

Aug. 5, 1958

E. C. KRADOSKA

2,845,887

LOCK SEAM UNROLLING MACHINE

Filed April 15, 1955

4 Sheets-Sheet 1

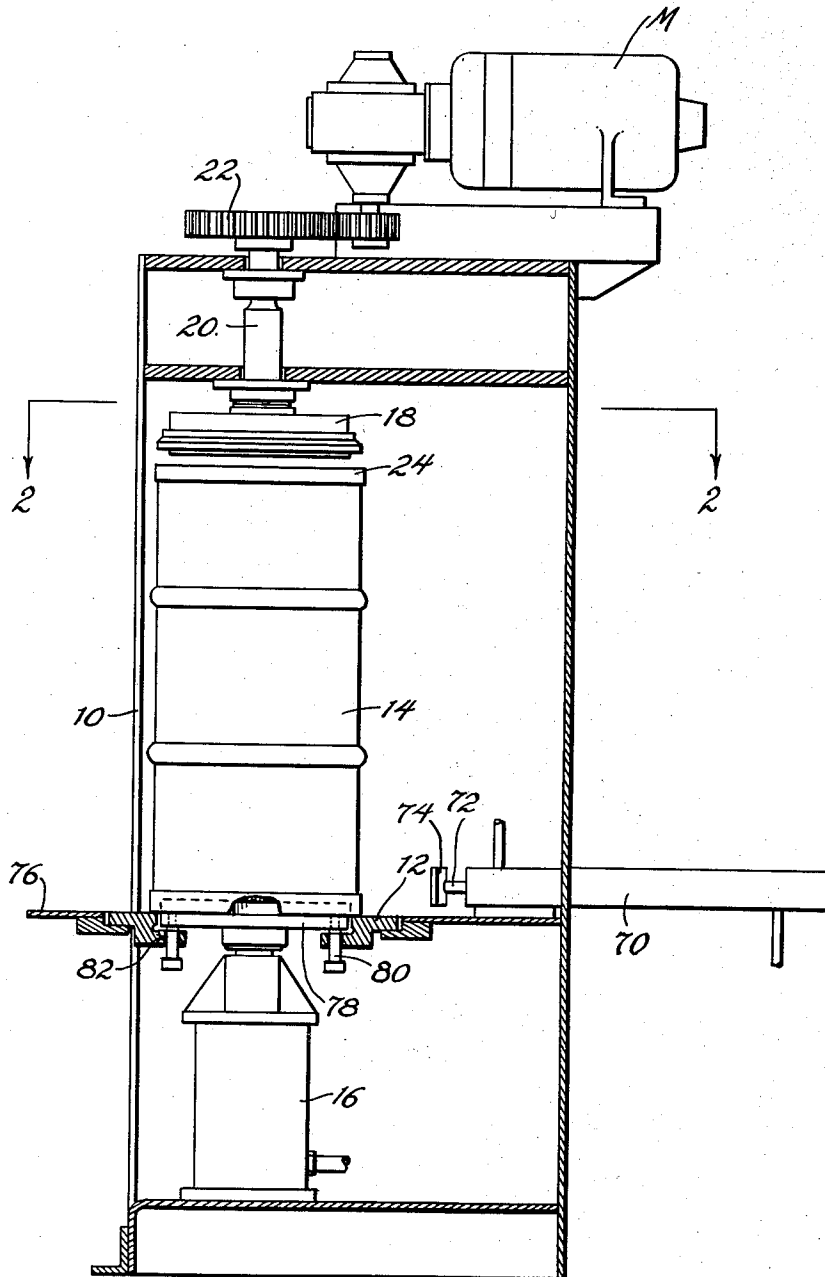


Fig. 1.

