

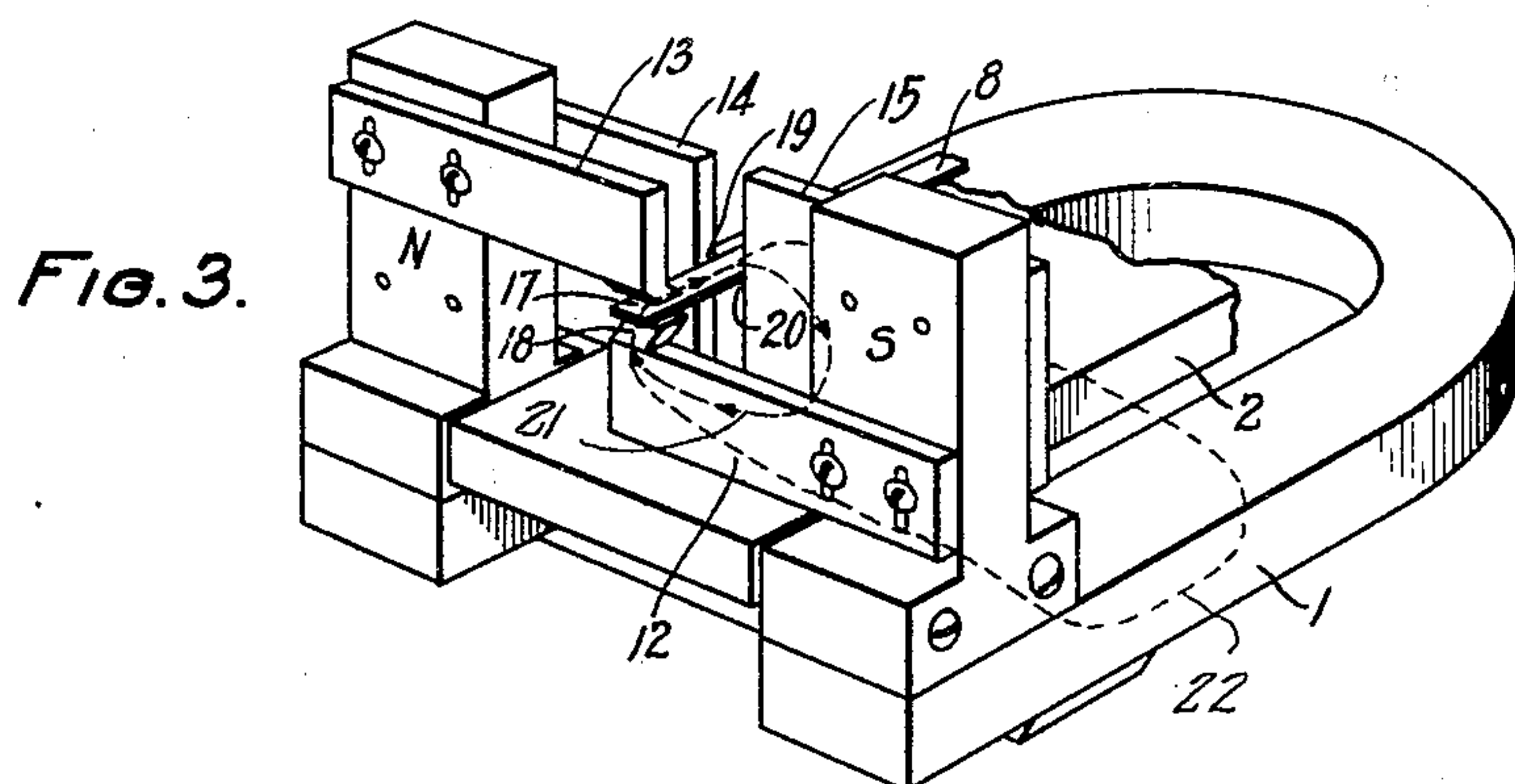
