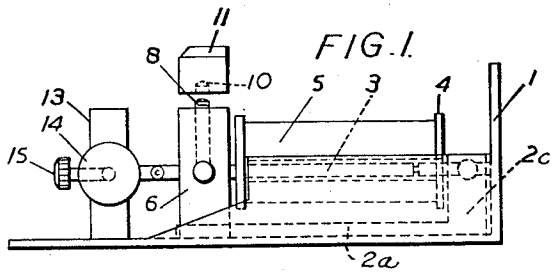
Sept. 4, 1956 H. E. S. McLELLAN ET AL 2,761,929

POLARISED ELECTROMAGNETIC RELAYS

Filed March 27, 1952

FIG. 1.



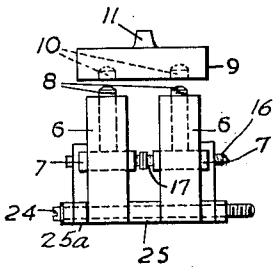


FIG. 3.

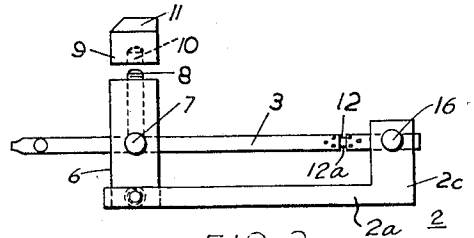


FIG. 2.

FIG. 4.

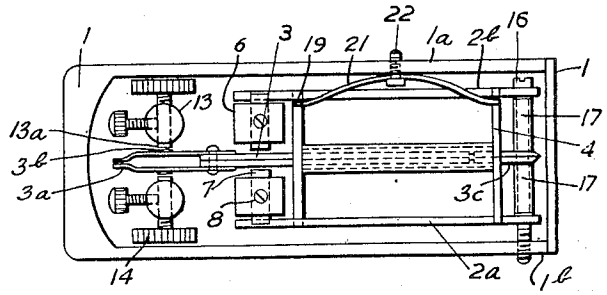


FIG. 6.

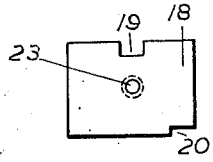
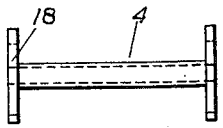


FIG. 5.



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POLARISED ELECTROMAGNETIC RELAYS

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5 Claims. (Cl. 200—93)

The invention relates to electromagnetic relay such as are used in telegraph circuits and telecommunication circuits generally.

In British Patent 641,117 there is described a relay incorporating an improved form of armature and also a novel form of magnetic circuit in which the previously used horseshoe shaped permanent magnet is replaced by a short thick straight permanent magnet having its ends directly attached to a framework made of magnetic material having high permeability but low retentivity. In the construction described, the permanent magnet is firmly attached to the magnetic framework by a coat-fusing process which obviates the necessity for drilling holes into the permanent magnet and so possibly impairing its efficiency.

It follows from the fact that the permanent magnet is rigidly fixed to the magnetic framework that any attention which is required to the pole gap has to be carried out while the magnet is in position. Thus any magnetic particles which are being cleared away from the gaps will tend to adhere to the magnetic framework near the pole pieces. Furthermore the magnetic properties of the circuit are likely to be impaired if adjustments are made with magnetic tools while the circuit is in its normal magnetised condition.

It is now proposed to provide a relay in which the permanent magnet is not positively attached to the magnetic framework but is held in position by its own magnetic flux so that it can be readily removed without the use of any tools. It is further arranged that the permanent magnet is so placed that it is not at all convenient to make adjustments to the pole pieces or clean the magnetic gaps until the magnet has been removed.

In the previous construction the magnetic pole pieces were carried in magnetic supports projecting upwards from the magnetic framework and the permanent magnet was mounted below the pole pieces and coat-fused to the magnetic support. In the present construction however, the permanent magnet is mounted on the top of the pole supports and is held there by its magnetic flux.

Two recesses are provided in that face of the magnet which is to rest on the pole supports and slightly projecting ends of the set screws which hold the pole pieces in position in the supports engage these recesses so that the magnet cannot be made to slide off but must be plucked off. This avoids impairments of the magnetic properties of the magnet such as is likely to occur if the magnet is removed from the magnetic circuit by sliding.

Apart from the modifications in the magnetic circuit the relay is otherwise substantially the same as that described in said Patent No. 641,117 but the changes have enabled the overall dimensions to be slightly reduced.