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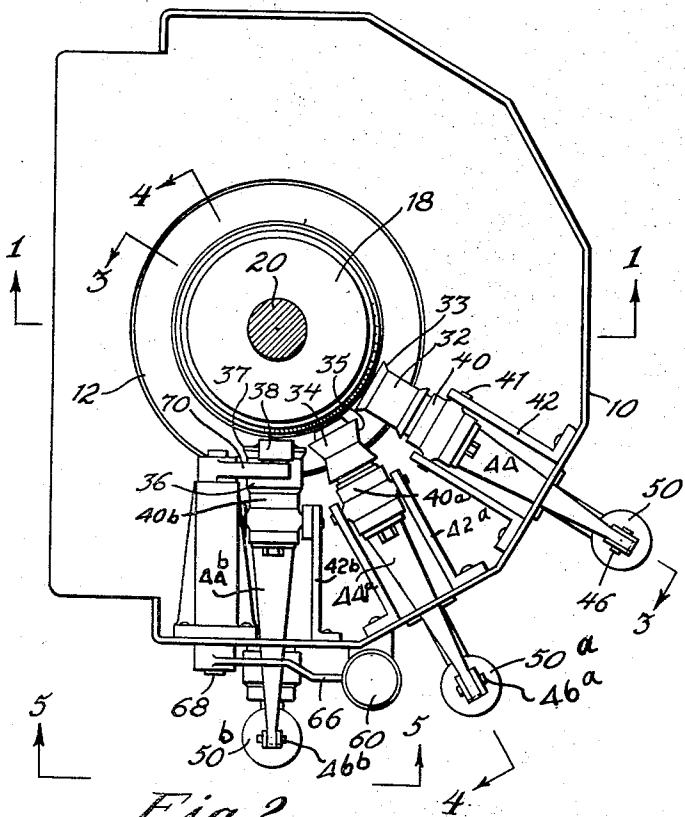


Fig. 2.

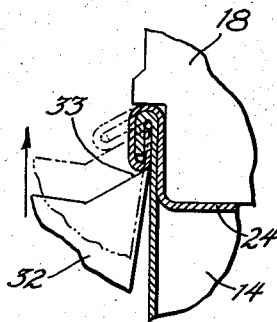


Fig. 7.

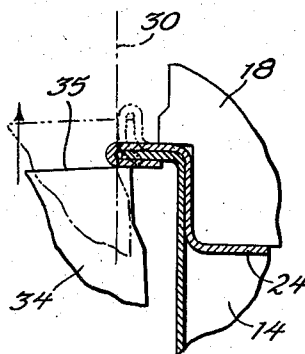


Fig. 8.

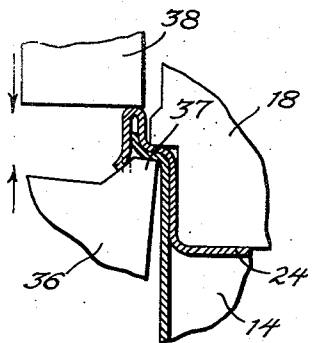


Fig. 9.

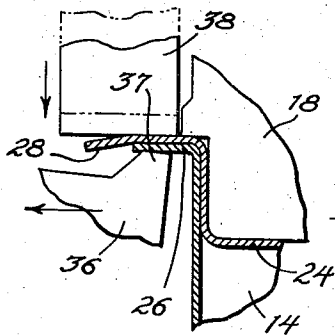


Fig. 10.

