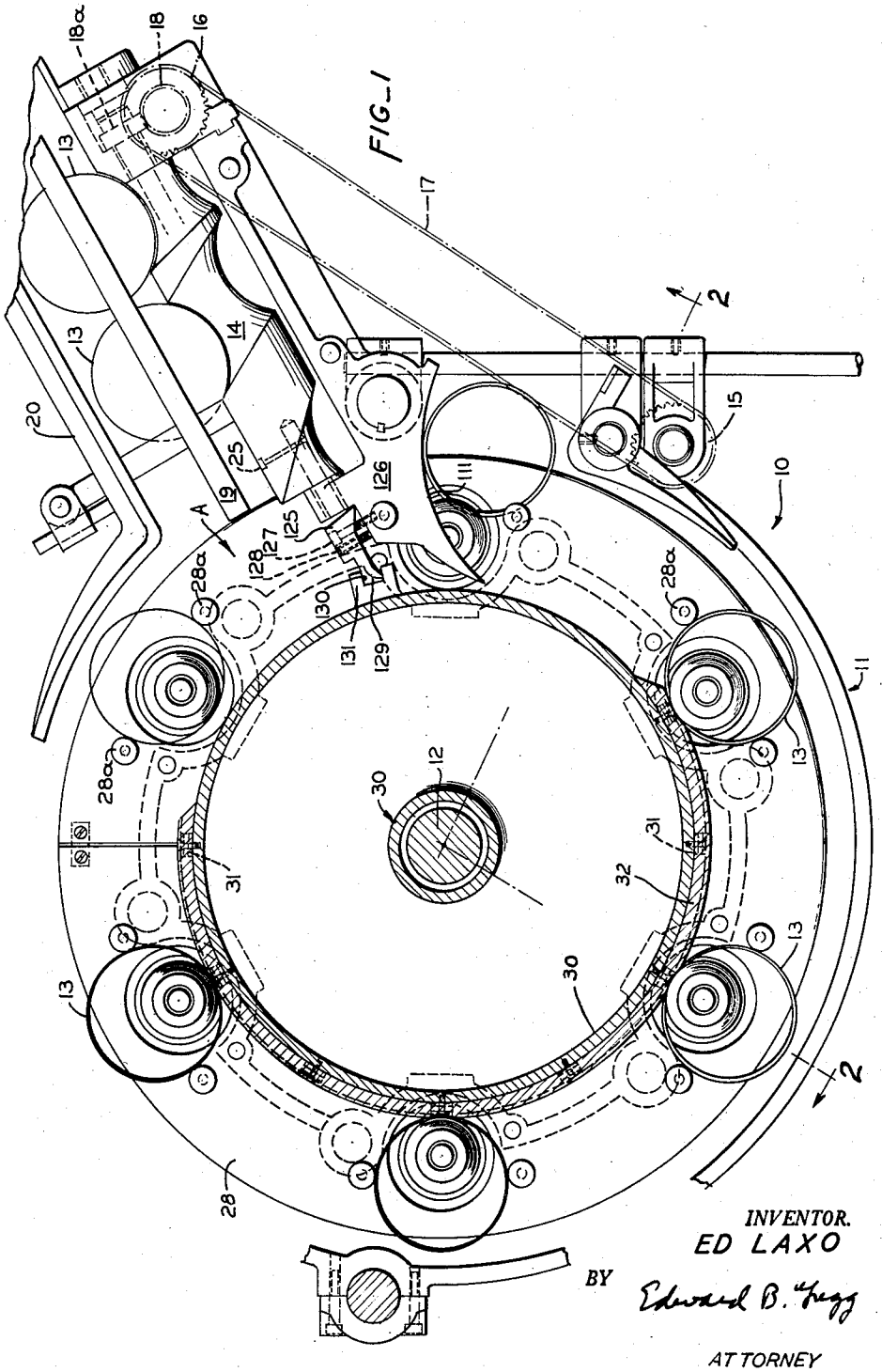
March 15, 1960 E. LAXO 2,928,454

ROTARY BEADING MACHINE FOR FORMING CIRCUMFERENTIAL BEADS IN CAN BODIES

Filed March 8, 1956 3 Sheets-Sheet 1

FIG_1



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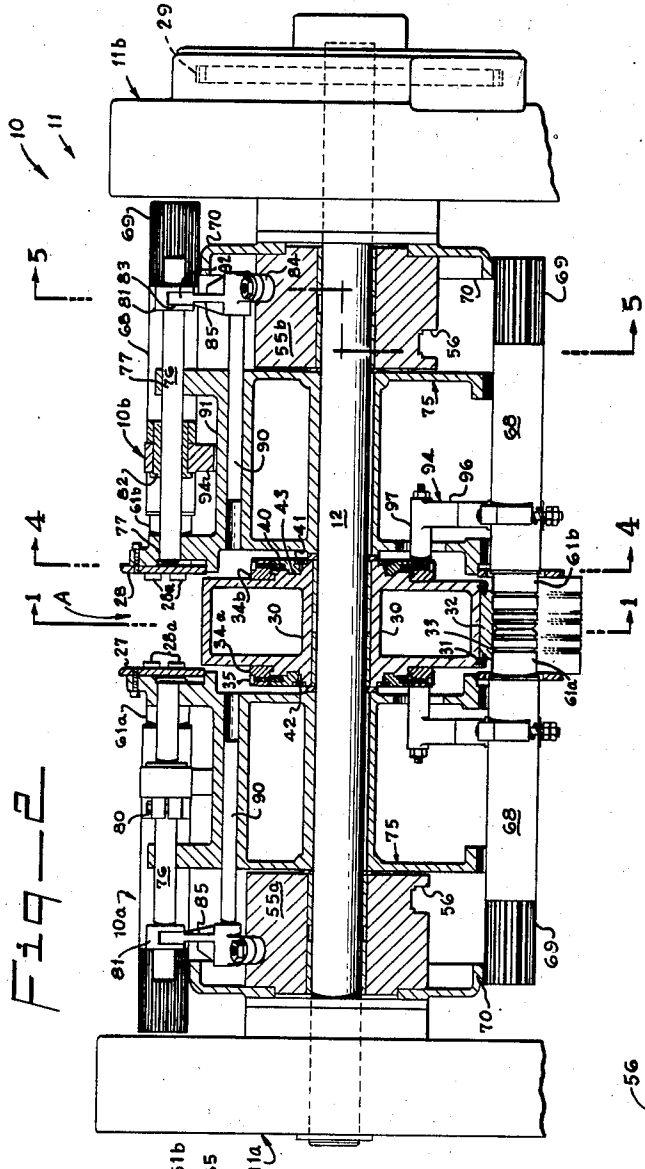
BY Edward B. Legg

