June 14, 1938. B. MISHELEVICH 2,120,339

ELECTROMAGNETIC DEVICE

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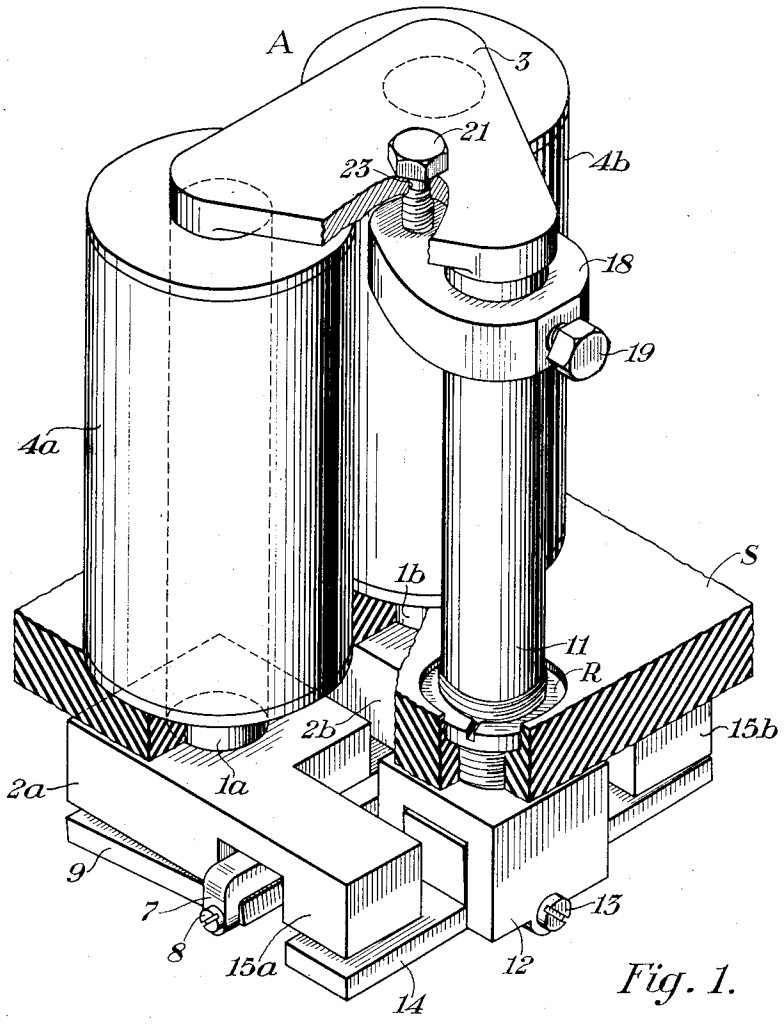


Fig. 1.

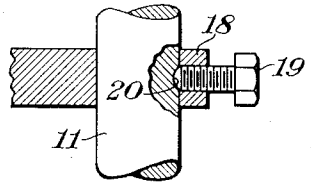


Fig. 1a.

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ELECTROMAGNETIC DEVICE

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My invention relates to electromagnetic devices, and particularly to polarized relays of the type having a permanent magnet and the cores of an electromagnet connected in a common magnetic flux path by a back strap.

An object of my invention is to provide new and novel means for connecting the back strap to the permanent magnet and to the cores of the electromagnet in such a manner as to provide highly efficient magnetic paths between the cores.

I will describe one form of electromagnetic device embodying my invention, and will then point out the novel features thereof in claims.

In the accompanying drawing, Fig. 1 is an isometric view, partly in section, illustrating one form of apparatus embodying my invention; while Fig. 1*a* is a detailed view, partly in section, of a portion of the apparatus embodying my invention not visible in Fig. 1.

Similar reference characters refer to similar parts in each of the views.