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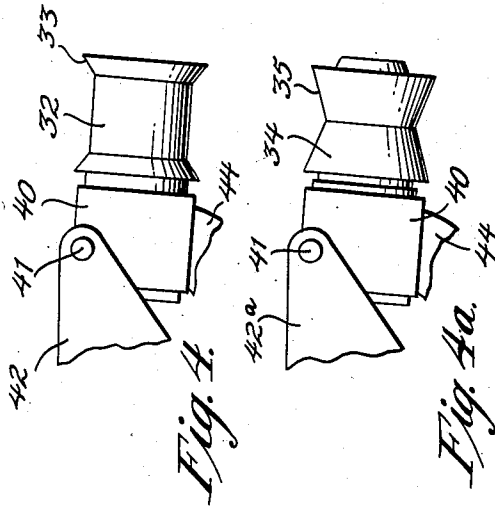
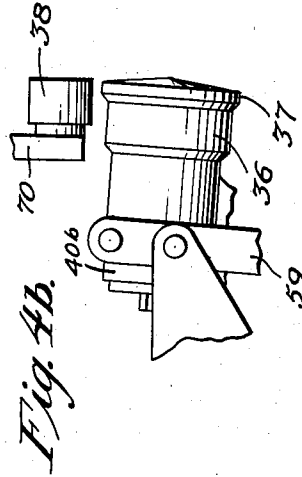
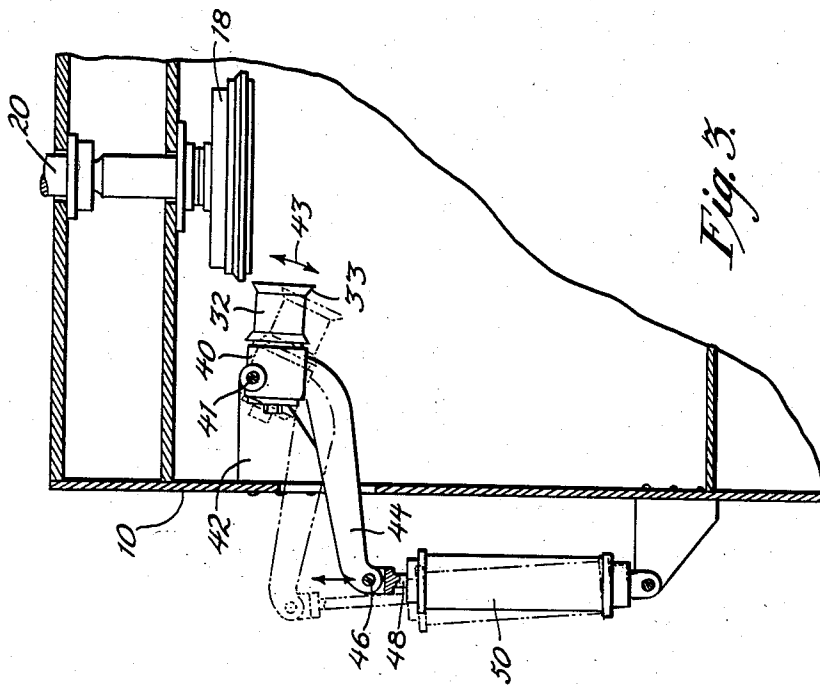
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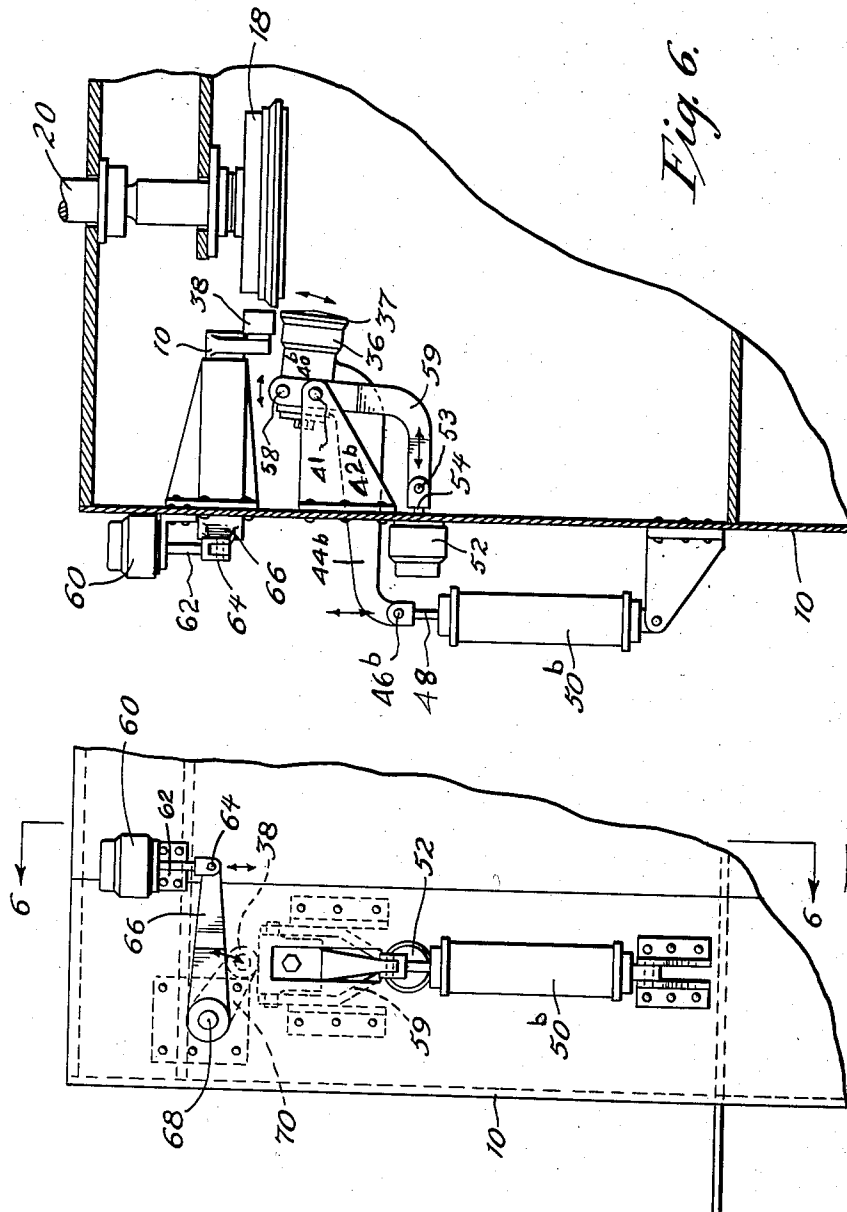
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4 Sheets-Sheet 4



