

Nov. 5, 1946.

P. B. DRAKE

2,410,432

SWITCHING MECHANISM

Filed Dec. 23, 1943

3 Sheets-Sheet 1

FIG. 2.

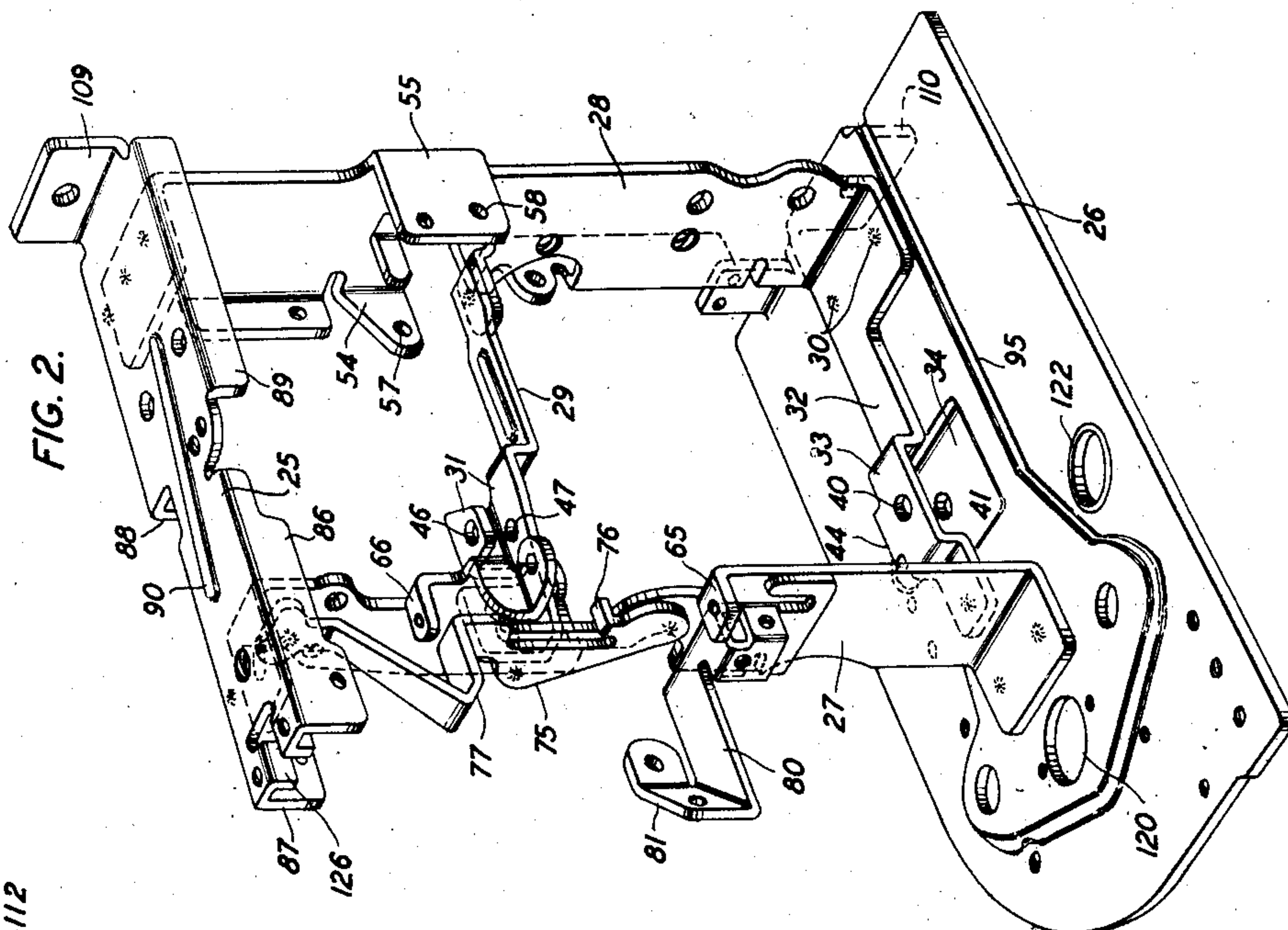
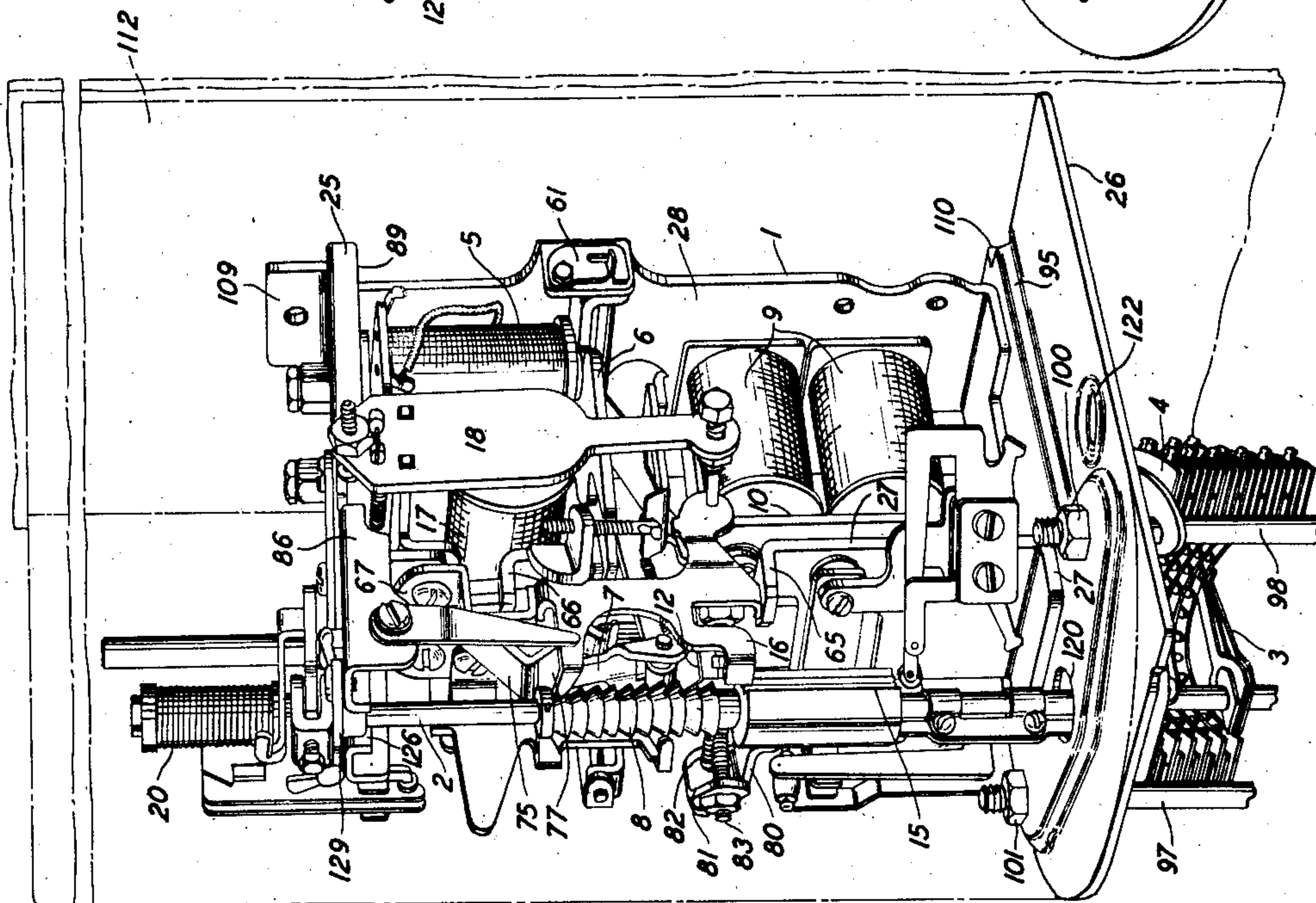


