Feb. 23, 1943. J. W. WILKINSON 2,312,225

MACHINE FOR TREATING THE EDGE OF A CASING

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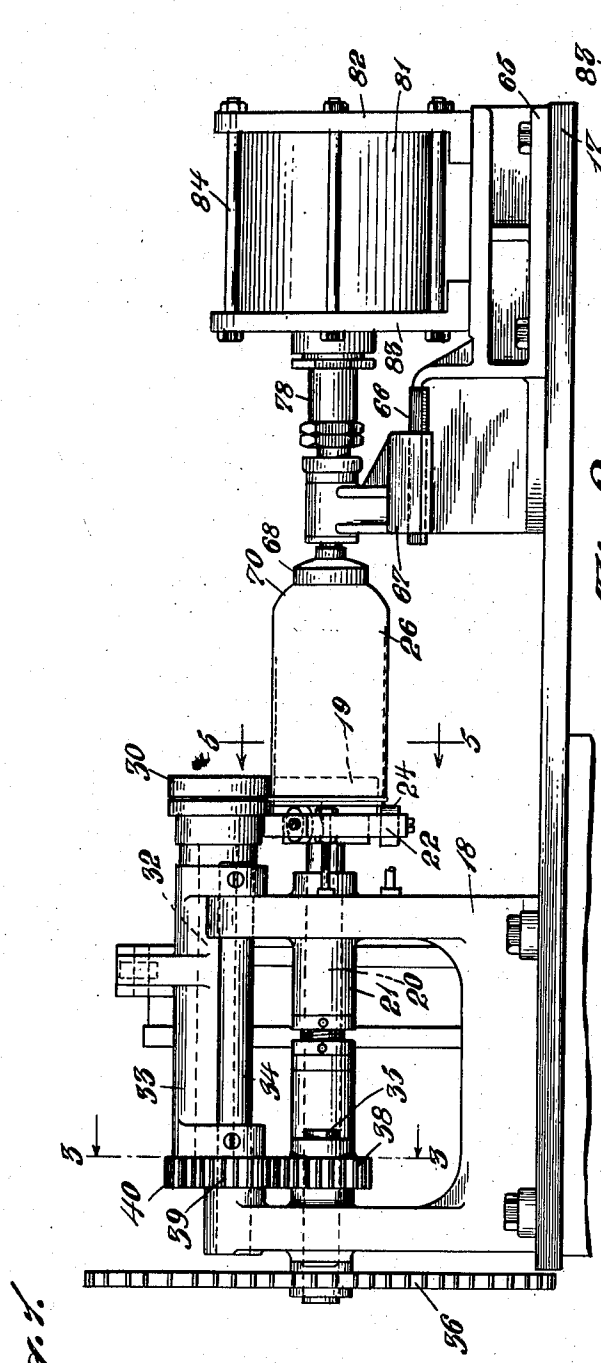


Fig. 1.

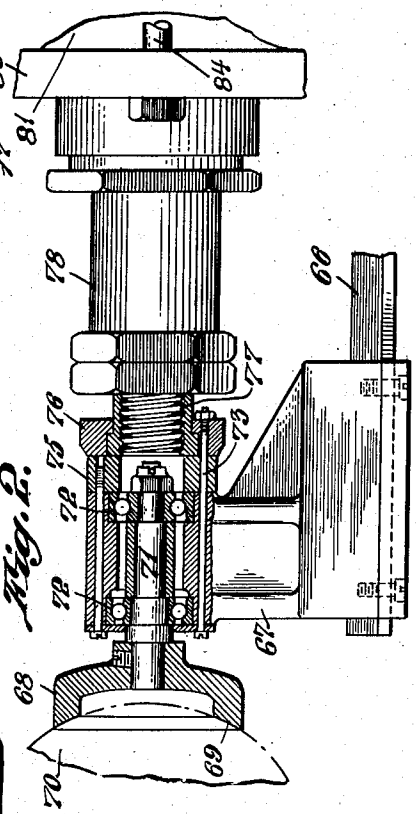


Fig. 2.

