April 24, 1962 L. G. WALLER 3,031,545

IMPACT SWITCH

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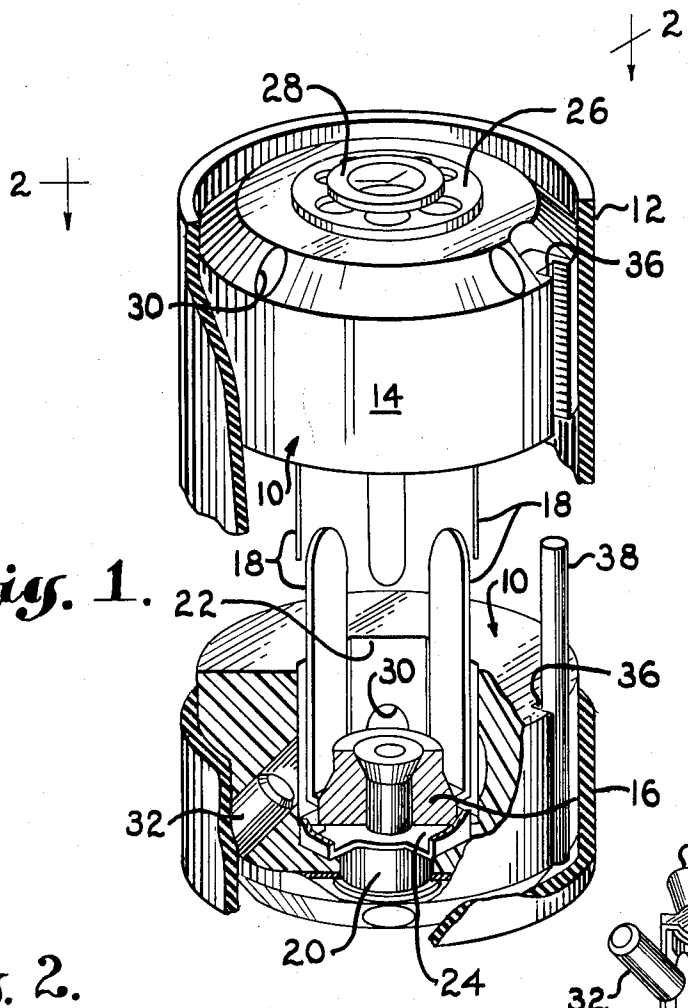


Fig. 1.

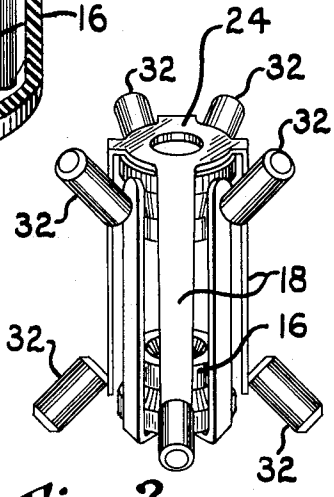
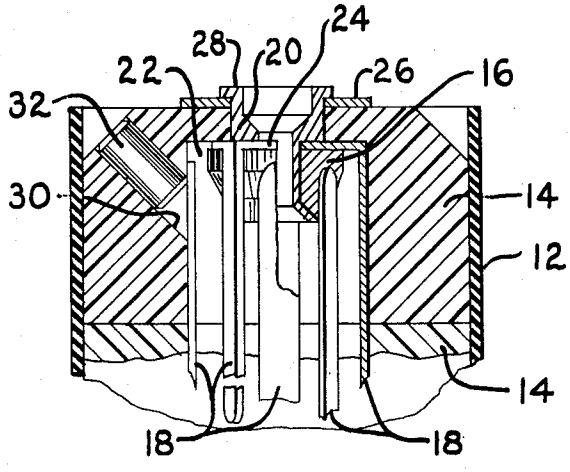


Fig. 3.

Fig. 2.



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IMPACT SWITCH

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This invention relates to switches and has particular reference to such a switch which is constructed and arranged to close as a consequence of a predetermined acceleration or deceleration of such switch in any direction.

The construction herein disclosed provides numerous functional and manufacturing advantages.

A principal object of the invention is to provide a new and improved impact switch.

Another object of the invention is to provide an impact switch which is simple in construction, easy an manufacture, dependable in operation and which will close upon a predetermined acceleration or deceleration in any direction.

Other objects and advantages of the invention will be apparent from a consideration of the following specification taken in conjunction with the accompanying drawing of which there is one sheet, and wherein:

FIGURE 1 is a partially exploded perspective view of a switch embodying the invention with parts thereof broken away; and

FIGURE 2 is a fragmentary sectional view taken along the line 2—2 of FIGURE 1; and

FIGURE 3 is a perspective view illustrating the operating parts of the switch.

