Oct. 28, 1958 C. D. SMITH 2,857,722

BAR WRAPPING MACHINE

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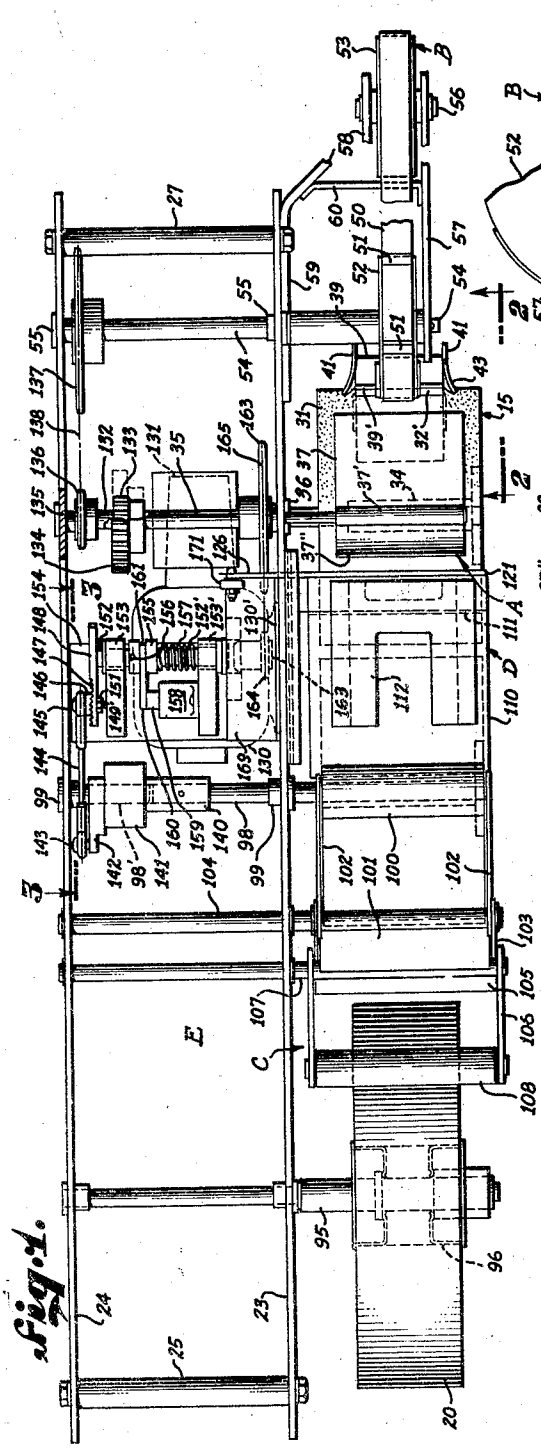


Fig. 1.

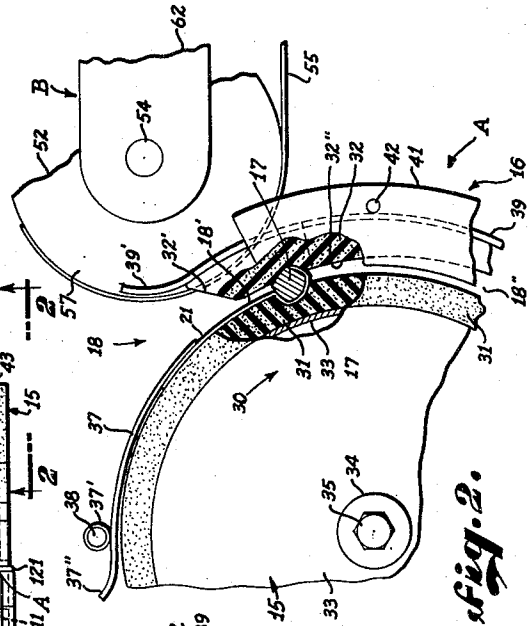


Fig. 2.

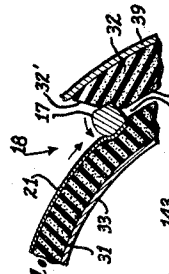


Fig. 2a.

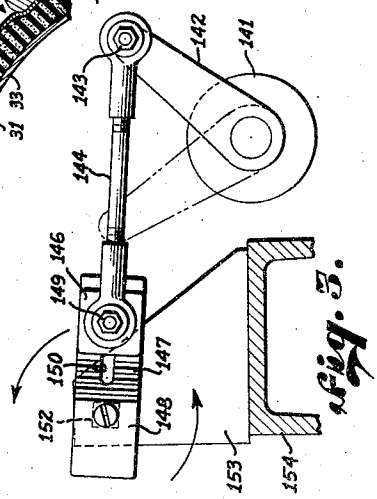


Fig. 3.

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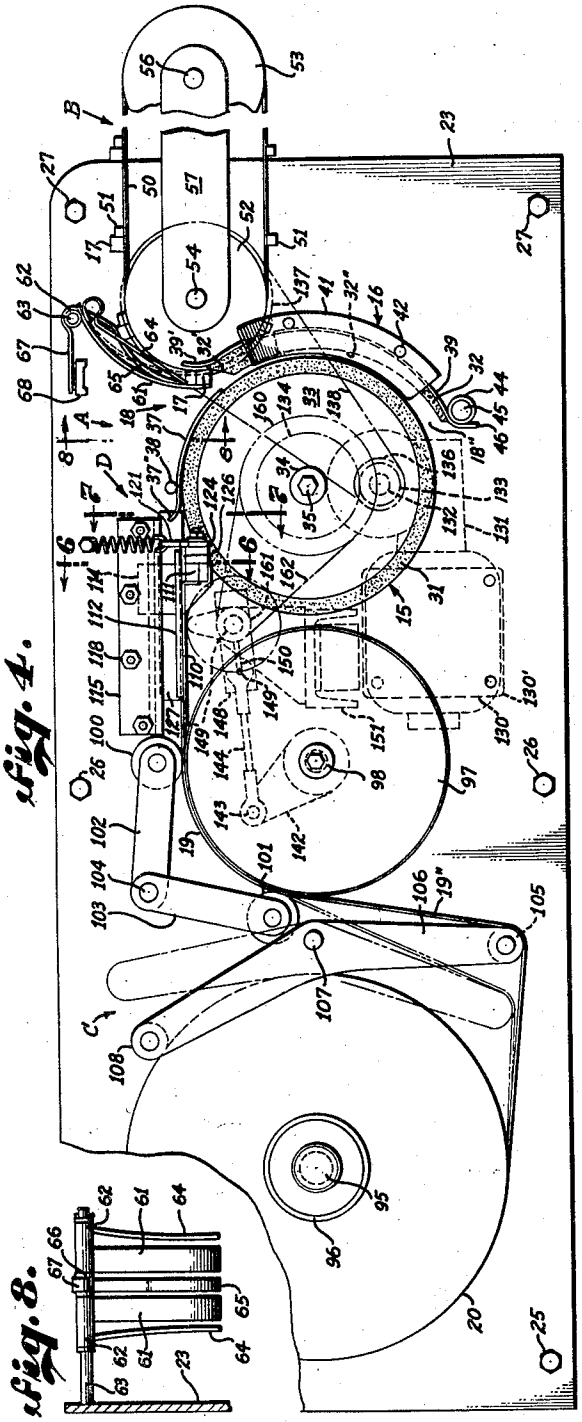


Fig. 4.