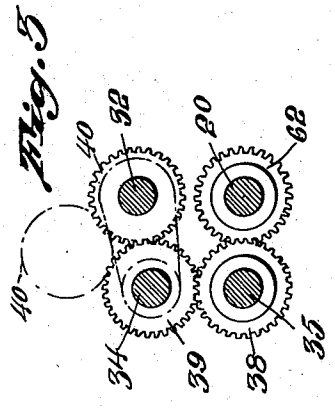


Fig. 3.

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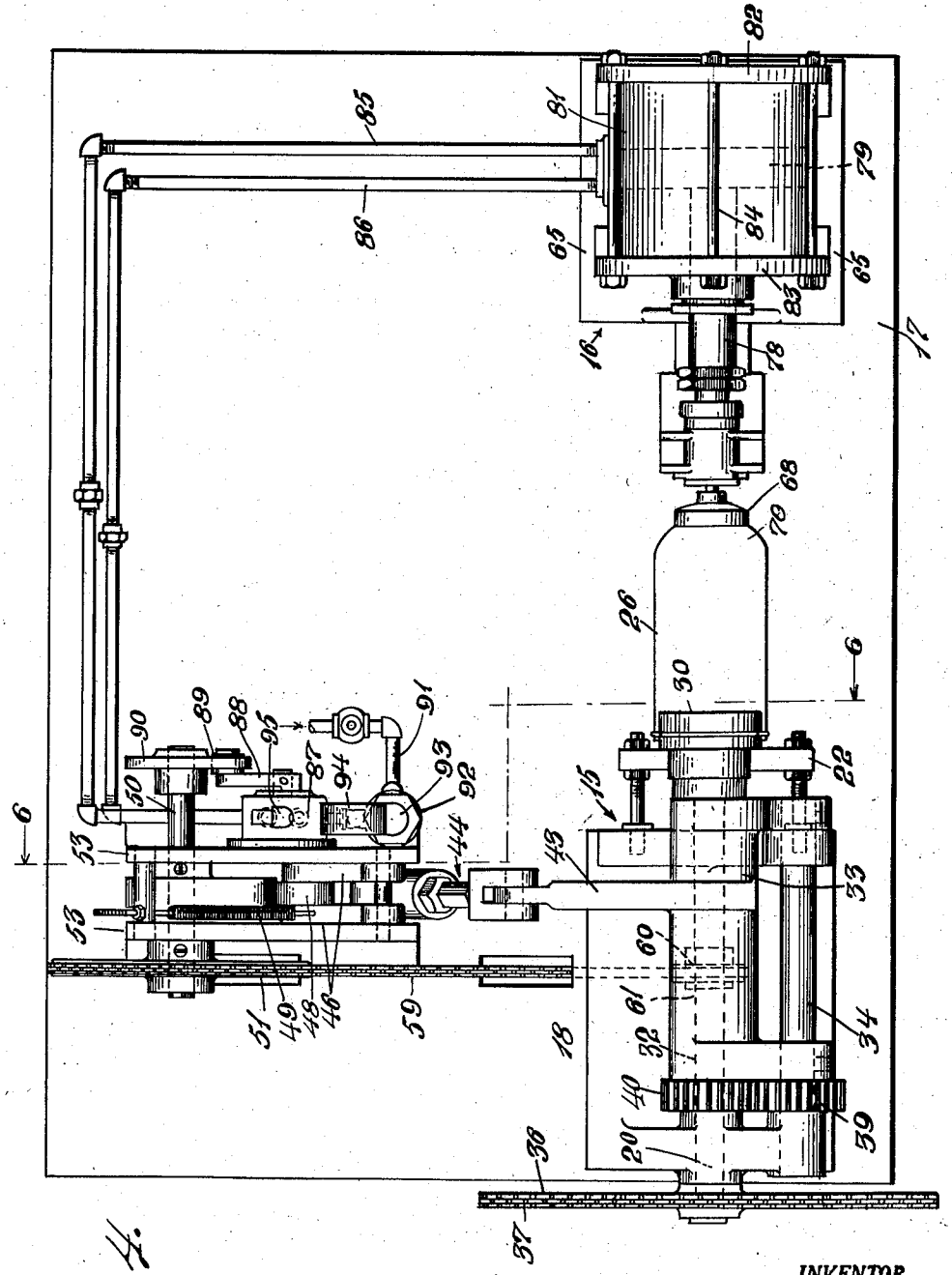


Fig. 1.

