

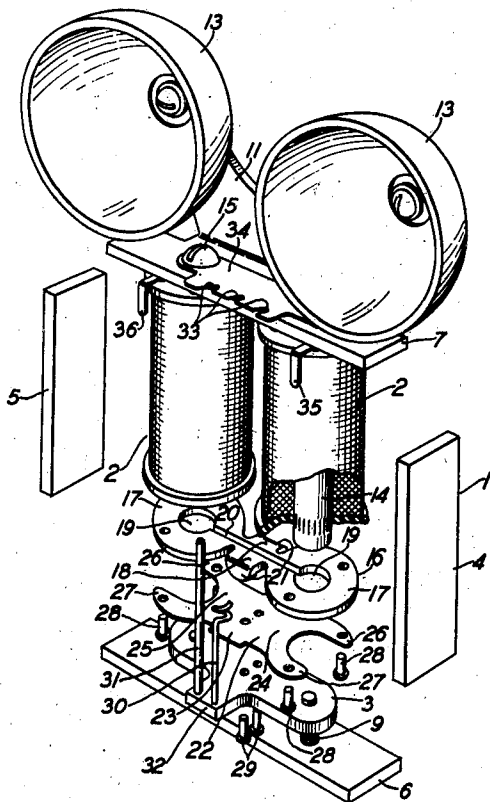
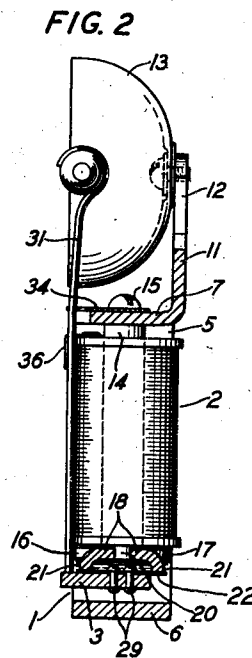
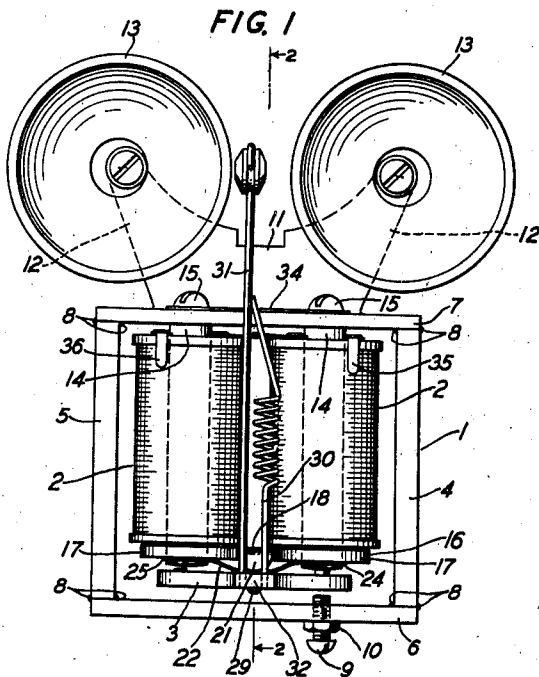
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ELECTROMAGNETIC DEVICE

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ELECTROMAGNETIC DEVICE

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This invention relates to electromagnetic devices and more particularly to electromagnetic devices employing a pair of operating coils and a centrally pivoted armature.

5 An object of the invention is to provide in a device of the type above mentioned improvements which will make the device better suited to meet certain conditions in service.

A feature of the invention resides in a spring support for the armature.

Another feature resides in the yoke structure supported on the cores of the electromagnets.

Another feature resides in an adjustable back-stop for the armature.

15 Other features reside in the particular structure and arrangement of the parts in combination.

One application of the invention is in electromagnetic devices commonly known as telephone ringers and is, therefore, shown and described as embodied therein merely for the purpose of explaining the invention.

In the drawing:

Fig. 1 is a front face view of a telephone ringer embodying the invention;

Fig. 2 is a side view, partly in section, and taken on the line 2—2 in Fig. 1; and

Fig. 3 is a view in perspective and partly in section of the ringer and with portions of the structure shown in exploded form.

The electromagnetic device shown in the figures in the drawing comprises a permanent magnet structure 1, a pair of operating coils 2 and a centrally pivoted armature 3.

35 The permanent magnet structure 1 is made in the form of a rectangular frame and comprises two permanently magnetized bars 4 and 5 arranged in parallel spaced relation. A bar 6 of magnetic material which may be readily drilled and tapped and which will hold, under conditions of long service, a screw thread formed therein is bridged across ends of the magnetized bars 4 and 5 at one end of the frame structure. A plate 7 of magnetic material is bridged across the bars 4 and 5 at the other end of the frame structure. End portions of the bar 6 and the plate 7 are securely fastened to the adjacent ends of the bars 4 and 5 in any manner found convenient for providing a good magnetic path through the parts. The parts of the permanent magnet structure are shown for instance as welded together at the points 8. The bar 6 of magnetic material is drilled and tapped to support a machine screw 9 of non-magnetic material. The screw 9 extends toward the back face of the armature 3

and is arranged to serve as an adjustable back-stop for one end portion of the armature. A lock nut 10 is provided on the screw 9 to hold the screw in adjusted position. The plate 7 of magnetic material may be an integral part of a bracket 11 on the diverging arm portions 12—12 of which are supported spaced bells 13—13 of the ringer. The permanent magnets are magnetized in the assembly 1 from the center of plate 7 to the center of bar 6. The operating coils 2—2 are arranged in parallel spaced relation within the space defined by the permanent magnet structure 1. The cross 14—14 of the operating coils 2—2 are supported on the plate 7 by means of the screws 15—15 and project toward the bar 6 of the permanent magnet structure 1.

