Dec. 3, 1940. A. M. CAMERON 2,223,599

BLANK FEEDING AND FLEXING MECHANISM

Filed April 20, 1938 4 Sheets-Sheet 1

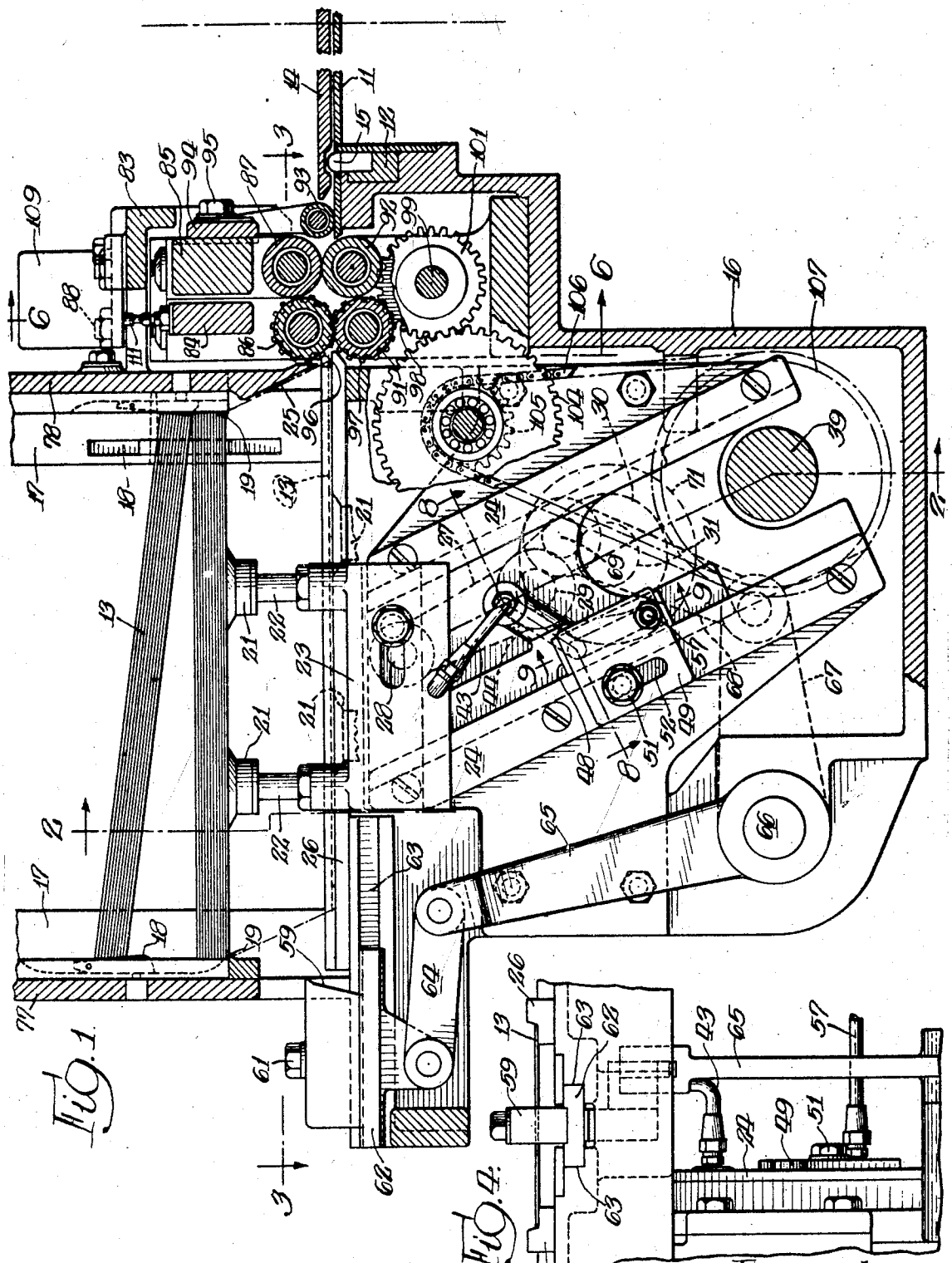


Fig. 1.

Fig. 4.