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Fig. 5.

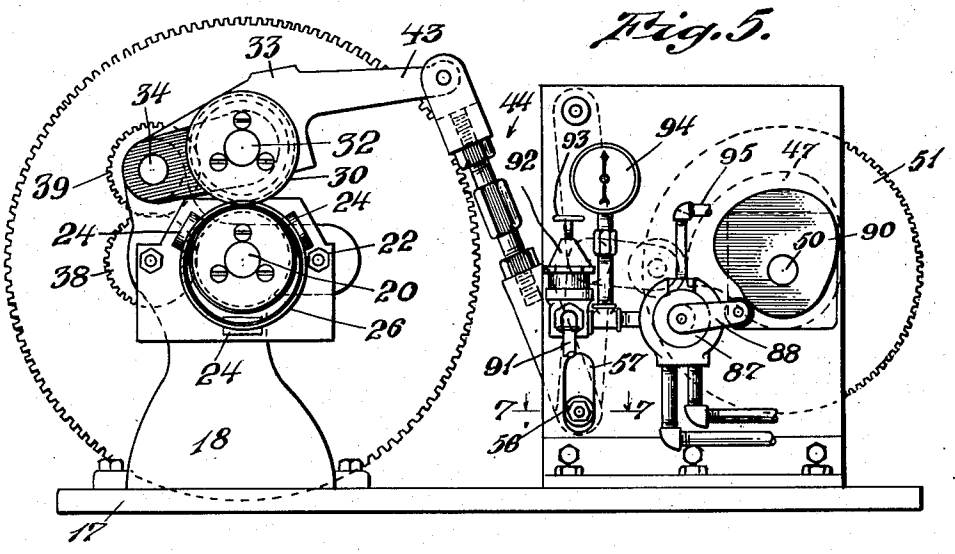


Fig. 6.

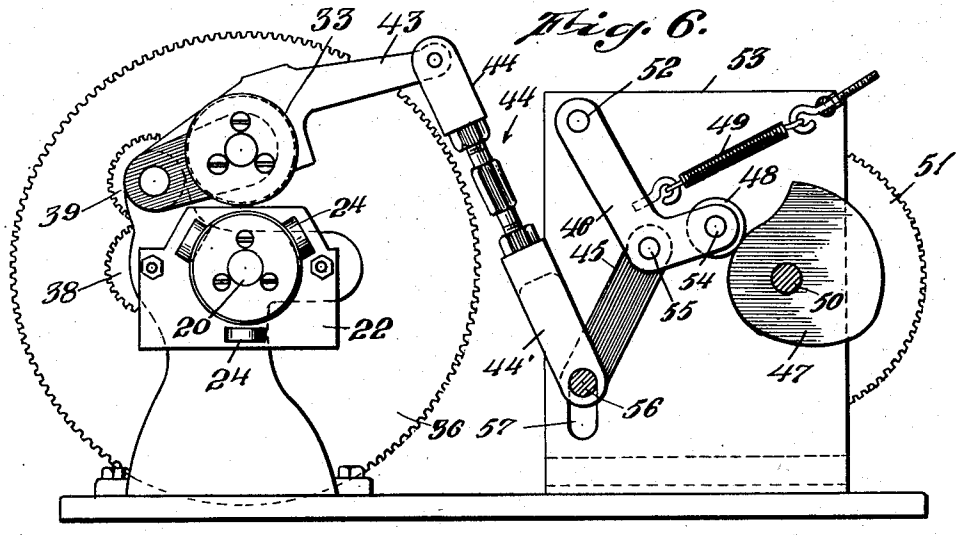
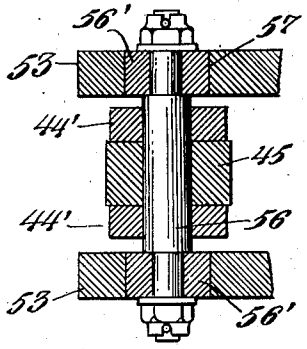


Fig. 7.