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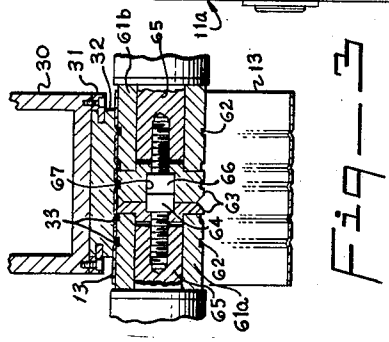
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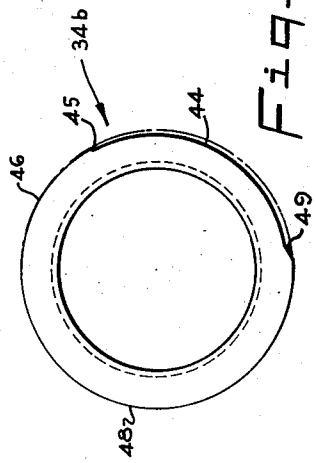
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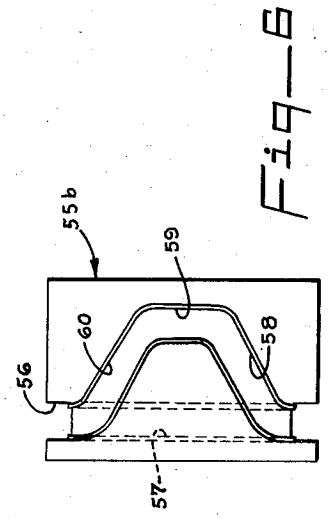
Fig—2



