May 24, 1938. A. C. MAGRATH 2,118,258

RELAY MECHANISM

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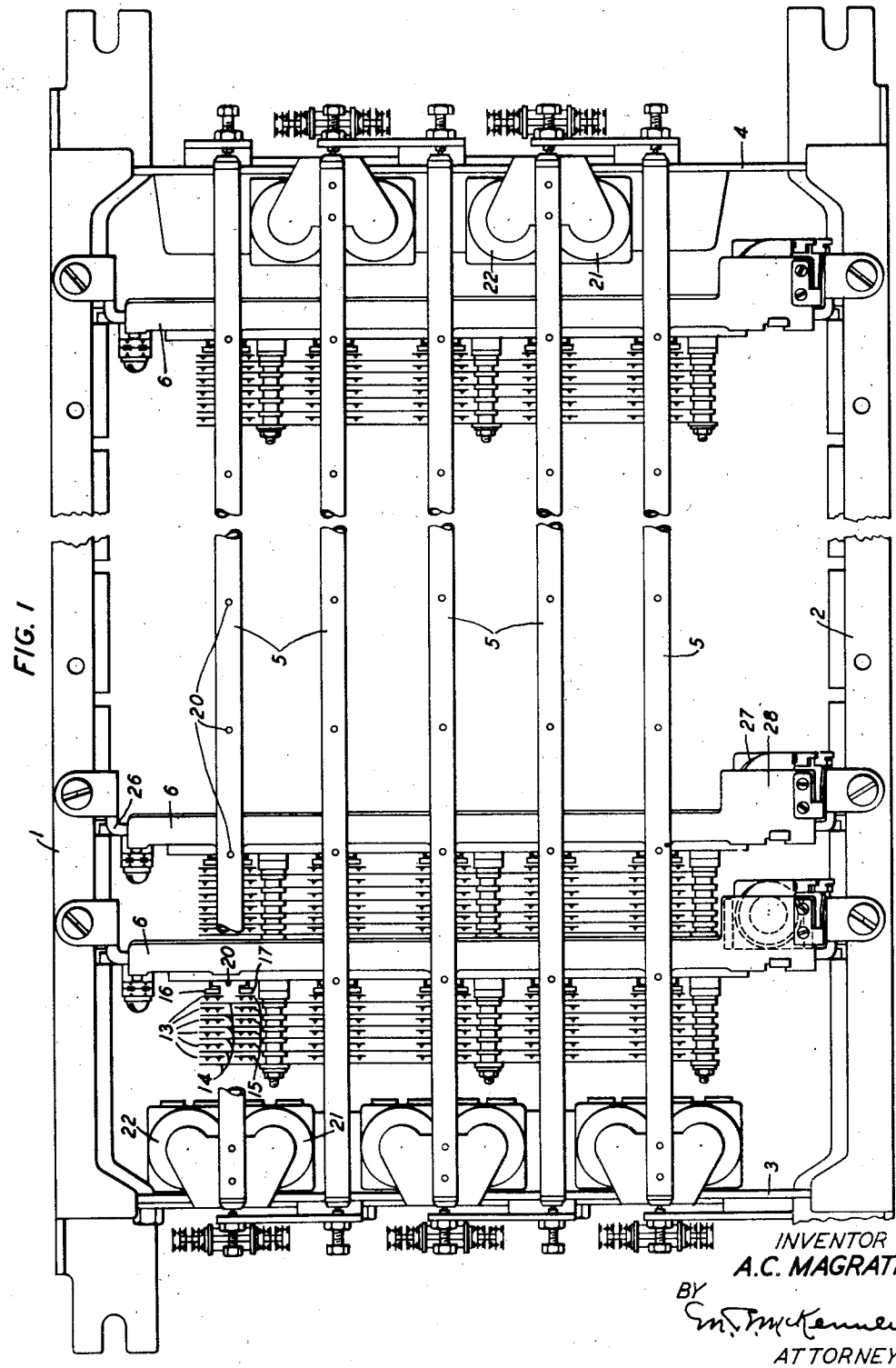

