Aug. 6, 1929. R. O. HELGEBY 1,723,035

AMMETER

Filed July 13, 1927

Fig. 1

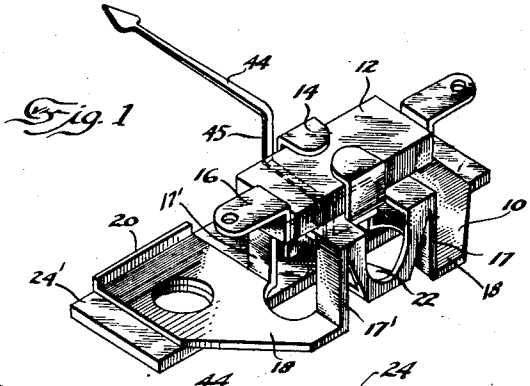
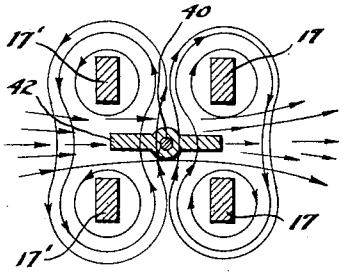


Fig. 6



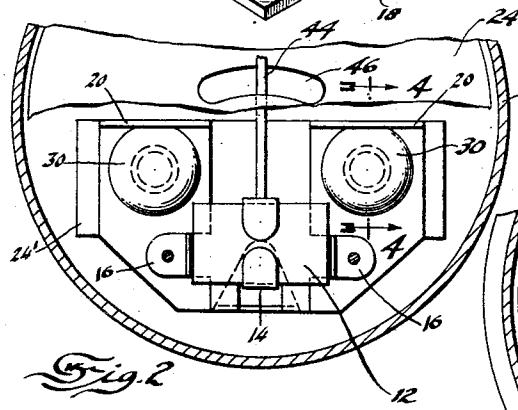


Fig. 2

Fig. 3

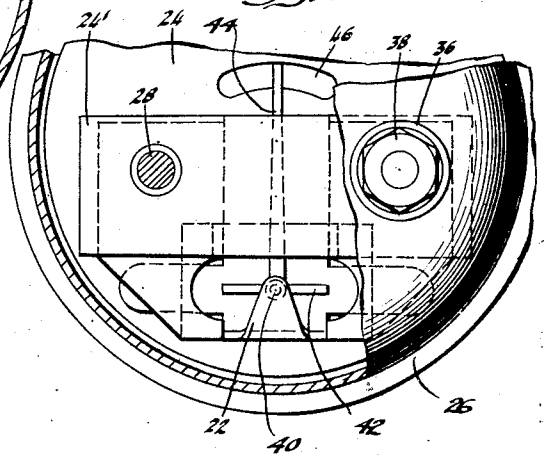


Fig. 4

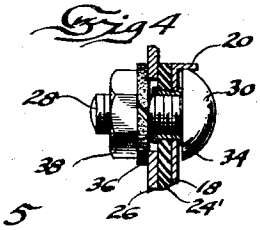
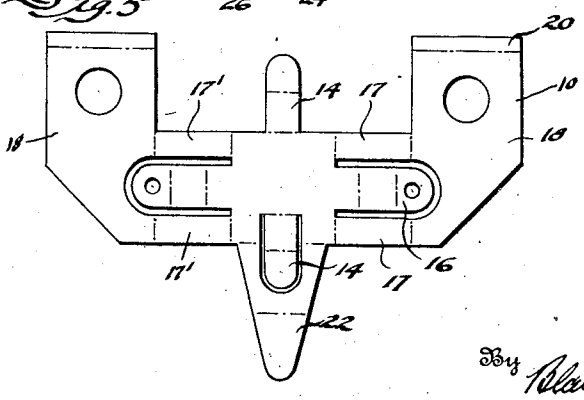


Fig. 5



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UNITED STATES PATENT OFFICE.

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AMMETER.

Application filed July 13, 1927. Serial No. 205,496.

