Aug. 15, 1950 M. E. FOGLE 2,518,609

INTERNAL PERMANENT MAGNET ELECTRICAL INSTRUMENT MECHANISM

Filed Dec. 19, 1946

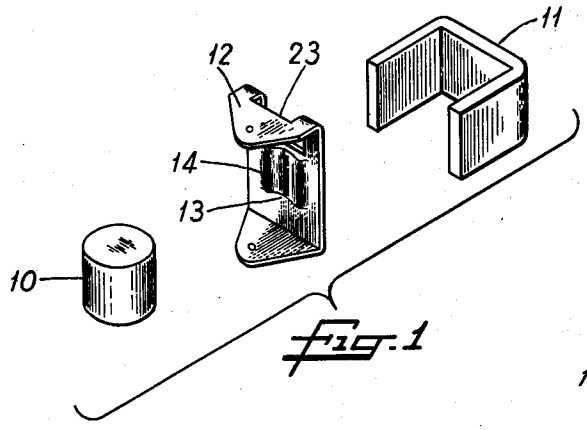


Fig. 1

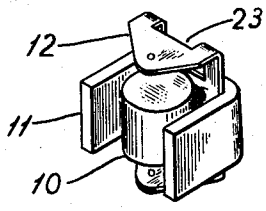


Fig. 2

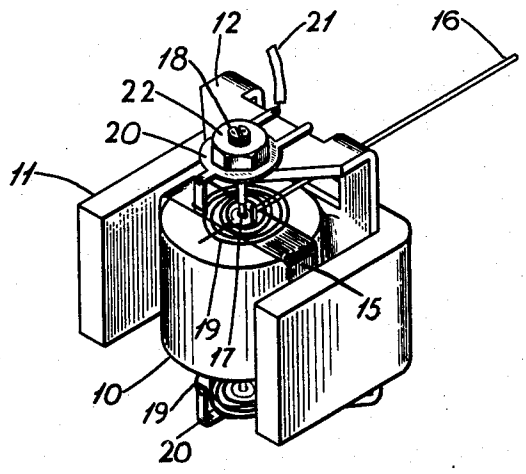


Fig. 3

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Patented Aug. 15, 1950 2,518,609

UNITED STATES PATENT OFFICE

2,518,609

INTERNAL PERMANENT MAGNET ELECTRICAL INSTRUMENT MECHANISM

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Application December 19, 1946, Serial No. 717,107

3 Claims. (Cl. 171—95)

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This invention relates to electrical mechanisms of the permanent magnet, movable coil type and more particularly to a novel construction and assembly of a structure that includes the magnetic circuit and the bridge member for pivotal support of the movable coil.

The prior art includes numerous constructions of electrical mechanisms of the type contemplated by this invention but these are open to the general objection that they comprise a large number of component parts and are costly to assemble.

In mechanisms of this class, wherein rotation of the movable coil is produced by a minute electric current flowing through the winding, it is essential the air gap be free of any particles or foreign matter that is likely to interfere with the motion of the coil. Magnetic particles are particularly objectionable as they adhere to the permanent magnet or to the soft-iron that forms part of the magnetic flux path. In present devices of this type great care must be exercised to remove metal burrs that are the result of machining operations such as milling, drilling, tapping, etc. Also, the completed device must be inspected carefully for particles which may have been formed and/or dislodged during the assembly operation as is always possible when the parts are assembled by means of screws.

It is also essential that the part forming the mechanism be secured together firmly and permanently as relative displacement of the parts will result in a change of the calibration constants of the mechanism, if not inoperativeness.

A mechanism made in accordance with my invention is not open to the above objections as it comprises a minimum number of parts that are assembled together without screws, bolts, brackets, or etc., and affords an economy of assembly unapproached by existing constructions.

An object of this invention is the provision of an electrical instrument mechanism which can be produced in a small size and at a minimum cost. An object of this invention is the provision of a novel instrument mechanism comprising a permanent magnet, a soft-iron yoke and a bridge member for pivotally supporting a movable coil, said bridge member being disposed between the magnet and the yoke. An object of this invention is the provision of a structure for electrical instruments comprising a permanent magnet and a soft-iron yoke disposed on opposite sides of a bracket member said parts secured together solely by cement. More specifically it is an object of this invention to provide an instrument mechanism comprising a cylindrical, permanent magnet, a soft-iron yoke of substantially U-shape having its ends spaced from the magnet to form magnetic flux-gaps, a bridge member positioned between the magnet and the yoke and having offset end extensions overlying the ends of the magnet, and a wire wound, movable coil pivoted between the offset end extensions of the bridge member for rotation in the flux gaps.

