## Technical field

The present invention pertains to a vehicle battery master switch adapted for improved vehicle maintenance and/or safety. It further pertains to a vehicle provided with such a switch.

## Background art

The previously known vehicle battery disconnecting master switches are believed to relate to the principle of that a moving part attaches/detaches two switch terminals. This solution simply applies the breaking of electric current at two positions/terminals, instead of breaking the current at one position, which means that the drawbacks relating to this procedure are doubled, compared to what should be necessary by introducing a one terminal breakage.

Current master switches are very prone to cause a Vehicle off Road (VoR) situation due to the many switch parts jamming by being exposed to moisture, even though they are isolated by gaskets. The many parts of the switch however make it difficult to prevent moisture from entering the switch housing causing corrosion of parts and consequently malfunction.

The patent application document EP0685903, entitled "Device for connection to a post", describes a battery pole connector with a rotating part firmly connecting to a battery pole when the rotating part is turned. This pole connector does not provide the function of a master battery switch utilized for vehicle maintenance purposes. A current vehicle master switch is an entity separated from the battery pole.

## Summary of the invention

One solution according to the present invention introduces a breakage of only one switch terminal, which makes it possible to half the switch terminal contact resistance and thus the contact and maneuver force utilized.

Alternatively, the solution in accordance with the present invention introduces a doubling of the contact force, but further reducing the contact resistance between a battery pole and a switch, thus securing the switch terminal contact more favorable.

Moreover, the present invention master battery switch approximately half's the risk of for instance an increased contact surface resistance. Even more, it enables decreasing the size of the switch making it more solid.

Furthermore, the present invention switch eliminates the possibility of the two switch terminals not lining up, which is apparent, not the least, if one battery switch terminal surface is damaged.

A switch constructed in accordance with the present invention findings would be more favorable due to many aspects relating to current switches, would be safer and more solid, and also cheaper to manufacture.

As a matter of fact, a battery switch is a critical detail overlooked by those who manufacture and deliver such switches. A failing switch provides that the vehicle that is due for service/maintenance cannot be started in a reliable manner, or not at all, i.e. a VoR situation.

Hence, the present invention sets forth a vehicle battery master switch being adapted to be utilized for at least one of vehicle maintenance and safety purposes. The invention thus comprises that the switch is connected to one vehicle battery pole providing disconnection and connection of electric power from the battery pole, having two conducting terminals, a first terminal and a second terminal, and having a switching mechanism for applying closing and opening of the switch to respectively feed and break power from the battery to the vehicle through the terminals when operated. The switching mechanism further comprises;

a single contact surface interface between the first and second terminals,

a toggle means arranged to disconnect and connect the electric power, respectively when operated around at least one pivot, the toggle means connecting to the at least one pivot and wherein the disconnection and connection of electric power from the battery is provided by respectively opening and closing the single contact surface interface between the first and second terminal, when the toggle means is operated.

One embodiment of the present invention provides that the single contact surface interface includes at least two electrically conducting surfaces to the second terminal.

Another embodiment of the present invention provides that the switching mechanism is made up of a conducting means, a leveler and at least one spring. The means is movably connected to one of the terminals.

Yet a further embodiment provides that the toggle means is made by an electric isolating material.

A further embodiment comprises that the toggle means is of rounded, for example, elliptical shape and arranged separating the conducting means from contacting at least the second terminals when rotated.

A yet further embodiment comprises that the toggle means is of rounded, for example elliptical, shape and arranged separating the first terminal from contacting the second terminal when rotated.

A still further embodiment comprises that the switch is adapted to introduce approximately half the switch terminal contact resistance and thus the contact and maneuver force utilized through the single contact surface interface.

Yet another embodiment comprises that the switch is provided with double spring means providing a doubling of the conductor means contact force.

Yet a still further embodiment comprises that the switching mechanism is arranged so that one of multiple contact surfaces contacts the second terminal if one spring means malfunctions.

In yet another embodiment, the switching mechanism is arranged providing a pivoted operation to open and close the switch.

