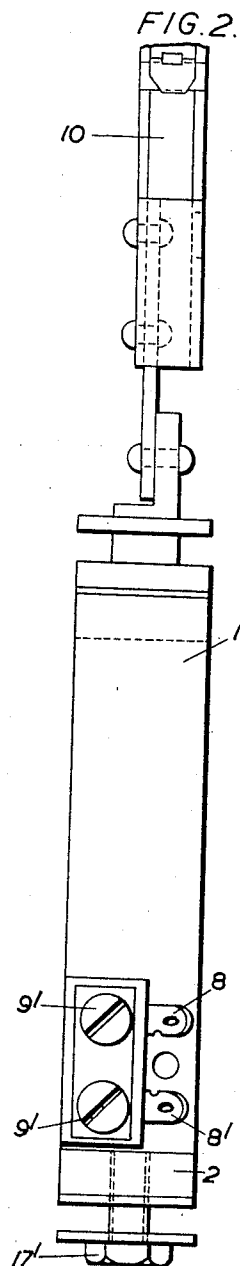
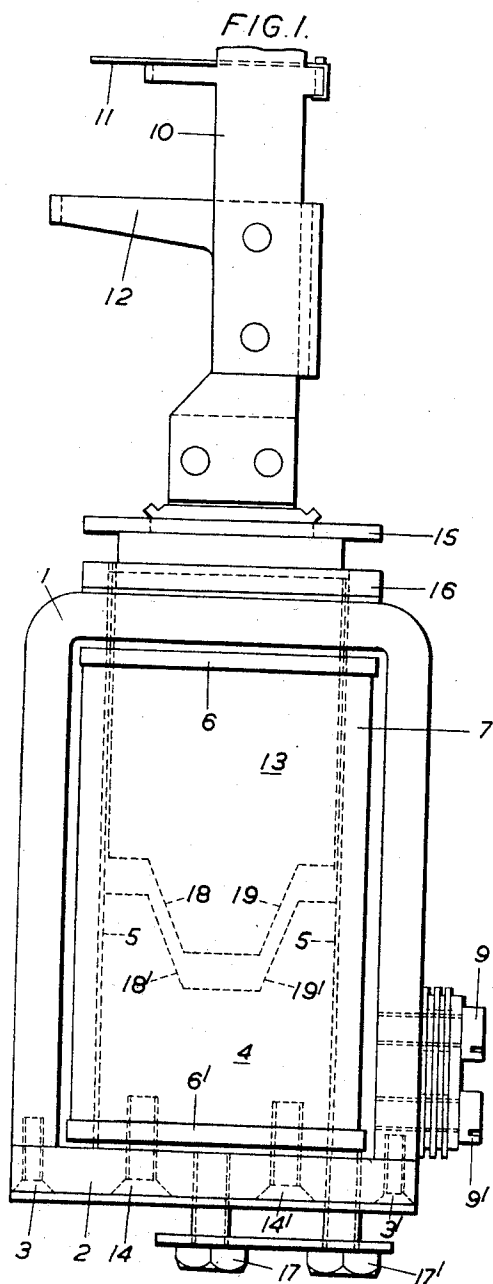


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OPERATING MECHANISM

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2,892,134

OPERATING MECHANISM

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The invention relates to an operating mechanism which can be used in telephone switches, and more particularly in those of the crossbar type.

Such switches are sometimes arranged as multi-switches so that they can provide for the connection between any inlet out of a plurality, and any outlet out of a plurality. A multi-switch of this type is, for example, disclosed in our co-pending patent application Serial No. 280,252, filed April 3, 1952, now Patent No. 2,822,431. They comprise a first set of parallel bars called select bars, and a second set of parallel bars called actuating and hold bars, which are arranged perpendicularly to those of the first set. In this manner, when a select bar corresponding to one or more outlets is first displaced, an actuating and hold bar corresponding to a particular inlet, can then be displaced and these two operations in succession will cause the operation of a contact mechanism which will establish a connection between the corresponding inlet and outlet conductors. The bars of both types can be operated by individual electro-magnets.

