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L. S. RUSSAKOV

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PRESET, AUTOMATICALLY RESETTABLE OMNI-DIRECTIONAL SWITCH

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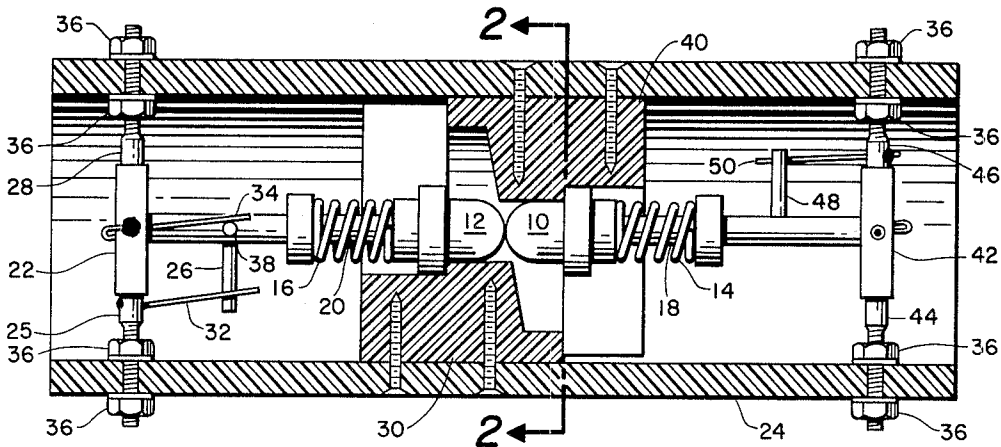


FIG. 1

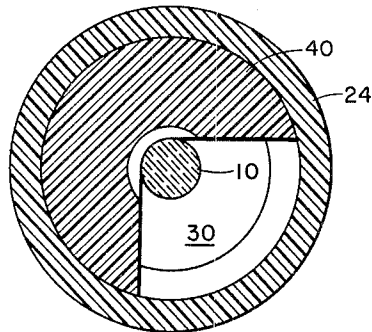


FIG. 2

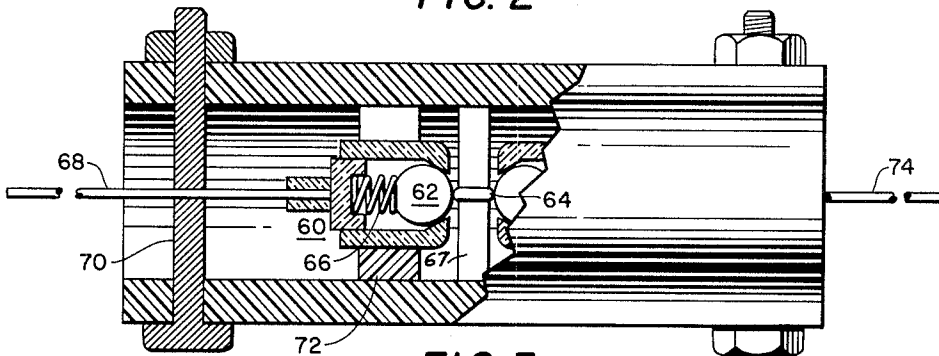


FIG. 3

LOREN S. RUSSAKOV
INVENTOR.

BY *J. M. Phillips*
J. M. St. Amant
ATTORNEYS

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PRESET, AUTOMATICALLY RESETTABLE OMNI-DIRECTIONAL SWITCH

Loren S. Russakov, Orange, Calif., assignor to the United States of America as represented by the Secretary of the Navy

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5 Claims. (Cl. 200—61.45)

(Granted under Title 35, U.S. Code (1952), sec. 266)

The invention herein described may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates to an inertially operated omni-directional switch which can be pre-set to operate in response to a predetermined acceleration force and is automatically reset.

One of the problems in detonating warheads carried by missiles and the like is that of having a switch responsive to collision forces caused by impact from any direction with a target. In testing firing circuits, it is desirable to have a switch which can be reset without disassembling the apparatus in which the switch is contained. In this way tests can be repeated without delay.

An object of the present invention is to provide a switch which will actuate in response to a predetermined force applied from any direction and will automatically reset itself when the force is discontinued.

Another object of the invention is to provide an omni-directional switch which is pre-set to respond to a predetermined acceleration force.

Other objects and many of the attendant advantages of this invention will become readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a cross-sectional view of one embodiment of the invention.

FIG. 2 is a sectional view taken along the lines 2—2 of FIG. 1.

FIG. 3 is a broken section of a second embodiment of the invention.

Referring now to the drawings wherein there is shown in FIG. 1 two electric current conducting contacts 10 and 12 which are urged into electrical contact by springs 14 and 16 respectively. Contacts 10 and 12 are spherically shaped so that the least movement of either contact in either direction will break the electrical connection. Each of contacts 10 and 12 are slidably affixed to shafts 18 and 20 respectively so that either contact may move in the longitudinal direction. Shaft 20 carrying contact 12 is secured to a retaining member 22 which is mounted in housing 24 by threaded studs 25, 28. Contact 12 is biased in the longitudinal direction by spring 16 and against stop 30 by spring members 32, 34 acting against pins 36, 38 attached to shaft 20. Tension is increased by rotating retaining member 22 in a counter-clockwise direction about studs 25, 28. When the proper tension is obtained, retaining member 22 is locked in that position by means of locking nuts 36. In a similar manner contact 10 is retained under tension against stop 40 by means of retaining member 42 studs 44, 46, pin 48 (the other pin is not visible in this view) and spring member 50.

