

Jan. 2, 1962

C. RAGETTLI

3,015,291

DRUM CLOSING TOOL

Filed March 10, 1958

3 Sheets-Sheet 1

Fig. 1

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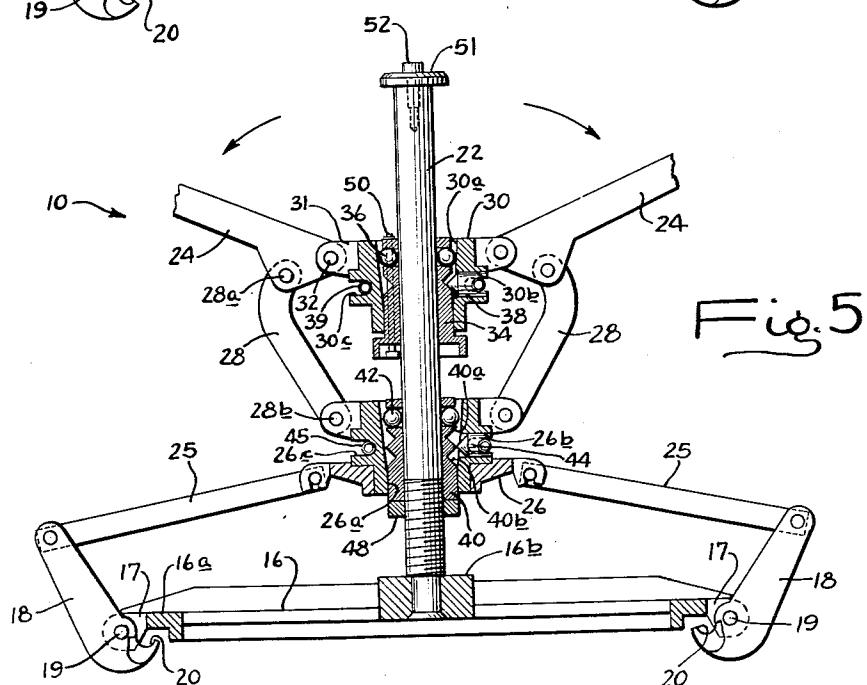
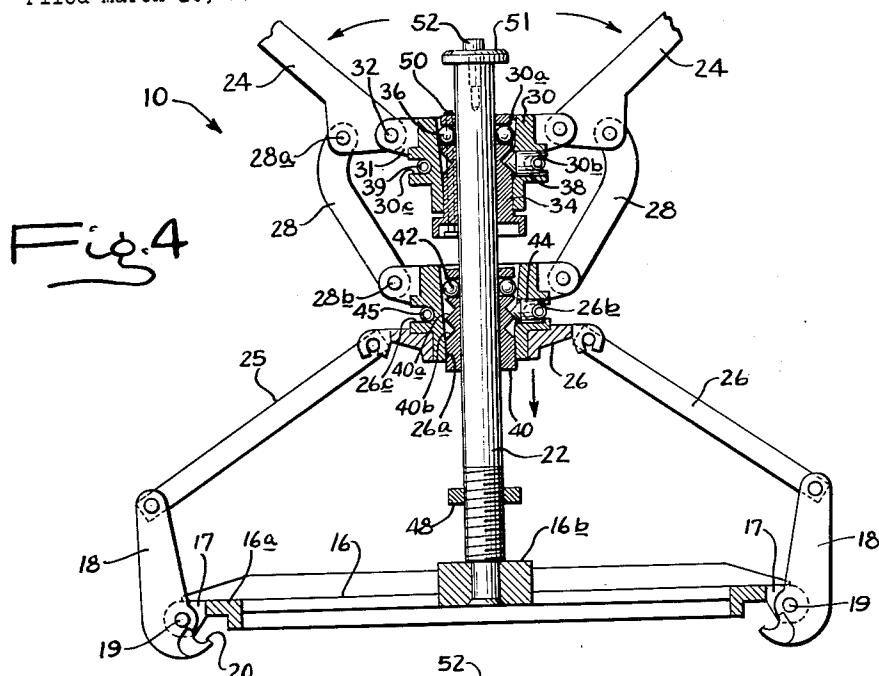
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### DRUM CLOSING TOOL