**Brief description of the drawings**

Henceforth, the present invention is described with reference to the attached drawings for a better understanding of its embodiments and given examples, wherein:

**Fig. 1** schematically illustrates a prior art master vehicle battery switch in a side elevation view;

**Fig. 2** schematically illustrates one embodiment of a master switch, switching mechanism in accordance with the present invention in a top elevation view;

**Fig. 3** schematically illustrates another embodiment of a master switch, switching mechanism in accordance with the present invention in a top elevation view;

**Fig. 4a** schematically illustrates a further embodiment of a closed master switch, switching mechanism in accordance with the present invention in a top elevation view;

**Fig. 4b** schematically illustrates the embodiment of the master switch of Fig. 4a opened, switching mechanism in accordance with the present invention in a top elevation view; and

**Fig. 5** schematically illustrates a side elevation view of a master switch, switching mechanism in accordance with the present invention housed in a housing similar to the prior art switch of Fig. 1.

**Detailed description of preferred embodiments**

The present invention relates to a main battery switch, in one embodiment, having a rotating toggle means operating on a conducting means providing electric current through switch terminals to a vehicle when closed and cutting off current when opened. Preferably, the vehicles are of the bigger category such as lorries, trucks, busses, tractors, bulldozers, other special purpose work vehicles and the like.

Henceforth, in a preferred embodiment, the toggle means is manufactured in an electric current isolating material, but the toggle means of the present invention is not restricted to being of an electric current isolating material.

Fig. 1 schematically illustrates a prior art master vehicle battery switch in a side elevation view. The switch is equipped with a housing 10, having a lid 12 tightened with a gasket (not shown) through screws (not shown) applied in the wholes13. In the bottom of the

housing 10, there are two terminals 14 attached leading electric current from a battery 16 when the switch is closed.

From the negative battery pole for instance a cable/conductor 18 is connected to vehicle earth/ground. A cable 20 leads electric current from the battery 16 positive pole to a bolt 22 attached to one terminal 14 through nuts 24. A conductor means 26, such as an electric current conducting material, for instance a bar/plate shaped metal is leveled to get in contact with the two terminals 14 through a spring 28 attached to a plunger 30 housed in a housing 32, having a track 34 guiding the handle/leveler 36 when turned to level the conducting means 26 to contact the terminals 14, to conduct electric current, or to disconnect from the terminals 14 to cut off power from the battery 16 for vehicle maintenance or/and safety purposes, as indicated by the double arrow in Fig. 1.

This switch depicted in Fig. 1 has the drawbacks mentioned, which are to be overcome by the present invention switch. A major drawback relates to the conducting means 26, being loosely attached to the plunger, i.e., movable sideways only hindered to turn 360 degrees by the wall of the housing 10, thus causing a problem for the conductor 26 to line up with the terminals 14. Also, the prior art conductor means 26 can be inadvertently slightly tilted and thus not level with the respective terminal 14 contact surfaces or the terminal 14 contact surfaces aren't level (due to such as damage or misalignment), also affecting contact resistance negatively when the conductor means 26 is operated to contact both terminals 14.

Another problem related to the switch in Fig. 1 is that the conductor means 26 contact surface 27 also introduces contact resistance at both terminals 14. The present invention thus aims to reduce the contact resistance to one terminal and thus to one terminal spot.

Hence there is an aim of the present invention to minimize problems related to a prior art switch by letting the conducting means 26 cut off and turn on power only by being leveled from or to one terminal 14.

Henceforth, corresponding means are indicated by the same reference numerals in the drawings when possible throughout the description of the present inventions given examples and embodiments.