It has, however, been found that the power rating of these electro-magnets and hence their cost and the volume which they occupy, might be reduced if they have only to perform a clutching-in action, the actual displacement of the bars being carried out by means of a common mechanism controlled by a so-called servo-electro-magnet which is used in common for all the bars, i.e. select or actuating and hold, of the same type. Such an arrangement is, for example, disclosed in connection with the actuating and hold bars in the co-pending patent application of G. X. Lens, filed September 6, 1950 and bearing Serial No. 183,445, now Patent No. 2,623,404.

On the other hand, it has also been known to reduce the total number of electro-magnets needed in conjunction with the operation of the select bars, by using a so-called code bar arrangement. This was, for example, disclosed in our said co-pending application first above-mentioned, and is permissible in view of the fact that the select bars need only be temporarily operated, the established connection in a crossbar multi-switch being maintained by the operated actuating and hold bar.

Such code bar mechanisms, although they will appreciably reduce the number of electro-magnets which becomes equal to the number of code bars, instead of equal to the larger number of select bars, have nevertheless the disadvantage that a common operating mechanism controlled by a servo-magnet, is nearly always required, the operation of a particular combination of code bars merely indicating which select bar is to be displaced. Further, the code bar mechanism itself and its association with the common operating mechanism, leads to a rather intricate arrangement and this might well offset the advantage obtained in reducing the number of electromagnets.

An object of the invention is to provide operating mechanisms individual to a bar of a multi-switch which are economical, occupy a very small space, are rugged and in general, entirely reliable.

The saving of space is very important in a multi-switch

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of the type disclosed in our said co-pending application, as the contact fingers which are used to effect the connections between inlet and outlet conductors in response to the operation of a select and an operating and hold bar, are very closely spaced thus providing a multi-switch of compact size. The select bars being aligned on the contact fingers, it is necessary that the operating mechanism for these bars should not take more space than that between two adjacent contact fingers, or two adjacent select bars, as otherwise one could no longer obtain a multi-switch of compact size or somewhat complicated coupling mechanisms would be necessary between the operating means for the select bars and the bars themselves.

In accordance with the main feature of the invention, individual solenoids are used for operating the bars.

In accordance with another characteristic of the invention, these solenoids occupy a very restricted space and more particularly, their smallest dimension is made as small as possible to be compatible with the small distance between two bars of the same type.

In accordance with another feature of the invention, a movable core used as a plunger, is placed in the field of the solenoid so as to be made displaceable under the action of the latter, and is made integral with the corresponding bar.

The above mentioned and other objects and features of the invention will become more apparent and the invention itself will be best understood by referring to the following description of an embodiment taken in conjunction with the accompanying drawings which represent:

Fig. 1, an elevation view of a solenoid controlling a select bar, part of which is shown;

Fig. 2, a side view of the solenoid and part of the bar shown in Fig. 1.

Referring to Fig. 1, the yoke 1 shaped in the form of a U, is closed by an auxiliary portion 2 which can be fixed on the said yoke by means of the screws 3 and 3'. The portion 2 is used to support a fixed core 4 having the shape shown in dotted outline in Fig. 1 and a very narrow cross section. This can be appreciated from Fig. 2 which shows that the overall width of the arrangement is substantially smaller than its other two dimensions. A sheath 5 of non-magnetic material can be inserted in the central part of the yoke 1 and can be made to project slightly beyond the central branch of the U formed by the yoke which is apertured at for that purpose. This sheath 5 will be supported at its lower end by the portion 2 after the latter has been placed into position, and inner perimeter of the sheath will exactly fit around the fixed core 4. Small shoulders can be punched out of the surface of the sheath 5 in particular at the level of the mid-portion of the U, so that this will abut against this part of the yoke 1 whereby the sheath 5 will be in an adequately fixed position. These shoulders can also be used to fix the position of the cheeks 6 and 6' of the coil 7 when the latter is inserted between both legs of the yoke 1 and around the sheath 5. After this insertion, the auxiliary portion 2 can be fixed to the yoke 1 by means of the screws 3 and 3' and the fixed core 4 can be made integral with the portion 2 with the help of the screws 14 and 14'. The ends of the winding of the coil 7 can be soldered to the terminals 8 and 8' (Fig. 2) attached to the outer portion of one of the legs of the yoke 1 by means of the screws 9 and 9'.

