Nov. 11, 1969 A. SAUSER 3,478,265

# FRAME FOR A MOVING COIL INSTRUMENT

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Fig.2

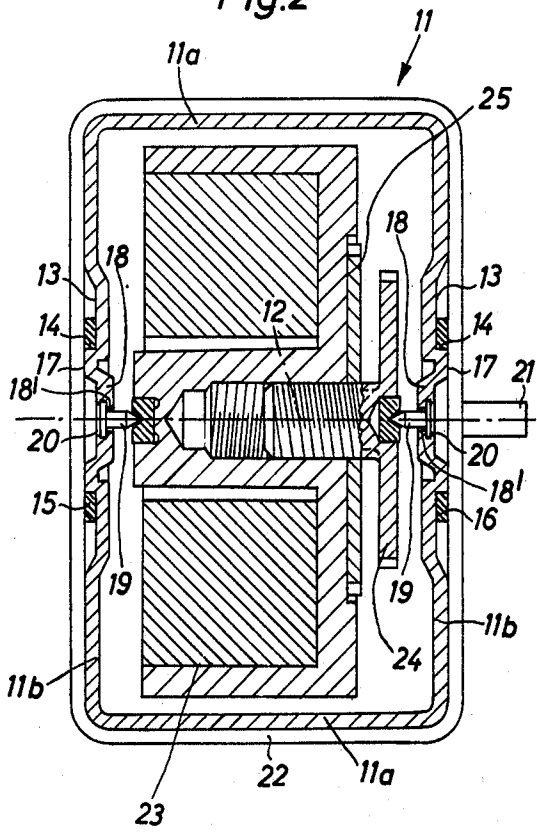
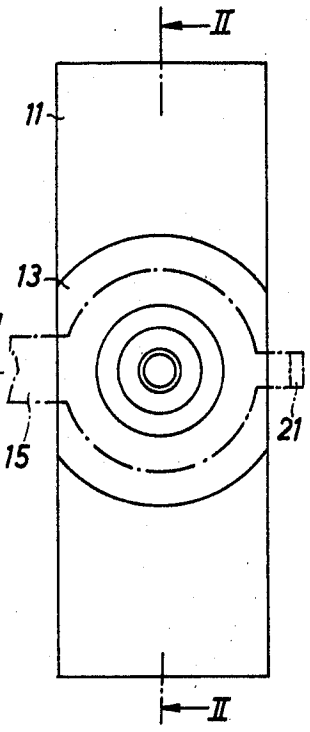



Fig.1




*INVENTOR.*
ALFRED SAUSER

*BY*

Michael J. Striker
Atty

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# FRAME FOR A MOVING COIL INSTRUMENT

Alfred Sauser, Solothurn, Switzerland, assignor to Sauser AG, Solothurn, Switzerland

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## ABSTRACT OF THE DISCLOSURE

A frame for a moving coil instrument includes two pairs of opposed walls. The outwardly directed faces of one pair of walls are each provided with a centrally located annular recess in which a bearing member may be positioned, and another annular recess concentric with the first one and in which an auxiliary member may be at least partly received.

The present invention relates to coils for electrical measuring instruments, and more particularly to an improved supporting frame for the convolutions of coils which may be utilized in moving-coil instruments. The invention also relates to an improved method of producing the above-mentioned frames.

In accordance with the presently prevailing practice, supporting frames for use in the coils of moving-coil instruments are produced by subdividing a hollow cylindrical body into ring-shaped blanks. In a separate operation, the resulting blanks are deformed into frames of rectangular outline. The resulting frames are used to support the convolutions of an insulated conductor thereon; they also serve to achieve the desired damping of the coil movement. In the latter case frames with low-ohmic resistance of their material achieve a stronger damping effect than frames having material with a high resistance factor. Frames of copper are used to achieve strong damping, frames of aluminum for lesser damping.

To the inside of such frames two bearing members are secured on opposite sides of the frame. These bearing members consist of needle-type bearings secured to flanges which are in turn soldered, welded or glued to the frame. However, it has not heretofore been known to provide the frames with means for precisely locating such bearings, and this of course makes it difficult to achieve absolute accuracy in positioning of the bearing members on the frame.

