

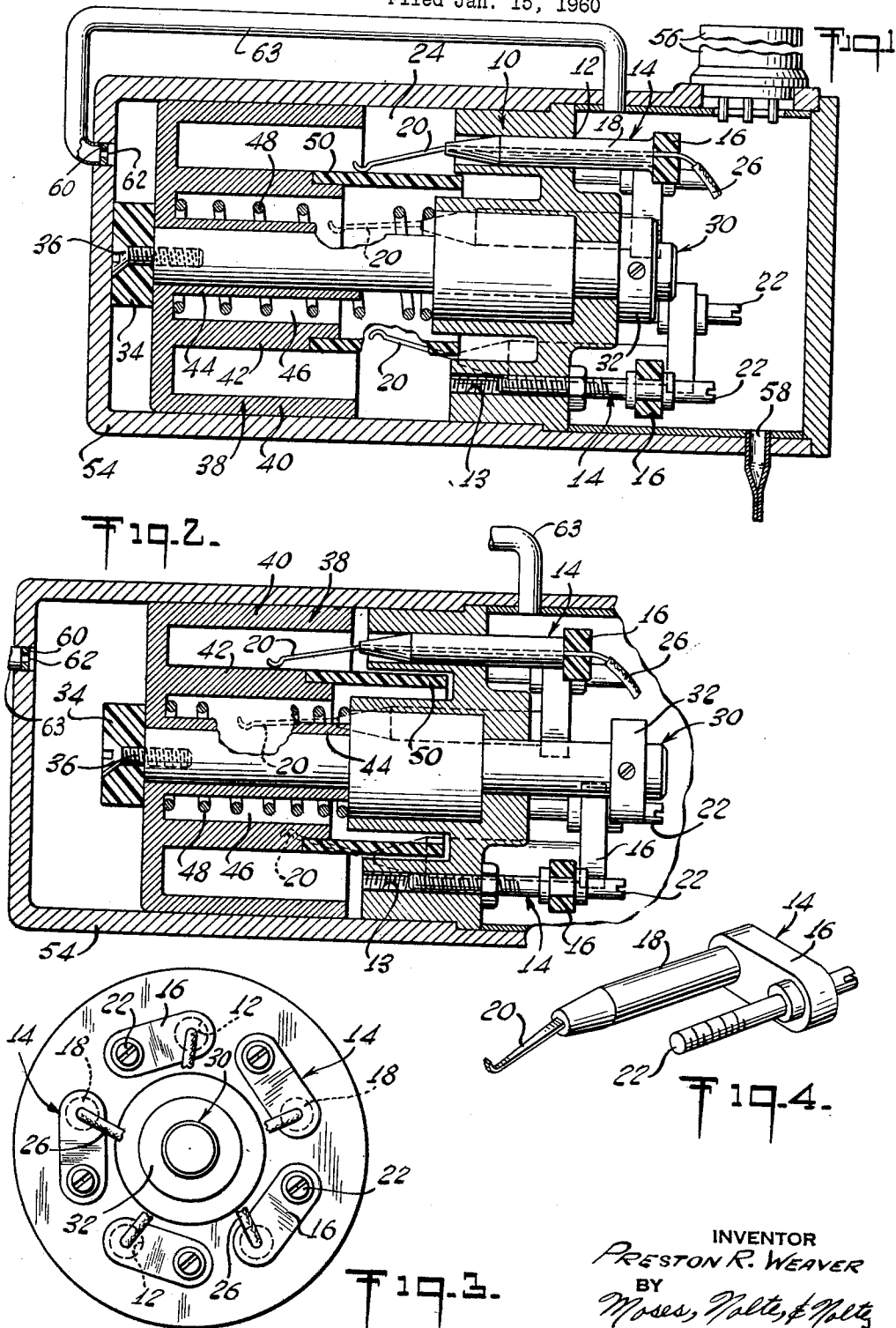
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ACCELERATION SWITCH

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ACCELERATION SWITCH

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This invention relates in general to switches and in particular to a new and useful acceleration type switch which includes a resiliently biased mass having non-conductive and conductive portions and arranged for movement against the biasing force upon acceleration to change the relative position of the conductive and non-conductive portions in respect to stationary contacts for electrical actuation of control circuits at various acceleration amounts.