FIG. 1

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FIG. 2

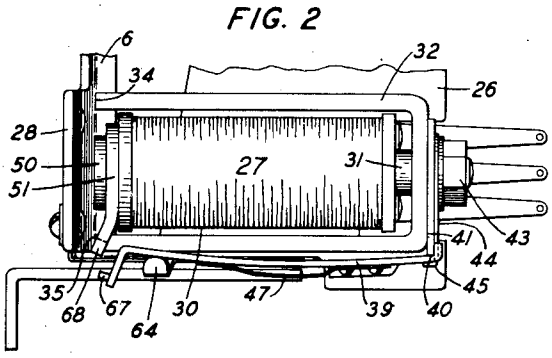


FIG. 3

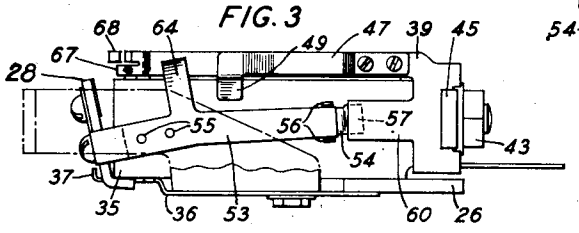


FIG. 4

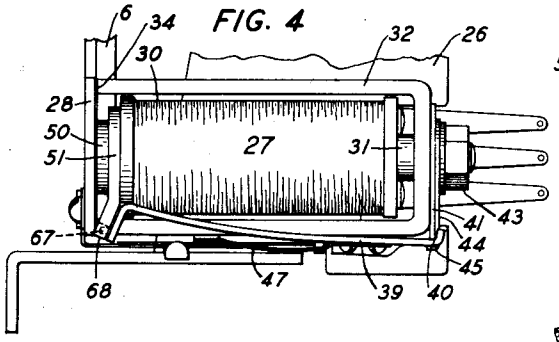


FIG. 5

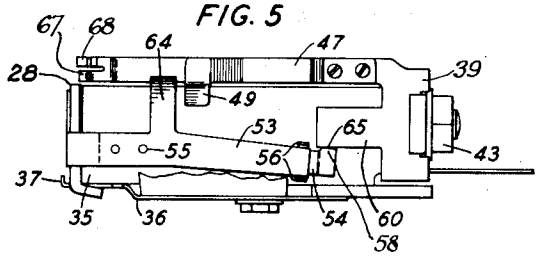


FIG. 6

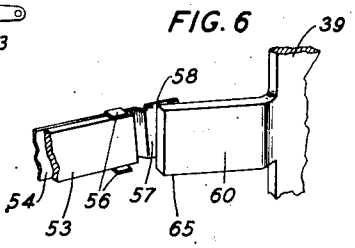


FIG. 7

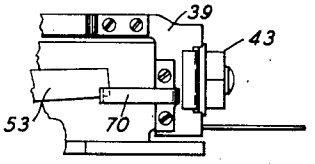
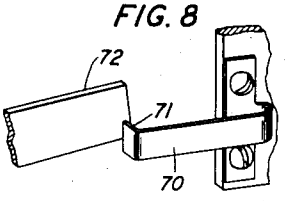


FIG. 8



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UNITED STATES PATENT OFFICE

2,118,258

RELAY MECHANISM

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Application May 14, 1937, Serial No. 142,631

5 Claims. (Cl. 179—27.54)

This invention relates to improvements in relay mechanisms and particularly to means for locking said mechanisms in actuated position.

It is an object of this invention to provide mechanisms of this kind in which the maintaining thereof in operated position is economically effected both in regard to the saving of holding current and in simplified structures.

Heretofore systems have been provided having locking means for armatures such as arrangements in which a heavy armature, attracted by a substantial current in one winding, is locked in operated position by a lighter armature attracted by a reduced current in another winding after the heavier current through the first winding ceases.

It is a feature of the present invention to provide an improved relay mechanism of this type comprising a single energizing winding and two armatures and in which one armature may be held in actuated position by the other armature with the winding energized by a fraction only of the original operating current.

Another feature is an arrangement whereby the two armatures may be operated simultaneously and one of these, that is, an auxiliary armature operates a stop member or latch which holds the other or main armature. The mechanism is so constructed that no interference will occur when said two armatures are operated simultaneously.

The invention is illustrated in the accompanying drawings in which:

Fig. 1 shows a front view of a cross-bar switch structure with applicant's invention applied thereto;

Figs. 2 to 6 show various views of a relay mechanism constructed in accordance with the applicant's invention applied specifically to the cross-bar switch structure as disclosed in Fig. 1;

Fig. 2 is a side view of the relay looking from the right side thereof as viewed in Fig. 1;

Fig. 3 is a bottom view;

Fig. 4 is a view similar to Fig. 2 except that the armatures are shown in locked positions;

Fig. 5 is a view similar to Fig. 3 except that the armatures are shown in locked position;

Fig. 6 is an enlarged perspective fragmentary view of the latch mechanism in normal position.

Figs. 7 and 8 are fragmentary views of a modified form of the applicant's invention;

Fig. 7 shows a bottom view of the relay structure with the armatures in normal position; and

Fig. 8 is a fragmentary perspective of the parts as illustrated in Fig. 7.