After applying the convolutions of the insulated conductor over the outside of the frame, the spiral holder and indicator member of the instrument are generally glued to the outside of the winding, since both of these members are usually included in the current path of the winding by securing the ends of the conductor to them, and since they therefore must be insulated from the frame and from one another. This manner of securing the indicator and the spiral holder to the winding is disadvantageous because under this system the ends of the convoluted conductor cannot be secured to the indicator member and the spiral holder until the winding operation is completed and the respective members have been applied to the outside of the winding. At this time the ends of the conductor are then soldered or welded to the indicator and spiral holder, respectively. Of course, such positioning of these auxiliary members on the outside of the winding not only provides little protection against detachment of these members, but also makes the finished coil unnecessarily bulky since the thickness of the respective members is added to the relevant dimensions of frame and winding.

It is an important object of the present invention to



provide a novel and improved method of producing supporting frames for use in coils of moving-coil instruments so as to eliminate the various above-mentioned drawbacks.

Another object of the invention is to provide a frame for moving-coil instruments in which the bearing members, the indicator and the spiral holder are automatically located in their proper position before winding of the insulated conductor begins.

Still a more specific object of the present invention is to provide a frame of the above-mentioned type in which the bearing members, indicator and spiral holder are disposed in recesses formed in the frame for this purpose, and are secured therein against dislocation.

An additional object of the present invention is to provide a frame of the outlined characteristics which may be mass-produced in conventional machinery, and which may be produced in any desired size to be useful in highly sensitive, as well as in less sensitive electrical measuring instruments.

In accordance with the stated objects one feature of my invention resides in the provision of a method of producing a frame for the coil of a moving-coil instrument or a similar apparatus. Such method comprises the steps of forming a sleeve-like frame blank of rectangular outline having two pairs of opposed flat walls; and deforming one pair of such walls so as to form therein respective recesses which each have an opening adapted to receive a bearing means, and respective second recesses which are concentric with the first recess and are adapted to each receive an auxiliary member therein, so as to accommodate the bearing means and auxiliary members and to fix them in predetermined positions.

Advantageously, the recesses will be so arranged as to provide seats for the auxiliary members on which the latter may be secured by frictional engagement between the respective seats and members. In accordance with another feature of the invention provision will be made in the recess for the bearing member so that the latter may be riveted or soldered or welded thereinto. Preferably, the recesses are of annular shape and are concentric with the axis about which the frame is to turn.

In accordance with a preferred embodiment of the present invention one of the recesses forms in the respective wall an outer cylindrical seat for the indicator and the spiral holder, respectively, and another recess forms a seat for the, preferably integral, flange of a needle bearing. It has been found advantageous to construct the seat for the indicator and the spiral holder of circular shape, but to provide at least one planar section thereon so as to fix at least the indicator in its position relative to the frame.

In accordance with another embodiment of the invention the recesses are of such depth that the members accommodated therein are at most flush with the outer surface of the respective wall, so that the members will lie below the convolutions of the insulated conductor.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a side-elevational view of a frame in accordance with the present invention; and

FIG. 2 is an axial section taken on a line II—II of FIG. 1 and shows the inventive frame with the electrical conductor applied thereon.

The frame is indicated in the drawing with reference numeral 11. It is formed by slicing off a section of a

tubular body which may be produced by cold forming, stamping, drawing, or any other suitable process. The thus obtained circular blank is then deformed to obtain a frame having a rectangular cross section. This frame has, as is evident from FIG. 2 of the drawing, a pair of transverse end walls **11***a* and a pair of parallel longitudinal walls **11***b* which connect the end walls **11***a*. The longitudinal walls **11***b* are respectively formed with a first inwardly extending recess **13** concentric with the axis **12** (indicated in dashed lines) about which the frame **11** is to turn. Recess **13** is formed with a radially innermost edge which forms an annular seat **14** concentric with the axis **12**. The recesses **13** have a depth which approximately equals the thickness of wall **11***b*, but which advantageously is not less than the thickness of the indicator **15** or the spiral holder **16** which are to be received in the recesses **13**. Both of these members **15** and **16** are formed with respective openings so dimensioned that they may be frictionally secured to seat **14** by being pressed into the recess **13**. If, as has been found desirable, the recess **13** is of a depth corresponding exactly to the thickness of the members **15** and **16**, then the outer faces of these members will be flush with the outer surface of the wall **11***b* so that the winding may be applied thereover without bulging. To fix the member **15** and **16** against turning relative to the frame, the seat **14** may be formed with one or more planar portions or sections (not shown), and to form the opening in member **15** with a complementary cross-section.