Fig—3



Fig—7



Fig—8

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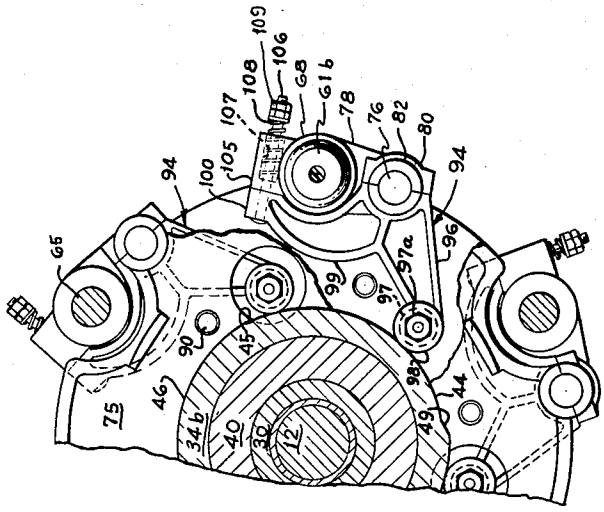
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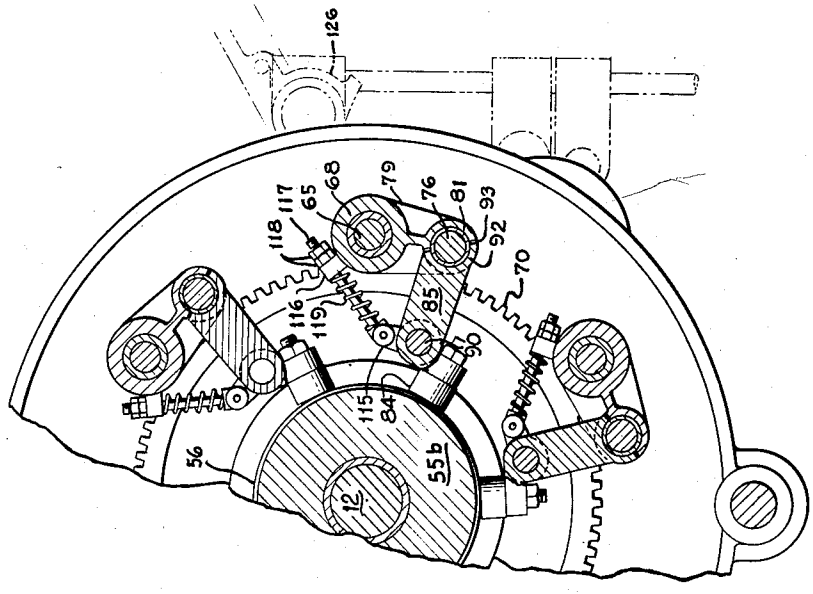
ROTARY BEADING MACHINE FOR FORMING CIRCUMFERENTIAL BEADS IN CAN BODIES

Filed March 8, 1956 3 Sheets-Sheet 3

Fig—4



Fig—5



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2,928,454

ROTARY BEADING MACHINE FOR FORMING CIRCUMFERENTIAL BEADS IN CAN BODIES

Ed Laxo, Oakland, Calif.

Application March 8, 1956, Serial No. 570,298

3 Claims. (Cl. 153—73)

This invention relates to a beading machine for beading and/or flanging can bodies. The machine is also adapted for use in forming end flanges on can bodies, but will be referred to herein as a "beader."

Can bodies are frequently beaded, i.e., they are formed with one or more peripheral grooves to strengthen the metal. By this means it is possible to use a thinner gauge metal in forming can bodies. Beading is especially important as a means of reinforcing large cans.

A can beader should be capable of operating at high speeds and it should form the beads accurately and dependably. It should adjust itself automatically for extra metal thickness as at can body side seams, so as to form the beads accurately and properly without exerting excessive pressure and causing rupture of the metal.

In my prior Patent No. 2,686,551, entitled "Beading and Flanging Machine," granted April 17, 1954, a beader is described which, among other things, is capable of automatic adjustment of the beading rolls in response to metal thickness to maintain adequate beading pressure and to avoid excessive pressure.

It is an object of the present invention to provide a beading machine having a more positive and dependable operation and control of the beading rolls with regard to beading pressure.