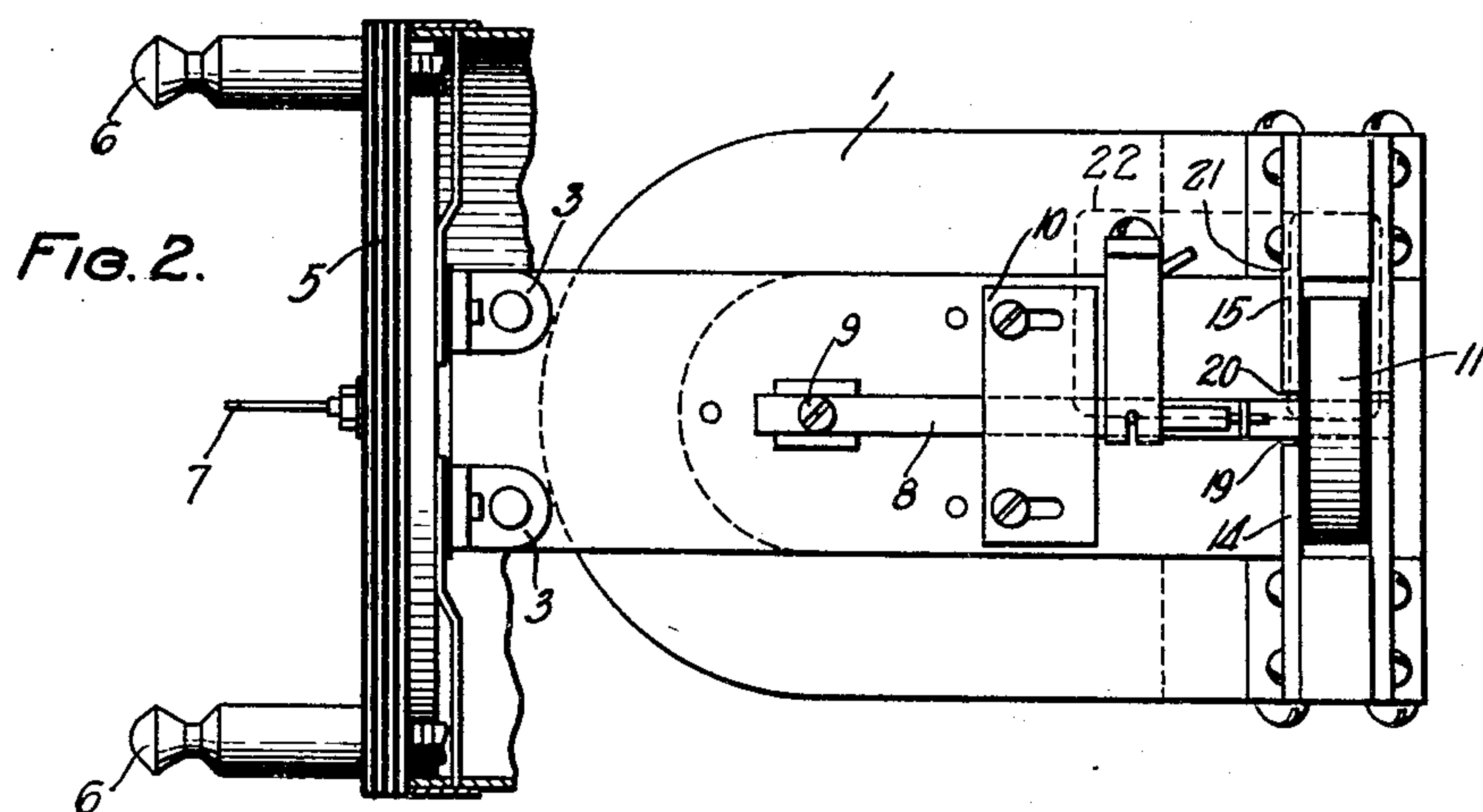
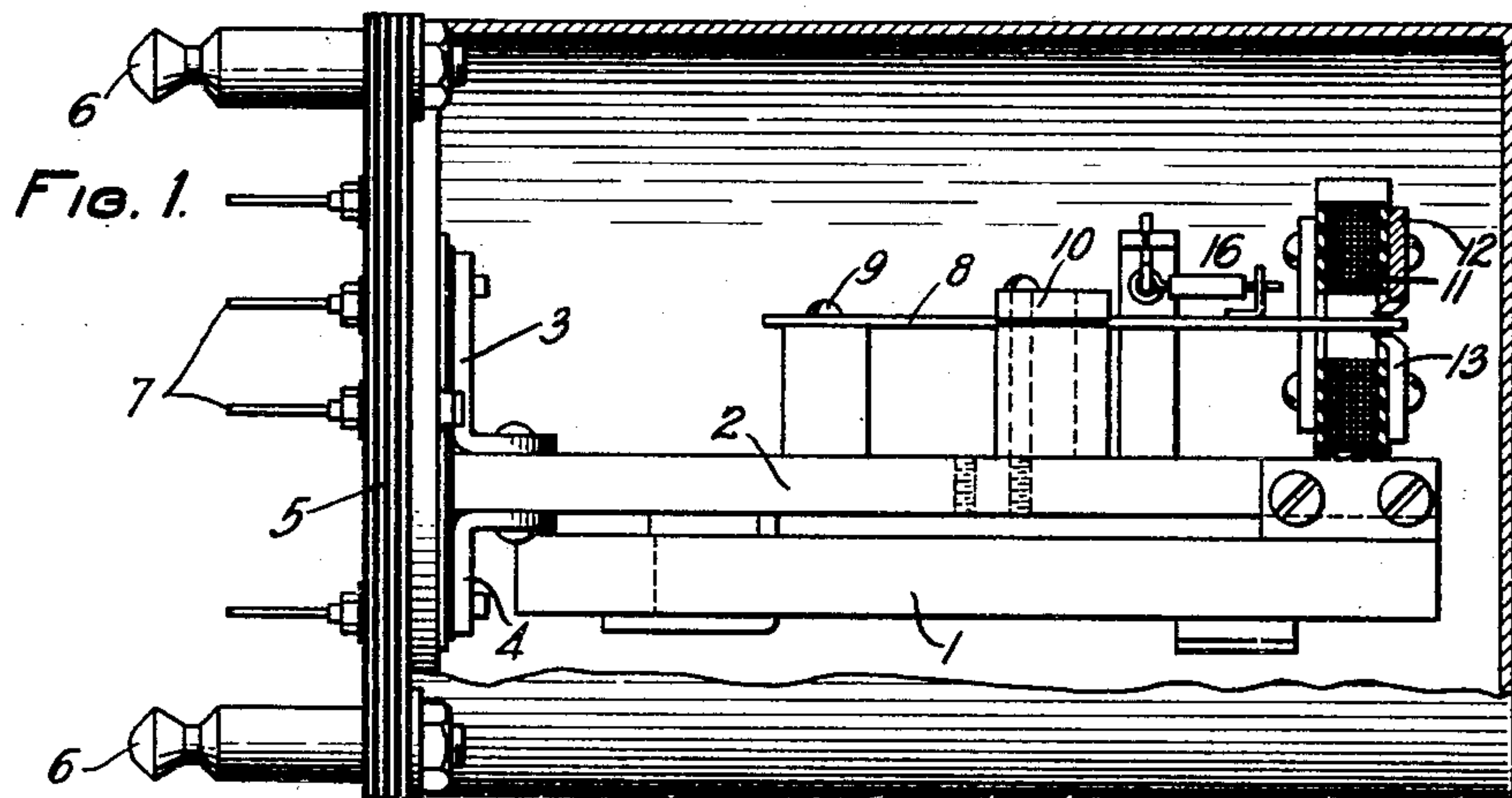
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RELAY