FIG. 1.



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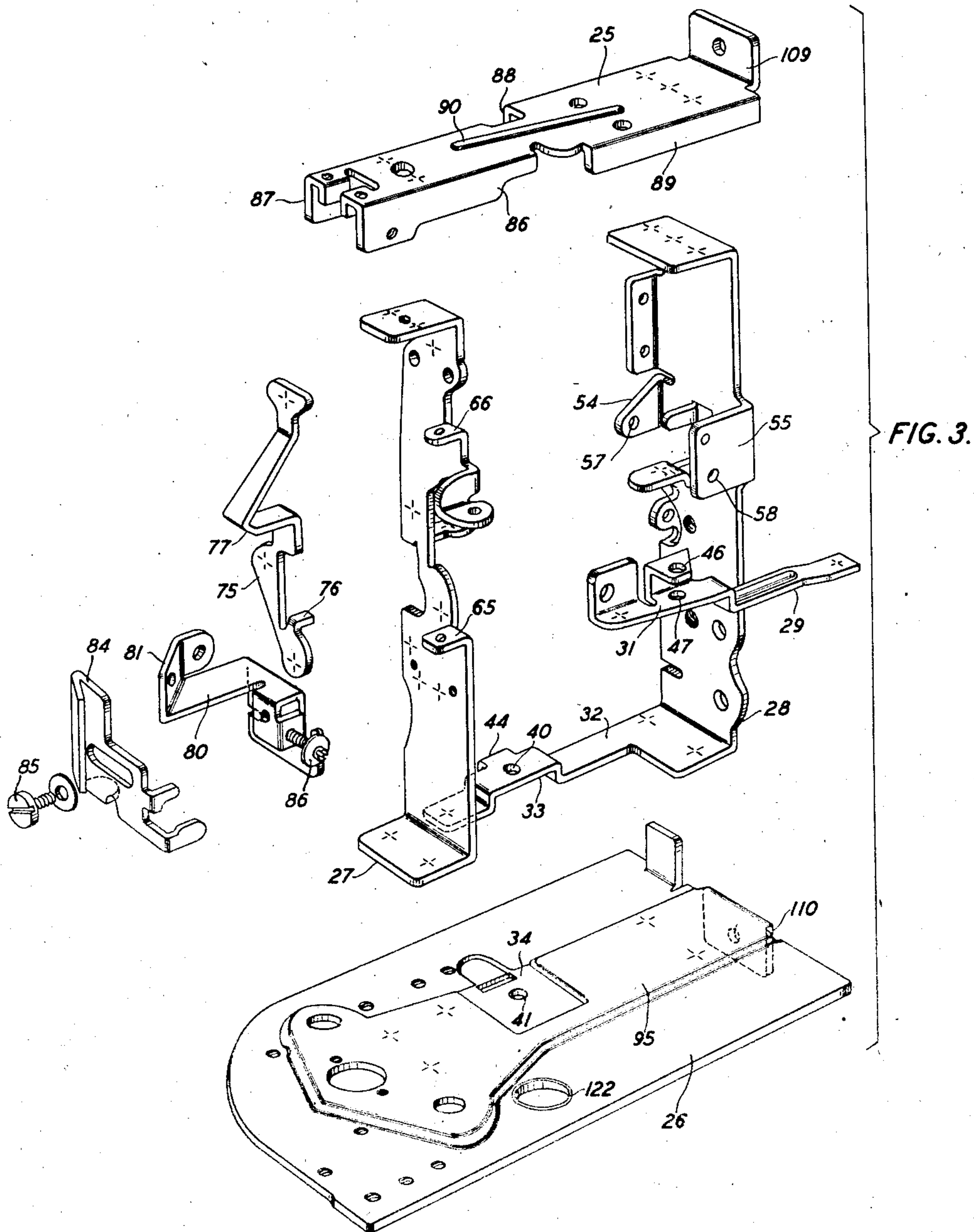
