Feb. 4, 1964 W. E. PFEFFER 3,120,639

ELECTRICAL INDICATING INSTRUMENT WITH A PERMANENT MAGNET ROTOR ACTUATED BY A SINGLE RIGID HALF-TURN WINDING

Filed June 25, 1962 2 Sheets-Sheet 1

FIG. 1

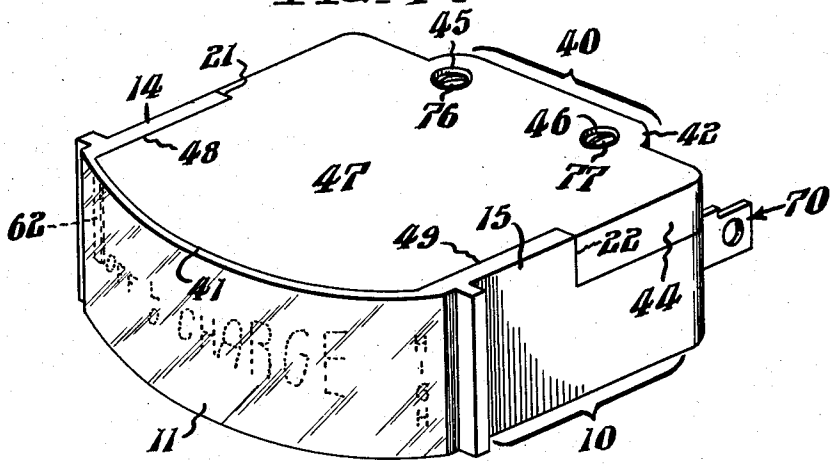


FIG. 8

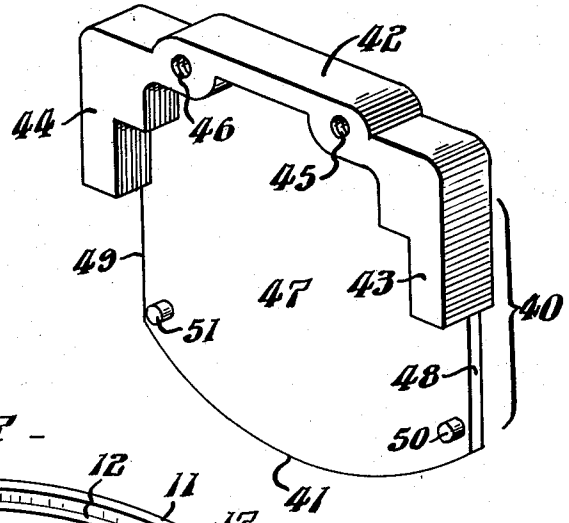
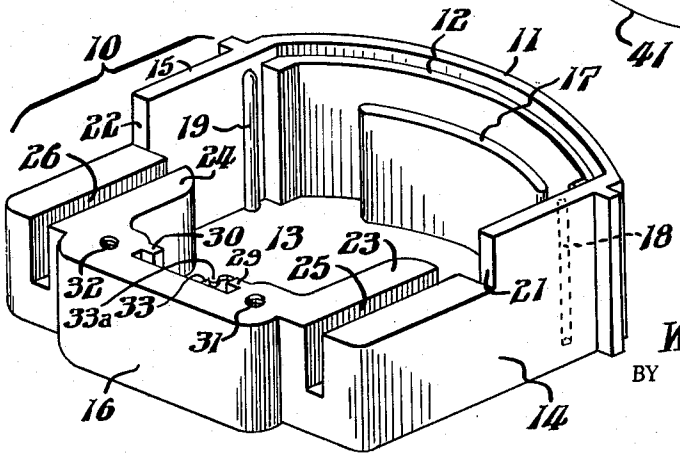


FIG. 7



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Filed June 25, 1962 2 Sheets-Sheet 2

