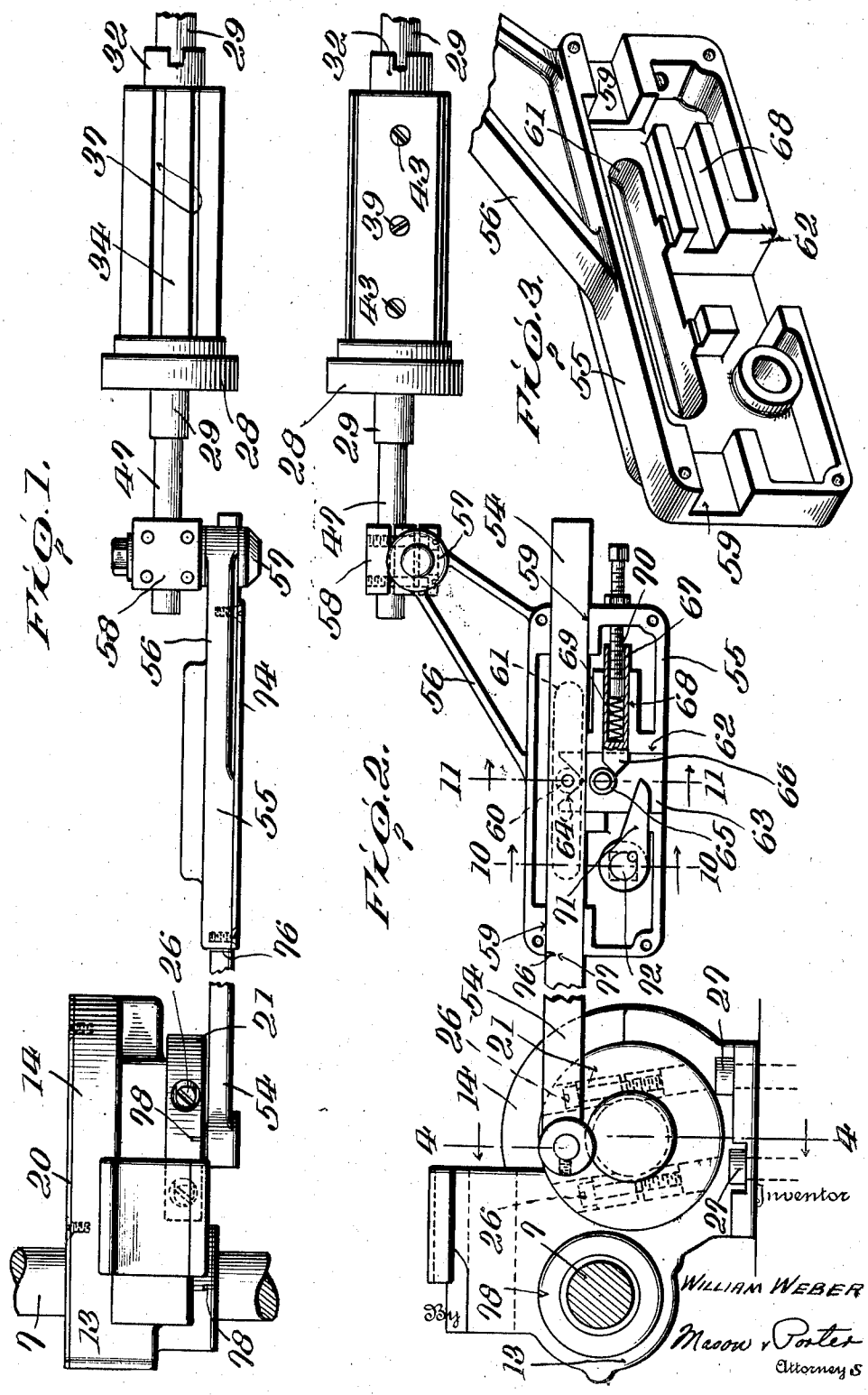
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HORN EXPANDER FOR CAN BODY MAKING MACHINES

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HORN EXPANDER FOR CAN BODY MAKING MACHINES

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Fig. 5.

