April 29, 1930. F. DÖRING ET AL 1,756,540

ELECTROMAGNETIC SWITCH

Filed Oct. 11, 1926

Fig. 1

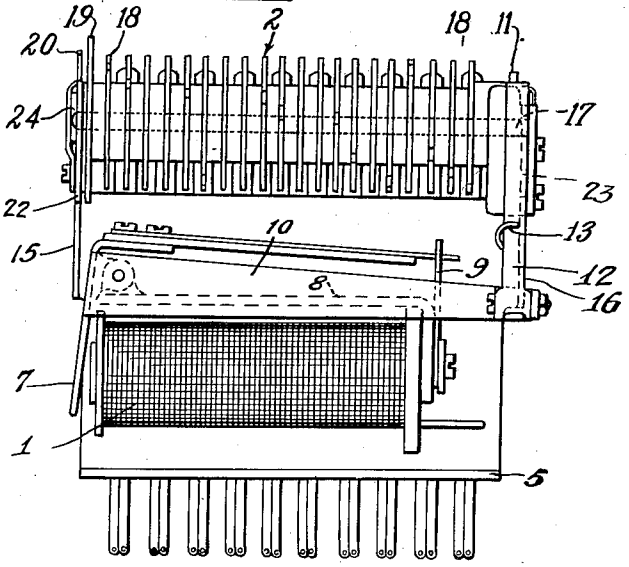


Fig. 2

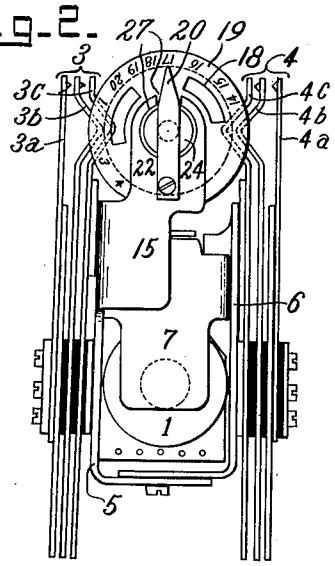
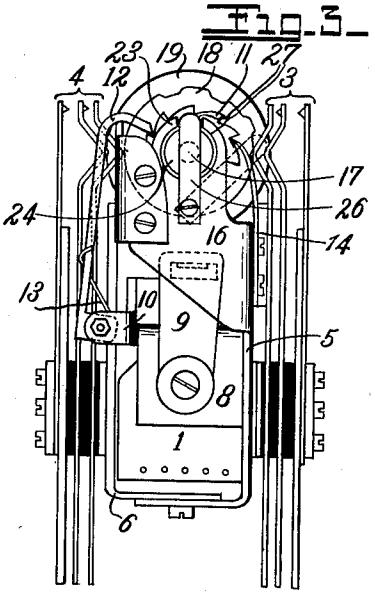


Fig. 4



Fig. 3



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UNITED STATES PATENT OFFICE

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ELECTROMAGNETIC SWITCH

Application filed October 11, 1926, Serial No. 140,811, and in Germany February 13, 1926.

The invention relates to an electro-magnetic cylinder switch, which is intended to control the circuits of communication systems and is very compact and yet has its parts easily accessible and visible.

According to the invention this purpose is preferably achieved by locating the driving magnet within a space, which is defined by the boundary planes of the switch cylinder. It is advisable to locate the driving magnet and the switch cylinder parallel to one another, but this arrangement is not essential. According to the invention the position of the driving magnet and the switch cylinder is so chosen that the plane formed by the driving magnet and by the switch cylinder runs parallel to the plane of the contact springs, which are influenced by the switch cylinder. Owing to this arrangement and especially due to the fact that according to the invention the contact spring sets are provided at both sides of the switch cylinder, the switch has comparatively little width, and unused spaces between the switch parts are avoided as mch as possible.

Another means for obtaining a very compact arrangement in the construction of the cylinder switches while at the same time obtaining a reliable operation of the contacts consists according to the invention in bending the operating end of the contact springs at right angles, these springs being directly controlled by the switch members of the cylinder and located within reach of the switch members.

One method of carrying out the invention will be described by way of example with reference to the drawing.

Figure 1 therein shows a side view of the switch, from which, for the sake of greater clearness, has been removed one of the two angle irons carrying the contact spring sets.

Figure 2 is a front view and Figure 3 is a back view of the switch.

Figure 4 shows separately one of the contact spring sets as seen from the back.

The main parts of the switch shown comprise the driving magnet 1, the switch cylinder 2 and the contact spring sets 3 and 4, located on either side of these parts. The contact spring sets are mounted on two angle irons 5 and 6, which are connected together by means of screws. On one side of the angle irons, namely 5, is also mounted the switch cylinder and below the latter the driving magnet 1 is fixed parallel thereto. The armature 7 of this magnet is rotatably mounted on the yoke 8. In its normal position the armature is held by a leaf spring 9, which also serves to move it back from its operated to the normal position. An arm 10 bent down at the side of the armature 7 carries at its free end the operating pawl 12, which operates the tooth wheel 11 of the switch cylinder 2. The pawl 12 is likewise movably mounted and is pressed against the tooth wheel 11 by the tension of a spiral spring 13. The tooth wheel 11 is held in any particular position by the holding pawl 14, which comprises a leaf spring fixed to the angle iron 5. The switch cylinder 2 consists of the shaft 17, which is rotatably mounted in the bent strips 15, 16 of the angle iron 5, the cams 18 of insulating material fixed to the shaft and the tooth wheel 11 located at one end of the shaft. The other end of the shaft 17 carries a round disc 19, which at its outer end is provided with numbered divisions. In conjunction with a rigidly fixed pointer 20, the disc serves to indicate the different positions of the switch. By means of special holding means herein not described, the cam discs 18 are fixed on the shaft 17 at such distances from each other that each cam disc 18 can operate one of the contact spring sets 3, and 4, located on both sides of the switch, the arrangement being such that the first, third, fifth, etc. cam disc 18 operates the contact spring sets 3 on the one side, while the second,

fourth, sixth, etc. cam disc operates the contact springs 4 on the other side.