FIG. 2

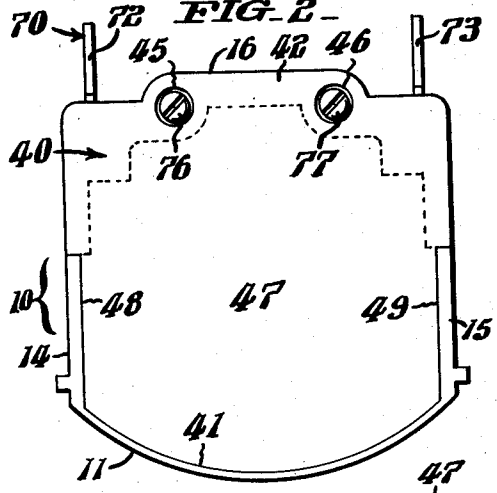


FIG. 4

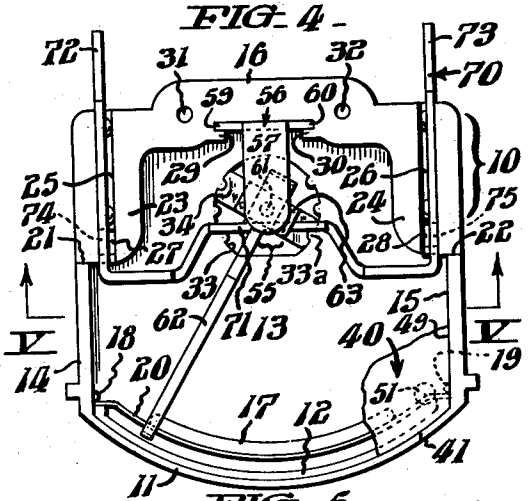


FIG. 3

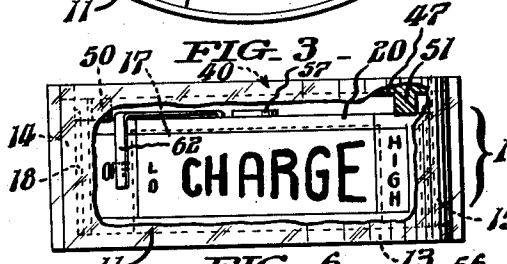


FIG. 5

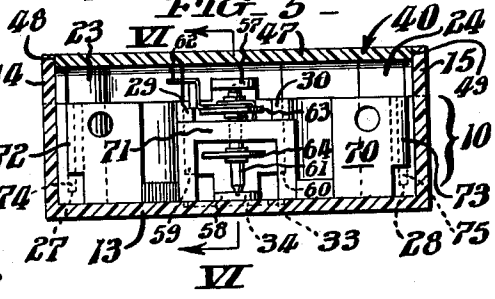


FIG. 6

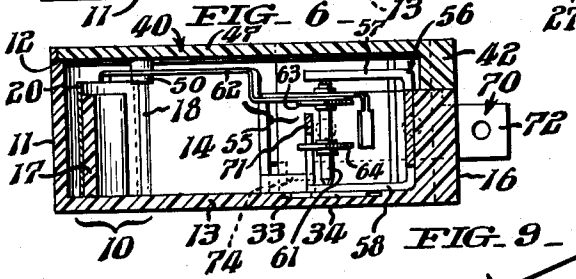


FIG. 9

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ELECTRICAL INDICATING INSTRUMENT WITH A PERMANENT MAGNET ROTOR ACTUATED BY A SINGLE RIGID HALF-TURN WINDING

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This invention relates to an electrical indicating instrument.

In connection with an instrument of the kind referred to, I aim to secure the advantages of structural simplicity and minimization in the number of component parts and ease of assembling them, with a view to reducing production costs without sacrifice of efficiency and reliability as to accuracy of its readings.

How the foregoing and other objects and advantages are realized in practice will appear from the following detailed description of the attached drawings, wherein:

FIG. 1 is a perspective view of the instrument;

FIG. 2 shows the instrument in top plan;

FIG. 3 shows the instrument in front elevation with a portion of its frontal window wall broken out;

FIG. 4 shows the instrument in top plan with the casing cover removed to disclose the parts in the interior;

FIG. 5 is a sectional view taken as indicated by the angled arrows V—V in FIG. 4;

FIG. 6 is a sectional view taken as indicated by the angled arrows VI—VI in FIG. 5;

FIGS. 7 and 8 are perspective views respectively of the casing of the instrument and of its cover; and

FIG. 9 is an exploded view in perspective showing a portion of the casing and the working parts of the instrument.

