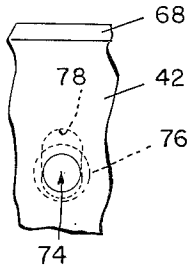
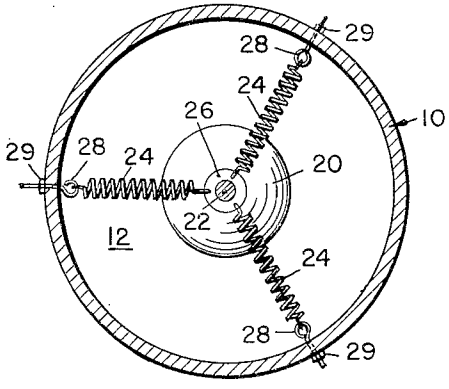


FIG. 8.



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AUTOMATIC CONTROLLABLE "G" IMPACT SWITCH

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11 Claims. (Cl. 200—61.5)

This invention relates to an improved automatic controllable "G" impact switch, and has for one of its principal objects the provision of means for automatically making an electrical contact, releasing a pre-tensioned spring or performing some other operation when the human element is not in a position to function and wherein the result to be accomplished must be performed within a very limited space of time, or actually instantaneously.

One of the important objects of this invention is to provide an apparatus which will automatically function to perform a predetermined operation upon a rapid or excessive acceleration or deceleration.

Another and still further important object of the invention is the provision of a device of the class described which can be pre-set for automatic functioning whenever a maximum movement in one direction or another is attained.

Other and further important objects of the invention will be apparent from the disclosures in the accompanying drawing and following specification.

The invention, in a preferred form, is illustrated in the drawings and hereinafter more fully described.

In the drawings:

Figure 1 is a vertical elevation partly in section and parts being broken away showing the improved automatic controllable "G" impact switch of this invention.

Figure 2 is an enlarged detail view of a portion of the structure shown in Figure 1.

Figure 3 is a horizontal section taken on the line 3—3 of Figure 1, looking in the direction indicated by the arrows.

Figure 4 is an enlarged detail view showing portions of the element which are automatically displaced when the apparatus of this invention operates.

Figure 5 is a view similar to Figure 1 but showing the parts after operation as distinguished from the inoperative relationship of the element illustrated in Figure 1.

Figure 6 is an enlarged detail view illustrating certain parts shown in Figure 2, and depicting the relationship of same following automatic operation of the structure of this invention.

Figure 7 is a partial sectional view taken on the line 7—7 of Figure 6 looking in the direction indicated by the arrows.

Figure 8 is a horizontal section on the line 8—8 of Figure 1, looking downwardly.

As shown in the drawings:

The reference numeral **10** indicates generally a housing or casing which is adapted to contain the improved automatic controllable "G" impact switch of this invention. This is preferably cylindrical in shape and composed of metal, but other shapes and materials may obviously be employed.

The casing is fitted with a bottom **12** which is removable for convenient access to the interior and a web or partition **14** is fixed in the casing at a point substantially adjacent its middle. Mounted in the center of the partition **14** and freely swingable through 360° by means of

a ball **16** and socket **18** is a pendulum **20** having a supporting shaft **22** fitted into the ball **16**. Three springs **24** spaced equi-distantly or 120° apart have their inner ends fastened to an annulus **26** adjacent the ball **20** of the pendulum and their outer ends fitted into rings, screw-eyes or the like **28** positioned in the walls of the housing **10**, and are provided for normally maintaining the pendulum in a neutral or central inoperative position, as shown in Figure 1. These springs can be varied in size and tension to meet different requirements, or adjustments can be made by way of the screw-eyes or similar devices for changing the tension if desired or necessary.

An extension or elongation of the pendulum supporting rod **22** is fitted into the opposed face of the ball **16**, such being indicated by the reference numeral **30**. This extension is hollow and a helical spring **32** is positioned therein for supporting a ball bearing or the like **34** in the upper end of the tubular extension **30**. From an inspection of Figure 4, it will be noted that the hollowed out portion of the extension **30** is inwardly flared at its upper end to produce a beveled edge **36** whereby the ball **34** is retained in this upper end regardless of the operative or inoperative position of the pendulum **20**. A plug **31** adjustably tensions the spring **32**.

Positioned so as to abut against and inter-fit with the end of the pendulum extension **30** and its retained ball **34** is a rod **40**, concave at its lower end to receive a portion of the ball **34**.

The upper end of the rod **40** is reamed out to form a sleeve **42** (Figure 6) and a spring **44** is in this sleeve portion.

The lower end of the rod **40** is screw-threaded as illustrated at **46** and a similarly internally screw-threaded sleeve **48** of insulating material is fitted around the lower end of the rod **40** (Figure 5). The insulating sleeve **48** is fixed in an annulus **50** having a conical depending portion, this being of metal or some other current carrying material, and a helical spring **52** surround the rod and sleeve assembly **40—48**.

Fixed in the housing **10** at diametrically opposite points and at the level of the lower end of the rod **40** with its contained sleeve and annulus is a pair of inwardly extending strips or bars **54** fastened to the sides of the housing **10** by means of bolts or the like **56** but electrically insulated therefrom by suitable materials in the form of washers or the like **58**. The ends of the bolts **56** project beyond the outer face of the housing and provide binding posts for the ends of current carrying wires **60**. The conical portion of the annulus **50** is so shaped as to interfit with correspondingly curved beveled ends **62** of the bars or strips **54** (Figure 3). There may be more than two bars or strips **54** for other purposes.