A further modification of previous practice lies in the arrangements for holding the spool carrying the winding in position. In the past these spools, commonly made of a plastic moulded insulating material have been held in position by means of long screws passing through the

end flanges and into the main framework of the relay. The spools of the present relay are formed with substantially rectangular flanges at the ends of a tubular barrel which carries the operating windings and through the hollow center of which the armature passes. This spool fits in between the two limbs of the framework and a strong spring mounted on the non-magnetic main framework of the relay presses it firmly against one limb of the magnetic framework. Suitable slots are cut in the rectangular flanges to engage the spring and the magnetic framework. This construction provides a simple and very reliable mounting for the spool and one which can readily be taken apart if required as it is only necessary to remove the armature by withdrawing one screw after which the spool can be released by pressure on the spring.

The invention therefore provides a polarised electromagnetic relay comprising a base on which is mounted a magnetic framework, two magnetic supports firmly attached to said framework, two magnetic pole pieces mounted in said supports and so positioned that there is a small gap between them within which the free end of the relay armature is able to move, a permanent magnet in the form of a short thick straight bar placed across those ends, of said magnetic supports which are remote from the base, the magnetic flux of said permanent magnet serving to retain it in position.

The nature of the invention will be better understood from the following description taken in conjunction with the accompanying drawing in which:

Fig. 1 shows a side view of the relay,

Fig. 2 shows a side view of the magnetic circuit only of the relay.

Fig. 3 shows an end view of the magnetic circuit,

Fig. 4 shows a plan view of the relay with the spool for carrying the windings in position,

Fig. 5 shows a side view of the spool and

Fig. 6 shows an end view of the spool.

In Fig. 1 there is shown the main framework **1** of the relay which is of non-magnetic material. Within the main framework there are shown the magnetic framework **2** and the armature **3**. The magnetic framework **2** and armature **3** are better shown in Fig. 2. The magnetic framework **2** consists of two two parallel L-shaped members **2***a* and **2***b* (best seen in Fig. 4) joined adjacent the ends of the short arms thereof by screw **16** and bushes **17** to form a U-shaped structure. The spool **4** carrying the windings **5** of the relay is mounted inside the frameworks as shown in Fig. 1 by means which will be described later and the armature passes through the hollow interior **23** in the spool. The magnetic framework **2** carries two magnetic pole supports **6** made of magnetizable material and shown in Figs. 1, 2 and 3. These supports carry the pole pieces **7** best seen in Fig. 3 and when these have been accurately adjusted they are held in position by set screws **8**. The pole pieces are in register with each other and define a magnetic gap therebetween. The two pole supports must be held on the framework **2** at a fixed distance apart to ensure adequate rigidity in the magnetic circuit. One bolt **24** shown in Fig. 3 passes through the two links of magnetic framework and through the pole supports **6** and finally into a side **1***a* (Fig. 4) of the main framework of the relay. A bush **25** acts as a spacer and when the bolt **24** is screwed home the pole pieces are very firmly held in position. Bolt **24** and bush **25** must of course, be made of non-magnetic material. The permanent magnet **9** is shown in Figs. 1, 2 and 3 as raised above the tops of the pole supports **6** but in service this magnet rests firmly on the supports and is held there solely by the magnetic flux. The magnet induces magnetic flux of opposite polarity to each support **6**. Two recesses **10** are provided in the under surface of the magnet **9** which are engaged by

the projecting tops of the set screws 8 and prevent the magnet from being removed by sliding or moving owing to vibration when the relay is in action. A raised tab **11** is formed on the top of the magnet 9 at its magnetically neutral point which is so shaped with respect to the relay cover (not shown) that the cover would abut against the tab and would prevent the magnet from being jolted off the pole supports when the relay was not in service and was being transported.

The armature 3 is of the laminated kind described in said Patent No. 641,117 in which the main body of the armature is formed of laminae of magnetisable material but in which there is a very narrow gap **12***a* bridged by means of a thin flexible metallic strip **12** which forms a hinge. In Fig. 1 there is shown one of the two pillars **13** carrying the fixed contacts **13***a* which pass through the pillars **13** and are adjustable by a knurled knob **14**. When the contacts have been correctly adjusted they are held in position by means of the set screw **15** which is also provided with a small knurled knob. The arrangement of the contacts is conventional, the armature being provided with the usual anti-chatter springs 3*a* carrying the moving contacts 3*b*.

Figs. 4, 5 and 6 show the novel method of mounting the spool in the relay.