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LOCK SEAM UNROLLING MACHINE

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Application April 15, 1955, Serial No. 501,670

3 Claims. (Cl. 113—1)

Steel drums of the type used for storage, or for shipment of oils, greases, and other materials are formed of a cylindrical open ended body and each of the open ends of the body is closed by means of a head which is clamped onto the end of the drum. In order to prevent leakage and contamination, a tight seal must be provided between the head and the end of the drum. In fact the seal must measure up to rigid specifications before the drum is considered acceptable for unrestricted use. One practical and approved form of seal is produced by rolling a flange on the edge of the head with a flange on the rim of the drum to form a chine which encompasses the end of the drum and tightly clamps the head to the end of the drum.

Drums of this type are relatively expensive and therefore it is the practice, after a drum has been emptied, to clean it, de-dent it, and otherwise recondition it for re-use. Indeed, there is a substantial industry devoted to the cleaning and reconditioning of steel drums. But, to render a drum acceptable for general, or unrestricted use, it must be capable of being re-sealed in the original approved manner. This means that the flanges of the head and of the drum must be re-rolled to form the lock seam originally produced when a new drum was first filled and sealed.

To this end it has heretofore been proposed to remove the head from an end of a drum by unrolling, or unfolding, the chine, as shown, for example, in the Huddleston Patent No. 1,319,395, of October 21, 1919. However, in this patent, and in other arrangements of which I am aware, the folded lock seam is only partially unrolled and, to complete the separation of the head from the end of the drum, that portion of the flange of the head which extends beyond, and which in the completed lock seam enfolds, the corresponding flange on the end of the drum, is cut off instead of being unrolled. See cutter 35 in Fig. 12 of the Huddleston Patent 1,319,395.

A drum so opened can be reclosed with the same head after a fashion but, because a portion of the flange of the head is cut off, it is impossible to produce a lock seam like that which was produced for the initial closing of a new drum. But, unless a drum can be reclosed in the original, approved manner, it will not be acceptable for unrestricted re-use and its value is correspondingly reduced.

It is therefore the object of my invention to produce an improved machine and method for removing a head from either end of a drum whereby the lock seams which clamp the heads to the ends of the drum are wholly unrolled and flattened to their original conditions, so that the flanges of the head and of the drum may be re-rolled to re-produce the original approved lock seam. This makes the drum available for unrestricted re-use, the same as a new drum, and extends the life of the drum with corresponding savings in terms of money, as well as in terms of metal consumption.

A further object of the invention is to produce an improved apparatus whereby the complete unrolling of the lock seams is carried out wholly automatically.

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The nature of the invention and the manner of its operation will be understood from the following specification and the accompanying drawings in which:

Fig. 1 is a view, partly in vertical section and partly in elevation taken on line 1—1 on Fig. 2 and showing an apparatus for carrying out my invention.

Fig. 2 is an enlarged, sectional view taken on line 2—2 on Fig. 1.

Fig. 3 is an enlarged, fragmentary view taken on line 3—3, on Figure 2.

Figs. 4, 4a and 4b are elevational views of the various rolls used in carrying out the invention.

Fig. 5 is an enlarged, fragmentary elevational view taken on line 5—5 on Fig. 2.

Fig. 6 is a view looking in the direction of line 6—6 on Fig. 5.

Figs. 7, 8, 9 and 10 are enlarged, fragmentary sectional views showing the successive method steps followed in carrying out the invention.

In the drawings only the barest essentials of structure which are necessary for a proper understanding of the invention have been shown.

An apparatus of this type includes a housing 10, a vertically movable platform 12 for supporting a drum 14, and an air cylinder 16 for raising the drum into engagement with a rotary forming die 18. The die 18 is carried by a shaft 20 and is driven by motor M through gears 22.