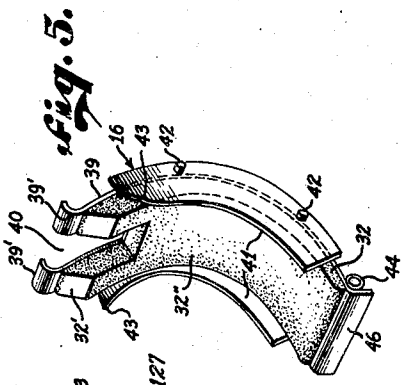


Fig. 5.

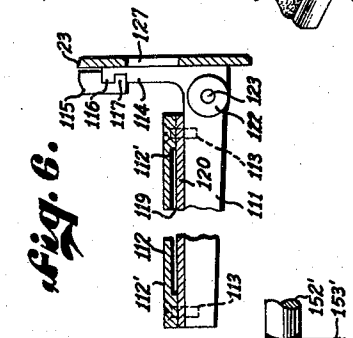


Fig. 6.

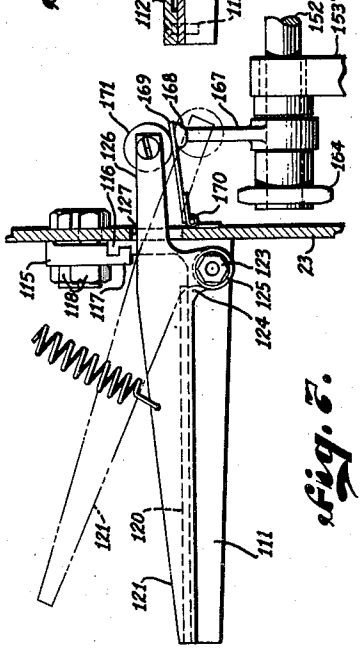


Fig. 7.

Fig. 8.

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BAR WRAPPING MACHINE

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Fig. 10.

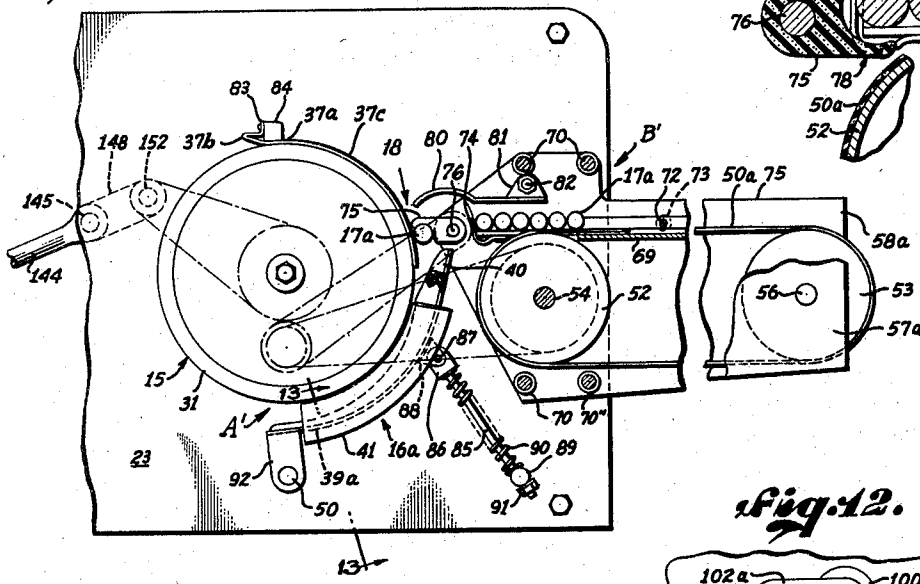


Fig. 11.

Fig. 12.

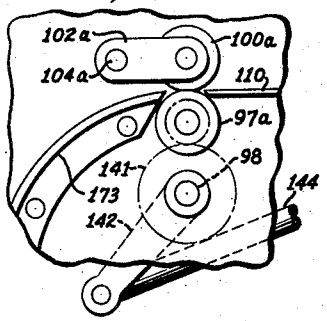
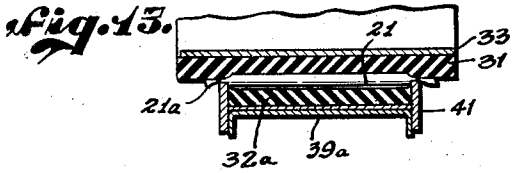


Fig. 9.

Fig. 13.



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United States Patent Office 2,857,722 Patented Oct. 28, 1958

2,857,722

BAR WRAPPING MACHINE

Cloyd D. Smith, Los Angeles, Calif.

Application December 20, 1954, Serial No. 476,459

9 Claims. (Cl. 53—57)

This invention relates to automatic wrapping machinery and has as its general object to provide a machine for wrapping bars, such as candy bars, in wrappers of foil or equivalent sheet material of relatively now elasticity, adapted to remain in clinging relation to the bar without requiring adhesive or heating sealing. More specifically the invention contemplates a machine particularly adaptable for inexpensive wrapping of small bars of substantially symmetrical polygonal cross section, in a wrapping operation in which the bar is rolled up into the wrapper and the ends of the wrapper are tucked against the ends of the bar with a crimping or twisting action which mechanically locks the wrapper in place so as to dispense with the necessity for adhesive sealing of the wrapper.

The machine of my invention is adapted to the wrapping of any bar ranging from cylindrical to prismatic form, and will accommodate some variance in cross sectional area from one end to the other of the bar, so long as the cross section is fairly symmetrical along its longitudinal axis around which the bar is rotated to provide the rolling action whereby the wrapper is rolled around the bar.

More specifically, the invention provides a mechanism wherein the bar is dropped by gravity into a pass defined between converging wrapping members of soft, yieldable, cushioning texture, operated so as to have relative peripheral movement between the respective members, such that the bar is moved downwardly between the two wrapping members and rotated about its longitudinal axis which is maintained horizontal; the wrapping members yielding to allow the bar to sink into the respective members while it is being rolled between them in association with a wrapper which is thereby rolled around the bar; the bar being discharged from the lower extremity of the pass, in a fully wrapped condition.

Another object of the invention is to provide such a wrapping machine wherein a wrapper is moved from one direction into the above mentioned pass and a bar is moved from an opposite direction into the pass, in synchronized relation to the movement of the wrapper, such that the bar is deposited on top of the wrapper near the forward end thereof; whereby the rolling action operates simultaneously on the bar and the wrapper so as to roll the bar into the wrapper.

Another object of the invention is to provide an improved mechanism for automatically crimping or twisting the end portions of a wrapper projecting beyond a bar around which the wrapper is being rolled, the rolling and crimping operation taking place simultaneously.

Other objects will become apparent in the ensuing specifications and appended drawings in which:

Fig. 1 is a plan view of a wrapping machine embodying my invention;

Fig. 2 is a detail view, on a larger scale, showing the operation of the wrapping unit, constituting that portion of the machine indicated by the line 2—2 of Fig. 1;

Fig. 2a is a fragmentary sectional view of the wrapping unit in a different position of operation;

Fig. 3 is a detail of a portion of the drive mechanism for the wrapper feed unit, viewed as indicated by the line 3—3 of Fig. 1;

Fig. 4 is a front side view of the machine;

Fig. 5 is a perspective view of the wrapper shoe and crimping part of the wrapping unit;

Fig. 6 is a detail sectional view taken on line 6—6 of Fig. 4;

Fig. 7 is a detail sectional view, taken as indicated by the lines 7—7 of Fig. 4 and illustrating the wrapper cut-off knife unit;

Fig. 8 is a detail view taken on the line 8—8 of Fig. 4;

Fig. 9 is a plan view of a machine embodying a modified form of the invention;

Fig. 10 is a fragmentary front elevation of the same, partially in section, taken as indicated by line 10—10 of Fig. 9;

Fig. 11 is a detail sectional view of the transposing device thereof;

Fig. 12 is a fragmentary front side elevation of another portion of the machine of Fig. 10; and

Fig. 13 is a detail sectional view of the same, taken on the line 13—13 of Fig. 10.

