Dec. 8, 1931. L. S. BRACH 1,834,934

SWITCH FOR INDICATING DEVICES

Filed March 15, 1928

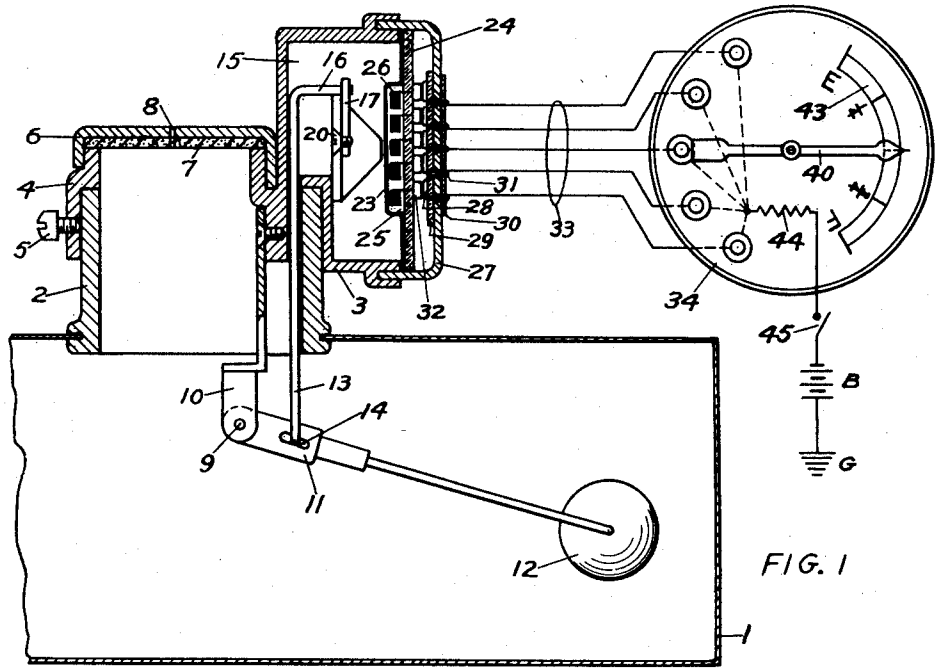


FIG. 1

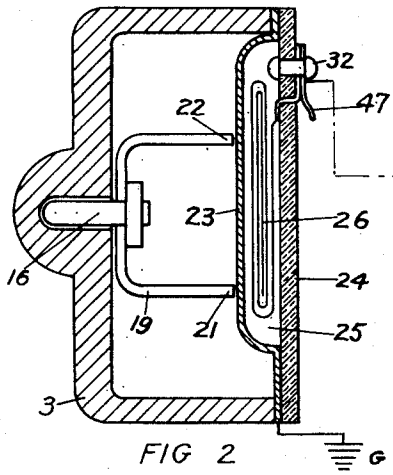


FIG 2

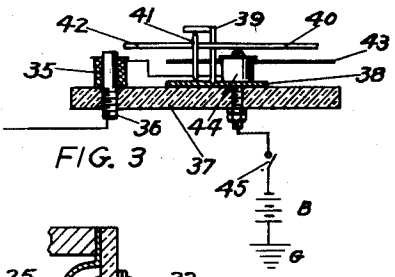


FIG. 3

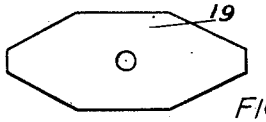


FIG. 4

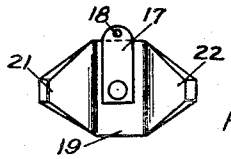


FIG. 5

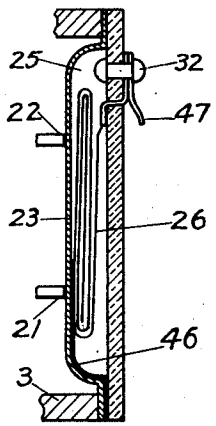


FIG. 6

INVENTOR
LEON S. BRACH
BY
A. D. T. Libby
ATTORNEY

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LEON S. BRACH, OF EAST ORANGE, NEW JERSEY

SWITCH FOR INDICATING DEVICES

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This invention relates to means for indicating a quantity of liquid in a reservoir.

Heretofore various means have been proposed for doing this work, some of them based on hydrostatic principles and others on mechanical and electrical principles. My present invention may be placed in the latter class, and has for its principal object a provision of means arranged and coordinated so as to eliminate various difficulties encountered in the past in electrical devices used for this purpose. In obtaining the principal object, it is another object of my invention to provide an arrangement in which the electrical contacts that are actuated by a float mechanism are in such a position as to prevent any spark which may be formed at the contacts, from taking place in the presence of any gas when the device is used for measuring the quantity of oil, gasoline, or other hydro-carbon fluid in a reservoir.

