

[54] METALLIC CAN BODY STRIPPERS
AND THE LIKE

[75] Inventor: Patrick F. Hutchison, Hawthorne,
Calif.

[73] Assignee: Standun, Inc., Compton, Calif.

[22] Filed: May 11, 1972

[21] Appl. No.: 252,246

[52] U.S. Cl. 72/344

[51] Int. Cl. B21d 45/00

[58] Field of Search.....72/344, 345, 346,
72/361, 427

[56] References Cited

UNITED STATES PATENTS

3,664,171	5/1972	Paramonoff.....	72/344
3,203,218	8/1965	Bolt et al.	72/344
3,390,565	7/1968	Smith et al.	72/344

Primary Examiner—Richard J. Herbst

Attorney—Thomas P. Mahoney, Robert D. Horn-
baker, George E. Schick et al.

[57] ABSTRACT

A series of stripper members are mounted by a
retainer ring so as to be moved outwardly by a cup-
shaped article during movement of the cup-shaped ar-
ticle and a ram end rearwardly therethrough, the
stripper members then moving inwardly to engage the
article during ram return movement and strip the arti-
cle from the ram end. Such stripper member move-
ment is controlled by an encircling resilient ring bear-
ing inwardly against an angular surface on each of the
stripper members so that the resilient ring simultane-
ously exerts axial forces to retain the stripper mem-
bers properly positioned and properly pivotal, as well
as radial forces to ensure such proper pivoting and ar-
ticle engagement.

7 Claims, 11 Drawing Figures

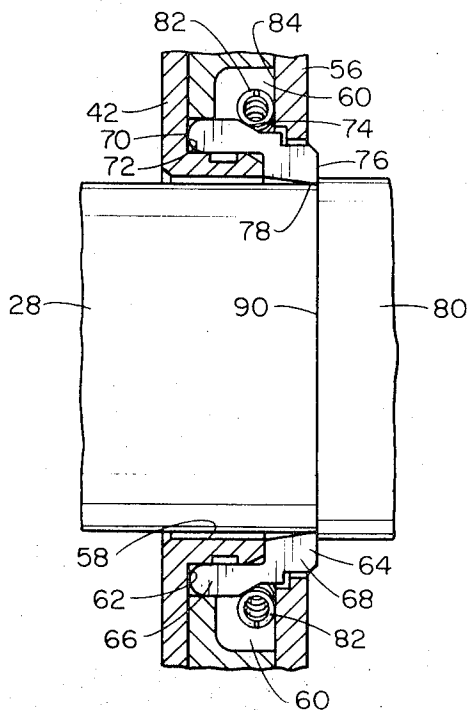


Fig. 1.

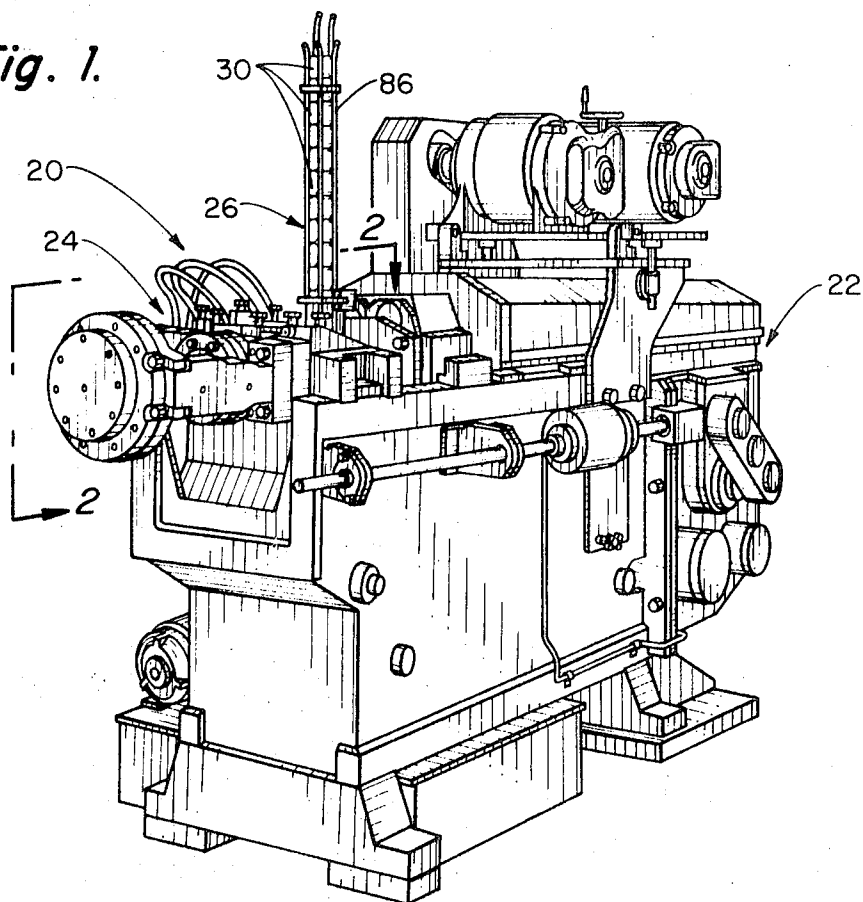


Fig. 2.