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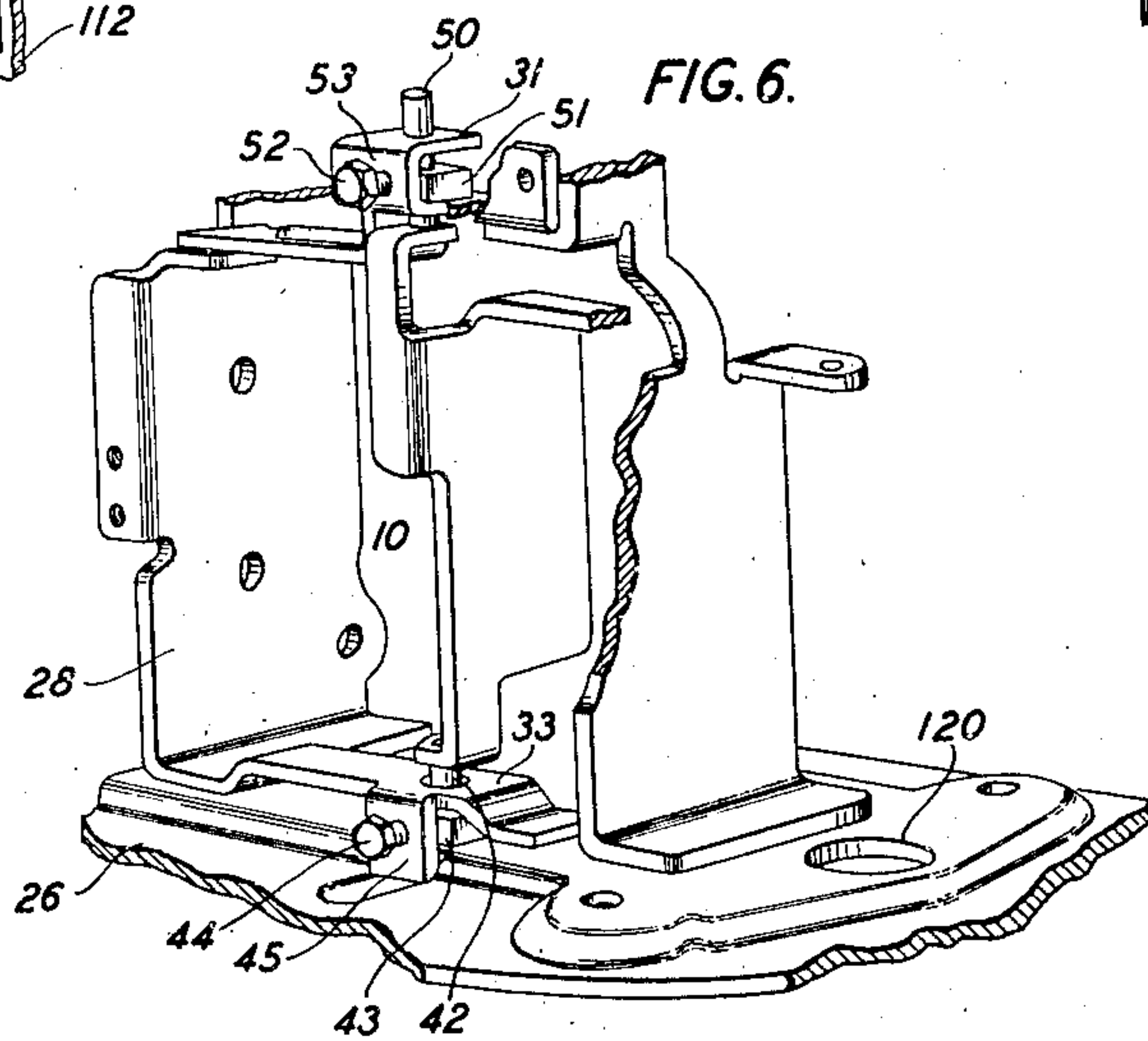
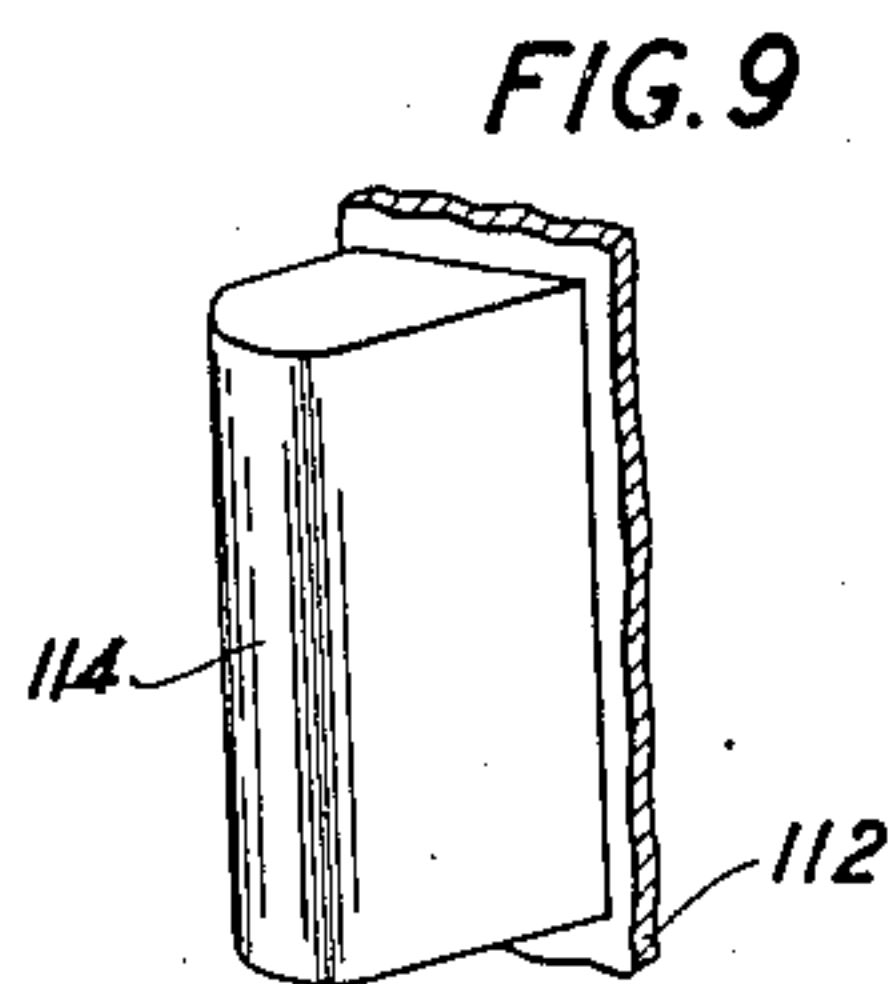