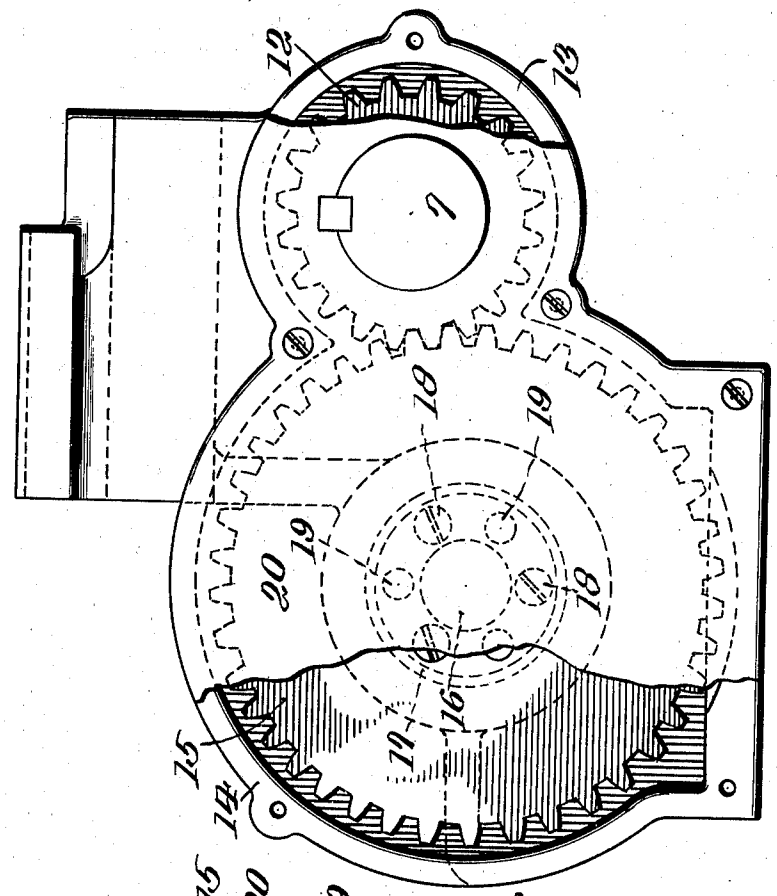
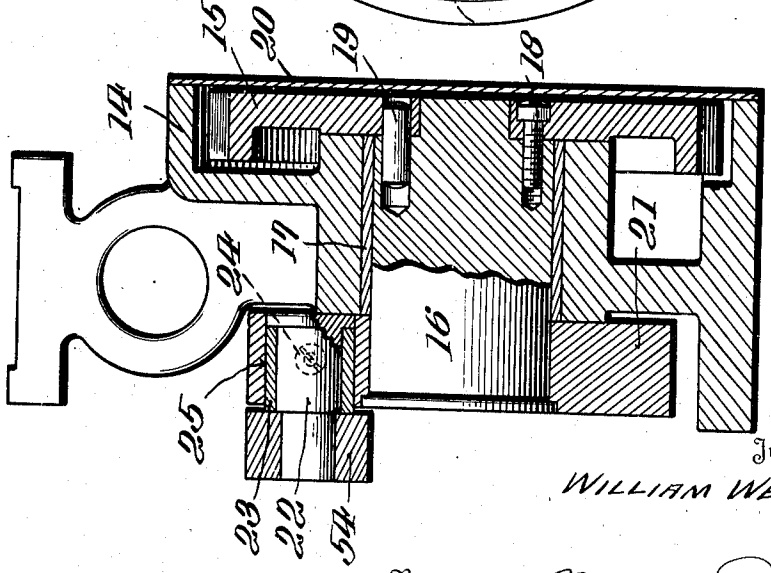



Fig. 4.




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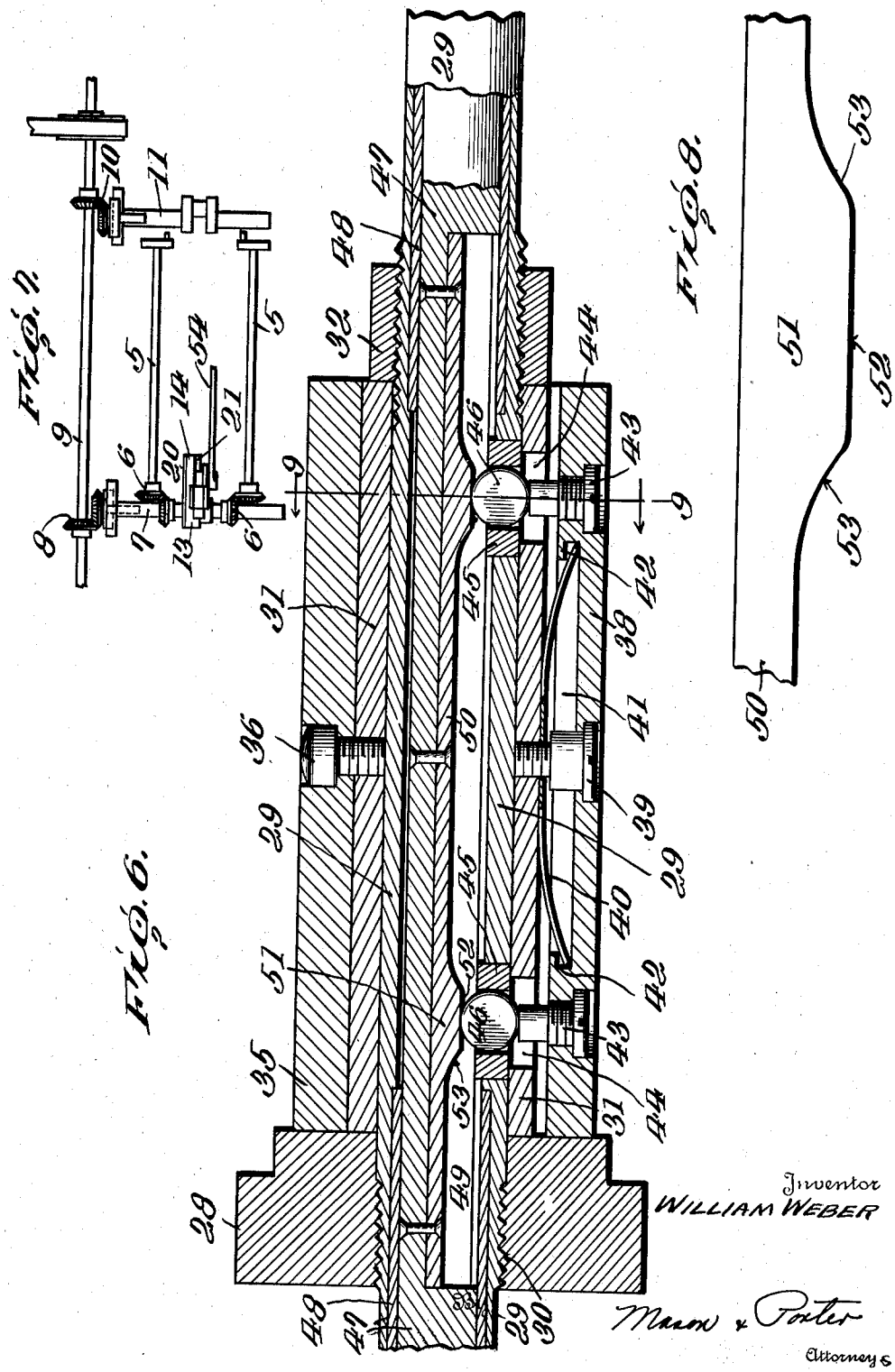
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HORN EXPANDER FOR CAN BODY MAKING MACHINES