In FIG. 2 the area in which contact 10 is free to move is shown. Contact 12 is free to move in the opposite direction. Housing 24 and stops 30 and 40 are preferably made of insulating material so that an electrical circuit can be established through studs 28, shaft 20, contacts 12, 10, shaft 14 and stud 46.

In the embodiment of FIG. 3 contact 62 is enclosed in

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a cylindrical container 64 having an opening through which a portion of the sphere shaped contact projects and engages conductor 66 embedded in an insulating separator 67. Sphere contact 62 is held in conducting relationship with conductor 66 by means of a compressed spring 66. The assembly unit 60 which acts as a single mass is suspended by a spring wire 68 from retaining bolt 70. Spring wire is positioned in bolt 70 at a slight angle so that there is a force pressing unit 60 against stop 72. The movement of assembly unit 60 is in the same manner as contact 12 in FIG. 1. An identical unit is suspended in the opposite end of housing 24 but is free to move in the opposite direction from that of unit 60. The switch may be connected to an electrical circuit through conducting wires 68 and 74.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. An omni-directional inertial switch comprising in combination:

- (a) first and second spherically shaped contacts being urged into electrical contact by spring means,
- (b) a stop means for each of said contacts for preventing longitudinal movement of said contacts except in opposite directions and away from each other,
- (c) each of said contacts being slidably affixed to a first and a second shaft respectively,
- (d) an elongated tubular housing,
- (e) support members mounted in each longitudinal end of said housing,
- (f) means securing said first shaft to said support members in one end of said housing,
- (g) means securing said second shaft to said support means in the other end of said housing,
- (h) means biasing said shafts in a direction to maintain said contacts against said stops, said contacts being permitted to move only in the direction opposite to the bias force when sufficient acceleration force is applied to overcome said biasing forces.

2. An omni-directional inertial switch comprising in combination:

- (a) an elongated tubular housing,
- (b) support members mounted in each longitudinal end of said housing,
- (c) first and second electrical contacts being urged into electrical contact by spring means,
- (d) each of said contacts being movably affixed to a first and second shaft respectively,
- (e) means securing said first shaft to the support member in one end of said housing to bias said first shaft in a direction transverse to the longitudinal axis of said housing,
- (f) means securing said second shaft to the support member in the other end of said housing to bias said second shaft in a direction opposite to the direction said first shaft is biased,
- (g) a stop means for each of said contacts for preventing longitudinal and transverse movement of said contacts except in opposite directions and away from each other when sufficient acceleration force is applied to overcome said biasing means.

3. An omni-directional inertial switch comprising in combination:

- (a) an elongated tubular housing,
- (b) support members mounted in each longitudinal end of said housing,
- (c) first and second spherically shaped contacts being urged into electrical contact by spring means,

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- (d) each of said contacts being slidably affixed to a first and a second shaft respectively for movement in the longitudinal direction,
- (e) means securing said first shaft to the support member in one end of said housing, 5
- (f) means securing said second shaft to the support member in the other end of said housing,
- (g) means biasing said shafts in a direction urging said contacts in equal but opposite transverse directions to the longitudinal axis of said housing, 10
- (h) a stop means for each of said contacts for preventing longitudinal and transverse movement of said contacts except in opposite directions and away from each other when sufficient acceleration force is applied to overcome said biasing means. 15
4. An omni-directional inertial switch comprising in combination:
- (a) an elongated tubular housing,
- (b) support members mounted in each longitudinal end of said housing, 20
- (c) first and second electrical contact assemblies including spring loaded contacts in the longitudinal direction,
- (d) resilient means mounting said first and second electrical contact assemblies on a first and a second support members respectively, 25
- (e) stop means mounted inside said tubular housing for aligning said assemblies under a predetermined tension along the longitudinal axis of said housing and for preventing longitudinal and transverse movement of said assemblies except in opposite directions and against the tension force when a predetermined acceleration force is applied. 30

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5. An omni-directional inertial switch comprising in combination:
- (a) an elongated tubular housing,
- (b) support members mounted in each longitudinal end of said housing,
- (c) first and second electrical contact assemblies,
- (d) each of said first and second contact assemblies comprising a cylinder closed at one end and partially open at the other,
- (e) a sphere shaped contact positioned in said cylinder and being pressed against the partially open end of said cylinder by a spring positioned between said contact and the closed end of said cylinder, a position of said contact extending beyond the end of said cylinder,
- (f) said first and second electrical contact assemblies being mounted on the end of a rod that is attached in a biased condition to said support members so that said contacts are in electrical contact along the longitudinal centerline of said housing,
- (g) a stop means for each of said contact assemblies for preventing movement of said assemblies in a direction transverse to said tubular housing except in opposite directions from each other and opposite to the direction of said bias force.

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BERNARD A. GILHEANY, *Primary Examiner.*BENJAMIN DOBECK, *Assistant Examiner.*