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Fig. 8.

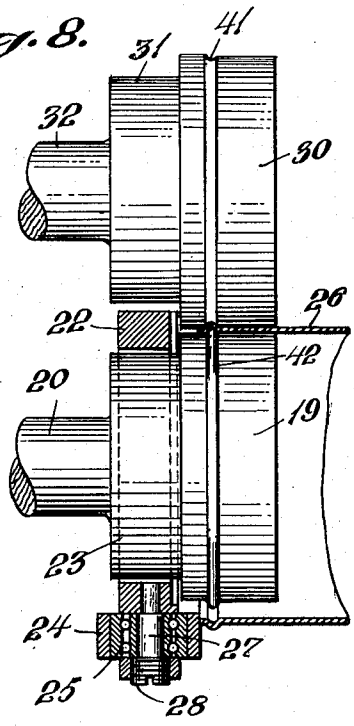


Fig. 9.

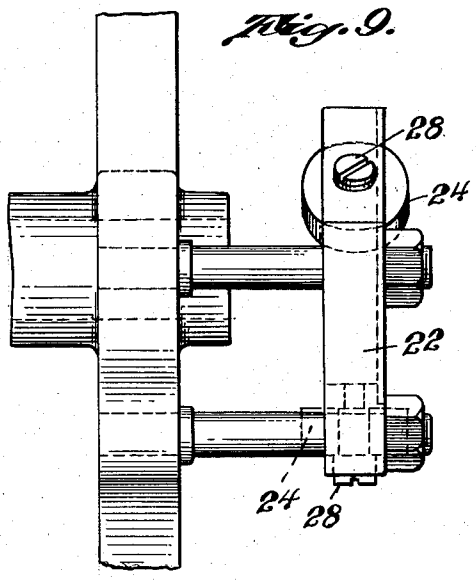


Fig. 12.

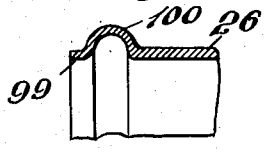


Fig. 10.

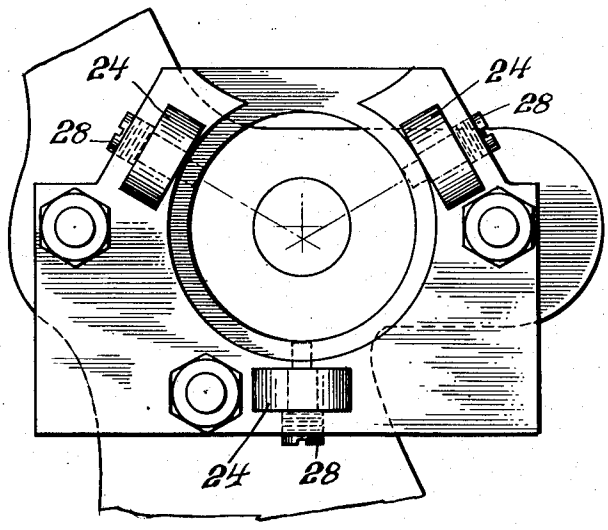
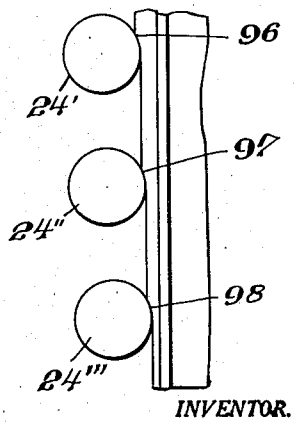