BRIEF GENERAL DESCRIPTION OF THE MACHINE

The bar wrapping machine of my invention, in either the early form of Figs. 1–8, or the preferred form of Figs. 9–13, comprises, in general, the following main operating units and mechanisms:

A. Wrapping unit (preferred form is indicated at A' in Fig. 10) comprising, in general, a rotatable wrapping drum 15 (Fig. 2) and a stationary wrapping and end crimping shoe 16 (Fig. 5);

B. A bar feed unit (preferred form is indicated at B' in Fig. 10) which is arranged to deposit a succession of bars 17 into a pass 18 defined by converging walls of wrapping drum 15 and shoe 16;

C. A wrapper feed mechanism (preferred form is indicated at C' in Fig. 10) which operates to unroll a continuous ribbon 19 of wrapper material from a roll 20 and to feed the same to

D. A wrapper cut-off knife unit (Fig. 7), which operates to sever the ribbon 19 into short lengths constituting wrappers 21 (Fig. 2) which are fed across the top of wrapper drum 15 and into the wrapping pass 18 in synchronized relation to the deposit of bars 17 in pass 18;

E. Drive mechanism for coordinated drive of all of the above mentioned units, such drive mechanism being referred to collectively by the letter E (Fig. 1).

Having outlined the basic components of the machine, I will describe in detail each of these components and its relation to the others. Before doing so, reference will be made to the frame structure of the machine, which comprises generally a pair of spaced longitudinally extending vertical mounting plates 23 and 24 joined and held in spaced relation by spacer bars 25, 26, and 27. The drive mechanism E, is disposed in the space between mounting plates 23 and 24 and the operating units A, B, C and D are disposed forwardly of the front plate 23, as indicated in the plan view of Fig. 1. The operating units A, B, C and D are mounted primarily upon a series of shafts which are mounted in plates 23, 24, and project through and forwardly from plate 23, as will be more specifically described hereinafter. Any suitable bracket means (not shown) may be utilized for anchoring the mounting plates 23 and 24 to a selected supporting bed or table.

A. *Wrapping unit*

As previously indicated, the wrapping unit A includes, in general, the rotating drum **15** and the stationary shoe **16**. Drum **15** rotates in the direction indicated by arrow **30**. It is provided with a rim **31** of soft, yieldable material such as sponge rubber. The shoe **16** is likewise provided with a facing **32** of similar material. Shoe **16** has an arcuate longitudinal contour, which provides facing **32**, on its inner face **32''**, with a concave curvature conforming substantially with the convex curvature of the periphery of rim **31**.

The upper end of facing **32** is bevelled, at **32''**, to deflect the bars into a narrow throat portion **18'** of pass **18**, where the wrapping commences. Shoe **16** is slightly eccentric with reference to drum **15**, so that beyond narrowed throat **18'**, pass **18** has a gradually widening portion **18''** defined between the arcuate convex and concave faces of rim **31** and facing **32** respectively.

The width of throat **18'** is considerably less than the diameter of bar **17**, and may be as narrow as one third of said diameter, though wide enough for bar **17** to readily enter the throat **18'**, compressing and sinking into the rim **31** and facing **32** as it does so. The material of rim **31** and facing **32** is sufficiently soft and yieldable to be thus indented by the bar **17** to a depth of one-third its diameter, without crushing or damaging the bar. The movement of the bar **17** from the position indicated in dotted lines, where it is initially deposited in the wider mouth of pass **18**, into the throat **18'**, is brought about by the downward movement of the adjacent portion of rim **31** which frictionally engages the bar and rolls it downwardly against the bevelled upper end face **32'** of facing **32** and then against the concave inner face **32''** of facing **32**.

The rim **31** also functions as a carrier for a wrapper **21** which has been fed thereto from the wrapper feeding unit C in synchronized relation to the deposit of bar **17** in pass **18**, such that the forward end of wrapper **21** will have arrived substantially at the point where bar **17** first contacts the rim **31** (Fig. 2*a*), at the same time that the bar makes such contact, whereby the bar will be deposited upon the forward end of the advancing wrapper **21**, and the wrapper will be interposed beneath the bar as the bar is rolled downwardly into throat **18'**. As the bar indents the facing **31** in its movement into throat **18'**, it will correspondingly indent the forward end portion of wrapper **21**, as indicated in Fig. 2*a*, with a forming action which conforms the wrapper to the cross sectional contour of the bar and causes it to cling to the bar as the bar rotates. Thus the forward end of the wrapper will traverse the throat **18'** and make contact with the inner face **32''** of shoe facing **32**, which will press the wrapper tightly against the bar as the downward rolling movement of the bar continues (Fig. 2). In the rolling action, the bar rolls against the periphery of rim **31**, i. e., in the direction opposite to the direction **30** of rotation of the drum, so that the trailing portion of the wrapper **21**, lying against the periphery of rim **31**, will be rolled around the bar. At the same time, the bar rolls downwardly against the inner face **18''** of shoe facing **32**, the rate of such downward movement being at approximately half the peripheral speed of the drum **15**. Thus the bar is moved downwardly into the widening portion **18''** of the pass **18** until finally the fully wrapped bar is discharged from the lower end of the pass (at the lower end of shoe **16**—Fig. 4).

The downward widening of portion **18''** of the pass **18** accommodates the increase of diameter imparted to the bar as the wrapper **21** is wrapped around it, without requiring any deepening indentation of the rim **31** and facing **32**. Drum **15** includes, in addition to the rim **31**, a drum body **33** which may be of drawn sheet metal and has a hub **34** which is fixedly mounted upon a shaft **35** rotatably mounted in bearings **36** in frame plates **23**, **24** and driven by the drive mechanism E to rotate the drum **15** in timed relation to the operation of the other units.

A guide plate **37**, of arcuate contour conforming to that of the periphery of rim **31**, and with a smooth, polished underface, is closely associated with said rim, and functions to smooth the wrapper **21** snugly against the rim so that the forward end of the wrapper may pass smoothly under the bar **17** which it meets in pass **18**, without jamming against the bar, and so that the wrapper, as it is wrapped around the bar, may be smooth and free from wrinkles. Guide plate **37** is attached to a mounting sleeve **37'** which is mounted upon a stud **38** projecting forwardly from mounting plate **23**. The attachment is preferably one in which the stud **38** is fitted in sleeve **37'** with sufficient tightness to fixedly support the guide plate **37** in any position to which it may be adjusted manually, although a completely fixed, non-adjustable connection between plate **37** and stud **38** could be utilized, or the connection could be a freely pivotal one, with plate **37** balanced sufficiently to rest with the lightest possible pressure against a wrapper **21** passing thereunder. Immediately below stud **38**, the plate **37** is spaced above the periphery of drum rim **31** by a distance considerably more than the thickness of the wrapper material. The space narrows down to approximately wrapper thickness at the free end of plate **37**. The adjacent end of shoe **37** is curved upwardly as at **37''** to define, with the periphery of drum **15**, a flaring throat to receive the forward end of the wrapper ribbon **19** as it meets the periphery of the drum **15**, and to guide the ribbon into the narrowing space between the plate **37** and the drum.