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3 Sheets-Sheet 2



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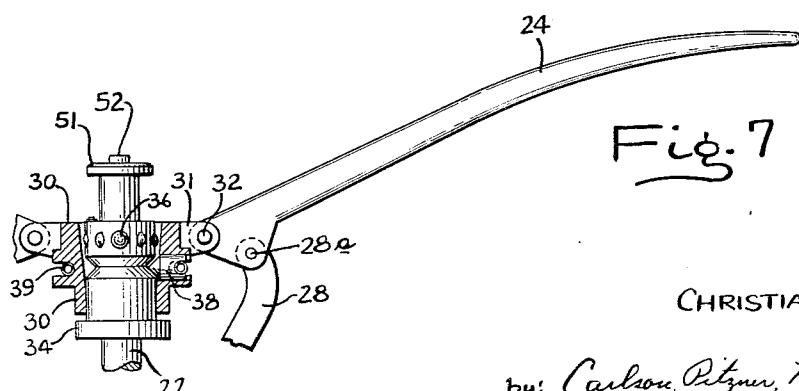
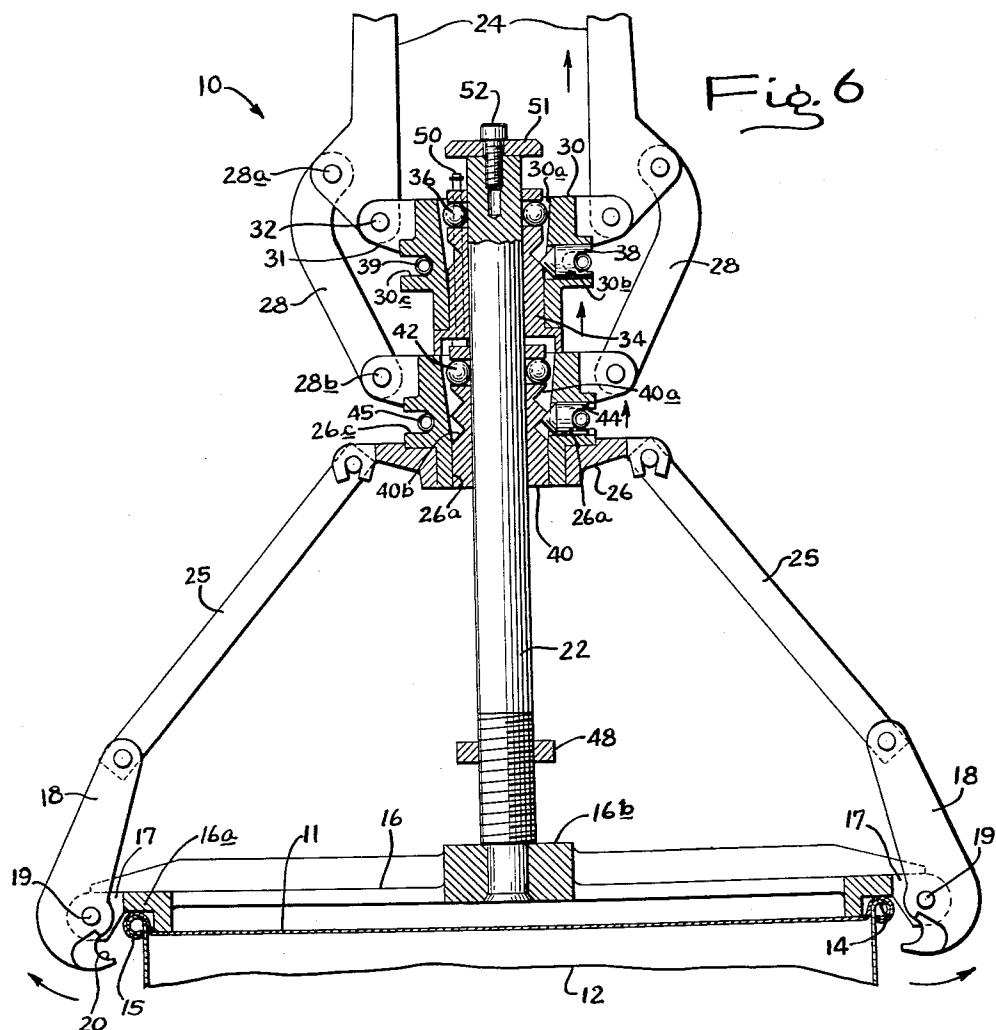
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## DRUM CLOSING TOOL

