D. D. MILLER.

SWITCHING DEVICE FOR TELEPHONE SYSTEMS.

APPLICATION FILED JUNE 8, 1915.

1,211,612. Patented Jan. 9, 1917.

Fig. 1.

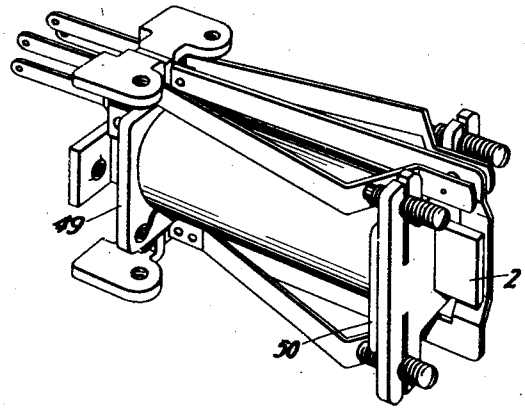
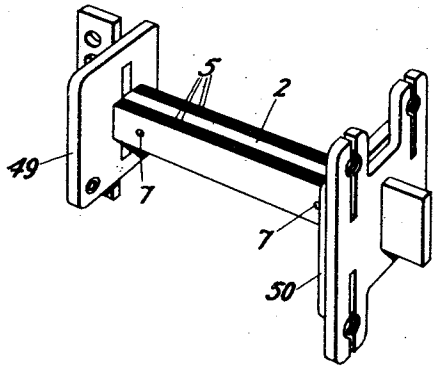


Fig. 2.



Witnesses:
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UNITED STATES PATENT OFFICE.

DANIEL D. MILLER, OF NEW YORK, N. Y., ASSIGNOR, BY MESNE ASSIGNMENTS, TO WESTERN ELECTRIC COMPANY, INCORPORATED, A CORPORATION OF NEW YORK.

SWITCHING DEVICE FOR TELEPHONE SYSTEMS.

1,211,612. Specification of Letters Patent. Patented Jan. 9, 1917.

Application filed June 8, 1915. Serial No. 32,847.

To all whom it may concern:

Be it known that I, DANIEL D. MILLER, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Switching Devices for Telephone Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to telephone switching devices, and more particularly to an electromagnetic device which will operate efficiently upon direct current but will offer a high impedance to alternating currents of talking frequencies.

The object of this invention is to provide a relay of this type which will be simple in construction, can be manufactured at a moderate cost, and which will have a high operating efficiency.

In accordance with this invention a relay is constructed in which the core is composed of a plurality of superposed sections of different lengths whereby a plurality of magnetic circuits, including airgaps of different lengths, are provided. Preferably the core is composed of one long section extending through the spool-heads, and shorter sections located between the spool-heads. The shorter sections may be composed of laminæ which are secured to the long section by riveting or similar means.

In the drawings illustrating this invention, Figure 1 is a perspective view of an assembled relay in which this invention is embodied, and Fig. 2 is a perspective view of the spool-heads and core of a relay embodying the invention.

The relay, so far as it is shown in Fig. 1 of the drawing, is precisely the same mechanically as that shown in the patent to Edward B. Craft, 1,121,897, issued December 22, 1914, and reference is made to this patent for a description of these details.

The invention is illustrated in detail in Fig. 2. As shown in this figure, the shank portion 2 of the core has secured to it upon opposite sides thereof a plurality of laminæ 5, 5 which are shown as abutting against the inner faces of the spool-heads 49 and 50. These laminæ 5, 5 are preferably the same width as the shank portion 2 of the core and are secured thereto by rivets 7, 7. These laminæ may be coated with lacquer or some similar substance which will serve to insulate adjacent ones from each other, thereby decreasing the eddy current losses and improving the efficiency as an impedance coil to high frequency currents. The spool-heads 49 and 50 are of non-magnetic material.

The relays heretofore used in the bridged impedance type of telephone connecting circuit, while operating efficiently on direct current for signaling purposes, were of low impedance to the high frequency or talking currents. Consequently, the distance over which satisfactory telephone conversation could be carried on was necessarily quite limited. In any of those relays the core and armature is such that, when the relay is operated, the flux density or the degree of magnetization is approximately the same in both the core and the armature, and approaches closely to the point of saturation. In this condition, which necessarily is the one obtaining while conversation is being held, the permeability of the core, and consequently the impedance of the coil to high-frequency or talking currents, is very low. Since this low impedance is bridged across the talking strands of the connecting circuit, it is clear that the talking efficiency of the system as a whole is materially reduced. In the relay herein described this condition has been overcome by the use of laminæ, which provide a plurality of magnetic circuits, including air-gaps of different lengths, as before described. As is well known, the action of an air-gap in a magnetic circuit is to reduce the flux therein in two ways,—first, by increasing the total reluctance of the magnetic circuit, and second, by opposing the production of the flux by the demagnetizing effect of "the ends." Thus, by this action in the relay herein disclosed a portion of the core is unsaturated and of high permeability to high-frequency or talking currents. A relay is thereby obtained which operates efficiently on direct current to perform its function as a signaling device, and at the same time, due to the unsaturated portion of the core, offers a high impedance to alternating currents of talking frequencies.

The only change necessary to adapt this feature to the relay described in the Craft patent hereinbefore described is the addi-

tion of the laminated sections to the core of the Craft relay and possibly an increase in the diameter of the winding.

What is claimed is:

1. An electromagnet having a core composed of a plurality of superposed sections of different lengths.

2. An electromagnet having a core composed of a long section and a plurality of shorter sections superposed thereon.

3. An electromagnet having a core composed of a long solid section having a plurality of shorter sections of laminæ secured thereto.

4. In an electromagnet, a pair of spool-heads, a main core section extending therethrough, and auxiliary sections located on said main section between said spool heads.

5. In an electromagnet, a winding and a core composed of two sections, one extending beyond the winding and the other being co-extensive therewith.

6. In an electromagnet, a pair of spool-heads of non-magnetic material, a core comprising a portion extending beyond the spool-heads, and a plurality of laminated sections located between the spool-heads.

In witness whereof, I hereunto subscribe my name this 5th day of June, A. D. 1915.

DANIEL D. MILLER.