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INERTIA SWITCH

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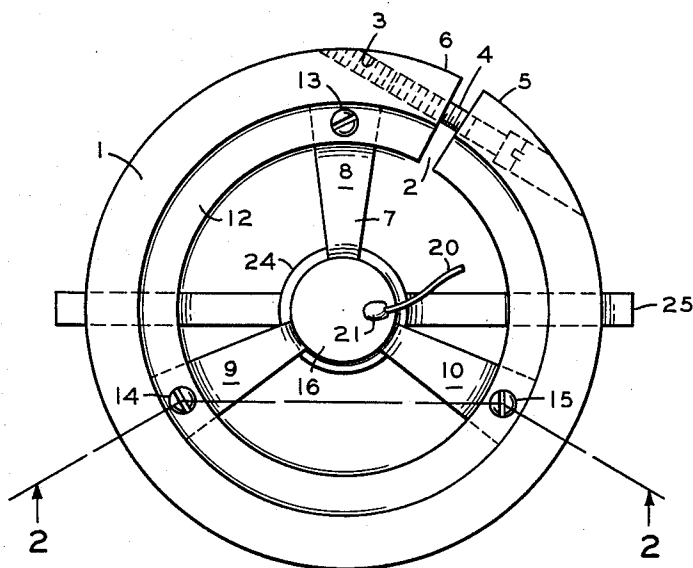


FIG. 1

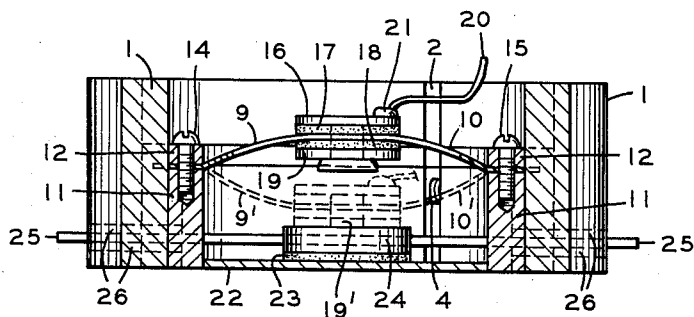


FIG. 2

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INERTIA SWITCH

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1 Claim. (Cl. 200—61.49)

An inertia switch consists in general of an electrical switch which is actuable, either to the open or closed position, by the forces of inertia.

One of the objects of my invention is to provide an inertia switch which will automatically "lock" itself at both extreme conditions of open and closed.

Another object of my invention is to provide a simple construction which can be accurately set to actuate at any given value of acceleration or deceleration, that is, a construction which can be adjusted by the simple turning of a screw, to vary the required value of acceleration to "trigger" the switch.

A further object of my invention is to provide a construction for an inertial switch which can be adapted either for linear or angular modes of motion.

Another object of my invention is to provide an inertia switch which will not actuate upon receiving a shock from the side, that is perpendicular to the longitudinal axis of the switch.

The above and other objects of the construction of the invention will be apparent to those skilled in the art of switches. The invention will now be described with reference to the accompany drawings, which show one preferred embodiment of my invention by way of example only, and in which:

FIGURE 1 is a top plan view of the switch; and

FIGURE 2 is a cross-sectional view taken along the line 2—2 of FIGURE 1.

Referring now to the drawings, numeral 1 is given to the switch housing, which is made of metal, preferably of aluminum or magnesium for lightness and is made in the form of a split cylinder. The split character is provided by the slot 2 which runs the entire length of the housing 1. Piercing the sidewall of the housing 1 is the threaded bore 3, in which rides the screw or bolt 4. One end of the bolt 4 is provided with an ordinary slot for a screwdriver. Thus it is possible to tighten the bolt 4 riding in the bore 3 and thereby to draw the sides 5 and 6 of the cylinder closer together or to spread them apart.

Inside the cylinder is positioned the spider 7, in the form of a three-legged cruciform shape of spring metal. The three legs are numbered 8, 9, and 10, and they are held in position between the cylinder wall ledge 11 and the retaining ring 12, by the small bolts 13, 14, and 15 respectively.

The spring legs 8, 9, and 10 have been given a permanent "set," that is they have been bent so that the spring 7 retains the position of FIGURE 2 when unrestrained by the bolts 13, 14, and 15.

Disposed upon the circular central portion of the spring 7 at which the three legs meet, is the metal contact stud 16. The contact stud 16 is insulated from the metal spring 7 by the nylon washers 17 and 18. After passing through the nylon washers and the spring 7 from which it is insulated the contact stud 16 is mounted integrally into the powerful magnet 19. The magnet 19 is in the shape of a ring and the bottom surface of the contact stud 16 is flush with the bottom surface of the magnet.

A thin, that is a very light, strand of wire 20 is soldered to the contact stud 16 by means of the solder lump 21, shown in both drawings. Thus an electrical circuit can be seen to extend through wire 20, contact stud 16 and the ring magnet 19, to the bottom surface of the latter.

