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(54) **Electric current inertial switch**

(57) An electric current inertial switch comprising a movable contact (1) fastened on an insulating base plate (2) and having two arms of different length situated at an angle each in relation to the other, as well as a fixed contact (4), whereas said movable contact (1) and said fixed contact (4) have contact elements (7) located opposite one to another, as well as conducting elements (5) connecting the inertial switch with the electrical circuit. The movable contact (1) is shaped as an L letter having its shorter arm (6) fastened in the base plate, and contact elements (7) of the movable contact (1) and of the fixed contact (4) are made of material having attraction-oriented magnetic properties.

The switch is automatically switching on electric current in case of acceleration, even greater than 3000 g.

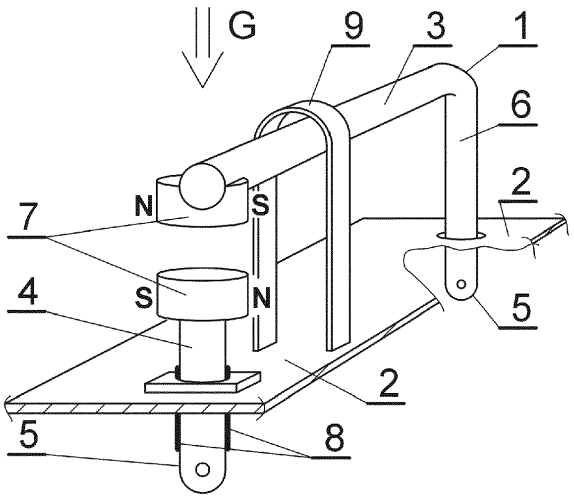

Fig. 1

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Description

[0001] An object of this invention is an inertial switch automatically switching on electric current supplying an electronic system in case of accelerations, even greater than 3000 g. It may be used therefore in an observation unit on firing it.

[0002] Inertial electrical switches comprising an L-shaped movable contact are known.

[0003] From patent specification US5742235 an inertial switch is known made as a shock sensor having its fixed contact located at an end of a longer arm made of insulating material as an L-profile. Its movable contact is located at an end of an elastic conducting element having its other end fastened in the shorter arm of the L-profile.

[0004] In patent application US20080156622 there is presented an inertial sensor which, in the result of gravitational ups and downs or sudden accelerations in a hard disc, controls an electromechanical unit to pull out writing/reading heads from rotating magnetic disks.

[0005] In patent application US20090008226, entitled Motion Switch, there is presented an inertial switch made of elastic and well-conducting material of circular or quadrangular contoured section as L-shaped, wherein a longer arm of this profile has an outer contact element located above an unmovable contact, and a shorter arm is also provided with an outer contact element. The contact elements are led through a base and are designed for soldering a sensor to an electronic circuit plate. In this solution, there are used side guides for the movable longer arm in order to make its movement impossible in a case when side acceleration is acting.

[0006] All known solutions of inertial electric current cutting out switches are used in the motor-car industry or in seismic investigations and they present acceleration values from a dozen or so up to several dozen g.

[0007] It is an aim of this invention to elaborate an electric current inertial switch which starts to work as a result of inertia reactions created by acceleration $\geq$ 3000 g, and is still on when the overload disappears.

[0008] This task was realized according to the invention by constructing an inertial electrical switch comprising a movable contact fastened on an insulating base plate and having two arms of different length situated at an angle each in relation to the other, as well as a fixed contact, both contacts being located opposite each other, as well as elements connecting said inertial switch to the electrical circuit.

[0009] The essence of the invention is that the movable contact is shaped as an L letter having its shorter arm fastened in the base plate, whereas contact elements of the movable contact element and of the fixed contact are made of material having attraction-oriented magnetic properties.

[0010] Advantageously, the longer arm of the movable contact is situated parallel to the insulating base plate.

[0011] The movable contact can advantageously have its contact element made of magnetically soft material whereas the fixed contact is made of magnetically hard material.

[0012] The movable contact can advantageously have its contact element made of hard magnetic material, and its fixed contact has its contact element made of magnetically soft material. Advantageously, a layer of electrically conducting material is put onto the surfaces of the movable contact, as well as of the fixed contact and onto the contact elements.

[0013] Advantageously, the movable contact is made of resilient material characterized by its good electrical conductivity and its elasticity, and has a circular or rectangular section. Advantageously, the fixed contact has a capacity for regulating a distance between the contact elements.

[0014] Advantageously, the movable contact is provided with a clamping ring, and as a result it is not moved in a direction other than the intended one.

[0015] The inertial switch according to this invention fulfils its requirements and reliably signals appearances of inertial forces resulting from acceleration $\geq$ 3000 g. Additionally, thanks to magnetic elements used in it, it is a bistable switch. It is characterized by two states of the permanent equilibrium, whereas an outer trigger signal has to be led in order to change one state to the other. The construction of such a switch ensures sustaining of the power supply for electronic assembles e.g. also after firing an observational module from a barrel.

[0016] The switch according to the invention is a permanent and reliable element.

[0017] The switch according to the invention is shown in its advantageous, not limiting embodiment in the drawing, in which Fig. 1 presents the switch in an axonometric view.

[0018] On a base plate 2 there is fastened a movable contact 1 having two arms of different length, situated at an angle each to the other, as well as a fixed contact 4, said movable contact 1 and said fixed contact 4 having contact elements 7 situated opposite one to another, as well as elements 5 for connecting the inertial switch to an electrical circuit.