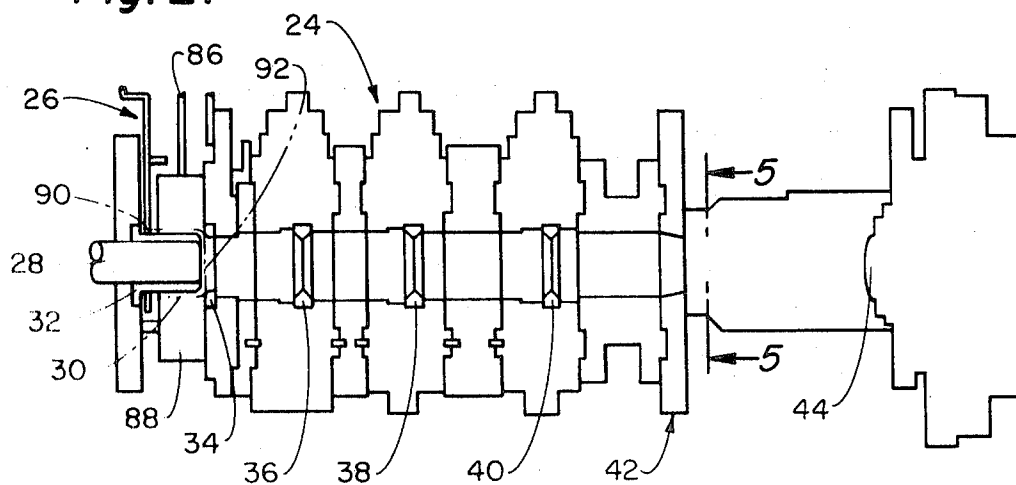


Fig. 3.

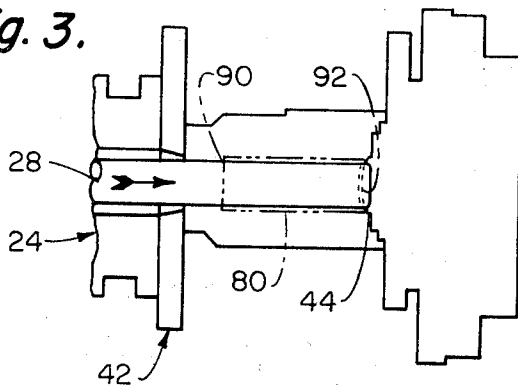


Fig. 4.

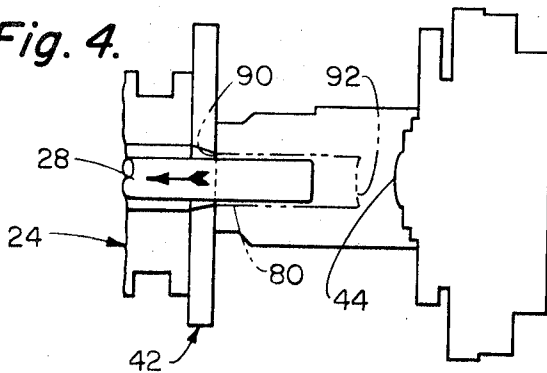


Fig. 5.

