United States Patent

Folk

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[54] FEEDING AND INSERTING APPARATUS

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[73] Assignee: **AMP Incorporated**, Harrisburg, Pa.

[22] Filed: **Jan. 27, 1970**

[21] Appl. No.: **6,103**

[52] **U.S. Cl.** ..... **29/203 R**, 29/203 B

[51] **Int. Cl.** **H05k 13/04**

[58] **Field of Search** ..... 29/203 B, 203 R, 203 DT, 203

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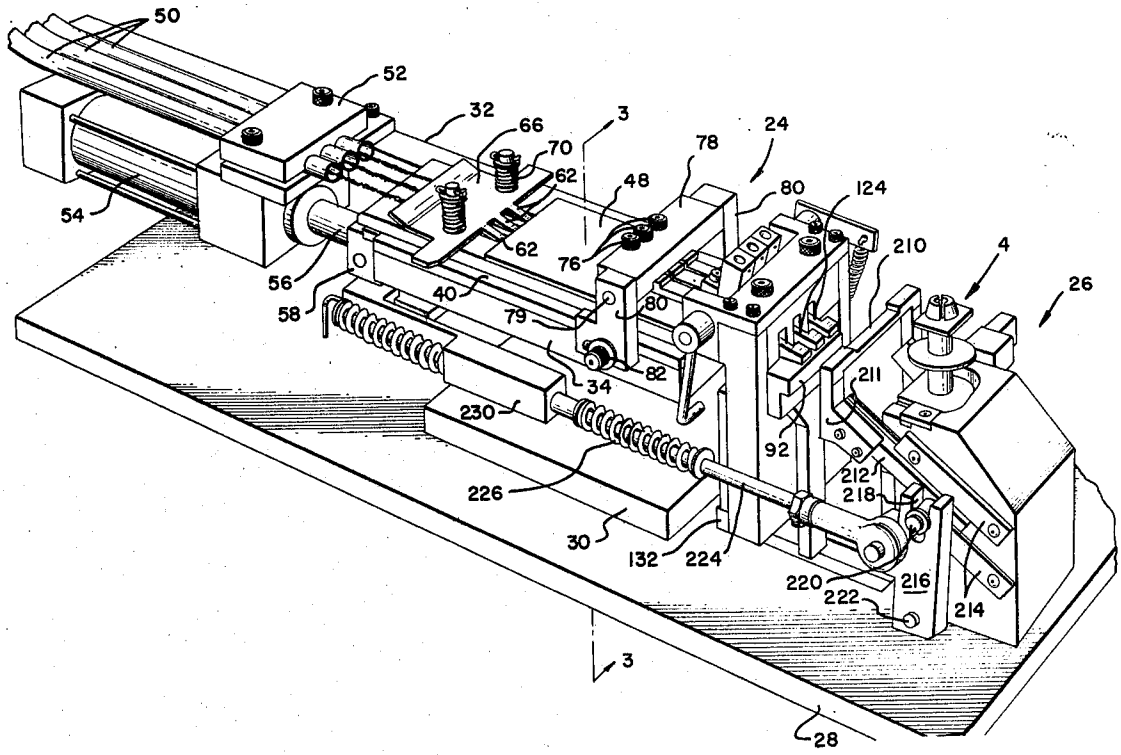
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[57] **ABSTRACT**

Inserting apparatus for inserting terminals in coil bobbins as improved feed means for feeding a strip of terminals. The apparatus comprises a reciprocable inserter which moves towards and away from the bobbin. During movement of the inserter towards the bobbin, feed fingers which are fixed onto the inserter, engage the strip so that it moves with the inserter towards the bobbin. During return movement of the inserter, the strip is engaged by a detent which is affixed to the frame and which prevents rearward movement of the strip. Feeding is thus accomplished by restraining the strip against rearward movement while the inserter moves rearwardly.

