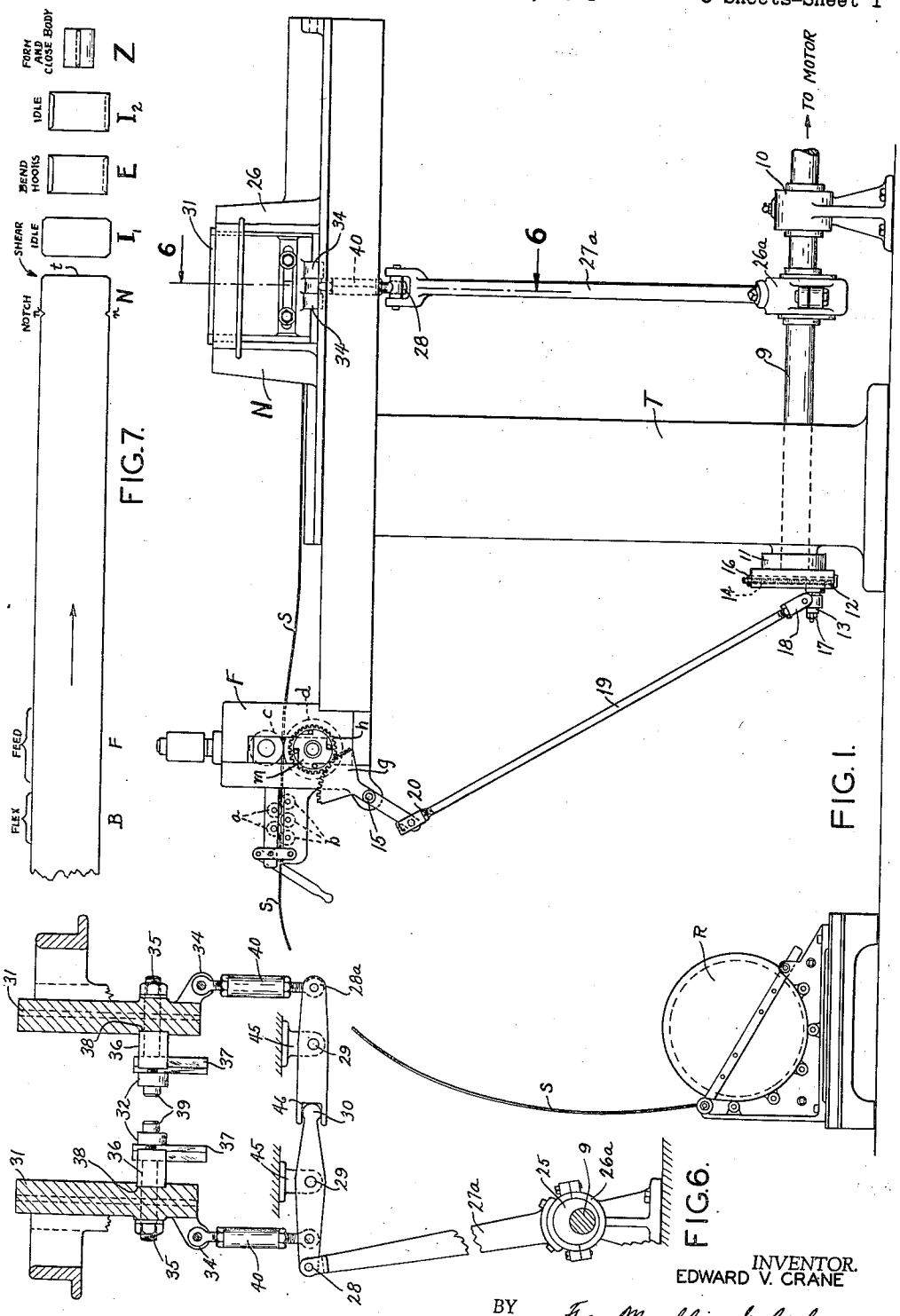
July 27, 1943. E. V. CRANE 2,325,230

NOTCHING AND BLANK FORMING APPARATUS

Filed Nov. 19, 1941 3 Sheets-Sheet 1



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Filed Nov. 19, 1941 3 Sheets-Sheet 2