These and other objects will be clear to one skilled in this art after a study of the specification taken in connection with the annexed drawings, wherein:

Figure 1 is a diagrammatic view showing means for carrying my invention into practice.

Figure 2 is a view through the receptacle for carrying electrical contact members, taken at right angles to that shown in Figure 1, but on a larger scale and of a somewhat modified form of contact holder.

Figure 3 is a diagrammatic view of the indicating gauge constituting a part of the indicating means.

Figure 4 is a plan view of the magnet used in the reservoir portion of the system.

Figure 5 is a view of the magnet shown in Figure 4 after it has been formed, and also shows means for attaching a float control member to the magnet.

Figure 6 is a partial view of the part shown in Figure 2, but showing a modified arrangement of certain of the parts.

In the drawings, 1 illustrates a reservoir or tank for holding a liquid such as gasoline. Attached to the top part of the reservoir 1 is a nipple 2. A receptacle 3 has an annular portion 4 adapted to fit on the nipple 2, and to be fastened thereto in a satisfactory manner, a set screw 5 is shown. The portion 4 is adapted to have a cover 6 and a gasket 7 fitted thereto. The cover 6 is used in the ordinary way for filling the reservoir 1, and when the arrangement is used on a gas tank on an automotive vehicle where the vacuum system is used to move the gasoline from the tank 1 to the carburetor, cover 6 is provided with a vent 8.

Pivotally mounted at 9 on a bracket 10 within the tank 1, is a lever arm 11, on the end of which is carried a float 12. Associated with the lever 11 is a member in the form of a rod 13, which preferably has a sliding connection with the lever 11 by means of the slot 14. The rod 13 extends upward through the wall of the receptacle 3, passes into the chamber 15 where its upper end 16 is bent over, and is fastened to an attachment member 17 as by means of a hole 18.

To the member 17 is attached a magnet 19 as by means of a screw 20. The magnet 19 has its ends preferably tapered and bent upward, as indicated by 21 and 22 (Fig. 5), and these ends are in a position closely adjacent a metallic disc 23. The disc 23 is of non-magnetic material such as brass or aluminum, and with the insulator 24 serves to close the chamber 15. The insulator 24 and the disc 23 are also so arranged as to form a sealed chamber 25, within which is arranged a plurality, five being illustrated, of contact members made of magnetic material and so constructed and disposed as to be readily attracted by the poles 21 and 22 of the magnet 19 as the same is moved in the manner hereinafter explained.

I prefer to make the contact members within the sealed chamber 25 of relatively thin silicon steel of the order of .007″ in thickness, and to form these strips into a series of convolutions 26 as more clearly shown in Figure 2. This arrangement gives great flexibility and at the same time, a very large surface to make contact with the disc 23 when the member 26 is drawn against disc 23 by the poles 21 and 22 of the magnet. Attached to the receptacle 3, is a cover 27 which carries a series of contacts 28 insulated from

the cover 27 by insulators 29 and 30, clearance holes being indicated in the cover where the ends 31 of the contact 28 pass through the cover.

The insulator 24 also carries a series of contacts 32 to which are connected one end of each of the members 26. When the cover 27 is put in place over the receptacle 3, contact is automatically made between the contacts 28 and 32. Extending from the contacts 31, is a cable 33 which is taken to some point such as the cowl or dashboard on an automobile where the gauge 34 is mounted.

The gauge 34 includes a plurality of electro-magnets 35 corresponding in number to the contact members 26. In constructing the electro-magnets 35, I prefer to use the core 36 as one end of its circuit. These core ends 36 are adapted to have the wires in the cable 33 connected thereto. The electro-magnets 35 with cores 36 are preferably mounted on an insulator 37, or if carried on a metal member, cores 36 are insulated therefrom.

Pivotally mounted on a staff 41 having bearings between the members 38 and 39, is a light permanent magnet 40 having its end 42 arranged to cooperate with one end of the cores 36, while the other end is made in the form of a pointer to cooperate with a scale 43, which is calibrated to show the amount of fluid in the reservoir 1. As a safety device, I provide a resistance coil 44 which is adapted to be connected through a swich 45 with a source of energy B, which in the case of an automotive vehicle, is the storage battery thereon, having one end connected to the frame of the vehicle.

As shown in Figure 1, one end of the protecting coil 44 is connected to each of the electro-magnets 35.