8 Claims, 13 Drawing Figures



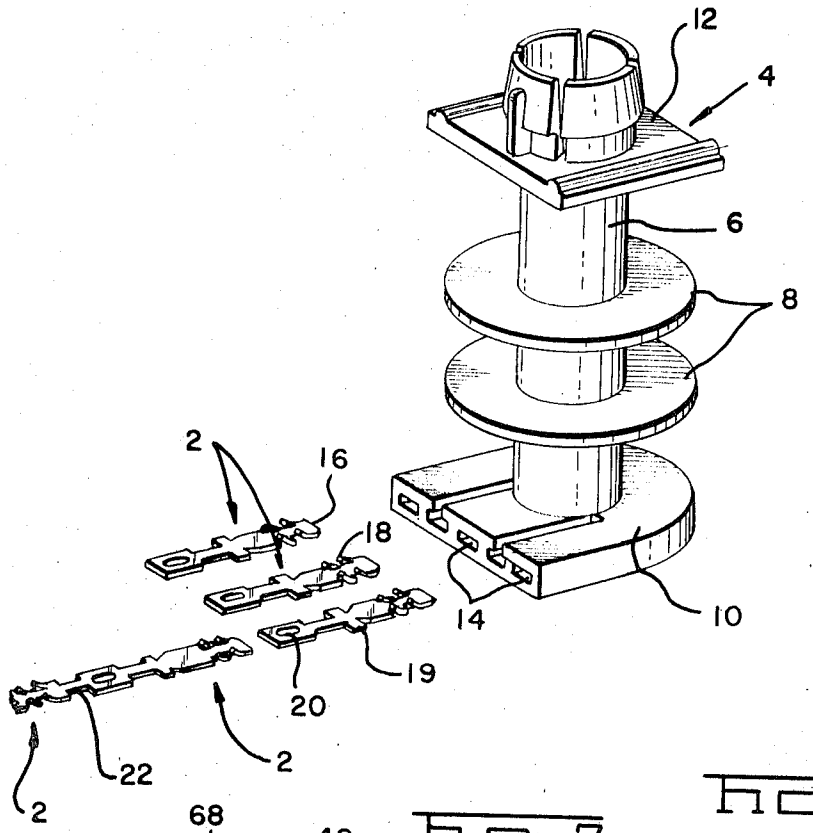


Fig. 1

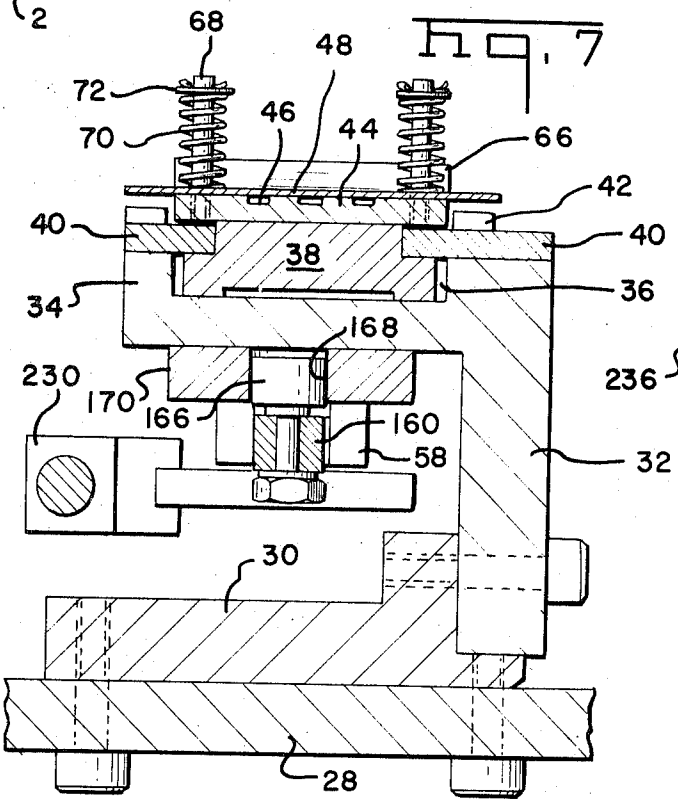


Fig. 7

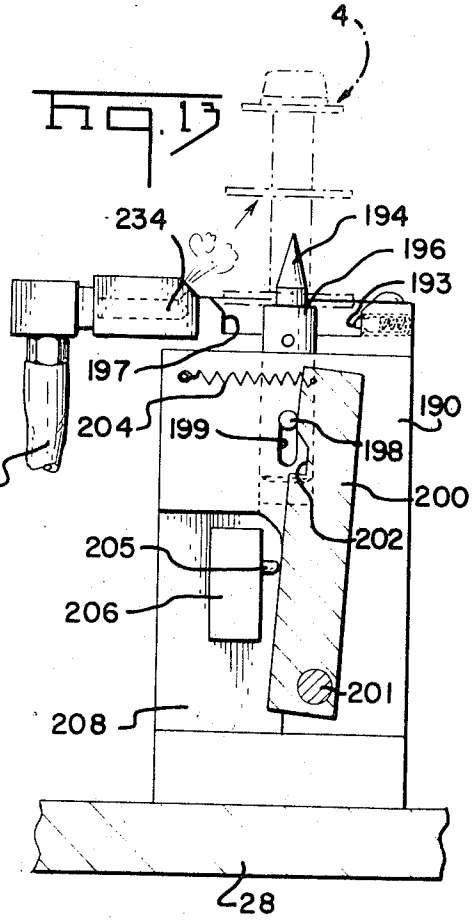


Fig. 13

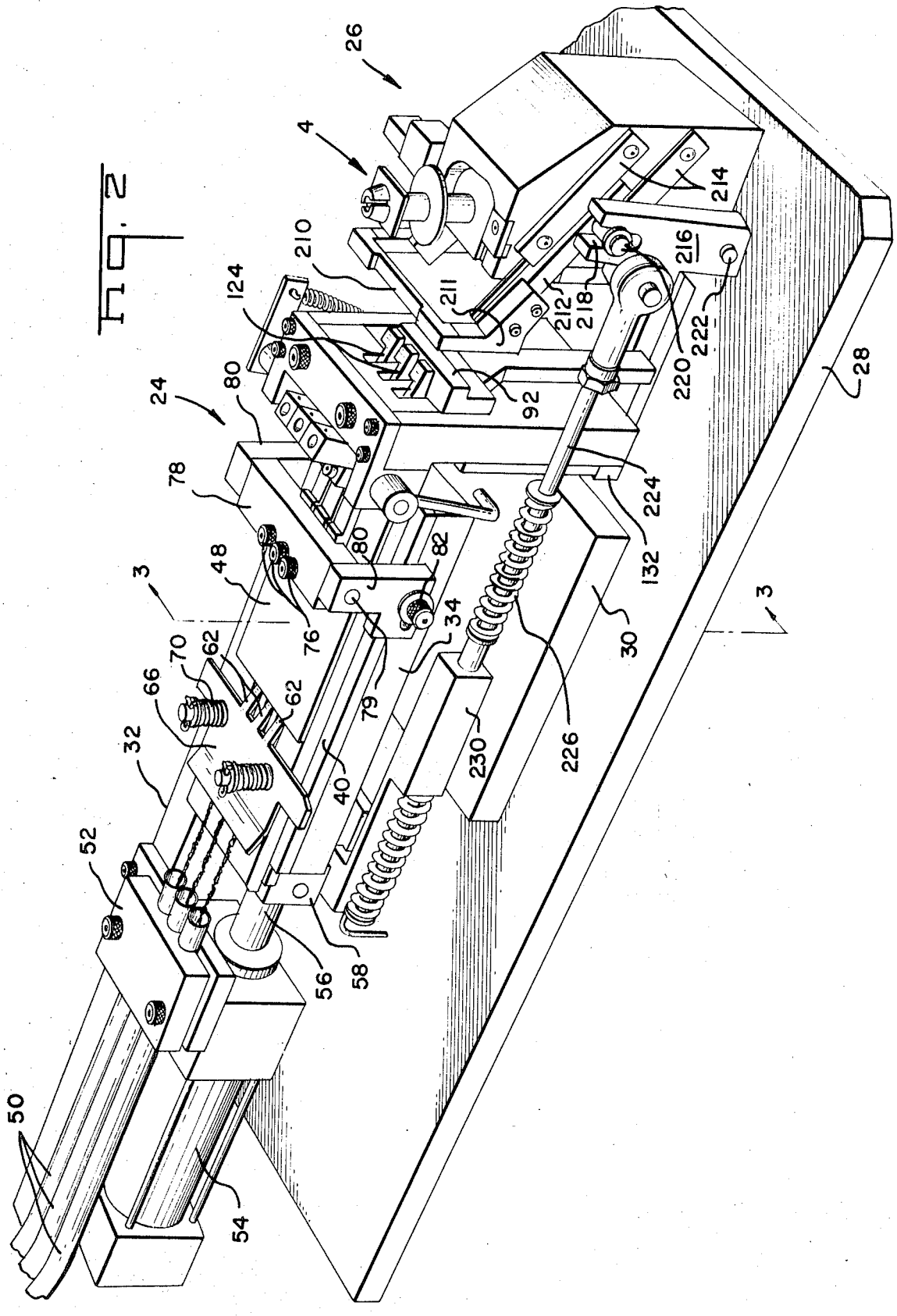

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Fig. 2