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BLANK FEEDING AND FLEXING MECHANISM

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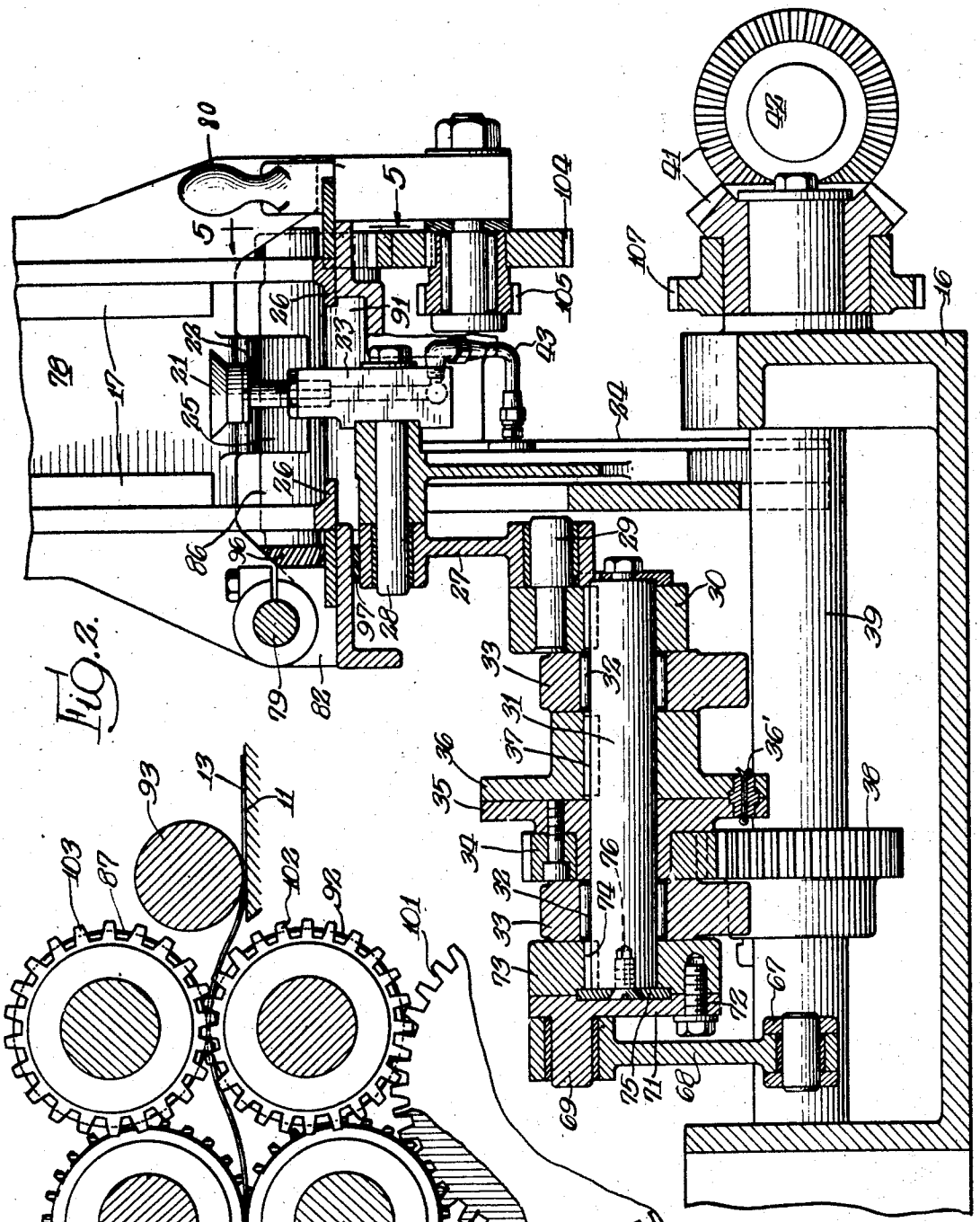


Fig. 2.

Fig. 5.