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HORN EXPANDER FOR CAN BODY MAKING MACHINES

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Fig. 9.

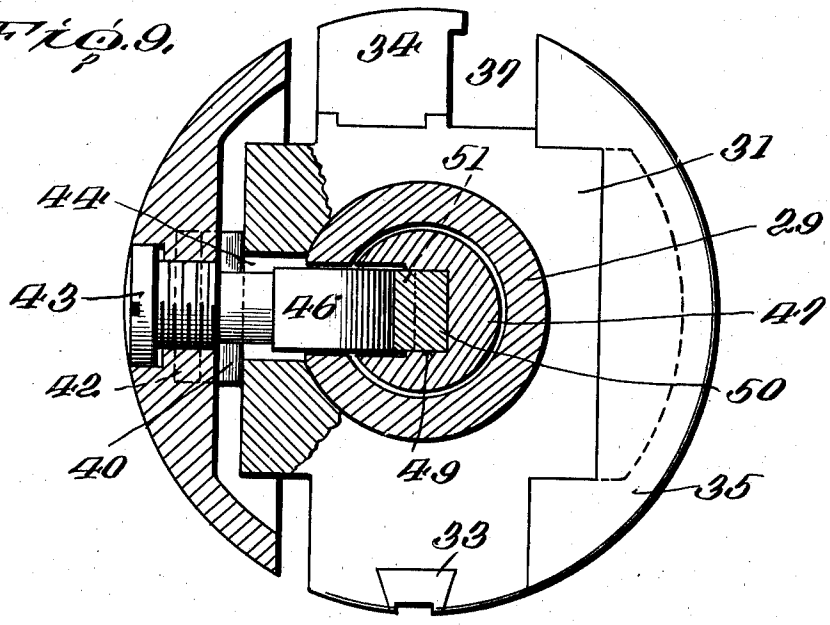



Fig. 10.

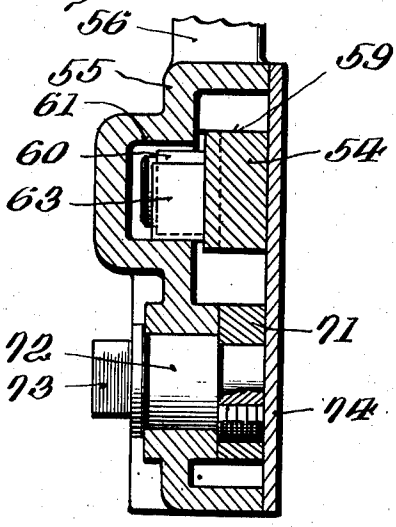
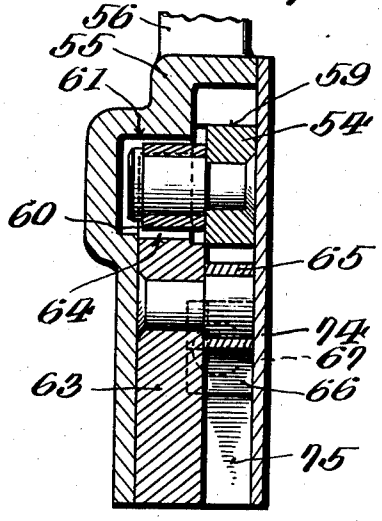



Fig. 11.