It is another object of the invention to provide a machine of the character and for the purpose described which is capable of operating at high speed, which forms beads and/or flanges dependably, which exerts the proper amount of pressure, at points of extra metal thickness such as can body side seams, and which has a more positive and dependable means of accomplishing such pressure control than prior machines.

These and other objects of the invention will be apparent from the ensuing description and the appended claims.

One form of the invention is illustrated by way of example in the following drawings in which,

Figure 1 is a vertical transverse section taken along the line 1—1 of Figure 2.

Figure 2 is a vertical longitudinal midsection through the machine taken along the line 2—2 of Figure 1.

Figure 3 is a sectional view taken through one of the beading heads showing a pair of beading rolls inside a can body and in the act of forming beads on a can body.

Figure 4 is a fragmentary, cross sectional view taken along the line 4—4 of Figure 2, showing the means employed to bring the beading rolls into contact with can bodies.

Figure 5 is a fragmentary sectional view taken along the line 5—5 of Figure 2, showing certain other features of the beading roll operating mechanism.

Figure 6 is a view in elevation of one of the two cams employed to shift the beading rolls into and out of can bodies.

Figure 7 is a diagrammatic view of one of the two beading cams employed to swing the beading rolls into and out of engagement with can bodies.

In accordance with the present invention a beader is provided which is preferably, although not necessarily of the rotary, turret type; which has a stationary beading member; and which also has at least one, preferably a plurality of movable beading members which move along the stationary member with a rolling motion, apply pressure to can bodies clamped between the two beading members, and cooperate with the stationary member to form beads and/or end flanges on the bodies. The movable beading members are preferably arranged in pairs which are axially aligned and movable into and out of can bodies, and they are resiliently urged toward the stationary beading member. To effect a precise control thereof, each movable beading member has a lever which opposes the resilient means, and which is cam operated to determine the position of the respective movable beading member, yet permits oscillatory movement of such beading member, i.e., permits yielding in response to metal thickness.

Referring now to Figure 1, a can beader is there shown which is generally designated by the reference numeral 10 and which includes a frame 11 within which is journaled a main shaft 12, as is best shown in Figure 2. Can bodies 13 (see Figure 1) are supplied by an indexing and feed screw 14 which is driven, in timed relation to the shaft 12, by means including sprockets 15 and 16, a chain 17 and helical gears 18 and 18*a*. The can body feed assembly also includes can guide rails, one of which is shown at 19, such rail being adjustable for cans of different height, and an adjustable side rail 20 which can be moved closer to or further from the feed screw according to the diameter of can bodies. By removing set screws such as shown at 25 the feed screw can be removed and a feed screw of different pitch can be substituted for can bodies of different diameter. Can bodies are guided by plates 27 and 28 to the entrance station A, as best shown in Figure 2, and are held between rollers 28*a* best shown in Figure 1.

As shown in Figure 2 the beader 10 has identical left and right hand halves 10*a* and 10*b*, respectively, the shaft 12 and certain other parts being common to both halves. The shaft 12 is driven by a gear 29 which is shown at the right of Figure 2 and it is journaled in end members 11*a* shown at the left of Figure 2 and 11*b* shown at the right of Figure 2.

Mounted on the center of the shaft 12 is a drum 30, the shaft 12 being rotatable in the drum 30, the latter being a fixed element of the machine. Clamped to the periphery of the drum 30 by gibs 31 is a cylindrical beading ring 32 having projecting ribs or beads 33. The drum 30 and beading ring 32 are shown in Figure 2 and, on a larger scale, in Figure 3. The beading ring 32 does not extend all the way around the drum 30. The ribs 33 are the elements which, in cooperation with the beading rolls, form beads in the can body. It will be apparent that the beading ring 32 can be easily removed and replaced by another beading ring having a different number, size and/or shape of beads. To facilitate removal and replacement, the beading ring is made in sections.

The drum 30 also supports left and right-hand beading cams 34*a* and 34*b*, respectively, each of which is made in sections for easy removal and replacement and each of which is clamped to the drum 30 by means of cap screws 35, a ring 40 keyed to the drum, a ring 41 and the cap screws 42. The ring 40 has a relatively loose fit so that, when the cap screws 35 are loosened, the cams 34*a* and 34*b* can be rotated relatively to the drum 30 for timing adjustment. When the cap screws 35 are tightened tongues 43 will hold the cams securely in adjusted position.