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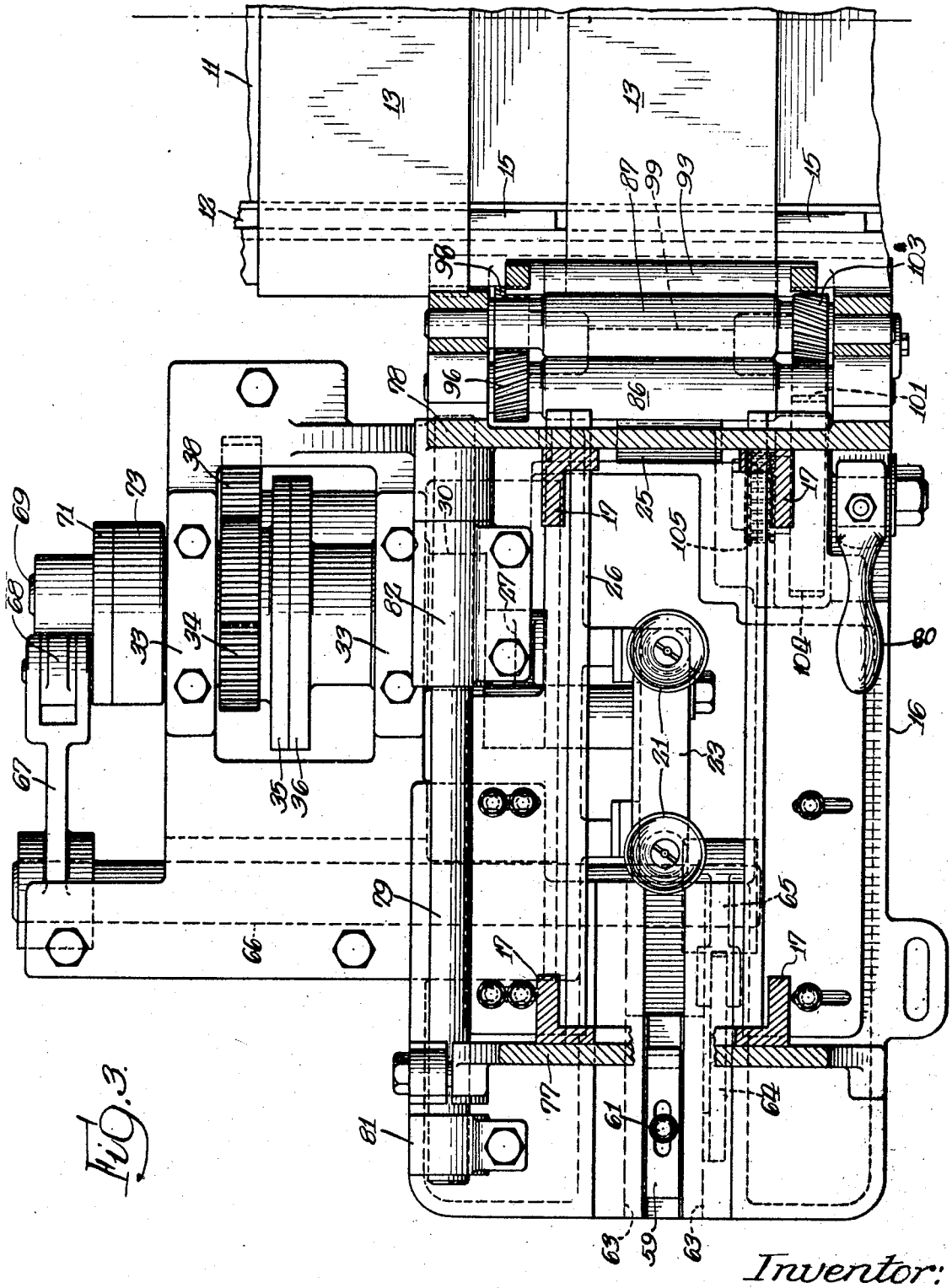


Fig. 3.

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BLANK FEEDING AND FLEXING MECHANISM

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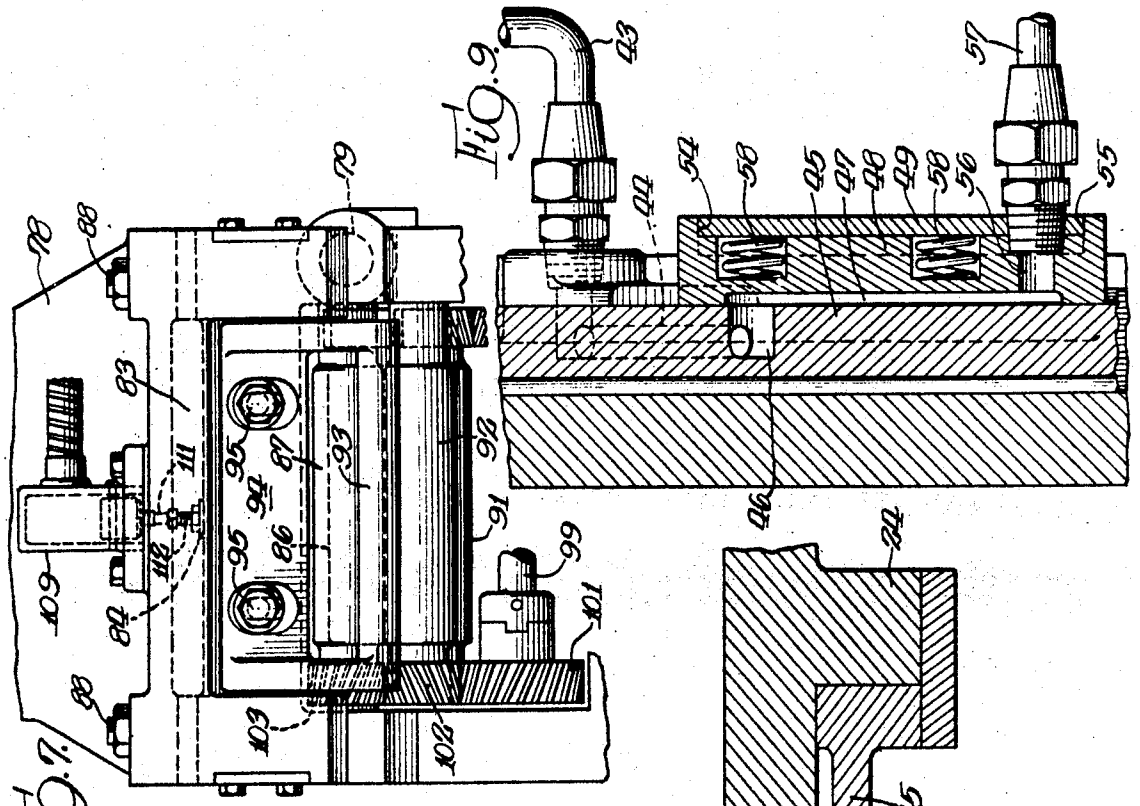


