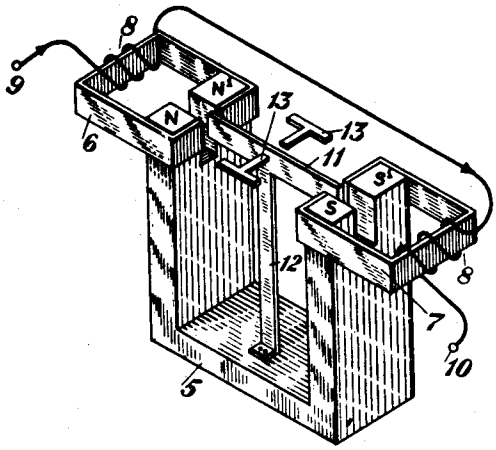
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MAGNETIC SYSTEM

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MAGNETIC SYSTEM

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1 Claim. (Cl. 175—339)

This invention relates to magnetic systems which are particularly adapted for use in connection with relays, phonograph reproducers, light valves, and the like.

One of the objects of the invention is to provide a magnetic system of high sensitivity.

Another object is to provide simple adjustable features for such system, whereby relatively low maintenance requirements are involved.

Another object is to provide an armature of light weight to facilitate a high speed of vibration.

A further object is to provide a system of the above character which is simple and comparatively inexpensive to manufacture.

These, and further objects, will be apparent from the following description when considered in connection with the accompanying drawing, in which one embodiment of the invention is illustrated.

Referring to the drawing, in which a respective view of the improved system is illustrated, a permanent magnet 5 is shown of U-shape form. It will be understood, however, that this magnet may be equally well made in any other suitable form. The permanent magnet 5 terminates in bipolar portions or bifurcated pole pieces to introduce a slotted portion between poles N, N¹ on one end of the magnet, and a like slotted portion between the poles S, S¹ on the other end of the magnet. These slotted portions are of such depth as to substantially isolate the pairs of poles N, S and N¹, S¹. The poles N, N¹ are connected by a yoke 6 of magnetic material, and the poles S, S¹ are similarly connected by a yoke 7 of like material. The ends of these yokes extend around the poles and are bent inwardly so that their adjacent terminals lie flush with the adjacent faces of the poles N, N¹ and S, S¹, respectively. The yokes 6 and 7 are illustrated as being of rectangular formation, and an operating winding 8 is wound about the core of each yoke. The yokes are made of such material that they provide a low reluctance in order to permit the windings 8, 8 to set up a high flux density. In order to aid in this respect, the yoke members 6 and 7 extend around the permanent magnet 5, as previously described, so their ends come in close juxtaposition. The windings 8, 8 are shown as being connected in series, but said windings may be connected with the yokes independently of each other, or, if desired, the windings 8, 8 may be connected in parallel relation. In the present case it may be assumed that current enters the terminal 9 and passes through the serially connected windings 8, 8 and flows through the output terminal 10 and establishes magnetic paths which will be presently described.

An armature 11 of magnetic material is carried by an arm 12. This arm may be made if desired from non-magnetic material and is suitably secured to the closed end of the permanent magnet 5, and said armature is adapted to vibrate between the contact stops 13, 13. The spacing of the poles N, N¹ from the poles S, S¹, with respect to each other, and to the armature 11 and the thickness of the armature, will be such that the stop contacts 13, 13 can be adjusted to limit the travel of the armature to a small magnitude. Under this condition the armature 11 gives reliable operation and requires only a small force to cause it to move from one contact to the opposite contact.

It will be apparent that the weight of the armature 11 which is included in the magnetic circuit, is relatively small as compared with usual magnetic structures in which the winding is around the armature itself. This permits the use of a very light armature without increasing the reluctance of the operating path too much, with a net increase in the speed of travel and operation which it is possible to obtain from the magnetic structure, as well as an attendant increase in sensitivity, due to the fact that less energy is required to move the lighter armature 11.

The poles, or pole pieces, N, N¹ of the permanent magnet 5 have the same polarity, or are polarized in the same direction, and the other poles S, S¹ are polarized in the opposite direction. Hence, the flux produced by the permanent magnet divides into two paths, one path extending from the pole N to the pole S, and the other path from the pole N¹ to the pole S¹. The fluxes in these two paths are substantially equal and permeate through the armature 11. The armature is equally affected by the fluxes in these two paths, and when no current passes through windings 8, 8 of the cores of the yokes 6 and 7, the armature may remain in an unbiased positon, or may, if desired, be initially biased due to its weight or due to the employment of a spring in either of its two positions, against one of the contact stops 13, 13.

When current flows through the windings 8, 8 in the direction indicated by the arrows, temporary fields will be produced by the electromagnets 6 and 7. One of these electromagnets i. e. 6 will then tend to establish a magnetic field so that the part of its core nearest the pole N will be magnetically south, and that part nearest the pole N¹ will be magnetically north. The other electromagnet i. e. 7 will set up a corresponding condition, i. e., the part nearest pole S will be mag-

netically north and the part nearest pole S^1 magnetically south. Thus, the magnetic field adjacent the pole N. as well as the magnetic field adjacent the pole S, will be both decreased in strength while the magnetic fields N^1 and S^1 will be correspondingly increased in strength. The magnetic field between the poles N and S will become weaker than the magnetic field between the poles N^1 and S^1. Consequently, the armature 11 will be traversed by a greater flux due to its position between the poles N^1 and S^1 than will be traversed through the armature due to its position between the field of the poles N and S. Therefore, the armature will be attracted toward the poles N^1 and S^1 and close the contact 13 on that side of the armature 11. It will be apparent that when the current is reversed through the windings 8, 8 a converse condition to that just outlined will be brought about. The armature 11 will be thus vibrated between the contact stops 13, 13 in accordance with the direction of the applied current.

What is claimed is:

The combination of a U-shaped permanent magnet having bifurcated ends which provide bi-polar extremities of the same polarity, a yoke of substantially rectangular formation carried by each end of said magnet and having portions cut away to correspond to said bi-polar extremities, an armature mounted on the closed end of said magnet and adapted to vibrate in the space between the bi-polar extremities and cut-away portions of said yokes, and a winding carried by each of said yokes.

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