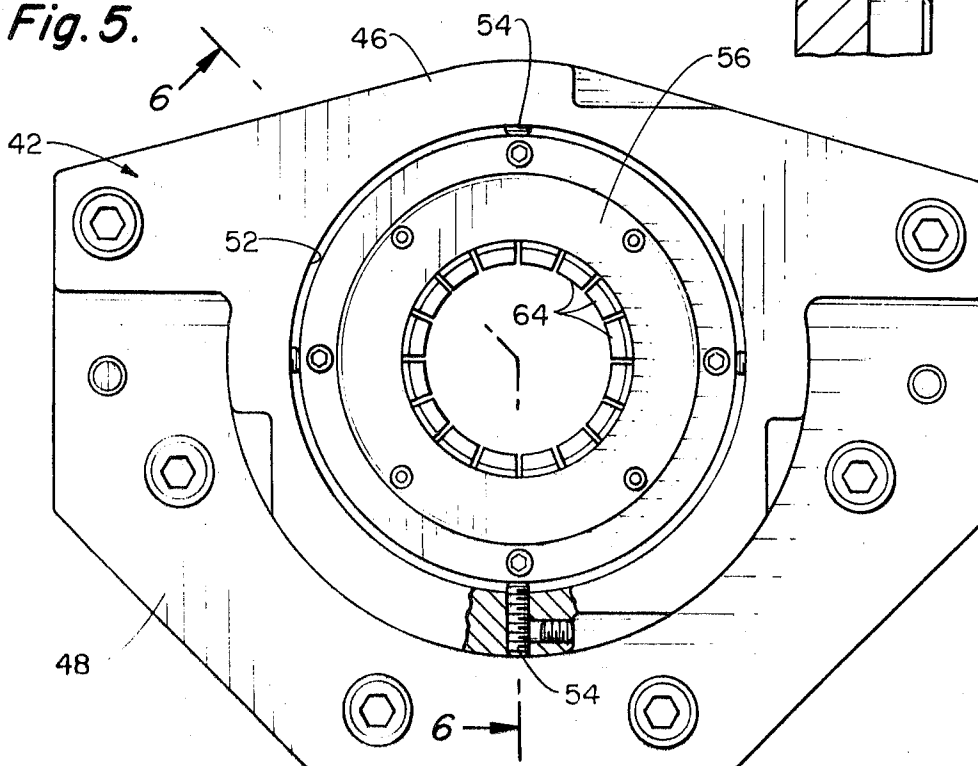
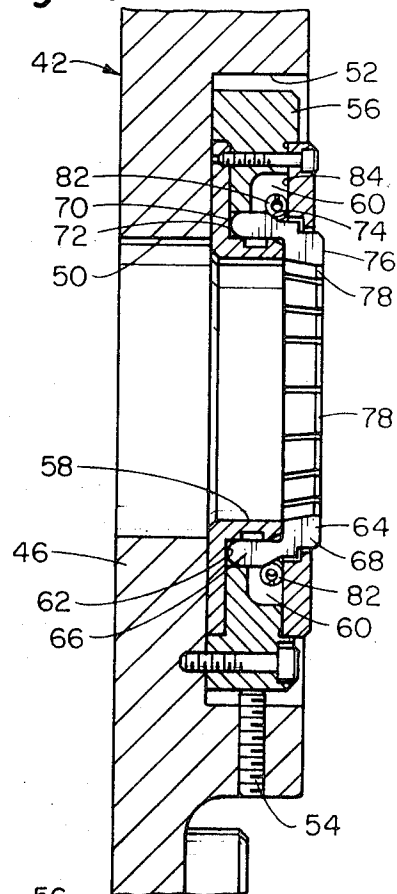
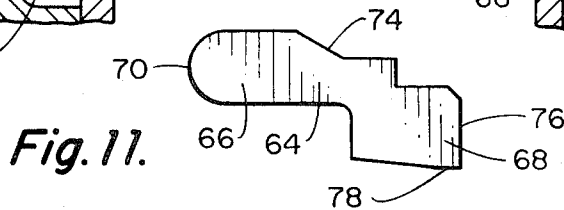
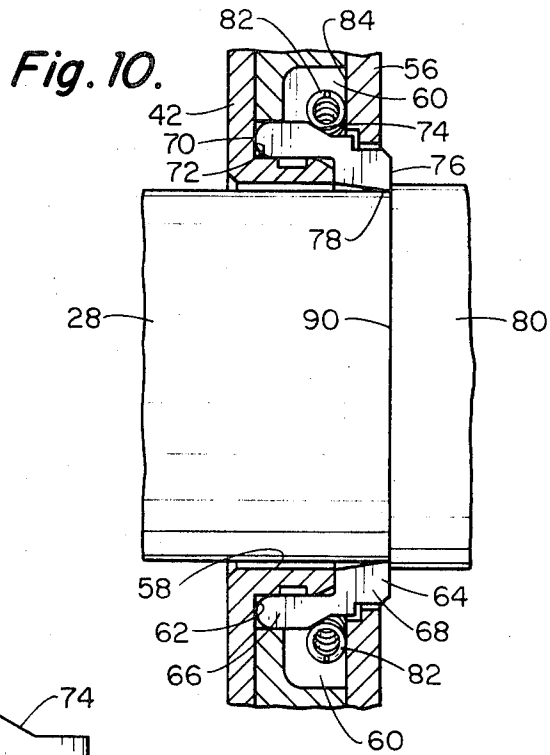
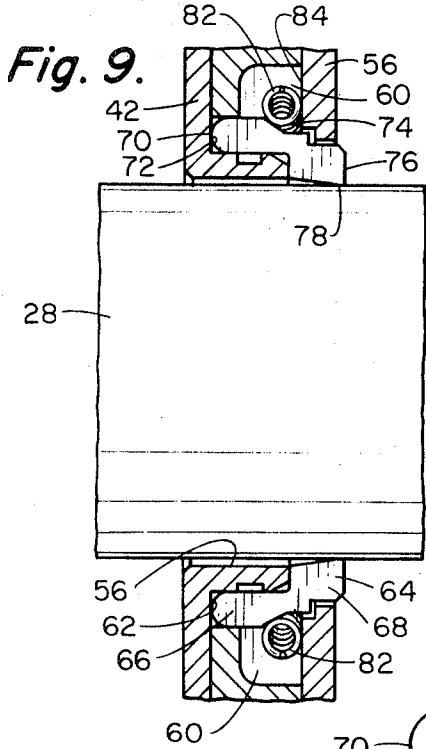
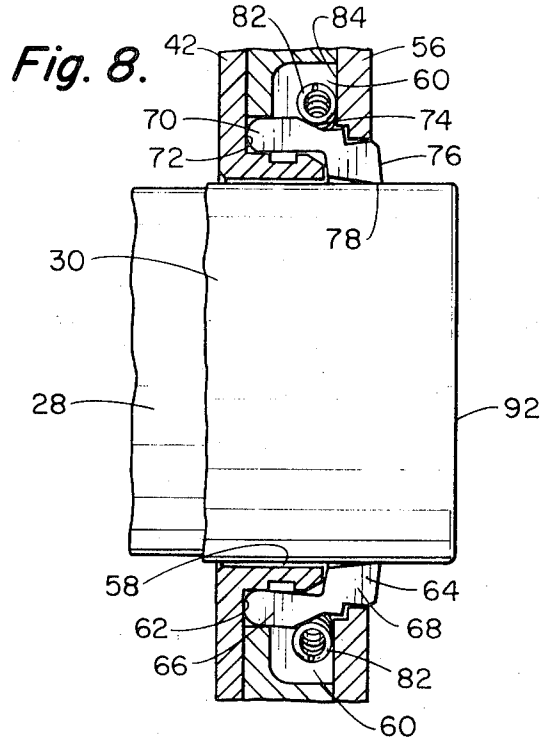
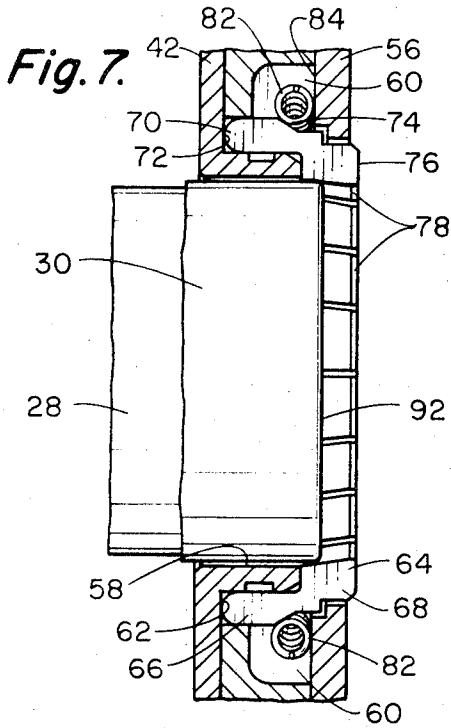