This invention relates to an ammeter and more particularly to an ammeter of the type ordinarily mounted on the dashboard of an automobile to indicate the direction and magnitude of the flow of current through the electrical system.

Ammeters of the type referred to must of necessity be extremely simple in construction in order that their cost may be kept at a minimum. The ordinary ammeter of this type consists of a permanent magnet, an indicating needle mounted on a shaft with a magnetic armature, and a conductor arranged parallel with the armature so that the resultant lines of force about the conductor will tend to move the armature to a position perpendicular to the conductor and against the pull of the permanent magnet.

It is well known that the density of the magnetic field at any point adjacent the conductor varies inversely with its distance from the conductor, other conditions remaining the same. A common difficulty in ammeters of this type is unequal deflection, that is, the deflection of the needle is not uniform for each unit change in the current. A mark may be made on the scale to indicate the deflection of the needle when one unit of current flows through the conductor. The swinging of the needle has moved the armature to a position farther away from the conductor where the magnetic lines are fewer for a given unit of current. As the next unit of current is passed through the conductor the intensity of the field adjacent the armature has been increased but not doubled and the deflection of the needle for the second unit of current is not so great as the deflection for the first unit. This principle operates progressively as the current increases and in order to make the scale accurate, the divisions on it must be progressively smaller away from the center or zero point.

It is an object of the present invention to avoid this difficulty by so constructing the conductor and so mounting the armature that as the armature rotates it remains substantially a uniform distance from the conductor, or in other words, so that the intensity of the magnetic field which acts on the armature will be directly and accurately proportional to the amount of current passing through the conductor. This arrangement makes possible a uniform scale on the dial.

Other objects of the invention will appear in the course of the following description, taken in connection with the accompanying drawing and appended claims.

In the drawing:

Figure 1 is a perspective view of the assembled unit removed from its case.

Figure 2 is a plan view, with parts broken away.

Figure 3 is a bottom view with parts broken away.

Figure 4 is a section on the line 4—4 of Figure 2.

Figure 5 shows the form of the blank from which the frame is constructed.

Figure 6 is a horizontal section through the conductor and armature, the direction of the magnetic lines of force being indicated diagrammatically by arrows.

Referring to the drawing, the numeral 10 indicates the frame, which in the present case is the conductor through which passes the current which is to be measured. The conductor frame is formed from a sheet of metal shaped as indicated in Figure 5, in which the dotted lines indicate lines on which the frame is to be given a right angle bend. On top of the center section of the frame 10 is a permanent bar magnet 12, held in place by bent up portions 14 and 16 of the frame. The portions 16 are bent out and apertured as illustrated, in order to provide means for riveting or bolting thereto the dial 24. The frame 10 is symmetrical and each side or section thereof is provided with spaced legs 17 and 17′ and horizontal apertured portions or wings 18, each wing being bent up as at 20 for a purpose described below. The portion 22 of the frame is bent back under the center to provide support for the shaft on which the indicating needle is mounted. From an examination of Fig. 1 it will be noted that the conductor comprises the wings or feet 18 and the connecting U-shaped portion having the legs 17 and 17′ and a connecting base portion on which the magnet 12 is mounted.

The numeral 24′ indicates a strip of in-

sulating material which is placed between the frame 10 and the bottom of the case 26. The case 26 is ordinarily constructed of a light metal, as aluminum, and is provided with spaced openings corresponding to the apertures in the insulating strip 24′ and in the wings 18 of the frame. Fitting within these apertures are the terminals. Referring to Figure 4, each terminal comprises a bolt 28 provided with a head 30. The head is provided with a straight edge for fitting against the flange 20 of the wing 18 for holding the bolt against rotation. The wing 18 and insulating strip 24′ are fixed together by the hollow rivet 34. An insulating washer 36 prevents contact of the nut 38 with the case 26. The construction described provides an insulated terminal for fixing thereto a terminal of the electric circuit.