The present invention is an improvement in acceleration switches generally and includes an arrangement which permits controlled electrical contact of various electrical circuits during various stages of acceleration when the unit mounting the switch is travelling in a predetermined direction. The arrangement includes a cylindrical stationary member which carries a plurality of radially disposed stationary contacts which extend into the hollow end of the stationary mounting member. A mass member is slidable in the open end of the stationary mounting member and includes conductive and non-conductive portions aligned in the same plane as the contact members and which are slidable toward and away from the contact members. The mass member is biased in a given direction and the complete switch is mounted so that acceleration in a given direction will cause movement of the mass member against its biasing in a direction toward the stationary contacts. The contacts are advantageously of different lengths so that the outermost one extends outwardly in a direction toward the mass member a greater distance than the inner one and the intermediate ones are spaced therebetween. One of the contacts is connected to an electrical current source and the others are connected to individual circuits to be energized. When the mass member is moved by acceleration toward the stationary contacts, an insulation portion of the sleeve is moved out of contact therewith and a conductive portion is moved into contact therewith (or vice versa) to effect the desired electrical contact (or disruption of electrical contact). The spacing of the contacts and the relative sizes of the insulation and conductive portions of the mass member and the size of the biasing force determines the acceleration at which each contact will operate.

Accordingly, it is an object of this invention to provide an improved acceleration type electrical switch.

A further object of the invention is to provide an acceleration switch including a plurality of stationary contacts of various lengths extending outwardly in a given direction and including a mass member biased in the opposite direction and having an insulation portion and a conductive portion and wherein said mass member is movable against said biasing force upon a predetermined acceleration to move the contacts in succession from an insulation portion to a conductive portion whereby to effect electrical conduction from the energized contact through each of said stationary contacts in order to electrically energize circuit connections made to other terminals on said mass member.

A further object of the invention is to provide an acceleration switch which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating ad-

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vantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

In the drawings:

FIG. 1 is a longitudinal section through an acceleration switch constructed in accordance with the invention; FIG. 2 is a view similar to FIG. 1 but showing the parts when subject to an acceleration;

FIG. 3 is a right end elevation of the switch; and

FIG. 4 is a perspective view of a stationary contact and adjustment screw assembly.

Referring to the drawings in particular, the invention as embodied therein includes a cylindrical stationary contact mounting member generally designated 10 having a plurality of radially spaced openings 12 and 13 provided to receive a stationary contact mounting yoke assembly generally designated 14. The stationary contact mounting yoke assembly 14 includes a collar member 16 into one end of which is fitted an insulation piece 18 covering interior resilient contacts 20 which are directed inwardly when they are positioned within the stationary contact mounting member 10. The alternate openings 13 are threaded to receive a stud 22 which is captive in the collar member 16. The collar member 16 is moved in and out by rotating the stud 22. In this manner it is possible to adjust the amount that the contact 20 extends through its opening 12 and into a hollow portion 24 of the cylindrical stationary contact mounting member 10. Suitable electrical wire connections 26 are made to the exterior end of each of the contact members 18 to connect all but one into separate control circuits requiring actuation upon attainment of various acceleration values. The remaining contact is connected to a suitable electrical current supply.

A central rod member generally designated 30 is slidable within a central portion of the cylindrical stationary contact mounting member 10 and includes an external collar portion 32. The opposite end is connected through a block 34 and screw 36 to a mass member or movable piston generally designated 38.

The mass member 38 includes an outer larger diameter portion 40 which is slidable within the housing 54 to be described hereinafter. The mass member 38 also includes an intermediate diameter sleeve portion 42 which is concentric with and spaced outwardly from a hub portion 44 and defines therebetween a slot 46. A compression spring 48 is positioned within the slot 46 and is biased between the interior edge of the cylindrical stationary contact mounting member 10 and the inner end of slot 46.

In accordance with the invention the mass member 38 is made of conductive material but includes an interior collar member 50 made of non-conductive material or insulation and which is axially aligned with the conductive sleeve portion 42. In one construction of the switch, as indicated in FIG. 1 of the drawings, the contacts 20 are all positioned on the insulation material 50 when the switch is in the non-actuated position or in positions at which the coil spring 48 is fully expanded and the mass member 38 is biased outwardly. If desired, one or more of the contacts 20 (such as the contact connected to the electrical energy source) may be moved outwardly into contact with the conductive portion 42. The others are advantageously spaced at any distance away from the conductive portion 42 on the insulation collar 50 by adjusting the associated studs 22.

When the switch is subject to an acceleration in a direction proceeding to the left as indicated in FIGS. 1 and 2, the mass member 38 will be moved by the acceleration force against the force of the spring 48, and, depending on the setting of the contacts 20 of each of the contact

members 18, they will be moved off the insulation collar and into resilient biasing engagement with the conductive sleeve portion 42.