In operation, the indicating means herein described functions as follows:

Assuming that the switch B is closed, a source of potential is supplied to the electro-magnets 35 and when the float 12 is raised and lowered, the poles 21 and 22 of the magnet are moved in a vertical direction to points opposite and adjacent to the members 26, and these members are attracted by the magnet against the inner surface of the disc 23, thereby completing an electrical circuit through the electro-magnets 35 which are connected to the member 26 opposite the pole pieces 21 and 22. The flow of current through this electro-magnet will attract the end 42 of the lever 40 and move it to a position such as indicated in Figure 1, wherein the magnet illustrated shows the poles 21 and 22 opposite the centrally positioned member 26, so that the indicating needle 40 is attracted by the centrally positioned electro-magnet and the gauge indicates that the reservoir 1 is now half full.

When the poles 21 and 22 are intermediate or between any two of the members 26, both of these members may be brought into contact with the disc 23, and in this connection the end 42 of the needle of the gauge will be positioned between the corresponding electro-magnets 35, so that in the arrangement illustrated in Figure 1, there will be nine positions of the indicating needle on the gauge 34.

By positioning the receptacle carrying the electrical contacts, outside of the tank and in a sealed chamber, I have completely eliminated all danger of a spark from these contacts from igniting any gaseous mixture, and the danger of corrosion and poor contact between the members 26 and the disc 23 is likewise eliminated, and the part that is actuated by the float 12 is extremely simple and has no mechanism which is likely to get out of order.

In the form shown in Figure 2, I have eliminated the cover 34 and have shown how the connections may be made directly to the spring contacts 47 on the insulator 24. In Figure 6, I have indicated a construction in which each of the flexible contacts 26 in the sealed chamber 25 may have one end of the convolutions tilted so as to come in close relationship with one pole of the magnet, thereby reducing the air gap at this point and hence making the magnetic pull on the other end of the member 26 stronger. When this construction is used, a thin insulator 46 is interposed as shown, in order to prevent the end of the member 26 from making electrical contact with the disc 23.

It may also be noted at this point that since the chamber 25 carrying the contacts 26 is preferably sealed, the chamber may be placed within or partially within the reservoir, preferably at the top. Hence, the exact location of this chamber is not limited to any one point. Furthermore, while I have shown the magnet 19 as moving in a vertical plane, it may have an arcuate motion, depending on the mechanical engagement with the float.

From what has been said, it will be seen that my switching mechanism is particularly adapted for use in a system made up of three units for easy application to an automotive vehicle; first, the reservoir unit; second, the indicator unit mounted apart from the tank or reservoir; and third, a cable unit extending between the first and second mentioned units.

From what has been said, it will be apparent that my invention is susceptible of many changes in the details which may be varied without departing from the spirit of my invention or the scope of the appended claims.

Having thus described my invention, what I claim is:

1. A switch for an indicating device including; a receptacle, a member carried by

said receptacle and extending without the same to which a force may be applied, a magnet within the receptacle adapted to be moved by said member, a plurality of spaced members of magnetic material mounted adjacent the path of movement of the poles of said magnet, means for preventing said members from coming into contact with the poles of the magnet, said members being adapted, when attracted by the magnet, to close, through said preventing means, contacts in an electrical circuit.

2. A switch for an indicating device including; a receptacle, a member carried by said receptacle and extending without the same to which a force may be applied, a magnet within the receptacle adapted to be moved by said member, a plurality of spaced members of magnetic material mounted adjacent the path of movement of the poles of said magnet, a metallic disc of non-magnetic material interposed between the poles of the magnet and said members of magnetic material, said disc acting to close contacts in an electrical circuit when said members are drawn against it by the magnet.

3. A switch for an indicating device including; a receptacle, a member carried by said receptacle and extending without the same to which a force may be applied, a magnet within the receptacle adapted to be moved by said member, a metallic disc of non-magnetic material forming a part of a sealed chamber, said chamber being positioned on said receptacle opposite the poles of the magnet so said disc is in close proximity to the poles of the magnet, a plurality of flexible members of magnetic material mounted within said chamber and normally out of contact with the disc but adapted to be brought into contact with it by said magnet when the latter is moved so as to present its poles toward one of said flexible members for the purpose described.

4. A switch for an indicating device including; a receptacle, a member carried by said receptacle and extending without the same to which a force may be applied, a magnet within the receptacle adapted to be moved by said member, a plurality of spaced members of magnetic material mounted adjacent the path of movement of the poles of said magnet, a metallic disc of non-magnetic material interposed between the poles of the magnet and said members of magnetic material, said disc acting to complete an electrical circuit when said members are drawn against it by the magnet for the purpose described.