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3 Sheets-Sheet 3



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## DRUM CLOSING TOOL

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The present invention relates to drum closing tools of the type for crimping the flange of a lid into sealing engagement with the bead that is conventionally formed about the edge of a drum or pail. More particularly, the invention relates to improvements in drum closing tools of the type intended for manual operation of the handles for effecting movement of the crimping jaws between open and closed positions.

Exemplary forms of prior devices of this general type are disclosed and claimed in Grotnes Patent No. 2,017,495 and in the copending patent application of Charles M. Stearns, Jr., Serial No. 481,129 filed January 11, 1955, now Patent Number 2,822,774, granted February 11, 1958. These devices include a plurality of lever-operated, spaced, crimping jaws which are arranged to circumferentially engage a can lid about the flange that is formed thereon and are adapted to be closed upon and pulled from engagement with the lid flange as a result of the movement of a pair of operating handles. The handles are pushed downwardly and apart to effect the crimping of the lid flange upon the can, and the handles are raised or brought together to release the jaws from the sealed lid and can. The tool can then be lifted free of the can and used successively to apply lids to a number of cans.

The can closing tool forming the subject matter of the aforementioned application was developed in recognition of the fact that tired or careless tool operators might not push the handles of prior devices "home" so that the lid flange was not crimped into firm sealing engagement with the can bead. Thus the device of the application was constructed and arranged to positively assure that the crimping jaws were fully closed during each operation.

Prior devices have been constructed and arranged to the end that movement of the handles through their full range had to obtain to effect full range of movement of the crimping jaws from open to closed positions. It will be recognized that the maximum effort is required in the final few degrees of movement of the jaws because it is in that short portion of their range of movement, the lid flange having already been bent against the can bead, wherein they must crimp the flange so as to draw the lid tight. It also will be seen that the handles of the prior devices are spread wide apart at this time thus making it difficult for the tool operator to apply the needed force to effect final jaw movement. This is true because his arms too must be widespread. This becomes a serious problem with large drums and with lids formed of relatively heavy gauge material.

It is an object of the present invention to obviate this difficulty through the provision of a new and improved drum closing tool which is not only easier to use but which in addition positively assures full closure of the crimping jaws in each closing and sealing operation.

It is a more specific object to provide a drum closing tool having crimping jaws which are movable between open and closed positions by means of handle operated linkage wherein the full range of jaw movement obtains as a result of successive handle movements.

A further and related object is to provide for the movement of the crimping jaws of a drum closing tool from open to closed position by successive strokes of the handles of an improved handle-operated, multiple toggle

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linkage which strokes are relatively short ranged as a result of a change of fulcrum location between strokes so as to obviate need for wide spreading of the operator's arms, and which requires full range of jaw movement before the tool can be removed from the lid and drum.

The objects of the invention thus generally set forth together with objects and ancillary advantages are attained by the construction and arrangement shown by way of illustration in the accompanying drawings, in which:

FIGURE 1 is a fragmentary section view, taken in a generally central vertical plane, of a drum closing tool embodying the features of the present invention and illustrating relative positions of the parts as a closing operation is begun.

