

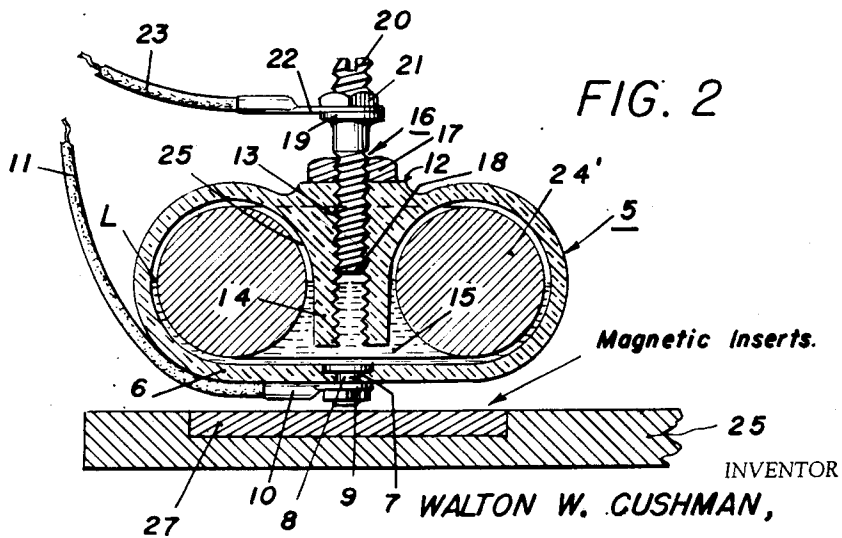
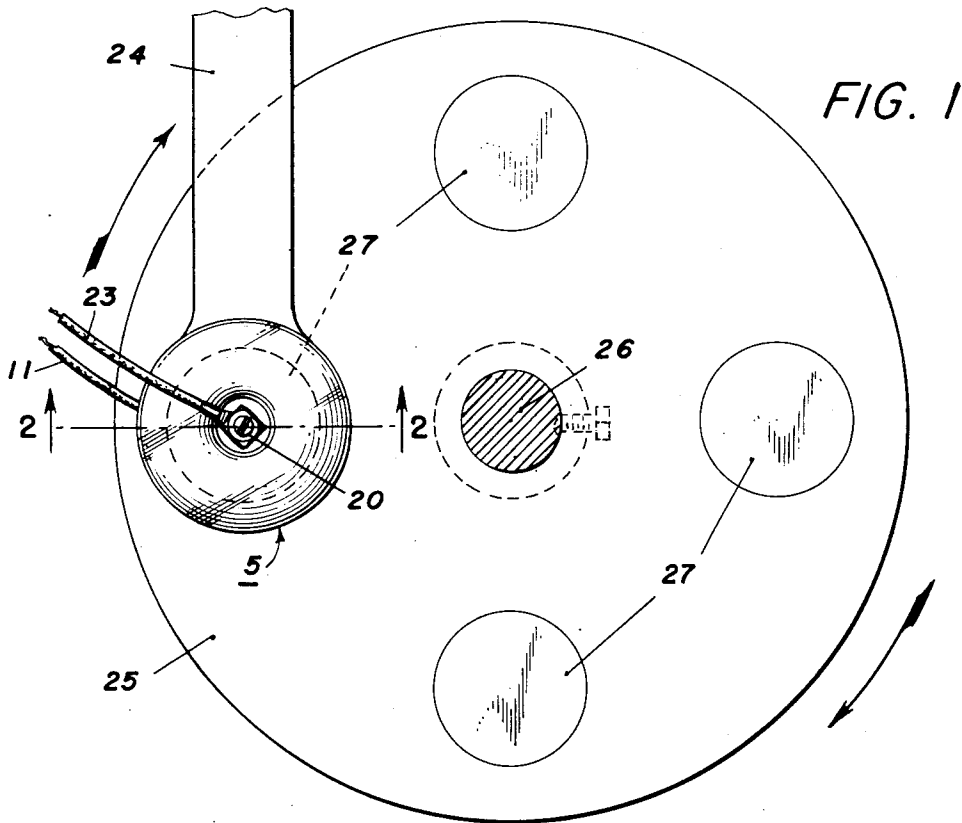
May 5, 1953

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2,637,792

MERCURY INTERRUPTER

Filed March 21, 1952



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2,637,792

MERCURY INTERRUPTER

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Application March 21, 1952, Serial No. 277,891

3 Claims. (Cl. 200—112)

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

1

The invention described herein, if patented, may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

My invention relates to an electrical interrupter.

A primary object of the invention is to provide an interrupter embodying a displaceable quantity of electrical conducting liquid such as mercury and a float element of magnetic material, which when attracted by a magnet displaces a quantity of the mercury and causes its level to rise for completing an electrical circuit.

A further object is to provide an interrupter of the above-mentioned character which is highly simplified and compact in construction, reliable and efficient in operation and well adapted for a wide variety of applications.

A still further object is to provide a magnetically operated mercury interrupter which may be employed in the ignition system of an internal combustion engine or the like.