Fig. 2 schematically illustrates one embodiment of a master switch switching mechanism in accordance with the present invention in a top elevation view. There are depicted a conducting means 40 and two switch terminals 42, 44, which are respectively connected to bolts 22 (not shown). The conductor means 40 is movably attached to and constantly contacting a first terminal 42 through for instance a first pivotally operating mechanism 56' such as a pivot, for example in the form of a pin, thus one contact resistance cause, i.e. contact place, is eliminated when operating the switch to feed power through the

circuit by closing it, compared to prior art solutions. Moreover, the switch is equipped with a toggle means 50, in this embodiment having a rounded but not circular shape, for example an oval or elliptical shape. The toggle means 50 having oval or elliptical shape has two distal ends and is arranged on a second pivotally operating mechanism or pivot 56, for example also in the form of a pin. When the toggle means 50 is pivotally operated i.e. rotated/turned 45 degrees by a leveler/handle 36 or other the like operating means, the one distal end forces the conductor out of contact with the second terminal 44, thus breaking battery power to a vehicle. Breaking of power is indicated by the conductor 40 and rotating toggle means 50 being drawn in bold lines.

The switching means of the present invention is comprised by a toggle means 50 and at least one of a spring means 28, 46-48 and conducting means 40.

The connection of vehicle power is indicated by broken lines in Fig. 2, where it can be seen that the toggle means 50, preferably made of an isolating material, has been turned 45 degrees to close the switch at the one contact surface interface comprising contact surface 58. A spring force 46, 48 depicted in Fig. 2 ads tension to pull back the conductor 40 when it is released by the toggle means 50. The spring is in tension at 46, and released at 48, depicted by broken lines. This switching mechanism has the advantage of providing approximately half the contact resistance, and half the spring force 46, compared to a prior art switch, for example that of Fig. 1.

Fig. 3 schematically illustrates another embodiment of a master switch, switching mechanism in accordance with the present invention in a top elevation view. Depicted in Fig. 3 is a first switch terminal 52, and a second terminal 54, wherein the first terminal 52 is arranged below/underneath and contacting a conducting means 40. Both terminals are attached to bolts 22 (not shown). The conducting means 40 is attached constantly contacting and glidingly movable on the terminal 52 to be able to respectively close and break the circuit feeding the power from the vehicle battery 16 through the single contact surface interface 58, 59 when operated to come into contact and out of contact with the second terminal 54, respectively. Conducting means 40 is to this end operated much in the same manner as the switch depicted in Fig. 2, by a pivotally operated oval or elliptically shaped toggle means 50 arranged on pivot 56, such as a pin, differing in that the conducting means 40 is here U-shaped, having the single contact surface interface including two contact areas 58, 59 against the second terminal 54, and being provided with two springs 47, applying a doubled spring force 46 to pull back the conducting means 40. If one of the conducting means 40 contact areas 58, 59 fails to contact the second terminal 54, by for instance lost spring force 46, the other contact area can still provide contact with the second terminal 54 preventing VoR.

In an alternative embodiment of Fig. 3, not shown, the conducting means 40 is able to act as both a conducting means 40 and a second terminal 54, and thus the conducting means has a bolt 22 attached to it which is displaced together with the conducting means 40.

Furthermore, the embodiment of Fig. 3 provides a greater spring force 46 than a prior art switch, providing a better second terminal contact force, thus further minimizing the electrical contact resistance.

Fig. 4a schematically illustrates a further preferred embodiment of a closed master switch switching mechanism in accordance with the present invention in a top elevation view. It is equipped with two terminals 52, 54, also acting as conducting means in accordance with previously described conducting means 40, an elliptical or oval shaped toggle means 50, and a released spring force 48. As has been previously described, the terminals/conducting means 52, 54 and the toggle means 50, each are pivotally attached for example on respective pivots 56′ and 56. The terminals/conducting means 52, 54 are attached to terminal bolts 22 (not shown), for example but not necessarily connecting through their respective pivots 56′, in which case these are capable of conducting electricity. Alternatively the terminal bolts 22 functions as pivots 56′. As the present invention requires, the switch needs a single contact interface having only one contact surface 58 for operation thereof.