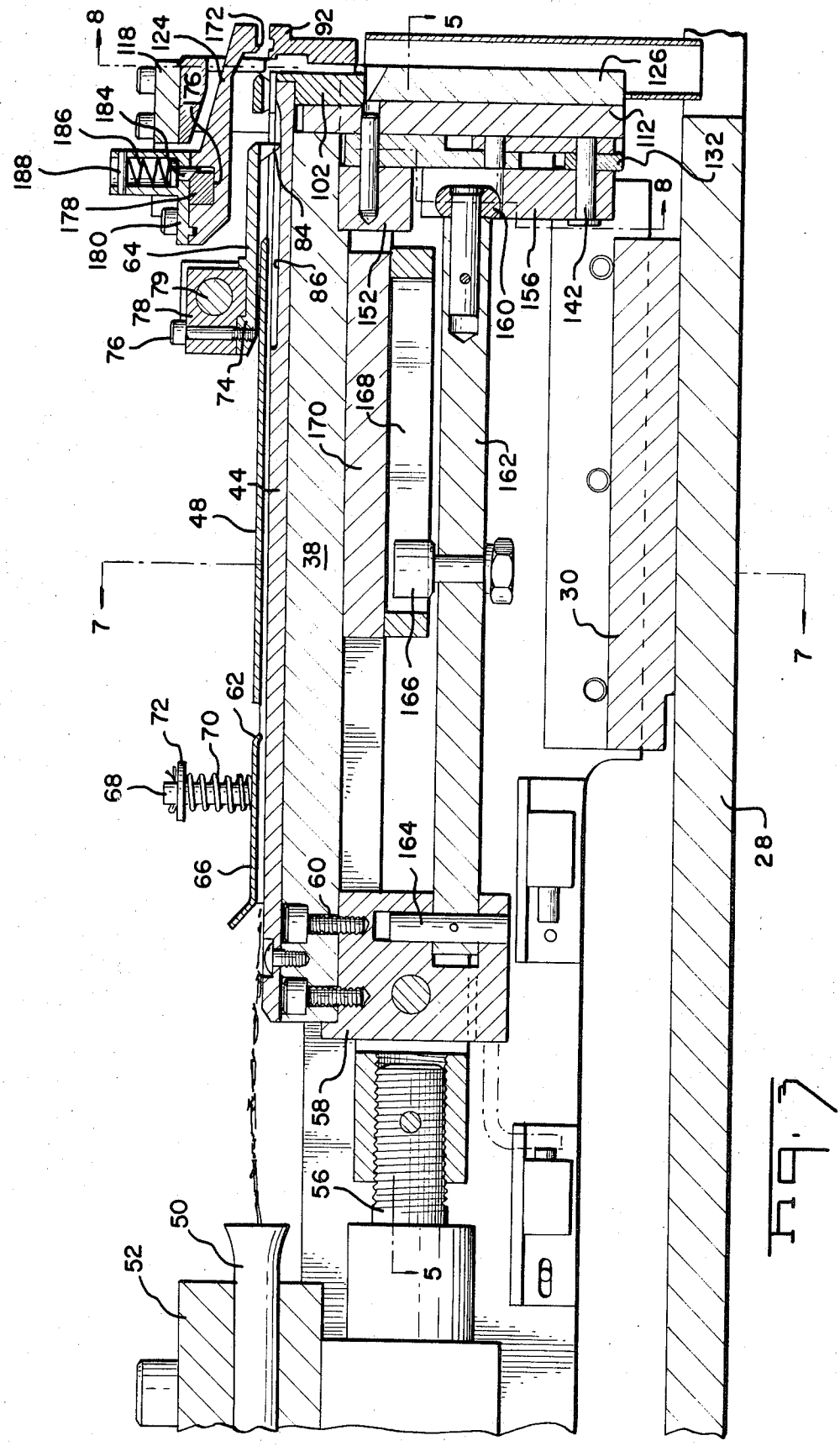

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Fig. 7

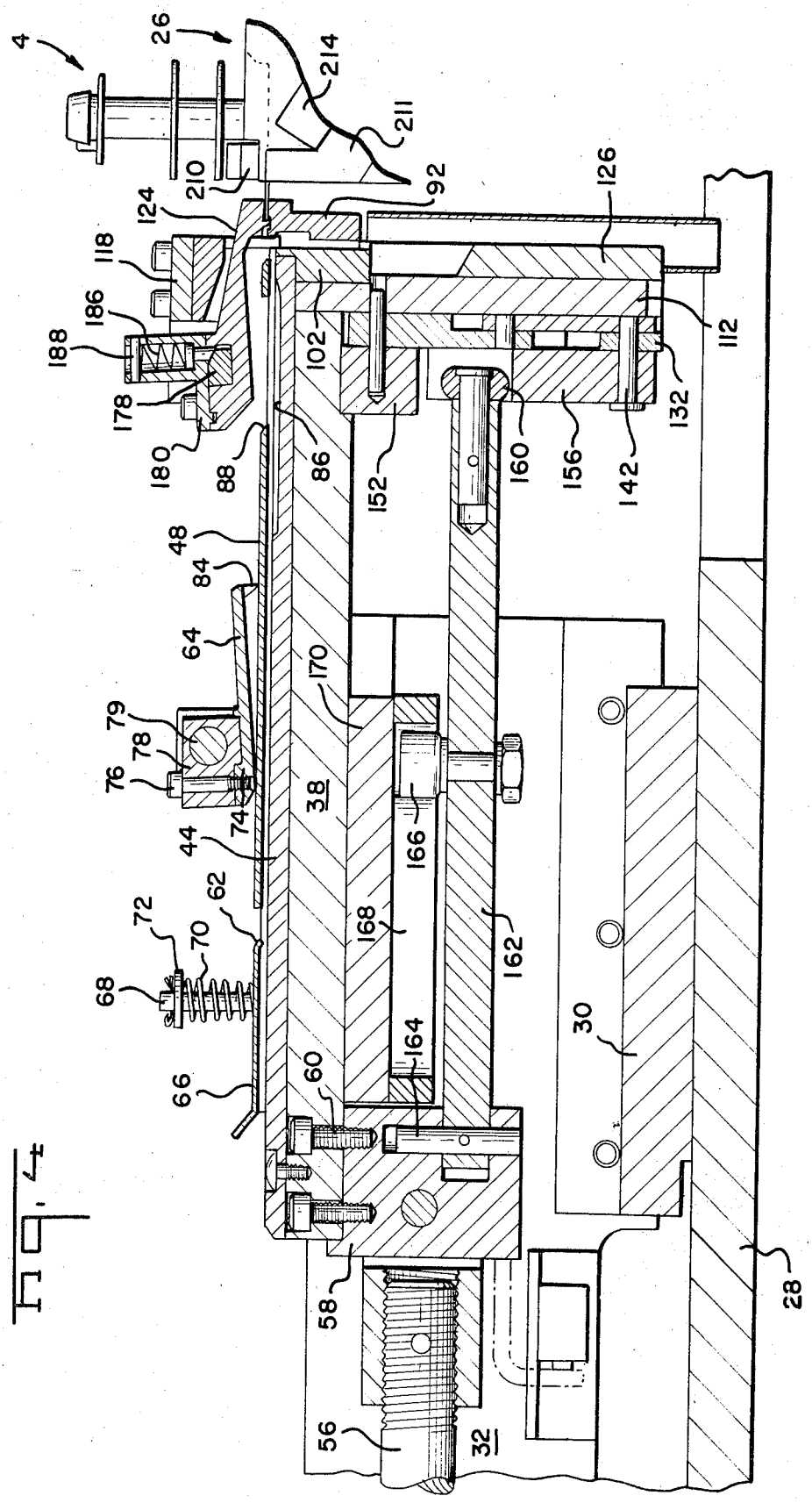

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Fig. 4

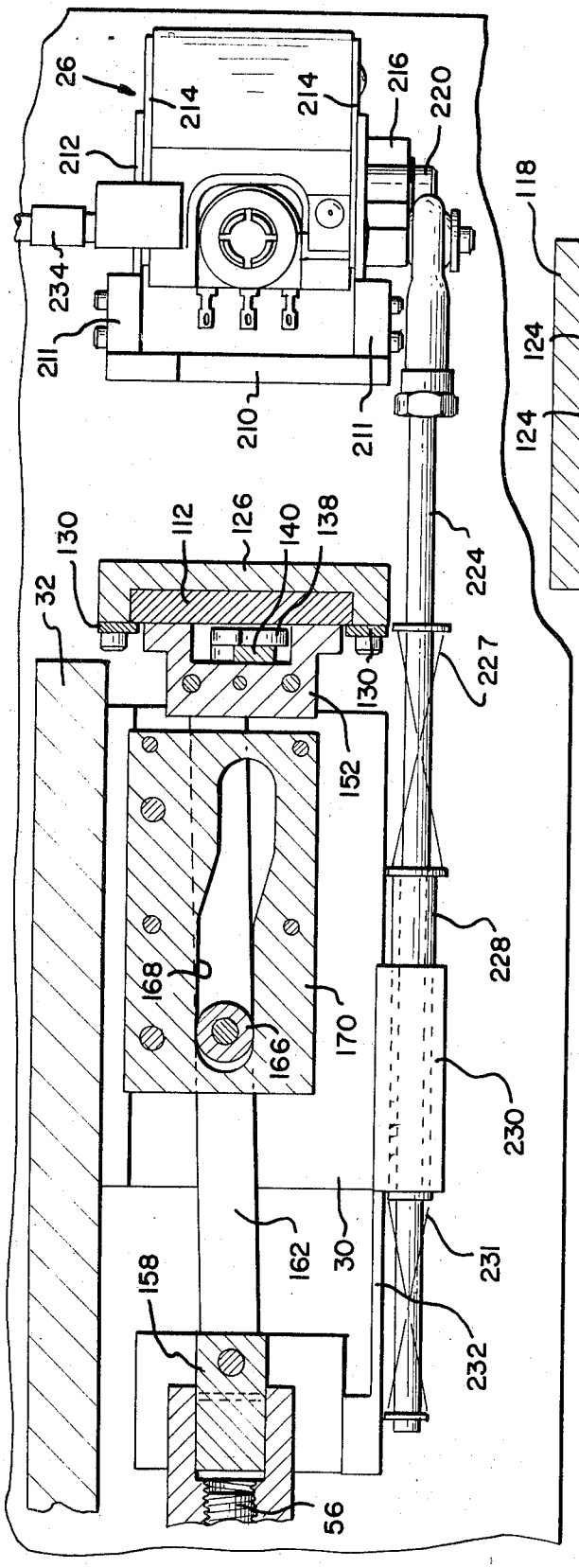