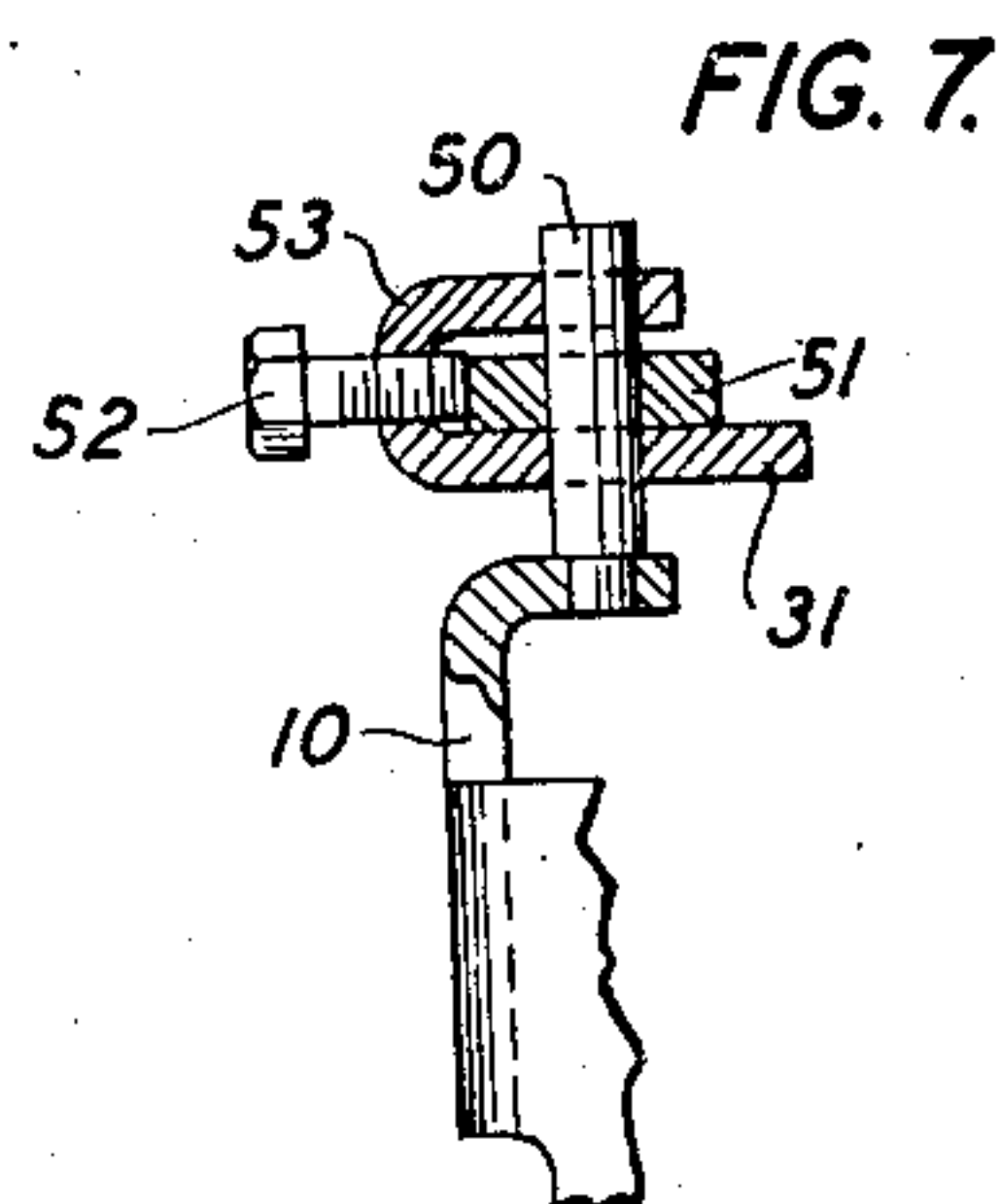
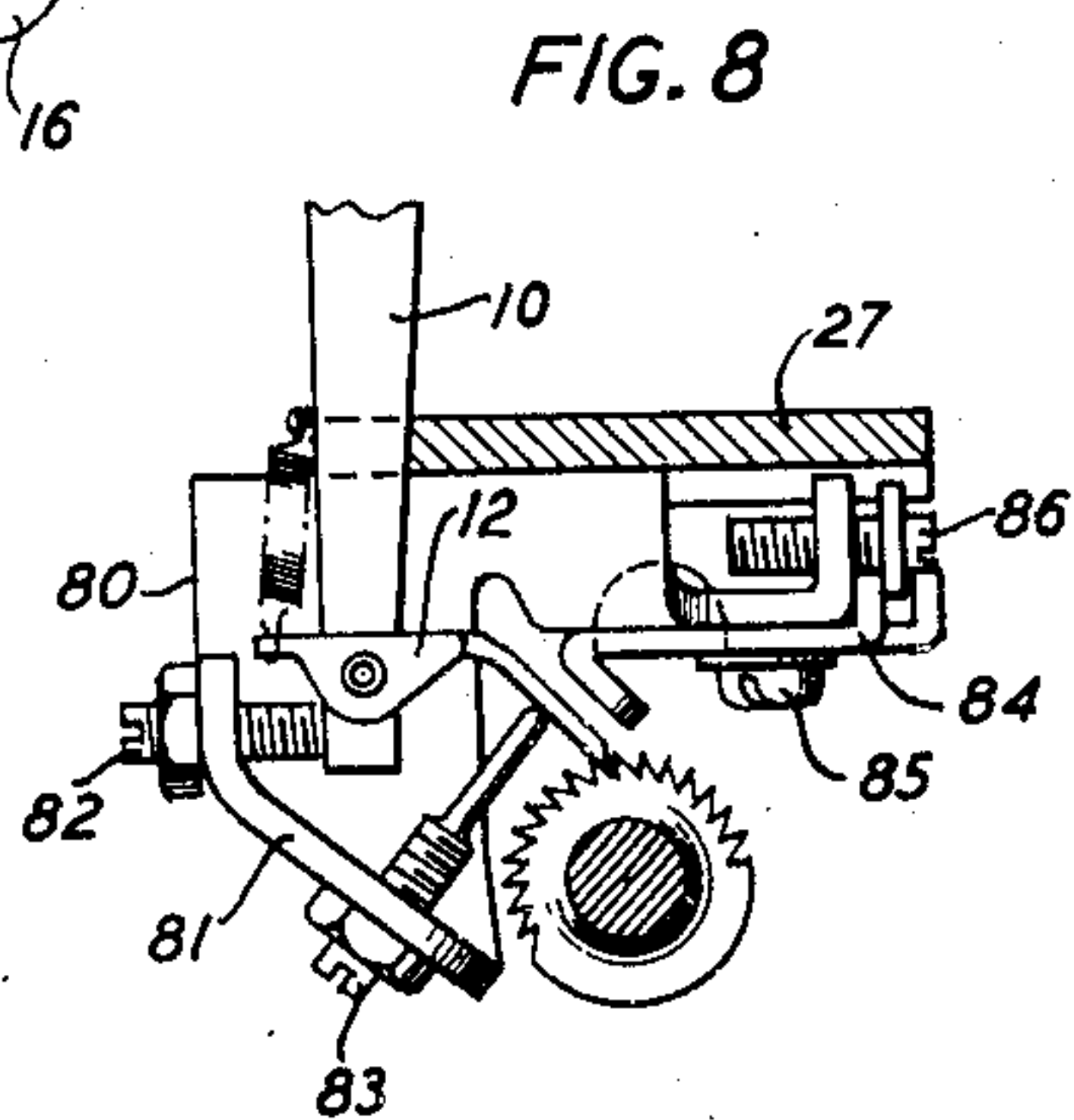
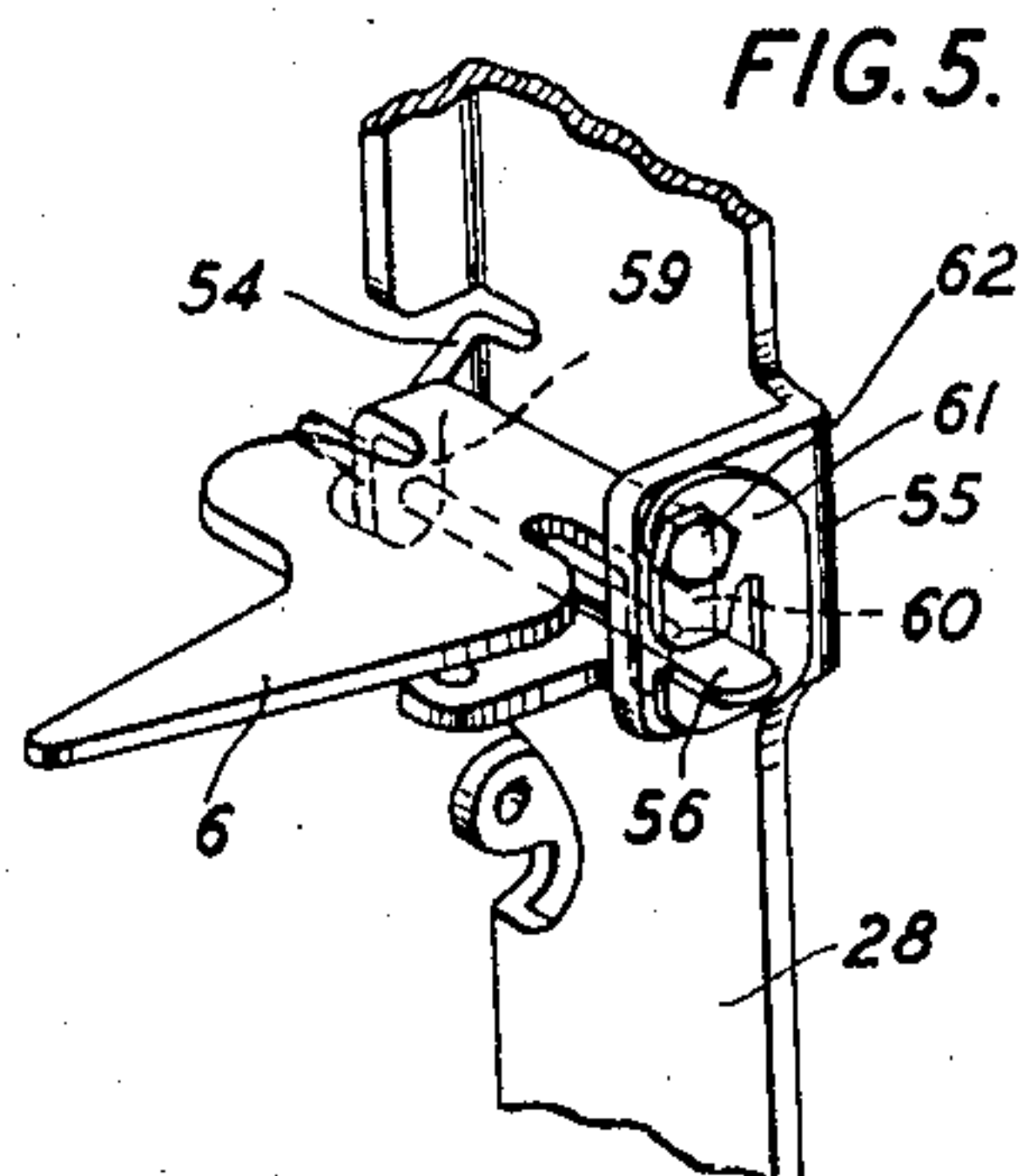