Fig. 4b schematically illustrates the embodiment of the master switch of Fig. 4a in accordance with the present invention in a top elevation view, the switching mechanism thereof being opened. As is depicted through Fig. 4b, the switching mechanism is opened to break battery power by turning/rotating the oval or elliptically shaped toggle means 50 at 45 degrees, thus creating tension in the spring 46 in order to aid a closing of the switch when the toggle means 50 is operated a further 45 degrees, either clockwise or anticlockwise, for closing the mechanism to conduct electric current to the vehicle. Please note that the terminals 52, 54 are pivotally rotated around the bolts acting as pivots 56′, although it looks like they are horizontally displaced it is thus to be understood that they are not.

Fig. 5 schematically illustrates a side elevation view of a master switch, switching mechanism in accordance with the present invention housed in a housing similar to the prior art switch of Fig. 1. Here, a toggle means 50 and spring 28 is attached to the conducting means 40, and the one end of the conducting means 40 is attached to terminal 42 via pivot 56′ for pivotal movement of the conducting means 40 opposite end to contact a second terminal 44 closing the power circuit upon operation of the toggle means. The toggle means 50 is operated by a push button means 60. An open position of the switch is depicted by the conducting means 40 indicated in bold lines, and the closed position providing battery power is indicated by broken lines.

It is appreciated that the attached set of claims provides further embodiments of the present invention to a person skilled in the art.

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**Claims:**

1. A vehicle battery (16) master switch for at least one of vehicle maintenance and safety purposes, said switch being connected to one vehicle battery pole providing disconnection and connection of electric power from said battery pole, said switch having two conducting terminals, a first terminal (42, 52) and a second terminal (44, 54), and having a switching mechanism (28, 40, 46, 48, 60) for applying closing and opening of said switch to respectively feed and break power from said battery to said vehicle through said terminals (42, 52, 44, 54), when operated; **characterized in that** said switching mechanism further comprises;

a single contact surface interface (58, 59) between said first and second terminals (42, 44, 52, 54),

a toggle means (50) arranged to respectively disconnect and connect said electric power when operated around at least one pivot (56, 56´), said toggle means connecting to the at least one pivot (56, 56´), and wherein said disconnection and connection of electric power from said battery (16) is provided by respectively opening and closing said single contact surface interface (58, 59) between said first and second terminal (42, 52, 44, 54), when said toggle means (50) is operated.

2. A master switch according to claim 1, wherein said single contact surface interface includes at least two electrically conducting surfaces (58, 59) to said second terminal (44, 54).

3. A master switch according to claim 1 or 2, wherein said switching mechanism comprises a conducting means (40), a leveler (36, 60) and at least one spring (46, 47, 48), said conducting means (40) being movably connected to one of said terminals (42, 44, 52, 54).

4. A master switch according to claim 1, wherein said toggle means (50) is of an electric isolating material.

5. A master switch according to claim 1, wherein said toggle means (50) is of rounded, preferably elliptical, shape and arranged separating said conducting means (40) from contacting at least said second terminal (44, 54) when rotated.

6. 4. A master switch according to claim 1, wherein said toggle means (50) is of rounded, preferably elliptical, shape and arranged separating said first terminal (42, 52) from contacting said second terminal (44, 54 ) when rotated.

7. A master switch according to claim 1, wherein said switch being adapted to introduce approximately half the switch terminal contact resistance and thus the contact and maneuver force utilized through said single contact surface interface (58, 59).

8. A master switch according to claim 1 or 3, wherein said switch is provided with double spring means (47) providing a doubling of the conductor means contact force.

9. A master switch according to claim 3 or 8, wherein said switching mechanism is arranged so that one of multiple contact surfaces (58, 59) contacts said second terminal (54) if one spring means (47) malfunctions.

10. A master switch according to claim 1, wherein said switching mechanism (28, 40, 46, 48, 50, 60) is arranged providing a pivoted operation to open and close said switch.

11. Vehicle, **characterized in** that it comprises a battery master switch according to any of the claims 1-10.

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**Abstract**

The invention relates to a vehicle battery (16) master switch being adapted to be utilized for at least one of vehicle maintenance and safety purposes. This is accomplished by the switch being able to feed electric power to a vehicle through a switching mechanism (28, 40, 46, 48, 60) by a single contact surface interface (58, 59) between a first and a second terminal (42, 44, 52, 54).