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FIG. 7

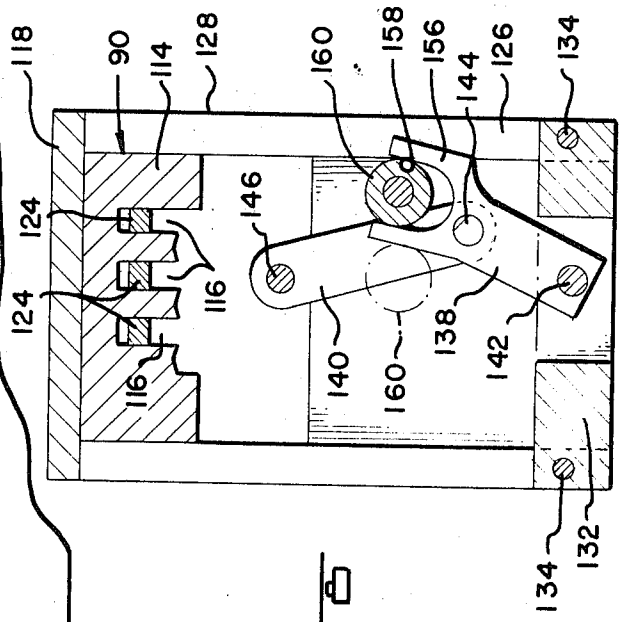
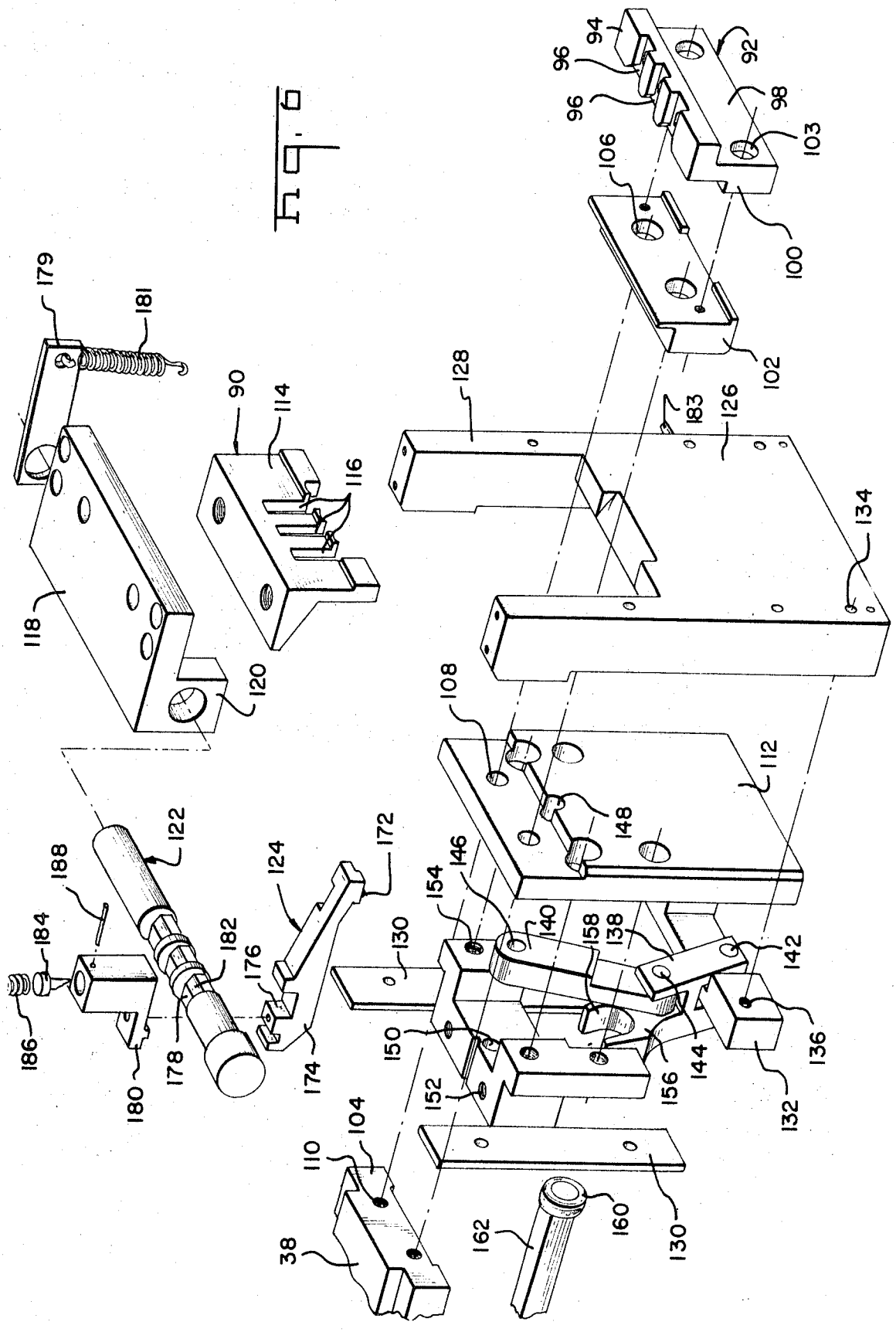

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FIG. 8

Fig. 6


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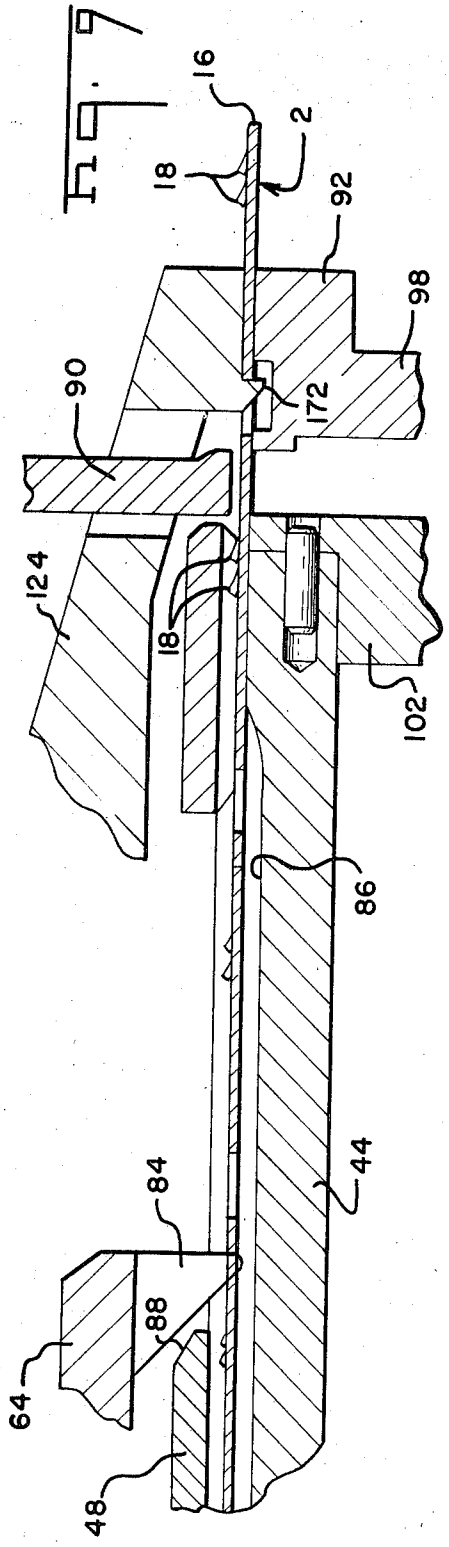