A yoke 16 of non-magnetic material is supported on the unsecured end portions of the cores 14—14. The yoke 16 comprises two enlarged spaced end portions 17—17 joined by a bridge portion 18. Each of the end portions 17 as shown in Fig. 3 is apertured at 19 to frictionally receive the free end portion of a core 14. The yoke 16 as above mentioned is made of non-magnetic material and since a portion of the yoke as will be subsequently explained is used as a fulcrum for the armature 3, the yoke structure must be substantially strong and rigid. It is common practice to make such parts of brass since this material is sufficiently strong for the purpose and is not magnetic. In the yoke structure I have made a departure from the usual practice of simply providing round apertures in the end portions to receive end portions of the cores of the operating coils. In the yoke structure I have devised, an elongated aperture 20 is provided in the bridge portion 18. The aperture 20 extends longitudinally of the bridge portion 18 and through portions of the enlarged end portions 17—17 and into communication with the apertures 19—19. This makes the end portions 17—17 incomplete rings at the unsupported ends of the cores 14—14 and reduces eddy current effects in the device. Lugs 21—21 are provided on the bridge portion 18 to serve as fulcrum points for the armature structure. The lugs 21—21 are in register with each other and extend downwardly from the plane of the lower face of the yoke 16 and are located on opposite sides of the bridge portion 18. The lower ends of the lugs 21—21 are made rounded to provide good rocking points for the armature 3.

The armature 3 is made of magnetic material and is supported by means of a spring 22. The spring 22 in its original form and before being

incorporated into the electromagnetic device is substantially flat as shown in Fig. 3, and comprises a central portion 23 and the end portions 24 and 25. The spring 22 may be made of sheet metal or any other material found suitable for the purpose. The end portions 24 and 25 are bifurcated, the paired leg portions 26 and 27 on each end being adapted to pass partially around the apertures 19 in the yoke 16 and being secured to the yoke 16 by suitable fastening means such as the rivets 28. The central portion 23 of the spring 22 is secured to the central portion of the armature 3 by suitable fastening means such as the spaced rivets 29. The spring 22 is interposed between the armature and the yoke and extends longitudinally of the yoke and armature. The bifurcated formation of the end portions of the spring permits free movement of the end portions of the armature to the ends of the cores of the operating coils. When the leg portions of the spring 22 are secured to the yoke 16 and the central portion of the spring is secured to the central portion of the armature 3, and the yoke 16 is forced into required position on the cores 14, the spring 22 takes a bowed formation as shown in Fig. 1. The deformation of the spring 22 from its original flat condition shown in Fig. 3 to the bowed formation shown in Fig. 1, builds up sufficient tension in the spring 22 to continually urge the central portion of the armature toward the rounded ends of the lugs 21 on the yoke 16. I have found it preferable to have the central portion of the spring 22 wide enough to span the lugs 21—21 so that the central portion of the spring is interposed between the inner face of the armature and the rounded ends of the lugs 21. This maintains the central portion of the spring in bowed formation. The arrangement also makes the spring take the wear rather than the armature when the armature is rocked under the influence of the operating coils. I have found that when the armature 3 is supported by the means above described, the wearing of the parts in service is negligible since as the armature is rocked back and forth, the bowed portion of the spring 22 simply rocks over the rounded end portions of the lugs 21—21 with comparatively no friction between the engaged parts. The means I have devised for supporting the armature is therefore superior to journal or pin type supports commonly found in devices of the type described and in which there is considerable friction at the points of support and appreciable wearing away of the parts in service. Temperature changes met in service do not affect the operation of my device since it contains no pin or journal type bearings in which the associated parts expand or contract under changes in temperature and cause binding or loosening of the engaging parts in the bearing structure. I have

also found that the means devised for supporting the armature is superior to reed type spring arrangements which are sometimes twisted beyond their elastic limits and thus are given an abnormal permanent set when the device is dropped to a floor or otherwise roughly handled. The spring in my device is comparatively wide and extends longitudinally of and between the yoke and the armature. It is anchored at each end at rather widely separated points to the yoke and is secured at its central portion to the central portion of the armature by spaced rivets or other suitable fastening means. In the event that the device is dropped to a floor or otherwise subjected to ordinary careless handling, the resulting forces on the spring are distributed over a large area and longitudinally of the spring rather than transversely of the spring and at some concentrated point.

The device shown for illustrating the invention is a polarized ringer provided with a biasing spring 30 and a bell striker. The biasing spring 30 and the bell striker rod 31 are mounted in spaced relation on a lug portion 32 of the armature 3 and extend in parallel spaced relation to the operating coils as well known in the art. The free end portion of the biasing spring may be adjustably placed in notches 33 in a plate 34 of non-magnetic material to obtain the required bias of the armature. The plate 34 is held by means of the screws 15—15 against the plate 7 of the magnet structure 1. The notched portion of the plate 34 extends beyond the adjacent edge portion of the plate 7. Terminals 35 and 36 are provided on the operating coil structure to permit the connection of the device to wires of a circuit.

What is claimed is:

1. In an electromagnetic device comprising a pair of electromagnets supported in parallel spaced relation, an armature operated by means of said electromagnets and a yoke extending across and supported on said electromagnets, spaced projections on said yoke extending normal to the plane of said yoke and a bowed spring secured at its end portions to said yoke and secured at its central portion to the central portion of said armature and pivotally supporting said armature on said projections.

2. In an electromagnetic device comprising a pair of electromagnets supported in parallel spaced relation, and a centrally pivoted armature operated by means of said electromagnets, a yoke supported on the cores of said electromagnets, a spring having its opposite end portions secured to said yoke and a central portion secured to said armature, and projections on said yoke extending into engagement with the central portion of said spring and serving as a fulcrum for said armature.

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