Fig. 6.





METALLIC CAN BODY STRIPPERS AND THE LIKE

BACKGROUND OF THE INVENTION

This invention relates to metallic can body strippers and the like, and more particularly to strippers of the type useable for stripping cup-shaped articles, such as can bodies, from the end of a ram after the can body has passed through a series of dies for accomplishing proper forming thereof. The can body stripper incorporating the principles of the present invention involves a unique form of control over stripper member movement wherein the stripper members are positively retained in their mounting retainer ring properly pivotal relative thereto and with such pivoting being on an exact predictable repeated basis, yet at the same time, such exact control is accomplished in a highly simplified manner so that the structure is serviceable over a long period of life, despite extremely high-speed conditions and despite such relative simplicity. Merely through the use of a single encircling resilient ring or spring engaging the stripper members against a particularly formed angled surface, both axial and radial forces in proper amounts are exerted simultaneously against the stripper members, the axial forces retaining the stripper members properly positioned for exactly repeated high-speed pivoting and the radial forces actually accomplishing the pivoting.

It is well known in the metal forming arts that various forms of strippers have heretofore been used in conjunction with metal forming dies in order to strip the finished metal parts from the dies after proper formation thereof. Furthermore, these strippers are particularly important where the metal forming press or other mechanism is incorporated in an automatic, mass production line operating on high-speed consecutive automatic feed, forming and stripping cycles, since a failure of any of the operating mechanism can cause metal part jamming resulting in serious damage to the various equipment. This is particularly true in the case of metallic can body forming mechanisms which incorporate multiple stage dies and operate at relatively high speeds, for instance, speeds in the range of 125 to 175 cycles per minute.

In the case of metallic can body forming mechanisms for forming either or both of aluminum can bodies and tinplate can bodies, the mechanism might incorporate an initial redraw die followed by as many as three ironing dies and finally a stripper. In operation, a semi-formed cup-shaped blank is fed into the apparatus and is picked up by a ram end which forces the cup-shaped blank progressively through the redraw and various ironing dies to ultimately reduce the diameter thereof, thin the walls and elongate such walls to form the cup-shaped blank into a properly dimensioned can body. After the can body has been finally finished by the last of the series of ironing dies, this finished can body must be stripped from the ram end in order for the ram to reciprocally return through the dies and commence the next can body forming operation, thus requiring the stripper for removing the finished can body from the ram end.