5. A switch for an indicating device including; a receptacle, a member carried by said receptacle and extending without the same to which a force may be applied, a magnet within the receptacle adapted to be moved by said member, a plurality of spaced members mounted adjacent the path of movement of the poles of said magnet, each of said members being composed of a plurality of integral segments or convolutions of thin magnetic material, the length of the members being at least as great as the distance between the poles of said magnet, a metallic disc of non-magnetic material interposed between the poles of the magnet and said members of magnetic material, said disc acting to complete an electrical circuit when said members are drawn against it by the magnet for the purpose described.

6. A switch for an indicating device including; a receptacle, a member carried by said receptacle and extending without the same to which a force may be applied, a magnet within the receptacle adapted to be moved by said member, a metallic disc of non-magnetic material forming a part of a sealed chamber, said chamber being positioned on said receptacle opposite the poles of the magnet so said disc is in close proximity to the poles of the magnet, a plurality of flexible members of magnetic material mounted within said chamber and normally out of contact with the disc but adapted to be brought into contact with it by said magnet when the latter is moved so as to present its poles toward one of said flexible members; said flexible members being composed of a plurality of integral segments or convolutions of thin magnetic material, the length of the members being at least as great as the distance between the poles of said magnet for the purpose described.

7. A switch for an indicating device including; a receptacle, a member carried by said receptacle and extending without the same to which a force may be applied, a magnet within the receptacle adapted to be moved by said member, a plurality of contacts adapted to be electrically connected to an indicator, said contacts being carried by said receptacle in spaced relation and having at least a movable part adapted to be moved by the magnet to close a circuit as the said member is moved by an applied force substantially as described.

8. A switch for an indicating device including; a receptacle, a member carried by said receptacle and extending without the same to which a force may be applied, a magnet within the receptacle adapted to be moved by said member, a disc of non-magnetic material arranged closely adjacent the poles of the magnet, a plurality of thin flexible contact members of magnetic material mounted adjacent the disc on the side thereof opposite to said magnet, said contact members to be brought into contact with said disc by said magnet to close a circuit as the said member is moved by an applied force substantially as described.

9. A switch for an indicating device in-

cluding; a receptacle, a member carried by said receptacle and extending without the same to which a force may be applied, a magnet within the receptacle adapted to be moved by said member, a disc of non-magnetic material arranged closely adjacent the poles of the magnet, a plurality of contact members, each composed of a long thin strip of magnetic material, said strip being formed into closely arranged loops the convolutions of which are at least as long as the spacing of the poles of the magnet, said contact members being mounted adjacent the disc on the side thereof opposite to said magnet, said contact members being adapted to be brought into contact with said disc by said magnet to close a circuit as the said member is moved by an applied force substantially as described.

10. A switch for an indicating device including; a receptacle, a member carried by said receptacle and extending without the same to which a force may be applied, a magnet within the receptacle adapted to be moved by said member, a plurality of movable contacts sealed in a chamber and carried by the receptacle, so said contacts are close to the plane of movement of the pole pieces of said magnet and adapted to be moved by them when the magnet is sufficiently moved, that side of the chamber toward the magnet pole pieces being of non-magnetic material and adapted to cooperate with said movable contacts to complete an electrical circuit as the said member moves said magnet into cooperative position with said movable contacts.

11. A switch for an indicating device including; a receptacle, a member carried by said receptacle and extending without the same to which a force may be applied, a magnet within the receptacle adapted to be moved by said member, a plurality of contacts mounted in spaced relation closely adjacent to the poles of said magnet and having at least some part thereof adapted to be moved by the magnet to close a circuit as the said member moves the magnet and means interposed between the poles of said magnet and said movable contact portions to prevent said portions from coming into physical engagement with the poles of the magnet and for completing a circuit depending on the position of said magnet as described.

12. A switch for an indicating device comprising a casing having two parts, a magnet located in one part and mounted for movement therein and provided with means extending without the casing for moving the magnet, a plurality of spaced members of magnetic material mounted in the other part of the casing closely adjacent said magnet and adapted to be operated thereby to close different electrical circuits.

13. A switch for an indicating device comprising a casing, a magnet in the casing, means extending without the casing and having an operative connection with the magnet, a plurality of spaced members of magnetic material mounted in a sealed chamber closely adjacent said magnet and adapted to be operated thereby to close different electrical circuits and means co-acting with said operative connection for preventing sudden movements of the magnet.

In testimony whereof, I affix my signature.

LEON S. BRACH.