

May 29, 1934.

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1,961,058

MAGNETIC INTERRUPTER

Filed June 8, 1933

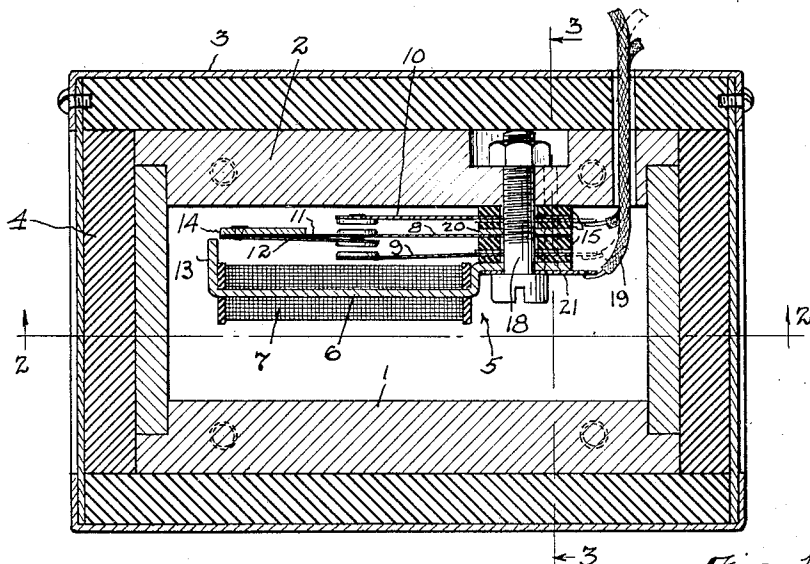


Fig. 1

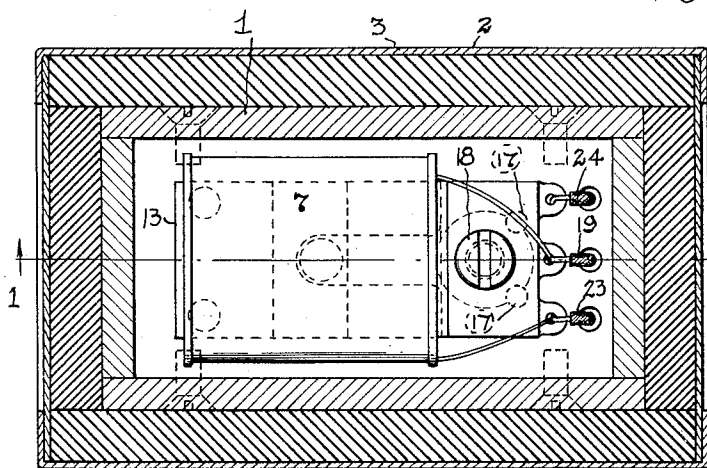


Fig. 2

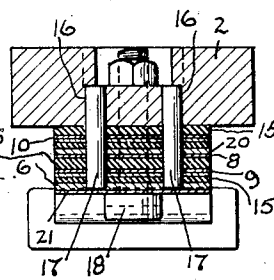


Fig. 3

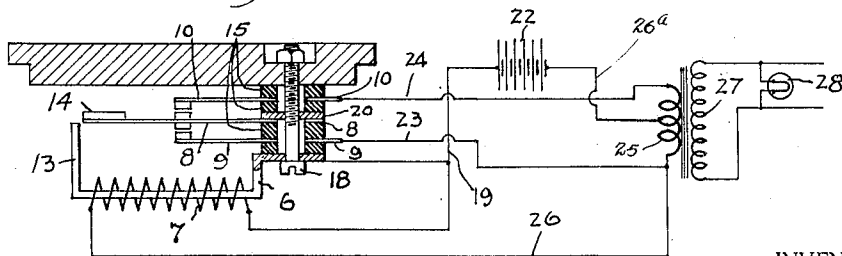


Fig. 4.

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1,961,058

MAGNETIC INTERRUPTER

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Application June 8, 1933, Serial No. 674,885

5 Claims. (Cl. 200—90)

This invention relates as indicated to magnetic interrupters and more particularly to magnetic interrupters of the character employed for the purpose of converting constant unidirectional current to pulsating and/or alternating current.

It is among the objects of my invention to provide a magnetic interrupter and the means for supporting the same so as to reduce to a minimum the hum and/or vibration usually incidental to the operation of apparatus of this character.

It is a further object of my invention to provide a magnetic interrupter in which the several parts necessary to be assembled to form the completed apparatus may be formed and so assembled in such manner and with such facility as to reduce the manufacturing cost of the apparatus and without a sacrifice of quality in the finished product.

A further object of my invention is to provide an interrupter of the character described in which the electromagnet or more specifically the armature thereof, as well as the vibratory reed, are both movable, at least to a limited extent whereby certain desirable characteristics incidental to the operation of the device are secured, particularly when employed in conjunction with a transformer.