The wall portion **17** located within the outline formed by the annular seat **14** is formed with another recess **18** which is preferably slightly deeper than the annular recess **13**. In turn, the recess **18** is formed at its center with an opening **18'** through the material of wall **11***b*, such opening being adapted to receive a needle-bearing **19** of hardened steel or the like. However, it will be understood that it is possible to dispense with the formation of this opening if the material of frame and needle-bearing **19** is such that the latter can be readily driven through the material of the frame. Bearing **19**, whose point is directed towards the interior of frame **11**, is formed at its outer end located within the recess **18** with a flange **20** which is preferably integral with the bearing needle **19**, and which is secured to the wall **11***b* by riveting, welding, or the like. By this arrangement the spacing between the points of the two bearing needles **19** is precisely defined, and the two needles are reliably prevented from axial movement. Of course it is possible to utilize another bearing instead of the bearing needles, for example, a jewel-type bearing.

Since electrical insulation between the bearing needles **19**, the indicator **15** and the spiral **16** on the one hand and the frame **11** on the other hand is necessary, the frame **11** is covered with one or more layers of an insulating lacquer prior to affixing of these members thereto. This can be advantageously accomplished by dipping the frame into the lacquer and letting the resulting coating dry.

Indicator **15** and spiral holder **16** are each provided with a portion **21** which is integral with the respective flanges of these members and extends outwardly therefrom in a direction parallel to the axis **12**. These portions **21** serve for fixing the respective ends of the winding, that is of the convoluted insulated conductor **22**. Prior to beginning of the winding process one end of the conductor is fixed to the portion **21** of one of the members **15** or **16**, the conductor is wound about the frame, and the other end of the conductor is then fixed to the other portion **21** of members **15** or **16**. The conductor is then advantageously secured against shifting on the frame by means of one or more additional layers of lacquer. At the same time, this lacquer also provides additional assurance against movement of the indicator **15** and the spiral holder **16**. This latter is necessary, of course, only if the seat **14** is not provided with one or more planar portions as mentioned before, since such a provision by itself will be completely adequate for preventing rotary displacement of the members **15** and **16** relative to the frame.

It will be obvious from a consideration of this disclosure that the method and the product obtained by this method result in provision of a frame for the coil of a moving-coil instrument which can be mass-produced with great economy which permits the securing of auxiliary members to the frame with considerable accuracy and in a very simple manner, which requires few and simple components, and which affords utmost economy of both manufacture of the frame and of the assembly of the auxiliary members to the frame.

Of course, it will be understood that, while the invention has here been described by way of a single specific example, its broadest aspects reside in the provision of a frame of the type disclosed in which a pair of spaced, opposite walls are formed with aligned recesses each provided with a bearing, one of these walls having an outer side provided with a second recess surrounding at least a portion of the respective first recess, and a carrier, such as an indicator, provided in this second recess and secured to the respective wall.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of moving-coil instruments differing from the types described above.

What is claimed as new and desired to be secured by Letters Patent is:

**1.** A substantially rectangular frame, particularly for use in the coil of a moving-coil instrument, and adapted to carry a pair of auxiliary members, comprising two pairs of opposed walls, the walls of one of said pairs being provided in the respective outwardly directed faces thereof with a first centrally located recess adapted to receive a bearing member, and with a second annular recess concentric with said first recess and having a given depth so selected as to at least partially receive one of said auxiliary members to be carried by said frame at least substantially flush with the respective outwardly directed face in which said second annular recess is provided.

**2.** A substantially rectangular frame, particularly for use in the coil of a moving-coil instrument, and adapted to carry a pair of auxiliary members, comprising two pairs of opposed walls, the walls of one of said pairs being provided in the respective outwardly directed faces thereof with a first centrally located annular recess adapted to receive a bearing member, and with a second annular recess concentric with said first recess and adapted to at least partially receive one of said auxiliary members to be carried by said frame, said auxiliary members having a given thickness and said second recess having a depth at least equal to said given thickness whereby an outwardly directed surface of a respective one of said auxiliary members will be at most flush with the face of the wall in which said recesses are formed.