As can be seen from the Figures 2 and 3, each spring set consists of three leaf springs 3^a, 3^b, 3^c or 4^a, 4^b, 4^c. The two inner springs, for example 3^b and 3^c of each switch set are bent at right angles at their operating end. Thereby a good surface is provided for the cam disc to run onto. But this arrangement also enables the contact spring sets to be mounted comparatively close to the cam discs 18. The contact spring 3^c or 4^c, which in each set has its bent end extending furthest into the cam discs 18, is provided with a slot 21 (Figure 4), through which the cam discs 18 protrude in order to be able to operate the middle spring 3^b or 4^b. The right angle bend enables the slots 21 of these springs to be made very short, so that they do not unnecessarily weaken the springs. The middle contact spring 3^b and 4^b are brought into contact with either the outer or the inner contact spring of their set, according as either a cam or a valley of the cam disc 18 reaches the right angle bend of the middle spring, while at other times the latter are placed in a neutral middle position by the cam discs. The driving magnet 1 operates indirectly, that is to say the pawl 12 does not move on the cam cylinder 17 until its armature 7 moves back to the normal position. At the same time the switch pawl 12 is slightly moved out of its position parallel to the tooth wheel 11, but this does not affect the reliable engagement of the pawl into the teeth of the wheel, and it has the advantage that it renders the position of the driving magnet less dependent on the switch wheel. During the step by step movement of the shaft 17, the cam discs 18 are also moved and each cam disc 18 in succession has its operating part extending into the slot 21 of the springs 3^c and 4^c of its corresponding contact spring set, thus the contact springs controlled by the cam discs are brought into their operated position. The indicating device 19, 20 enables the position of the switch shaft to be ascertained at any time.

In order to render the operating parts easily accessible and to facilitate the removal of the switch cylinder 2 from the switch, the bent strips 15 and 16 of the angle piece 5 are elongated to provide supports 22, 23, which are slotted to enable the shaft 17 to have its ends pushed into these slots, 27, of the supports 22, 23 from above and from the front. After the shaft 17 has been inserted in the slots 27, the shaft is locked in position by special bearings 24 which receive the ends of shaft 17 and which are inserted in the slots 27 in order to confine the ends of the shaft 17 and so prevent its being moved sideways. The bearings 24 are retained in their slots 27 by means of two guarding pieces 20, 26. The guarding pieces are screwed to the supporting pieces 15 and 16, and their free ends extend into the upper portion of the slots 27 of the supports. In order to remove the shaft 17, the guarding pieces 20, 26 are lifted out of the slots 27 in the supports 22, 23 and are brought into the position shown dotted in the Figure 3. With the guards in this position, the bearings 24 can be taken out of the slots and the shaft 17 with its cams 18 can be removed from the supports after the operating pawls 12 and 14 have been lifted clear of the teeth of the toothwheel 11 engaged by them. It will be seen from Figure 2 that one of these guarding pieces 20 is so shaped that its free end also serves as a pointer for the indicating device 19, so that a special piece need not be provided for this purpose.

It is obvious that the individual parts can be constructed in a different manner than that shown and described. Of importance is the accessible and compact arrangement according to the invention, which is mainly achieved by the location of the driving magnet with respect to the switch cylinder, as well as by the location of the contact spring sets on one or both sides of the driving member and by the special construction of the contact springs.

What is claimed is:

1. In a sequence switch, a switch cylinder, a plurality of cams mounted on said cylinder, a motor magnet for operating said cylinder, two cooperating L-shaped brackets, projecting means on said brackets for mounting said cylinder and motor magnet with the axis of one parallel to the axis of the other, and a plurality of spring contact sets arranged in rows on both sides of said cylinder and mounted on said brackets in operative relation with said cams.

2. In a sequence switch, a switch cylinder, a plurality of cams mounted on said cylinder, an electro-magnet for operating said cylinder, a pair of cooperating L-shaped brackets, projecting means on said brackets for mounting said cylinder and magnet with the axis of one parallel to the axis of the other, detachable bearings and leaf springs cooperating with the projecting means for holding said cylinder in place, and a row of spring contact sets on each side of said cylinder mounted on said brackets in operative relation with said cams.

3. In a sequence switch, a cylinder carrying a plurality of cams, a row of vertical contact springs on each side of said cylinder and adapted to be operated by said cams, a motor magnet included between said rows and having the axis of its core parallel to the axis of said cylinder, said two axes lying in a vertical plane parallel to and midway between said vertical rows of springs, a ratchet on one end of said cylinder, an armature on the opposite end of said magnet and having an arm extend-

ing between the magnet and the cylinder substantially parallel with the axes thereof, and a pawl on the end of said arm and cooperating with said ratchet to rotate said cylinder about its axis under control of said magnet to cause said cams to operate said contact springs.

In witness whereof, I hereunto subscribe my name this 17th day of September, A. D. 1926.

FRITZ DÖRING.

In witness whereof, I hereunto subscribe my name this 17th day of September, A. D. 1926.

KONRAD MÜLLER.