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3,035,136

MULTIPLE ELECTROMAGNETIC SWITCH

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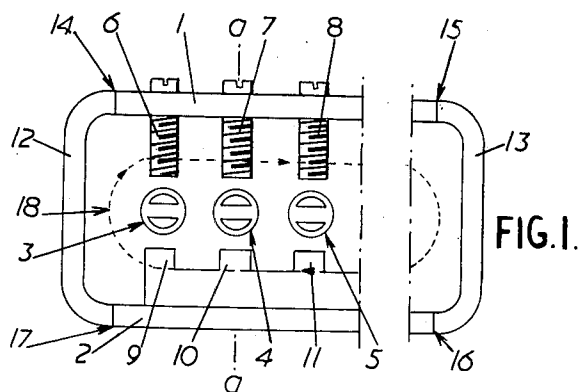


FIG. 1.

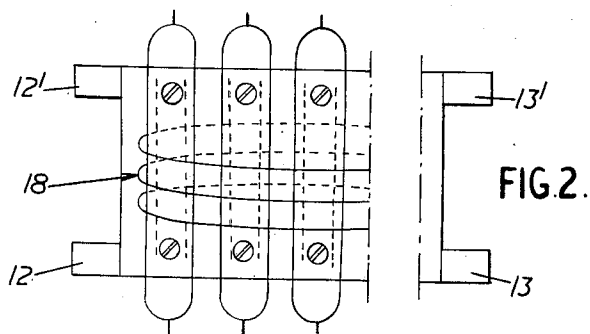


FIG. 2.

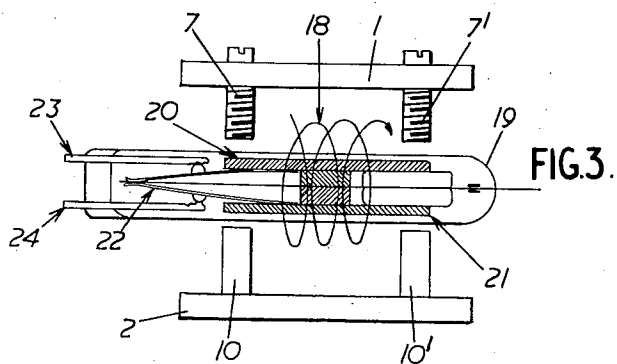


FIG. 3.

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MULTIPLE ELECTROMAGNETIC SWITCH

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This invention relates in general to electromagnetic switches and in particular to single winding electromagnetic switches which are composed of a number of individual polarized switching elements mounted within a common magnetic structure. Its principal object is to provide an economical and reliable switch of the above character wherein the individual switching elements may be operated simultaneously or in any predetermined sequence.

In electrical switching systems wherein a number of wires must be switched, single-winding electromagnetic relays are used which have a switching capacity corresponding to the number of wires to be switched. These relays were limited in their flexibility in that they were restricted to the simultaneous switching of all associated wires and accordingly had no utility in situations requiring a particular sequence of switching. Other single winding electromagnetic switches are known wherein a plurality of separate armatures are actuated successively in accordance with a series of pulses delivered to the single winding. These relays have the disadvantage that they operate only in a fixed sequence and only in response to driving pulses.

According to the present invention, the foregoing disadvantages are overcome by providing a plurality of switching elements in a common magnetic field, each element having adjustable pole pieces which vary the sensitivity of the switching element to the magnetic field. Thus, according to the adjustment of the pole pieces, and the intensity of the magnetic field, any desired combination may be actuated. Also, variations in the intensity of the magnetic field will result in any desired sequential operation of the elements or element combinations.

It has been chosen to illustrate the invention employing glass sealed polarized relays as the individual switching element. These polarized relays may be of the type disclosed in U.S. patent application, Serial No. 682,654, filed Sept. 9, 1957, which issued January 12, 1960, as U.S. Patent No. 2,921,161. The structure supporting these relays is polarized by a permanent biasing magnetic field.

Accordingly, an object of the present invention is to arrange a plurality of glass sealed relays inside a single frame of magnetic material of high permeability and to provide this frame with magnetic polarities through adjustable pole pieces, the polarities being obtained by means of permanent magnets located in suitable positions on the magnetic frame.

Another object of the invention is to provide adjustable pole pieces for adjusting the magnetic flux in each glass sealed relay to individually adjust its sensitivity in order to permit the noted predetermined sequencing.

A further object of the present invention is to arrange a single energizing coil surrounding all the glass sealed relays in order to act simultaneously or sequentially on the armatures of the relays to obtain the required operations according to the relative positions of each armature which is controlled by the fixed magnetic field applied thereto.