While relay mechanisms in accordance with the applicant's invention may be used in a number of different ways and in general may be applied to different types of cross-bar switches, it has been illustrated as applied to a particular type of switch as described in the Patent to J. N. Reynolds 2,021,329 of November 19, 1935.

Referring now to the drawings and particularly to Fig. 1, a general description will be made of the essential parts of the cross-bar switch shown to which the applicant's invention has been applied. For a full description of the details of this switch and its operation reference may be had to the above-mentioned patent to Reynolds. This switch consists of a frame comprising members 1, 2, 3, and 4, five horizontal bars 5 and a series of ten vertical bars 6. The first, second and last of the latter bars only have been shown in full with their corresponding horizontal and vertical rows of contact sets. The first horizontal row of contact sets is marked 13 and the first vertical row is marked 14, while the second horizontal row is marked 15. The actuating spring for connecting the horizontal contacts 13 to the vertical contacts 14 is shown at 16 and the actuating spring for connecting the horizontal contacts 15 with the vertical contacts 14 is shown at 17. The first or upper horizontal bar 5 may be rotated in one direction to cause the associated selecting fingers 20 to select the upper row of horizontal contacts 13 by the operation of the magnet 21 and be rotated in the opposite direction to select the second row of horizontal contacts 15 by the operation of magnet 22. The selecting finger in the case of the operation of the magnet 21 is placed in front of the actuating spring 16 and on the operation of magnet 22 is placed in front of actuating spring 17. The vertical operating bar 6 which is mounted on the member 26 may be actuated by magnet 27 through the armature 28 integral with the operating bar 6 to cause said bar to operate on an actuated selecting finger 20 to press an actuating spring such as 16 or 17 against the contact set 13 or 15 to make contact with a vertical contact set 14. The members 26 are secured to the upper and lower frame members 1 and 2 while the horizontal bars 5 are pivotally supported between the frame members 3 and 4. After the magnet 27 has operated on the armature 28 the corresponding bar is locked in operated position in a manner that will be hereinafter described and the operating current in magnet 27 may then be reduced to a small fraction of its original value to hold this bar in actuated position. The corresponding horizontal bar 5 may then be returned to normal

and the established connection is maintained until the circuit for the magnet 27 is broken at which time the bar 6 is released and the selecting finger 20 returns to normal causing the connections through the contact sets to be opened.

Referring now specifically to Figs. 2 to 5, the details of the relay mechanism as embodied in this cross-bar structure will be described. The magnet 27 consists of a winding 30 on a core 31 which is fastened to a U-shaped pole-piece 32. This pole-piece may be welded to the support 26. The vertical bar 6 is mounted with its armature 28 on knife edges on the sides of the U-shaped pole-piece 32 at points 34 and 35 and is prevented from displacement by the spring 36 which is provided with a right angle projection 37 for this purpose. The auxiliary armature 39 is mounted on a knife edge at 40 on a mounting plate 41 which is secured to the bottom portion of the U-shaped pole-piece 32 by means of a nut 43 which also secures the core 31 to the pole-piece 32. This armature 39 is prevented from displacement by a spring member 44 mounted between the nut 43 and the plate 41 and is provided with a right angle projection 45 for this purpose. This auxiliary armature 39 is held in released position by spring 47 secured thereto and resting on the bottom of the lower side member of the U-shaped pole-piece 32 by means of a projection 49, as shown in Fig. 3. The main armature 28 when attracted takes its position against the free end 50 of the core 31 and the auxiliary armature when attracted takes the position with its bent and free end against a special magnetic spoolhead 51 attached to the free end 50 of the core 31. This bent end of the auxiliary armature 39 is bifurcated with one prong 67 bent to engage a cut-in portion on the spoolhead 51 and thus serves to guide the auxiliary armature 39 to prevent it from a sidewise shift when locking the main armature in the manner hereinafter to be described.

On the main armature 28 is mounted a right angle bracket 53 and to this bracket is secured a flexible spring member or latch 54 riveted at 55 and having prongs 56 to prevent it from shifting sidewise. This is clearly shown in Figs. 3 and 6. The end of spring 54 is bent forward so as to present a portion 57 with its upper surface flush with the lower surface of the bracket 53. This portion 57 is provided with a right angle bent edge portion 58 to provide a wider contact surface, as the spring itself is rather thin. This portion 57 engages normally an extension 60 on the auxiliary armature 39. The bracket 53 is cut to form a right angle hook-shaped member 64 the end of which normally engages the auxiliary armature 39 and serves as a back stop for this armature.