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Patented July 2, 1940 2,206,795

# UNITED STATES PATENT OFFICE

2,206,795

## HORN EXPANDER FOR CAN BODY MAKING MACHINES

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Application April 2, 1938, Serial No. 199,714

18 Claims. (Cl. 113—12)

The invention relates generally to can body making machines of the type disclosed in U. S. Letters Patents to Troyer #1,543,460, of June 23, 1925, and Troyer, et al., #1,750,550 of March 11, 1930, and primarily seeks to provide a novel and efficient double-acting horn expanding mechanism designed to enable material speeding up of the operation of such machines.

In can body machines of the type mentioned, the body blanks are intermittently advanced, by reciprocating feed bars, along a guideway past certain devices which operate to form oppositely turned hooks on the ends of the blanks, after which the blanks are advanced to the horn and are wrapped or formed about it by the action of a pair of wing clamps, so that their flanged edges will be brought into overlapped relation. Just before the forming operation the horn is slightly moved so as to clamp the blank against an abutment to prevent slipping and then the horn is expanded diametrically so that the overlapped ends of the blank will be hooked together, one within the other, and when in this relation, they are struck by a bumper so as to clamp them together in a tightly closed seam.

Heretofore, the horn expanding means have been movable with the blank feeding means and certain limitations of design and relative timing of parts occasioned by this driving relation have resulted in undesirable and unnecessary overloading of the feeding means, excessive velocity of movement of the feeding devices at the time of contact with the blanks, resulting in damage to the blank edges, excessive movement and wearing of the horn expanding means, jamming of parts due to displacement of elements included in the horn expanding means, and reduction in potential speeds of operation obtainable in the machine as a whole. It has been found that by providing the novel horn expanding means herein disclosed, which is operated independently of the blank feeding means, the difficulties alluded to can be eliminated.

In its more detailed nature, the invention resides in the provision of a novel horn expanding means operable independently of the blank feeding devices and including a double acting reciprocable expanded rod to which one complete reciprocation is imparted for each two can body forming operations, and which operates to expand and relieve or collapse the horn once for each single direction stroke movement of said rod.

Another object of the invention is to provide novel movement transmitting devices for driving the horn expanding means and including a thrust bar and one to two ratio gearing connections with a power shaft of the machine which rotates once for each complete can body forming cycle.

Another object of the invention is to provide movement transmitting devices of the character stated including a novel overload release mechanism.

With the above and other objects in view which will more fully appear, the nature of the invention will be more clearly understood by following the detailed description, the appended claims, and the several views illustrated in the accompanying drawings.

In the drawings:

Fig. 1 is a plan view illustrating the invention;

Fig. 2 is a right side elevation of the parts shown in Fig. 1, the overload release mechanism cover plate being removed;

Fig. 3 is a detail perspective view of the main body portion of the overload release mechanism housing;

Fig. 4 is a vertical cross section taken on the line 4—4 of Fig. 2;

Fig. 5 is a left side elevation of the drive gear housing, portions of the cover plate being broken away;

Fig. 6 is an enlarged central longitudinal section of the horn;

Fig. 7 is a diagrammatic plan view showing the manner of driving the horn expander rod and associated machine parts;

Fig. 8 is an enlarged detailed plan view of one of the double-acting expander cam portions;

Fig. 9 is an enlarged detailed vertical cross-section taken on the line 9—9 on Fig. 6;

Fig. 10 is an enlarged detailed vertical cross-section taken on the line 10—10 on Fig. 2;

Fig. 11 is an enlarged detailed vertical cross-section taken on the line 11—11 on Fig. 2.

As has been previously stated, the present invention deals with improvements in machines of that general construction shown in United States Patents #1,543,460, issued to Nelson Troyer on June 23, 1925, and #1,750,550, issued to Nelson Troyer et al., on March 11, 1930, each of which shows a machine comprising a guideway along which can body blanks are advanced by the action of reciprocating feed bars past a series of mechanisms which notch the opposite ends of the blanks and then flange and bend back the ends to form oppositely turned hooked portions which later are interlocked and seamed together to form the blanks into cylindrical bodies.

After a can body blank has been advanced by

the feed bars, past the hook forming devices to a position overlying the horn, the opposite end portions of the blank are then bent downwardly about the horn so as to bring their hooked end portions into overlapped relation. This bending of the blank is accomplished by the downward closing movement of a pair of wing clamps adapted to be actuated between open and closed positions by operative connections with rotatably driven shafts mounted along the opposite sides of the machine.

As is shown in Fig. 7, the two shafts 5 are driven by suitable sets 6 of gearing from a cross shaft 7 which, in turn, has geared connection, as at 8, with a main drive shaft 9 extended along one side of the machine. This drive shaft 9 also has a geared connection, as at 10, with the cross shaft 11 providing that the feed bars, horn, wing clamps and bumper all operate in synchronism. See also Figs. 1, 2 and 3 of Troyer et al. Patent #1,750,550.

