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ANTI-DISTURBANCE SWITCH

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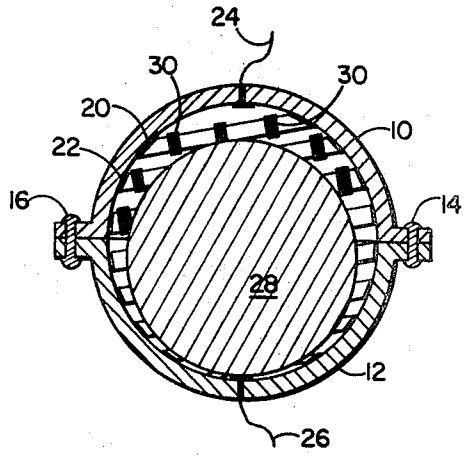


FIG. 1

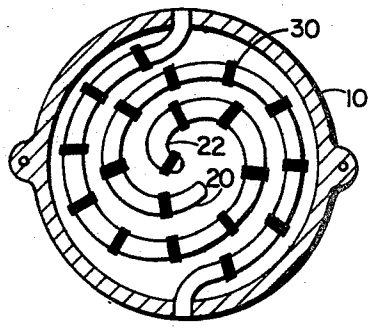


FIG. 2

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# ANTI-DISTURBANCE SWITCH

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## ABSTRACT OF THE DISCLOSURE

An anti-disturbance switch providing a switching function when forces external to the switch induce relative motion between a conductive sphere and a pair of spiral, spaced conductors within a spherical switch housing.

The invention herein described was made in the course of or under a contract with the Department of the Air Force.

## BACKGROUND OF THE INVENTION

### Field of the invention

The present invention pertains generally to the field of electrical switches and more particularly to electrical switches actuated by a disturbance force acting upon the switch.

### Description of the prior art

Various anti-disturbance switches are known in the prior art. The size and complexity of the prior art switches makes them inefficient to utilize and expensive to produce. Furthermore, the prior art switches are often overly sensitive to background disturbances for which no switch function is desired.

## SUMMARY OF THE INVENTION

The present invention provides an anti-disturbance switch employing a conductive sphere enclosed in a slightly larger spherical housing and resting between two conductors attached to the inner surface of the spherical housing to normally close an electrical circuit.

By properly spacing the conductors along the inner surface of the spherical housing, the sensitivity of the switch may be varied. The nature of the rolling of the conductive sphere within the conductive cavity of the switch housing assures that a switching function will occur regardless of the direction of the disturbance force.

It is, therefore, an object of the present invention to provide an improved omnidirectional anti-disturbance switch.

A further object of the present invention is to provide an anti-disturbance switch wherein a single moving part is used to provide a switching function.

These and further objects will become apparent to those skilled in the art upon examination of the following specification, claims, and the drawing.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a cross-sectional view of an anti-disturbance switch, illustrating a preferred embodiment of the invention; and

FIG. 2 is an elevational view of one of the hemispherical portions of the switch housing.

## DETAILED DESCRIPTION

Referring now to FIG. 1, a cross-sectional view of an anti-disturbance switch according to the present invention is shown. The spherical housing of the switch is assembled from two hemispherical cups **10** and **12**. Each of the



cups is equipped with two or more tabs, projecting outwardly from the edge of the two cups, for fastening together the two hemispherical halves by means of pins, clamps, or other fastening means as shown at **14** and **16**.

A pair of conductors **20** and **22** are attached to the inner surface of the housing. Conductors **20** and **22** are arranged in a substantially parallel helical pattern to provide a pair of parallel elevated conductive paths. Conductors **20** and **22** are electrically insulated from each other by providing an insulative barrier between the conductors and the housing or by constucting the housing itself of a nonconductive material, such as plastic or rubber. Additionally, a plurality of elevated insulative cross members **30** are arranged along conductors **20** and **22**. The function of the cross members **30** will become clear from the following description. A conductive sphere **28** is mounted within housing **10** for free motion therein. The diameter of the sphere **28** is smaller than the internal diameter of housing **10** but sufficiently large so that it will rest in contact with the two elevated conductors without abutting on the housing surface between the conductors. As a result of the relationship and due to the arrangement of the conductors **20** and **22**, sphere **28** will under all static conditions rest on a conductive segment of each of the two conductors to provide a normally closed electrical contact therebetween.

