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D. L. MILLER

2,583,273

CENTRIFUGAL SWITCH

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Fig. 2

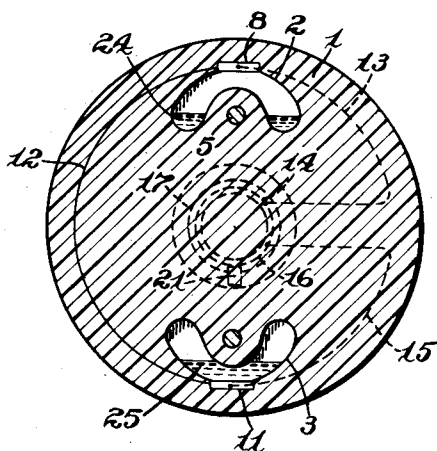


Fig. 1

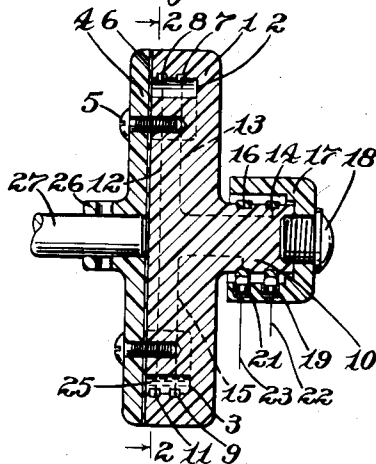
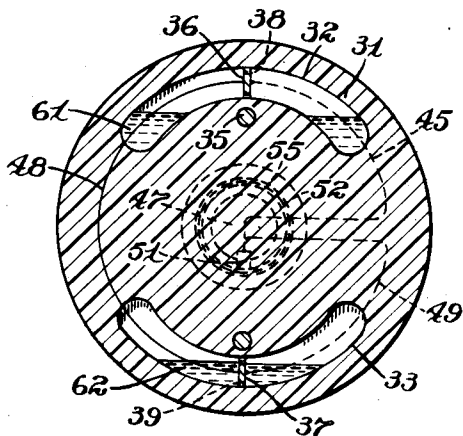


Fig. 4

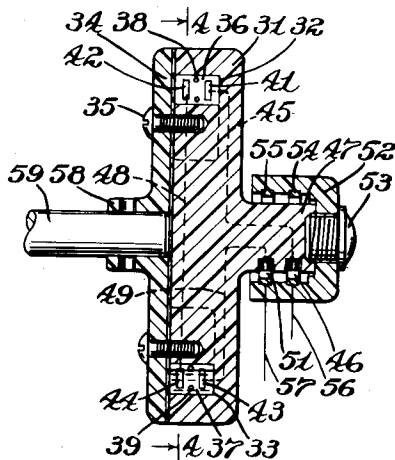


Fig. 3

WITNESS:

*Ether M. Stockton*

INVENTOR.

*Donald L. Miller*

BY

*Clinton S. Jones*

ATTORNEY

## UNITED STATES PATENT OFFICE

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## CENTRIFUGAL SWITCH

Donald L. Miller, Elmira, N. Y., assignor to Bendix Aviation Corporation, a corporation of Delaware

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3 Claims. (Cl. 200—80)

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The present invention relates to a centrifugal switch, and more particularly to a switch of this type which is adapted for automatically closing and opening electrical circuits of an internal combustion engine power plant responsive to the rotation and stoppage, respectively, of the engine.

In certain types of power plants, more particularly those used in automotive vehicles, it is desirable, in order to reduce fire hazards, to provide an automatic switch to render the ignition and/or fuel pump circuits inoperative when the engine stops, and to close said circuits automatically by rotation of the engine above a predetermined minimum speed.

Various mechanical devices operating by inertia, centrifugal force, engine oil pressure etc. have been employed for this purpose, but have generally been subject to one or more of the objections of uncertainty, or sluggishness of action, deterioration or sensitivity to external conditions of temperature, or contamination by dirt, oil and/or moisture.

It is an object of the present invention to provide such a switch which is efficient and reliable in operation, simple in construction, and substantially free from deterioration over long periods of use.

It is another object to provide such a switch which closes reliably at a low minimum engine speed, but opens infallibly when the engine stops.

It is another object to provide such a device which is in the form of a closed sealed unit which is unaffected by external conditions.

It is another object to provide such a switch which is readily adapted for mounting on, or connection to any conveniently accessible rotating part of the engine.

Further objects and advantages will be apparent from the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a side elevation partly broken away and in section of a preferred embodiment of the invention;

Fig. 2 is a section taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a view similar to Fig. 1 showing a second embodiment of the invention; and

Fig. 4 is a section taken substantially on the line 4—4 of Fig. 3.

In Fig. 1 of the drawing there is illustrated a generally cylindrical body 1 of suitable insulating material such as a phenolic condensation product, having arcuate pockets 2 and 3 diamet-

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rically arranged therein. A cover 4 of similar material is fixedly attached to the face of the body 1 by suitable means such as indicated at 5, so as to hermetically seal the pockets 2 and 3, a gasket 6 being inserted between the body 1 and cover 4 if deemed necessary.