**3.** A substantially rectangular frame for use in the coil of a moving-coil instrument or the like and adapted to carry a pair of auxiliary members, comprising two pairs of opposed walls, the walls of one of said pairs being formed in the respective outwardly directed faces thereof with a first centrally located recess adapted to receive a bearing member and having a bottom wall formed with an aperture through which a portion of said bearing member may pass, and a second annular recess concentric with said first recess and having a given depth so selected as to at least partially receive one of said auxiliary members to be carried by said frame at least substantially flush with the respective outwardly directed face in which said second annular recess is provided.

**4.** A frame as defined in claim **3**, wherein said first annular recess has a depth greater than said given depth.

5. A substantially rectangular frame for use in the coil of a moving-coil instrument or the like and adapted to carry a pair of auxiliary members, comprising two pairs of opposed walls, the walls of one of said pairs being formed in the respective outwardly directed faces thereof with a first centrally located annular recess adapted to receive a bearing member formed with a retaining flange, said first annular recess having a bottom wall formed with a depression for receiving said flange and having an aperture within said depression through which a portion of said bearing member may pass, and a second annular recess concentric with said first recess and adapted to at least partially receive one of said auxiliary members to be carried by said frame.

6. A substantially rectangular frame for use in the coil of a moving-coil instrument or the like and adapted to carry a pair of auxiliary members, comprising two pairs of opposed walls, the walls of one of said pairs being formed in the respective outwardly directed faces thereof with a first centrally located circular recess concentric with an axis about which said frame is to turn and having a bottom wall formed with a depression and an aperture passing through said bottom wall within said depression and coaxially with said axis, a second only substantially circular recess concentric with said first recess and adapted to at least partially receive one of said auxiliary members, and a bearing member comprising a flange received in said depression and a shaft extending through said aperture and projecting into the interior of said frame.

7. A frame for moving-coil instruments and the like, comprising a pair of spaced walls located opposite each other and having aligned recesses, one of said walls having an outer side provided with a second recess surrounding at least a portion of the respective first recess; a bearing provided in each of said first recesses; and a carrier provided in the second recess of said one wall and secured to the respective wall.

8. A frame for moving-coil instruments and the like, comprising a pair of spaced walls located opposite each other and having aligned recesses, one of said walls having an outer side provided with a second recess surrounding at least a portion of the respective first recess; a bearing provided in each of said first recesses; and a carrier engagingly received in the second recess of said one wall and secured to the respective wall.

9. A substantially rectangular frame for moving-coil instruments and the like, comprising a pair of spaced walls located opposite each other and having aligned recesses, at least one of said walls having an outer side



provided with a second recess surrounding at least a portion of the respective first recess; a bearing provided in each of said first recesses; and a carrier provided in the second recess of said one wall and secured to the respective wall.

10. A substantially rectangular frame for moving-coil instruments and the like, comprising a pair of spaced walls located opposite each other and having aligned recesses, said walls each having an outer side provided with a second recess surrounding at least a portion of the respective first recess; a bearing provided in each of said first recesses; and a pair of carriers respectively received in said second recesses of said walls and being secured to the respective wall.

11. In a moving-coil instrument, a coil frame comprising a pair of spaced walls located opposite each other; a pair of aligned inwardly directed bearing members on said opposite spaced walls; a recess in the outer side of at least one of said walls at least partly surrounding said bearing member on said one wall and a carrier provided in said recess and secured to said one wall.

12. In a moving-coil instrument, a coil frame comprising a pair of spaced walls located opposite each other; a pair of aligned inwardly directed bearing members on said opposite spaced walls; a recess in the outer side of at least one of said walls at least partly surrounding said bearing member on said one wall and a carrier engagingly received in said recess of said one wall and secured to said one wall.

13. In a moving-coil instrument, a coil frame comprising a pair of spaced walls located opposite each other; a pair of aligned inwardly directed bearing members on said oppositely spaced walls; a recess in the outer space of each of said oppositely spaced walls at least partly surrounding the said bearing member on the respective wall; and a pair of carriers respectively received in said recesses of said walls and being secured to the respective wall.

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ALFRED E. SMITH, Primary Examiner

U.S. Cl. X.R.

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