Another object of the invention is to provide a device of the above-mentioned character which is quite inexpensive to manufacture.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this application, and in which like numerals are employed to designate like parts throughout the same,

Figure 1 is a plan view of an interrupter embodying my invention, part broken away, and,

Figure 2 is an enlarged vertical section on line 2—2 of Figure 1.

In the drawings, where for the purpose of illustration is shown a preferred embodiment of my invention, the numeral 5 designates generally a circular casing of nonconducting material, such as glass, moldable plastics material or the like. The casing 5 includes a flat bottom 6, having a central opening 7 for receiving a fixed metallic terminal or binding post 8, suitably rigidly secured therein, and forming a liquid-tight connection with the bottom 6, so that no liquid may pass out of the casing, through the opening 7. The terminal 8 may be screw-threaded as shown, for the reception of a nut 9, serving to secure one terminal end 10 of a wire 11 to the terminal or binding post 8, as shown.

The side wall of the casing 5 is circularly curved in radial cross section, and the top of the casing 5 is provided with a flat boss 12 having a central vertical screw-threaded opening 13

2

formed therein and extending downwardly through a depending tubular boss or sleeve 14, formed integral with the top of the casing 5 and located centrally therein, with respect to the side wall thereof. The bottom end of the tubular boss 14 terminates a relatively short distance above the bottom 6, as shown, and the screw-threaded opening 13 extends through the lower end of the tubular boss 14 so that a quantity 15 of mercury contained within the casing 5 may rise freely within the screw-threaded opening 13. The quantity of mercury within the casing 5 is preferably such that the normal level L of the mercury is substantially at the vertical center of the casing 5, as shown.

An adjustable screw-threaded binding post or terminal 16 formed of metal engages within the screw-threaded opening 13 and is vertically adjustable therein, and a lock nut 17 on the screw-threaded binding post 16 serves to releasably lock the binding post 17 in the selected adjusted position so that its lower end 18 may be spaced slightly from the level L of the mercury. The binding post 16 is provided near its top end and above the nut 17 with a flange or shoulder 19, integral therewith and an integral screw-threaded extension 20 is formed upon the binding post 16 above the shoulder 19, for receiving a nut 21, serving to clamp one terminal end 22 of a wire 23 against the shoulder 19.

A horizontal support arm 24 is preferably formed integral with the casing 5 and extends radially beyond one side of the same and is fixedly secured to any suitable support, not shown, so that the casing 5 will be supported in a fixed horizontal position.

A ring or annulus 24' is mounted within the casing 5 and is circular in radial cross section, as shown. The ring 24' is formed of iron or a suitable alloy of magnetic material, and the ring floats within the mass 15 of mercury, as shown, and normally maintains the level L at the point shown in Figure 2. The outer periphery of the ring 24' has a relatively close fit with the circularly curved side wall of the casing 5, so that the ring is not subject to any substantial lateral or horizontal shifting within the casing. The top and bottom of the ring 24' are likewise spaced a slight distance only from the top and bottom of the casing 5, so that the ring may partake of only a slight vertical movement within the casing. Also, the bore of the ring 24' is spaced a slight distance only from the periphery of the tubular boss 14, which has a large circularly curved fillet 25' connecting it with the top of the casing 5 and

blending into the circularly curved side wall of the casing. When the ring 24' is floating in the mercury 15, it is centered within the casing 5 and preferably spaced equidistantly from the top and bottom of the casing, as shown. The horizontal ring 24' is thus capable of only slight movement in any direction within the casing 5, due to its close fit therein, and such slight movements due to vibrations and the like will not materially change the level L of the mercury.

The casing 5 is supported above a horizontal rotary disk or table 25, mounted upon a vertical shaft 26 for rotation therewith, the shaft 26 being driven by any suitable means. A plurality of circumferentially equidistantly spaced magnets 27 may be embedded within the top of the disk 25 and positioned to pass directly beneath the axial center of the casing 5 as the disk or table 25 rotates. The tops of the magnets are preferably spaced a slight distance only from the bottom 6 of the casing, so as to pass as close as possible to the annulus 24', during rotation of the disk 25.

In operation, as the disk or table 25 rotates, the magnets 27 pass beneath the casing 5, and as each magnet passes beneath the casing it will attract the iron ring 24' and draw the same downwardly into contact with the bottom 6 of the casing. This will displace some of the mercury in the casing 5 and cause the level L to rise sufficiently to make contact with the lower end 18 of the adjustable terminal 16. Each time this occurs, an electrical circuit is completed through the wire 11, fixed terminal 8, mercury 15, adjustable terminal 16 and through the wire 23. As soon as each magnet 27 passes from beneath the casing 25, its magnetic attraction of the ring 24' is broken and the ring then rises to its normal level shown in Figure 2 and floats upon the mercury 15. This action allows the level L of the mercury to return to its normal position in Figure 2 and the contact of the mercury with the lower end 18 of the adjustable terminal is broken for interrupting the flow of current in the circuit.