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Fig. 9

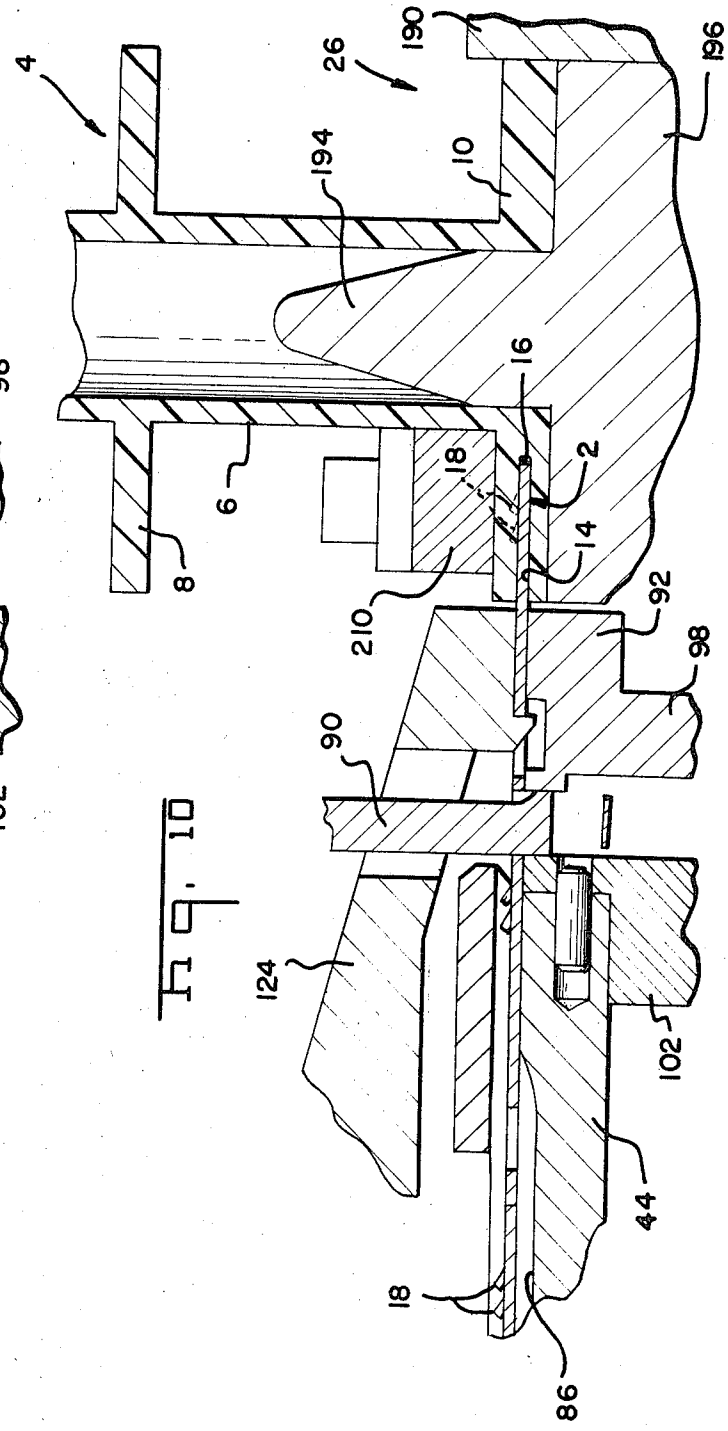

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Fig. 10

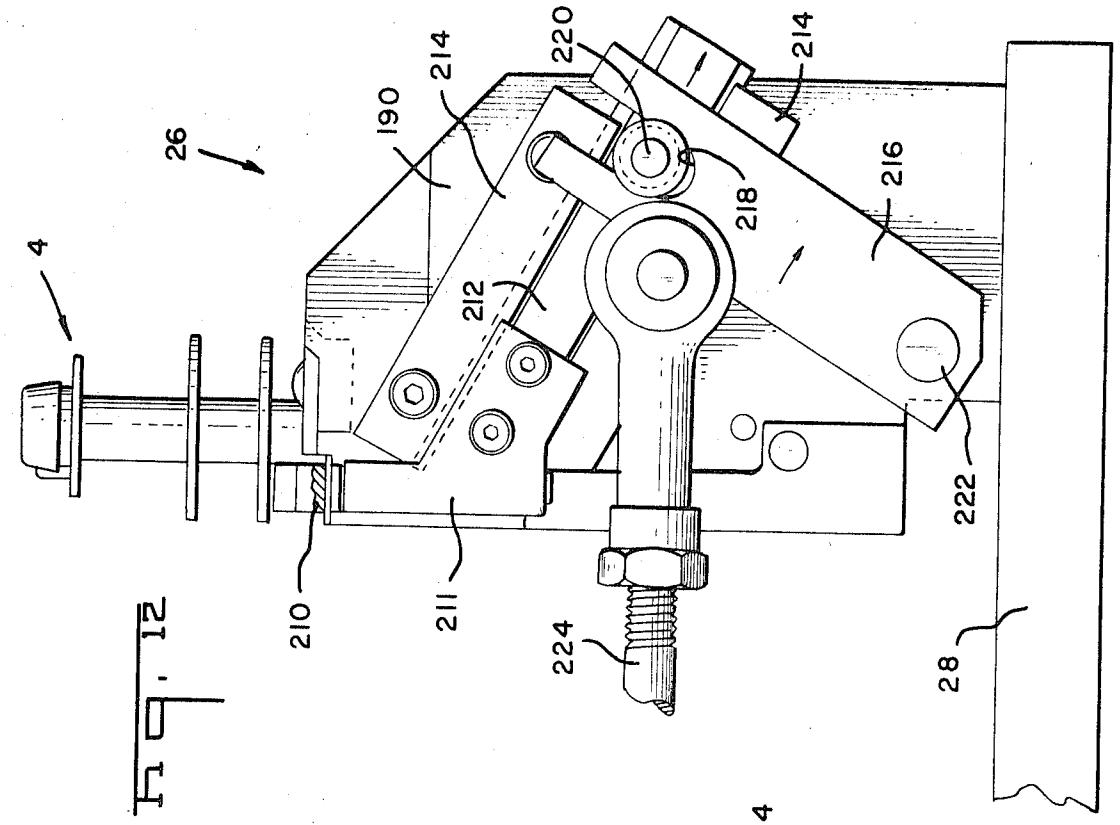

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Fig. 12

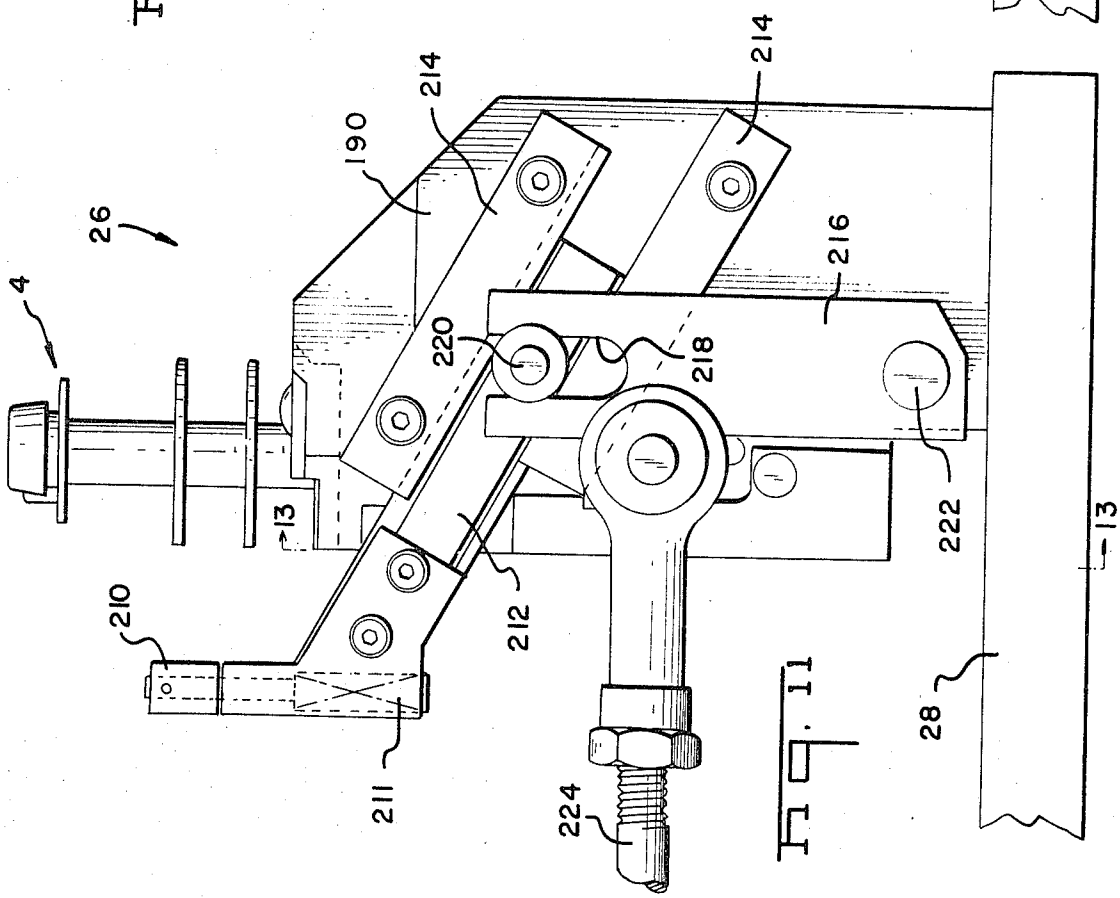

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Fig. 11

FEEDING AND INSERTING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to an apparatus for inserting small articles in end-to-end strip form into workpieces. The invention is herein disclosed with particular reference to the insertion of electrical terminals into molded bobbins of the type used for electrical coil windings. It will be apparent, however, that the principles of the invention can be applied to other insertion and assembly operations where the problems encountered are similar to those encountered in the assembly of terminals of coil bobbins.

Electrical coil bobbins are commonly manufactured as molded and are provided wit openings in their flanges which are adapted to receive electrical terminals. After the coil has been wound on the bobbin, the taps from the coil and the lead wires for the coil are soldered or otherwise connected to the terminals. Small coils are used in relatively large numbers in inexpensive types of equipment and the coils themselves must, therefore, be produced at a minimum of cost. If follows that the operations of assembling the electrical terminals to the coil bobbin must also be carried out at an extremely low cost. Assembly apparatus for inserting terminals into bobbins must, therefore, be rapid operation, must be operable by unskilled or semiskilled labor, and must be relatively troublefree and capable of producing large number of parts without failures or rejects.

In accordance with the instant invention, terminals in end-to-end strip form are advanced through an inserting apparatus which has mechanisms for severing the leading terminal from the terminal strip and for clamping the terminal in a precisely predetermined position. The entire inserting apparatus is then moved to the previously positioned bobbin, which is held in a workholder, and the leading end of the terminal is pushed into the terminal-receiving hole in the bobbin. Relative feeding of the terminal strip is achieved during the return stroke of the inserting mechanism by the expedient of restraining the terminal strip against rearward movement during rearward movement of the inserter so that the strip is advanced with respect to the inserter. A significant advantage of the invention is that the clamping of the terminal in the inserter, and the movement of the inserter towards the previously positioned bobbin, results in the exercise of a high degree of control over the terminal so that it can be accurately guided to the bobbin flange at the time of insertion.