Obviously, if the stripper does not properly perform its finished can removal from the ram end, the finished can body will begin to return reversely through the ironing dies with the returning ram end and if this occurs, it is clear that serious damage can result to quite

expensive die equipment as well as other parts of the can body former. Even though the stripper is capable of performing the stripping operation, this does not completely solve the problem in view of the fact that with an improper stripping operation, the final product desired, the finished can body, can be severely damaged beyond any possible later use. This is true in varying degrees whether the can body is formed of aluminum or the more difficult to form material such as the tinplate.

Substantially all strippers used in metallic can body forming apparatus include a retainer ring mounting a plurality of circumferentially adjacent stripper members thereon, which stripper members have finger parts projecting radially inwardly into a central ram opening of the retainer ring. As the ram of the can body forming apparatus forces the cup-shaped metal part through the final of the ironing dies, the subsequent passage thereof through the stripper forces the stripper members slightly radially outwardly by engaging the finger parts to permit such passage. Immediately upon the finally formed can body completing its passage through the stripper, the stripper members return radially inwardly closely adjacent the ram outer surface so that when the ram reverses and passes reversely forwardly through the stripper, the stripper member finger parts engage the edge of the can body at the can body open end forcing the same from the ram end as the ram end completes its passage reversely forwardly through the stripper.

It can be seen, therefore, that the movements of the stripper members must be exactly controlled and exactly predictable, this being even more greatly appreciated when it is considered that the thicknesses of the walls of the finished can bodies are quite small, a matter of a few thousandths thickness and are travelling at an extremely high speed. Furthermore, since the entire engagement of the stripper members with the finished can bodies is at this thin end surface of the can body, such engagement is only with a very thin ring closely surrounding the ram outer surface. Still further, not only must the stripper members properly engage the thin finished can body end portions, but these stripper members must uniformly exert sufficient force thereon to endwise slide the can bodies from the ram end over which such can bodies have been formed, and this becomes increasingly more difficult as the ram speeds increase in the more modern forming apparatus and the can bodies are required to be formed of the more difficult to form aluminum and tinplate metals.

Certain of the prior strippers used in metallic can body forming apparatus have included the mounting of the stripper members for quite a complex cushioned movement in an effort to reduce wear by reducing shock loads thereon encountered when the stripper members are contacted by the can body during the stripping operation. This resilient mounting while still attempting to accomplish exact pivotal movement has, however, although solving certain wear problems from shock loads, presented more troublesome problems of erratic stripper member pivotal movement. Thus, these prior constructions have not been completely satisfactory.

A still further important factor to consider in the forming of metallic can bodies is the fact that while it is extremely important to produce finished can bodies with proper dimensioning, it is also very desirable to

produce finished can bodies free from scratches and other blemishes on the outer surfaces thereof. In other words, even though the finished can bodies may be of proper dimensions, they still may be unuseable merely from the fact of improper appearance. Obviously, any slight misalignments of the stripper members, particularly during the passage of the final can bodies there-through in advancement of the final stripping operations, can cause damaging scratches and blemishes.

OBJECTS AND SUMMARY OF THE INVENTION

It is therefore, an object of this invention to provide metallic can body strippers and the like wherein, by use of a unique principle of construction, it is possible to maintain the stripper members pivotal in an exact predictable manner, despite high speed operation thereof and use over a long period of time. This unique principle involves the application of forces against the stripper members in such a manner that both axial and radial force components are produced. The axial force components insure proper positioning of the stripper members in tight surface engagement for the pivotal movements and the radial force components serve to produce such pivotal movements.

It is a further object of this invention to provide metallic can body strippers and the like which minimize shock problems normally encountered with metallic can body strippers and similar stripping devices while still providing the foregoing exact predictable pivotal control thereof. With the above-discussed axial force components being exerted on the stripper members to retain these stripper members at all times in tight surface abutment with their mounting retainer ring, the shock loads of the metallic can bodies engaging the finger portions of the stripper members are reduced to a minimum. At the same time, in view of the tight surface abutment, the exact predictability of pivotal movement is virtually assured so that maximum efficiency of operation is received, all necessary for satisfying the final end goal.

It is also an object of this invention to provide metallic can body strippers and the like satisfying both of the foregoing objects in a relatively simple and efficient manner, yet with the overall stripper construction being of maximum simplified form minimizing the cost of equipment provision. In the preferred form hereinafter described and shown in the accompanying drawings, a conventional encircling resilient ring, such as a coiled garter spring, generally radially inwardly engages angled surfaces on the respective stripper members, the surface angling being formed to produce a combination of axial and radial forces, the axial forces urging tight abutment of arcuate end surfaces on mounting parts with radial surfaces of a simple U-shaped pocket of the retainer ring, and the radial forces creating the actual pivotal movement in this exact mounting assembly. Thus, both the retainer ring and stripper members are relatively easily formed by usual machining operations and the fabrication costs are thereby greatly reduced from those previously required for the more complicated prior constructions.