The select bar 10 is of the type disclosed in our said co-pending application and resilient coupling elements such as the blade 11, are mounted on it to communicate the movement of the latter to clutch mechanisms (not shown) co-operating with the actuating and hold bars (not shown), and permitting the final displacement of the contact operating mechanism (not shown). The extension 12 is used to drive directly a special contact finger (not

shown) which will thus close contacts every time the select bar 10 is displaced. Through riveting or other suitable fastening, the bar 10 is made integral with the movable core 13 having the shape shown in Fig. 1 and acts as a plunger.

The select bar 10 which is in the upright position, is normally maintained in the position shown by a spring return mechanism (not shown), which is located at the top end of the bar and can, for example, be as disclosed in our said co-pending application. It will be observed that the dimensions of the movable core 13 are slightly smaller than those of the fixed core 4, so that whereas the latter fit snugly inside the sheath 5, the former is able to slide within said sheath without undue friction.

A shoulder piece 15 is provided on top of the movable core 13 and a shock-absorber 16 made of resilient material, and having an aperture is mounted on top of the central branch of the U-shaped yoke 1 and is disposed between the yoke and the shoulder piece 15. The movable core 13 movably projects through the apertures. The whole assembly can be mounted on a suitable bracket by means of the screws 17 and 17'.

As soon as current is made to flow through the winding of the coil 7, the movable core 13 will be drawn downwards until the shoulder piece 15 abuts against the shock absorber 16. In this way, the select bar 10 will be lowered and the parts such as 11 and 12 will accomplish the functions referred to above. Energy will be stored in the spring return device (not shown) so that, when the coil 7 is de-energized, the select bar will return to its original position as shown, withdrawing the movable core 13 back to its original position.

The particular shapes of the two opposite ends of the cores 4 and 13 permit a most efficient use of the electric energy delivered to the coil 7 and in particular permit a centering of the field lines along the axis of both the cores, so as to diminish the friction of the movable core 13 against the inside surface of the sheath 5. It will be noticed that the opposite ends of the cores 4 and 13 are profiled so as to be complementary to each other. Sloping flanks 18, 19 and 18', 19', have been provided as complementary portions of cores 13 and 4, respectively. This profiling has been found to have a beneficial effect on the rapid diminution of the reluctance of the airgap.

While the principles of the invention have been described above in connection with specific apparatus, 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 flat electromagnetic structure comprising a flat, U-shaped magnetic yoke, an energizing coil located within the arms and boundaries of said yoke and operatively associated therewith, a magnetic bridging member connecting the arms of said yoke, a movable, flat, bar core, said movable core having a principal portion of its mass within one end of the hollow of said coil and having at one end a truncated wedge-shaped portion with a pair of oppositely disposed base sections extending outwardly from the base of the wedge and normal to the axis of said movable core, a fixed core piece extending within the other end of the hollow of said coil and in flux relation with said yoke and said coil, said fixed core piece attached to said bridging member and having a profile complementary to the truncated portion of said movable core, said truncated portion normally extending partially within the complementary portion of said fixed piece whereby a plurality of differently spaced air gaps are defined between the complementary faces of said movable core and said fixed core piece, the reluctance of the opposed angular disposed portions of the wedge and the core piece is substantially less than the reluctance of gaps defined by said base sections, thereby permitting a centering of field lines along the axis of said movable core and said fixed core piece.
2. A structure as claimed in claim 1 wherein the other portion of the mass of said movable core extends through an aperture in the base of the U-shaped yoke.

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