(Fig. 4a)

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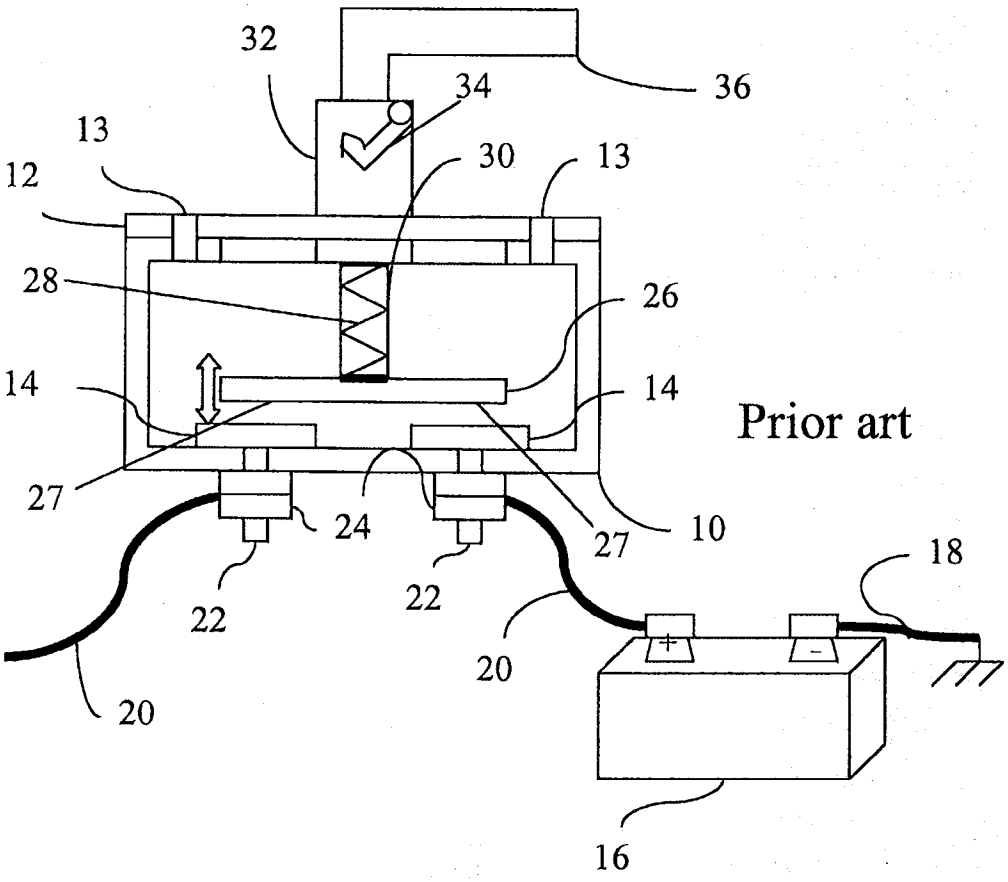
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Prior art
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Fig. 1