The contact mounting member 10 is held within a cylindrical cover member 54, which is provided with a connector member 56 having terminals for connection to each of the contacts 20, and to an external electrical circuit.

The space inside the cover member 10 is evacuated of air through opening 58 and filled with a gas of known characteristics for damping the movement of the mass member 38. The opening 58 is then sealed. This damping action is affected by the close tolerances between the mass member 38 and the inter wall of member 54. Additional damping control is provided by an interchangeable orifice plate 60 which permits flow through an orifice 62 and a by-pass tube 63. All of the contact members 20 may be set to operate simultaneously at the same acceleration force, or they may be spaced in a longitudinal direction on the insulation collar 50 to become actuated at different values of acceleration.

Thus the invention provides a simple acceleration switch construction permitting simple and easy adjustment of various electrical circuits for actuation at different values of acceleration. It should be appreciated that the insulation collar 50 could be located at the location of the conductor sleeve 42 and vice versa in the event that it is desired to open or disconnect the electrical circuits upon increase in acceleration instead of closing them.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the invention principles, it should be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. An acceleration switch comprising first and second relatively movable members, means to bias said first member outwardly from said second member, and said first member including an insulation portion and a conductive portion, said second member supporting a contact member to engage one of said conductive and said insulation portions, said first and second members being relatively movable upon acceleration against the force of said biasing means, whereby said contact member is moved from one to the other of said insulation and conductive portions and means mounted upon said second member to adjust said contact member to change the location of said contact member in relation to said conductive and insulation portions.

2. An acceleration switch according to claim 1, in which said second member supports a plurality of contact members insulated from each other and arranged to engage spaced locations along one of said conductive and insulation portions, and adjusting means for each such contact member.

3. An acceleration switch comprising a cylindrical contact mounting member, a plurality of radially disposed and angularly spaced contacts mounted in an end wall of said member and extending through said wall, the opposite end of said cylindrical contact mounting member being recessed, and a mass member slidable into the recessed end of said cylindrical contact mounting member, said mass member including a sleeve in longitudinal alignment to engage said contacts, said sleeve having insulation and conductive portions, resilient means to bias the mass member outwardly from said cylindrical contact mounting member, said contacts being disposed to be in contact with at least one of said conductive and non-conductive areas, said mass member and said contact

mounting member being relatively movable upon acceleration and against said biasing to shift the engagement of said contacts to the other of said conductive and non-conductive portions.

4. An acceleration switch according to claim 3, wherein said contacts are longitudinally adjustable in said cylindrical stationary contact mounting member, and means for adjusting said contacts longitudinally whereby to change the location of said contacts in relation to said conductive and non-conductive areas.

5. An acceleration switch according to claim 3, wherein said mass member includes a cylindrical outer portion and a cylindrical interior sleeve portion of conductive material, and an insulation collar mounted adjacent said interior sleeve portion and longitudinally aligned therewith, and wherein said contacts are initially in engagement with said non-conductive insulation material.

6. An acceleration switch according to claim 3, including a central rod slidable in said cylindrical stationary contact mounting member and connected to said mass member at one end to serve as a guide for the mass member during movement.

7. An acceleration switch comprising a substantially cylindrical mounting member having a plurality of radially spaced contacts adjustable thereon, means for adjusting said contacts longitudinally of said cylindrical member axis, a cylindrical mass member of conductive material slidable relative to said cylindrical contact mounting member, said mass member including an insulation portion engaging said contacts and a conductive portion in longitudinal alignment with said insulation portion, and means to bias said mass member in one direction, said mass member being movable against said biasing means to move said contacts from said insulation portion to said conductive portion.

8. An acceleration switch according to claim 7, wherein said contact members are arranged in contact with said insulation portion at longitudinally spaced locations therealong whereby each is actuated at a different value of acceleration.

9. An acceleration switch comprising a hollow sealed outer housing, a damping gas in said housing, first and second relatively movable members slidable in said housing with their outer portions in contact with the interior walls of said housing, said first member being biased away from said second member and including an insulation portion and a conductive portion, said second member having contact means in slidable engagement with one of said conductive and said insulation portions, said first and second members being relatively movable upon acceleration against said biasing whereby said contact member is slidably moved to the other of said insulation and conductive portions, and a damping gas conduit connecting a space in said housing between said first member and one end thereof and a space between said second member and the opposite end of said housing.

10. An acceleration switch according to claim 9 including an orifice in said damping gas by-pass to control the flow of gas upon movement of said members from one end of said housing to the other.

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