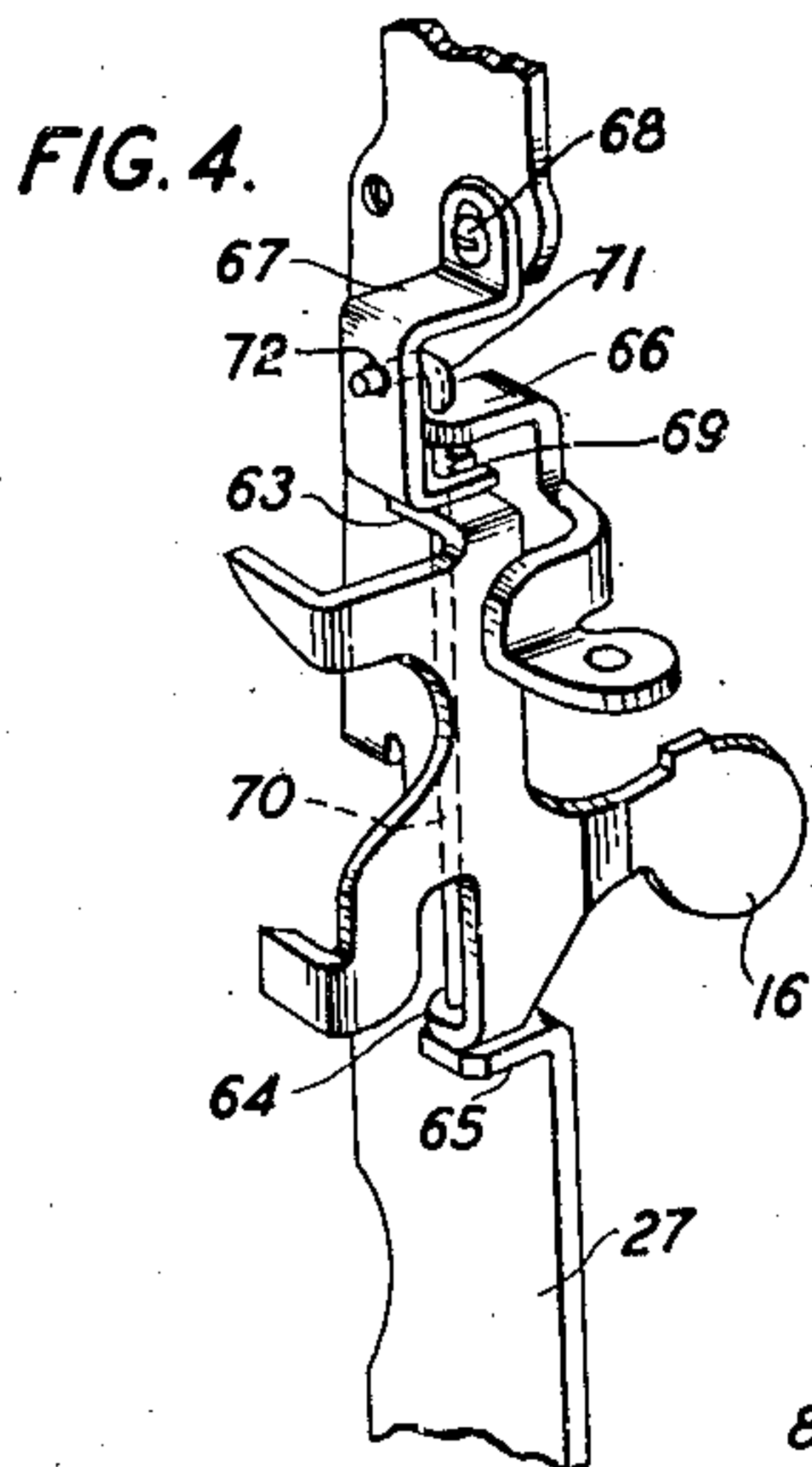
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2,410,432