The shoe **16** includes, in addition to the facing **32**, an arcuate back plate **39** which has upper end portions **39'** of reverse curvature projecting above the upper end of facing **32** as indicated in Fig. 2. The upper end portions **39'** and the upper end portion of facing **32** are bifurcated to provide a notch **40** (Fig. 5) which receives the cylindrical periphery of the discharge end portion of bar feed unit B, with the respective furcations lying on respective sides thereof. A relatively wide receiving mouth of pass **18** is defined between the periphery of drum **15** on one side and the peripheral end portion of feed unit B, together with end portions **39'** of back plate **39** on the other side.

Shoe **16** also includes a pair of crimping flanges **41**, secured to the respective side edges of back plate **39**, as by means of cross bars **42** welded or otherwise secured to the outer face of back plate **39'** and having end portions projecting laterally therefrom, extending through flanges **41** and headed or riveted or welded thereto. The upper ends of crimping flanges **41** are flared outwardly, to provide ears **43**. The flared ears **43** engage the projecting end portions of the wrapper as it commences to roll around the bar and start the folding or crimping of these projecting end portions against the respective ends of the bar, which crimping action is continued progressively as the bar is rolled downwardly in shoe **16**.

Shoe **16** has at its lower end a mounting bushing **44** by means of which the shoe is pivotally mounted on a stud **45** (Fig. 4) which is anchored in forward mounting plate **23** and projects forwardly therefrom. The lower end of back plate **39** is bent downwardly to form an apron **46** which provides a discharge shoulder over which the wrapper bars may smoothly roll into a receptacle.

B. *Bar feed unit*

The bar feed unit B of Figs. 1–6 inclusive comprises an endless conveyor belt **50** to the outer face of which are attached a series of cleats **51** against which the bars **17** are positioned by an operator feeding the machine. Conveyor **50** is suspended and travels between rollers **52**, **53**, the former being mounted upon and driven by a shaft **54** which is rotatably mounted in bearings **55** in frame plates **23**, **24**. Roller **53** is an idler roller, carried by a shaft **56** which is journalled in the end of bars **57**, **58** comprising a conveyor frame (Fig. 1). Bar **58** is in the

form of a bracket of Z-shape, including a portion 59 which is secured to frame plate 23. Frame bar 57 is a straight bar, one end of which is supported on the outer end of shaft 54, the other end being rigidly tied to bracket arm 58 as by means of a cross bar 60.

The discharge portion of conveyor belt 50 and the roller 52 are received in notch 40 of the bifurcated upper end of shoe 16 as previously indicated. Thus the upper end portions 39' of the shoe are disposed within the periphery of conveyor belt 50, so that the bars 17 will clear the extremities 39' and drop freely into pass 18. Being positioned forwardly of cleats 51, bars 17 will drop clear of the conveyor as they pass extremities 39'.

To guide the bars into pass 18, I provide guide fingers 61 (Fig. 4) the upper ends of which have eyes 62 which are pivotally mounted upon a stud 63 projecting horizontally from the front plate 23. Guide fingers 61 are of curvature normally eccentric with relation to roller 52 so as to provide a guide space of ample width at the upper extremity thereof, to freely receive the bars, and narrowing downwardly so as to restrain the bars from dropping away from feed belt 50 before reaching the lower ends of the guide fingers, at a point sufficiently within the mouth of pass 18 so that the bars will remain properly oriented with reference to the wrapping members 15 and 16 as they drop to a position for entry into throat 18'. The guide fingers 61 are therefore disposed so that their lower ends are substantially level with the upper ends of shoe surfaces 32', whereby the bars will be engaged between surfaces 32' and facing 31 almost immediately upon passing the ends of fingers 61. Fingers 61 are suspended for free-swinging movement, at an angle to the vertical, such that they rest with very light pressure against bars 17 as the latter approach their lower ends, but the pressure is sufficiently light and the inner surfaces of the fingers are highly polished to sufficient smoothness so that the fingers do not tend to adhere to the bars, to tilt them outwardly, or to damage them. As each bar is released below the tips of the fingers, the fingers will swing by gravity toward the roller 52, engaging the feed belt 50 momentarily in the position shown in dotted lines in Fig. 4. In this position, they will be engaged by the next bar prior to the point of travel thereof at which it would slide downwardly if not restrained.

Attached to fingers 61, in fixed relation thereto, are a pair of end guide fingers 64 (Fig. 8) which determine the proper positions for the respective ends of bars 17 as they enter pass 18. The end guide fingers 64 converge downwardly so as to exert a camming effect against an excessively projecting end of a bar which is displaced to one side or the other of feed belt 50, thus shifting the bar to a properly centered position.

The invention provides means for arresting the operation of the machine in the event an unoccupied position on the feed belt 50, moves beneath the guide fingers 61. Such means comprises a feeler finger 65, independently pivoted on stud 63 by means of a collar 67 and having attached thereto, in fixed relation, an actuator arm 66 for a microswitch 68. Microswitch 68 functions to arrest the operation of the machine in the event that finger 65 drops into a void created by the absence of a bar 17 from a normal position against a cleat 51. This avoids the discharge of unused wrappers into the receptacle for the wrapper bars and also avoids the possibility of an unused wrapper becoming balled up between the wrapping facings 31 and 32.

B'. *The bar feeding mechanism of Figs. 9–11*

An improved form of the bar feeding mechanism is shown in Figs. 9–11. This bar feed mechanism embodies an endless conveyor 50*a* travelling between rollers 52 and 53 but lacking the cleats 51 of Fig. 4. The bars 17*a* are arranged on conveyor belt 50*a* in side to side contact as indicated in Fig. 10. Cylindrical bars 17*a* are shown, to illustrate that the machine can handle such bars as well as prismatic bars.

Conveyor 50*a* travels in a casing comprising side members 57*a* and 58*a*, joined integrally by a web 69 and supported by bars 70 extending between mounting plates 24, 23, projecting through and forwardly of the latter. Spacer sleeves 70' and 70'', on bars 70, may be utilized for spacing members 57*a* and 58*a* from plate 23 and from one another. The upper stretch of conveyor belt 50*a* is flanked by a pair of rails 71 of angle iron, each including a horizontal flange 71' having an upper face lying in a plane just slightly below that of said upper stretch of belt 50*a*. Web 69 is attached to flanges 71'. The rails 71 are suitably supported as by means of tie elements 72 (e. g., bolts) projecting through frame bars 57, 58, secured to the vertical flanges of rails 71, and are laterally positioned by spacer washers 73. Rails 71 have discharge end portions projecting beyond roller 52 in tangential relation to the periphery thereof. The ends of bars 17*a* project over the horizontal flanges 71' of rails 71 and are guided between the vertical flanges of the rails. As the bars 17*a* are carried forwardly toward pass 18 by the conveyor belt 50*a*, they will reach a point, slightly beyond the axis of roller 52, where the downward slope of conveyor belt 50*a* will cause them to be deposited upon rail flanges 71', and the forward push of the bars which are being moved forwardly by conveyor belt 50*a* will advance the several bars which thus become supported upon the discharge ends of rails 71, to a discharge point from which they are transferred into pass 18. This discharge point is determined by engagement of bars 17*a* against L-shaped stop fingers 74 which are secured, as at 74', to the undersides of flanges 71' and project upwardly adjacent the ends of the rails 71, as shown.