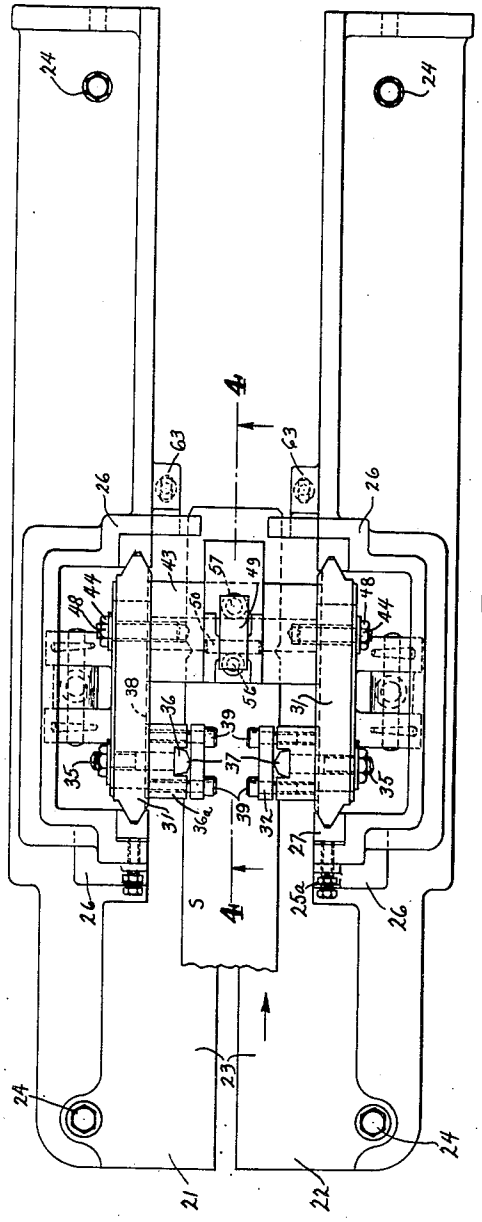

FIG. 2.

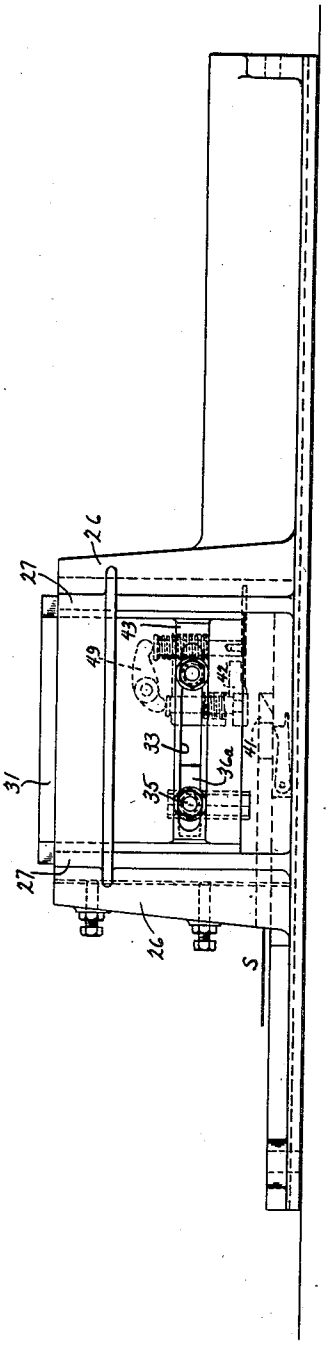

FIG. 3.

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Filed Nov. 19, 1941 3 Sheets-Sheet 3