The driver gear 12 is secured upon the cross shaft 7 and is housed within an extension 13 of a gear housing 14. See Figs. 1, 2, 5 and 7. Within the housing 14 is mounted a gear 15 to which rotation is imparted by the driver gear 12. These gears have a one to two ratio so that rotation is imparted to the gear 15 at half the speed of rotation of the shaft 7 and gear 12. The gear 15 is secured upon a stud shaft 16 having rotatable bearing as at 17 in the housing, the gear 15 being secured to the stud shaft through the medium of screws 18 and positioning studs 19 as shown in Figs. 4 and 5 of the drawings.

The housing 14, 13, is open at one face as shown in Fig. 4 of the drawings, and this open face is closed by a removable cover plate 20. The stud shaft 16 projects from the housing bearing as shown in Figs. 1 and 4 and carries a crank disc 21 equipped with a headed crank pin 22. The crank pin is secured in a bushing sleeve 23 screw secured as at 24 in a receiving aperture 25 formed in the disc, and the disc itself is equipped with pinch bolt equipment 26 for adjustably securing it upon the stud shaft 16. See Fig. 2. By releasing the pinch bolt equipment 26 it is possible to adjust the position of the crank disc about the axis of the stud shaft. The gear housing 14, 13 is suitably anchored as at 27.

The expansible and collapsible horn is shown in detail in Figs. 6 and 9 of the drawings and includes the usual slide block 28 and tubular supporting stud 29 thread secured as at 30 in said block. The horn also includes a central body 31 supported on and surrounding the stud 29 and secured thereon by a lock nut 32. A hardened spline or bumping anvil 33 is mounted in the lower portion of the body 31, and a head piece 34 is secured to the upper portion of the central body. A stationary side piece 35 is secured as at 36 to the central body 31, and a feed bar guideway 37 is provided between the upper portions of the side piece and the head piece 34, as shown in Fig. 9 of the drawings.

In this particular disclosure I have illustrated a horn having one stationary side piece and one movable side piece. It is to be understood, however, that two movable side pieces may be employed if desired as illustrated in the Troyer, et al. Patent #1,750,550, hereinbefore referred to.

The single movable side piece disclosed in this particular illustration is indicated at 38 and is secured to the central body 31 by an outward movement limiting screw 39, as illustrated in Fig. 6 of the drawings. A leaf spring 40 constantly tends to collapse the horn by moving the movable piece 38 inwardly toward the central body 31, the ends of the spring being extended into a receiving recess 41 formed in the piece 38 for engagement with overhanging lugs 42.

Adjustable thrust receiving screws 43 are mounted in the movable piece 38, one thereof being provided at each side of the limiting screw 39, and the thrust receiving ends of these screws project into apertures 44 provided in the side wall of the central body 31, as shown in Figs. 6 and 9 of the drawings. The apertures 44 align with openings formed in the tubular supporting stud 29 and fitted with retainers 45 for the thrust imparting rollers 46. It will be noted that the thrust receiving screws 43 project like distances into the central body apertures 44 so that the rollers 46 which engage these screws are equi-distantly spaced from the axis of the tubular supporting stud 29.

An expander rod 47 is reciprocably mounted in the tubular supporting stud 29, being slidable in bearing bushings 48 fitted in said stud as shown in Fig. 6 of the drawings. The rod 47 is provided with a longitudinal recess 49 for receiving the inwardly projected portions of the rollers 46 and also the double acting cam bar 50 which is mounted in said recess and secured to the rod as illustrated in Fig. 6. The cam bar is equipped with two double acting cam projections 51, each including oppositely directed cam surfaces spaced by a longitudinal dwell portion 52. At each side of its straight line or dwell portion 52, each cam projection 51 includes a gradual camming surface 53 as best shown in Fig. 8 of the drawings.

It will be obvious that each time the rod 47 is moved to the right of the position illustrated in Fig. 6, the rollers 46 will leave the dwell portions 52 of the cam projections and ride inwardly on the moving cam surfaces 53 at the left hand side of the projections, thus permitting the horn, or rather the movable side piece 38 thereof, to collapse. When the rod is again moved to the left, the rollers 46 will ride up on the moving cam surfaces 53 and onto the dwell portions 52, forcing the screws 43 and the horn side piece 38 outwardly to expand the horn.

Upon continued movement of the rod 47 in the direction stated, the rollers will ride down the cam portions at the opposite sides of the projections 51 and again effect a collapsing of the horn. Thus, the rod and cam equipment disclosed in Fig. 6 of the drawings, is double acting and is capable of effecting an expansion and contraction or collapsing of the horn in each direction of movement or during each stroke of reciprocation. Also, by providing the gradual cam surfaces 53, and by moving the rod 47 relatively slowly, the expansion and contraction of the horn is effected without shock and unnecessary wear.

