April 27, 1943.

P. B. DRAKE

2,317,743

SWITCHING MECHANISM

Filed Sept. 24, 1941

2 Sheets-Sheet 1

FIG. 2

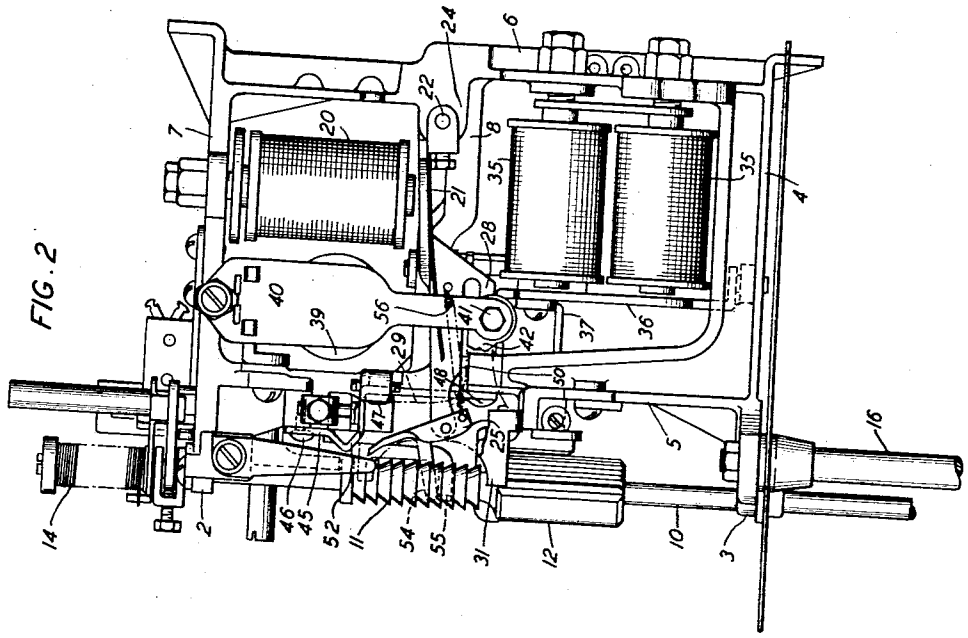

FIG. 1

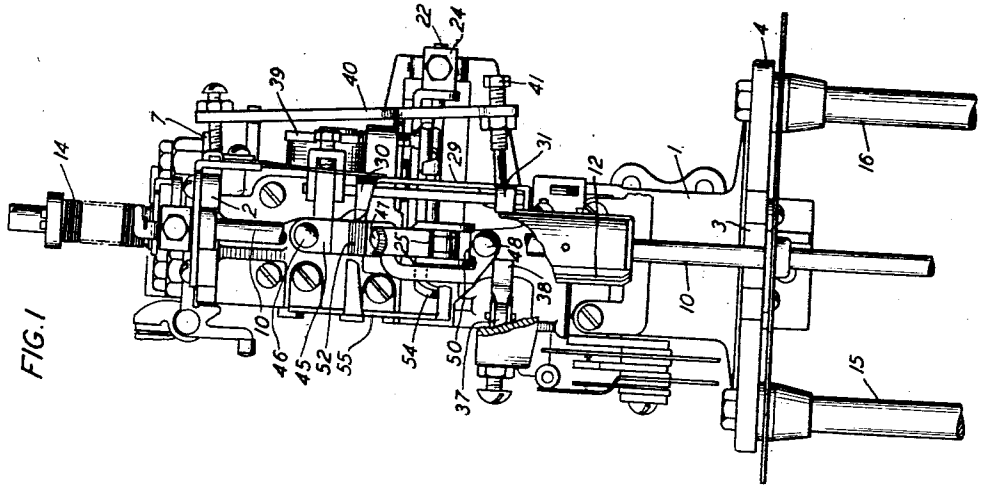

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FIG. 4

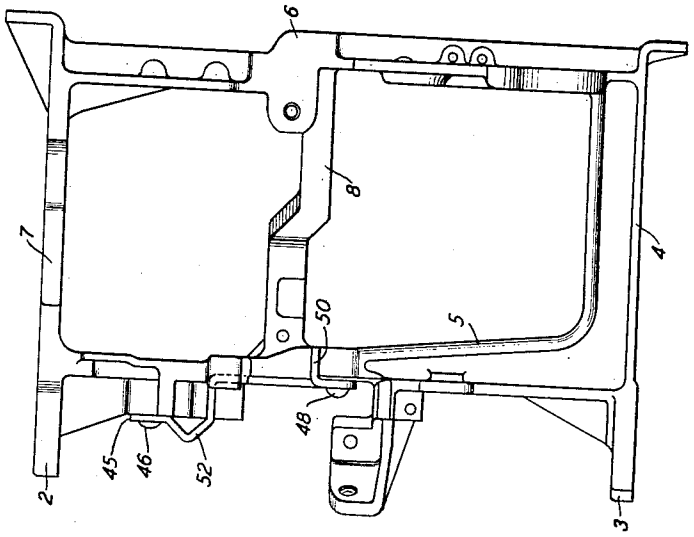


FIG. 3

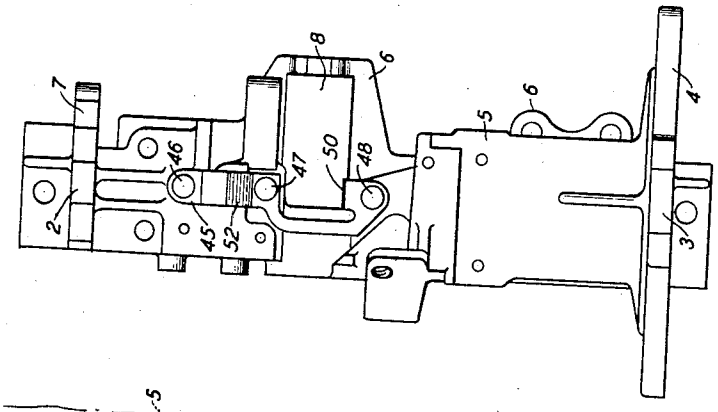
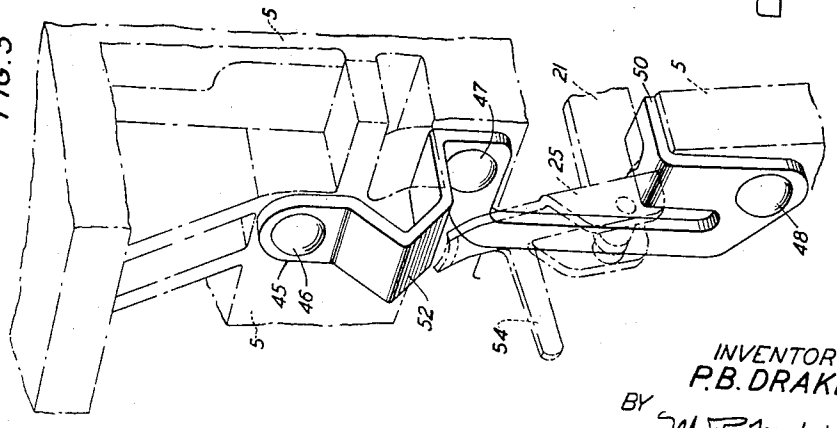


FIG. 5



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UNITED STATES PATENT OFFICE

2,317,743

SWITCHING MECHANISM

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Application September 24, 1941, Serial No. 412,053

3 Claims. (Cl. 179—27.52)

This invention relates to switching mechanisms and particularly to such mechanisms as are employed in telephone systems.

An object is to reduce the cost and simplify the manufacture of said switch structures as well as to reduce the weight thereof.

Heretofore switching mechanisms have been arranged in which a frame structure for supporting the various parts of the mechanism was molded from hard metal such as iron, and in which said frame was machined in various places to provide accurately located surfaces on which to mount the stationary and movable parts of the switch and against and between which the movable parts of the switch would operate freely and accurately.