Fig. 9.

Fig. 7.

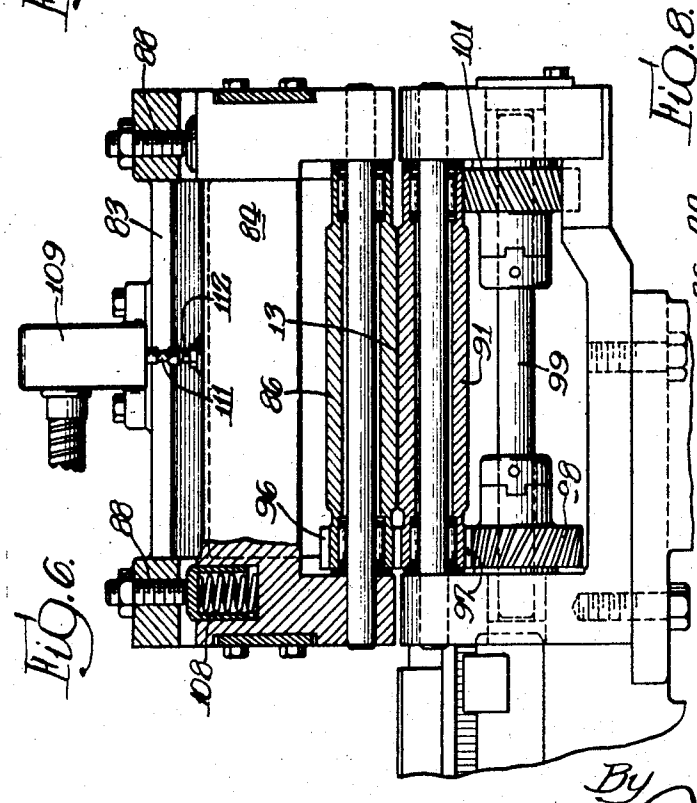


Fig. 6.

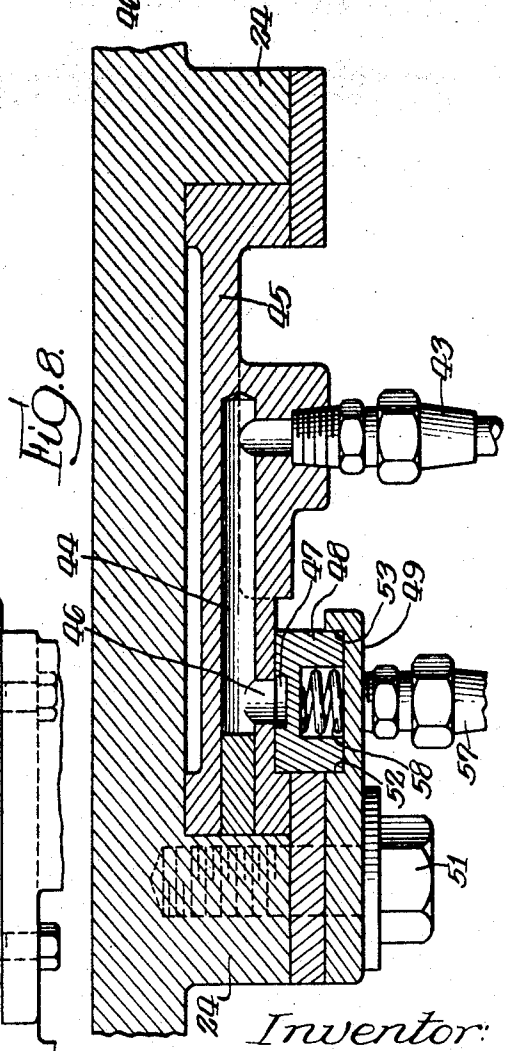


Fig. 8.