It is accordingly an object of the invention to provide an improved inserting apparatus. A further object is to provide an apparatus for inserting electrical terminals into the flanges of electrical coil bobbins. A still further object is to provide an inserting apparatus in which a high degree of control is maintained over the terminal during insertion so that it can be precisely positioned in a hole or aperture in the workpiece. A still further object is to provide an inserting apparatus having terminal strip feeding means, terminal shearing means, and inserting means which are operated by a single power source such as a pneumatic piston-cylinder.

These and other objects of the invention are achieved in a preferred embodiment thereof which is briefly described in the foregoing abstract, which is described in detail in the specification which follows, and which is shown in the accompanying drawings in which:

FIG. 1 is a perspective view of a typical electrical coil bobbin illustrating the manner in which electrical terminals are inserted into one of the flanges of the bobbin.

FIG. 2 is a perspective view of a preferred form of inserting apparatus in accordance with the invention.

FIG. 3 is a longitudinal cross-sectional view of the apparatus of FIG. 2 showing the positions of the parts at the beginning of an operating cycle.

FIG. 4 is a view similar to FIG. 3 but showing the positions of the parts after the inserting operation has been completed and prior to the return stroke of the inserting apparatus.

FIG. 5 is a sectional view taken along the lines 5—5 of FIG. 3.

FIG. 6 is a perspective exploded view of portions of the forward end of the inserting apparatus of FIG. 2 particularly illustrating the actuating mechanism for the shearing means and the terminal clamping means.

FIGS. 7 and 8 are views taken along the lines 7—7 and 8—8 respectively of FIG. 3.

FIG. 9 is an enlarged fragmentary view showing portions of the feed finger, the clamping finger, and the shearing means prior to shearing of a leading terminal from a terminal strip.

FIG. 10 is a view similar to FIG. 9 but showing the positions of the parts at the conclusion of the inserting operation.

FIG. 11 is a side view of the bobbin holding means showing the positions of the parts at the beginning of the operating cycle and prior to clamping of the bobbin.

FIG. 12 is a view similar to FIG. 11 but showing the positions of the parts subsequent to clamping and precise positioning of the bobbin in the holding means.

FIG. 13 is a sectional view of the holding means taken along the lines 13—13 of FIG. 11.

As shown in FIG. 1, a typical coil bobbin 4 has a cylindrical shaft portion 6, radially extending collars 8 intermediate its ends, and end flanges 10, 12. It will be understood that bobbins of this type are manufactured in a wide variety of sizes and shapes for specialized uses in many types of equipment. In all instances, coil wire is wound on the shaft 6 and taps from the coil are electrically connected to metallic terminals mounted in one of the flanges to which the lead wires are also connected. The terminals shown in the drawing 2 have leading ends 16 which are adapted to be inserted into rectangular holes 14 in the flange 10, the terminals having struck up lances 18 adjacent to their leading ends and are adapted to be force fitted into the holes so that after insertion, the terminals cannot be withdrawn from the flange. Laterally extending stops 19 may be provided on the terminals intermediate their ends to limit their movement into the openings 14 and the trailing ends of the terminals may be provided with holes 20 adapted to receive the tap wires and the lead wires. The terminals shown are manufactured in the form of a continuous strip with each terminal connected to its neighbors by means of connecting sections or necks 22. These connecting sections are removed and discarded at the time the terminal is sheared from the strip preparatory to an inserting operation.

Referring now to FIGS. 2, 3, and 7, the disclosed embodiment of the invention is mounted on a suitable baseplate 28, which is adapted to be mounted on a workbench or the like, and comprises a stationary base block 30 secured to the base plate and a stationary upright frame member 32 which is fastened to the base block on one side thereof. This upright frame member has a laterally extending arm 34 at its forward end in which there is provided a central recess 36 for the accommodation of a slide 38, suitable guide gibs 40 being secured by fasteners 42 to the frame structure to retain the slide in position. A feed track plate 44 is secured to the upper surface of slide 38 and has, in the disclosed embodiment, three side-by-side channels or grooves 46 which function as feed paths or guide paths for three terminal strips. A cover plate 48 is mounted on the reciprocable slide and functions to retain the strips in the channels 46 and cooperates in the strip feeding operation as will be explained below.

The three individual terminal strips are fed from suitable reels or other endless supplies through guide tubes 50 which are clamped in a clamping block 5 mounted on the head of a piston-cylinder 54. The piston-cylinder has a piston rod 56 having a connecting block 58 on its end which is secured to the slide 38 at its rearward end by fasteners 60. During each complete stroke of the piston-cylinder 54, the reciprocable portions of the mechanism move from the positions of FIG. 3 to the position of FIG. 4 then return to the position of FIG. 3. During the forward stroke, the leading terminals of the strips, which were fed during the previous operating cycle, are severed from the strips, clamped in the forward end of the inserter, and inserted into a bobbin held in a bobbin holder 26.

Feeding of the terminal strips relatively over and the plate 44 and through the channels 46 is achieved by the cooperative

action of detent fingers 62, which are mounted on the slide 38, and stationary feed arms 64 which are supported on the frame portions 32, 34. The feed fingers 62 are integral with, and extend from a relatively thin plate 66 which is resiliently held against the upper surface of the slide by means of pins 68 that extend into the slide and springs 70 which are interposed between the upper surface of the plate and washers 72 mounted on the upper end of the pins and retained in position by cotter pins as shown. The downwardly turned ends of the feed fingers 62 lodge behind the upwardly struck lances 18 on the terminals thereby preventing relative leftward movement, as viewed in FIG. 3, of the strips with respect to the plate 44. The stationary feed arms 64 extend parallel to the plate 42 adjacent to the right-hand end thereof when the parts are in the positions of FIG. 3 and have rearward mounting portions 74 which are secured by fasteners 76 to a mounting block 78. The block 78 in turn is rotatably mounted on a shaft 79 having reduced diameter end portions which are supported in mounting ears 80. These mounting ears are, in turn, secured by fasteners 82 to the sides of the frame arm 34 and the upright frame sections 32.

The right-hand ends of the feed arms 64 have depending fingers 84 designed to lodge behind the laterally extending stops 19 of the individual terminals. It should also be noted from FIG. 3 that the channels through which these strips are fed are relatively deeper as shown at 86 in the vicinity of engagement of the feed fingers with the terminal strips thereby to ensure positive engagement of the fingers with the terminal strips.

Feeding of the terminal strips is accomplished as follows. When the slide 38 moves rightwardly from the position of FIG. 3 to the position of FIG. 4, the terminal strips are carried with the slide by virtue of the fact that they are pushed by fingers 62 which, as noted above, are movable with the slide. The feed arms 64 ride over the terminal strips and over the upper surface of the cover plate 48 as shown in FIG. 4. During the return stroke of the slide 38, the strips will be carried with the slide until the end 88 of the cover plate 48 moves leftwardly, as viewed in FIG. 4, past the feed fingers 84 at which time these feed fingers will drop into the feed channels and lodge behind the lateral projections of the leading terminals of the three strips. Thereafter, rearward movement of the terminal strips will be prevented while the slide continues to move rearwardly and the terminals will be advanced relatively through their feed channels until the leading terminals of the strips occupy the positions shown in FIG. 9.

The leading terminals of the three strips are sheared from the strips by a downwardly movable upper shear 90 (FIG. 6) and front and rear lower shears 98, 102. The front fixed shear 92 comprises a transversely extending bar 94 having three side-by-side slots 96 therein which are in alignment with the slots 46 defining the feed paths for the terminal strips. This front shear is secured to the rear shear 102 by means of a depending mounting flange 98 having bosses 100 on its ends through which bolt holes 103 extend. The bolt holes 103 are adapted to receive bolts which are threaded into openings in the rear shear 102. The shear block 102 is in turn secured to the forward end 104 of the slide 38 by means of bolts which extend through bolt holes 106 in the shear block 102, through oversized holes 108 in a guide block 112, and into threaded holes 110 in the slide. It will be apparent from the foregoing that the fixed shear blocks 94, 102, and the movable shear block 90 reciprocate with the slide 38. The movable shear block also moves downwardly during forward movement of the slide to effect the shearing operation illustrated in FIGS. 9 and 10.