As shown in Fig. 10, a conventional drum is provided with a flange 26 and a conventional head 24 is provided with a flange 28. When the open end of a drum is closed by a head 24, flanges 26 and 28 abut and are rolled together to form a chine which clamps the head to the end of the drum as shown in solid lines in Fig. 7. When so rolled flanges 26 and 28 are tightly nested and tightly embrace the end of the drum to clamp the head onto the end of the drum.

As above stated, it has been the conventional practice to unfold, or unroll, the lock seam thus formed from the solid line position of Fig. 7 to the solid line position of Fig. 8 and then to cut off flange 28 along broken line 30 in Fig. 8. This shortening of flange 28 makes it impossible to reproduce the lock seam of Fig. 7 and hence correspondingly reduces the value of the drum. According to my invention, I provide an improved method of, and apparatus for, wholly unrolling the lock seam, as shown in Figs. 8, 9 and 10, whereby the head is removed intact and whereby the original chine of Fig. 7 may be reproduced when it is desired to re-close and re-seal the drum.

To carry out my invention I use roll 32 to perform the first step which consists in moving the chine to the position shown in broken lines in Fig. 7; I next use roll 34 to carry out the second step which consists in moving the chine to the position shown in broken lines in Fig. 8, and finally use rolls 36 and 38 to carry out the operations shown in Figs. 9 and 10 and flatten out both flanges completely.

Because rolls 32 must enter between the bottom rounded edge of the lock seam and the adjacent wall of the drum, this roll has a relatively high taper and presents a relatively thin edge 33; because roll 34 must engage the inclined surface presented by the lock seam as shown by the broken line in Fig. 7, this roll is provided with a slanted surface 35 which corresponds, generally, to the slant of the lock seam so as to cause the major portion of the surface 35 of roll 34 to engage a major portion of the area of the lock seam, and because roll 36 must move the outer wall of the lock seam from the vertical position of Fig. 9 to the horizontal position of Fig. 10, this roll is provided with a cylindrical lip 37 adapted to enter between the outer wall of the lock seam and the wall of the drum, and is mounted for movement

toward and away from the drum. The upward thrust of rolls 32 and 34 is resisted by forming die 18 and the upward thrust of roll 36 is additionally resisted by roll 38. Rolls 32 and 34 are carried by castings 40 and 40a which are pivoted at 41 to brackets 42 and 42a which are fixedly carried by housing 10. Castings 40 and 40a are fixedly carried by the ends of yokes 44 and 44a the other ends of which are pivoted at 46 and 46a to the piston rods 48 of double acting air cylinders 50 and 50a. By this arrangement, when air under pressure is introduced into the upper end of air cylinder, 50, for example, its piston 48 moves down to the solid line position of Fig. 3, and tilts roll 32 to its upper solid line position of Fig. 3. This upward movement of edge 33 of rotating roll 32 gradually unrolls the lock seam from the solid to the broken line position of Fig. 7. When air is introduced into the lower end of cylinder 50, its piston rod 48 moves up and tilts roll 32 to the broken line position of Fig. 3 in which it is out of engagement with the lock seam and out of the path of movement of the drum. It will be understood that roll 34 is similarly actuated by air cylinder 50a to unroll the lock seam from the solid, to the broken, line positions of Fig. 8.

Roll 36 is carried by casting 40b which is pivoted at 41 to bracket 42b which is fixedly carried by housing 10. Casting 40b is fixedly carried at one end of yoke 44b the other end of which is pivoted at 46b to piston rod 48 of air cylinder 50b. When the piston of cylinder 50b moves up, roll 36 is tilted to its lower, out of the way position, and vice versa, the same as roll 32 in Fig. 3. Casting 40b is also pivoted at 58 to one end of a yoke 59 which is pivoted at 41, to bracket 42b. The other end of yoke 59 is pivoted at 53 to the piston rod 54 of a double acting cylinder 52. When air under pressure is introduced into cylinder 52 in a direction to move piston rod 54 inwardly of the cylinder, yoke 59 rocks in clockwise direction about pivot 41 and roll 36 is moved toward the drum, or to the position of Fig. 9. When this air is exhausted and air under pressure is introduced into cylinder 52 in a direction to move piston rod 54 outwardly of the cylinder, yoke 59 rocks in counter-clockwise direction about pivot 41 and roll 36 is moved away from the drum or from the position of Fig. 9 to the position of Fig. 10 so as to straighten out flanges 26 and 28.