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Patented Dec. 3, 1940 2,223,599

UNITED STATES PATENT OFFICE

2,223,599

BLANK FEEDING AND FLEXING MECHANISM

Allan M. Cameron, Chicago, Ill., assignor to Cameron Can Machinery Co., Chicago, Ill., a corporation of Illinois

Application April 20, 1938, Serial No. 203,061

12 Claims. (Cl. 153—54)

This invention relates in general to mechanism for handling sheet metal blanks of tin plate or the like, and while the principles thereof may be embodied in mechanisms adapted for various uses, the invention is here shown and described for illustrative purposes as embodied in mechanism for feeding and flexing blanks of tin plate such as are customarily employed in the manufacture of tin cans.

The bodies of cans of this type are produced from flat metal blanks by a body maker, which, under modern practice, runs at a speed of three hundred or more per minute. In order to produce perfectly round cans upon such a machine, it is customary preliminarily to treat the blanks so as to render them pliant by breaking the grain of the metal of the blanks as they are fed into the machine. This grain breaking treatment is accomplished by flexing the blanks so as to reduce their stiffness and thereby enable them to be bent into truly circular form without the production of so-called "flats." My present invention is concerned with the feeding of blanks to a body maker and with breaking the metal grain of the blanks en route to the body maker.

One of the features of my invention resides in the construction of the grain breaking mechanism which is so designed that the entering rolls which receive the blanks from the magazine are mounted in non-adjustable fixed position exactly in alignment with the approaching blanks so that failure of a blank to enter between and be grasped by the rolls is obviated. The single rear or delivery roll, however, of my grain breaking mechanism is adjustable so that the extent and direction of curvature, if any, of the delivered blank may be controlled. The grain breaking mechanism also embodies a stop device by which the machine may be instantly stopped in the event that a plurality of blanks should be accidentally fed to the grain breaking mechanism simultaneously.

Another purpose of my invention is to transfer the blanks at high speed from the magazine to the grain breaking mechanism and to so control the blanks during such transfer that they are positively deposited by suction devices in alignment with and in close proximity to the entering rolls of the grain breaking mechanism so that only a slight movement of the blanks is necessary to introduce them between the rolls. By carrying the blanks toward the rolls as they are withdrawn from the magazine, the distance required to be subsequently traveled by the blanks is minimized, and any likelihood of loss of control of the blanks in transit is correspondingly reduced. Furthermore, the travel of the feed slide by which the blanks are introduced between the rolls is correspondingly diminished enabling this slide thereby to be operated at high speed with a minimum of wear and vibration.

Another feature of my invention resides in the construction of the mechanism by which the suction cups are operated and controlled and by which the application of suction thereto is accurately controlled so that the cups will operate with certainty and uniformity, and the application of suction thereto will be made and disrupted in accurate, predetermined timed relation with the travel, and by mechanism which will be subject to a minimum of wear and vibration in use.

Other objects and many of the inherent advantages of my invention should be readily appreciated as the same becomes better understood by reference to the following description when considered in connection with the accompanying drawings:

Referring to the drawings,

Fig. 1 is a side elevation partially in section of a mechanism embodying the principles of my invention;

Fig. 2 is a sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a horizontal sectional view on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary end elevation looking toward the right at Fig. 1;

Fig. 5 is a fragmentary sectional view on the line 5—5 of Fig. 2;

Fig. 6 is a sectional view on the line 6—6 of Fig. 1;

Fig. 7 is a fragmentary rear elevation of the mechanism;

Fig. 8 is a sectional view on the line 8—8 of Fig. 1; and

Fig. 9 is a fragmentary sectional view on the line 9—9 of Fig. 1.

When mechanism of the character disclosed is employed in conjunction with a tin can body maker, two mechanisms are customarily used, one being mounted at each side of the blank advancing mechanism of the machine at the front end of such machine. The two mechanisms are so timed that blanks are delivered alternately thereby onto the advancing mechanism of the body maker. Since the mechanisms are duplicates in all essential details, the present disclosure is restricted to one only of such mechanisms.

On the drawings, reference character 11 indicates generally a fragment of the forward portion

of the bed of a body maker along which the blanks are fed by a reciprocatory feed bar 12 to the various mechanisms for operating thereon. The blanks indicated generally by reference character 13 are delivered from flexing mechanism, to be later described, onto the bed 11 beneath a holding plate or bar 14 by which the blanks are held under control. Such control is further facilitated by spring pressed plungers 15 projecting into the path of the delivered blanks and frictionally holding the blanks against accidental misplacement.

The mechanism of my invention is carried by a suitable frame structure 16 mounted and suitably supported, as previously indicated, in proximity to the forward end of a body maker. The mechanism comprises a magazine in which the blanks are stacked, which magazine consists of four upright angle-shaped members 17 equipped with the usual holding and control devices indicated by 18 and having at the bottom supporting ledges 19 upon which the ends of the lowermost blanks in the stack are supported.