A supporting disc or plate **64** is fixed in the housing **10** above the bars or strips **54** and this is centrally pierced to receive and support the upper hollow portion **42** of the rod **40**. An integral boss **6** is preferably formed in the plate **64** for abutment of the spring **52** there against. This spring **52** is normally under compression by reason of the adjusted position of the annulus **50**, as best shown in Figure 1.

A centrally bored conical element **68** is fixed to the plate **64** with its central opening in alignment with the corresponding central opening of the plate and in such relationship thereto that the sleeve **42** fits snugly into these aligned openings and is thereby held in desired position therein.

A plug **70** is slidably placed in the upper end of the sleeve **42** in such a position as to normally compress the spring **44**. This plug has an opening **72** in one face thereof (Figure 6) and a pull-pin **74** having a head **76** passes through an opening in the sleeve **42** and has its end normally fitted into the opening **72** in the plug **70**. This pull-pin likewise passes through a slotted opening **78** in the

conical element **68** and is adapted for up and down movement therein, as best shown in Figures 2 and 6. The head **76** of the pull-pin **74** is beveled at its point of juncture with the pin, the angle of this bevel corresponding to the angle of the outer face of the conical element **68**.

The apparatus is normally set in inoperative position as shown in Figure 1, with the springs **24**, **32**, **44** and **52** under proper or desired initial or adjusted tension, depending upon the final result to be achieved or upon the maximum or minimum conditions under which the device is desired to automatically operate. The apparatus can be used in airplanes to automatically break off current connections to prevent fires in case of a crash, and also can be similarly used in land or water vehicles including automobiles, trucks, railway trains, ships, boats and the like, or in fact any place where certain conditions must or should be met instantaneously after some untoward or unexpected accident or similar occurrence. Instead of breaking current connections, a connection may be made as illustrated and this in turn may operate a relay for performing the current breaking or other operation.

Additionally when the combination pin and sleeve **40—42** is forced downwardly by the action of the spring **52** when the pendulum is displaced, the pull pin **74—76** will ride outwardly in its slot **78** with the result that its end will be withdrawn from the opening in the plug **70** and the spring **44** will then operate to forcibly eject the plug, which can in itself perform some other or desired operation, or it may contact a pin such as that shown at **80** in Figures 1 and 5 to elevate or displace the same, thereby consummating or initiating another operation. The movement of the plug can be limited by a piston, disc, plate or the like **82** fitted into the upper end of the housing **10**.

It will be evident that herein is provided an automatic controllable "G" impact switch which can be pre-set to operate at or upon the application of a force which may be that of anything over gravity as indicated by the letter "G." For example, if a vehicle of any type into which the apparatus of this invention is installed has its speed too suddenly accelerated or decelerated, the automatic functioning will immediately control any desired sequence of predetermined operations whereby loss and damage due to excessive speed or sudden stops can be avoided. Additionally, the device can be employed in all research operations associated with guided missile work or other supersonic speeds and in this connection, the automatic ejection of cameras and other scientific recording instruments from the missile or other object under study can be readily, simply and efficiently accomplished.

I am aware that many changes may be made and numerous details of construction varied throughout a wide range without departing from the principles of this invention, and I therefore do not propose limiting the patent granted hereon otherwise than as necessitated by the prior art.

I claim as my invention:

1. An automatic controllable "G" impact switch comprising a casing, a pendulum swingably mounted in the casing, an extension beyond the pivotal point of the pendulum, a spring impelled pin in the housing normally in contact with the end of the extension and automatic control means connected to the spring impelled pin, springs in the housing connected to the pendulum for normally maintaining the same in static relationship, means for adjusting the tension on said springs, said adjusting means including screw-eyes in the housing, the pivotal support for the pendulum comprising a ball and socket joint, the extension of the pendulum being hollow, a spring pressed ball in the extension, the end of the operating pin adjacent the pendulum extension being concave for normal reception of the spring pressed ball.

2. A device as described in claim 1, wherein said automatic control means includes a current carrying element, a pair of current carrying bars mounted in the housing adjacent the current carrying element on the pin.

3. A device as described in claim 2 wherein a pair of current carrying bars are mounted in the housing adjacent the current carrying element on the pin.

4. A device as described in claim 1, wherein one end of the spring impelled pin is cylindrical and a second spring in said cylindrical end.

5. A device as described in claim 4, wherein a plug is slidably positioned in said cylindrical end, said plug normally compressing the second spring.

6. An automatic controllable "G" impact switch comprising a casing, a pendulum swingably mounted in the casing, an extension beyond the pivotal point of the pendulum, a spring impelled pin in the housing normally in contact with the end of the extension and automatic control means connected to the spring impelled pin, one end of said pin being cylindrical, a helical spring in said cylindrical end, a plug slideably positioned in said cylndrical end for normally compressing the spring, a pull-pin for normally retaining the plug in spring compressing position.

7. A device as described in claim 6, wherein a conical support surmounts the cylindrical end of the rod, said support having a slot therein for reception of the pull-pin.

8. A device as described in claim 7, wherein the head of the pull-pin is wider than the slot.

9. A device as described in claim 8, wherein the cylindrical end of the rod has an opening therein, said opening being adjacent the slot in the conical member and for the passage of the pull-pin therethrough.

10. A device as described in claim 9, wherein a second pin is positioned in the housing adjacent the end of the first named pin and tubular element, said pin being in alignment therewith and adapted for contact with the slidable plug when the same is ejected from its tube.

11. A device as described in claim 2, wherein more than two current carrying elements are mounted in the housing, said elements adapted for accomplishing both one and a plurality of results.

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