Fig. 11



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Patented Feb. 23, 1943 2,312,225

UNITED STATES PATENT OFFICE

2,312,225

MACHINE FOR TREATING THE EDGES OF CASINGS

James W. Wilkinson, Providence, R. I., assignor to Fram Corporation, a corporation of Rhode Island

Application May 20, 1940, Serial No. 336,164

6 Claims. (Cl. 153—2)

This invention relates to a machine for operating upon the edge portion of a casing to suitably form the edge portion into desired shape.

The invention has for one of its objects to provide for the working upon the edge portion of a casing closer to the edge of the casing for manipulating the stock thereof than any machines with which I am familiar.

Another object of the invention is to provide a finished surface on the edge of the casing without grinding.

Another object of the invention is to deflect the portion of the casing spaced back from but close to the edge and at the same time finish the edge of the casing.

Another object of the invention is to provide for the accommodations of cases of varying lengths without any adjustment required in the apparatus.

Another object of the invention is to hold the casing in the position in which it is to be operated by a flexible means and yet one which has considerable latitude through which its action is applied.

Another object of the invention is to bring sufficient pressure to bear upon the edge of the casing to deflect the edge thereof to a very large extent.

Another object of the invention is to provide for the cycle of operations through which the machine passes automatically.

With these and other objects in view, the invention consists of certain novel features of construction, as will be more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings:

Fig. 1 is a side elevation of the machine;

Fig. 2 is a sectional view through the end supporting and end pressure-applying structure of the machine;

Fig. 3 is a section on line 3—3 of Fig. 1;

Fig. 4 is a top plane view of the machine;

Fig. 5 is a sectional view taken on substantially line 5—5 of Fig. 1;

Fig. 6 is a sectional view taken on line 6—6 of Fig. 4, showing the cam for operating the toggle;

Fig. 7 is a section on line 7—7 of Fig. 5;

Fig. 8 is a fragmental view partly in section illustrating the action of the rolls upon the edge of the work;

Fig. 9 is a side elevation of a fragment of the mechanism which mounts the abutment rolls for facing the edge of the casing;

Fig. 10 is a face view of the rolls for abutting the edge of the casing;

Fig. 11 is a diagrammatic view largely exaggerated, illustrating the action of the three abutting rolls in their various positions as they affect the edge of the casing;

Fig. 12 is a sectional view of a fragmental portion of the casing.

In operation upon a casing where it is desired to deflect the edge of the stock of the casing and there is a change of diameter of the stock, it is known that unless there is a substantial amount of stock to afford a good grip on the free edge of the casing by the rolls which deflect the stock, an axial movement because of such insufficient grip on the stock by the rolls occurs; and further, when such manipulation is attempted, there is a ragged edge provided on the edge of the casing which is gripped. It has heretofore been thought by many that a machine to deflect the stock of the casing closely adjacent the edge thereof in a casing of substantial gauge where a large amount of pressure was required would be impractical. I, however, have provided for the holding of the casing up into the position in which it is to be operated upon by the rolls by a fluid pressure such, for instance, as air, permitting of substantial flexibility and a large range of stroke while maintaining the same pressure; and I have found that I can not only hold the casing in the desired position but also, by providing rotary means for engaging and supporting the edge to permit of its easy rotation while forced into position, may surface the edge of the casing so as to provide a substantially finished edge, thus permitting not only a beading to occur on the casing, but also the finishing of the edge, both operations being in the same machine and at the same time; and the following is a more detailed description of the present embodiment of this invention, illustrating the preferred means by which these advantageous results may be accomplished:

With reference to the drawings, the machine which I provide consists essentially of a roll-actuating head portion designated generally 15 (see Fig. 4) and a tail supporting end pressure-applying portion of the machine designated generally 16 which is actuated in time with the head end of the machine through suitable automatic controls. The machine is assembled upon a suitable table 17 supported above the floor and beneath which certain power-applying means such as an electric motor, gears, sprocket chains or other power-transmitting devices to be employed are suitably supported.