A pitman bar 54 is connected to the crank pin 22 and this bar is slidably received in a housing 55. Under normal operations, the bar 54 and housing 55 move as a unit, but there is included in the housing an overload release mechanism which engages the bar, and whenever an overload is imposed upon the composite pitman equipment, this release mechanism releases the bar and permits it to slide relative to the housing, thus avoiding breakage of parts.

The housing 55 includes an extension or bracket portion 56 which is pivotally connected as at 57 to a block 58 adjustably secured to the reciprocable horn expander rod 47.

Within the housing 55 a roller 60 is secured to the bar 54 and the housing is provided with an elongated recess 61 for accommodating and permitting movement of the roller 60 whenever the overload release mechanism releases the bar to slide relatively in the housing. The housing also includes a vertical guide-way 62 in which a latch plate 63 is slidably mounted. The latch plate is equipped at its upper end with a V-notch 64 for receiving the bar roller. This plate also carries a roller 65 and the plate is normally, and yieldably held up against the bar roller, as shown in Figs. 2 and 11 of the drawings, by one face of a V-nose 66 of a latch member 67 slidable in a horizontal guide-way 68 formed in the housing.

The latch member is constantly urged by a spring 69 into roller engaging and retaining contact and the degree of compression of this spring can be adjusted by an adjustable screw-plunger equipment 70 mounted on the housing 55.

If, for any reason, an over-load is imposed upon the reciprocable rod 47, the latch plate 63 will yield downwardly to free the roller 60 from the notch 64. When the latch plate is thus displaced, the roller 65 will displace the latch member 67 and after it passes the nose 66 the latch member will again be projected by its spring and the nose portion 66 thereof will retain the roller 65 in the lowered, latch plate released position. With the parts in this condition, the bar 54 is free to slide back and forth in the housing 65 without imparting reciprocation to the rod 47.

In order to provide for the resetting of the parts to the normal movement imparting condition, I provide a reset lever 71 which is pivoted at 72 in the housing and has a hub portion extended through a wall of the housing and equipped with a non-circular head 73 to which a wrench may be applied for manipulating the lever. The lever extends under the latch plate roller 65 as shown in Fig. 2 of the drawings, so that by proper manipulation of this lever, the latch plate can be forced upwardly, displacing the latch member 66, 67 and restoring the parts to the normal position illustrated in Fig. 2 of the drawings.

The housing is in the nature of a skeleton casting provided with an open face as shown in Figs. 2 and 3 of the drawings. The open face of the housing is closed by a removable cover plate 74 including a filler block portion 75 projecting into the guide-way 62 to aid in confining the latch plate 63.

After the overload release devices have functioned as above stated, to free the bar 54 for relative movement in the housing 55, and the machine condition causing the over-load has been remedied, the parts are reset to their normal condition as above stated. In order to facilitate this re-setting of parts, the bar 54 is provided with an indicator notch 77 which may be lined up with the housing end wall as shown in Fig. 2 of the drawings so as to determine the position of the bar roller 60 within the housing at the time the re-setting of the latch is being effected. Notches or indicating marks 78 may also be provided on the gear housing 13, 14 for facilitating the proper positioning of the pitman bar 54 and crank disc 21.

In prior equipments, such as the horn disclosed in the Troyer, et al. Patent #1,750,550, the thrust receiving screws were of different lengths and the camming equipments, effective in one direction of movement only, had to be stepped at different distances with respect to the axis of the horn. In such equipments, when attempts were made to operate the machines rapidly, so as to produce more than three hundred and fifty (350) cans per minute, problems were presented by displacement of the rollers engaging the shorter of the screws, causing a jamming of parts. These difficulties have been avoided by the symmetrical double acting equipments hereinbefore described.

Again, in the operation of previously known body forming equipments the expansion of the horn has begun when can feeder or finger bars had about 7/8" of travel left before completing their retracting stroke. Full expansion of the horn required about $\frac{5}{16}$" of travel and the remaining $\frac{2}{16}$" of travel took place along flat or dwell portions of the control devices within the horn. On the forward or can feeding stroke, 7/8" of travel would be required before the horn would be completely collapsed and the finger bars might start pushing the newly formed can off the horn. Through this 7/8" of travel, the velocity of the fingers increased materially and the fingers struck the tin plate a very sharp blow, resulting in a battering and marking of the edges of the can bodies and frequently causing trouble during subsequent operations on the cans.

By providing the hereindescribed horn expanding and collapsing mechanisms which are entirely independent of the body blank feeding devices, all of these difficulties have been avoided. The independent horn expanding mechanism is designed to make the design of the horn, expanding and collapsing, and the period through which the horn is held expanded, independent of the feed finger assembly timing. It is thus possible to time the collapsing of the horn so that the feeding fingers have traveled only $\frac{3}{32}$" on their forward stroke before engaging the tin plates. Thus the velocity attained by the fingers at the time of contact with the tin plate is negligible and finger marks are not discernible on can bodies formed on this improved equipment at a speed of four hundred (400) per minute.

