Oct. 13, 1942. V. W. LEONARD 2,298,890

ELECTRIC SWITCH MECHANISM

Filed Dec. 24, 1940

Fig. 1.

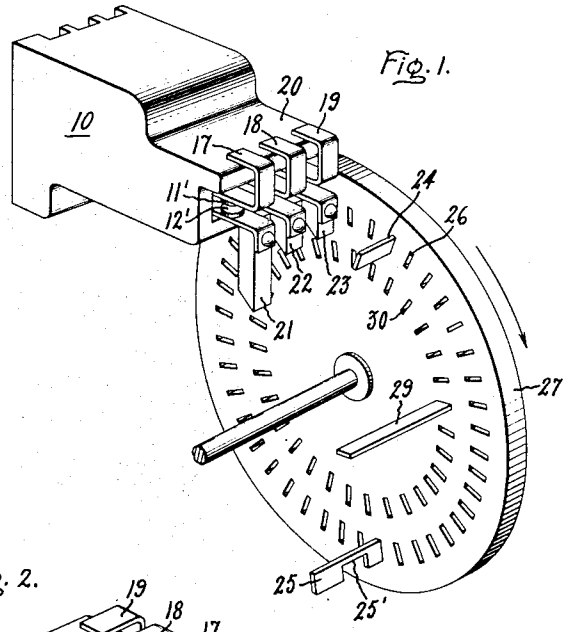


Fig. 2.

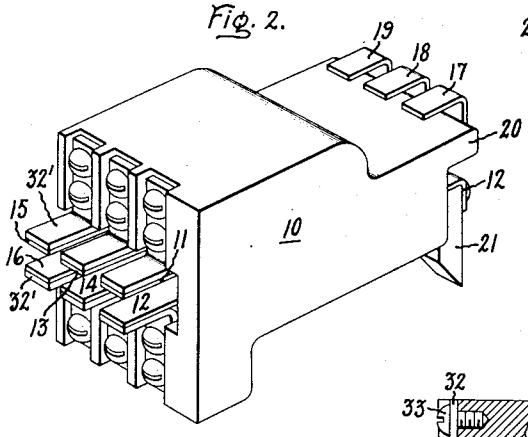
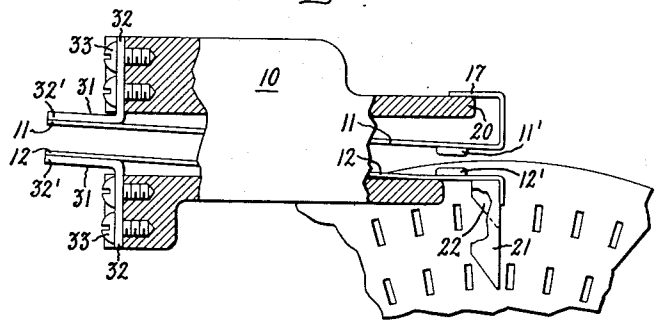


Fig. 3.



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Patented Oct. 13, 1942

2,298,890

UNITED STATES PATENT OFFICE

2,298,890

ELECTRIC SWITCH MECHANISM

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Application December 24, 1940, Serial No. 371,494

1 Claim. (Cl. 200—1)

My invention relates to an electric switch mechanism and more particularly to a switch mechanism provided with switch contact arms of the resilient blade type.

One object of my invention is to provide an improved switch mechanism provided with a resilient switch contact arm which may be readily adjusted to regulate the operating pressure between a contact tip carried by the arm and a cooperating contact tip.

Another object of my invention is to provide an improved switch mechanism provided with a resilient contact arm the flexure of which contact arm may be adjusted to regulate the force required to actuate the contact arm for switching operations.

For a better understanding of my invention, together with other and further objects thereof, reference is had to the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

In the accompanying drawing I have chosen to illustrate my invention by way of example, as applied to a switch mechanism used in traffic signal controllers. Fig. 1 of the drawing illustrates a switch mechanism including a group of switch contact arms mounted in a single block of insulation and actuated by actuating fingers or keys mounted in a rotating dial; Fig. 2 is a rear perspective view of the contact block illustrated in Fig. 1, and Fig. 3 is a cross-sectional view of the contact block illustrating, in side view, the mechanism in the block.

Referring to the drawing in detail, the switch mechanism illustrated includes a block 10 of a suitable insulating material having a generally rectangular shape provided with a slot open on one side and at the ends of the block. Three pairs of switch contact arms 11, 12; 13, 14; and 15, 16 extend through this block from end to end, being placed into the slot through the open side thereof. The pairs are arranged side by side and the contact arms of a pair are arranged above one another.

The contact arms are made of a metal strip which is preferably bronze or hard copper. They are mounted rigidly at one end and are provided with contact trips at their free ends which are given a limited range of movement. Such metal strips have the characteristic of being flexible to a degree, in the manner of a spring steel blade, without permanently losing shape. In other words, a strip of this metal may be held rigidly at one end and the other end may be moved for a considerable degree out of line with its normal position and, when released, it will spring back to its original position. The force required to flex such a strip increases with the distance by which the end of the spring is displaced from its original position, whereby a range of contact pressures may be obtained by regulating the amount of initial flexure of the strip.

The front ends of the upper contact arms, which project out of the block 10 at the front end are bent backwardly to form hooks 17, 18 and 19, the ends of which hooks engage a projecting ledge or stop 20 at the forward upper end of the block. The hooked ends 17, 18 and 19 rest upon this ledge 20 to stop the downward movement of the contact arms. The hooks are so proportioned as to leave a considerable space between the under side of the ledge 20, which is a continuation of the slot surface, and the upper side of the contact arm, this space providing the range of movement of the forward end of the contact arm.