Another object of my invention is to provide a magnetic interrupter of the character described particularly applicable to be used for the purpose of low voltage unidirectional current to high voltage pulsating and/or alternating current for use in the operation of radios, luminous tube lamps and the like.

Other objects of my invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention, then consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawing:—

Figure 1 is a transverse sectional view of an apparatus constructed in accordance with the principles of my invention taken on planes substantially indicated by the line 1—1 of Figure 2; Figure 2 is a transverse sectional view of the apparatus illustrated in Figure 1 taken on a plane substantially indicated by the line 2—2; Figure 3 is a fragmentary sectional view of the apparatus

illustrated in Figure 1 taken on a plane substantially indicated by the line 3—3; and Figure 4 is a diagrammatic representation of the apparatus illustrated in the previous figures shown in conjunction with a transformer.

Referring now more specifically to the drawing and more especially to Figures 1 and 2, the magnetic interrupter presently to be described is, according to the principles of my invention, mounted within and supported by an inner box generally indicated at 1, preferably formed of non-magnetic material. The base 2 upon which the interrupter is mounted forms one side of this inner box. The inner box 1 is contained within the outer box generally indicated at 3, also preferably formed of non-magnetic material. The boxes 1 and 3 are spaced apart and separated by means of a plurality of slabs of some suitable soft resilient material 4, such as sponge rubber.

Enclosing the magnetic interrupter in the above defined manner reduces to a minimum the vibration and hum usually incidental to the operation of apparatus of this character and supporting the interrupter within the closed space defined by the several boxes and layers of insulating material is effective to exclude air from the space surrounding the interrupter so that the harmful effect of any arcing which may take place at the contacts is reduced to a minimum.

The magnetic interrupter proper comprising my invention consists of an electro-magnet, generally indicated at 5 which consists of a core 6 and an electro-magnet coil, generally indicated at 7, which, for convenience, is wound on the core 6.

Positioned in substantial parallel relation to the coil 7 are a vibratory reed, generally indicated at 8 and a pair of contact arms generally indicated at 9 and 10.

The reed consists of a main blade 11 and an auxiliary blade 12 secured to one end thereof, such blades carrying contact members of the usual type on their opposite faces. The core 6 of the electro-magnet is preferably terminally bent laterally, as at 13, and extends adjacent the free end of the reed to which a block of magnetic material, or an armature, generally indicated at 14, is secured. The core 6, the reed 8 and the contact carrying blades 9 and 10 are all supported at one end only, in a pillar formed by the ends of such members and alternate layers of insulating material such as 15.

In order to facilitate manufacture and assembly of the parts and particularly in insulated relation, the base 2 is provided with a pair of spaced apertures 16 into which are set close-fit-

ting pins 17 formed of insulating material. The several elements which are supported at their one end in the pillar and in non-conductive relation are provided with apertures which closely fit the pins 17 so that these pins serve as the means whereby the several elements forming the supporting pillar are maintained in predetermined relation. Centrally of the pins 17, the various elements forming the supporting pillars are provided with enlarged axially aligned apertures through which a bolt 18 extends and by means of which the several components of the pillar are rigidly secured to the base 2.

By employing the locating pins 17 of insulating material for maintaining the several parts in predetermined relation and by passing the securing bolt 18 through an enlarged aperture in the pillar, it is not necessary to provide insulating means other than the air space between the sides of the bolt and the several blades and reed. In this fashion, the cost of manufacture is considerably reduced and the assembly of the device greatly facilitated.

In order to provide electrical communication between an incoming lead such as 19 and the reed 8, I may prefer to employ a block of electrical conductive and magnetic material 20, which has the central aperture therein either threaded or in such close fitting engagement with the bolt 18 as to be in electrical and magnetic communication therewith. By providing a plate 21 of conducting material under the head of the bolt 18 and connecting the lead 19 to such plate, communication with the reed 8 through the bolt 18 and layer 20 may be had. This makes possible a connection to the reed which is much superior to that which could be secured by soldering or similarly securing the lead 19 directly to the reed. The plate 20 being formed of magnetic material assists in completing the magnetic circuit for the flux generated by the winding 7, i. e., the return flux through the reed 8 is carried by the plate 20 which is in magnetic communication with the bolt 18, the latter being of magnetic material and in contact with the core 6.

It will be noted that the reed and the electro-magnet or more specifically the core thereof, are both secured cantilever-wise at only one end, which reduces the mechanical resistance of the reed to vibration so as to increase the efficiency of the interrupter.

Supporting the electro-magnet at only one end also permits the electro-magnet to vibrate in addition to the vibration of the reed. This also increases the efficiency of the apparatus.

Positioning the electro-magnet in overlying relation to the reed makes possible the arrangement of its poles in such a manner as to more effectively influence the reed when the magnet is energized than if such magnet were positioned entirely at one end of the reed.