SWITCHING MECHANISM

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5 Claims. (Cl. 179—27.52)

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This invention relates to switching mechanisms and particularly to such mechanisms used in telephone exchanges to establish electrical connections.

An object is to simplify and reduce the cost of manufacturing such mechanisms.

Heretofore switching mechanisms have been used particularly for advancing wipers over terminal banks in steps in two directions for establishing electrical connections between said wipers and terminals in the bank. The various detail mechanisms for advancing such wipers in general consist of a vertical magnet operating on an armature having a pawl that acts on a vertical rack on a central shaft on which the wipers are attached to advance said shaft in steps to select the level of terminals from which selection will later be made. A rotary magnet is also provided with an armature having a pawl acting on a rotary rack or ratchet wheel attached to said shaft to rotate it to advance the wipers in a rotary direction to select a particular set of terminals in the selected level. Pawls are provided to hold the shaft in its advanced vertical and rotary directions and a release magnet having an armature acting on said pawls to release the shaft and wipers to normal position. In switches of this kind these various detail mechanisms are mounted on a frame structure having suitable supporting and guiding means therefor. This frame generally consists of a main casting variously formed and shaped for this purpose. This casting may be secured to a supporting frame or rack member and the various detail mechanisms enclosed in a dust cover or hood which covers all parts except the wipers and the terminal banks.

It is a feature of the applicant's invention to substitute for such a cast frame structure a frame structure consisting of a series of sheet metal members welded together at suitable points. This sheet metal structure is particularly light in weight and shaped to form supporting members and guiding surfaces for the various magnets, armatures and pawls and provided with a bottom covering surface which forms with a simple metal hood a complete dust proof covering for the various mechanisms. Supporting members are extended from and form part of the sheet metal frame for the attaching of the switch structure to the usual rack.