FIG. 2 is a fragmentary transverse section taken generally in the plane of line 2—2 in FIGURE 1.

FIG. 3 is similar to FIG. 1 but illustrates relative component positions after the first closing stroke has been taken and the device is being conditioned for a succeeding closing stroke.

FIG. 4 is similar to FIG. 1 but is illustrative of relative component positions during a succeeding closing stroke.

FIG. 5 is similar to FIGS. 1 and 4 but is illustrative of relative component relationship at the completion of the closing operation.

FIG. 6 is similar to FIGS. 1, 3, 4 and 5, but is illustrative of relative component relationship after completion of a closing operation and during removal of the illustrative tool from a drum.

FIG. 7 is a fragmentary elevational view partly in section of the upper portion of the device illustrated in the preceding figures.

While the invention has been shown and is described in considerable detail with reference to a particular embodiment thereof, it is to be understood that there is no intention that it thus be limited to such detail. On the contrary it is the intention here to cover all modifications, alternative constructions and equivalents falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more particularly to the drawings, the exemplary drum closing tool, generally designated 10, and constructed in accordance with the teachings of the present invention, has been shown as employed in sealing a lid 11 upon a drum 12. The drum has at its upper edge a rolled or otherwise suitably formed bead 14 around which a deformable flange 15, which is integral with the lid, is to be crimped in sealing relation. Preferably the flange is serrated to facilitate this crimping deformation.

The tool 10 includes a base plate 16 which is adapted to rest upon the lid 11 after it has been placed upon the drum. The base plate 16 extends peripherally beyond the lid and drum and is provided with a series of circumferentially spaced pairs of ears 17 for pivotally supporting a plurality of similarly spaced crimping levers 18. The latter are mounted upon pins 19 which are received in the ears 17 and each includes a depending or hooklike portion 20 constituting a jaw. It will be seen that the jaws 20 are disposed to engage and clamp the flange 15 about the drum bead 14 when rocked inwardly. To prevent deformation of the drum 12 and of the lid 14, the base plate 16 is provided with an annular axially projecting shoulder 16a which serves as a backing or stationary die.

The base plate 16 may be of weblike form or of ribbed form, for minimizing its weight without sacrificing strength, and it includes a central hub 16b for the reception of a cylindrical standard or stud 22.

For imparting crimping movement to the levers 18, that is to open and close the crimping jaws 20, handles 24 are provided, and interposed between the handles and

the levers 18 is a multiple toggle linkage. The multiple toggle linkage includes a link 25 for each one of the crimping levers 18. Each of the links 25 is pivotally connected to the inner end of one of the levers 18 and converges inwardly toward the standard or stud 22. At their inner ends the links 25 are pivotally connected to a collar 26 which surrounds the stud. Interposed between each of the handles 24 and the collar 26 is a link 28. The links 28 are of arcuate form and are suitably apertured at each end for the reception of pivot pins 28a and 28b, respectively, by means of which the links 28 are attached to the handles 24 and to the inner collar 26.

To fulcrum the handles a second collar 30 is provided which surrounds the stud 22 outwardly of the collar 26. This second collar is provided with diametrically disposed pairs of lugs 31 for the reception of pivot pins 32 by means of which the handles 24 are connected thereto. It will be noted that the handles 24 are so formed adjacent at their inner ends that the pivot pins 28a and 32 are spaced apart, thereby providing a lever arm which is substantially shorter than the lever arm defined by the length of the handles so that when an operator of the device applies a force at the outer ends of the handles to move the same there exists a large mechanical advantage.