The upper shear 90 has a depending flange portion 114 which cooperates with the shearing edges of the shear blocks 94, 102, in which there are provided three side-by-side slots 116 for the reception of end portions of hold down or clamping fingers 124 described below. Shear block 90 is secured by suitable fasteners to a L-shaped mounting block 118 which extends transversely of the slide member and has depending ears 120 on its sides which receive the ends of a shaft 122. The clamping fingers 124, which are mounted on this shaft, will be described in detail below.

The upper shear 90 is moved downwardly by means of a vertically reciprocable plate 126 having arms 128 on its sides which are secured by fasteners to the underside of the mounting block 118. The previously identified guide block 112, which does not reciprocate vertically, is received between the opposed faces of the arms 128 and is secured by fasteners 134 to a bar 132, these fasteners extending through holes 134 in the plate and into threaded openings 136 in bar 132. Bar 132 has a recess intermediate its end for the accommodation of the H-shaped lower link 138 of a toggle mechanism, this lower link being pivoted at 142 to bar 136 and being pivoted at its upper end 144 to the upper toggle link 140. The upper link 140 has a fixed pivot on a pin 146 which extends into a hole 148 in the guideplate 112 and into an opening 150 in retaining block 152. The retaining block, in turn, is secured to the underside of the slide 38 by suitable fasteners as is apparent from FIG. 3.

Straightening of the toggle link 138, 140 is effected by a control rod 162 having a generally cylindrical bearing 160 on its end which is received within the bifurcated upper end 158 of one arm 156 of the lower toggle link 138. This control rod 160 extends rearwardly beneath the slide member 38 and is mounted on a vertically extending pivot pin 164 in the connecting block 158 on the end of piston rod 56. During forward motion of the slide from the position of FIG. 3 to the position of FIG. 4, the arm 160 is swung through a slight arc in a direction to straighten the toggle link 138, 140 by a cam comprising a block 170 which is secured to the underside of the frame member 34, see FIGS. 5 and 7. The confined cam track 168 in this camming block receives a cam roller 166 mounted on the arm 160 intermediate its ends.

It will thus be apparent that as the slide moves from the position of FIG. 3 to the position of FIG. 4, the toggle comprising the links 138, 140 will be straightened and the bar 132 will be moved relatively downwardly. Since this bar is secured to the vertically reciprocable plate 126, this plate 126 also moves downwardly and carries with it the upper shearing member 90 and the L-shaped mounting block 118 on which the feed fingers are mounted. The plate 126 is guided along its path of vertical reciprocation by the guide plate 112 and by suitable retaining plates 130 secured to the sides of the plate 126 in overlapping relationship to edge portions of the guide plate.

The previously identified clamping arms 124 extend forwardly through slots 116 in the upper shear 90 and have depending finger portions 172 which are adapted to clamp the severed terminals against the fixed shear block 94 as shown best in FIG. 9. At their rearward ends 174, the clamping arms have rectangular grooves 176 which are adapted to receive complimentary rectangular sections 178 of the shaft 122 which, as noted above, is mounted for rotation in depending ears 120 of the mounting block 118. The width of the grooves 176 in the gripping arms 124 are somewhat greater than the corresponding dimension of the portions 178 of shaft 122, as is apparent from FIG. 3, for reasons which will be explained below.

The arms are held on the noncircular portions 178 of the shaft 122 by clamping plates 180 which are secured by fasteners to the rearward ends of the arms. The shaft 122 is biased in a clockwise direction as viewed in FIG. 3 by a spring 181 on the end of an arm 179 extending from one end of the shaft 122, the other end of this spring being secured to a pin 183 extending from the side of the vertically reciprocable slide 126. As a result of the clockwise bias of the shaft, the ends of the arms are biased downwardly to provide a resilient clamping force for clamping the severed terminals.

The clamping plates 180 have cuplike receptacles on their right-hand ends, as viewed in FIG. 3, which contain wedges 18 having enlarged heads disposed in the receptacles. These wedges have inclined lower ends which are complimentary to bevels 182 on the corners of noncircular shaft portions 178 and are urged against the shaft by springs 186 which are

retained in the receptacles by transversely extending pins **188**. These springdbiased wedges function to bias the arms to the limit of their leftward travel, as viewed in FIG. **3**, relative to the shaft **122** so that a slight clearance normally exists between the sides of the notches **176** and the sides of the non-circular shaft portions **178**. This arrangement permits overtravel of the shaft relative to the arms in the event that one or more of the terminals should be fully inserted before the end of the forward stroke of the inserting apparatus. For example, if one of the openings **14** should be partially filled with a small piece of molding flash, the terminal being inserted into that opening would not be inserted to the same extent as the other terminals being inserted at the same time. After bottoming of the terminal in the partially blocked hole, the arm clamping that terminal would remain stationary and the shaft would continue to move forward with the inserting apparatus. The wedge **184** would be moved upwardly against the biasing force of the spring **186** during this overtravel of the shaft. The amount of overtravel permitted by this arrangement is only very slight but only a slight amount of overtravel is required to compensate for variations in the depths of the holes **14**.

Referring now to FIGS. **2** and **11–13**, the workpiece holder **26** which clamps the bobbin in a precisely predetermined position relative to the inserter, comprises a block **190** mounted on the baseplate **28** having a recess **192** on its upper end which conforms to the shape of the lower bobbin flange **10**. A spindle **196** is mounted in a vertical hole in block **190** and extends into the recess **192**. The upper end of this spindle has a reduced diameter with a conical tip adapted to enter a hollow spool of the bobbin. This spindle is resiliently biased upwardly but can be moved downwardly against the force of its biasing spring until the lower bobbin flange **10** is disposed entirely within the recess **192**. A detent device **193** comprising a spring biased plunger is mounted on the right-hand side of the block as viewed in FIG. **13** and adapted to bear against the edge of the lower flange **10** thereby to bias the entire bobbin leftwardly and against the side **197** of the recess. By virtue of this arrangement, the bobbin is precisely located in the recess so that the terminal receiving apertures **14** of the flange are also precisely located relative to the inserter.

When a bobbin is positioned on the upper end of the spindle **196** and the spindle is depressed until the bobbin is firmly seated in the recess **192**, the electrical and hydraulic controls of the apparatus are energized by means of a pin **198** extending laterally from the spindle through a slot **199** in the block **190**. This pin bears against a lever **200** which is pivoted at its lower end **201** to the block **190** and is leftwardly biased as viewed in FIG. **13** by means of a spring **204** which has one end secured to the lever and another end anchored on a suitable pin extending from block **190**. Adjacent to its upper end, the lever **200** is notched on its left-hand side as shown at **202** so that as the spindle moves downwardly, the lever is permitted to swing through a slight counterclockwise arc under the influence of a spring **204** thereby to depress the plunger **205** of a switch **206** which is mounted in a recess **208** in the lower portion of block **190**. It will be understood that the switch **206** functions to control other switch means which in turn control the supply of compressed air to the piston cylinder **54**.

Immediately prior to actual insertion of terminals into the apertures **14**, the lower flange **10** of the bobbin is clamped against the surface of the recess **192** by means of a clamping yoke comprising a transversely extending clamping bar **210** having depending legs **211** at its ends. These legs are secured by suitable fasteners to slide members **212** on the sides of the bock **190** which are guided along a downwardly and obliquely extending path by guide gibs **214**. Upon movement of the slide members from the position of FIG. **11** to the position of FIG. **12**, the bar **210** moves over the internal surface of the lower flange **10** and clamps the entire bobbin firmly and snugly in position in the recess.

The slides **212** are reciprocated by means of a lever **216** mounted on the left-hand side of the block **190** as viewed in FIG. **2** and pivoted to the block at its lower end **222**. The upper end of this lever is inwardly slotted as shown at **218** for the reception of a cam roller **220** mounted on the left-hand slide **212**. The laterally extending ear of the lever **216** has a pivotal connection to a connecting rod **224** which is coupled by means of a resilient and compressible coupling **226** to a block **230** which in turn a leftwardly extending arm **232** secured to the block **58** on the end of the piston rod **56**. The resilient coupling **226** of the disclosed embodiment comprises a tube **228** mounted in the block **230** which receives the end of the connecting rod **224**. Additionally, a washer mounted on the connecting rod intermediate its ends and a spring **227** is interposed between the leftwardly facing surface of this washer and an additional washer mounted on the end of the tub **28**. By virtue of this arrangement, the connecting rod **224** can continue to move rightwardly as viewed in FIG. **5** or FIG. **12** a short distance after the bobbin has been firmly clamped in the recess **192** with concomitant compression of the spring **227**. A similar resilient coupling may be provided on the left-hand end of the connecting rod **224** as shown at **231** to allow for overtravel of the block **230** while it is moving leftwardly as viewed in FIG. **5**.

