

July 9, 1940.

J. A. MAURER, JR

2,207,064

OSCILLOGRAPH GALVANOMETER

Filed Aug. 10, 1938

2 Sheets-Sheet 1

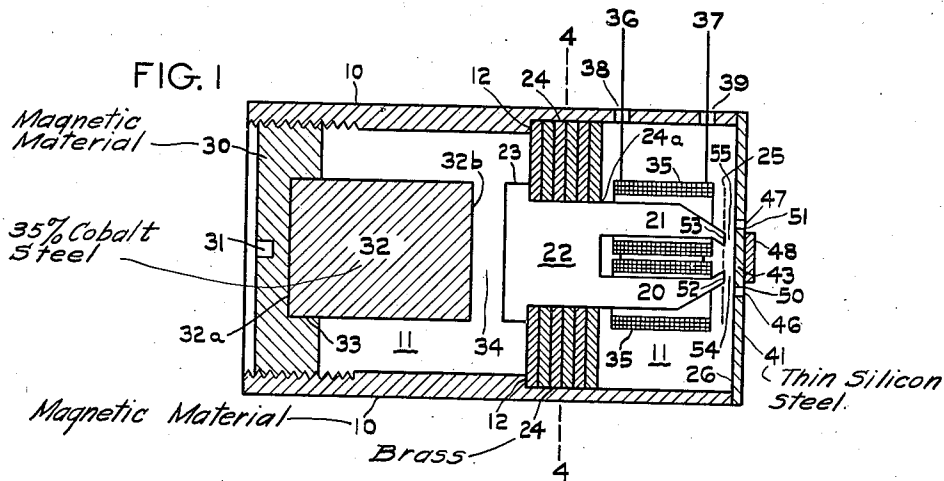


FIG. 3

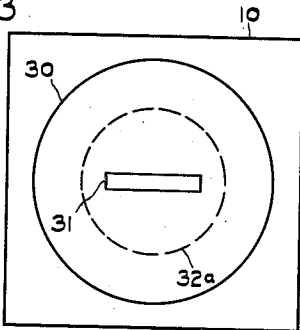


FIG. 4

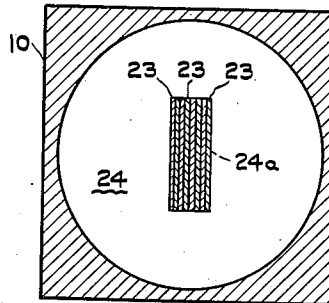


FIG. 5

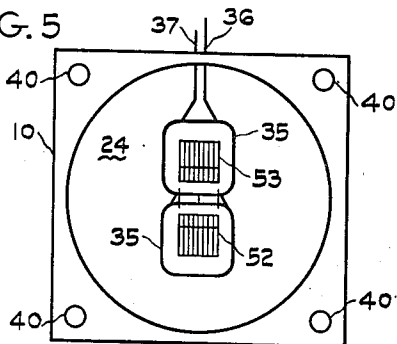
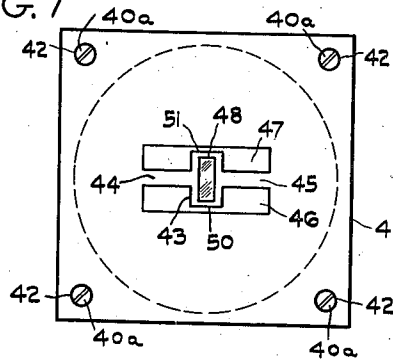


FIG. 7



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FIG. 2

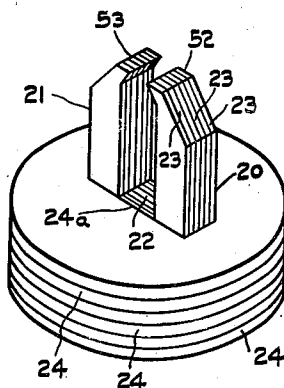
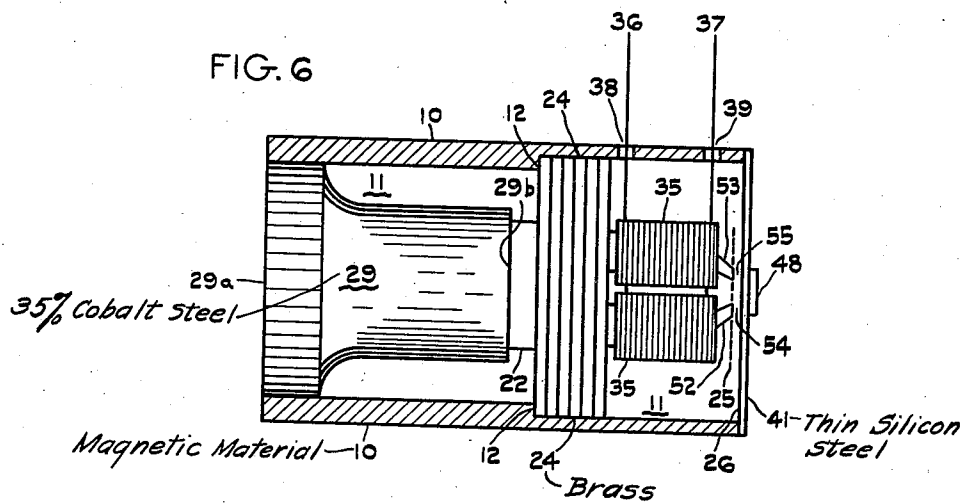