In FIG. 2, an elevation view of the hemispherical cup **12** is shown revealing the pattern of conductors **20** and **22**. Conductors **20** and **22** in the preferred embodiment are terminated along the lip of the hemispherical cup **10** displaced 180° from each other. Conductor **22** is connected through the wall of the cup **10** to an external conductor **24**. Conductor **20** is connected through the wall of cup **12** to an external conductor **26**.

The spherical switch housing of FIG. 1 may be formed by connecting two of the hemispherical portions as shown in FIG. 2 such that two independent conductive paths are formed with each path connected to an exit conductor such as **24** or **26** at one of the poles of the resultant spherical housing.

## OPERATION

When the anti-disturbance switch is at rest, the conductive sphere **28** forms an electrical connection between the conductors **20** and **22**, thereby creating a completed electrical circuit between the external conductors **24** and **26**. If the switch housing is disturbed, the conductive sphere **28** is displaced within the housing momentarily breaking the connection between conductors **20** and **22**. Further well known circuitry not shown in this specification may be connected to terminals **24** and **26** to sense the momentary opening of the electrical connection between the terminals and produce a suitable output. For example, the opening of the electrical circuit may be used to initiate the detonation of a munition or in another application, may be used to provide an audible alarm.

If the switch housing is moved about an axis in such a way that the conductive sphere **28** would tend to move along a path defined by the conductors **22** and **24**, no switch function would ordinarily occur. To prevent this situation arising sections of the conductors **20** and **22** are provided with insulative cross members such as **30** which break the electrical connection between the conductors **20** and **22** with the conductive sphere **28**. Thus, the anti-disturbance switch will provide a switching function in response to movement of the switch housing about any axis.

The sensitivity of the switch is related to the relative size of the conductive sphere **28** and the switch housing as well as the spacing and the height of conductors **20** and **22** above the inner surface of the conductive housing as well as the weight of conductive sphere **28**. A detent action is provided by the slight projection of conductors

20 and 22 above the inner surface of the housing. This detent action resists rolling of the ball and assures that the sphere will assume a static position wherein conductors 20 and 22 are electrically connected. The interrupter sections such as 30 are raised above the level of the conductors 20 and 22 to provide a detent action along the path of the conductors and to prevent the conductive sphere 28 from coming to rest on an insulated portion of conductors 20 and 22.

From the above description, it will be apparent that we have invented an electrical switch having a new and more effective means for detecting disturbance of the switch housing. Although the form of the invention described herein constitutes a preferred embodiemnt, it will be understood that changes will be made within the spirit of the invention.

We claim.

1. A switch comprising, in combination.

a hollow housing having a substantially spherical cavity therein;

a pair of conductors mounted on the inner surface of said hollow housing, said pair of conductors being electrically exposed to the interior of said housing, but being electrically insulated from each other;

a pair of terminals projecting through said housing, each of said pair of terminals connected to one of said pair of conductors;

a conductive sphere enclosed and freely rollable within said spherical cavity and having a radius relative to the radius of said spherical cavity such that an electrical path is momentarily formed and broken between said pair of terminals whenever relative motion between said conductive sphere and hollow housing is introduced and means coacting with said conductors and effective on movement of the sphere along a path defined by said conductors providing a switching action on said electrical path.

2. An anti-disturbance switch comprising, in combination:

a hollow, non-conductive housing having a substantially spherical cavity therein;

first conductor means attached to the inner surface of said spherical cavity describing a substantially spiral pattern thereon;

second conductor means attached to the inner surface of said spherical cavity in a substantially spiral pattern related to the spiral pattern of said first conductor means such that an approximately constant distance is maintained between said first conductor means and said second conductor means;

terminal means for providing projections of said first conductor means and said second conductor means through said hollow non-conductive housing. and

a conductive sphere enclosed within the spherical cavity of said hollow, non-conductive housing forming an electrical connection between said first conductor means and said second conductor means when said sphere is at rest with respect to said housing and momentarily breaking said electrical connection when said anti-disturbance switch is disturbed causing said conductive sphere to overcome the detent action provided by the first and second conductor means and to move with respect to said hollow, non-conductive housing.

3. Apparatus of the class described in claim 2, and insulating means for said first and second conductor means wherein said first and second conductor means are intermittently insulated from contact with said conductive sphere by said insulating means covering portions of said first and second conductor means such that the electrical circuit formed between said first conductor means and said second conductor means by the conductive sphere will be momentarily interrupted if said conductive sphere moves along the spiral pattern formed by said first conductor means and said second conductor means.


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