Mounted upon the bottom wall 22 of the housing, and

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insulated therefrom by the nylon washer 23, is the flat cylindrical magnet 24. Passing through the magnet 24 and the side walls of the housing cylinder 1 is the contact rod 25. The contact 25 is electrically connected to the magnet 24, but is insulated from the walls of the housing 1 by the nylon liners or jackets 26 which are shown in dotted lines in FIG. 2.

The operation of the switch is as follows. If the switch of FIG. 2 is accelerated upward in the figure, inertia forces will come into being upon the spring-suspended mass composed of the contact stud 16, the nylon washers 17 and 18, and the ring magnet 19. At a given acceleration "a" these forces will be sufficient to force the assembly comprised of the spring 7 and the spring-suspended mass to assume the dotted lines position shown in FIG. 2. This dotted lines position is illustrated with 9', 10', and 19'.

It will be noted that I prefer to magnetize the ring magnet 19 and the cylindrical magnet 24 so that their opposite and contacting faces are of opposite poles. Thus the bottom surface of 19, when in the position 19' is strongly attracted to the upper surface of magnet 24 with which it is in contact.

The principal purpose of the use of the magnets in such opposed relationship is to provide an additional force to lock the switch in its dotted lines position at the moment of contact. This prevents "chattering" when the deformation has reached that point and serves to hold the bottom surface of 19, together with the flush surface, that is the bottom surface of contact stud 16, against the upper surface of magnet 24.

At the same time it will be recognized that the given acceleration "a" which is the actuating acceleration, serves principally to move the suspended mass upon the spring 7 past the centerline position, which is that center position between the extreme positions shown. As the housing is accelerated upward in FIG. 2, the mass upon the center of the spring 7 moves downward relative to the housing. At the given acceleration "a" the spring is all under compressive forces. It remains under compressive forces, since it is restrained in its position by the bolts 13, 14 and 15, until its carried mass passes the center line. At this condition, the spring legs are free to expand to the lower dotted lines position of FIG. 2. Thus the switch has a decided "snap" action. This action occurs whenever the suspended mass upon the center of spring 7 is moved downward relative to the housing 1, past the center line position.

Now the amount of acceleration "a" which will actuate the switch can be established by means of the bolt 4 riding in the threaded bore 3. By tightening the bolt 4 the ends 5 and 6 of the walls can be drawn closer together, see FIGURE 1. When the ends 5 and 6 come closer together the spring legs 9 and 10 of FIGURE 2 will be bowed further and the suspended mass, 16, 17, 18, and 19 will be raised in FIGURE 2. Consequently the spring forces in the legs 8, 9 and 10 will be greater and a greater accelerative force, that is one greater than the initial setting of "a" will be required to "trigger" the switch.

Conversely, to lower the setting of the switch, it is only necessary to loosen the bolt 4 so that the wall ends 5 and 6 of FIG. 1 are allowed to separate further. Thus the suspended mass 16, 17, 18 and 19 will be positioned lower in FIG. 2 and the spring forces in the legs 8, 9, and 10 will be lower and a lesser accelerative force will be required, that is one lesser than the initial setting of "a" will be required to "trigger" the switch.

Of course in the dotted lines position of FIG. 2 the wire 20 is electrically connected to the rods 25 and an electrical circuit has been established through the switch

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which can be applied to perform any of a number of functions.

The switch so constructed can be made to operate at settings from tenths of "g," that is gravity, to settings measured in hundreds of g's.

While my invention has been described in detail in terms of the foregoing specific embodiments, it is to be understood that further modifications combining the disclosed features in other ways will be apparent to those skilled in the art. Variations in the number of spring legs, size of the suspended mass, and magnet strengths and the like will still be within the scope of the invention. The scope of the invention therefore should not be considered as limited to these specific details, but is to be ascertained from the appended claim.

What I claim is:

An inertia switch comprising a cylindrical housing, having side walls and a bottom wall, a flat cylindrical magnet adjacent said bottom wall, and insulated therefrom by a nylon insert, a contact rod passing through and projecting through said side walls and insulated therefrom by insulating jackets, said contact rod passing through and electrically connected to said cylindrical magnet, a spider spring attached to the side walls with a retainer ring and bolts, said spring provided with a permanent set, a suspended mass mounted upon the

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center of said spider spring and maintained by said set of the spring above the ends of the spring, said suspended mass consisting of a contact stud and a ring magnet, said contact stud mounted on one side of said spring and said ring magnet mounted on the other side of said spring, both said contact stud and said ring magnet being insulated from said spring by insulating washers and said contact stud and said ring magnet being in electrical contact, said ring magnet being on the side of the spring adjacent said cylindrical magnet, and so magnetized that the lower surface of the ring magnet is of opposite polarity from the upper surface of the cylindrical magnet, a longitudinal slot in the side wall of the housing, a threaded bore perpendicular to said slot and located in said side wall, and an adjusting bolt in said threaded bore for adjusting the spring forces in said spider spring and the position of said suspended mass relative to the cylindrical magnet.

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