Referring to the drawing, the reference character A designates a polarized relay having the usual enclosing frame of which the top plate S is the only part shown in the drawing. The relay comprises an electromagnet having cores 1*a* and 1*b*, which pass through suitable holes in the top plate S and terminate in pole pieces 2*a* and 2*b* on the underside of the top plate. The cores 1*a* and 1*b* are provided with the usual windings 4*a* and 4*b*, respectively. The relay also comprises a permanent magnet 11 which passes through a hole in the top plate S and terminates in a pole piece 12 on the underside of this top plate. The permanent magnet 11 and the cores 1*a* and 1*b* are rigidly attached to the top plate S by the usual threaded rings R, the ring on the permanent magnet being the only one which is illustrated in the drawing. The upper ends of the cores 1*a* and 1*b* and the upper end of the permanent magnet 11 are connected by a triangular back strap 3. The upper ends of the cores and the permanent magnet, as well as the under surface of the back strap 3, are ground to insure good mechanical and magnetic contact. For the purpose of high electromagnetic efficiency of the relay as a whole, the operating coils 4*a* and 4*b* preferably occupy the entire space between the top plate S and the back strap 3. The permanent magnet 11 is, however, not provided with an operating coil, and in accordance with my invention this magnet is used to hold the back strap firmly in engagement with the upper ends of the cores 1*a* and 1*b* and the magnet 11. For this purpose I provide a mechanical link extending between the magnet 11 and the back strap 3. The main portion of this link consists of a clamping member 18 surrounding the permanent magnet 11 at a point slightly below the top thereof. As clearly illustrated in Fig. 1*a*, the member 18 is held in fixed relation to permanent magnet 11 by a cap screw 19 threaded through the member 18 and engaging a shallow indentation 20 in the side of the permanent magnet 11. A second cap screw 21 passes through a hole 23 in the back strap 3 and is threaded into a tapped hole in the member 18. When the cap screw 21 is tightly drawn down it holds the back strap 3 in firm contact with permanent magnet 11 and cores 1*a* and 1*b*, respectively.

Other structural details of the relay may take any one of several forms. In the present disclosure, attached to the one side of the pole pieces 2*a* and 2*b*, respectively, there is a non-magnetizable bracket 7 which carries two pivot screws 8, only one of which is visible in the drawing. Pivotally mounted on the screws 8 for swinging movement toward or away from the pole pieces 2*a* and 2*b* is a neutral armature 9 which may be used to actuate circuit switching contacts, and which is picked up whenever coils 4*a* and 4*b* are energized.

The permanent magnet 11 at its lower end is provided with a bifurcated pole piece 12. Pivotally supported between the bifurcations of the pole piece 12 on the ends of two pivot screws 13, only one of which is visible in the drawing, is a polarized armature 14, which may be used to actuate circuit switching contacts. The pole pieces 2*a* and 2*b* of cores 1*a* and 1*b*, respectively, are provided with integral extensions 15*a* and 15*b*, respectively, the pole faces of which overlie the opposite ends of the armature 14. When the coils 4*a* and 4*b* are energized, the polarized armature 14 will swing toward one or the other of these extensions, depending upon the polarity of the current which is supplied to coils 4*a* and 4*b*, respectively.

The magnetic flux path for effecting the operation of armature 9 includes pole piece 2*a*, the core 1*a*, a portion of back strap 3, core 1*b*, and pole piece 2*b*, respectively. By use of the hereinbefore described novel means of holding the back strap 3 in firm engagement with the top ends of the cores 1*a* and 1*b*, it is unnecessary to drill and tap these cores or to perforate the backstrap at these points in order to hold the back strap 3 to the cores 1*a* and 1*b*, and therefore, I have provided a highly efficient magnetic path between cores 1*a* and 1*b*.

There are two magnetic flux paths for effecting the operation of armature 14. The one path includes the pole piece extension 15*a*, pole piece 2*a*, core 1*a*, a portion of the back strap 3, permanent magnet 11, and the pole piece 12; while the other path includes pole piece extension 15*b*, pole piece 2*b*, core 1*b*, a portion of the back strap 3, permanent magnet 11, and pole piece 12. It will be seen that, since each of the traced

magnetic flux paths over which the armature 14 may be operated includes the back strap 3 and one of the electromagnet cores, the operating efficiency of the device as regards armature 14 is also improved as a result of the improved manner in which the back strap 3 is held firmly against permanent magnet 11 and the electromagnet cores 1a and 1b, respectively.