Pairs of contact members 7, 8 and 9, 11 are rigidly mounted in the pockets 2 and 3 respectively, being preferably molded in the material of the body 1. As illustrated, these contacts are located side by side adjacent the outermost portions of the pockets 2 and 3.

Contacts 8 and 11 are connected by a conductor 12. Contact 7 is connected by a conductor 13 to a slip ring 14, and contact 9 is connected by a conductor 15 to a slip ring 16, said conductors and slip rings being preferably molded in the body 1 with the slip rings having coaxial exposed surfaces located on a reduced extension 10 of said body.

Means for connecting the switch with its pairs of contacts in series in a circuit to be controlled thereby is provided comprising a cup-shaped brush carrier 17 swiveled on the reduced extension 10 of the switch body 1 as indicated at 18, and carrying a pair of brushes 19 and 21 positioned to bear upon the slip rings 14 and 16 respectively, said brushes having conductors 22 and 23 for connection with the external circuit.

Pockets 2 and 3 are partially filled with a conducting liquid such as mercury as best shown at 24 and 25 in Fig. 2 whereby when the mercury occupies the radially outward portions of the pockets it serves to connect the pair of contacts there located, but when the switch is stationary, at least one pair of contacts will not be immersed in the mercury so that the circuit through the switch will be interrupted.

The cover 4 of the switch is provided with a hub 26 adapted to be mounted on and rotatably connect the switch to any suitable rotating part such as the generator shaft 27 of the engine, the circuits of which are to be controlled.

In the operation of this embodiment of the invention, when the parts are stationary as illustrated in Fig. 2, the circuit through the switch is broken, since contacts 7, 8 in the upper pocket 2 of the switch are not connected. When the engine is rotated, however, the rotation of the switch causes the mercury 24, 25 in the pockets 2 and 3 to move outward by centrifugal force so as to immerse both pairs of contacts and complete the electrical circuit through the switch. If the engine should stop for any reason, such as in case of a collision or upset of a vehicle in

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which the engine is mounted, at least one pair of contacts is immediately disconnected by withdrawal of the mercury, so that the circuits controlled by the switch are rendered inoperative.

In the embodiment of the invention illustrated in Figs. 3 and 4 a body 31 of insulating material is provided with arcuate pockets 32 and 33 which are sealed by a cover 34 attached to the body by suitable means indicated at 35. Partitions 36 and 37 are mounted across the middle portions of the pockets 32 and 33, said partitions having openings 38, 39 respectively permitting slow leakage of liquid therethrough.

Contacts 41, 42 are mounted in the partition 36, being moulded in the partition with surfaces exposed on both sides of the partition. Contacts 43 and 44 are similarly moulded in the partition 37.

Contact 41 is connected by a conductor 45 to a brush 46 mounted in the hub 47 of the switch body 31. Contact 42 is connected to contact 44 by means of a conductor 48, and contact 43 is connected by a conductor 49 to a brush 51 mounted in the hub 47 axially spaced from the brush 46.

A cup-shaped carrier 52 is swiveled on the hub 47 of the switch body as indicated at 53, and has moulded therein a pair of slip rings 54, 55 in position to be engaged by the brushes 46, 51, the slip rings being provided with conductors 56, 57 for connection to the external circuit to be controlled. The cover 34 of the switch is provided with a hub 58 adapted to be fixedly mounted on a rotating shaft 59 of the engine, the circuits of which are to be controlled by the switch.

The pockets 32 and 33 are partially filled with a conducting liquid such as mercury, as indicated at 61, 62 in Fig. 4 whereby the contacts in said pockets are immersed in said liquid when the latter occupies the outer portions of the pockets.

In the operation of this embodiment of the invention, when the switch is stationary, at least one pair of contacts is not immersed in the conducting liquid, and the circuit through the switch is broken, as shown in Fig. 4. As soon as the engine starts to rotate however, the mercury in the upper pocket flows down against the partition therein and immediately closes the circuit

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through the contacts in the partition. The continuity of the circuit through the switch is thus maintained even at very low engine speeds, such as during cranking in cold weather. When the engine stops, however, the circuit is broken after a short predetermined time-delay due to the leakage of the mercury through the holes 38 or 39 of whichever partition 36 or 37 happens to be uppermost when the engine stops.

Although certain structure has been described in detail, it will be understood that other embodiments are possible and various changes may be made in the design and arrangement of the parts without departing from the spirit of the invention.

I claim:

1. In a centrifugal switch a rotatable body of insulating material having diametrically arranged sealed pockets arcuate in shape partially filled with a conducting liquid, pairs of contacts fixed in said pockets in position to be immersed in said liquid when the liquid occupies the central portions of the pockets, and means for connecting said pairs of contacts in series in a circuit to be controlled by the switch; said pockets being provided with substantially medially arranged partitions having openings permitting leakage of the fluid therethrough.

2. A centrifugal switch as set forth in claim 1 in which said pairs of contacts are located in juxtaposition in said partitions so as to be connected by the liquid trapped by the partitions.

3. A centrifugal switch as set forth in claim 2 in which the contacts extend through the partitions so as to be exposed to the liquid on either side of the partitions.

DONALD L. MILLER.

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