Roll 38 is moved downwardly so as to resist the thrust of roll 36 during the flange straightening operation shown in Figs. 9 and 10 and is retracted to an upper, out of the way position by a double acting air cylinder 60 which is carried by the housing and the piston 62 of which is pivoted at 64 to a bell crank 66 which is pivoted at 68 to the housing 10, and the arm 70 of which carries roll 38. When air under pressure is introduced into cylinder 60 in a direction to move piston rod 62 downwardly, as viewed in Figs. 5 and 6, bell crank 66 rocks in clockwise direction and roll 38 is moved down to the effective, solid line position of Fig. 10. When this air is exhausted and air under pressure is introduced into cylinder 60 to move piston rod 62 upwardly relative to its cylinder, bell crank 66 rocks in counter-clockwise direction and roll 38 is moved to the upper broken line position of Fig. 10 in which it is out of engagement with the now straight flanges 26 and 28.

Air cylinders 16, 50, 50a, 50b, 52 and 60 may be manually operated in the required order or they may be hooked up to a central control mechanism which is set in motion by means of a single switch or lever and which trips or triggers the various rolls automatically. One such control mechanism is disclosed, albeit for another type of operation, in my co-pending application Serial No. 462,745, of October 18, 1954, entitled Bead Forming and Re-Rolling Machine, now Patent No. 2,811,192. But, since no claim to an automatic control mechanism is being made in this application, the same is not shown nor described.

The operation is as follows:

A drum to be opened is placed on platform 12, air is supplied to air cylinder 16 to raise the drum into engagement with forming die 18 and motor M is energized. Air is next supplied to cylinder 50 which operates roll 32 to move this roll from the broken to the solid line position of Fig. 3 so as to unroll the lock seam from the solid to the broken line position of Fig. 7. Air is next supplied to this cylinder in a direction to move roll 32 to its lower, broken line position of Fig. 3. Simultaneously air is supplied to the cylinder 50a which operates roll 34 in the same manner to cause this roll to unroll the lock seam from the solid to the broken line position of Fig. 8. Air is next admitted to cylinder 50a in a direction to move roll 34 to its lower, out of the way position. In connection with this operation it only need be pointed out that the inclination of the surface 35 of roll 34 is such as to abut the major area of the inclined surface of the lock seam so as to prevent the edge of the roll from cutting or denting the lock seam. Air is next supplied to cylinder 52 to move roll 36 toward the drum and air is supplied to cylinder 50a to move roll 36 to its upper position or to the position of Fig. 9. Air is supplied to cylinder 60 to move roll 38 to its lower, solid line position in Fig. 10. Air is next supplied to cylinder 52 in a direction to move roll 36 from right to left or from the position of Fig. 9 to the position of Fig. 10. This lateral movement of roll 36 and the resistance of roll 38 straightens out flanges 26 and 28 as shown in Fig. 10. Next, air is supplied to cylinder 60 to move roll 38 upwardly and to cylinder 50b to tilt roll 36 to the broken line position of Fig. 3. Finally, air is exhausted from cylinder 16 to lower platform 12 for the removal of the opened drum and for the reception of another drum to be opened in the same manner.

While I have described the operation as performed on one end of a drum, it will be understood that the same operation can be carried at the other end and that both ends of the drum may be operated on simultaneously.

In a preferred embodiment I may use an automatic ejector for pushing a drum off platform 12. Such ejector may take the form of a double acting cylinder 70, the piston rod 72 of which carries an annular shoe 74. When air is admitted to the right hand end of cylinder 70, its piston is moved outwardly of the cylinder to push drum 14 off platform 12 and when air is admitted to the left hand end of cylinder 70 its piston is retracted to an out of the way position.