The transfer of the bars from rails 71 into pass 18 in exactly timed relation to the movement of wrapper 21, is effected by a rotatable feeder hand 75 which is mounted on the outer end of a shaft 76 journalled in bearings 77 in frame plates 23, 24 and projecting through plate 23. Feeder hand 75 rotates counterclockwise, as viewed from the front (Fig. 11) and as indicated by arrow 78. Its path of movement is such that it will pick up the bars 17*a* successively as they reach the ends of rails 71, will swing each bar upwardly and over the pass 18 and thence straight downwardly into the pass. Fig. 10 illustrates the position of the hand as the bar commences to drop away from it into the pass 18. Fig. 11 illustrates the position of the hand as it picks up the subsequent bar from the ends of rails 71. The width of the hand is slightly less than the spacing between rail flanges 71' so that it clears them as it moves upwardly between the rails. The tip of the hand 75 just clears the periphery of roller 52 as it swings upwardly.

The speed of travel of feed belt 50*a* is faster than the rate at which free space is made available at the ends of rails 71 by the removal of bars 17*a* therefrom. Consequently, as long as bars are being deposited on belt 50*a* by the operator, a number of bars will be backed up against stop fingers 74, eliminating the possibility of the occurrence of a missing bar in the succession of bars being fed into pass 18. The automatic declutching of the wrapper feed, including feeler and micro-switch parts 61—68, and solenoid-clutch parts 155—160 of Fig. 1, is dispensed with in the preferred form of the invention.

The hand 75 is of soft rubber or equivalent synthetic resin plastic material, to cushion the impact thereof against the bar 17*a* upon initial contact therewith, the hand 75 flexing slightly to absorb the inertia of the bar 17*a* as it is picked up by the hand. This achieves two important advantages namely (*a*) avoiding damage to the bar by the impact and (*b*) avoiding the bar being tossed upwardly by the shock of the impact with a possible dislocation of the bar from its proper position.

The hand 75 has an offset shoulder 79 against which

the bar 17a is cradled as the hand engages beneath the bar. The yielding character of the hand provides the further advantage (c) of avoiding the bar being crushed against the shoulder 79 by the advancing movement of the column of bars pushing it forwardly, during the interval that the bar is being lifted out of the path of the succeeding bar.

Instead of the guide mechanism 61—64 of Fig. 4, the invention provides, in Fig. 10, a guide apron 80 having ears 81 attached, by pivotal connections 82, to plates 57a, 58a, so that the apron may be adjusted, with a swinging movement, to a proper spacing of its arcuate free end portion with reference to the path of rotation of the tip of hand 75. To avoid obscuring the parts shown in Fig. 9, the apron 80 is omitted from that figure.

The arcuate end portion of apron 80 is slightly eccentric with reference to the axis of shaft 76, the space between the two gradually widening toward the discharge end thereof.

A. *The wrapper mechanism of Figs. 9 and 10*

In the wrapper unit of Figs. 9 and 10, the wrapper guide plate 37a has an upwardly inclined forward portion 37b which is bent back upon itself and then upwardly to provide a flange 83 by means of which it is attached to the forward side of a beam 84 secured to plate 23 and projecting forwardly therefrom. Guide plate 37a is preferably shaped with substantial areas thereof cut out to provide several spaced, resilient fingers 37c.

Fig. 10 illustrates an improvement in the wrapper shoe unit, designated 16a. In this improvement, a combined adjustable and yieldable support is provided for the upper end of shoe 16a, said support comprising a strut 85 having at its upper end a head 86 pivoted at 87 to a bracket 88 attached to the rear side of back plate 39a near the upper end thereof. The lower end of strut 85 passes through an opening in a stud 89 which is anchored in frame plate 23, and is axially slidable therein. A coil spring 90 is confined under compression between stud 89 and head 86 and surrounds strut 85. The lower end of strut 85 is threaded and is provided with a nut 91 threaded thereon and engaging, through a washer, the lower side of stud 89. By advancing nut 91 on strut 85, the upper end of shoe 16a may be drawn away from drum 15. By backing off nut 91, spring 90 is permitted to expand, moving the upper end of shoe 16a closer to drum 15. In all positions of adjustment, the upper end of shoe 16a is yieldingly supported by coil spring 90, and may yield away from drum 15 in the event of congestion developing between the shoe and the drum, thus minimizing the damage that can occur from such congestion.

Fig. 10 also illustrates a slightly revised mounting for the lower end of the shoe, in the form of laterally spaced ears 92 formed integrally with and bent downwardly from the lower end of back plate 39a, the ears 92 being pivoted on stud 50.

C. *Wrapper feed mechanism—Figs. 1–7*

The wrapper feed mechanism comprises a spindle 95, mounted in frame plate 23, 24 and projecting through and forwardly of plate 23 to provide a rotatable support for a reel 96 carrying the roll 20 of wrapper ribbon.

Between roll 20 and wrapper drum 15 is a wrapper feed roll 97 which is secured to and actuated by a shaft 98. The shaft 98 is journalled in bearings 99 in mounting plates 23, 24. The wrapper ribbon 19 passes over the upper side of feed roll 97 and is maintained in snug engagement with approximately a 90° arc of the periphery thereof by means of pressure rollers 100 and 101 which are carried by pairs of arms 102, 103, all pivoted on a common pivot stud 104 mounted in plates 24, 23, extending through the latter and projecting forwardly thereof. Rollers 100 and 101 rest by gravity against the ribbon 19 passing over feed roll 97, and provide sufficient frictional engagement between the ribbon and the feed roll so that when the latter is rotated, it will advance the ribbon, unreeling it from roll 20.

Means, presently to be described, are provided for rotating feed roll 97 intermittently, each advancing movement being of such extent as to feed the proper length of ribbon material forwardly, to provide one wrapper.

As the ribbon is thus advanced by feed roll 97, a majority or all the length thereof required for one wrapper is provided for by taking up a slack portion 19'' which extends between the roll 20 and feed roll 97, maintained in that condition by an idler roller 105 carried between the lower ends of a pair of bell cranks 106 pivoted on a stud 107 which is mounted in plates 24, 23, projecting through and forwardly of the latter. Between the upper ends of bell cranks 106 is another idler roller 108 which is adapted to engage the periphery of roll 20 at a limit position of swinging movement of bell crank 106. This limit position will vary as the diameter of roll 20 decreases. Bell crank 106 tends to rotate counterclockwise from the position shown in Fig. 4, so as to move idler roller 105 away from the roll 20. During advancing movement of feed roll 97, the pull of ribbon 19, shortening the slack portion thereof 19'', causes roller 105 to swing toward roll 20, thus cushioning the inertia load of the roll 20 as applied to ribbon 19 in resisting the advancing movement thereof, and applying the tension of ribbon 19 gradually to roll 20, though the gravitational loading of roller 105 resisting the movement thereof toward roll 20. As the feed roll 97 reaches its limit of advancing movement, the idler roller 105 will gradually swing away from roll 20 toward its normal position shown in full lines, and idler roller 108 will contact the periphery of roll 20 to brake the rotation of the latter.