Referring to Figure 1, the center portion is shown with four vertical legs 17 and 17′ spaced as indicated in Figure 6. The bent under portion 22 and the under side of the center of the frame 10 are prick punched to provide for the shaft 40 on which is supported the magnetic armature 42 and needle 44. The needle is provided with an offset portion 45 extending through a slot 46 in the dial so that the arrow shaped end of the needle will be visible to the operator. A glass cover may be fixed to the case over the dial in the usual manner.

One section of the conductor is divided into two legs 17 and the other section into two other legs 17′. The plane of the armature shaft 40 is parallel with the legs 17 and 17′ in any position of the armature, the latter being normally held by the permanent magnet in the position illustrated in Figure 6. With the armature and the legs of the conductor arranged as illustrated, the direction of the magnetic field is as shown in Figure 6, it being obvious that the current goes up the side 17 and down the side 17′ or vice versa. Thus the field about the conductor tends to turn the armature from the position illustrated to a position at right angles thereto. The four legs 17 and 17′ are so spaced that the lines adjacent the armature are in a curve which is in a general way concentric with the shaft 40 supporting the armature. As current passes through the conductor and the armature is deflected, it moves in a substantially uniform field and gives a quite uniform deflection for a unit change in current.

I claim:

1. An ammeter comprising a pivotally supported armature, a conductor provided with terminals for connection in an electric circuit, said conductor comprising portions extending along and adjacent to the axis on which the armature is supported, each portion being divided to cause the lines of force resulting from the passage of a current therethrough to extend arcuately about said axis, and a permanent magnet tending to hold said armature against rotation.

2. An ammeter comprising a pivotally supported armature, a conductor provided with terminals for connection in an electric circuit, said conductor comprising side portions extending along and adjacent to the axis on which the armature rotates and on opposite sides thereof, each side portion being divided to cause the lines of force resulting from the passage of a current therethrough to extend arcuately about said axis, and a permanent magnet tending to hold said armature against rotation.

3. In an ammeter, a conductor comprising two substantially parallel portions offset from each other and connected at one end, each portion being divided into a plurality of legs, an armature mounted to rotate on an axis between and substantially parallel with said portions, and a permanent magnet tending to hold said armature against rotation.

4. An ammeter comprising a pivotally supported armature, a conductor having side portions connected at one end and extending along and adjacent to the axis on which the armature moves and on opposite sides thereof, each side portion being divided into legs substantially equidistant from said axis, and a permanent magnet tending to hold said armature against rotation.

5. In an ammeter, a conductor frame comprising a central portion and side portions extending in offset planes, each side portion being divided to provide an extended field of force thereabout on the passage of an electric current through said conductor, an armature pivotally supported on the central portion of said conductor frame between said side portions, and a permanent magnet tending to hold said armature against rotation.

6. In an ammeter, an armature shaft and an armature supported thereon, said armature extending in a plane disposed axially of said shaft, a permanent magnet tending to hold said armature against rotation, and a conductor comprising side portions along the outer edges of said armature, each side portion comprising a plurality of legs.

7. In an ammeter, a conductor comprising wing portions and a U-shaped portion, each side of the U formed into a plurality of legs, and an armature and pointer swinging mechanism mounted within the U and between said plurality of legs whereby a substantially uniform field about said armature is obtained.

8. The structure of claim 7, and a permanent magnet mounted on the base of the U and rigidly held thereon by integral portions bent from said conductor.

9. In an ammeter, an integral conductor

having lateral wing portions and a U shaped central portion connecting the wings, a magnet, integral tongues bent away from the full length of each side or leg of the U and adapted to assist in supporting said magnet on said conductor, and an integral tongue at one side of the base of the U bent under the base and with the base adapted to support a pointer and armature.

10. The structure of claim 9, and integral tongues extending from the base of the U over the magnet to rigidly hold it in place.

11. The structure of claim 9, and a dial mounted on the tongues bent from the legs of the U.

In testimony whereof I affix my signature.

RALPH OLAF HELGEBY.