As illustrated in the embodiment of the invention selected for purposes of illustration, the switch comprises in general two substantially identical assemblies 10 which may be enclosed in an insulating tube 12. The upper assembly 10 as illustrated comprises a hollow body 14 of an insulating material, a switch contact 16 and a series of spring fingers 18 disposed about the contact 16 and in current conducting relation therewith. The fingers 18 are disposed in parallel relation and project away from the contact 16.

As shown in FIGURE 2 a hollow rivet 20 which extends through a central opening in the wall of the body 14 secures the contact 16 within the cavity 22 of the body 14. The spring fingers 18 as shown in FIGURE 3 may be formed integral with a collar 24 which is clamped between the contact 16 and a shoulder on the rivet 20. A lock washer 26 is clamped between the head 28 of the rivet and the outer surface of the wall of the body 14 so as to prevent rotation of the rivet 20 and the spring fingers 18 about the longitudinal axis of the switch. The body 14 is provided with a series of bores 30, there being 4 bores in the body 14 as shown. A weight 32 is slidably positioned in each bore 30. As shown the bores 30 each lie on an axis at 45° with respect to the longitudinal axis of the switch and the bores 30 are arranged in an annular series spaced 90° apart.

The lower assembly 10 is identical with the upper assembly 10 which has just been described. The assemblies 10 as illustrated in FIGURE 1 are provided with axially extending grooves 36 in the periphery thereof for accommodating a dowel 38 so that the upper and lower assemblies may be assembled in proper relation.

The assemblies 10 are assembled so as to bring the parts thereof in the relation as illustrated in FIGURES 2 and 3 wherein the free ends of the spring fingers 18 of the upper assembly project into the cavity 22 of the lower assembly and the free ends of the spring fingers 18 of the lower assembly project into the cavity 22 of the

upper assembly with the fingers of each assembly disposed in interdigitated relation with the fingers 18 of the other assembly and out of contact therewith. As shown the fingers 18 of the lower assembly are arranged 45° out of phase with the fingers of the upper assembly.

As shown in FIGURES 2 and 3 the free ends of the fingers 18 of the lower assembly overlie the inner ends of the bores 30 in the upper assembly and the free ends of the springs 18 of the upper assembly overlie the inner ends of the bores 30 of the lower assembly so that the free end of each spring finger 18 is disposed inwardly of a weight 32 and in the inward path of movement thereof. As shown in FIGURE 2 the free ends of all of the spring fingers are biased outwardly so as to bear against the inner surface of the cavity 22. The upper ends of the fingers 18 of the lower assembly 10 are spring biased out of engagement with the upper contact 16 and the free ends of the spring fingers of the upper assembly 10 are biased out of engagement with the contact 16 of the lower assembly.

It will also be noted that the series of weights 32 of the lower assembly 10 are arranged to move in diverging paths with respect to the weights 32 of the upper assembly. Each of the weights 32 is normally held against inward movement by the end of the spring finger 18 which obstructs its inward path of movement. The mass of the weights 32 with reference to the stiffness of the spring fingers 18 is such that a predetermined acceleration or deceleration of the switch is required to cause a weight 32 to move inwardly and to move its associated finger 18 into engagement with the adjacent contact 16. It will be noted that each of the weights is arranged to engage its adjacent finger at a point spaced from the point of engagement of such finger with the adjacent exposed contact 16. This permits the finger 18 to yield under the impact of the weight 32, thereby permitting a longer period of contact between the finger 18 and the contact 16 than would otherwise be the case. The step in the contact 16 provides a limit for the movement of spring 18.

The arrangement of the weights 32 as shown and the number employed provides a switch construction in which a predetermined acceleration or deceleration in any direction will cause one of the weights to move the end of the adjacent finger lying in its path of movement into engagement with the adjacently disposed contact 16 to close the switch. Depending upon the application, the number of fingers 18 and weights 32 may be increased or decreased. The design of the switch provides spin saftey through any axis of rotation of the switch from its geometric center to any axis of rotation displaced not farther from the geometric center than the center of gravity of any of the sliding weights. The forgoing switch design may be employed to cover a wide range of performance by altering overall size and/or materials.

While I have illustrated and described a preferred embodiment of the invention, it is capable of modification and therefore I do not wish to be limited to the details set forth but desire to avail myself of such changes and alterations as fall within the scope of the following claims.

I claim:

1. An impact switch comprising a first contact having a series of spring fingers disposed thereabout and in current conducting relation therewith, said fingers being disposed in parallel relation and projecting away from said contact, a second duplicate contact having a duplicate series of spring fingers, said contacts being oppositely disposed in spaced relation on a common axis with the fingers of each contact disposed interdigitated relation with the fingers of the other contact but out of contact therewith and with he ends of the fingers of each series dis-

posed opposite the other contact and out of engagement therewith, and two series of movable weights, one disposed adjacent the ends of each series of fingers, each of said weights being releasably secured against movement and arranged to move as a consequence of a predetermined acceleration or deceleration of said switch, and means constraining said weights for movement in diverging paths, said weights being so disposed with respect to said fingers so that the end of each finger is in the path of movement of a weight and so that a predetermined acceleration or deceleration of said switch in any direction will cause at least one of said weights to move the end of the finger lying in its path of movement into engagement with the adjacently disposed contact.