Obviously, the rate of operation of the interrupter will depend upon the speed of rotation of the disk 25, and a wide range of operating rates are made possible by simply varying the speed of rotation of the disk 25. My interrupter is capable of a wide variety of commercial applications, and is particularly well suited for use in the ignition systems of internal combustion engines and the like, where a timed interruption in the flow of current is necessary for proper operation of the engine. As previously stated, slight movements of the ring 24' in the casing 5 due to vibrations or other external forces will not sufficiently disturb the mercury level L to cause the circuit through the terminal 16 to be completed. The interrupter can be rendered very sensitive by adjusting the screw-threaded terminal 16 downwardly close to the mercury level L, and this increases the usefulness and range of application of the device.

It is to be understood that the form of the invention herewith shown and described is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of the invention or scope of the subjoined claims.

Having described my invention I claim:

1. An interrupter comprising a casing of electrical insulating material which is arranged horizontally in use, the casing having a side wall and

top and bottom substantially horizontal walls, a depending boss secured centrally to said top wall of the casing and having a bottom end terminating near and spaced above said bottom wall, said depending boss having a substantially vertical bore extending therethrough and opening through the bottom end of the boss and through said top wall of the casing, the side, top and bottom walls of the casing forming with the depending boss a substantially annular chamber surrounding the depending boss, a substantially annular body of magnetically attractable material inclosed within said annular chamber and occupying the major portion of the chamber and having a vertical thickness only slightly less than the vertical height of the chamber between said top and bottom walls, whereby the annular body is shiftable vertically within the chamber a slight distance only, there being a quantity of mercury within the chamber and partly filling the same, said annular body floating upon the mercury, a first electrical terminal secured to said bottom wall of the casing and arranged in electrical contact with the mercury, a second electrical terminal engaging within the bore of said boss and being adjustable vertically therein and having its lower end positioned near the level of the mercury within the chamber, the mercury entering the lower end of the bore, and movable magnetic means arranged below the casing for magnetically attracting the annular body and drawing the same downwardly against said bottom wall and thereby causing the level of the mercury to rise in the bore of the boss and electrically contact said second electrical terminal.

2. An interrupter comprising a casing of electrical insulating material which is arranged horizontally in use, the casing having a circular side wall and top and bottom substantially horizontal walls, a depending boss secured centrally to said top wall of the casing and having a bottom end terminating near and spaced above said bottom wall, said boss having a substantially vertical screw threaded bore extending therethrough and opening through the bottom end of the boss and through the top wall of the casing, the circular side wall, top and bottom walls of the casing forming with said depending boss an annular chamber surrounding the boss, an annular body of magnetically attractable material inclosed within the annular chamber and occupying the major portion of the chamber and having a vertical thickness only slightly less than the vertical height of the chamber, whereby the annular body is movable vertically within the chamber for a slight distance only, there being a quantity of mercury within the chamber partly filling the same and entering the screw threaded bore of the boss through the open bottom end of the bore, the annular body floating upon the mercury, a first electrical terminal secured to said bottom wall of the casing and arranged in electrical contact with the mercury, an adjustable screw threaded terminal engaged within the screw threaded bore of the boss and having its lower end positioned near the level of the mercury within the bore and chamber, the adjustable screw threaded terminal projecting above said top wall of the casing for connection with an electrical conductor, and movable magnetic means arranged below the casing for magnetically attracting the annular body and drawing the same downwardly for causing the level of the mercury to rise within the screw threaded bore until the

5

mercury electrically contacts said adjustable screw threaded terminal.

3. An interrupter comprising a casing of electrical insulating material which is arranged horizontally in use, the casing having a circular side wall and top and bottom substantially horizontal walls, a depending boss secured centrally to said top wall of the casing and having a bottom end terminating near and spaced above said bottom wall, said depending boss having a substantially vertical screw threaded bore extending therethrough and opening through the bottom end of the boss and through said top wall of the casing, the circular side wall, top and bottom walls of the casing forming with said depending boss a substantially annular chamber surrounding the depending boss, an annular body of magnetically attractable material inclosed within said annular chamber and occupying the major portion of the chamber and having a horizontal and vertical thickness only slightly less than the radial width and vertical height of the chamber so that the annular body is movable vertically and horizontally within the chamber slight distances only, there being a quantity of mercury within the chamber partly filling the same, the mercury entering the screw threaded bore of the boss through the open bottom end of the bore, the annular body floating upon the

6

mercury, a fixed electrical terminal secured to the bottom wall of the casing and arranged in electrical contact with the mercury and adapted for connection below said bottom wall with a first electrical conductor, an adjustable screw threaded terminal engaging within the screw threaded bore of the boss and having its lower end positioned near the level of the mercury within the bore and projecting above said top wall of the casing for connection with a second electrical conductor, and movable magnetic means arranged below the casing for magnetically attracting the annular body and drawing the same downwardly in the mercury so that the mercury rises within the screw threaded bore and electrically contacts the lower end of said adjustable screw threaded terminal.

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