As herein exemplified, the instrument comprising a casing 10 and a cover 40 therefor, which are separately illustrated in perspective in FIGS. 7 and 8, both being molded or otherwise formed in practice from dielectric material, such as plastic. The casing 10 is open at one side and, except for having a convexedly rounded transparent frontal window wall 11 with a slightly recessed ledge 12, is generally rectangular in plan and has a bottom wall 13, side walls 14 and 15 and a back wall 16. Projecting upwardly from the bottom wall 13 is a web 17 which is curved concentrically with the window wall 11 and spaced slightly therefrom; and extending inwardly from side walls 14 and 15 respectively adjacent opposite ends of said web are straight stop ribs 18 and 19. Sprung over the curved web 17 with its ends engaged behind the ribs 18 and 19 is a scale strip 20 of flexible material having on the exposed face thereof, in this instance, informative inscriptions "Off," "Low," "Charge," and "High" as shown in FIG. 1 for use of the instrument, for example, on the dashboard of an automobile to indicate the functioning of the ignition system. Referring again more particularly to FIGS. 7 and 9, the side walls 14 and 15 of the casing 10 are downwardly recessed as at 21 and 22, and the rear portions 23, 24 thereof are thickened and longitudinally slotted respectively as at 25 and 26. Adjacent their rear ends, the slots 25 and 26 have small narrow downward recesses 27 and 28 for a purpose later on explained. The back wall 16 of the casing is formed on its inner face with laterally spaced undercut ribs 29 and 30 and is provided moreover, with a pair of tapped holes 31 and 32, said ribs and said holes being symmetrically spaced relative to the central longitudinal plane through the casing. From FIG. 9 it will be noted further that the bottom wall 13 of the casing 10 has somewhat forward of its rear wall 16, a shallow depression 33 for reception of a small "restoring" bar magnet 34, the center of said depression being coincident with the center of curvature of the window wall 11 and being formed with an even number of equally spaced inwardly extending peripheral teeth 33*a*. The magnet 34 is in the form of a bar which corresponds in thickness to the depth of the depression 33 in the casing bottom and is notched at opposite ends for selective engagement with diametrically opposite teeth of the depression in a manner which will be readily understood from FIG. 4.

The casing cover 40 is of a plane configuration generally like that of casing 10, i.e. it has an edge 41 corresponding in curvature to that of the window wall 11, and a thickened rear edge portion 42 with extensions part way along the opposite side edges as at 43 and 44. It is to be further noted that the thickened portion of the cover 40 is of a depth equal to that of the recesses 21 and 22 of the casing 10, and that it is provided with holes 45 and 46 which correspond to the tapped holes 31 and 32 in the back wall 16 of the casing. Projecting from the main web 47 of the cover 40 in the corner regions between the curved edge 41 and the slightly inwardly set side edges 48 and 49 are short studs 50 and 51.

The instrument further comprises a preassembled movement unit 55 which as best shown in FIG. 9, includes a bracket 56 with spaced arms 57 and 58 connected by a transverse bar which has wings 59 and 60 extending beyond opposite sides of said arms. Pivotally supported between the arms 57 and 58 of bracket 56 is an arbor 61 whereto is affixed a counterbalanced pointer hand 62 and immediately below said hand, a small permanent bar magnet 63 and below said magnet in spaced relation to said bar a second small bar magnet 64.

In addition, the instrument comprises a unitary coil and terminal element 70 which as best seen in FIG. 9, is bent to substantially U-configuration from a profiled strip—in practice of non-ferrous metal such as brass or copper—with a depressed half coil 71 formed in the narrowed transverse portion of the U between the legs 72 and 73 which latter have pendent lugs 74 and 75 adjacent and corner junctures with said transverse portion.

The procedure for assembling the instrument is as follows: The restoring bar magnet 34 is first inserted into the depression 33 in the bottom wall 13 of the casing 10 and its notched ends engaged with a pair of diametrically opposite teeth 33*a* of said depression. The movement unit 55 is next applied and the lugs 59 and 60 of its frame incidentally engaged into the grooves 29 and 30 in the back wall 16 of the casing, and then pressed down until the lower arm 58 of the bracket bears upon the back wall as in FIGS. 5 and 6, the small bar 34 being thereby definitely held in place, and the downwardly bent end of the pointer hand being incidentally entered into the interval between the window wall of the casing and the scale strip 20.

The element 70 is next applied by engaging its legs 72 and 73 into the slots 25 and 26 in the thickened portions 23 and 24 of the side walls of the casing 10, care being taken to enter the lugs 74 and 75 in the legs 72 and 73 of said element into the recesses 27 and 28 in the bottoms of said grooves. When the element 70 is fully pressed home, the bottom edges of its legs 72 and 73 bear fully upon the bottoms of the slots 25 and 26 as best seen in FIG. 4. The element 70 is thus definitely positioned in the casing 10 with its half loop 71 disposed at a level substantially midway between the magnet 63 and the magnet 64 on the arbor 61 in close proximity to the arbor as in FIGS. 5 and 6. Finally, the cover 40 is applied over the open top of the casing 10 by engaging its rounded edge 41 into the recessed ledge 12 of the side wall 11 and pressing it down into place, the thickened portions 42, 43, 44 of the cover fitting into the recessed portions 21 and 22

of the casing to bear upon the top edges of the legs 72 and 73 of the element 70 thereby to hold the latter in place with the ends of said legs protruding at the back of the casing as in FIGS. 1, 2 and 4 to serve as terminal prongs. After being thus applied, the cover 40 is made fast by passing the shanks of two headed screws 76, 77 (FIG. 2) through the holes 45 and 46 in the thickened rear edge of the cover and threadedly engaging the shanks of said screws into the tapped holes 31 and 32 in the rear wall 16 of the cover 40. From FIG. 3 it will be noted that the studs 50 and 51 on the cover 40 engage the top edge of the scale strip and thereby assist in holding said strip in place in the casing 10.