2. A switch according to claim 1 wherein said means comprises a switch housing provided with two series of bores, each of said bores having one of said weights disposed therein.

3. A switch according to claim 1 wherein said weights are disposed outwardly of and around said spring fingers.

4. An impact switch comprising a first contact having a series of fingers disposed thereabout, said fingers being disposed in parallel relation, a second duplicate contact having a duplicate series of fingers, said contacts being oppositely disposed in spaced relation on a common axis with the fingers of each contact disposed in interdigitated relation with the fingers of the other contact but out of contact therewith and with the fingers of each series disposed opposite the other contact and out of engagement therewith, and a plurality of movable weights, each of said weights being arranged to move as a consequence of a predetermined acceleration or deceleration of said switch, said weights being so disposed with respect to said fingers so that each finger is in the path of movement of a weight and so that a predetermined acceleration or deceleration of said switch in any direction will cause at least one of said weights to move the finger lying in its path of movement into engagement with the adjacently disposed contact.

5. A switch according to claim 4 wherein each of said weights movably engages a finger at a point spaced from the point of engagement of such finger with the adjacently disposed contact.

6. An impact switch comprising a contact member having a series of spring fingers disposed threabout and in current conducting relation therewith, said fingers being disposed in parallel relation and projecting away from said contact member, a second contact member, said contact members being disposed in spaced relation on a common axis with the ends of the fingers disposed opposite the second contact member and out of engagement therewith, a series of movable weights disposed adjacent said fingers, each of said weights being releasably secured against movement and arranged to move as a consequence of a predetermined acceleration or deceleration of said switch, and means constraining said weights for movement in diverging paths, said weights being so disposed with respect to said fingers so that each finger is in the path of movement of a weight and so that a predetermined acceleration or decleration of said switch will cause at least one of said weights to move the finger lying in its path movement into engagement with the adjacently disposed contact member.

7. A switch according to claim 1 wherein said means comprises a switch housing provided with bores, each of said bores having one of said weights disposed therein.

8. An impact switch comprising a series of fingers, a fixed contact member, said contact member and fingers being disposed with the fingers arranged symmetrically around the contact member and out of engagement therewith, and a series of movable weights disposed adjacent said fingers, each of said weights being releasably secured against movement and arranged to move as a consequence of a predetermined acceleration or deceleration of said switch, and means constraining said weights for movement in diverging paths, said weights being so disposed with respect to said fingers so that each finger is in the path of movement of a weight and so that a predetermined nonrotational acceleration or decleration of said switch will cause at least one of said weights to move the finger lying in its path of movement into engagement with said contact member, said diverging paths being disposed symmetrically with respect to a line passing through the geometric center of said switch and said paths being disposed at an angle other than normal to said line.

9. A switch according to claim 8 wherein said weights are disposed outwardly of and around said fingers.

10. An impact switch comprising a pair of fixed contacts disposed in spaced relation on a common axis, a series of fingers disposed thereabout, each of said fingers being arranged in current conducting relation with one of said contacts and out of current conducting relation with the other, and two series of movable weights, each of said weights being releasably secured against movement and arranged to move as a consequence of a predetermined nonrotational acceleration of said switch, and means constraining said weights for movement in diverging paths, said weights being so disposed with respect to said fingers so that each finger is in the path of movement of a weight and so that a predetermined acceleration or deceleration of said switch in any direction will cause at least one of said weights to move the finger lying in its path of movement into current conducting engagement with the adjacently disposed contact so as to close said switch, said weights and fingers being symmetrically disposed with respect to said common axis.

11. A switch according to claim 10 wherein said weights are disposed outwardly of and around said fingers.

12. An impact switch comprising a pair of contacts disposed in spaced relation on a common axis, a series of spring fingers symmetrically disposed thereabout, each of said fingers being arranged in current conducting relation with one of said contacts and out of current conducting relation with the other, and actuating means releasably secured against movement by said fingers and arranged to move as a consequence of a predetermined acceleration or deceleration of said switch in any direction, said means being so disposed with respect to said fingers so that a predetermined acceleration or deceleration of said switch in any direction will cause at least a part of said means to move one of said fingers into current conducting engagement with the adjacently disposed contact so as to close said switch.

13. A switch according to claim 8 wherein said weights are releasably secured against switch closing movement by said fingers.

14. A switch according to claim 8 wherein said weights are so disposed that rotation of said switch about any axis passing between the centers of gravity of said weights will not cause any of said weights to move any of said fingers into engagement with said contact member.

References Cited in the file of this patent

UNITED STATES PATENTS

1,383,079	Cressall	June 28, 1921
2,458,478	Maneval	Jan. 4, 1949
2,573,199	Holman	Oct. 30, 1951
2,714,674	Richard	Apr. 10, 1956