The base of the head end of the machine 18 is provided with a bearer roll 19, see Fig. 8, which is removably secured to and rotatably supported by shaft 20 in suitable bearings 21 in the base 18. A frame 22 surrounds the reduced portion 23 of this roll and shaft 20 and has removably mounted thereon studs 27 secured by threads 28 for rotatably supporting thereon rolls 24 mounted upon ball bearings 25. These rolls 24 are located at a plurality of suitable locations such, for instance, as at 120 degrees apart and the same dis-

tance from the center of rotation of the work so as to engage the edge of the work 26 which would be moved toward their cylindrical surfaces. This center is lower than the center of the smaller support roll 19. The frame 22 in which these rolls are supported is fixed with reference to the base 18.

Cooperating with the bearer 19 there is a former and pressure roll 30 reduced as at 31 to clear the frame 22 and removably secured by suitable screws upon shaft 32 rotatably supported in a rockable frame 33 pivotally mounted about a shaft 34 at the head end of the machine. This frame 33 with its former roll 30 may be rocked toward and from the bearer roll 19.

Drive is applied to shaft 20 (see Fig. 3) by means of gear 36 mounted upon one end thereof which is a sprocket gear and which is driven by sprocket chain 37 from some suitable source of power such, for instance, as from beneath the table or bed plate 17. Gear 62 on shaft 20 drives gear 38 upon shaft 35 which in return drives gear 39 upon shaft 34 which in turn drives gear 40 upon shaft 32 for the rotation of the former roll.

The former roll 30 is provided with a groove 41 and the bearer roll 19 is provided with a rib 42 which cooperate to provide for the deflection of the stock from the inside of the casing 26 outwardly when pressure is applied. The frame 33 is swung to apply pressure on the roll 30 by reason of its arm 43 to which link 44 is connected to be operated by the toggle lever 45, 46 moved through a cam 47 engaged by the cam follower 48 which is urged toward the cam by the action of the spring 49 tending to move the cam follower into engagement with the cam. This cam is mounted upon shaft 50 which shaft is rotated by gear 51 and sprocket chain 59 (see Fig. 4) from sprocket gear 60 driven from shaft 61 rotatably mounted beneath the table. The link 44 is adjustable as to length in any known manner and is connected by a bifurcated stirrup 44' to the toggle lever. The toggle portion 46 comprises spaced levers pivoted as at 54 between the pair of standards 53 and are L-shaped to mount the cam follower roll 48 upon pivot 54 extending between them while at the elbow the link member 45 is pivoted on a pin 55 also extending between these levers and is connected to the adjustable link stirrup 44' between the fork parts thereof by a pin 56 which has rolls 56' slidable in slots 57 of the pair of standards 53.

Shaft 50 also has upon it another cam for controlling the pressure applied by the free rotating tail center 16 which I will proceed to describe. The tail center 16 has a base 65 having a guideway 66 upon which the carriage 67 is slidably mounted. A holder consisting of a cup-shaped device 68 shaped as at 69 to receive the rounded end 70 of the work 26, is secured upon shaft 71 which is rotatably mounted in ball bearings 72 for permitting the free rotation of shaft 71. Tie rods 73 extend through the carriage and bind a plate 73, washer 75 and collar 76 in position on the threaded stud 77. This free rotating tail stock is forced forwardly through plunger 78 and double acting piston 79 in the drum 81 having heads 82 and 83 bound in place by tie rods 84 for forcing the work 26 against the rolls 24.

The piston 79 in the drum 81 is controlled by air pressure conduits 85 and 86 connected to a valve 87 having an arm 88 with a cam follower 89 thereon to engage the cam 90 secured on shaft 50 for actuation of the same. Air pressure is supplied to the valve 87 from some suitable source through conduit 91 and reducing valve 92 regulated by handle 93, the pressure of which may be indicated by dial 94. The exhaust of the air may be through conduit 95 leading from the valve 87.