The operation of locking the main armature 28 will now be described. When the armature 28 is attracted toward the free end 50 of the core 31, the bracket 53 carries the spring 54 from its normal position under the extension 60 to one side thereof, as shown in Fig. 5 and at the same time the auxiliary armature 39 is attracted so that the free end thereof engages the spool-head 35. This causes the extension 60 on the auxiliary armature 39 to press the spring 54 downward away from the bracket 53 but when both armatures are fully attracted, the portion 57 of the spring 54 wil be placed as shown alongside of the extension 60 with the right angle portion 58 engaging the edge 65 of the extension 60. The auxiliary armature if remaining in this position will therefore now lock the main armature in actuated position. The operating current required for operating these two armatures may now be reduced to a small fraction of its original value and need only be sufficient to hold the auxiliary armature 39 against the spool head 51 as the main armature is securely locked in its operated position by the portion 58 of spring 54 energizing edge 65 of the bracket 60 of the auxiliary armature 39. Thus, it will be seen that both armatures can operate simultaneously due to the flexibility of the spring 54, and the position of the spring 54 and extension 60 are such that there is practically no pressure on the armature 39 on the part of the main armature 28 to dislodge the armature 39 from its actuated position. It should be noted that the force exerted by the armature 28 in its attempt to return to normal is directed solely against the edge 65 of the extension 60 and the armature 39 itself is guided by the prong 67 engaging the portion 68 of the spoolhead 51 to prevent a sidewise shift of the armature 39. This force exerted at the point 65 is near the pivotal point of the auxiliary armature 39 while the magnetic force exerted on portion 67 is at the extreme free end of the armature. It is readily seen that sidewise pressure of the prong 67 on portion 68 is considerably reduced as compared with the pressure of the bracket 53 at point 65 due to this difference in leverage. Consequently the magnetic force required to hold armature 39 in actuated position need only be sufficient to overcome the tension of the restoring spring 47 which in turn must be sufficient to overcome the frictional pressure at point 65 when the magnet is deenergized to return the armature 39 to normal and thus release the armature 28.

Referring now to Figs. 7 and 8, a modified disclosure is shown in which the bracket 53 of the armature 28 is not provided with any spring, but the auxiliary armature 39 is provided with a flexible spring 70 that ends in a right angle extension 71 that normally engages the bracket 53 on its upper surface. When the armature 28 is energized, the bracket 53 will slip from under the extension 71 and as the auxiliary armature is operated, the spring 70 will be pressed against the bracket 53 and consequently when the extension 71 slips off the upper edge of projection 53, it will come to rest on the side of this bracket at point 72. Thus the spring 70 will lock the bracket 53 to hold the armature 28 in operated position in a similar manner to that described in connection with Figs. 2 to 6.

What is claimed is:

1. In a relay mechanism, a single energizing winding, a main armature and an auxiliary armature, both armatures operated to actuated positions by certain energizations of said winding and the auxiliary armature held in its actuated position by certain less energizations of said winding, and mechanical means movable on the operation of both armatures for locking the main armature in actuated position under control of the auxiliary armature and for maintaining said main armature locked if the energization of the winding is subsequently reduced to a point sufficient to hold the auxiliary armature in operated position.

2. In a relay mechanism, a single energizing winding, a heavy armature and a lighter armature both operated simultaneously to actuated positions by a certain energization of said winding, and latching means operative on the operation of both armatures for locking the heavier armature

in actuated position by the lighter armature and for maintaining said heavier armature locked if the energization of the winding is subsequently reduced to a certain point sufficient to hold the lighter armature in operated position.

3. In a relay mechanism, an energizing winding, a main armature and an auxiliary armature both operated simultaneously to actuated positions by certain energizations of said winding and the auxiliary armature held in its actuated position by certain less energizations of said winding, and a flexible latch member on one of said armatures in position to lock the main armature in operated position, when both armatures are operated in actuated position, and in position to maintain the main armature locked if the energization of the winding is subsequently reduced to a point sufficient to hold the auxiliary armature in operated position.

4. In a relay mechanism, an energizing winding, a main armature and an auxiliary armature, a relatively long projection on the auxiliary armature, and a flexible latch member secured to the free end of the projection on the main armature cooperating with the projection on the auxiliary armature for locking the main armature in actuated position when both armatures are operated by the energization of the winding and for maintaining it locked when the energization of the winding is reduced to a point sufficient to hold the auxiliary armature in operated position.

5. In a relay mechanism a single energizing winding, a main armature and an auxiliary armature, both armatures operated to actuated positions by a certain energization of said winding, a latching member on each of said armatures cooperating on the operation of said armatures for locking the main armature in operated position when both armatures are operated and cooperating to maintain the main armature locked if the energization of the winding is subsequently reduced to a point where it will only hold the auxiliary armature in operated position.

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