After completion of the insertion operation and the return stroke of the inserter, the bobbin having the terminals assembled thereto may be removed manually from the recess **196** although automatic ejection is preferable. In the disclosed embodiment, such automatic ejection is achieved by means of an airblast through an orifice **234** supplied with compressed air by means of an air line **236**.

The operation of the disclosed embodiment is briefly as follows. At the beginning of the operating cycle, the parts will be in the positions of FIGS. **2**, **3**, **5** and **11**. The operator first locates a bobbin on the upper end of the spindle **196** and presses it downwardly until the lower flange at the bottom is in the recess **192** and is held in position by the detent means **193**. During downward movement of the plunger or spindle **196**, the switch **206** will be closed thereby to actuate suitable control valve (not specifically shown) for the double acting piston-cylinder **54**. The inserting slide then moves rightwardly as viewed in FIGS. **3** and **4** and the clamping bar **210** is moved downwardly and obliquely as explained above. During rightward movement of the inserting slide, the three strips of terminals are carried with the slide and the leading terminals of the strips are severed by the shearing means **90**, **98**, **102**. Substantially simultaneously, the gripping fingers **124** are urged downwardly against the upper surface of the shearing means **92** and the terminals are resiliently gripped by the fingers **172** of the arms **124**. When the slide **38** arrives at the limit of its rightward stroke as viewed in FIG. **4**, the severed terminals will have been inserted in the apertures **14** in the flange **10** of the bobbin and the slide commences its return stroke. The lances **18** on the terminals firmly hold the terminals in the apertures in the bobbin and the fingers, which are resiliently urged against the terminals, are cammed upwardly as apparent from FIG. **9** and out of engagement with the terminals as the return stroke of the slide proceeds. Finally during the return stroke, the three strips of terminals are fed relatively over the upper surface of the plate **44** by the stationary feed arms **64**. As explained in detail above, the feeding of the terminal strips is accomplished by restraining them against leftward movement as viewed in FIGS. **3** and **4** while the slide **38** returns to its starting position. Finally, during the return stroke the clamping bar **210** moves obliquely upwardly and out of engagement with the lower bobbin flange and an airblast from the orifice **234** ejects the bobbin from the recess **192**.

A salient advantage of the disclosed embodiment is that after severance of the leading terminals from the strips and gripping of these terminals by the arms **124**, the terminals are precisely located in the leading end of the inserting mechanism. The mechanism itself moves along a precisely predetermined path toward the workholder **26** and the bobbin **4** is precisely located in this workholder so that the apertures can be located precisely on the path along which the severed along which the severed terminals are being moved. A high

degree of control is thus exercised over both the terminals and the bobbin during the entire operation which in turn permits the insertion of the terminals into apertures **14** that are only slightly larger in their transverse dimensions than the terminals themselves.

It should also be noted that the disclosed embodiment, all of the required motions are obtained from the reciprocation of the piston rod **56** of the single piston cylinder **54**. Feeding of the terminal strip is accomplished as a byproduct of the reciprocatory movement of the slide **38** as is the transverse movement of the strip shearing means and the oblique movement of the clamping bar **210**.

It will be apparent to those skilled in the art that modifications may be made to the disclosed embodiment to adapt it to the insertion of different sizes or shapes of terminals into bobbins of other types than the types shown in FIG. **1**. Particularly, the workholder or bobbin holder **26** may take a variety of forms depending upon the actual shape of the bobbin itself. It will be noted that in the disclosed embodiment the three strips of terminals being fed over the slide **38** lie in planes extending parallel to the slide. It has been found that the principles of the invention can be applied to the feeding of terminals in planes extending transversely of the plane of the sides where the configuration of the bobbin requires this modification.

Changes in construction will occur to those skilled in the art and various apparently different modifications and embodiments may be made without departing from the scope of the invention. The matter set forth in the foregoing description and accompanying drawings is offered by way of illustration only.

I claim:

1. Apparatus for inserting terminals into workpiece comprising:

support means,

workpiece holding means mounted on said support means,

inserting means mounted on said support means,

actuating means for reciprocating said inserting means towards and away from said workpiece holding means along a predetermined path.

a guidetrack on said inserting means for guiding a strip of said terminals thereacross, said guidetrack extending parallel to said path,

feed finger means on said inserting means, said feed finger means being engageable with said strip upon movement of said inserting means towards said workpiece holding means whereby said strip is carried with said inserting means towards said workpiece holding means, and

stationary detent means on said support means, said detent means being engageable with said strip of terminals on said guidetrack, said detent means permitting movement of said strip with said inserting means in the direction of insertion and preventing retractile movement of said strip during retractile movement of said inserting means whereby,

said strip of terminals is carried by said inserting means towards a workpiece on said holding means and the leading terminal on said strip is inserted during movement of said inserting means towards said holding means, and said strip is restrained from movement during the return stroke of said inserting means thereby to feed said strip along said guidetrack relative to said inserting means.

2. Apparatus as set forth in claim **1** wherein said workpiece comprises an electrical coil bobbin.

3. Apparatus as set forth in claim **1** including strip shearing means on said inserting means, said strip shearing means being reciprocable in a direction extending transversely of said path and being effective to shear said leading terminal of said strip from said strip.

4. Apparatus as set forth in claim **3** including terminal clamping means on said inserting means for clamping said leading terminal during insertion thereof into said workpiece.

5. Apparatus as set forth in claim **1** including workpiece clamping means on said holding means, said workpiece clamping means being responsive to said actuating means and being effective to clamp said workpiece on said holding means in a precisely predetermined position relative to said path.

6. Apparatus as set forth in claim **1** including strip shearing means on said inserting means, said strip shearing means being reciprocable in a direction extending transversely of said path and being effective to shear said leading terminal of said strip from said strip, said actuating means comprising an actuator reciprocable along a path extending parallel to said predetermined path, and motion translating means effective between said actuator and said shearing means to reciprocate said shearing means.

7. Apparatus for inserting contact terminals into workpieces such as bobbins, said terminals being in the form of a continuous terminal strip, said apparatus comprising:

workpiece holding means for holding one of said workpieces in a predetermined position,

terminal inserting means reciprocable along a predetermined path towards and away from said holding means, said terminal inserting means having one end which is proximate to said workpiece holding means,

a guidetrack for said terminal strip on said inserting means, said guidetrack extending towards said one end of said inserting means,

shearing means on said one end for shearing said leading terminal from said strip,

terminal holding means on said one end for holding said leading terminal whereby, upon movement of said inserting means towards said workpiece holding means, said leading terminal is severed from said strip and held by said terminal holding means, and said terminal is inserted into said workpiece upon completion of the stroke of said inserting means towards said holding means,

feed finger means on said inserting means, said feed finger means being engageable with said strip upon movement of said inserting means towards said workpiece holding means whereby said strip is carried with said inserting means towards said workpiece holding means,

stationary detent means mounted adjacent to said inserting means, said detent means being in engagement with said strip and preventing retractile movement of said strip while permitting forward movement of said strip with said inserting whereby,

said detent means prevents movement of said strip with said inserting means during the return stroke of said inserting means thereby to advance said strip relative to said inserting means.

8. Apparatus for inserting terminals into workpieces such as coil bobbins said terminals being in the form of a continuous strip of end-to-end connected terminals, said apparatus comprising:

workpiece holding means for holding said workpiece in a predetermined position,

stationary frame means spaced from said holding means,

a reciprocable inserter mounted on said frame means, one end of said inserter being proximate to said holding means and being adjacent to said holding means upon movement of said inserter to the limit of its stroke towards said holding means,

a guidetrack for said terminal strip on said inserter extending to said one end,

shearing means on said one end and terminal gripping means adjacent to said shearing means for shearing the leading terminal from said strip and gripping said leading terminal after shearing thereof and during insertion into said bobbin, and

feed finger means on said inserter preventing retrograde movement of said strip relative to said inserter but permitting retrograde movement of said inserter relative to said strip,

and detent means on said frame for preventing relative retrograde movement of said strip with respect to said frame but permitting movement of said strip towards said one end whereby,

upon movement of said inserter towards said holding means, said strip is carried with said inserter towards said workpiece holding means and said leading terminal is severed from said strip and inserted into a workpiece held in said workpiece holding means, and upon movement of said inserter away from said holding means, said detent means engages said strip thereby preventing retractile movement of said strip and to feed the next adjacent terminal of said strip past said one end.

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