These and other objects and features of the present invention will be more clearly understood from the following description of an embodiment of the device of the invention taken in conjunction with the figures of the accompanying drawing, in which:

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FIG. 1 shows a longitudinal cross section of one of said multiple switching units in which there are shown three of the glass sealed relays;

FIG. 2 shows a plan view of the multiple switching unit in relation with the cross section of FIG. 1;

FIG. 3 shows, in a schematic form, a side cross section of FIG. 1, taken along *a—b* of FIG. 1 to illustrate the operation of the armature of the glass sealed relays under the action of constant and variable magnetic fields controlling the position of the armatures and the excitation of the unit.

Referring to FIG. 1 there are shown two parallel plates 1 and 2 of highly permeable magnetic material with a plurality of sealed contact magnetic elements or armatures 3, 4, and 5 mounted therebetween. These plates carry north and south pole pieces 6, 7, 8 and 9, 10, 11, respectively.

The south pole pieces such as 9 can be made from a single piece of magnetic material which are secured to plate 2.

The north pole pieces such as 6, are provided with small threaded screws, of magnetic material, screwed into the magnetic top plate 1. These pole pieces are located normal to the longitudinal dimension of the movable armatures and adjacent their ends as shown in FIG. 3.

There will be two series of pairs of pole pieces, south and north respectively, as shown in FIG. 3. A pole of each pair is adjacent an end of the magnetic armatures of each relay which encloses the armature itself and the stationary and movable contacts.

Two or more permanent magnets as 12, 13 and 12', 13' (FIGS. 1 and 2) are secured to the end edges 14, 15, 16, 17 of plates 1 and 2 to magnetically energize and provide these plates with suitable polarities.

The energizing coil of all switching elements is indicated in FIG. 1 by the dotted line 18 and shown schematically in FIGS. 2 and 3; the coil surrounding all the switching elements.

The operation of the multiple switching unit is now considered with reference to FIG. 3, which shows a cross section of a polarized relay among those contained in said multiple switching unit shown in FIG. 1. The relay 19 contains a magnetic armature formed by two small bars 20 and 21 of magnetic material, a movable contact 22 and two stationary contacts 23 and 24. The relay 19 is inserted between the two magnetic plates 1 and 2 in such a way that the ends of the magnetic bars 20 and 21 are adjacent pole pieces 7, 7' and 10, 10', carrying north and south polarities.

The energizing coil 18, which is inserted between the two rows of pole pieces, 7, 7' and 10, 10' which follow at regular intervals on both sides of relay 19 surrounds all the relays 3, 4 and 5 placed parallel with each other. By means of adjustable pole pieces, the position of the magnetic armatures of individual relays or switching structures is varied as desired.

When current flows through the energizing coil 18, each armature is shifted or holds its position in relation to the fixed magnetic polarities, according to the position of the adjustable pole pieces adjacent the respective armatures and according to the magnetic flux generated by the energizing coil 18, which is in relation to the value of the current flowing through the coil 18 itself. Therefore it is possible to obtain a plurality of different, sequential or simultaneous contact operations through this multiple switching unit, as it is well understood.

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

What is claimed is:

1. A multiple electromagnetic switching structure, comprising a plurality of magnetic switching devices mounted therein, said structure including permanent magnets for producing a constant magnetic field through said devices, a coil surrounding all of said devices for producing a variable magnetic field through said devices, separate means for each switching device for adjusting the intensity of the constant magnetic field therethrough, and means for energizing the said coil to cause the simultaneous or predetermined sequence of operation of said switching devices according to the said adjustment of the intensity of the constant magnetic field through each device and to the intensity of the variable magnetic field.

2. A multiple electromagnetic switching structure, as claimed in claim 1 wherein the switching devices consist of an armature formed by two magnetic bars carrying movable contacts at one end and stationary contacts facing said movable contacts, all elements being enclosed in a sealed vessel either evacuated or filled with an inert gas, said devices being arranged parallel with each other and inserted between two magnetic plates each of which carries two rows of pole pieces which are adjacent the ends and normal to the longitudinal axis of each of said magnetic armatures, a plurality of pairs of said pole pieces, extending from one plate, are adjustable in order to move towards

or away from each pole piece the respective ends of each magnetic armature.

3. A multiple electromagnetic switch structure as claimed in claim 2 wherein a single energizing coil surrounds all switching devices mounted between said pair of magnetic plates and having their armatures adjusted in a definite position whereby when current flows through the winding of said coil, each magnetic armature will move from or will hold its position according to the value of the magnetic flux passing through said magnetic armature, said adjustment being obtained by the position of the adjustable magnetic pole pieces with respect to said armature and according to the value of the current flowing through said coil.

References Cited in the file of this patent

UNITED STATES PATENTS

713,497	Rowland	Nov. 11, 1902
1,624,476	Cummings	Apr. 12, 1927
2,594,088	Sonnemann et al.	Apr. 22, 1952
2,821,597	Germanton et al.	Jan. 28, 1958
2,907,846	Wilhelm	Oct. 6, 1959