May 14, 1940. K. MÜLLER 2,200,803

MOTOR DRIVEN SWITCH

Filed Oct. 21, 1937

FIG. 1

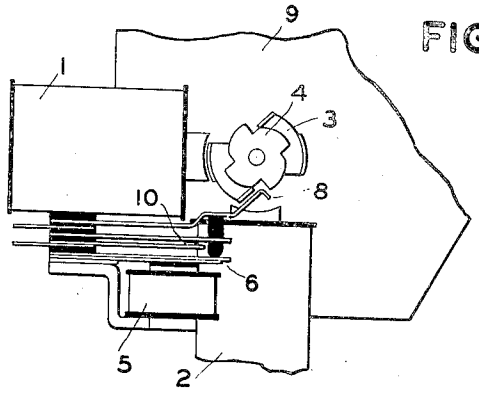


FIG. 2

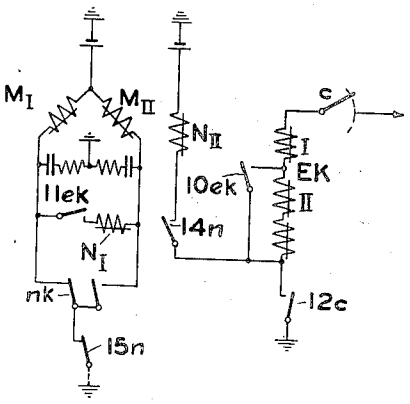
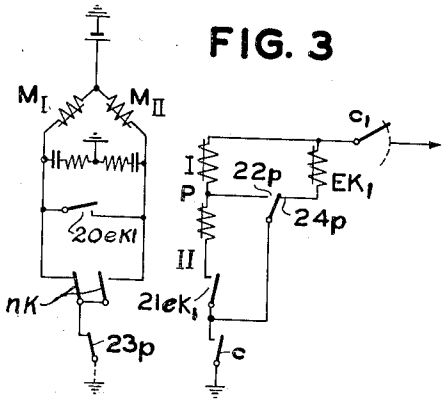


FIG. 3



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MOTOR DRIVEN SWITCH

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4 Claims. (Cl. 179—27.5)

The present invention is concerned with a testing circuit for high speed switches in particular for motor switches in telephone systems.

In such high speed switches only a small time is available for the testing operation. The testing operation must therefore proceed very rapidly so as to insure that the switch is efficiently brought to rest on the particular contact in its contact bank in question.

This requirement is met acoerding to the invention in that on each step of the switch the armature of the testing relay is mechanically pressed against its magnet by the driving device while at the same time the contacts controlled by the testing relay are operated.

This arrangement as may be recognized from the nature of the problem to be solved has the advantage of rapid testing because the testing current does not have to cause the relay to energize but it is only necessary for the relay to be held energized, its contacts having been already operated mechanically by the driving device.

In Figs. 1–3 of the drawing embodiments of the invention are represented. The invention is not limited to these embodiments. Only those details necessary to enable the invention to be understood have been shown.

While Fig. 1 represents the mechanical construction of the new relay as used in a motor drive for switches, Figures 2 and 3 represent the relay in a corresponding circuit diagram.

Fig. 1 shows the energizing coils 1 and 2 of a motor switch drive disposed at right angles. The armature 3, of which a side view can be seen in Fig. 1, is set in rotation by the alternate energization of these two coils. By means of this driving device a switch can be advanced in positive fashion for the purpose of free hunting.

Reference character 5 indicates the testing relay according to the invention. The armature 6 of this relay is pressed by means of the spring 8 against the pole of the relay on each step of the switch by means of a cam disc 4 fixed to the motor shaft. The contact 10 is closed at the same time. Naturally other contacts can be operated by the testing relay, these being either normal or working contacts as desired.

The spring 8 which is operated at intervals by the cam disc 4 is shown in the normal position, i. e., in the position which it occupies when disengaged from the cam. The parts mentioned are fixed to the base plate 9.