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RELAY

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This invention relates to relays and more particularly to alternating current relays for signaling circuits.

It is the object of the invention to provide a relay which is very sensitive, easy to adjust and capable of adjustment for satisfactory operation over a wide range of frequencies.

In accordance with the general features of the invention, these requirements are met by a polarized relay of the tuned reed type in which the armature, under the influence of the signaling currents, vibrates between pole faces arranged to provide two fixed and two working gaps. An adjustable clamp of magnetic material is adapted to vary the tuning of the reed armature and is so arranged with respect to the magnet system that it serves also to lower the reluctance of the return path of the signal flux.

These and other features of the invention will be understood from the following description and the accompanying drawing. In the drawing, Fig. 1 represents a relay embodying the invention and shows the coil and pole-pieces in cross section. Fig. 2 is a different view of the relay which shows more clearly the novel features of the magnetic circuit, and Fig. 3 is a perspective view with the coil removed to show particularly the arrangement of the rear pole-pieces and the path of the signal flux.

Inasmuch as this invention consists essentially of a novel arrangement of the armature and pole-pieces, the general features of the relay which are common to all polarized devices of this sort and form no part of the present invention, will be described only very briefly.

A permanent magnet 1 for supplying the polarizing flux is attached to a relay base 2 which is in turn supported by brackets 3, 3 and 4, 4 to the mounting base 5 which is equipped with suitable mounting posts 6, 6 and terminals 7 for adapting the relay for use in a standard receptacle. The reed armature 8 is pivoted at one end by a screw 9 and clamped by the adjustable magnetic clamp 10 which may be moved along the reed armature to adjust its resonant frequency to the desired value. The other end of the arma-

ture is surrounded by a coil 11 which receives the signal currents from the external circuit through terminals 7. The members 12 and 13 are arranged to form front pole-pieces above and below the armature respectively and the members 14 and 15 are arranged to form rear pole-pieces with faces terminating at the sides of the armature so that the reluctance of the gaps will be unchanged as the armature vibrates in response to the signal currents. A loose contact device 16, such as that disclosed in Patent 1,628,991, is mounted on the armature in such a way that its contacts which are connected in the circuit which the relay controls, will be opened when the armature vibrates with sufficient amplitude. The pole-pieces 12 and 13 are provided with transverse slots as indicated so that the front gaps 17 and 18 may be made exactly equal after the armature has been adjusted to the required frequency. Under this condition, a flux will flow from the north to the south pole of the magnet through both sets of pole-pieces, but there will be no tendency to displace the armature.

Assume then that a signal pulse traverses the coil 11 in such a direction as to set up in the armature a flux flowing toward its pivot point. Since the rear gaps are very small, say of the order of .005 of an inch, this flux will circulate around the magnetic circuit including the armature and pole-pieces 15 and 12 as shown by short dashes in Fig. 3. Under this condition, the armature no longer will be in equilibrium but will be deflected upward, since the signal flux opposes the polarizing flux in gap 18. When a signal pulse traverses the coil in the opposite direction, the pull between the armature and the pole-piece 13 will be decreased in a similar manner so that the armature will be deflected downward. If these signal pulses occur at substantially the frequency to which the reed is tuned, the armature will respond sufficiently to operate the loose contact device.

This type of construction employing only two working gaps instead of 4 has several advantages over conventional designs. It is found in such devices that each time the

armature clamp is moved to modify the tuning that the armature becomes slightly biased toward one pole-piece or the other so that the pole-pieces must be readjusted to equalize the gaps. In a relay according to the present invention only gaps 18 and 19 require adjustment and these are made readily accessible by merely removing the relay cover. The rear gaps 19 and 20 being of constant reluctance regardless of the position of the armature, limit the flux density which can be built up in that member and therefore overcome to a large extent the tendency of the armature to stick on either pole-piece when the relay is being operated at high sensitivity, that is to say, with very small gaps. This advantage may be utilized in either of two ways, the working gaps may be made smaller than would be practical heretofore, thereby increasing the sensitivity, or the relay may be used with a greater free length of armature, that is, may be tuned to lower frequencies.

A relay of the type described operates quite satisfactorily with a non-magnetic clamp but it has been found that the sensitivity is somewhat further improved by using a magnetic clamp. While the reason for this has not been determined definitely, it is believed that due to the small area of the armature opposite the rear pole-pieces, it has a tendency to become saturated at that point and that this condition is relieved by lowering the reluctance of the leakage path between the armature and the permanent magnet. The manner in which this is accomplished will be evident from the drawing. The lower portion of the clamp 10 constitutes a low reluctance leakage path extending over the greater portion of the distance separating the legs of the magnet 1 hence while most of the signal flux will follow the path indicated by the dotted line 21 in Figs. 2 and 3 the remainder will flow up the armature to the clamp 10 and through the air to the upper pole of the magnet as indicated by the dotted line 22. Obviously then this leakage path is in parallel with the fixed air gap 20 so that the leakage flux relieves the saturation at the sides of the armature but the reluctance of the leakage path is still too high to have any considerable effect on the strength of the polarizing flux.

It is understood, of course, that the invention is independent of any theory of operation and that it is intended to limit it only by the following claims.

What is claimed is:

1. A magnetic circuit for electromagnetic devices comprising a reed type armature and a magnet having two sets of pole faces at right angles to each other and adjacent to the armature.

2. A magnetic circuit for electromagnetic

devices comprising a reed type armature secured by a magnetic clamp and a magnet having two sets of pole faces at right angles to each other and adjacent to the armature, the magnetic clamp forming part of a return circuit for the flux of the magnet.

3. An electromagnetic device comprising a magnet having two north and two south polar extensions forming two sets of north and south poles; a coil positioned between the polar extensions, an armature extending between the polar extensions and through the coil, the pole faces of one of the sets of the polar extensions being parallel to the direction of vibration of the armature.

4. In an electromagnetic device, an electric circuit and a magnetic circuit, the electric circuit comprising a coil in operable relation to the magnetic circuit and the magnetic circuit comprising a reed type armature, an adjustable clamping device securing the armature and a magnet with poles bifurcated to form air-gaps with the armature, two of the gaps being independent of the clamping device and of substantially constant reluctance for all working positions of the armature.

In witness whereof, I hereunto subscribe my name this 20th day of November, 1928:
EDWARD J. PRATT.

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