Although I have herein shown and described only one form of electromagnetic device embodying my invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim is:

1. In an electromagnetic device, a permanent magnet and two electromagnet cores, means for rigidly securing said permanent magnet and said electromagnet cores together in parallel relation, a back strap spaced from said securing means for magnetically coupling the ends of said permanent magnet and cores together, a back strap clamping member having a hole through which said permanent magnet passes, a first screw threaded through said clamping member and engaging said permanent magnet for holding said clamping member in fixed relation with respect to said permanent magnet; and a second screw passing through a hole in said back strap and threaded into said clamping member for holding said back strap against said permanent magnet and electromagnet cores respectively.

2. In an electromagnetic device, two magnetic flux carrying elements, means for rigidly securing said elements together in parallel relation, a back strap spaced from said securing means for connecting the ends of said elements together, an armature associated with both of said elements, a coil on one of said elements for operating said armature; and means including a clamping member surrounding the other of said elements, a first screw threaded through said clamping member into engagement with said other of said elements, and a second screw passing through said back strap and threaded into said clamping member, for holding said back strap in firm contact with said elements to form an efficient magnetic path between said elements.

3. An electromagnetic device comprising two parallel magnetizable cores and a permanent magnet secured adjacent one end to an insulating top plate and provided at their opposite ends with ground surfaces all lying in the same plane, a back strap of magnetizable material having a ground surface which engages said cores at their ground surfaces to provide a good magnetic contact between said cores and said magnet, and a clamping member secured to said back strap at a point spaced from said cores and said magnet and to said permanent magnet intermediate its ends for firmly holding said back strap in engagement with said cores and said magnet.

4. An electromagnetic device comprising a plurality of flux carrying elements rigidly secured to a supporting member in parallel relation and provided at one end with ground surfaces all lying in the same plane, a back strap of magnetizable material provided with a ground surface which engages the ground surfaces of said elements to magnetically connect the elements together, and a clamping member secured to one of said elements intermediate its ends and to said back strap at a point spaced from all of said elements for holding said back strap in engagement with said elements.

5. An electromagnetic device comprising two parallel electromagnet cores and a permanent magnet secured adjacent one end to an insulating top plate and provided at their opposite ends with ground surfaces, a back strap of magnetizable material having a ground surface which engages said cores and said permanent magnet at their ground surfaces to provide a good magnetic coupling between said cores and said magnet, energizing coils disposed on said electromagnet cores for energizing said cores and extending into close proximity to said back strap, a back strap clamping member having an opening through which said permanent magnet passes, means for securing said clamping member to said permanent magnet, a screw passing through a hole in said back strap and threaded into said clamping member for firmly holding said back strap in engagement with said electromagnet cores and said permanent magnet, and armatures associated with said permanent magnet and said electromagnet cores and controlled by the fluxes traversing these elements.

6. An electromagnetic device comprising two parallel electromagnet cores and a permanent magnet secured adjacent one end to an insulating top plate in triangular spaced relation and provided at their opposite ends with ground surfaces, a back strap of magnetizable material having a ground surface which engages said cores and said permanent magnet at their ground surfaces to provide a good magnetic coupling between said cores and said magnet, energizing coils disposed on said electromagnet cores for energizing said cores and extending into close proximity to said back strap, a back strap clamping member having a hole through which said permanent magnet passes, a first screw threaded through said clamping member and engaging said permanent magnet for securing said clamping member to said permanent magnet, a second screw passing through a hole in said back strap substantially equally spaced from said two cores and said permanent magnet and threaded into said clamping member for holding said back strap in engagement with said cores and said permanent magnet, and armatures associated with said electromagnet cores and said permanent magnet and controlled by the fluxes traversing these elements.

7. An electromagnetic device comprising a plurality of flux carrying elements rigidly secured to a supporting member in parallel relation, a back strap of magnetizable material engaging the ends of said elements to magnetically couple said elements together, and a clamping member secured to one of said elements intermediate its ends and to said back strap at a point spaced from all of said elements for holding said back strap in engagement with said elements.

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