Other objects and advantages of the invention will be apparent from the following specification and the accompanying drawing which are for the purpose of illustration only.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a typical metallic can body former incorporating a preferred embodiment of the metallic can body stripper of the present invention;

FIG. 2 is an enlarged, fragmentary, somewhat schematic sectional view primarily of the diepack of the metallic can body former of FIG. 1, looking generally in the direction of the arrows 2—2 in FIG. 1;

FIG. 3 is a view similar to FIG. 2, but of a rearward portion of the diepack containing the stripper of the present invention and illustrating a finally formed can body in broken lines rearward of the stripper ready for forward return stripping movement;

FIG. 4 is a view similar to FIG. 3, but showing the finally formed can body in broken lines intermediate the actual stripping operation;

FIG. 5 is an enlarged, rear elevational view of the stripper looking in the direction of the arrows 5—5 in FIG. 2, but with the stripper removed from the diepack;

FIG. 6 is an enlarged, fragmentary, vertical sectional view looking in the direction of the arrows 6—6 in FIG. 5;

FIG. 7 is an enlarged fragmentary, vertical sectional view taken from the central portion of FIG. 6 and showing a ram of the metallic can body former with a nearly finally formed can body on an end thereof just engaging the stripper members of the stripper of the present invention during rearward movement of the ram;

FIG. 8 is a view similar to FIG. 7, but with the nearly finally formed can body passing through the stripper;

FIG. 9 is a view similar to FIG. 7, but with the nearly finally formed can body having passed through the stripper with only a portion of the ram located within said stripper;

FIG. 10 is a view similar to FIG. 7, but with the ram having returned forwardly returning the finally formed can body to the stripper and the actual stripping operation taking place; and

FIG. 11 is an enlarged view of one of the stripper members taken from the stripper of the present invention.

DESCRIPTION OF THE BEST EMBODIMENT CONTEMPLATED

Referring to FIG. 1 of the drawings, a typical metallic can body former as generally indicated at 20 and for purposes of defining the environment of the metallic can body stripper of the present invention, includes a ram guide and drive assembly generally indicated at 22, a diepack generally indicated at 24 and a part feed assembly generally indicated at 26. Further, also referring to the somewhat sectional view of the diepack 24 shown in FIG. 2, a ram 28 is reciprocally driven by the ram guide and drive assembly 22 horizontally rearwardly and then returned forwardly through the diepack 24 with semi-formed one-piece metallic can bodies 30 being fed downwardly by the part feed assembly 26 into the forward end of the diepack to be transported rearwardly through the diepack by the ram and formed into finally formed can bodies as will be hereinafter described. The can body former 20, as well as the diepack 24 included therein, may be formed of usual materials and in the usual manner appropriate for the use intended.

As shown in FIG. 2, the diepack 24 beginning at the forward end thereof or the left-hand end as shown in FIG. 2, is comprised of a redraw die pad 32 working in conjunction with a redraw die ring 34, a first ironing die ring 36, a second ironing die ring 38, a third ironing die ring 40, an embodiment of the stripper of the present invention 42 and a doming or bottom forming die 44. The various draw pad, die rings, stripper and forming die are positioned and supported in the diepack by usual fixtures and spacers in a somewhat conventional manner properly aligned for carrying out the required redraw, wall ironing and bottom forming functions. The general operation thereof will be hereinafter described after a more detailed description of the stripper 42 and along with the description of the operation of said stripper.

More particularly to the principles of the present invention and referring to FIGS. 5 through 11, the stripper 42 constituting a preferred embodiment of the present invention includes a stripper housing 46 secured to a mounting frame 48, the mounting frame being, in turn, secured to the diepack 24 in the usual manner. The housing 46 has a central ram opening 50 axially therethrough and opening rearwardly into an annular stripper mounting recess 52 within which the stripper 42 may be forwardly inserted and secured. A series of threaded positioning studs 54 project inwardly from the housing 46 into the housing recess 52 for bearing against the periphery of the stripper in order to exactly align the stripper radially prior to final securement to the housing 46.

As is particularly shown in FIGS. 6 through 10, the stripper 42 includes a multiple part retainer ring 56 having a central opening 58 spaced larger than the outer dimensions of the ram 28 and a can body 30 thereon for permitting free passage therethrough, the retainer ring central opening communicating forwardly with the ram opening 50 in the housing 46. The retainer ring 56 in its multiple part assembly forms an annular recess terminating forwardly in a rearwardly opening, generally U-shaped cross-section pocket 62, said pocket therefore likewise being annular. The retainer ring recess 60 is radially enlarged rearwardly of the pockets 62 and then opens both axially rearwardly and radially inwardly of the retainer ring 56.

A series of stripper members or segments 64 are positioned circumferentially adjacent within and projecting axially rearwardly and radially inwardly from the retainer ring recess 60, each stripper member including a mounting portion 66 connected rearwardly to a finger portion 68. Important to the principles of the present invention, each of the stripper member mounting portions 66 is forwardly received in the U-shaped pocket 62 of the retainer ring recess 60 terminating forwardly within said U-shaped pocket in an arcuate forward end surface 70 radially rockably abutting a generally radially extending surface 72 of the retainer ring 56. Also important to the principles of the present invention, the stripper members 64 are each formed at an outer surface thereof with an angled surface part 74 at the general point of connection between the mounting and finger portions 66 and 68, this angled surface part constituting a control surface and angling a greater degree to radial than to axial, preferably in the order of 60° to radial and 30° to axial, while at the same time being substantially totally axially exposed within the recess 60.