FIG. 6



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OSCILLOGRAPH GALVANOMETER

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Application August 10, 1938, Serial No. 224,069

6 Claims. (Cl. 171—95)

This invention relates to devices which translate alternating electric current signals into corresponding oscillations of a beam of light, and has for its principal object the provision of an improved oscillograph galvanometer suitable for use in connection with recording sound on film, picture transmission, and the like.

Other objects of the invention are the provision of an oscillograph galvanometer which lends itself readily to standard manufacture, which is rugged in structure and of uniform performance over long periods of service and which needs no adjustment once it is properly assembled, but which at the same time is of improved efficiency in response and of improved fidelity in translation. These results are substantially achieved by employing a small number of elements and adapting as many of them as possible to be formed by punch press operations, by making the whole structure compact, by inserting in the field magnetic circuit of the device an air gap which is easily adjustable, by accurately controlling the length of the air gaps that separate the armature from the pole pieces, and by various other features which are set forth in the following description.

The invention will be better understood when the following description is considered with the accompanying drawings, and its scope will be pointed out in the appended claims.

Referring to the drawings:

Fig. 1 is a longitudinal section of an oscillograph galvanometer according to the invention.

Fig. 2 is a perspective view of certain elements thereof.

Fig. 3 is an elevation of the left-hand end of Fig. 1.

Fig. 4 is a section on line 4—4 of Fig. 1.

Fig. 5 is a section on line 26 of Fig. 1.

Fig. 6 shows another oscillograph galvanometer according to the invention; the shell being broken away, and the elements being shown in top view.

Fig. 7 is an elevation of the right-hand ends of Figs. 1 and 6.

Referring first to Figs. 1 to 5 inclusive, there is shown a shell 10, containing the other elements of the oscillograph galvanometer. Shell 10 is made of magnetic material, for example, of steel, and may preferably have rectangular sides and square faces as shown. The interior 11 of shell 10 is cylindrical but has two different diameters, so that a shoulder 12 is formed within the shell 10.

A pair of pole pieces 20 and 21 and a yoke 22, magnetically connecting them together, are made up by assembling laminae 23, 23, . . . of mag-

netic material and of suitable shape, for example, of U-shape as shown in Figs. 1 and 2, as a bundle, and inserting them with a press fit into an aperture 24a of corresponding size in a stack of washers 24, 24, The laminae 23 may preferably consist of silicon steel punchings, and the washers 24 are made of non-magnetic material, for example, brass.

The stack of washers 24 is inserted with a press fit into the larger portion of the interior of shell 10 and seated against the shoulder 12 therein so as to hold the laminae 23 within the shell 10. The dimensions of the parts are so chosen that the plane, in which pole pieces 20 and 21 end and which is indicated in Fig. 1 by the broken line 25, is a short distance inside the plane of the face of shell 10, which is indicated in Fig. 1 by the line 26; line 26 denoting at the same time the back face of the armature support 41.

A mounting block 30 of magnetic material is threaded into the opposite end of shell 10 and is on its outer face, provided with a slot 31 or similar means to receive the blade of a screwdriver or the like for adjusting its position within shell 10. The pole 32a of a permanently magnetized element 32, conveniently of cylindrical form, is mounted in a correspondingly shaped recess 33 in the inner face of block 30. The permanent magnet 32 may be made of steel or preferably of any one of several magnetic materials now available which have high coercive force, such as 35% cobalt steel or the alloys of aluminum, nickel, and cobalt.

The exposed pole 32b of the magnet 32 is faced by the yoke 22, that is, the bottom end of the bundle of laminae 23, and the distance between yoke 22 and pole 32b may be adjusted with considerable accuracy by screwing block 30 in or out. Thus, yoke 22 and pole 32b are separated by an adjustable air gap 34, by the adjustment of which the field strength of the oscillograph galvanometer can readily be controlled.

In a simplified arrangement, shown in Fig. 6, a permanent magnet 29 is fixedly mounted within the shell 10 so that its pole 29a is magnetically connected to the shell 10. This may be accomplished, for example, by giving to the magnet 29 a shape somewhat like a mushroom, as shown, and inserting it with a press fit into that end of shell 10 which has the narrower internal diameter, so that its exposed pole 29b touches or comes close to yoke 22. Thus, air gap 34 may be dispensed with or may be given a definite length, and a device is obtained which still will yield satisfactory results, though it will not give quite as

good performance as though the adjustable air gap 34 were provided in the manner described above.