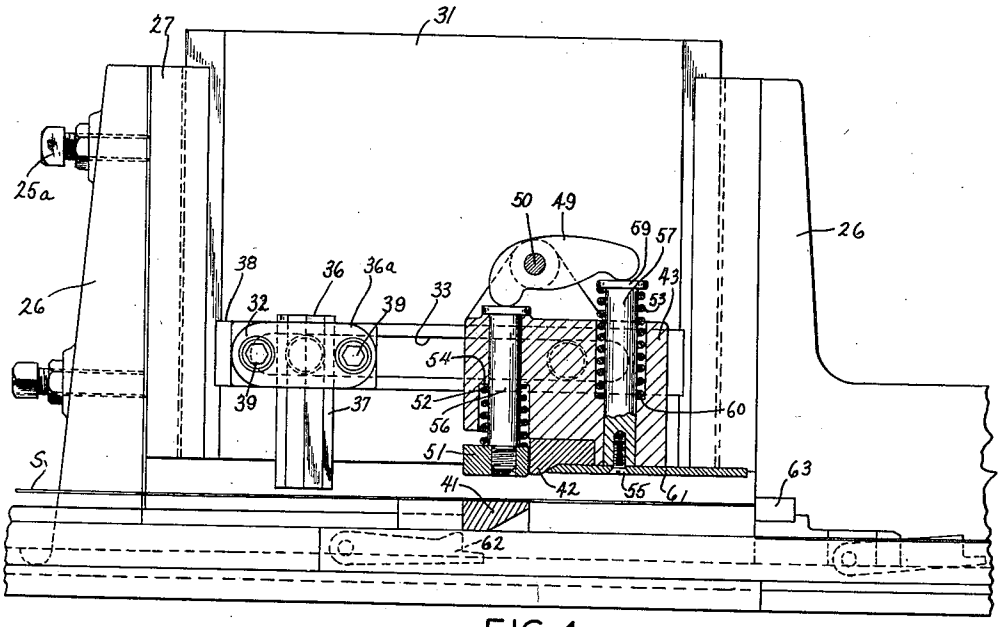

FIG. 4.

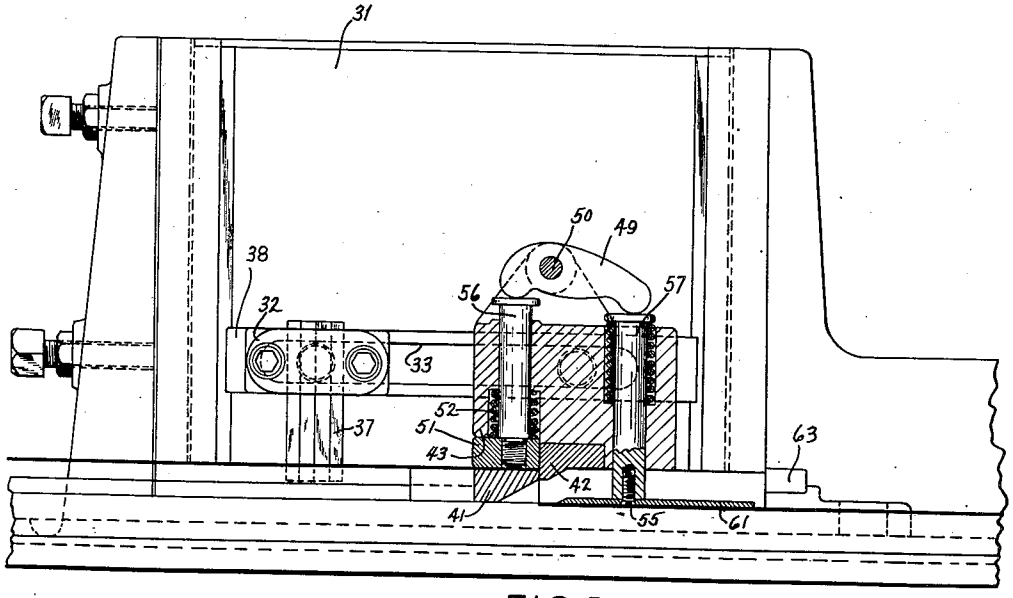

FIG. 5.

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NOTCHING AND BLANK FORMING APPARATUS

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Application November 19, 1941, Serial No. 419,764

7 Claims. (Cl. 164—51)

The present invention relates to can body makers and more particularly to the processing of strip material into blanks ready to be made into can bodies.

Heretofore it has been customary to use wide metal sheets for making can bodies which were cut into strips of the width and length of a single can body in a prior slitting operation. Contrary to this general usage the present invention relates to a new method and mechanism according to which metal strip of a width to make a single can body is fed through the machine from a coil, which strip after having traveled through flexing and feeding stations is fed to the notching station where it is notched and at the same time cut into blanks of proper size. This combination of a notching and blank cutting mechanism is an important improvement in the art since it simplifies the work and helps to save time and labor.

In addition to the foregoing the present mechanism acts to strain harden the sheet or blank commonly called breaking the grain, along lines which are substantially normal to the axis of the completed can. By this action the metal constituting the sheet is given approximately the same physical properties everywhere throughout its area. By accomplishing the strain hardening along a line normal to the can axis there is no initial bending effect along lines coinciding with elements of the can and thus there is no initial shaping tendency which would act to distort the can as it is wrapped into a body at the can body-maker station.