The blanks are withdrawn in succession from the bottom of the stack by a plurality of suction devices 21, here illustrated as being of cup shape and mounted upon hollow posts 22, which, in turn are carried upon a reciprocatory head 23. This head is guided in its reciprocatory movements between inclined guide members 24 by which the suction members are caused to travel in an inclined path. As the suction members are moved downwardly with suction applied thereto, they withdraw with them the lowermost blank in the magazine by bending it downwardly between its ends so as to free the ends from the supporting ledges 19. The blank attached by suction to the devices travels downwardly and at the same time to the right viewing Fig. 1 beneath the inclined guide surface 25 formed on the magazine until it is deposited substantially in the dotted line position shown in Fig. 1 upon the table 26. The front end of the blank is thus positioned exactly in alignment with and in proximity to the entering rolls of the flexing mechanism which are located in close proximity to the end of the table 26.

Reciprocatory movement is imparted to the head 23 by a link 27 journalled at one end upon a stub shaft 28 projecting from head 23 and at its other end upon a crank pin 29 carried by a crank 30 fixed upon a shaft 31 which is journalled in roller bearings 32 carried by the supports 33. The shaft is driven by a gear wheel 34 fixed on the shaft, in the present instance through a pair of members 35 and 36 connected by a stud 36', the member 36 being splined at 37 to the shaft. Gear 34, in turn, is driven from a gear 38 mounted upon a drive shaft 39, which is driven through the intermeshing beveled pinions 41 from a drive shaft 42 connected with and driven in timed relation from the drive mechanism of the body maker.

The hollow head 23 which carries the hollow suction cup supporting post 22 is connected by a tube 43 (Figs. 1, 2, 8 and 9) with a passage 44 formed in the head-carrying slide 45, which, in turn, is guided in its reciprocatory movements in the guideways 24. The passage 44 communicates through a port 46 with a grooved passage 47 formed in the face of a stationary valve member 48 which is held in position by a bracket plate 49 adjustably mounted on one of the guides 24 by a bolt 51 passing through a slot 52 in the plate. The plate 49 is provided with shoulders 52 and 53 engaging the sides of the valve member, and the valve member is provided with shoulders 54 and 55 engaging the ends of the plate whereby the valve member is securely held in adjusted position against displacement. The cooperating faces of the valve member and the slide 45 are machined or ground to afford a close, air-tight contact which will prevent leakage at the sides and ends of the passage 47.

The lower end of passage 47 communicates through a port 56 with a tube 57 which is connected with any suitable source of vacuum, such as a vacuum pump or a vacuumized chamber. Springs 58 interposed between the plate 49 and the valve member 48 urge the valve member into snug engagement with the surface of the slide 45 to insure and maintain the air-tight contact.

When the parts are in the position shown in the drawings, vacuum is applied to the suction cups to cause the cups to pick off the lowermost blank from the magazine. Upon downward movement, the cups carry the blank downwardly and endwise toward the flexing mechanism, as previously explained, and just as the blank is deposited upon the table 26, the port 46 in the slide 45 passes the stationary port 56, thereby cutting off the vacuum, and immediately thereafter port 46 is exposed to atmosphere as its lower edge passes the bottom of value member 48 (Fig. 9), thereby relieving the vacuum on the cups so as to free the cups from the blank which may then be fed to the flexing mechanism by a feed device now to be described.

The feed device comprises a feed dog or block 59 adjustably mounted by a bolt and slot connection 61 upon a slide 62 which is guided in its reciprocatory means by guideways 63. The slide is connected by a link 64 with the arm 65 of a bell crank lever fulcrumed at 66, the other arm 67 of the lever being connected by a link or connecting member 68 with a crank pin 69 carried by the shaft 31. For convenience in manufacture and assembly, the crank pin is carried by a disk 71 secured by cap screws 72 to a head 73 splined as at 74 to shaft 31 and held against displacement by a disk 75 and screw 76. The crank 69 is therefore driven in predetermined timed relation with the crank 29 so that the feed dog is moved to the right viewing Figs. 1 and 3 immediately upon release of a blank by the suction cups. The blank is, therefore, moved by the feed dog into the rolls of the flexing mechanism, and since the blank was deposited by the suction cups in close proximity to the rolls, only a slight movement thereof by the feed dog is necessary. The length of travel of the feed dog is therefore relatively slight and the parts are capable of operating at extremely high speeds without vibration and with a minimum of wear.