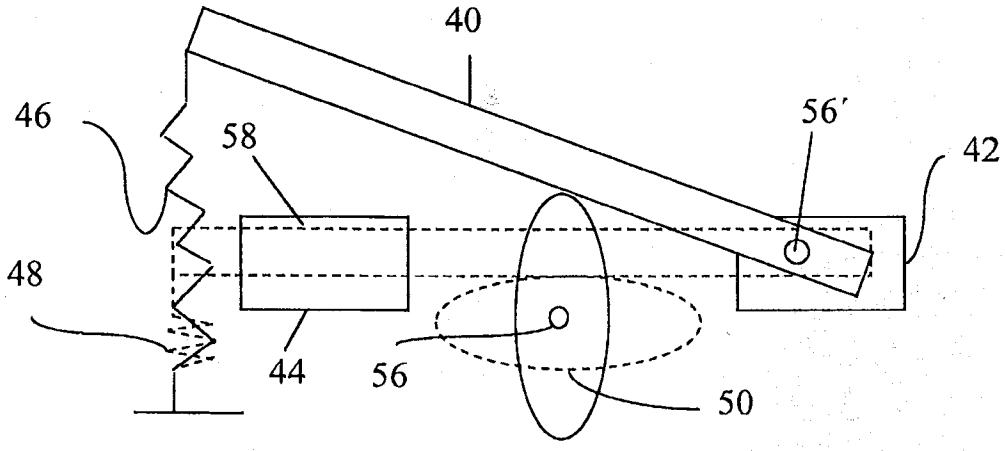


Fig. 2

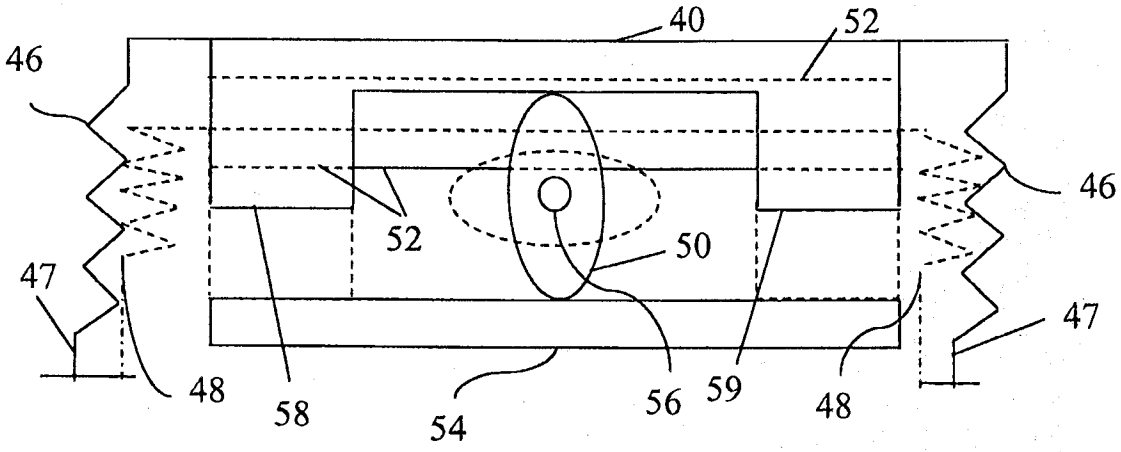


Fig. 3

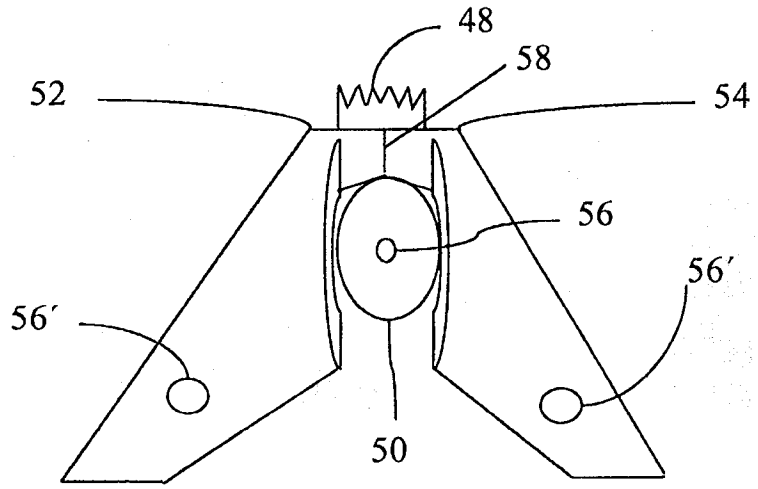