With the above mentioned objects in mind I provide an operating station comprising means for mounting the notching and blank cutting tools and means for actuating said tools in timed relationship while the strip is passed through the station on a conveyor means. The notching die and the blank cutting knife are so mounted relatively to each other that while the rear of one particular blank is notched the front is cut; then, by the next operating stroke, the blank is completely severed from the strip and fed out of the station by the regular feed bar mechanism which is of a well known type.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the annexed drawings and the following description setting forth in detail certain mechanism embodying the invention, such disclosed means constituting, however, but one of various forms in which the principle of the invention may be used.

In said annexed drawings:

Fig. 1 is a diagrammatic illustration of the general arrangement of several stations of my improved sheet forming machine;

Fig. 2 is a top plan view of the combined notching and blank forming station;

Fig. 3 shows a side elevation of the station;

Fig. 4 is a side view partly in section taken on line 4—4 of Fig. 2;

Fig. 5 is a similar view illustrating the parts of the mechanism in another stage of the work;

Fig. 6 is a section taken on lines 6—6 of Fig. 1; and

Fig. 7 shows the notched metal strip and the parts made therefrom.

Referring now to Fig. 1, R designates a reel which carries a coil of metal strip S. As the strip is uncoiled it is passed between sets of rollers *a* and *b* of a flexing mechanism B which will slightly strain harden the metal, commonly called breaking the grain, in a manner well known in can body manufacturing. The roll feed mechanism F for moving the strip comprises two feed rolls *c* and *d* which also act on the strip to take the kinks out of it. From the feed roll mechanism F the strip is fed on to the notching and blank cutting station N.

The driving mechanism which serves for operating the feed mechanism and the notching station comprises a main drive shaft 9 supported by an upright T of the machine frame and mounted in a standard bearing 10. The drive shaft 9 is connected to a source of power, not shown in the drawings. Rigidly secured to said drive shaft 9 is a crank disk 11 carrying a square piece 12 with a T-slot formed therein. Slidably mounted in this slot is a pin 13 which threadingly engages an elongated screw 14 for adjustment of the eccentricity. Nut 16 serves for fastening the screw 14 and nut 17 for holding the pin 13 in an adjusted position. Mounted on an ear extending from pin 13 and forming a universal joint with the same is a clevis 18 carrying a connecting rod 19. The other end 20 of this rod is pivoted to a gear sector *g* journalled as at 15 in the frame of the feeding station F. The gear sector *g* meshes with a gear *h* formed on the outer member of a rolling key clutch of known construction, the inner member of which is designated by *m*. This last mentioned member is rigidly connected with roll *d* of the roll feed mechanism.

As the drive shaft 9 rotates rod 19 will move up

and down on account of the crank action and will transmit a rocking movement to the gear sector *g*, which in turn will rotate gear *h* in the direction of forward feed. During the backward movement of the gear sector *g* the inner clutch member *m* will be disengaged and roll *d* will, therefore, not be driven in the reverse direction.

The notching station N, to which the metal strip is fed from the station F, is more fully shown in Figs. 2 to 5.

As illustrated in Fig. 2, the station is built in two halves 21, 22, which makes it possible to accommodate strips of different widths to be handled therein. The parts 21 and 22 are castings each having a base plate 23 fastened to the bed of the machine as at 24. Each casting has two upright portions 26, between which guideways 27 are mounted and attached thereto by means of bolts 25a. In each side of the mechanism is a slide 31 mounted in said guideways 27 for reciprocating vertical movement. Each slide carries a notching die 36 and both slides together carry a cross-member 43 to which the movable knife 42 is rigidly connected. Thus the slides 31 while being moved up and down in unison carry the notching dies 36 and the knife 42 which, on the downward stroke of the slides, simultaneously work on the metal strip traveling underneath.

Both the notching dies and the cross-members are mounted for horizontal adjustment in a slot 33 (Fig. 3) which allows setting them at the proper distance relatively to each other for cutting blanks of varying lengths.

The notching die proper 37 is an elongated member of polygonal or other cross-section according to the shape of the notch which it is desired to punch out. The upper part of the die is mounted in a block 36a which fits into a groove 38 formed in the slide. Heavy bolts 35 serve to secure the block 36a rigidly to slide 31. In front of said block a clamping bar 32 is fastened thereto by bolts 39, thus holding the die in a fixed position.

The blank cutting tool comprises a stationary lower knife 41 mounted on the bed plate and a movable knife 42 which, as already mentioned, is rigidly connected to the cross-member 43.