Between feed roll 97 and wrapping drum 15 is a guide bed 110, which may be of sheet metal, and secured by means of a downturned flange at its forward end, to a supporting beam 111 projecting forwardly from plate 23, in a horizontal position. Bed 110 lies in a plane substantially tangent to the peripheries of feed roll 97 and drum 15 at the upper extremities thereof, whereby a section of ribbon 19 may be guided smoothly from feed roll 97 across the gap between that roll and drum 15 and meet the periphery of drum 15 in tangency thereto, beneath guide part 37''. Between the latter and guide bed 110 is a cut-off shear which will presently be described. For restraining the ribbon from moving upwardly from guide bed 110 in response to any air currents contacting the same, the invention preferably utilizes a hold-down plate 112 having thickened marginal portions 112' (Fig. 6) secured to bed 110, the plate 112 being supported primarily by attachment thereof to beam 111, as by means of screws 113.

Beam 111 may comprise the horizontal arm of a bracket 114 which is supported for horizontal sliding adjustment in a rail 115. Such sliding connection may comprise interfitting tongue and track members 116, 117 on the respective bracket 114 and rail 115 respectively, with bracket 114 bearing flatly against the forward face of plate 23. Rail 115 is secured in any suitable manner to plate 23, as by means of bolts 118. Defined between cover plate 12 and guide bed 110 is a shallow horizontal space 119 through which ribbon 19 travels (Fig. 6).

The horizontally adjustable connection between bracket 114 and rail 116 provides adjustment for wrappers of varying length, in the adjustment, with reference to drum 15, of the position of the wrapper cut-off mechanism which will now be described.

C'. *Wrapper feed mechanism of Figs. 9–12*

Fig. 12 illustrates the modified wrapper feed mechanism which may be embodied in the mechanism of Figs. 9–11 or in the apparatus of Figs. 1–7, as desired. In this modified feed, the large diameter feed roll 97 is dispensed with, and in its place there is provided a relatively small diameter feed roll 97a together with a fixed

guide plate 173 of approximately 90° arcuate curvature, around which the wrapper ribbon 19 slides as it passes upwardly from swinging take-up roller 105 (Fig. 4) the upper end of guide plate 173 being tangent to the horizontal plane of guide plate 110, to which the top of roller 97*a* is also tangent. Guide plates 173 and 110 approach fairly closely to the periphery of rolls 97*a* on opposite sides thereof, as indicated. The hold-down roller 100*a*, swingingly carried by a pair of arms 102*a* pivoted on a stud 104*a*, engages the ribbon immediately above feed roller 97*a*, to provide sufficient traction for the feed roller 97*a*.

D. *Wrapper cut-off mechanism*

Secured to the upper face of bracket beam 111 and projecting toward drum 15 is a horizontal shear plate 120, the free edge of which is sharpened to provide a cutting edge. Cooperating with this cutting edge is a shear blade 121 (Fig. 7) which is mounted for oscillating movement in a vertical plane adjoining said cutting edge. To this end, the bracket 114 may have a boss 122 with a pivot stud 123 received through an aperture in an arm 124 extending downwardly from shear plate 121, with a nut 125 threaded onto stud 123 and confining the arm 124 against the end face of boss 122. Shear blade 121 has a tail lever 126 which extends through a slot 127 in mounting plate 23. Slot 127 is of sufficient length to allow the adjustment of bracket 114 (together with the shear blade 121 carried thereby) substantially the length of rail 116. In such adjustment, bolts 118 are loosened to allow the bracket 114 to be slid to a new position of adjustment, and are then tightened to clamp the bracket 114 against plate 23 in the new position of adjustment.

Adjustment of the cut-off mechanism provides for adjustment to wrappers of different lengths, with the wrapper in each instance being cut off in a position in which its forward end has the same location with reference to the ends of guide fingers 37 and therefore the same location with reference to the bar 17 when it meets the bar 17 in pass 18, regardless of the length of the wrapper.

E. *Drive mechanism*

The ensuing description of the drive mechanism will be broken into sections relating to the respective units A–D inclusive. In general, the drive mechanism utilizes an electric motor 130 from which the drive proceeds to the various units. Motor 130 is mounted on the inner face of plate 23 by means of the motor base 130'.

(*a*) *Wrapping drum drive.*—Reduction gearing 131 at one end of motor 130 drives from motor 130, at reduced speed, a counter-shaft 132, on which is mounted a spur pinion 133. Pinion 133 drives a spur gear 134 which is secured to the drive shaft 35 of drum 15. Countershaft 132 (shown in Fig. 1 by the breakaway of drum shaft 35) extends between plates 23, 24 and is mounted in suitable bearings 135 therein. Countershaft 132 rotates counterclockwise, thus rotating drum 15 clockwise.

Drum 15 is operated continuously so long as motor 130 rotates.

(*b*) Bar feed drive.—Bar feed mechanism B is driven from a sprocket pinion 136, secured on counter-shaft 132, an aligned sprocket 137 secured on shaft 54, and a drive chain 138 travelling over sprockets 136 and 137. Thus feed belt 50 is driven counterclockwise.

(*c*) Wrapper feed drive.—Secured to feed roll shaft 98 (Fig. 1) is the hub 140 of a conventional one way drive clutch 141 of the over-running clutch type, having a drive shaft 98' which drives through the clutch 141 to shaft 98 in the direction indicated by arrow 30 of Fig. 2, the clutch 141 releasing so as to break the drive when shaft 98' oscillates in the opposite direction. Shaft 98' has secured thereto a crank arm 142 having a crank pin 143 to which is linked one end of a pitman 144 (Fig. 3). The other end of pitman 144 is linked to a trunnion 145 carried by a fitting 146 having a toothed face for intermeshing engagement with a rack face 147 on a crank arm 148. Fitting 146 has a threaded stud 149 (which may be a reduced extension of trunnion 145) projecting through a slot 150 in crank arm 148 and carrying a nut 151 which may be cinched against arm 148 to lock fitting 146 in any selected position of adjustment.

Crank arm 148 is secured to one end of a short shaft 152 which is journalled in a bracket 153 carried by and projecting upwardly from a beam 154 extending between mounting plates 23, 24. To the other end of shaft 152 is secured a collar 155 which has a bore rotatably receiving an end of a countershaft 152' which is journalled in a bracket 153' carried by beam 154. Collar 155 has an end notch which normally receives a pin mount in shaft 152', this notch and pin combination providing a jaw clutch connection between collar 155 and shaft 152', referred to generally by the numeral 156. A coil spring 157, surrounding shaft 152' and engaged under compression between bracket 153' and collar 155, yieldingly tends to enclutch this connection by sliding collar 155 on shaft 152 to which it has a keyed connection 155' (Fig. 9). The jaw clutch 156 is thus normally maintained engaged. It is disengaged by the operation of a solenoid 158 having an armature 159 which carries a fork 160 engaged in an annular groove 161 in collar 155 whereby, when solenoid 158 is energized, armature 159 is drawn into the solenoid, moving collar 155 against the resistance of coil spring 157.

The electric circuit of the machine includes a branch circuit, controlled by normally closed micro-switch 68, for energizing solenoid 158 when micro-switch 68 is closed. Switch 68 is maintained open by switch actuator arm 67 so long as a continuous succession of bars 17 pass beneath feeler finger 65, and closes when finger 65 drops into a void adjacent a cleat 51 where no bar 17 is present, thereby causing solenoid 158 to release clutch 156 through one revolution of shaft 152', and consequently during this one cycle of operation of the machine, there will be no wrapper feeding movement of roll 97.