The stripper member finger portions 68 are stepped axially rearwardly and radially inwardly from the mounting portions 66 terminating axially rearwardly in a flat radial surface 76 and radially inwardly in a short, flat axial surface 78. The stripper member finger portions 68 are relieved on their inward surfaces forwardly of the flat axial surfaces 78 for the obvious purpose of minimum contact of the stripper members 64 with the can bodies 30 passing through the retainer ring 56. As is usual, in maximum inward pivoted positions of the stripper members 64, as shown in FIGS. 7, 9 and 10, the stripper member finger portions 68 have the flat axial surfaces 78 thereof positioned at a diameter against the ram 28 or slightly less than the outer diameter of the ram 28 but necessarily less than the outer diameter of a completed or finished one-piece metallic can body 80. At the same time, the retainer ring recess 60 provides sufficient clearance for the stripper members 64 permitting radial outward pivoting by a semi-formed one-piece metallic can body 30 engaging the flat axial surfaces 78 to permit passage of this semi-formed one-piece metallic can body and its transporting ram end therethrough as shown in FIG. 8.

To complete the structure of the stripper 42, a resilient ring or preferably an annular garter spring 82 is positioned in the retainer ring recess 60 encircling the stripper members 64 and resting generally radially inwardly against the stripper member angled surface parts 74 between these angled surface parts and a rearward radial surface 84 of the retainer ring recess 60. It will be noted that the spring 82 contacts the stripper members 64 solely against said angled surface parts 74 and is free of contact with the stripper members at any other point including either radially inwardly or outwardly of the angled surface parts, in the preferred form being ensured by the spring circular cross-section. Thus, the spring 82, as guided by the recess rearward radial surface 84 against the angled surface parts 74 of the stripper members 64, resiliently exerts both axial and radial force components, the axial components forcing and ensuring retainment of the arcuate forward end surfaces 70 of the stripper member mounting portions 66 in tight abutment pivotally movable over the radially extending surfaces 72 within the retainer ring U-shaped pocket 62 for full pivot control and the radial components constantly radially inwardly urging the stripper members 64.

In general operation of the can body former 20 in forming metallic can bodies from the semi-formed can bodies 30 to the finished can bodies 80, a can forming cycle begins with the ram 28 at its forwardmost withdrawn position forwardly clear of the diepack 24. During the period of time that the ram 28 is forwardly clear of the diepack 24, one of the semi-formed can bodies 30 in supply chute 86 of the part feed assembly 26 is fed downwardly into part positioning yoke 88, an open end 90 of the can body facing forwardly and a closed end 92 thereof facing rearwardly. The redraw die pad 32 then moves rearwardly ahead of the ram 28 and enters the open end 90 of the semi-formed can body 30 with the ram 28 following through the now-positioned redraw die pad to engage the closed end 92 of the semi-formed can body as shown in FIG. 2.

The ram 28 proceeding on its rearward movement through the redraw die pad 32 moves the semi-formed can body 30 from the redraw die pad rearwardly through the redraw die ring 34 carrying out an initial

redraw operation, followed by movement of the can body by the ram progressively rearwardly through the first, second and third ironing die rings 36, 38 and 40 to carry out progressive ironing operations on the can body. As the can body and the ram 28 leave the third ironing die ring 40, they begin entering the stripper 42 with the can body engaging the stripper members 64 which, up to this point, are in their maximum inward positions projecting inwardly into the retainer ring central opening 58, a maximum distance with the stripper member flat axial surfaces 78 projecting inwardly to a diameter less than the outer diameter of the can body as shown in FIG. 7. As shown in FIG. 8, continued progressive rearward movement of the can body 30 and the ram 28 causes the stripper members 64 to pivot radially outwardly by the arcuate forward end surfaces 70 of the stripper member mounting portions 66 rocking over the retainer ring radially extending surface 72 within the recess U-shaped pocket 62, so that the stripper member flat axial surfaces 78 of the stripper member finger portions 68 ultimately rest on and slide axially along the can body outer surface as shown during passage of the can body rearwardly through the stripper 42. In the final rearward movement of the can body and the ram 28 rearwardly of the stripper 42 and against the doming or bottom forming die 44 as shown in FIG. 3, the stripper member 64 once again pivotally rock back inwardly substantially to their normal positions as shown in FIG. 9 as caused by the radial force components of the spring 82 against the stripper member angled surface parts 74, thereby once again assuming the stripper member maximum inward positions engaging the surface of the ram 28, and now positioned in axial aligned interference with the open end 90 of the semi-formed can body 30 which is now becoming the finished can body 80. During the contact of the can body with the doming or bottom forming die 44, the can body bottom is inwardly domed to complete the can body formation resulting in the finally formed or finished can body 80. Immediately thereafter, the ram 28 begins its return forward movement through the diepack 24 so as to carry the finally formed or finished can body 80 forwardly until the can body open end 90 engages the stripper member flat radial surfaces 76 of the stripper member finger portions 68 to commence the stripping of the finished can body from the ram as shown in FIGS. 4 and 10.