The use of the automatic rejector makes it necessary that the surface of platform 12 be flush with the surface of bed plate 76. To this end I provide the piston of air cylinder 16 with a plate 78 which, when air cylinder 16 is energized rises upwardly in the usual recess in the bottom of the drum 14 or to the broken line position of Fig. 1. This serves to center the drum and to guide plate 78 and to permit it to move up without, for the present, moving the platform 12 with it, I provide plate 78 with bolts 80 which slide freely in openings 82 formed in the depressed periphery of platform 12. The length of the bolts is such that, before plate 78 engages the bottom of the drum, the heads of the bolts will engage the underside of platform 12 so that further upward movement of the piston of air cylinder 16 will cause platform 12 to move upward jointly with plate 78. In this way, lower lock seam of the drum, as viewed in Fig. 1, will be supported by platform 12, during the unrolling operation. In other words, plate 78 only enters the bottom excess of the drum to guide or center it. When cylinder 16 is exhausted plate 78 will move down to a position flush with, or below, the face of platform 12 the surface of which in turn, is flush with bed plate 76. With only its chine resting on platform 12, the drum

can be automatically pushed off by operation of air cylinder 70.

Drums of the type referred to are usually not provided with bung holes in their heads especially when the drum is to be used for heavy grease or other materials which are not easily removed. Also the interior of the drum may be corroded and in need of cleaning and repair or the head may be dented from rough usage in the field. The lock seam may initially be insufficiently tight or it may develop a leak or it may be desired to put the drum to a use for which it was not originally intended. For any one or more of these reasons, it becomes necessary to remove one or both heads of the drum and to put them back on or to replace them with new or with different heads. In other words, this is a common occurrence and because the number of drums in use is in millions, the problem facing the industry, and to which my invention supplies a practical answer is very serious.

The solution suggested in the Huddleston and similar patents is not practical because, if the flange on the head is cut off, as shown in the patent, it will not be possible properly to reseal the drum unless the end of the drum is rerolled to restore the flange to its original size. If this is done, the capacity of the drum is reduced.

By my invention as above set forth, the heads of the drum may be removed intact and they may be used for resealing the drum in the approved manner and without reducing the capacity of the drum.

The machine above described is intended for belt line, or mass production in conjunction with one conveyor for delivering drums to platform 12 and another conveyor for carrying away the drums operated on. This reduced the cost further and makes the operation practical and feasible.

What I claim is:

1. A machine for wholly unrolling a generally U-shaped lock seam of the type which engages the exterior of the end of a drum and clamps a closure to said end of said drum, said machine including a rotary die engageable with said closure and with the bight portion of said seam, a first roll engageable with the end of said seam remote from said end of said drum and cooperating with said die to move said seam to a position in which the inner wall of said seam is separated from the exterior of said drum, a second roll engageable with said inner wall of said seam and cooperating with said die for moving said seam into a position in which the outer and inner walls of said seam form an inverted U, a third roll located near one end of said seam and engageable with the bight portion of said U, and a fourth roll located near the other end of said seam and engageable with the adja-

cent end of the outer wall of said seam, means for moving said third roll towards said fourth roll to compress said seam therebetween, and means for moving said fourth roll in a direction at an angle to the direction of movement of said third roll to unroll said seam to a position in which the walls of said seam are wholly flattened out and are parallel to each other.

2. The structure recited in claim 1 in which said first roll has a sharply tapered edge for insertion between the inner wall of the seam and the body of the drum and in which said fourth roll has a narrow substantially cylindrical end portion insertible between the outer limb of the U and the body of the drum.

3. A machine for wholly unrolling a vertically disposed generally U-shaped lock seam which engages the exterior of the end of a drum and clamps a closure to said end of said drum, said machine including a rotary die engageable with said closure and with the bight portion of said lock seam, a rotary platform for receiving said drum, means for moving said platform towards said die, to press said closure and said lock seam against said die, a first roll having a tapered edge and mounted for movement toward and away from said lock seam, means for moving said first roll toward said seam in a manner to force said edge of said first roll between the body of said drum and said seam to pry said seam to a first position in which its inner wall is spaced from the body of said drum, a second roll mounted for movement towards, and away from, said lock seam and having a surface engageable with the inner surface of the lock seam when the latter is in its first position, means for moving said second roll in a direction to engage said seam and to move it to a second substantially vertical position in which the inner and outer walls of said seam form an inverted U, a third roll vertically movable into and out of engagement with the bight portion of said inverted U, a fourth roll mounted for movement toward and away from said drum and engageable with the underside of said seam, said fourth roll having a narrow cylindrical end portion insertible between the outer limb of said U and the body of said drum, means for moving said fourth roll into engagement with the lower end of said U, and means for moving said fourth roll horizontally away from said drum while simultaneously moving said third roll vertically toward said bight portion to flatten out the walls of said seam.

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1,319,395	Huddleston	Oct. 21, 1919