In the normal operation of the machine, each cycle of operation (each complete rotation of countershaft 152') will produce one oscillation of drive shaft 98' of over-running clutch 141, advancing roll 97 a distance corresponding to the length of one wrapper, and leaving the roll in the position to which it has been advanced while shaft 98' oscillates back to a starting position with over-running clutch 141 released. The length of stroke imparted to feed roll 97 may be adjusted by changing the point of connection of fitting 146 to crank arm 148, a corresponding adjustment in the position of cut-off shear mechanism 120—126 being correspondingly made in the manner hereinbefore described.

Countershaft 152' is driven from a sprocket 162 secured on the shaft 35, a sprocket pinion 163 secured on shaft 152', and a chain 164 travelling over these sprockets.

(*d*) *Cut-off drive.*—Cut-off mechanism D is actuated by a cam 165 (Fig. 7) on countershaft 152', engaging a wear lug 166 of hard plastic material which is secured to the underside of a swinging arm 167 hinged at 168 to plate 23. A roller 169, pivotally attached to the inner end of tail lever 126 of shear blade 121, rides on arm 167. Cam 165 may be of any suitable peripheral contour to produce a fairly uniform oscillating movement of arm 167 and shear blade 121, and the peripheral configuration of the cam is therefore not shown in detail.

E'. *Modified drive mechanism of Figs. 9–12*

In the apparatus of Figs. 9–12, the feed belt drive 136 137, 138; and the drive 160, 161, 162, to the crank 148, are the same as in the apparatus of Figs. 1–7, with the exception that the solenoid-clutch mechanism 155—160 is omitted, and the crank shaft 152 extends uninterrupted-

ly through bearing brackets 153, 153' to sprocket pinion 163 to which it is directly secured.

The drive to the wrapper feed mechanism, including crank 148, over-running clutch 141 and intervening parts 142—146, is indicated in Figs. 10 and 12 and is the same as in Figs. 1–7.

The drive ratio to roller 97*a* is properly related to the diameter of the roller so as to provide the required range of wrapper length. Adjustment of wrapper length within this range is provided for by the adjustment mechanism 146—151 of Fig. 1 which, being the same as in that figure, is not illustrated in Fig. 9.

In addition to the drive mechanism described above, the preferred appartus includes a drive to transfer hand 75, including spockets 168 and 169 on shaft 76 and countershaft 132, and a chain 170 travelling between these sprockets. The drive ratio is so related to that of the wrapper feed mechanism as to produce one rotation of transfer hand 75 for each oscillatory cycle and advancing movement of wrapper feed drum 97.

The mechanism of Figs. 9–12 is the preferred form of invention.

This form of the invention not only provides the improvements in bar feed and wrapper feed mechanism, hereinbefore described in sections B' and A', but also a modified end-wrap function, involving the projection of the end portions 21*a* of wrapper 21 across the edges of side members 41 of the wrapping unit, and the twisting of end portions 21*a* between said edges and the cushion facing 31 of feed roll 15, as indicated in Fig. 13.

I claim:

1. In a bar wrapping machine: complementary wrapping units, one being a substantially stationary shoe having a concave arcuate facing member, and the other having an endless peripheral facing member including a convex portion embraced by said arcuate facing member, opposed thereto, spaced therefrom to define an arcuate pass narrower than the diameter of the bar to be wrapped, and having a bar receiving mouth at its upper end, said facing members being of frictional material for non-slip engagement of the bar and wrapper; means for depositing a bar in said mouth; means for actuating said other unit to effect downward movement of said convex portion of its peripheral facing member in said pass; and means for depositing a wrapper on said peripheral facing member in timed relation to the entry of the bar into said mouth, such that said bar, in entering said mouth, will come to rest between the upper end of said shoe and the advance end of said wrapper to start the wrapping and will then be drawn downwardly through the pass by the movement of the peripheral facing member and thereby will be rolled between the latter and said shoe so as to draw the wrapper around itself and become fully wrapped therein, said bar depositing means comprising an endless belt conveyor having spaced cleats against which successive bars may be positioned, said conveyor including a convex portion moving downwardly above and toward said mouth in generally tangent relation to said pass; arcuate guide means roughly conforming to and spaced from said downwardly moving portion of the conveyor and spaced substantially the height of said cleats, to guide the bars into said mouth; electric motor means for driving said conveyor; a cut-out switch in the circuit for energizing said motor; and a feeler finger pivotally mounted for engagement by said bars as they pass between the conveyor and said arcuate guide means, and adapted to drop toward the conveyor in the event of passage of a cleat having no bar occupying the space ahead thereof, and to thereby cause said switch to interrupt the motor circuit.

2. In a bar wrapping machine: complementary wrapping units, one being a substantially stationary shoe having a concave arcuate facing member, and the other having an endless peripheral facing member, including a convex portion embraced by said arcuate facing member, opposed thereto, spaced therefrom to define an arcuate pass narrower than the diameter of the bar to be wrapped, and having a bar receiving mouth at its upper end, said facing members being of frictional material for non-slip engagement of the bar and wrapper; means for depositing a bar in said mouth; means for actuating said other unit to effect downward movement of said convex portion of its peripheral facing member in said pass; and means for depositing a wrapper on said peripheral facing member in timed relation to the entry of the bar into said mouth, such that said bar, in entering said mouth, will come to rest between the upper end of said shoe and the advance end of said wrapper to start the wrapping and will then be drawn downwardly through the pass by the movement of the peripheral facing member and thereby will be rolled between the latter and said shoe so as to draw the wrapper around itself and become fully wrapped therein; said bar depositing means comprising an endless belt conveyor having on its upper side an uninterrupted bar supporting surface including a portion travelling horizontally toward said mouth and a succeeding portion travelling downwardly past said mouth and clearing the upper portion of said shoe; means providing a substantially horizontal extension bar supporting surface operative as a continuation of said horizontal portion of the conveyor surface and extending beyond said downwardly travelling portion of the latter; stop means for arresting the advance bar of a group of bars on said extension supporting surface at the terminal end of the latter; a transfer hand rotatable on a horizontal axis above the upper end of said shoe, transverse to the path of movement of said conveyor and substantially at the level of said horizontally travelling portion thereof; and means for rotating said hand in a path wherein its free end portion will move upwardly past the projecting end of said extension surface, lifting said advance bar therefrom and conveying it with an overhead swinging movement to a point where it will move downwardly into said mouth.

3. A bar wrapping machine as defined in claim 2, wherein said hand is of a soft, resilient, flexible, yielding nature to cushion the impact thereof against said advance bar so that the hand will maintain control of the bar during the transfer of the bar into said mouth.

4. A bar wrapping machine as defined in claim 3, wherein said hand has an arcuate finger portion providing a concave seat for cradling the bar as it is picked up, and a shoulder between said finger portion and the axis of rotation of the hand, said shoulder, at the point of pick-up of the bar, extending upwardly from said seat to provide a stop to yielding restrict the advancing movement of the bar.