Thus, as the ram 28 continues its forward movement through the stripper 42 with the finished can body 80 being retained stationary by the stripper members 64 through the engagement therebetween, the finished can body is stripped from the ram. Furthermore, during this stripping operation, it will be noted that the radial force components on the stripper members 64 resulting from the spring 82 against the stripper member angled surface parts 74 will retain the stripper members firmly in their normal maximum inward positions blocking forward passage of the finished can body 80 to accomplish the stripping thereof from the ram 28, while at the same time, the axial force components against the stripper members also resulting from the spring 82 against the stripper member angled surface parts 74 will retain the stripper member arcuate forward end surfaces 70 tightly in the retainer ring U-shaped pocket 62 and tightly against the radially extending surface 72 of said pocket for preventing impact forces against these respective surfaces which could ultimately destroy the

same. The cycle is completed by the ram 28 proceeding forwardly through the remainder of the diepack 24 and from the redraw die pad 32 ready for the next cycle commencement, with the now stripped finished can body 80 dropping from the diepack to conveyor means (not shown) and being transported thereby from the can body former 20.

According to the principles of the present invention, therefore, an improved form of metallic can body stripper and the like is provided wherein the exact movement of the stripper members contained therein is controlled by use of a unique combined force principle wherein a single spring or other resilient force applying ring against a uniquely angled surface of each of the stripper members serves the dual purpose of absolute pivotal control of the stripper members and the absolute positioning control thereof relative to their mounting retainer ring 56. This unique combined result from the novel assembly gives the necessary predictable pivotal control of the stripper members under extremely high speed conditions while minimizing any shock problems and the consequent wear resulting on mating parts of the assembly still again under these extremely high speed conditions. Despite the marked advantages of the novel stripper of the present invention, the overall assembly is extremely simplified over anything heretofore provided so as to be capable of fabrication at a minimum of material and labor costs.

We claim:

1. In a stripping device of the type receiving an end of an axially rearwardly and forwardly moving ram therethrough with said ram end carrying a cup-shaped article thereon for stripping said cup-shaped article from said ram end during ram end forward movement; the combination of: a retainer ring having an axial ram opening therethrough spaced larger than outer dimensions of said ram end and a cup-shaped article thereon; an annular recess formed in said retainer ring and opening into said ram opening, said recess having an annular and rearwardly opening pocket formed at a forward extremity thereof with said pocket being generally U-shaped in radial cross-section; a plurality of stripper members in said retainer ring recess, each of said stripper members having a generally forwardly extending mounting part forwardly received in said retainer ring recess pocket with a forwardly facing arcuate surface of said mounting part at all times abutting and pivotal over a generally radial surface of said retainer ring recess pocket, each stripper member mounting part being connected spaced rearwardly of said retainer ring recess pocket to a radially inwardly projecting finger part slidable over a cup-shaped article upon outward pivoting of said stripper member during rearward movement of said article and ram end there-through and engageable with a forward edge of said article upon inward pivoting of said stripper member during forward ram movement, each of said stripper members having a generally radially outwardly facing angular control surface formed thereon spaced rearward of said retainer ring recess pocket, said control surface angling a greater degree to radial than to axial; and resilient ring means surrounding said stripper members engaging said stripper member angular control surfaces for exerting combined axial and inward radial forces thereon resiliently retaining said stripper members forwardly in said retainer ring recess pockets at all times abutting said pocket radial surfaces and at all times re-

silently urging inward pivoting of said stripper members, said resilient ring means being at all times free of engaging said stripper members rearwardly of said stripper member angular control surfaces.

2. A stripping device as defined in claim 1 in which said resilient ring means rearwardly abuts generally radially extending surfaces of said retainer ring recess.

3. A stripping device as defined in claim 1 in which said stripper member control surfaces angle in the order of 60° to radial.

4. A stripping device as defined in claim 1 in which said resilient ring means at all times engages said stripper members solely at said angular control surfaces.

5. A stripping device as defined in claim 1 in which said stripper member control surfaces angle in the order of 60° to radial; and in which said resilient ring

means rearwardly abuts generally radially extending surfaces of said retainer ring recess.

6. A stripping device as defined in claim 1 in which said resilient ring means at all times engages said stripper members solely at said angular control surfaces and rearwardly abuts generally radially extending surfaces of said retainer ring recess.

7. A stripping device as defined in claim 1 in which said stripper member control surfaces angle in the order of 60° to radial; and in which said resilient ring means at all times engages said stripper members solely at said angular control surfaces and rearwardly abuts generally radially extending surfaces of said retainer ring recess.

* * * * *

20

25

30

35

40

45

50

55

60

65