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These and other objects and advantages will be apparent from the following description when taken with the accompanying drawings in which:

Figure 1 is an exploded view showing the main parts of a device made in accordance with my invention;

Figure 2 is an isometric view of the assembled structure; and

Figure 3 illustrates the complete instrument mechanism, on an enlarged scale.

Referring now to Figures 1 and 2, my novel instrument structure comprises the permanent magnet 10 that is magnetized across the diameter, a soft-iron yoke 11 of substantially U-shape, and a bracket member 12 made of non-magnetic material, preferably brass. These parts are secured together, as shown in Figure 2, by applying a thin coating of a suitable cement to the contacting surfaces and placing the assembly in a fixture while the cement is polymerized under the action of heat. To afford a greater surface area of contact between the cylindrical magnet 10 and the bracket member 12, the base of the latter is provided with a concave arcuate surface section 13 defined by the ridges 14 and which is formed during the stamping operation by impressing a pair of parallel, longitudinally-extending indentations in the outer face of the bracket base. It is pointed out that the ridges 14 also serve to position the magnet centrally with respect to the bridge member thereby facilitating the mass production of structures falling within established limits of tolerance. The curvature of the concave, arcuate surface section in the base of the bracket is made to conform to the circumferential surface of the cylindrical magnet 10. There is thus provided contiguous surfaces of relatively large area resulting in a strong, cemented joint between these members. The concave section 13 and the ridges 14 are so formed that the back surface of the bracket 12 remains substantially flat to afford a stable and large surface area of contact against the inside surface of the yoke 11. By designing the parts as shown I am able to provide a sturdy, permanent structure which consists of only 3 parts held together solely by cement,

thereby obviating the need for screws, bolts, brackets, etc., and reducing to a minimum the possibility of metal particles becoming lodged in the working area of the mechanism. Although my structure comprises only three parts it provides a complete magnetic circuit and a bridge for pivotal support of a movable element.

The movable element of my instrument mechanism comprises the wire wound coil 15 carrying the pointer 16 and pivots 17 which operate in bearings 18 to afford rotational motion of the coil, as is well known in the art. Current is brought to the movable coil through the hair springs 19 having their ends soldered to the abutments 20, the latter also serving as terminals to which the lead wire 21 may be soldered, substantially as shown. The bearings 18 and the abutments 20 are retained in fixed position by a suitable nut 22. To facilitate the assembly of the movable element the pointer 16 preferably projects through a transverse slot 23 in the bracket member 12. This design also reduces the space requirement when the mechanism is housed in a casing. It is apparent the two ends of the coil 15 must be electrically insulated from each other and this is readily accomplished by "floating" one of the abutments 20 between suitable insulating washers in the conventional manner.

Having now described my invention certain modifications in the arrangement and location of the parts will be apparent to those skilled in the art without departing from the scope and spirit of the invention as recited in the claims.

I claim:

1. In an assembly for an electrical instrument of the permanent magnet-movable coil type the combination of a U-shaped bracket stamped from a unitary strip of non-magnetic material to provide a base and parallel-extending legs; a pair of parallel, longitudinally-extending indentations pressed into the outer face of the bracket base to thereby form a concave, arcuate surface section on the inner face of the bracket base; a cylindrical magnet having a circumferential surface conforming to and secured to the said concave, arcuate surface section of the bracket; and

a U-shaped yoke of soft-iron secured to the outer face of the bracket base such that the legs of the yoke lie spaced from the magnet to form magnetic flux gaps, the legs of said yoke being spaced apart a distance substantially equal to the width of the bracket base.

2. The invention as recited in claim 1 wherein the soft-iron yoke and the magnet are secured to the bracket base solely by cement.

3. An electrical instrument comprising a U-shaped bracket stamped from a unitary strip of non-magnetic material to provide a base and parallel-extending legs; a pair of parallel, longitudinally-extending indentations pressed into the outer face of the bracket base to thereby form a concave, arcuate surface section on the inner face of the bracket base; a transverse slot in the bracket base; a cylindrical magnet having a circumferential surface conforming to and cemented to the said concave, arcuate surface section of the bracket; a U-shaped yoke of soft-iron cemented to the outer face of the bracket base such that the legs of the yoke lie spaced from the magnet to form magnetic flux gaps; a wire wound coil pivoted between the legs of the bracket for rotation in the magnetic flux gaps; a pointer secured to the coil and extending through the transverse slot in the bracket base; and a pair of spiral springs for conducting current to the said coil.

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