This cross-member 43 consists of a casting secured to slides 31 by bolts 44. In order to accommodate strips of different widths these bolts may be released and the slides set before the machine is started in accordance with the width of the strip to be handled. They are then fixed in that adjusted position by nuts 48. As regards the adjustment of the station as a whole, it is accomplished by unscrewing the set screws 24, placing the two castings 21, 22 in the proper position and fixing them after adjustment by replacing and tightening screws 24.

Carried by said casting 43 are two plungers 56 and 57 which are moved up and down with the casting, but are capable of an independent movement as well. The heads of both plungers are in engagement with a lever 49 pivotally mounted on a pin 50, the two arms of said lever having a considerable leverage, about 3 to 1. Plunger 56 carries at its bottom a hold-down member 51 which is controlled by the action of a spring 52 mounted on plunger 56 in a cylindrical bore 54 of casting 43. Plunger 57 likewise has a spring 53 mounted thereon which with one end bears on the plunger head 59, with the other end on the bottom of a cylindrical bore 60. Bolted to the bottom of plunger 57 as at 55 is a kicker bar 61. The blanks are positively fed by this mechanism to a lower level in position to be picked up and fed out of the machine.

On a plane beneath the working plane of the station pivotally mounted feeding fingers 62 are passed through the station on reciprocating feed bars in timed relation with the roll feed mechanism feeding the strip. The feeding fingers pick up the cut-off blanks and carry them out of the station and on to succeeding stations.

At the rear end of the operating station stops 63 (Figs. 2, 4 and 5) are adjustably mounted on the bed plate on either side of the machine for intercepting the incoming strip at the beginning of an operating cycle to position the same with regard to the mechanism just described.

The mechanism for reciprocating the slides 31 in unison with cross-member 43 is illustrated in Fig. 6. It comprises an eccentric 25 on main drive shaft 9 housed in a split bearing 26a. An eccentric strap 27a connects the eccentric with a lever 28 journalled at 29 in one of two symmetrical brackets 45 secured to the machine frame. The other bracket 45 carries pivotally connected thereto a lever 28a which has a U-shaped end 46 adapted to engage with the ball shaped end 30 of lever 28. Both levers are pivotally connected at their other ends with turnbuckles 40 which are in turn pivoted to lugs 34 carried by slides 31. As the eccentric strap 27a reciprocates under the driving action of the main shaft 9 a rocking movement is transmitted to lever 28 which passes the movement on to lever 28a. As lever 28 is pushed upward at the left-hand end, the other end 30 is depressed, taking along end 46 of lever 28a. This movement causes the right-hand end of lever 28a to move upward, both levers being thus capable to reciprocate turnbuckles 40 and slides 31 in unison with each other.

When the mechanism is first started the strip is inched, namely, fed forward in small increments manually, through the machine until the two forward corners have been notched. The strip is then inched on until it engages the stop 63, at which time the machine is ready for continued automatic operation.

As the slide 31 makes the second downward stroke, notching die 37 will descend from the position shown in Fig. 4 to the one illustrated in Fig. 5 and punch the notches *n* (Fig. 7). Simultaneously plungers 56 and 57 are moved down in casting 43, which results in hold-down members 51 clamping the sheet for the cutting action of knives 41 and 42 that occurs immediately afterwards.

As the member 51 bears on knife 41 the spring 52 which is initially compressed in bore 54 establishes the member 51 in its clamping position. At the same time plunger 56 exerts a pressure on the arm of lever 49 engaging the head of the plunger and causes the lever to rock to the position shown in Fig. 5. This pushes plunger 57 downward, compressing spring 53 and forcing the cut-off blank down positively to be received and moved on by fingers 62. During the return stroke, while slide 31 moves upward, plunger 57 will return to the position of Fig. 4 under the action of spring 53, thereby rocking lever 49 and causing plunger 56 to take up the starting position of Fig. 4. Owing to the above-mentioned leverage, plunger 57 moves about three times as far up and down as plunger 56.

Fig. 7 diagrammatically illustrates a strip of metal in the various stages of can body making. The strip is shown to pass the flexing and feed

mechanism B and F, the combined notching and blank cutting station N, where it receives the notches *n* and is cut as at *t*. It then passes over an idle station I_1 to the edging station and over a second idle station I_2 to the can forming and seaming station Z.