A bi-polar winding 35 is mounted on a suitable support and placed over the pole pieces 20 and 21, that is, the arms of the bundle of laminae 23. The ends 36 and 37 of the winding 35 leave the shell 10 through holes 38 and 39, and are connected to the source of the alternating signal currents.

On that face of shell 10 near which the pole pieces 20 and 21 terminate, there are provided holes 40, shown in Fig. 5, threaded to receive screws that secure the armature support to this face of shell 10.

The armature may be made integral with its support, as shown in Fig. 7, wherein the armature support 41 is a square plate of magnetic material, for example, thin steel, preferably silicon steel. Holes 42 are provided for the insertion of the screws 40a that enter the holes 40 on the face of shell 10 for securing the support 41 to the shell 10. The armature 43 and the two torsion arms 44, 45, on which it is suspended, are obtained by cutting out from the plate 41 the two apertures 46, 47. A mirror 48 is mounted on the side of armature 43 turned away from the pole pieces 20 and 21, or this side of armature 43 may be polished and rendered reflecting by any suitable means, such as plating.

When the support 41 is fastened to the shell 10 the armature 43 is supported so that its ends 50 and 51 are symmetrically located opposite the poles 52 and 53 of pole pieces 20 and 21, that is, the unsupported ends of the bundle of laminae 23, when no signal currents are being applied to winding 35. The air gaps 54 and 55 separating the ends 50 and 51 of the armature 43 and the poles 52 and 53 can be controlled, when the shell 10 and the stack of washers 24 holding the laminae 23 have been finally assembled, by grinding or lapping the face of shell 10 to a plane surface, and at the same time grinding off the poles 52 and 53, so that their plane indicated by the dotted line 25 in Figs. 1 and 6 will be the required distance below the plane of the face of shell 10, indicated by the line 26 in Figs. 1 and 6. The distance between planes 25 and 26 can be measured very accurately by means of a micrometer depth gauge or the like, and this distance once established is not subject to errors arising from any subsequent assembling operations.

The above description is merely to illustrate certain presently preferred embodiments of the invention, and many other ways of carrying it out will readily suggest themselves to those skilled in the art. The invention, therefore, is not to be limited, except in so far as is necessitated by the prior art and by the spirit of the appended claims.

What is claimed is:

1. An oscillograph galvanometer including a shell of magnetic material; a mounting block of magnetic material threaded into one end of said shell and adapted to be screwed in and out of said shell; a permanent magnet having two poles and secured by one of said poles on the inner face of said block; a stack of non-magnetic washers mounted within said shell; a bundle of U-shaped laminae of magnetic material inserted into said stack of washers, the bottom end of

said bundle of laminae facing the other pole of said permanent magnet; a bi-polar winding placed over each arm of said bundle of laminae; a support of magnetic material secured to the other end of said shell; and an armature supported by said support opposite the unsupported ends of said bundle of laminae, the ends of said armature and said unsupported ends being separated by air gaps.

2. An oscillograph galvanometer including a shell of magnetic material; a permanent magnet having two poles and mounted within said shell, one of said poles being magnetically connected to one end of said shell; a pair of pole pieces magnetically connected together and held by non-magnetic means within said shell, their magnetic connection facing the other pole of said permanent magnet; means for adjusting the distance between said magnetic connection and said other pole of said permanent magnet; a bi-polar winding placed over said pole pieces; a support of magnetic material secured to the other end of said shell; and an armature supported by said support opposite the poles of said pole pieces; the ends of said armature and said poles of said pole pieces being separated by air gaps.

3. In an oscillograph galvanometer a permanent magnet having two poles; a pair of pole pieces magnetically connected together with their magnetic connection facing one of said poles; and means for adjusting the distance between said magnetic connection and said pole.

4. An oscillograph galvanometer including a shell of magnetic material; a permanent magnet having two poles and mounted within said shell, one of said poles being magnetically connected to one end of said shell; a pair of pole pieces magnetically connected together and held by non-magnetic means within said shell, their magnetic connection facing and separated by an air gap from the other pole of said permanent magnet; a bi-polar winding placed over said pole pieces; a support of magnetic material secured to the other end of said shell; and an armature supported by said support opposite the poles of said pole pieces, the ends of said armature and said poles of said pole pieces being separated by air gaps.

5. In an oscillograph galvanometer a permanent magnet having two poles; and a pair of pole pieces magnetically connected together with their magnetic connection facing and being separated by an air gap from one of said poles.

6. An oscillograph galvanometer including a shell of magnetic material; a permanent magnet having two poles and mounted within said shell, one of said poles being magnetically connected to one end of said shell; a pair of pole pieces magnetically connected together and held by non-magnetic means within said shell, their magnetic connection facing and touching the other pole of said permanent magnet; a bi-polar winding placed over said pole pieces; a support of magnetic material secured to the other end of said shell; and an armature supported by said support opposite the poles of said pole pieces, the ends of said armature and said poles of said pole pieces being separated by air gaps.

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