Referring now to Figure 7, which is a diagrammatic view of the beading cam 34*b* it will be seen that the contour of this cam is as follows: (The contour of the other beading cam 34*a* is identical.) There is a low dwell 44 which spans the entrance point A where can bodies enter the beader; there is relatively short and sharp rise at 45, followed by a longer and more gradual rise at 46; then there is a high dwell at 48; and at 49 there is a decline from the high dwell 48 to the low dwell 44. It is the purpose of the beading cams 34*a* and 34*b*, acting through a mechanism described hereinafter, to control the beading rolls positively and with precision. Such beads are shown in the process of formation in Figures 2 and 3. The relative lengths of the dwell and rise portions of the beading cams 34*a* and 34*b* may vary, but are preferably about as shown in Figure 7. The rise portion 46 should be long enough to apply a gradually increasing pressure and the high dwell 48 should be long enough to form the beads.

Referring now to Figure 2, shifting cams 55*a* and 55*b* are mounted on opposite ends of the shaft 12, at the left-hand and right-hand ends thereof, respectively. Each lifter cam is fixed to the frame of the machine so as not to rotate and the shaft 12 is journaled in the cams 55*a* and 55*b* so as to be free to rotate therein. One of these cams (cam 55*b*) is shown in Figure 6. A cam track or groove 56 is formed in each of the cams 55*a* and 55*b*, the contour of which is best shown in Figure 6. It will be seen that each cam track 56 has a first dwell 57, a connecting portion 58, a second dwell 59 and another connecting portion 60. It is the purpose of the cams 55*a* and 55*b* to shift left and right-hand beading rolls 61*a* and 61*b*, respectively, through means which will now be described. There are six pairs of beading rolls 61*a* and 61*b*, as will be seen from an inspection of Figure 1, although a greater or lesser number may be employed, and the members of each pair are in axial alignment and are parallel to the shaft 12 and beading ring 32 and are arranged uniformly about the shaft 12.

As best shown in Figure 3, the left-hand beading roll 61*a* has circumferential grooves 62 formed therein, and it is clamped by means of a cap 63 and a projecting cap screw 64 to a spindle 65. The right-hand beading roll 61*b* is also formed with circumferential grooves 62, and it has a head portion or extension 63. The extension 63 is clamped to the respective spindle 65 by a recessed cap screw 66. It is intended that, when a pair of beading rolls 61*a* and 61*b* are located at the "in" position illustrated in Figure 3, the projecting head of the cap screw 64 of the beading roll 61*a* will be seated in the socket 67 formed in the beading roll 61*b*. As shown in Figure 2, the circumferential grooves 62 register with the beading ribs 33 on the beading ring 32.

Each beading spindle 65 is journaled in a spindle sleeve 68 (see Figure 2), which has a purpose described hereinafter. At their outer ends the spindles 65 are fixed to gears or pinions 69 which mesh with and are driven by large stationary gears 70. It will be apparent that, as the beading spindles 65 revolve about the axis of the main shaft 12, the spindles will spin about their individual axes by reason of the meshing relationship between the pinions 69 and the gears 70. It will also be apparent that the pinions 69 are sufficiently long to allow horizontal shifting of the spindles 65, while maintaining the meshing relationship between the pinions 69 and the gears 70.

Each of the beading rolls 61*a* and 61*b* is supported for several types of movement; i.e., for shifting movement to enter and retract from can bodies located between the plates 27 and 28 (see Figure 2); for spinning motion about its individual axis; and for pivotal, oscillatory movement to and from the beading ring 32. The spinning motion arises from the fact that each spindle is journaled in its sleeve 68 and is driven by its pinion 69 and gear 70. The means whereby the beading rolls are supported and operated for shifting and pivotal movements will now be described.

A carrier or spider 75 is provided for each half of the machine which is keyed to and rotates with the main shaft 12. A pivot shaft 76 is provided for each beading roll 61*a* and 61*b*, and said shaft, as best shown in Figure 2, is clamped at 77 to the respective carrier 75. Each pivot shaft 76 therefore rotates with the main shaft 12, but it does not rotate relatively thereto, nor to its carrier 75, nor does it shift axially. Each spindle sleeve 68 is rotatably and slidably supported on its pivot shaft 76 as follows: Referring to Figures 4 and 5, arms 78 and 79, which are integral with the sleeve 68, terminate in sleeves 80 and 81, respectively. The sleeve 80 is split and its parts are clamped together and to a collar or bushing 82 (see Figure 2), which is rotatable and slidable on the pivot shaft 76. The other sleeve 81 is constructed in one piece; it is slidable and rotatable on the pivot shaft 76; and it is milled out circumferentially to form a slot 83 (see Figure 2) for a purpose hereinafter described.