Fig. 2 shows the new testing relay incorporated in a motor switch circuit. MI and MII represent the two energizing windings of the motor while the relay N with its two windings I and II represents an auxiliary relay, EK indicates the testing relay 5. It has windings I and II which are disposed in the testing circuit of a switch of which only the wiper *c* is indicated. The references *nk* represent cam contacts (not shown in Fig. 1) which are operated by the motor shaft to effect the alternate energization of the windings MI and MII.

When the motor is subjected to current when the switch is seized (in any way, not shown) i. e., when a circuit is closed for winding MI over contact *nk* the motor is started up. Through the switching over of contacts *nk* to the right the winding MII is subjected to current and then winding MI again and so on. Referring to Fig. 1, on the first step the spring 8 is brought into position by cam 4 so that armature 6 is brought against relay 5. In terms of Fig. 2, this means that the relay EK corresponding to relay 5 is correspondingly influenced so that the contacts 10*ek* and 11*ek* are closed. The testing relay EK is provided with a testing winding I and a locking winding II. When the testing wiper *c* of the motor driven switch reaches a free line, i. e., when it finds negative potential the armature of the auxiliary magnet is held operated by the testing circuit since contact 12*c* has already been closed on the seizure of the switch. The line which has been found is guarded over contact 10*ek* by the short-circuiting of winding II of relay EK. The motor is brought to rest over the other contact 11*ek*. The holding current by means of which the motor is brought to rest then flows over the low resistance winding I of relay N which then disconnects the motor and locks up over its winding II and its contact 14*n*. The motor is disconnected at contact 15*n*.

Since on each step taken by the switch the contact 10*ek* which exercises the guarding function is temporarily closed, existing calls must not be interrupted when busy contacts in the switch are passed over. This is provided for by the short-period during which contact 10*ek* is closed.

Fig. 3 shows another embodiment of the invention. The motor is started up over its winding MI by the closing of a contact which is not shown. The testing relay in this case is represented by reference EK1 and only possesses a locking winding. When a free line is found over wiper *c*1 the armature of the auxiliary magnet is held fast and the motor is brought to rest over contact 20*ek*1 since a holding circuit is set up over

the busy windings of the motor over this contact. Contact 21*ek*I connects the auxiliary relay P to the testing lead and this relay which is provided with windings I and II makes a further test, guards the line by closing its contact 22*p* and thereby incidentally short-circuits its high resistance winding II and disconnects the motor at contact 23*p*. When contact 22*p* is closed contact 24*p* is opened whereby the winding of the testing relay EKI is disconnected. The disconnection of the winding has no further influence on the motor since this is already disconnected.

What is claimed is:

1. In a circuit arrangement for controlling the operation of a high speed stepping switch, motor magnets, a motor armature for stepping the switch, means for causing the operation of the armature by alternate energization of the magnets, an auxiliary relay having an armature and contacts mechanically operated each time the switch steps, certain of said contacts operated to render said magnets ineffective, and means including others of said contacts for energizing said relay to cause the deenergization of said magnets.

2. In a switch having a movable wiper for testing the lines of a group in succession to find a marked line therein, a motor for moving said wiper step by step thereby to associate same with the lines of said group one after another, a contact, a cam operated by the motor to close said contact upon each step of said motor, electromagnetic means operated over said closed contact responsive to said wiper encountering the marked line and effective to maintain said contact closed independently of said cam, and means controlled by said last means for controlling the operation of said motor.

3. In a switch having a movable wiper for testing the lines of a group in succession to find a marked line therein, a motor for moving said wiper step by step thereby to associate same with the lines of said group one after another, a testing relay for halting said motor responsive to said wiper encountering a marked line, and a contact on said relay mechanically operated by said motor upon each step, said contact when operated rendering said relay effective.

4. In a switch having a movable wiper for testing the lines of a group in succession to find a marked line therein, a motor for moving said wiper step by step thereby to associate same with the lines of said group one after another, a testing relay, means controlled by said motor for mechanically operating the armature of said relay upon each step of said wipers, the winding of said relay being energized to maintain its armature operated independently of said means only when said wipers encounter a marked line.

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