In order to fix the lower ends of the handles with respect to the central standard 22 to the end that outward movement of the handles about the pivots 32 imparts force to the multiple toggle linkage for effecting crimping movement of the levers 18 and jaws 20, the outer collar 30 includes means for gripping the standard 22. As shown this means includes an inner sleeve 34 for supporting a series of circumferentially spaced balls 36 for engagement with the central standard 22. The collar 30 is provided with an inwardly tapered bore 30a, and the sleeve 34 and the balls 36 are respectively dimensioned so that the balls project radially outward for engagement with the wall of the bore 30a to the end that the balls are wedged into engagement with the stud 22 upon relatively axial movement between the sleeve 34 and the collar 30. Means is provided for normally biasing this sleeve inwardly along the stud 22 with respect to the collar 30 so that the balls 36 are normally urged by the tapered bore wall 30a into engagement with the stud 22. In the illustrative device this means includes a tapered pin 38, the inner end of which bears against the inner inclined surface of a V-groove formed peripherally in the sleeve 34. The pin 38 is movable radially in a bore 30b in the sleeve 30 under the action of an annular compression spring 39. The annular spring 39 embraces the collar 30 and is received in a circumferential groove 30c formed therein to hold the spring in place. The pin 38 has a transverse notch 38a in its outer end, registering with the groove 30c, to receive the annular spring 39.

It will be apparent upon reference to the drawings that upon outward movement of the handles 24, when any resistance to such movement is offered by the toggle linkage and the gripping levers and jaws, there is an initial tendency for the levers to pivot about the pins 28a, and there is a corresponding tendency toward an outward movement of the extreme inner ends of the handles 24 and thus of the pivot pins 32. This initial tendency for movement in such direction results in an even tighter wedging of the balls 36 against the central standard or stud 22 by the wall of the bore 30a of the collar 30 thereby insuring firm gripping of the stud 22. As a result the collar 30 and thus the handle fulcrums as defined by the pins 32 is fixed. As the operator continues movement apart of the handles, there results the application of force by way of the links 28 to the collar 26 to urge the same inwardly along the stud 22 and toward the plate 16a. Thus force is imparted from the collar 26 to the crimping levers 18 by way of the links

25 with the result that the outer ends of the levers 18 are swung outwardly and the crimping jaws 20 are swung inwardly to initiate crimping of the lid flange 15 about the drum bead 14.

The collar 26 is also provided with means for gripping the central standard or stud 22 so that it can normally be moved along the stud 22 only in a direction toward the plate 16 until the full range of movement of the crimping levers 18 and jaws 20 has been attained. The purpose of this is to insure complete sealing of the lid flange 15 about the can bead 14 so that a tired or careless operator cannot remove the tool until the job is done. For this purpose the collar 26 has a tapered central bore 26a therein disposed within which is a sleeve 40. The sleeve 40 serves as a carrier for a series of circumferentially spaced gripping balls 42 which are adapted to engage the central stud 22 upon relative axial movement between the collar 26 and the sleeve 40. As with the outer collar and sleeve assembly 30-38, the sleeve 40 is normally biased inwardly with respect to the collar 26 by means of a cam pin 44 which is received in a radial bore 26b formed in the sleeve 26. The pin 44 is urged inwardly by means of an annular spring 45. As shown, the spring 45 is received in a circumferential groove 26c and engages in a notch 44a formed transversely in the outer end of the cam pin 44. The inner end of the cam pin normally engages the inner inclined surface of a V-groove 40a formed peripherally about the sleeve 40. It will be seen that inward movement of the collar 26 along the central stud 22 obtains when the handles 24 are spread apart, and thus force is imparted to the collar 26 by way of the links 28. The transmission of this force to the links 25, and thence to the levers 18, is unimpeded for the collar 26 is moved inwardly with respect to the sleeve 40 so that wedging action of the bore wall 26a upon the balls 42 is relieved. However, when the operator of the device moves the handles toward each other there tends to be an upward movement applied to the collar 26 by way of the links 28. Since the cam pin 44 under the action of the spring 45 normally urges the sleeve 40 downwardly, thus urging the balls against the tapered wall of the bore 26a, a slight outward movement of the collar 26 with respect to the sleeve 40 obtains which results in the wedging of the balls 42 into gripping engagement with the central stud 22 and the lower collar becomes fixed with respect to the stud.