The uprights 17 of the magazine are mounted upon front and rear plates 77 and 78 which are fixed upon a shaft 79 journalled in supporting bearings 81 and 82. This construction permits the plates and the parts carried thereby, that is the magazine and the upper ones of the flexing rollers, to be tilted back or swung as a unit in a counter-clockwise direction viewing Fig. 2 to permit access to the bed, the suction cups and the flexing rollers for purposes of repair or adjustment. A manually releasable latch or locking device 80 (Figs. 2 and 3) comprising a handle pivoted on the frame and provided with an extension adapted to be swung over a flange of the magazine serves to lock the unit in its normal operative position, as shown in these figures.

The rear plate 78 carries a frame structure 83 in which the yokes 84 and 85 are adjustably mounted. Flexing roll 86 is rotatably carried by yoke 84, and roll 87 is rotatably mounted in yoke 85. The vertical position of both of these yokes and the rolls carried thereby may be regulated by adjustable abutment screws 88.

A lower roll 91 rotatably mounted in the side pieces of the frame structure cooperates with roll 86. A similar roll 92 mounted in the frame structure cooperates with roll 87. The rolls 87 and 92 are mounted at a little higher level than the rolls 86 and 91 so that as the blank leaves the latter rolls, it is bent slightly upwardly in order to pass between rolls 87 and 92, as illustrated in Fig. 5. At the rear of these rolls is mounted a final roll 93 carried by a yoke 94 which is adjustably mounted by bolts 95 upon the yoke 85 so as to be capable of vertical adjustment. Normally, the roll 93 is adjusted substantially to the position shown in Fig. 1 so that the blank, as it emerges from between rolls 87 and 92, is flexed downwardly beneath the roll 93 and then delivered in a straight line along the table 11. Roll 93 is loosely mounted upon its shaft and is freely rotatable thereon, but rolls 86 and 91 are provided with intermeshing driving gears 96 and 97, the latter of which is driven from a pinion 98 fixed on a shaft 99. At its other end, shaft 99 is provided with a driving gear 101 similar to gear 98 which meshes with gear 102 on roll 92, which, in turn, meshes with gear 103 on roll 87 to drive the same. The four rolls are therefore positively driven at one and the same speed from the gear 98.

Gear 98, in turn, is driven from a gear 104, the hub of which is equipped with a sprocket wheel 105 adapted to be driven by a drive chain 106 from the driving sprocket wheel 107 fixed on the shaft 39.

The bight of rolls 86 and 91 is disposed in alignment with the upper face of table 26, and since roll 91 is not adjustable, its upper surface is always substantially tangent to the plane of the blank which is advanced by the feed dog 59 along the table into the bight of the rolls. As the blank travels through the flexing mechanism, it is first bent upwardly to enter between rolls 87 and 92, then downwardly to pass beneath roll 93, and finally is returned to its original plane by engagement with the face of the table 11. This manipulation of the blank breaks the grain of the metal and renders the blank sufficiently flexible so that a truly round can body without flats will be produced therefrom by the body maker.

In order to insure against injury to the mechanism in the event that a plurality of blanks should accidentally be fed to the rolls, the yoke 84 carrying roll 86 is equipped with spring abutments 108 against with the adjusting screws 88 protrude. If more than one blank is fed between the rolls, roll 86 will be forced thereby upwardly against the tension of the spring abutments 108.

This movement of yoke 84 is utilized to stop the machine, and for this purpose a switch 109 of any preferred construction is mounted upon frame 83, and the operating element 111 thereof is disposed in contiguous relation to a companion element 112 so that upon upward movement induced by excess blank thickness between the rolls, the switch will be actuated to stop the machine without injury by breaking the driving motor circuit or throwing a clutch, thereby enabling the error to be rectified.

It should be apparent from the foregoing that I have provided a mechanism which is simple in construction, positive and reliable in operation and in which the path of travel of the operating parts is short, thereby enabling the machine to operate at extremely high speeds with minimum vibration and wear. The flexing mechanism is so constructed that the rolls are always properly positioned for reception of the blanks from the feed table, adjustment being provided for in the final flexing roll whereby the amount of final flexure of the blanks may be regulated. In the event of accidental feeding of more than one blank to the flexing mechanism, the machine is promptly stopped, thereby obviating damage or injury to the parts.

While I have shown and described that embodiment of my invention which at present seems preferable, it should be appreciated that the structural details thereof may be modified within considerable limits without departing from the scope of my invention as defined in the following claims.

I claim:

1. In a mechanism of the character described, the combination of a magazine adapted to contain blanks in superposed relation, flexing mechanism located below and at one side of said magazine, reciprocatory suction cups adapted to withdraw the lowermost blank from the magazine, and means for causing said cups to travel downwardly in a path inclined toward said flexing mechanism whereby a blank engaged by said cups is carried downwardly and horizontally to position one edge thereof in close proximity to said flexing mechanism.