By having reference to Figure 4, the operation of the apparatus above described will now be briefly explained:—The lead identified in the foregoing description by the ordinal 19 is connected in the manner previously explained with the reed 8 and is also connected to one side of the winding 7 of the electro-magnet 5. This lead 19 may be connected to one side of any suitable source of supply for a unidirectional current such as the battery 22. The contact carrying blades 9 and 10 are respectively provided with leads 23 and 24, which are respectively connected to the opposite ends of the primary winding 25 of a transformer. The other side of the winding 7 of

the electro-magnet is also connected to one end of the winding 25 by means of a lead 26. The other side of the battery 22 is connected by means of a lead 26a to approximately the midpoint of the winding 25.

The secondary winding 27 of the transformer may have any suitable resistance such as a lamp 28 connected thereacross. Assuming that the circuit as illustrated in Figure 4 from the battery is closed, preferably by means of a switch in series in the lead 19 so as to establish the circuit illustrated in said figure and with the parts as illustrated in Figure 4, the only path for current flow in the circuit including the battery is through the lead 19, magnet winding 7 and back to the battery through lead 26, winding 25 and lead 26a. This will energize the coil 7 forming an electro-magnet of the core 6. The pole piece 13 of the core 6 will, when energized in this fashion, attract the block of magnetic material or armature 14 secured to the end of the reed. When the reed is thus attracted to the magnet when energized, this attraction will move the reed into contact with the lower blade 9, thereby short-circuiting the coil 7 through the lead 23. The amount of current flowing in the coil 7 is, therefore, considerably reduced so that the strength of the magnet is no longer sufficient to overcome the spring action of the reed, whereupon the reed will snap up and over-carry into contact with the upper blade 10.

When the reed makes contact with the upper blade 10, a flow of current will be established through the upper portion of the winding 25, but in a direction opposite to the flow of current in the lower portion of such winding. Vibration of the reed 8 between the blades 9 and 10 will, therefore, result in the establishment of alternating magnetic flux threading the secondary winding 27 of the transformer.

As soon as contact between the reed 8 and the lower blade 9 is broken, the coil 7 is again energized so that the magnet reasserts its influence on the armature 14 to move the reed back into contact with the blade 9, thereby maintaining continuous vibration of the reed between the blades 9 and 10 at a rate depending upon the excitation of the winding 7, as well as the natural period of the several moving parts of the apparatus, so that each is permitted to vibrate to a certain extent, the current impulse produced by the interrupter will be sharply defined so that as the magnetic lines of force incidental to the flow of these current impulses through the primary winding 25 thread the secondary winding 27, a high potential alternating current will be generated which is particularly characterized by flattened tops on the nodes of the wave produced by an oscillograph analyzing the output of the transformer.

The apparatus comprising my invention, due to its simplicity of construction, low cost of manufacture, small size for a given output, as well as the character of its output, is particularly applicable to be used in connection with apparatus such as radios and luminous tube display signs. The apparatus has been demonstrated as particularly useful in the operation of luminous tube signs on automobile vehicles and the like where low potential direct current only is available. The principles of my invention are, of course, applicable to a wide variety of uses other than those enumerated and it is to be understood that the use of the invention is not limited to the ex-

amples of its use which have been chosen for purposes of illustration.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I, therefore, particularly point out and distinctly claim as my invention:

1. In a magnetic interrupter, the combination of an electro-magnet comprising a bar-like core supported in cantilever fashion at one end thereof, a winding about said bar, a vibratory reed arranged in parallel relation to said core and likewise supported at only one end, and an armature supported upon the reed and adjacent the end of said reed, said armature having substantially the same cross sectional area as said core.

2. In a magnetic interrupter, the combination with an electro-magnet, of a vibratory reed adjacent said magnet, said reed comprising a blade of resilient material supported only at one end, a second blade of resilient material secured only at one end to the free end of said first-named blade, contact members carried by the opposite faces of said reed blades, resilient blades on opposite sides of said reed and supported only at one end adjacent the fixed end of said reed, and contact members on the opposed faces of said last-named blades.

3. In a magnetic interrupter, the combination of an electro-magnet comprising a bar-like core supported in cantilever fashion at one end thereof, a winding about said bar, a vibratory reed arranged in parallel relation to said core and likewise supported at only one end, and an armature supported upon the reed and adjacent the end of said reed, said armature having substantially the same cross sectional area as said core, said reed comprising a plurality of substantially parallel resilient blades secured together at one end only and to which said contact members are respectively secured.

4. In a magnetic interrupter, the combination of a supporting base, an electro-magnet coil, a flat bar core within said coil upon which the latter is supported, a vibratory reed adjacent said coil and parallel with said core, and means respectively supporting said reed and core at only one end of said base.

5. In a magnetic interrupter, the combination of a supporting base, an electro-magnet coil, a flat bar core within said coil upon which the latter is supported, a laterally extending pole piece on said core, a vibratory reed adjacent said coil, and means supporting said reed and core in substantially parallel relation and in cantilever beam fashion on said base.

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