The forward end of each of the lower contact arms 12, 14 and 16 is bent downwardly at right angles to the body of the arm and is provided with an actuating block. A block 21 is attached to the contact arm 12, a block 22 is attached to the contact arm 14 and a block 23 is attached to the arm 16. The actuating blocks 22, 23 are of equal length but are considerably shorter than the actuating block 21.

The contact arms are each supported at the back end of the block by a soft metal member 31. This supporting member 31 is made of a nonresilient and comparatively soft metal such as copper, for example. In the illustrated switch mechanism this member is bent at the center to form two legs 32 and 32' meeting at an apex at substantially right angles to each other. One leg 32 is provided with holes so that it may be attached to the end of the block 10. This leg is attached to the end of the block by screws 33 so that the other leg 32' projects away from the end of the block. This leg 32' has attached to it the back end portion of the resilient contact arm. Any convenient method of attaching the arm may be used. In the illustrated example the arm is attached by being soldered to the leg 32'. The arm then projects through the slot to the other end of the block, parallel to the surface of the slot and slightly spaced therefrom.

After a set of contacts is mounted in an insulating block as shown in the drawing, the projecting leg 32' of each member 31 may be sepa-

rately gripped by a pair of pliers and may be bent about the apex of the L member. This bending effects an adjustment of the front end of each contact arm about the apex of the L member as a pivot. In the illustrated contact mechanism the L member supporting the contact arm 12 may be bent so that the forward end of the contact arm 12 will rest upon the forward end of the block 10 which forms a stop for the contact arm, and may then be bent further to flex the contact arm until a certain pressure will be required to move this forward end upwardly, this pressure being large enough to prevent the forward end of this contact arm from vibrating as a result of ground vibrations set up, for instance, by heavy traffic. The force required to move the arm must be small enough so as not to place too great a load upon the actuating mechanism. Similarly, the leg 32' supporting the contact arm 11 may be bent so that the forward end of the contact arm 11 will move downwardly and its hook 17 will engage the upper side of the ledge 20. The leg may then be bent further to flex the contact arm 11 so that the hook will engage the ledge with some pressure and will not vibrate. During operation, when the contact arm 12 is actuated, the contact arm moves upwardly until its contact tip 12' engages the contact tip 11' of the arm 11. In order to insure a good contact, in each instance, the engagement of the contact tips occurs before the end of the movement of the contact arm 12. It is therefore necessary to overcome the flexing resistance of both arms 11 and 12 for the last part of the actuation or movement of the contact tip 12'. In order to require a minimum actuating force, the flexure of the two contact arms must therefore be reduced to a minimum consistent with the tendency of the contact arms to vibrate and consistent with the needed pressure between the contact tips during engagement.

The other contacts in the block 10 are similarly provided with L members whereby their positions can be individually adjusted with the aid of suitable pliers being applied to the rearwardly projecting arms 32' of their respective L members. This improved mounting of the contact finger enables an operator to mount all contact arms within a single block and then individually adjust the flexure and alinement of each contact without removing a single one from the block.

One method of actuating the contact arms of my improved switch mechanism is illustrated in Figs. 1 and 3. The blocks 21, 22 and 23 are therein actuated by keys placed in a rotating dial. The short blocks 22 and 23 are actuated by keys 24 and 25 placed in an outer row of slots 26 of the rotating dial 27. The key 24 actuates the block 23 nearest to the dial and the key 25, having therein a slot 25', passes the block 23 and actuates the block 22. The block 21 is actuated by a key 29 placed in an inner row of slots 30 on the dial 27. Each of the blocks 21, 22 and 23 is provided with an end surface arranged at such angle that during the clockwise rotation of the actuating keys 24, 25 and 29 they respectively engage the surfaces and effect an upward motion of the blocks during the circular motion of the keys. During such operation the block 21, for example, is lifted upwardly by the key 29, thereby moving the forward end of the contact arm 12 upwardly so that the contact tip 12' mounted at the forward end of the contact arm engages the cooperating contact tip 11' mounted on the underside of the contact arm 11 thereby effecting a circuit closure between this pair of contact arms. Similar contact tips are mounted opposite each other upon the other two pairs of contact arms and similarly the keys 24 and 25 engage and move upwardly the blocks 23 and 22 respectively to effect a circuit closure between the contact tips of these two pairs of contact arms.

What I claim as new and desire to secure by Letters Patent of the United States is:

In a switch mechanism, the combination of an insulating block provided with a slot and a ledge at one end of said slot, a pair of L members each L member comprising two legs projecting from an apex in angular relationship to each other one of said legs being attached to the end of said block with the second leg projecting away from the end of said block at one end of said slot said projecting legs being spaced from each other and arranged above one another, a resilient switch contact arm attached at one end to the upper one of said second legs projecting through said slot and provided with a hook at its free end for engaging said ledge at the other end of said slot said second leg being adjustable about its apex to effect an engagement of said hook end of said contact with the said ledge and upon further adjustment to effect a flexure of said contact arm to establish a predetermined resistance to a movement away from said ledge, a second contact arm attached to the lower projecting leg said contact arm also projecting through said slot and being arranged to cooperate with said first-mentioned contact arm said lower second leg being adjustable about its apex to move said free end of said contact arm against the side of said slot and to further move said contact arm to effect a predetermined flexure of said arm thereby to establish a predetermined resistance to actuation of said last-mentioned arm, and means arranged to intermittently actuate said contact arms.

VINCENT W. LEONARD.