2. In a mechanism of the character described, the combination of a magazine adapted to contain blanks, blank flexing mechanism below and at one side of said magazine, means for withdrawing the blanks in succession downwardly from the bottom of said magazine, and means for causing said last named means to travel in a rectilinear path inclined to the vertical during the downward movement thereof so as to deliver the removed blanks in horizontal position with one edge thereof in proximity to said flexing mechanism.

3. In a mechanism of the character described, the combination of a magazine adapted to contain blanks, a mechanism located below and laterally of the magazine for operating on said blanks vacuum means for removing the blanks successively from the magazine, means for reciprocating said vacuum means, and an inclined guideway for causing the vacuum means to travel in a path inclined to the vertical to thereby position the removed blanks out of vertical alignment with the magazine and in proximity to said operating mechanism.

4. In a mechanism of the character described, the combination of a magazine, a table beneath said magazine, vacuum means for transferring blanks from the magazine to said table, means for reciprocating said vacuum means, means for causing the vacuum means to travel in a path inclined to the vertical, and means for intermittently applying vacuum to said vacuum means, said last mentioned means including a slide member movable with the vacuum means and provided with a vacuum passage terminating in a port, a stationary valve member provided with a passage adapted to cooperate with said port, and a source of vacuum connected with said last mentioned passage, said slide and valve

being so arranged that upon each reciprocation of the slide vacuum will be alternately applied to and released from said vacuum means.

5. In a mechanism of the character described, the combination of a magazine, suction means for removing blanks from said magazine, a slide supporting said suction means, a guide inclined to the vertical in which said slide is reciprocable, a stationary valve cooperable with said slide, springs for urging said valve into sealing engagement with the slide, a source of vacuum connected with the valve, a passage connecting the valve with said vacuum means, means for reciprocating the slide relatively to the valve whereby said passage is alternately subjected to atmosphere and to said vacuum through the valve, and means for operating upon blanks removed by said vacuum means from said magazine.

6. In a mechanism of the character described, the combination of a table, means for depositing blanks upon said table, a pair of rollers mounted to receive blanks from said table, a second pair of rollers mounted to receive blanks from said first pair of rollers, means for positively rotating all of said rollers, a final flexing roller, means for adjustably supporting the same in cooperative relation to said first rollers, and means rendered operable to stop the operation of said mechanism upon the entrance of a plurality of blanks between said rollers.

7. In a mechanism of the character described, the combination of feed mechanism and flexing mechanism, said feed mechanism including vacuum means vertically and horizontally movable for positioning blanks in proximity to said flexing mechanism, means for advancing said positioned blanks into said mechanism, the flexing mechanism comprising a plurality of pairs of positively driven flexing rolls and a freely rotatable roll adjustable relatively to the driven rolls, and means operable upon bodily movement of one of said flexing rolls for stopping said mechanism.

8. In a mechanism of the character described, the combination of a machine frame, a unit comprising a magazine and the upper rollers of a flexing mechanism pivotally mounted on said frame so as to be swung from operative position to facilitate access to the underlying parts, and means for locking said unit in operative position.

9. In a mechanism of the character described, the combination of a frame construction, feed mechanism carried thereby, a magazine, flexing mechanism, said magazine and a portion of said flexing mechanism constituting a unit pivotally mounted upon said frame so as to be movable into inoperative position thereon, and means for locking said unit in operative position.

10. In a machine of the character described, the combination of a frame, feed mechanism carried thereby, flexing mechanism comprising cooperating upper and lower rollers, a magazine, said magazine and said upper rollers being assembled and connected together to constitute a unit, and means for pivotally supporting said unit upon said frame so as to permit tilting of the unit to afford access to said feed mechanism and said lower rollers.

11. In a mechanism of the character described, the combination of a magazine adapted to contain blanks, a table beneath the magazine, flexing mechanism including rolls disposed in horizontal alignment with said table at one end thereof but out of vertical alignment with the magazine, vacuum means for transferring blanks from the magazine onto said table, means for reciprocating said vacuum means, a guideway inclined to the vertical by which said vacuum means is caused to travel in a path inclined toward flexing mechanism to cause said blanks to approach said flexing mechanism and be deposited on the table in proximity thereto, and means for advancing the blanks along the table into the bight of said flexing rolls.

12. In a mechanism of the character described, the combination of a blank feeding mechanism including means for positioning blanks in proximity to a flexing mechanism and means for advancing said blanks into said mechanism, flexing mechanism comprising a plurality of cooperative flexing rolls, a slidable yoke in which one of said rolls is journalled, yielding means acting on said yoke to urge said roll toward its companion roll and adjustable means for regulating the tension of said yielding means, an electric switch mounted in proximity to said yoke, and a member carried by said yoke in position to actuate said switch upon a predetermined separation of said one roll from said companion roll.

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