In addition to the elimination of finger marks on the formed can bodies, my improved mechanism decreases the stroke of the expander rod by half. The number of strokes of the expander rod is reduced to half the number of body shaping part operations and all difficulties resulting from horn roller displacements are eliminated.

What I claim is:

1. In a can body forming machine, an expansible and collapsible horn, and means including an overload release connection and movable in a single direction for effecting an expansion and a collapsing of said horn.

2. In a can body forming machine, an expansible and collapsible horn, a reciprocable cam, and means movable under control of said cam and effective during each stroke of movement of said reciprocable cam for expanding and collapsing said horn, and means for reciprocating said cam including an overload release connection effective to render the cam ineffective upon imposition of an overload during any stroke of movement thereof.

3. In a can body forming machine, a power shaft rotated once during each can body forming cycle, an expansible and collapsible horn, a double acting reciprocable element effective in each direction of reciprocation to expand and collapse the horn, and means for imparting to

the element one complete reciprocation for each two rotations of said shaft.

4. In a can body forming machine, a power shaft rotated once during each can body forming cycle, an expansible and collapsible horn, a double acting reciprocable element effective in each direction of reciprocation to expand and collapse the horn, and means for imparting to the element one complete reciprocation for each two rotations of said shaft, said means including a one to two ratio gearing connection and a crank and pitman interposed between said gearing and said element.

5. In a can body forming machine, a power shaft rotated once during each can body forming cycle, an expansible and collapsible horn, a double acting reciprocable element effective in each direction of reciprocation to expand and collapse the horn, means for imparting to the element one complete reciprocation for each two rotations of said shaft, said means including a one to two ratio gearing connection and a crank and pitman interposed between said gearing and said element, and an overload release means in said crank and pitman connection.

6. In a can body forming machine, a power shaft rotated once during each can body forming cycle, an expansible and collapsible horn, a double acting reciprocable element effective in each direction of reciprocation to expand and collapse the horn, means for imparting to the element one complete reciprocation for each two rotations of said shaft, said means including a one to two ratio gearing connection and a crank and pitman interposed between said gearing and said element, and means for longitudinally adjusting the position of said element with respect to said pitman.

7. In a can body forming machine, a power shaft rotated once during each can body forming cycle, an expansible and collapsible horn, a double acting reciprocable element effective in each direction of reciprocation to expand and collapse the horn, means for imparting to the element one complete reciprocation for each two rotations of said shaft, said means including a one to two ratio gearing connection and a crank and a pitman interposed between said gearing and said element, means for longitudinally adjusting the position of said element with respect to said pitman, and means for adjusting the position of said crank with respect to said gearing.

8. In a can body forming machine wherein is provided an expansible horn, and means for forming about the horn can bodies each including a side seam disposed longitudinally of the horn, said means including a seam bumper movable for seam bumping purposes each time the horn is expanded; means for effecting and relieving expanded conditions of the horn including a reciprocable element effective in each direction of its reciprocation to once effect and once relieve an expanded condition of the horn, and means for moving the element and the seam bumper in timed relation so that the seam bumper operates once during each expansion of the horn.

9. In a can body forming machine wherein is provided an expansible horn, and means for forming about the horn can bodies each including a side seam disposed longitudinally of the horn, said means including a seam bumper movable for seam bumping purposes each time the horn is expanded; means for effecting and relieving expanded conditions of the horn including a reciprocable actuator member effective in each direction of its reciprocation to expand said horn, and means for moving said member and the seam bumper in timed relation so that the seam bumper operates once during each expansion of the horn.

10. In a can body forming machine wherein is provided an expansible horn, and means for forming about the horn can bodies each including a side seam disposed longitudinally of the horn, said means including a seam bumper movable for seam bumping purposes each time the horn is expanded; means for effecting and relieving expanded conditions of the horn including an actuator member effective in a single direction of movement for expanding and collapsing said horn, and means for moving said member and the seam bumper in timed relation so that the seam bumper operates once during each expansion of the horn.

11. In a can body forming machine wherein is provided an expansible horn, and means for forming about the horn can bodies each including a side seam disposed longitudinally of the horn, said means including a seam bumper movable for seam bumping purposes each time the horn is expanded; means for effecting and relieving expanded conditions of the horn including a reciprocable cam, means movable under control of said cam and effective during each stroke of movement of the cam for expanding and collapsing said horn, and means for reciprocating said cam and moving the seam bumper in timed relation so that the seam bumper operates once during each expansion of the horn.

12. In a can body forming machine wherein is provided an expansible body forming horn including a tubular supporting stud, a body portion surrounding said stud, a side piece mounted for movement outwardly from and inwardly toward said body portion for alternately expanding and collapsing said horn, said stud and said body portion having registering side apertures therein opening toward said side piece, spring means constantly tending to move the side piece toward the body portion, and thrust transmitting elements mounted in said apertures and engaging said side piece; horn expanding means including an actuator rod reciprocable in said stud, and double acting cam elements carried by the rod and presented for cooperative engagement with the thrust transmitting elements for moving the side piece outwardly and then releasing it to permit the spring means to move inwardly during each stroke of reciprocation of said rod.