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

Fig. 1 shows a perspective of a switch structure in accordance with applicant's invention including all the operating mechanisms;

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Fig. 2 shows the frame structure consisting of the various sheet metal members welded together in accordance with the applicant's invention;

Fig. 3 shows an exploded perspective view of the frame structure as shown assembled in Fig. 2;

Fig. 4 shows a part of the front member and mounting means for a double holding pawl;

Fig. 5 shows a fragmentary perspective of the supporting means for the armature of the vertical magnet;

Fig. 6 shows parts of the frame members and the supporting means for the armature for the horizontal magnet;

Fig. 7 shows in detail the pivotal means for the armature for the rotary magnet;

Fig. 8 shows in detail the guiding means for one of the operating parts;

Fig. 9 shows a general view of the switch mechanism mounted on a rack.

Referring now to the drawings and particularly to Fig. 1, the frame structure generally referred to with the reference character 1 contains all the operating parts of a step-by-step switch of more or less standard type. It consists in general of an operating shaft 2 having brushes 3 for the selection of connections to terminals on bank 4 by being raised in steps to select a level of terminals and then rotated in steps to select a particular set of terminals in the selected level. The shaft is raised by means of a vertical magnet 5 secured to the upper part of the frame structure 1 and having an armature 6 to which a pawl 7 is attached, which engages a vertical rack 8 on the shaft 2. The shaft 2 is rotated in steps by means of a rotary magnet 9 secured to the back of the frame structure 1 having an armature 10 to which is attached a pawl 12 which acts on the rotary ratchet 15 on the shaft 2. A double pawl 16 is provided for holding the shaft in the raised and rotated position and to release the shaft to normal position; a release magnet 17 is provided with an armature 18 which engages the pawl 16 for this purpose when the release magnet 17 is energized. The shaft is returned from its rotary position by the usual spring 22 and is lowered in the vertical direction by gravity.

Referring now also to the remaining figures of the drawings a detailed description will be made of the frame structure in accordance with the applicant's invention. It consists primarily of a top plate 25, a bottom plate 26, a front plate 27, a back plate 28 and an intermediate plate 29 spot-welded together at suitable positions as shown, for example, by the asterisk spots in Fig. 2, such as, for example, spots 30.

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The intermediate plate 29 is provided with a U-shaped formation 31, while on a forward extension 32 of the back plate 28 is an inverted U-shaped formation 33 and below this extension 32 a similar downward U-shaped formation 34 is provided on the bottom plate 26. As the formation 33 is placed over the formation 34 the two holes 40 and 41 in these parts register with each other. Through these holes is passed a pin 42 which is held in place by a bushing 43 which in turn is engaged by a screw 44 in a downward extension 45 from the U-shaped formation 33 so as to hold pin 42 tightly anchored in the holes 40 and 41. Similar holes 46 and 47 are provided in the side members of the U-shaped formation 31 on the intermediate plate 29. These holes register with each other and through them is inserted a pin 50 which is held by a bushing 51 engaged by a screw 52 screwed into the bottom member 53 of the U-shaped formation 31 as shown clearly in Figs. 6 and 7. On pins 42 and 50 is mounted for rotation the armature 10 for the rotary magnet 9. In Fig. 7 the arrangement of the pin 50, bushing 51, screw 52 and the U-shaped formation 31 is shown with the armature 10 pivoted for rotation on the pin 50 in more detail, the arrangement being practically the same for the lower pin 42 and its associated parts for mounting the rotary armature 10.

The mounting means for the armature 6 for the vertical magnet is shown in detail in Fig. 5. It consists of the ears 54 and 55 extending from the sides of the rear plate 28. Between these ears is inserted a pin 56 through apertures 57 and 58 and on this pin is mounted the armature 6 through suitable ears 59 and 60. The pin 56 is held in place by a clip 61 which is fastened to ear 55 by a screw 62. The mounting means for the holding pawl 16 is shown in detail in Fig. 4. This pawl is mounted by means of ears 63 and 64 thereon between ears 65 and 66 bent out from the front member 27. A U-shaped bracket 67 is secured by means of a slot therein and a screw 68 to the member 27. This bracket 67 is provided with a slot 69 to accommodate pin 70 and is pressed down against the ear 63 to maintain the pawl 16 in place and it will be noted that pin 70 passes through holes in ears 66, 63, 64 and 65 and is bent to form the angle extension 71 which holds the pin 70 in place by entering a hole 72 in bracket 67. On the front surface of the front plate 27 is also mounted a special bracket 75, Fig. 2, for regulating the stroke of the pawl 7 on the armature 6 of the vertical magnet 5. This bracket 75 is spot-welded as shown by the asterisk in Figs. 2 and 3 to the front plate 27 and is provided with a horizontally bent projection 76 serving as the backstop for the pawl 7 when the armature 6 is released and is also provided with a slanting surface 77 for guiding the pawl 7 to engage the teeth in the rack 8 at the proper point when the armature 6 is attracted by the magnet 5 to raise the pawl 7 to take a step. Another bracket 80 is also spot-welded to the front plate 27 and extends forwardly and upwardly and the upward part 81 is bent at an angle and provided with two screws 82 and 83, Figs. 1 and 3, to regulate the forward and backward stroke of the pawl 12 on the armature 10 for the rotary magnet 9 when it rotates the shaft to take a step. On bracket 80 is mounted another guide member 34 for the pawl 12 which is adjustably secured to this bracket 80 by screws 85 and 86, as shown in Fig. 8.