As the operator continues movement of the handles toward each other, and since the collar 26 is held in place by the wedging of the balls 42 against the stud 22, the pivot pins 28a become the fulcrum point for the handles 24 and the lower ends of the handles carrying the pivot pins 32 move inwardly to urge the outer collar 30 inwardly along the stud. Such inward movement is unimpeded by the gripping means incorporated within the outer collar for such inward movement of the collar 30 tends to move the collar inwardly with respect to the sleeve 34 so that the balls 36 tend to be moved toward a portion of the bore 30a which is of larger diameter thereby relieving wedging action thereon.

As soon as the operator of the device again begins to move the handles apart the action heretofore set forth is repeated. Thus, the outer collar becomes fixed with respect to the central standard 22 and further downward movement of the collar 26 obtains to the end that the crimping levers 18 and jaws 20 are swung further toward closed position of the jaws. Several handle strokes may be imparted by the operator to the device in order to achieve the fully closed positions of the crimping jaws.

Means is provided which is operable as an incident to the achievement of the fully closed positions of the crimping jaws for disabling the gripping means 40-45 incorporated in the inner collar 26 so that when the operator subsequently moves the handles 24 toward each other, the crimping levers 18 and jaws 20 are returned to fully opened condition whereby the tool can be lifted from the

lid and drum. As shown in the illustrative device this disabling means includes a stop 48 on the central stud 22, the cam pin 44, and a second V-groove 40b formed in the sleeve 40. The stop 48 is in the form of a pin which is disposed transversely of the stud 22 and is adapted for engagement by the inner end of the sleeve 40 as the same is moved inwardly along the stud 22 sufficiently far for the crimping levers and jaws to have attained their fully closed positions. It will be recalled that the cam pin 44 normally engages the lower inclined surface of the V-groove 40a to urge the sleeve 40 inwardly with respect to the collar 26. When the collar 40 engages the stop 48, further inward movement of the collar 26, under the force applied to it by the links 28 from the handles 24, causes the pin 44 to be cammed outwardly in the passage 26b until the inner end of the pin 44 registers with the groove 40b into which it is then urged by the action thereon of its biasing spring 45. As a result the pin 44 engages the outer inclined surface of the V-groove 40b and urges the sleeve 40 axially outward with respect to the collar 26 carrying with it the balls 42 so that the balls are moved outwardly within the collar bore 26a where the bore is of larger diameter. Thus wedging action on the balls 42a is relieved. When this condition obtains upward movement by the operator upon the handles 24 finds no resistance or "anchoring" provided by the collar 26. Therefore, the collar 26 is moved upwardly into engagement with the lower end of the sleeve 34.

As this movement continues, the sleeve 34 is moved axially outward with respect to the collar 30, and the balls 36 are moved outwardly within the bore 30a to a place of larger diameter so that no wedging action of the balls 36 against the stud 22 obtains. Thus, with the gripping means of both the inner and outer collar assemblies being disabled movement of the handles together and outwardly away from the plate 16 results in the outward movement of the bore collar assemblies along the stud 22. This movement causes an inward swinging of the upper ends of the crimping levers 18 and an outward movement of the crimping jaws 20 to the fully open positions of the latter thereby releasing the tool from the lid and drum so that it can be lifted therefrom.