Such switches often are of the well-known Strowger type and in general consist of a vertical shaft having brushes thereon operating on terminal banks to select sets of terminals by a vertical and rotary movement of the shaft, said movements of the shaft being controlled by operating magnets in a step-by-step manner.

This invention relates to switching mechanisms of this type in which the frame structure for supporting the various parts of the switch is die cast from soft metal, such as a zinc composition, in place of a molded hard metal casting. By providing this type of casting a number of the machining operations necessary for mounting the stationary and movable parts are eliminated and the weight of the switch structure is materially reduced.

It is a feature of the invention to provide a hard metal bracket mounted on the frame to serve as a stop member for a pawl on an armature controlled by a stepping magnet and also to serve as a stop member for the armature when in normal position. This hard metal bracket, therefore, not only serves to regulate the stroke of the pawl and armature but also prevents deformation of the soft metal frame by the pounding of the pawl and the armature during the stepping operations thereof.

The invention has been illustrated in the accompanying drawings in which:

Fig. 1 shows a front view of a switch structure embodying the applicant's invention, this switch structure being in general of the Strowger step-by-step switching type;

Fig. 2 is a right-hand side view of the structure shown in Fig. 1;

Fig. 3 is a front view of the die cast frame structure;

Fig. 4 is a right-hand side view of this frame; and

Fig. 5 is a fragmentary perspective view showing the hard metal bracket in accordance with applicant's invention.

Referring now to the drawings, in general the mechanism provided in this type of switches consists of the following parts: A soft metal die cast frame structure 1 having forwardly projecting members 2 and 3, a base member 4, a front member 5, a rear member 6, a top member 7 and an intermediate cross member 8 connecting members 5 and 6. In apertures through the members 2 and 3 is journaled an operating shaft 10 having a vertical ratchet 11 and a rotary ratchet 12 by means of which the shaft is lifted and rotated by magnet armatures and pawls as will be described hereinafter. At the upper end of the shaft is mounted a spring 14 to return the shaft from an advanced rotary position to normal and at the opposite lower end is a mounted series of brushes to be lifted and rotated to establish connections with terminals in banks, not shown, but generally mounted on posts 15 and 16 which are secured to the bottom member 4. To lift the shaft vertically a vertical magnet 20 is mounted on the member 7 and operates an armature 21 mounted on a pinion 22 between the cross member 8 and the lug 24. This armature is provided with a pawl 25 which engages the ratchet 11 to lift it one step each time the armature is operated. The armature 21 is provided with an extension 28 operating on the locking spring, not shown, for the so called "double dog" holding pawl 29 having an upper pawl member 30 engaging, when the holding pawl is released, a tooth in the ratchet 11 and a lower pawl member 31 engaging, when the holding pawl is released, a tooth in the ratchet 12 to hold, respectively, the shaft in advanced vertical and rotary positions. On the rear member 6 is mounted a rotary magnet 35 which operatets on an armature 36 having a forwardly extending bracket 37 on which a pawl 38 is mounted to engage the ratchet 12 and rotate it when the magnet 35 is operated. To release the shaft to normal position after having been operated by the vertical and rotary magnets 20 and 35 a release magnet 39 is mounted on the front member 5 of the frame and operates on its armature 40 which through a pin 41 acts on the rearward extension 42 of the holding pawl 29 to cause the pawls 30 and 31 to release the shaft, the shaft rotating back to normal by the tension in spring 14 and returns from its vertical position by gravity.

Referring now particularly to the hard metal bracket 45 which is provided as the stop member for the pawl 25 and armature 21, this bracket is secured to the front member 5 by rivets 46, 47 and 46. A right-angle extension 50 that extends rearward from the front of the structure serves as the back stop for the armature 21 when in normal position. The bracket extends from the lower end where it is secured by the rivet or drive screw 48 towards the left looking at Fig. 5 and then upwardly to the rivet 47 where it extends toward the right. From this point on the bracket extends at a right-angle forwardly and then at an oblique angle again forwardly and at a right-angle towards the rear and then perpendicularly upward to the rivet 46. The portion 52 serves as a stop member for the pawl 25 when the armature has lifted the pawl and the pawl has engaged a tooth in ratchet 11 to limit the upward movement of the armature and pawl. The outer surfaces of portions 50 and 52 are accurately located in relation to each other so as to limit the movement of the armature and pawl from the normal position to the operated position. The pawl 25 has a forwardly extending projection which engages a projection 54 on a bracket 55 mounted on the left-hand side of the frame member 5 as shown in Fig. 1 so that when the armature is in normal position the pawl will be removed or rotated on its pivot away from the teeth in the ratchet 11. A spring 56 is secured to the pawl 25 at one end and at the other end to the armature 21 to tension or urge the pawl 25 to engage the tooth in ratchet 11.