A tangent to all of the rolls 24 at right angles to the axis of the work and at their engaging edges is not in the same plane; rather, the tangent of one of the rollers designated 24' in Fig. 11 is in a plane to force the edge inwardly as exaggeratedly shown therein as at 96. The tangent of the next roll 24'' is in a plane which would force the edge inwardly slightly further as at 97 whereas the tangent of the third roll is in a plane which would force the edge inwardly still further as at 98 to the finish position. These rolls progressively move the stock to the desired position rather than attempting to do so all at one time. Further, the rolls 19 and 31 will cause the stock at the edge 99 spaced inwardly from the bead 100 to be of a lesser internal and external diameter than the main portion of the casing 26 (see, for instance, Fig. 8 or Fig. 12).

In operation the attendant will position the casing 26 so that its edge will abut the rolls 24 and as the machine is running the cam 90 will first cause air pressure to be supplied to the free rotating tail center to force the work firmly against the rolls 24 next in sequence of operations. The cam 47 will through toggle lever formed of links 46 and 45 and through adjustable link 44 move the frame 33 downwardly to cause the roll 30 to engage the edge of the work forcing it against the bearer roll 19. Through this firm grip on the work the work will commence to rotate and at the same time the bead will be formed on the edge of the work while by reason of the air forcing in the edge of the work against the rolls 24, the edge of the work will be deflected and smoothed out and finished in substantially a single plane and to the breadth desired dependent upon the degree to which it is forced. I will usually not deform the edge to an extent sufficient to increase its thickness but I may do so if desired. The edge, however, is brought inwardly to a slightly lesser diameter by shape of rolls 19 and 30 which assists in centering this edge in its position against the gasket of the cover as is more fully explained in my copending application, Serial No. 285,476, filed July 20, 1939.

The toggle action is at first rather gentle by reason of the toggles being at an angle but as the rolling of the stock progresses, the toggle is brought to apply greater pressure upon the work being forced inwardly positively to a greater extent by the cam 47 so as to increase the pressure greatly upon the edge of the work operated upon. After a predetermined number of revolutions of the work which is free to rotate by reason of the tail center in this ball bearing through which pressure is also applied, the toggle levers are retracted; the pressure in the tail stock drum reversed so that the operator may remove the casing fom the machine and place another one in position to be operated upon during the interval that the roll 30 is raised that the cycle of operations may be repeated.

I claim:

1. A machine of the class described for operating upon the edge of a hollow, cylindrical casing, comprising rotary means for supporting and urging the casing axially in one direction, a plurality of freely rotatable rolls, means sup-

porting said rolls arranged to present them to bear against the end of the casing in the direction of its length as it is forced axially against the operating surfaces of said rolls and in a manner so that the rolls will independently and successively operate upon each part of said end to progressively deform the stock of the casing edge inwardly and longitudinally of the casing to cause said edge surface to be deflected, smoothed-out and finished in substantially a single plane, and means including a positively driven roll to rotate said casing operative simultaneously during deformation of said end edge thereof and adapted to provide a bead on the outer surface of the casing closely adjacent said end edge.

2. In a machine of the character described for operating upon the edge of a casing, a pair of positively-driven, bead-forming rolls, one to engage the outer and the other the inner cylindrical surfaces adjacent the marginal edge of a casing, said rolls being provided with a complementary groove in one and a rib on the other to roll a bead on the casing adjacent the end edge thereof, when the rolls are brought into cooperating relationship and in operative engagement with the inner and outer surfaces of the casing, a plurality of rolls arranged to bear against the end edge of the casing in a manner so that the rolls will successively operate upon each part of said end to deflect, smooth-out and finish the end surface in substantially a single plane, means for urging the casing in an axial direction and forcing it against said end-finishing rolls, toggle levers to move one of said rolls toward and from coacting relationship with the other, and a cam for actuating said toggle levers to effect firm gripping engagement of said bead-forming rolls with the edge portion of the casing to rotate the casing and form a bead thereon close to the end of the casing simultaneously with the deflection and finishing of the end edge of the casing by said end-finishing rolls.