5. In a bar wrapping machine especially adapted for wrapping frangible bars of generally polygonal cross-section: complementary wrapping units, one being a substantially stationary shoe having a concave arcuate facing member, and the other having an endless peripheral facing member including a convex portion embraced by said arcuate facing member, opposed thereto, spaced therefrom to define an arcuate pass narrower than the diameter of the bar to be wrapped, and having a bar receiving mouth at its upper end, at least one of said facing members being of soft resilient material adapted to yield under light pressure of a bar thereagainst so as to receive a substantial portion of the cross-section of the bar within its face outline; means for depositing a bar in said mouth; means for actuating said other unit to effect downward movement of said convex portion of its facing member in said pass; means for depositing a wrapper on said peripheral facing member in timed relation to the entry of the bar into said mouth, such that said bar, in entering said mouth, will come to rest between the upper end of said shoe and forward end of said wrapper, will then indent said forward end of the wrapper into said yieldable facing member so as to start the wrapping, will then be drawn downwardly through the pass by the movement of said pe-

ripheral facing member and thereby will be rolled between the latter and said shoe so as to draw the wrapper around itself and become fully wrapped therein; a pivot mounting the lower end of said shoe for swinging movement of the upper end of the shoe outwardly from said peripheral facing member; means yieldingly supporting said upper end and urging it toward the peripheral facing member; and means adjustably limiting the movement of said upper end toward the peripheral facing member.

6. In a bar wrapping machine especially adapted for wrapping frangible bars of generally polygonal cross-section: complementary wrapping units, one being a substantially stationary shoe having a concave arcuate facing member, and the other having an endless peripheral facing member including a convex portion embraced by said arcuate facing member, opposed thereto, spaced therefrom to define an arcuate pass narrower than the diameter of the bar to be wrapped, and having a bar receiving mouth at its upper end, at least one of said facing members being of soft resilient material adapted to yield under light pressure of a bar thereagainst so as to receive a substantial portion of the cross-section of the bar within its face outline; means for depositing a bar in said mouth; means for actuating said other unit to effect downward movement of said convex portion of its facing member in said pass; means for depositing a wrapper on said peripheral facing member in timed relation to the entry of the bar into said mouth, such that said bar, in entering said mouth, will come to rest between the upper end of said shoe and forward end of said wrapper, will then indent said forward end of the wrapper into said yieldable facing member so as to start the wrapping, will then be drawn downwardly through the pass by the movement of said peripheral facing member and thereby will be rolled between the latter and said shoe so as to draw the wrapper around itself and become fully wrapped therein; an arcuate guide having a polished, anti-frictional inner face conforming substantially to the contour of said peripheral facing member and substantially in contact therewith, said guide having a terminal end at said mouth; and means for guiding a wrapper beneath the forward end of said guide.

7. In a bar wrapping machine especially adapted for wrapping frangible bars of generally polygonal cross-section: complementary wrapping units, one being a substantially stationary shoe having a concave arcuate facing member, and the other having an endless peripheral facing member including a convex portion embraced by said arcuate facing member, opposed thereto, spaced therefrom to define an arcuate pass narrower than the diameter of the bar to be wrapped, and having a bar receiving mouth at its upper end, at least one of said facing members being of soft resilient material adapted to yield under light pressure of a bar thereagainst so as to receive a substantial portion of the cross-section of the bar within its face outline; means for depositing a bar in said mouth; means for actuating said other unit to effect downward movement of said convex portion of its facing member in said pass; means for depositing a wrapper on said peripheral facing member in timed relation to the entry of the bar into said mouth, such that said bar, in entering said mouth, will come to rest between the upper end of said shoe and forward end of said wrapper, will then indent said forward end of the wrapper into said yieldable facing member so as to start the wrapping, will then be drawn downwardly through the pass by the movement of said peripheral facing member and thereby will be rolled between the latter and said shoe so as to draw the wrapper around itself and become fully wrapped therein; an arcuate guide having a polished, anti-frictional inner face conforming substantially to the contour of said peripheral facing member and substantially in contact therewith, said guide having a terminal end at said mouth; means for guiding a wrapper beneath the forward end of said guide; means for feeding a continuous ribbon of wrapper material to said peripheral facing member; and means for intermittently severing said ribbon at a point slightly in advance of said guiding means, whereby to form an individual wrapper.

8. In a bar wrapping machine especially adapted for wrapping frangible bars of generally polygonal cross-section: complementary wrapping units, one being a substantially stationary shoe having a concave arcuate facing member, and the other having an endless peripheral facing member including a convex portion embraced by said arcuate facing member, opposed thereto, spaced therefrom to define an arcuate pass narrower than the diameter of the bar to be wrapped, and having a bar receiving mouth at its upper end, at least one of said facing members being of soft resilient material adapted to yield under light pressure of a bar thereagainst so as to receive a substantial portion of the cross-section of the bar within its face outline; means for depositing a bar in said mouth; means for actuating said other unit to effect downward movement of said convex portion of its facing member in said pass; means for depositing a wrapper on said peripheral facing member in timed relation to the entry of the bar into said mouth, such that said bar, in entering said mouth, will come to rest between the upper end of said shoe and forward end of said wrapper, will then indent said forward end of the wrapper into said yieldable facing member so as to start the wrapping, will then be drawn downwardly through the pass by the movement of said peripheral facing member and thereby will be rolled between the latter and said shoe so as to draw the wrapper around itself and become fully wrapped therein; an arcuate guide having a polished, anti-frictional inner face conforming substantially to the contour of said peripheral facing member and substantially in contact therewith, said guide having a terminal end at said mouth; the advance end of said guide being flared outwardly from said peripheral facing member to provide a pilot for a wrapper entering between the same and said guide; and a pivot disposed slightly rearwardly of said pilot, on which said guide is pivoted for adjustment away from the peripheral facing member, the body of the guide gravitating toward the latter.

9. In a bar wrapping machine especially adapted for wrapping frangible bars of non circular cross section: a wrapping drum having a curved rim facing of non-slip material; a substantially stationary wrapping shoe having a concave arcuate facing of non-slip material extending generally vertically around a portion of the periphery of said drum and spaced radially therefrom to define an arcuate pass narrower than the diameter of the bar to be wrapped at its narrowest dimension and having a bar receiving mouth at its upper end; at least one of said facings being of soft, resilient material adapted to yield under light pressure of a bar thereagainst so as to receive a substantial portion of the cross section of the bar within its face outline; means for depositing a bar to be wrapped, in said mouth; means for rotating said drum in a direction to effect downward movement of that portion of its periphery which is opposed to said shoe in said pass; and means for depositing a wrapper on said drum periphery in timed relation to the entry of the bar into said mouth, such that said bar, in entering said mouth, will come to rest between the upper end of said shoe and the advance end of said wrapper, will then indent said advance end of the wrapper into said yieldable facing so as to start the wrapping and will then be drawn downwardly through the pass by the movement of the drum and thereby will be rolled between the drum and said shoe so as to draw the wrapper around itself and become fully wrapped therein; said bar depositing means comprising an endless belt conveyor having on its upper side an uninterrupted bar supporting surface including a portion travelling hori-

zontally toward said mouth and a succeeding portion travelling downwardly past said mouth and clearing the upper portion of said shoe, means providing a substantially horizontal extension bar supporting surface operative as a continuation of said horizontal portion of the conveyor surface and extending beyond said downwardly travelling portion of the latter, stop means for arresting the advance bar of a groupp of bars on said extension supporting surface at the terminal end of the latter, a transfer hand rotatable on a horizontal axis above the upper end of said shoe, transverse to the path of movement of said conveyor and substantially at the level of said horizontally travelling portion thereof, and means for rotating said hand in a path wherein its free end portion

will move upwardly past the projecting end of said extension surface, lifting said advance bar therefrom and conveying it with an overhead swinging movement to a point where it will be deposited downwardly into said mouth, said hand being of a soft, resilient, flexible, yielding nature to cushion the impact thereof against said advance bar so that the hand will mtaintain control of the bar during the transfer of the bar into said mouth.

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