Means is provided for resetting the lower sleeve 40 so that the cam pin 44 again engages the outer V-groove 40a so that the sleeve 40 is again biased inwardly with respect to the collar 26 thereby reconditioning the tool for a subsequent crimping operation. As shown, this means includes a pin 50 which is mounted for limited longitudinal movement in a passage formed longitudinally in the outer sleeve 34. The pin 50 at its lower end is adapted to engage the outer end of the sleeve 40. The upper end of the pin 50 extends outwardly beyond the sleeve 34 for engagement with a stop 51 that is fixed to the outer end of the central stud 22 by means of a cap screw 52. Thus, at the end of the outward movement of the collar assemblies along the central stud 22 and the lifting of the tool from the lid and drum, the pin 50 is brought into engagement with the stop 51 and is urged inwardly with respect to the sleeve 34 so that its lower end presses inwardly upon the sleeve 40. When this occurs the outer inclined surface of the V-groove 40b forces the cam pin 44 outwardly, releasing the sleeve 40 and forcing the same inwardly along the stud until the V-groove 40a registers with the inner end of the pin 40 where by the annular biasing spring 45 urges the same into engagement with the inner inclined surface of the V-groove 40a. Thus the gripping means that is associated with the lower collar 26 is reset so that the tool is reconditioned for subsequent operation.

From the foregoing it will be seen that a drum closing tool constructed in accordance with the teachings of the present invention not only insures that firm sealing engagement between a lid flange and a drum bead is attained before the tool can be removed from the drum, but

in addition provides for operation by successive, short-ranged strokes of the handles of the device thereby obviating the need for awkward and tiring widespreading of the operator's arms in manipulating the handles to effect full range of crimping jaw movement. Thus a drum closing tool so constructed is substantially easier to use. At the same time the instant construction and arrangement entails substantially no delicate or hard-to-form parts thereby permitting it to be economically made. The components will be seen to be rugged and this, together with their uncomplicated form, results in a long, trouble-free operating life.

I claim as my invention:

1. A drum closing tool having a circular base plate 15 adapted to seat against the flanged lid of a drum and having a series of crimping levers pivotally mounted around its peripheral edge to swing from retracted positions to operated positions to crimp the flange of the lid to the drum, said tool having means operable manually for swinging the crimping levers step-by-step from retracted to operated positions comprising, in combination, a standard extending upwardly from the base plate, a first collar mounted on and slidable axially of said standard, a second collar mounted on said standard between said first collar and the base plate and slidable axially thereof, links pivotally connected between said second collar and the respective levers operative to rock the levers toward operated positions as the collar moves toward the base plate and to retract the levers as the collar moves away from the base plate, a pair of hand levers pivotally mounted on said first collar to swing from a generally upright retracted position outwardly and downwardly to an actuated position, a pair of links pivotally connected to the respective hand levers and to said second collar, standard gripping means for each collar normally allowing said collars to move toward the base plate while restraining them against movement away from the base plate thereby conditioning said first collar to define stationary fulcra for said hand levers to enable them to move said second collar toward the base plate when the levers are rocked from retracted to operated position and conditioning said second collar and the links of said pair to define stationary fulcra for said hand lever to enable them to move said first collar toward said base plate 30 when the levers are rocked from the actuated to the retracted position, means operative in response to the movement of said collars through a predetermined range for releasing said gripping means to free the collars for return movement, and means operative in response to the return of the collars to retracted position for resetting the gripping means for a subsequent operation.

2. A drum closing tool as defined in claim 1 in which the gripping means for each collar comprises a sleeve interposed between the collar and the standard, a plurality of balls supported in said sleeve for movement toward and from the standard, and coating surfaces on the collar operative to shift the balls inwardly against the standard in response to relative movement of the collar and sleeve in one direction.

3. A drum closing means as defined in claim 1 in which the gripping means for each collar comprises a sleeve slidable on the standard and seated in a tapered bore in the collar, said sleeve having radially directed openings with ball elements disposed therein adapted to be engaged by the bore wall and forced inwardly into clamping engagement with the standard in response to relative movement of the sleeve and collar to a predetermined position.