Fig. 4a

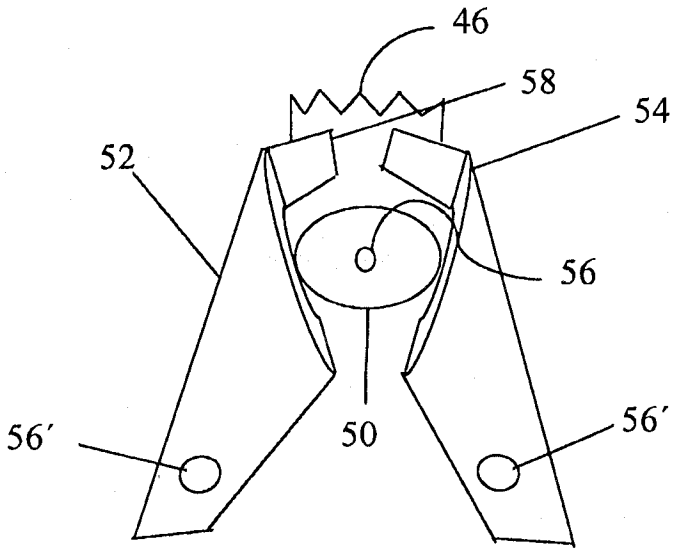


Fig. 4b

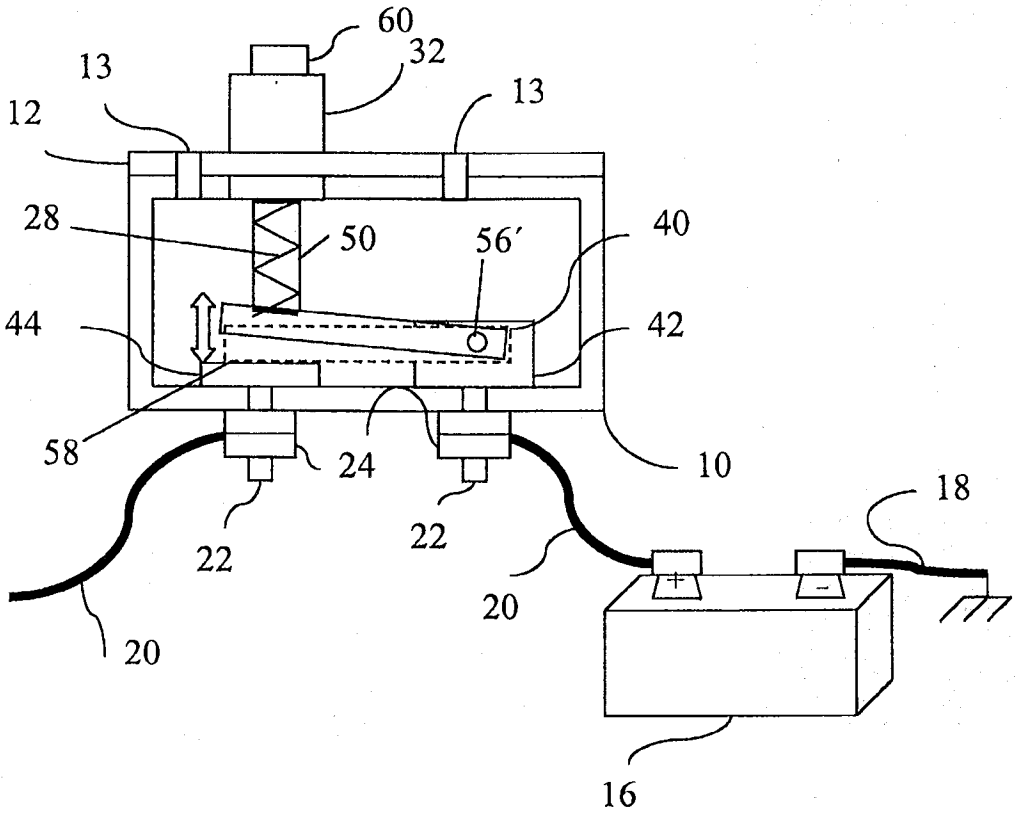


Fig. 5