It will, therefore, be apparent that each spindle sleeve 68 and its spindle 65 and beading roll 61*a* or 61*b* are able to shift horizontally or parallel to the pivot shaft 76 and to pivot about the axis of such pivot shaft.

The aforesaid shifting movement is accomplished as follows: A cam follower roller 84 is provided for each spindle 65 which rolls in its respective cam groove 56 (see Figure 2) and which is mounted on one end of an angular forked member 85. At its mid portion the forked member 85 is clamped to a shaft 90 which slides in a sleeve 91 formed in the carrier 75. The other end of the forked member 85 is bifurcated at 92 and, as shown in Figures 2 and 5, it fits within the circumferential slot 83 milled out of the sleeve 81. As best shown in Figure 5, there is a small clearance space 93 between the fork 92 and the sleeve 81. It will be apparent that, as each cam follower roller 84 moves in its cam groove 56, its shifting motion will be transmitted to the respective spindle sleeve 68 and beading roll 61*a* or 61*b*. Meanwhile, the respective shaft 90 will slide in its sleeve 91 and will maintain the roller 84 in its cam groove 56.

Referring to Fig. 4, the aforesaid pivoting movement of each beading roll 61*a* or 61*b*, i.e., its pivotal, oscillatory movement about the axis of its pivot shaft 76, is accomplished as follows: A lever 94 is provided which is rotatably mounted on the pivot shaft 76. The lever 94 has an arm 96 on one end of which is a hub 97 which rotatably carries a cam follower roller 98 intended to roll on one of the cams 34*a* and 34*b*. As will be seen, a cap screw 97*a* secures each cam follower roller 98 to its hub 97 and the mounting of the roller 98 is eccentric. Therefore, by loosening the cap screw, rotating the eccentric mounting and then tightening the cap screw, the normal position of the lever 94 is adjusted. The other arm 99 of the lever 94 has an end portion 100 which abuts a lug 105 integral with and projecting from the respective spindle sleeve 68. A screw 106 extends slidably through the end portion 100 and the lug 105 and the latter is formed with a socket 107 which receives a coiled spring 108 which is compressed by nuts 109, one of which serves as a lock nut.

As the main shaft 12 rotates, each cam follower roller 98 rolls on its cam 34*a* or 34*b* and it oscillates in accordance with the contour of such cam. By this means, the respective beading roll 61*a* and 61*b* is held clear of the beading ring 32 at the entry portion of the machine (point A in Figure 1). The rise 46 moves the beading roll toward the beading ring and the high dwell 48 holds the beading roll in operative relation to the beading ring while the can body spins. Beads are thereby formed. The beading pressure is relieved when the rollers 98 roll onto the low dwell 44. The cams 55*a* and 55*b* retract the beading rolls 61*a* and 61*b* to release the beaded

can, while is then guided out of the machine by a blade **111** (see Figure 1).

When an extra metal thickness is encountered, as at a side seam, the extra metal will act against the beading roll and the expansive force of the spring **108**. By reason of the clearance space **93** above mentioned (see Figure 5), the beading roll **61***a* or **61***b* and its spindle are permitted to pivot outwardly to relieve the excess pressure. Nevertheless, the spring **108** maintains adequate beading pressure, it restores the beading roll to its normal position instantly when the region of extra metal thickness has been passed; and the separation of the beading roll from its normal position occurs only at the precise point and to the precise degree needed.