4. A drum closing tool comprising, in combination, a plate mounting an upright standard, a series of clamping jaws pivoted on the marginal edge portion of said plate for movement between open and closed positions, a first collar assembly mounted on said standard including means for gripping the standard normally operative to resist relative movement of the assembly along the standard away

from said plate, a second collar assembly mounted on said standard including means for gripping the standard normally operative to resist relative movement along the standard away from the plate, a pair of handles pivoted on said second collar assembly to swing between retracted and operated positions, a first set of toggle links positioned between said clamping jaws and said first collar assembly and a second set of toggle links interposed between said handle and said first collar assembly, said second toggle links applying force in the movement of said handles toward operated position to said first collar assembly for moving the same along said standard toward said plate, said first toggle links thereby effecting movement of said jaws toward said closed position, said second toggle links transmitting force applied in the movement of said handles back toward retracted position to said second collar assembly for moving the same along said standard toward said first collar assembly, and means for disabling the gripping of said first collar assembly in response to the attainment of said jaws by their fully closed position so that upon subsequent movement of said handles to said retracted position both collars can be moved along said standard away from said plate whereby said jaws are moved into their open position.

5. A drum closing tool comprising, in combination, a generally circular plate mounting an upright standard, clamping jaws pivoted at the peripheral edge of said plate for movement between open and closed positions, first and second collar assemblies mounted on said standard each including means for gripping the standard normally effective to resist relative movement of the assembly along the standard away from said plate, a pair of handles pivoted on said second assembly to swing between retracted and operated positions, toggle links interposed between said jaws and said first collar assembly, other toggle links interposed between said handles and said first collar assembly, said toggle links and said first collar assembly transmitting force applied in moving said handles toward operated position to said jaws for moving the same toward closed position while said first collar assembly is moved along said standard toward said plate, said toggle links also transmitting force applied in moving said handles back toward retracted position to said second collar assembly for moving the same along said standard into a new position toward said plate, and means for disabling the gripping means of said first collar assembly in response to attainment by said jaws of their fully closed position so that upon subsequent movement of said handles toward their retracted position both collar assemblies can be moved along said standard away from said plate whereby said jaws are moved into their open positions, and means for resetting the gripping means associated with said first collar assembly in response to the attainment by said first and second collar assemblies of their initial positions upon said standard, whereby said tool is reconditioned for subsequent operation.

6. A drum closing tool for applying a flanged lid to a drum comprising, in combination, a plate adapted to seat against the outer face of the lid, a standard rigid with said plate, clamping jaws pivoted at the marginal edge of said plate for movement from an open position to a closed position in which they crimp the lid flange to the drum, a first collar having a tapered bore, a first set of toggle links interposed between said first collar and said jaws, a second collar disposed outwardly of said 10 first collar and having a tapered bore, a pair of handles pivoted to said second collar to swing between retracted and operated positions, a second set of toggle links interposed between said handles and said first collar, a sleeve disposed about said standard and nested within the bore 15 of said second collar, said sleeve having radially directed circumferentially spaced openings, a ball disposed in each of said openings between the second collar bore wall and said standard, means normally biasing said second collar and said sleeve to a position effective to 20 wedge said balls into gripping engagement with said standard, a second sleeve disposed about said standard and nested within the bore of said first collar, said second sleeve having radially directed circumferentially spaced openings, a ball disposed in each of said openings 25 adapted when engaged by the bore wall to be wedged into gripping engagement with said standard, said second sleeve being shiftable relative to the first collar upon movement of said handles toward retracted position, said toggle links applying force in the movement of said 30 handles to operated position to said jaws to effect movement of said jaws toward closed position while said first collar is moved along said standard towards said plate, said toggle links also applying force upon movement of said handles to retracted position to said second 35 collar for moving it toward said first collar, and means operative to terminate the wedging of all of the balls against the said standard in response to said jaws attaining fully closed position, thereby releasing said collars so that upon subsequent transmission of force thereto by 40 said links upon movement to retracted position of said handles both collars and their associated sleeves are moved away from said plate to restore the jaws to fully open position.

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