In Fig. 4 there is shown the main framework **1** of the relay and also the magnetic framework **2**. The spool **4** is shown in position but without any operating windings. The armature 3 passes through the hollow interior of the spool and is fixed to the magnetic framework by means of a bolt **16** which passes through both limbs **2***a* and **2***b* at rear portion **2***c* of the magnetic framework and finally screws into the side **1***b* of the main framework of the relay. Two bushes **17** of magnetisable material surround the bolt **16**. The armature **3** is provided with a laminated end 3*c* having holes therein through which the bolt **16** passes and the armature is thus held in position when the bolt is tightened up. It can be seen that the armature can very readily be drawn out if the bolt **16** is first removed. The spool **4** is made of a strong insulating material and each end flange **18** is substantially square but is provided with a notch **19** and a cut away corner **20**. In Fig. 4 there is shown a spring **21** firmly fixed to the side **1***a* of main framework **1** of the relay by a screw **22** threaded through said side. When a spool is to be placed in position in the relay, the spring **21** is pressed against the framework **1** by hand when the spool can be put into position with the cut away corners **20** resting on the limb **2***a* of the magnetic framework and the notches **19** will then be engaged by the spring **21** and the spool will be firmly held. Finally the armature 3 is passed through the hollow interior **23** and fixed in position as explained above by means of the bolt **16** and the bushes **17**.

While the principles of the invention have been described above in connection with specific embodiments and particular modifications thereof, it is to be clearly understood that this description is made only by way of example and not as a limitation on the scope of the invention.

What is claimed is:

1. A polarized electro-magnetic relay comprising a mounting base member of non-magnetic material, a magnetic framework attached to said base member, a pair of spaced supports made of magnetizable material having their lower ends fixed perpendicularly to said framework, a permanent bar magnet bridging the upper ends of said spaced supports and held in position solely by magnetic atttraction, a pair of magnetic pole pieces each mounted on a different one of said supports intermediate the ends thereof and spaced in opposed relationship to each other to define a magnetic gap therebetween, an operating winding, means to mount said winding on said framework, an armature comprising two portions, means to mount a

first portion of said armature on said framework in return flux relation with said pole pieces and in electromagnetic relationship with said winding, the second portion of said armature disposed within said gap and transversely thereof and utilization means under control of said armature.

2. A polarized electro-magnetic relay as claimed in claim 1 in which said pole pieces are threaded through apertures in said supports and are held in position by set screws the tops of which project above the upper ends of said supports, said bar magnet being provided with a pair of cooperating shallow recesses adapted to register with the projecting tops of said screws.

3. A polarized electromagnetic relay as claimed in claim 1, wherein said mounting member comprises a U-shaped structure and said magnetic framework comprises a pair of spaced parallel L-shaped members, a resilient element affixed to one of the arms of said U-shaped structure extending intermediate said winding and said one arm to urge said winding against one of said L-shaped members thereby to hold said winding in fixed operating position.

4. A polarized electromagnetic relay as claimed in claim 3 wherein said resilient element has two ends and said winding comprises a pair of spool flanges mounted at either end thereof, each end of said resilient element extending from said one arm to contact a different one of said spool flanges, each flange having profiled portions adapted to accommodate an end of said resilient element.

5. A polarized electro-magnetic relay comprising a mounting member, a pair of spaced, parallel L-shaped magnetic framework members attached to said mounting member, a pair of spaced supports made of magnetizable material, each having their first ends mounted at an extremity of different of the long arms of said L-shaped members and, perpendicularly thereto a pair of opposed magnetic pole pieces each mounted on a different one of said supports intermediate the ends thereof and adapted to define a magnetic gap therebetween, a hollow operating winding, means to mount said winding on said framework, an armature, comprising two end portions and an intermediate portion, said intermediate portion disposed through the hollow of said winding and having a first end portion thereof removably mounted on the short arm of said L-shaped framework, a pair of contacts mounted on the other end portion of said armature, a pair of fixed contacts attached to said mounting member and adapted to cooperate with said first pair of contacts, said intermediate portion extending within said gap and transversely thereof, a straight, permanent bar magnet having a pair of spaced shallow recesses on the bottom thereof, said magnet bridged across the other ends of said supports in magnetic flux relation therewith, said magnet adapted to induce magnetic flux of opposite polarity to each of said supports, a pair of projecting screws, each set into the other end of a different one of said supports and adapted to cooperate with the recesses in said magnet, said magnet having a raised portion at its magnetic neutral point, said raised portion adapted to abut against an outer cover, resilient means disposed between one side of said mounting member and said winding and adapted to wedge said winding against one of the long arms of said framework.

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