In the use of the instrument, when current is passed through the element 70, the flux created around the half turn coil of the element 71 reacts upon the bar magnet 63 on the arbor 61 of the unit 55 thereby causing the pointer 62 to swing relative to the scale strip 20 from the indication "Lo" toward the indication "High" by a distance corresponding to the strength of such current as will be readily understood. The small bar magnet 34 in the bottom of the casing 10 by reaction with the bar magnet 64 on the arbor 61 of the unit 55 serves to maintain the pointer hand 62 normally at the zero or "Lo" position on the scale strip 20. The bar 34 is rotatively adjustable in the depression 33 in the bottom of the casing 10 by engaging its notched ends with different diametral pairs of peripheral teeth 33*a* of said depression as may be necessary to insure normal maintenance of the pointer hand 62 at the zero position.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the instrument described without departing from the spirit and scope of the invention as set forth in the appended claims, and that in some cases certain features of my invention may be used to advantage without a corresponding use of other features.

Having thus described my invention, I claim:

1. In an electrical indicating instrument: an open top casing of dielectric material having a bottom wall, a transparent frontal window wall, a back wall, and opposite side walls; an outwardly convexed scale visible through the window wall of the casing; an element fashioned to U-configuration from non-ferrous metal, said element being set into the casing with end portions of its legs protruding through the back wall of the casing to serve as terminal prongs; a movement unit comprising a bracket, an arbor pivotally supported by the bracket, a pointer hand and a permanent magnet in the form of a cross bar affixed to the arbor, said movement unit being set into the casing with the axis of the arbor coincident with the center of curvature of the scale, and with the end of the pointer hand overlying the scale, and with the bar magnet on the arbor in proximity to the transverse portion of the U-shaped element for reaction with flux created as current

is passed through said element to cause the pointer hand to move relative to the scale; and a cover of dielectric material secured over the open top of the casing.

2. An electrical indicating instrument characterized as in claim 1, wherein the transverse portion of the U-shaped element has the configuration of a half-turn coil.

3. An electrical indicating instrument characterized as in claim 1, wherein the casing and its cover are both molded from transparent plastic.

4. An electrical indicating instrument characterized as in claim 1, wherein the U-shaped element is fashioned from a profiled blank struck from non-ferrous sheet metal.

5. An electrical indicating instrument characterized as in claim 1, wherein the arbor and its appendages and its supporting bracket are pre-assembled into the form of a self-contained movement unit, wherein said bracket is fashioned from sheet metal with the transverse portion connecting its arms extending beyond opposite sides of said arm, and wherein the back wall of the casing has spaced grooves into which the extended side portions of the bracket arms are engaged.

6. An electrical indicating instrument characterized as in claim 1, wherein the casing has, on its bottom wall, an upstanding web spaced slightly from its window wall, said web and window wall being outwardly convexed and their centers of curvature being coincident with that of the scale, and projections on its opposite side walls adjacent said web; wherein the indicating scale is in the form of a strip of flexible material sprung over said web, with its ends engaged behind said projections.

7. An electrical indicating instrument characterized as in claim 1 wherein the opposite side walls of the casing are slotted part way of their lengths for reception of the legs of the U-shaped element.

8. An electrical indicating instrument characterized as in claim 1, further including a second bar magnet on the arbor below the first mentioned bar magnet; and a bar magnet set into the bottom of the casing and rotatively adjustable about a center in line with the axis of the arbor to react with the second bar magnet on said arbor to normally maintain the pointer at zero on the scale.

9. An electrical indicating instrument characterized as in claim 8, wherein the bottom of the casing has, in line with the axis of the arbor of the movement, a circular depression with pairs of inwardly-projecting circumferential teeth; wherein the bar magnet is notched at opposite ends for engagement with a selected pair of the teeth; and wherein said bar magnet is confined to the depression in the bottom of the casing by the bottom arm of the bracket of the movement unit.

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