This hard metal bracket therefore limits the movements of the armature 21 and pawl 25 and also serves as a protection for the soft metal frame member 5 so that this member will not be deformed by the pounding of the armature and pawl during their forward and backward strokes as the pawl 25 engages the outer surface of portion 52 on the forward stroke and the armature 22 engages the outer surface of portion 50 on the backward stroke. It should be noted that the portions of the bracket engaging the frame member 5 are comparatively large and the bracket substantially constructed and secured so as to form rigid stop surfaces for the pawl and armature. As the frame 1 is die cast from a soft metal such as a zinc composition, no machining operations are required on the frame to accurately locate the stationary and movable parts of the mechanism and the manufacture of this switch mechanism is therefore considerably simplified and reduced in cost. The frame structure is also of substantially less weight than the prior cast-iron frames as heretofore used and consequently the weight of the completed mechanism is materially reduced.

What is claimed is:

1. In a switching mechanism, a soft metal frame, an operating shaft mounted thereon, a magnet mounted in said frame, an armature controlled by said magnet, a pawl secured to said armature and operated thereby to control said shaft and a hard metal bracket mounted on said frame and having a surface against which the pawl strikes when the armature is actuated to fix the operated position of the pawl and another surface against which the armature strikes when it returns to normal to fix the normal position of the armature and having a plurality of other comparatively large surface areas contacting correspondingly large areas of the frame so that shocks caused by the repeated pounding of the pawl and armature against said respective striking surfaces are distributed over said plurality of large contacting areas of the frame and thus absorbed thereby to prevent deformation of the soft metal frame by said shocks.

2. In a switching mechanism, a soft metal frame, an operating shaft mounted thereon, a magnet mounted in said frame, an armature controlled by said magnet, a pawl secured to said armature and operated thereby to control said shaft and a hard metal bracket mounted on said frame and shaped to have three comparatively large flat portions thereof engaging comparatively large surfaces on the frame, two of said portions being connected together to form a limiting stop for the forward stroke of the pawl when the pawl is operated and another portion serving directly as a limiting stop for the backward stroke of the armature when returned to normal said large engagement surfaces between said three portions of the bracket and the frame serving to distribute and absorb the shocks caused by said forward and backward strokes of said pawl and armature and thus prevent distortion of said soft metal frame by said shocks.

3. The combination in a switch having a brush shaft movable in a step-by-step motion to a plurality of successive contact-selecting positions, a stepping magnet having an armature and a pawl for operating said shaft in its step-by-step movement, said stepping pawl having a normal position and a fully operated position, both of which have a definite and fixed relation to the positions of said shaft, a die-cast frame of relatively light, soft and deformable material on which the parts of said switch, including said shaft, magnet, armature and pawl, are mounted, the relation between the normal and operated positions of said pawl and any one of the successive positions of said shaft being determined by the locations of the normal and operated positions of said pawl with respect to said frame, and a bracket of relatively hard material mounted on said die-cast frame serving as a front stop to limit and fix the fully operated position of said pawl and serving as a back-stop to limit and fix the normal position of said pawl, said bracket being integral in structure and having surfaces of large areas engaging surface areas of the soft material of said die-cast frame, the large engagement areas of said bracket serving to distribute over the correspondingly large engagement areas of said frame the forces applied to said bracket by the repeated blows incident to the operation of said pawl to prevent the deformation of said frame and the consequent disturbance of the fixed relation between said pawl, shaft and other parts of the switch.

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