13. In a can body forming machine wherein is provided an expansible body forming horn including a tubular supporting stud, a body portion surrounding said stud, a side piece mounted for movement outwardly from and inwardly toward said body portion for alternately expanding and collapsing said horn, said stud and said body portion having registering side apertures therein opening toward said side piece, spring means constantly tending to move the side piece toward the body portion, thrust transmitting elements mounted in said apertures and projecting like distances inwardly into said rod recess and outwardly toward the side piece, and adjustable thrust receiving screws projecting inwardly like distances from said side piece and engaging said elements; horn expanding means including an actuator rod reciprocable in said stud and having

a longitudinal recess therein, and a cam bar mounted in said rod recess and having double acting cam elements projecting like distances therefrom and engaging said thrust transmitting elements and cooperating with said thrust transmitting elements and screws in moving the side piece outwardly and then releasing it to permit the spring means to move it inwardly during each stroke of reciprocation of said rod.

14. In a can body forming machine wherein is provided a power shaft rotated once during each can body forming cycle, a body forming horn including a tubular supporting stud, a body portion surrounding said stud, a side piece mounted for movement outwardly from and inwardly toward said body portion for alternately expanding and collapsing said horn, said stud and said body portion having registering side apertures therein opening toward said side piece, spring means constantly tending to move the side piece toward the body portion, thrust transmitting elements mounted in said apertures and projecting like distances inwardly into said rod recess and outwardly toward the side piece, and adjustable thrust receiving screws projecting inwardly like distances from said side piece and engaging said elements; horn expanding means including an actuator rod reciprocable in said stud and having a longitudinal recess therein, a cam bar mounted in said rod recess and having double acting cam elements projecting like distances therefrom and engaging said thrust transmitting elements and cooperating with said thrust transmitting elements and screws in moving the side piece outwardly and then releasing it to permit the springs to move it inwardly during each stroke of reciprocation of said rod, and means for imparting to the rod one compelte reciprocation for each two rotations of said shaft.

15. In a can body forming machine wherein is provided a power shaft rotated once during each can body forming cycle, a body forming horn including a tubular supporting stud, a body portion surrounding said stud, a side piece mounted for movement outwardly from and inwardly toward said body portion for alternately expanding and collapsing said horn, said stud and said body portion having registering side apertures therein opening toward said side piece, spring means constantly tending to move the side piece toward the body portion, thrust transmitting elements mounted in said apertures and projecting like distances inwardly into said rod recess and outwardly toward the side piece, and adjustable thrust receiving screws projecting inwardly like distances from said side piece and engaging said elements; horn expanding means including an actuator rod reciprocable in said stud and having a longitudinal recess therein, a cam bar mounted in said rod recess and having double acting cam elements projecting like distances therefrom and engaging said thrust transmitting elements and cooperating with said thrust transmitting elements and screws in moving the side piece outwardly and then releasing it to permit it to move inwardly during each stroke of reciprocation of said rod, means for imparting to the rod one complete reciprocation for each two rotations of said shaft, said last named means including a one to two ratio gearing connection and a crank and pitman interposed between said gearing and said rod, and means for adjusting the relation of the pitman with the gearing and of the pitman with the rod.

16. In a can body forming machine wherein is provided an expansible and collapsible horn, and a reciprocable rod for controlling the expanding and collapsing of said horn; means for reciprocating said rod comprising a rotary crank, a pitman for transmitting the rotary motion of the crank in the form of reciprocatory motion to said rod and comprising a housing portion, a bar portion slidable in said housing portion, and latch means normally causing said bar and housing portions to move together and releasable upon imposition of an overload to allow the bar portion to slide back and forth ineffectually in the housing portion.

17. In a can body forming machine wherein is provided an expansible and collapsible horn, and a reciprocable rod for controlling the expanding and collapsing of said horn; means for reciprocating said rod comprising a rotary crank, a pitman for transmitting the rotary motion of the crank in the form of reciprocatory motion to said rod and comprising a housing portion, a bar portion slidable in said housing portion, latch means normally causing said bar and housing portions to move together and releasable upon imposition of an overload to allow the bar portion to slide back and forth ineffectually in the housing portion, yieldable means for holding the latch in its normal position, and adjustment means for adjusting the resistance to latch movement of said yieldable means.

18. In a can body forming machine wherein is provided an expansible and collapsible horn, and a reciprocable rod for controlling the expanding and collapsing of said horn; means for reciprocating said rod comprising a rotary crank, a pitman for transmitting the rotary motion of the crank in the form of reciprocatory motion to said rod and comprising a housing portion, a bar portion slidable in said housing portion, latch means normally causing said bar and housing portions to move together and releasable upon imposition of an overload to allow the bar portion to slide back and forth ineffectually in the housing portion, yieldable means for holding the latch in either its normal or its released position, adjustment means for adjusting the resistance to latch movement of said yieldable means, and latch resetting means operable from without the housing.

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