From the foregoing description it will be seen that I have provided a can making machine which operates on the strip material to notch and edge the same prior to its manufacture into can bodies. Furthermore, it will be apparent that I have provided a novel way of making such can bodies, including the step of strain hardening the material on a direction generally normal to the longitudinal axis of the completed can.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a can body maker having feed bar means for feeding sheet metal through several operating stations, a combined notching and blank cutting apparatus comprising a bed, a frame, vertically reciprocating means mounted on said frame, a notching die and a movable blank cutting knife carried by said reciprocating means, a stationary knife on said bed adapted to cooperate with said movable knife, a hold-down member for clamping a metal strip during the cutting operation and an ejecting member for positively moving the cut-off blank to said feed-bar means for feeding it out of said station, said hold-down member and said ejecting member for moving out the cut-off blank being interconnected and alternately operative on said blank.

2. In a can body maker having feed bar means for feeding sheet metal through several operating stations, a combined notching and blank cutting apparatus comprising a bed, a frame, vertically reciprocating slide means mounted on said frame, a pair of notching dies and a movable blank cutting knife mounted for simultaneous operation with said notching dies on said slide means, a stationary knife on said bed adapted to cooperate with said movable knife, a hold-down member for clamping a metal strip during the cutting operation and means for positively moving the cut-off blank to said feed-bar means for feeding it out of said station, said hold-down member and said means for moving out the cut off blank being mounted to reciprocate with said slide and being capable of independent alternating up and down movement as well.

3. In a can body maker having conveyor means for feeding sheet metal through several operating stations, a notching station, a combined blank cutting and feed-out mechanism in said notching station, a frame, vertically reciprocating means mounted on said frame, a movable blank cutting knife carried by said reciprocating means, a stationary knife adapted to cooperate with said movable knife, and means cooperating with said knives for rejecting cut-off blanks to said conveyor means for feeding them out of said station, said hold-down member and said ejecting means comprising each a plunger mounted on said vertically reciprocating means to move therewith and alternately to move up and down independently thereof and lever means for interconnecting said plungers and control the alternating movement of the same.

4. In an operating station of a can body maker, a combined blank cutting and kicker mechanism comprising a vertically reciprocating slide, carrier means on said slide adapted to reciprocate therewith, a knife rigidly fixed to said carrier means, two cooperating elongated members mounted on said carrying means to reciprocate therewith and alternately to move up and down independently thereof, lever means to control the alternating movement of said members, one of said members carrying a hold-down element for clamping a blank during the cutting thereof and the other of said members having a kicker bar rigidly connected thereto for ejecting a cut-out blank.

5. In an operating station of a can body maker, a combined blank cutting and kicker mechanism comprising a vertically reciprocating slide, carrier means on said slide adapted to reciprocate therewith, a knife rigidly fixed to said carrier means, two cooperating plungers mounted on said carrying means to reciprocate therewith and alternately to move up and down independently thereof, lever means to control the alternating movement of said plungers, said lever means having arms of different length, one of said plungers carrying a hold-down element for clamping a blank during the cutting thereof and the other of said members having a kicker bar rigidly connected thereto for ejecting a cut-out blank.

6. In an operating station of a can body maker, a combined blank cutting and kicker mechanism comprising a vertically reciprocating slide, carrier means on said slide adapted to reciprocate therewith, a knife rigidly fixed to said carrier means, two cooperating plungers mounted on said carrying means to reciprocate therewith and alternately to move up and down independently thereof, one of said plungers carrying a hold-down element for clamping a blank during the cutting thereof and the other of said plungers having a kicker bar rigidly connected thereto for ejecting a cut-out blank, and a lever having arms of different lengths for controlling the alternating movement of said plungers, the short arm of said lever being adjacent the hold-down plunger.

7. In an operating station of a can body maker, a combined blank cutting and kicker mechanism comprising a vertically reciprocating slide, carrier means on said slide adapted to reciprocate therewith, a knife rigidly fixed to said carrier means, two cooperating plungers mounted on said carrying means to reciprocate therewith and alternately to move up and down independently thereof, one of said plungers carrying a hold-down element for clamping a blank during the cutting thereof and the other of said plungers having a kicker bar rigidly connected thereto for ejecting a cut-out blank, a lever having arms of different lengths for controlling the alternating movement of said plungers, the short arm of said lever being adjacent the hold-down plunger and a spring associated with each plunger, said springs being of different lengths in proportion with the lengths of said plungers and being adapted to aid in the alternating actuation thereof.

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