It will be apparent that when a pair of beading rolls **61***a* and **61***b* are in their retracted position, i.e., while their rollers **84** (see Figure 2) are in the dwells **59** (see Figure 6), the corresponding cam follower rollers **98** are off the beading cams **34***a* and **34***b*. However, their freedom to swing is restricted by the following construction, which prevents clashing of the rollers **98** and cams **34***a* and **34***b* when the beading rolls move in again. Referring to Figure 5, lugs **115** and **116** are formed on each forked member **85** and its spindle sleeve **68**, respectively. A rod **117** is pivotally connected at one end to the lug **115** and at its threaded other end it extends slidably through lug **116**. Nuts **118** are threaded to the rod **117** and serve to compress a coil spring **119** between the two lugs. It will be apparent that, by appropriate adjustment of the nuts **118**, the roller **98** is prevented from clashing with its cam **34***a* or **34***b* when the respective beading roll moves in.

Referring now to Figure 1, the drum **30** which carries both of the beading cams **34***a* and **34***b* and the beading ring **32** is held stationary and is adjustable by the means now to be described: A block **125** is clamped to a casting **126**, which forms a stationary part of the machine by a screw **127**. A set screw **128** is threaded through the block **125** and bears against the casting **126**. The block **125** is pivoted on the casting **126** and it has a rounded knob **129** seated in a notch **130** formed in a lug **131** projecting from the drum **30**. By loosening the screw **127** and turning the set screw **128** one way or the other, the block **125** is rocked and moves the drum **30** one way or the other. When suitably adjusted the drum is clamped in position by tightening the screw **127**.

It will, therefore, be apparent that a beading machine is provided which is capable of accomplishing the beading of can bodies at high speed, dependably and effectively. The machine, among other things, is relatively simple from the standpoint of assembly, disassembly, inspection, repair and timing. It is provided with a yieldable feature whereby proper and adequate beading pressure is exerted at all times during the beading part of the cycle of operation regardless of metal thickness interposed between the stationary and moving beading elements. The position of the moving beading element, hence the beading pressure, is under positive control at all times during the beading operation, yet it does not interfere with automatic yielding of the moving element in response to varying metal thickness.

I claim:

1. A rotary can beader comprising a stationary, arcuate beading ring concentric to a main axis, a carrier rotatable about said main axis, a pair of beading rolls cooperable with said ring to bead a can body as the latter is clamped between the ring and the rolls and the rolls move along the ring with a rolling movement; said machine also comprising a pivot shaft for each beading roll carried by said carrier outwardly of said beading ring, said shafts being axially aligned and parallel to said main axis; means mounting said rolls on their respective pivot shafts to rotate therewith about said main axis, to shift on the pivot shafts and to pivot on said shafts inwardly to and ouwardly from said beading ring; lever and cam means operated by rotation of the carrier to rock said lever means inwardly toward and outwardly from said beading ring, and means interconnecting said lever means and said rolls to transmit motion of the former to the latter thereby oscillating the rolls to clamp, bead and release a can body during each cycle of operation of the machine; said interconnecting means comprising first and second opposing members fixed to the lever means and to the rolls, respectively, and resilient means urging said opposing members into contact with one another but permitting separation thereof when the rolls contact a can body side seam, said resilient means acting during such separation to exert a beading pressure on the beading rolls.

2. A rotary beader comprising a frame and a main shaft journaled therein, a stationary drum mounted on and concentric to said shaft betwen its ends, a beading ring clamped to said drum, a pair of circular beading cams also clamped to said drum at opposite ends of said ring, a pair of beading rolls cooperable with said ring to clamp can bodies to the ring and to bead the can bodies as said rolls revolve about said main axis with a spinning motion, means supporting said rolls outwardly of said ring for such revolving and spinning motions and also for radial, pivoting movement inwardly to and outwardly from the ring and means operatively connecting each cam with one of said supporting means to oscillate the rolls to clamp a can body to the ring, bead the can body and release it during each cycle of operation of the machine.

3. A rotary beader comprising a frame and a main shaft journaled therein, a stationary drum mounted on and concentric to said shaft between its ends, a beading ring clamped to said drum, a pair of circular beading cams also clamped to said drum at opposite ends of said ring, a pair of beading rolls cooperable with said ring to clamp can bodies to the ring and to bead the can bodies as said rolls revolve about said main axis with a spinning motion, means supporting said rolls outwardly of said ring for such revolving and spinning motions and also for radial pivoting movement inwardly to and outwardly from the ring and coaxial lever means operatively connecting each cam with one of said supporting means to oscillate the rolls to clamp a can body to the ring, bead the can body and release it during each cycle of operation of the machine.

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