3. In a machine of the class described, a pair of positively-driven rolls one to engage the outer and the other the inner marginal edge of the side wall of a casing, one of said rolls being provided with a circumferential groove and the other with a circumferential rib to roll a bead on the casing adjacent the end edge thereof at a distance not greater than the thickness of the stock of the casing when the rolls are brought into coacting relation and in engagement with the casing side wall at opposite portions thereof, pivoted means rotatably mounting one of said rolls for swinging movement toward and from the other roll, fluid-actuated means for flexibly urging the casing axially in one direction, a stationary support, and a plurality of rolls loosely rotatable upon said support and equally spaced from each other and the axis of rotation of the casing, said last-named rolls having their respective cylindrical operating surfaces disposed in different planes parallel to each other and at right angles to the axis of rotation of the casing, and being arranged to bear against the end of the casing in the direction of its length in a manner so that the rolls will independently and successively operate upon each part of said end edge of the casing to progressively deform any metal projections at the casing edge incident to endwise flow of the metal of the casing during formation of the bead to cause said edge surface to be deflected, smoothed-out and finished in substantially a single plane.

4. In a machine for operating upon an end portion of a hollow cylindrical casing, the combination of a pair of positively-driven bead-forming rolls to be moved into and out of coacting relationship to form a circumferential bead at the marginal edge portion of a casing close to one end thereof when the casing is positioned between said rolls, one of said rolls being provided with a circumferential rib and the other roll having a groove for cooperating with the rib of said first roll, a pivoted carrier mounting one of said bead-forming rolls for swinging movement toward and from the other roll, a plurality of rolls arranged to bear against the end edge of the casing to operate in succession on each portion of said edge to deflect, smooth-out and finish the end surface in substantially a single plane as the casing is rotated and forced in an axial direction against said end-finishing rolls, fluid-actuated means for rotatably supporting and urging the casing in a longitudinal direction toward said end-finishing rolls, toggle linkage for moving said pivoted carrier and its associated bead-forming roll into and out of operating position relative to the other bead-forming roll, a cam for actuating said toggle linkage to effect firm gripping engagement of said bead-forming rolls with the wall of the casing close to an end thereof to rotate the casing and form a bead thereon, and a second cam operable in timed relation with said first cam for actuating said fluid pressure support means for the casing to force the casing in a longitudinal direction firmly against the end-finishing rolls as the bead is being formed in the casing and simultaneously finish said end edge.

5. A machine of the class described for operating upon the edge of a hollow cylindrical casing comprising means for supporting and urging the casing axially in one direction, a plurality of freely rotatable rolls, support means for said rolls arranged to present them to bear against the end of the casing in the direction of its length as it is forced axially against the operating surfaces of said rolls and in a manner so that the rolls will independently and successively operate upon each part of said end to progressively deform the stock of the casing edge to cause said edge surface to be deflected, smoothed-out and finished in substantially a single plane, and a pair of positively driven bead-forming rolls to rotate said casing during deformation of said end edge and adapted to press the metal of the wall of the casing radially outwardly to provide a bead on the outer surface of the casing closely adjacent said end edge.

6. In a machine of the character described for operating upon an edge surface of a hollow, cylindrical casing, means for supporting said casing, means for rotating the casing, means for urging the casing axially in one direction, a plurality of spaced rolls, means to mount each roll to rotate about an axis extending generally perpendicular to the axis of rotation of said casing, so as to present their circumferential surfaces to said edge surface, and said means presenting the tangent of each roll, at the point of contact of each of said rolls with said edge in a plane advanced a selected distance from that of the previous roll to successively step by step engage said edge, so as to operate thereon to progressively deform the casing edge to cause said edge surface to be deflected, smoothed-out and finished in substantially a single plane.

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