The top plate 25 is provided with side members

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bent downward, such as 86, 87, 88 and 89 to strengthen this member and also with a depression rib 90 provided for the same purpose. The bottom plate 26 is provided with a raised portion 95 to give it the necessary strength and in the front part of this raised portion are mounted the posts 97 and 98 on which the bank 4 is mounted by means of the usual top and bottom plates holding the terminals together. These posts are held in the usual manner to the bottom plate 26 by nuts such as 100 and 101. The top member 25 provides an upward extending rear lip 109 and a similar downwardly extending rear lip 110 is provided on the bottom plate 26 for mounting the frame on the usual rack member 112 as shown in general in Fig. 9. Fitting around the mechanisms mounted on the sheet metal frame structure described is a cover 114 which is open at the bottom but fits snugly around the bottom plate 26 so that this cover in conjunction with the bottom plate 26 provides a dust proof covering for the mechanisms except the bank 4 and the brush 3. The shaft 2 extends in the usual manner through a hole 120 in the bottom plate 26 and another hole 122 is provided in this plate for the passage of the connecting conductors for the various magnets inside the cover. The upper part of the shaft 2 extends through an opening 126 in the top plate 25 and is slidably or rotatably mounted in the usual mechanism or bracket such as 129 screwed to the top plate 25. In general this step-by-step mechanism is of the well-known construction of the so-called Strowger type with the exception of the frame structure members welded together in accordance with the applicant's invention to provide the various supporting means and guiding surfaces for the movable and stationary parts of the mechanism.

What is claimed is:

1. An automatic step-by-step switch having magnets, armatures and pawls for actuating the switch and a sheet metal frame comprising a top plate, a bottom plate, a front plate and a back plate spot-welded together, brackets welded to said frame members, said frame members and brackets being so formed and proportioned as to serve as the mounting means for the magnets, armatures and pawls and as limiting and guiding means for the operating movements of the armatures and pawls and means including a part of said bottom plate for enveloping against dust, the remaining portions of the frame and said magnets, armatures and pawls.
2. An automatic step-by-step switch having magnets, armatures and pawls for actuating the switch and a sheet metal frame comprising a top plate, a bottom plate, a front plate and a back plate spot-welded together, a first bracket welded to said frame members so formed as to serve for one of said magnets and its armature, a second bracket welded to one of said frame members so formed as to serve as a limiting and guiding means for the operating movement of the pawl and armature of another of said magnets mounted upon said frame members, prongs on said frame members for mounting the armature of said second magnet and for mounting an independent holding pawl, screws for limiting and guiding the operating movements of the pawl and armature of said first magnet, and a third bracket welded to one of said frame members for adjustably mounting said screws.

3. An automatic step-by-step switch having a shaft and wipers attached thereto, magnets hav-

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ing armatures and pawls and means controlled thereby for stepping said shaft in vertical and rotary directions and for releasing it to a normal position to cause said wipers to establish and release electrical connections, a metal frame comprising a top plate, a bottom plate, a front plate, a back plate and an intermediate plate between said front and back plates spot-welded together, a U-shaped extension formed from said intermediate plate, an extension on said back plate forming with the bottom plate a U-shaped formation, a pivotal pin extending through apertures in the side members of the U-shaped extension, a pin extending through apertures in the side members of the U-shaped formation, a bushing on each pin between the associated side members, a screw extending through the bottom member on the U-shaped extension and another screw extending through the bottom member of the U-shaped formation each arranged to engage the associated bushing to tighten the associated pin in the aperture, said pins serving as pivotal bearings for one of said armatures, parallel ears extending from the back plate, a bearing pin for another of said armatures extending between and through apertures in said two ears, a clip secured to one of said ears to hold said pin in place, ears extending from the front plate, a pin extending through apertures in said last-mentioned ears and serving as a bearing pin for one of said pawls, a bracket secured to said front plate and arranged to cooperate with said last-mentioned pawl and its bearing pin to keep them in place, a second bracket spot-welded to the front plate having surfaces serving to limit the movement of a second pawl, a third bracket spot-welded to the front plate, screws in said third bracket serving to adjust the movement of a third pawl, terminal banks, posts secured to and extending downwardly from said bottom plate on which said terminal banks are mounted, a support member for said switch, a cover hood for said switch, said bottom plate being provided with a raised portion to stiffen it and otherwise shaped to serve as the bottom end plate for said cover hood and having a downwardly bent back portion by means of which said switch may be secured to said support, said top plate having its surface indented and provided with angular side portions to stiffen it and an upwardly extending back portion by means of which the switch may be secured to said support.

4. An automatic step-by-step switch having a shaft and wipers thereon for establishing electrical connections, a lifting magnet having an armature and a pawl for lifting said shaft, a ro-

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tary magnet having an armature and a pawl for rotating said shaft, a holding pawl for maintaining the shaft in its lifted and rotated positions, a release magnet having an armature for controlling said holding pawl to release said shaft from an actuated position, a sheet metal frame for mounting said shaft, magnets, armatures and pawls comprising a top plate, a bottom plate, a front plate, a back plate and an intermediate plate between said front and back plates spot-welded together, means associated with said frame members for rotatably mounting and guiding the movements of the armatures and pawls for said lifting magnet and said rotary magnet, means associated with said frame members for adjustably mounting and rotatably holding said holding pawl, and means including the bottom plate of said frame member for enclosing against dust said magnets, armatures, pawls and a portion of the shaft.

5. An automatic step-by-step switch having a shaft and wipers thereon for establishing electrical connections, a lifting magnet having an armature and a pawl for lifting said shaft, a rotary magnet having an armature and a pawl for rotating said shaft, a holding pawl for maintaining the shaft in lifted and rotated positions, a release magnet having an armature for controlling said holding pawl to release said shaft from an actuated position, a sheet metal frame for mounting said shaft, magnets, armatures and pawls comprising a top plate, a bottom plate, a front plate, a back plate and an intermediate plate between said front and back plates spot-welded together, means including extensions from said back plate for rotatably mounting the armature for the lifting magnet, a bracket spot-welded to the front plate and formed to definitely limit and guide the operative movements of the pawl for said lifting magnet, means including extensions and formations on the back plate, the bottom plate and intermediate plate for rotatably mounting the armature for the rotary magnet, a second bracket spot-welded to the front plate, means mounted on said second bracket for adjustably limiting and guiding the operative movements of the pawl for the rotary magnet, means including an extension from the front plate and a bracket mounted on said front plate for adjustably mounting and rotatably holding said holding pawl, a hood forming with the bottom plate a dust-proof cover for said magnets, armatures, pawls and a portion of the shaft, a support for said frame and extensions on the top and bottom plates for securing said frame to said support.

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