[0019] The movable contact 1 is made of coppery wire with diameter of 1 mm. The movable contact 1 is shaped as an L letter with its shorter arm 6, 4 mm in length, fastened in a base plate 2, whereas contact elements 7 of the movable contact 1 and of the fixed contact 4 are made of material having opposite magnetic poles in a contact place. A layer of electrically conducting material (e.g. gold) is put onto the surface of the movable contact 1, the fixed contact 4, and onto the contact elements 7. The longer arm 3 of the movable contact 1 is 25 mm in length and is parallel to the insulating base plate 2.

[0020] The longer arm 3 of the movable contact 1 can have two stable positions thanks to contact elements 7 having attraction-oriented magnetic properties.

[0021] In the first position, the contact elements 7 are situated in a distance one from another, so the magnetic circuit is open. The electrical circuit is open, too.

[0022] In the second position, in the situation of the overload >3000 g, the longer arm 3 of the movable contact 1 bends, contact elements 7 made of materials having opposite magnetic poles approach one another, and their attraction-oriented magnetic fields are added to an acceleration vector, the contact elements 7 stick together and they are connected together even when the overload disappears. The magnetic circuit, as well as the electrical one in the inertial switch, are closed. The movable contact 1 has a leading clamping ring 9 making it impossible to move in a direction other than the intended one.

[0023] In an alternative embodiment, the movable contact 1 is made of a spring-steel tape covered with cooper and having the dimensions of 0,3 mm x 1,2 mm, and the fixed contact 4 has the regulator 8 for setting a distance between contact elements 7, and consequently for setting an overload value "g", at which the inertial switch starts to work.

[0024] In another embodiment, not shown in the drawing, the movable contact 1 has its contact element 7 made of magnetically soft material, and the fixed contact 4 has its contact element 7 made of magnetically hard material.

[0025] In yet another embodiment, not shown in the drawing, the movable contact 1 has its contact element 7 made of magnetically hard material, whereas the fixed contact 4 has its contact element 7 made of magnetically soft material.

[0026] When reading this specification, one should pay attention to advantages of the bistable inertial switch starting its motion by the overload even greater than >3000 g. However, this invention is not limited to the mentioned examples described above and shown in the drawings, and it may be an object of many detailed modifications according to the skills of each person having suitable technical qualifications without going beyond the scope of the invention described in the enclosed patent claims.

List of references

[0027]

1- movable contact,
2- base plate,
3- longer arm of the movable contact,
4- fixed contact,
5- connecting element,
6- shorter arm of the movable contact,
7- contact element,
8- regulator,
9- leading clamping ring

Claims

1. An electric current inertial switch comprising a movable contact fastened on an insulating base plate and having two arms of different length situated at an angle each in relation to the other, as well as a fixed contact, said movable contact and said fixed contact having contact elements located opposite one to another, as well as lines connecting the inertial switch to the electrical circuit, **characterized in that** the movable contact (1) is shaped as an L letter having its shorter arm (6) fastened in the base plate, and moreover contact elements (7) of the movable contact (1) and of the fixed contact (4) are made of material having attraction-oriented magnetic properties.

2. A switch according to claim 1 or 2 **characterized in that** a longer arm (3) of the movable contact (1) is situated parallel in relation to the insulating base plate (2).

3. A switch according to claims 1-3 **characterized in that** the movable contact (1) has its contact element (7) made of magnetically soft material, and the fixed contact (4) has its contact element (7) made of magnetically hard material.

4. A switch according to claims 1 - 3 **characterized in that** the movable contact (1) has its contact element (7) made of magnetically hard material, and the fixed contact (4) has its contact element (7) made of magnetically soft material.

5. A switch according to claims 1 - 4 **characterized in that** surfaces of the movable contact (1), fixed contact (4), and of contact elements (7) are covered with a layer made of electrically conducting material.

6. A switch according to claims 1 - 5 **characterized in that** the movable contact (1) is made of resilient material of good electric conductivity, and is circular or rectangular in section.

7. A switch according to claims 1 - 6 **characterized in that** the fixed contact (4) has a regulator (8) of a distance between contact elements (7).

8. A switch according to claims 1 - 7 **characterized in that** the movable contact (1) has a leading clamping ring (9) preventing its movement in a direction other than the intended one.

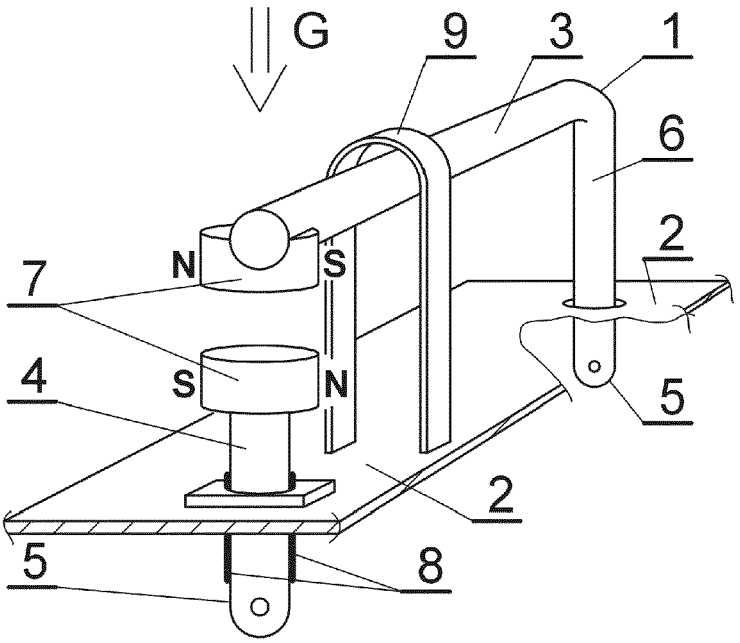

Fig. 1

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 5742235 A **[0003]**
- US 20080156622 A **[0004]**
- US 20090008226 A **[0005]**