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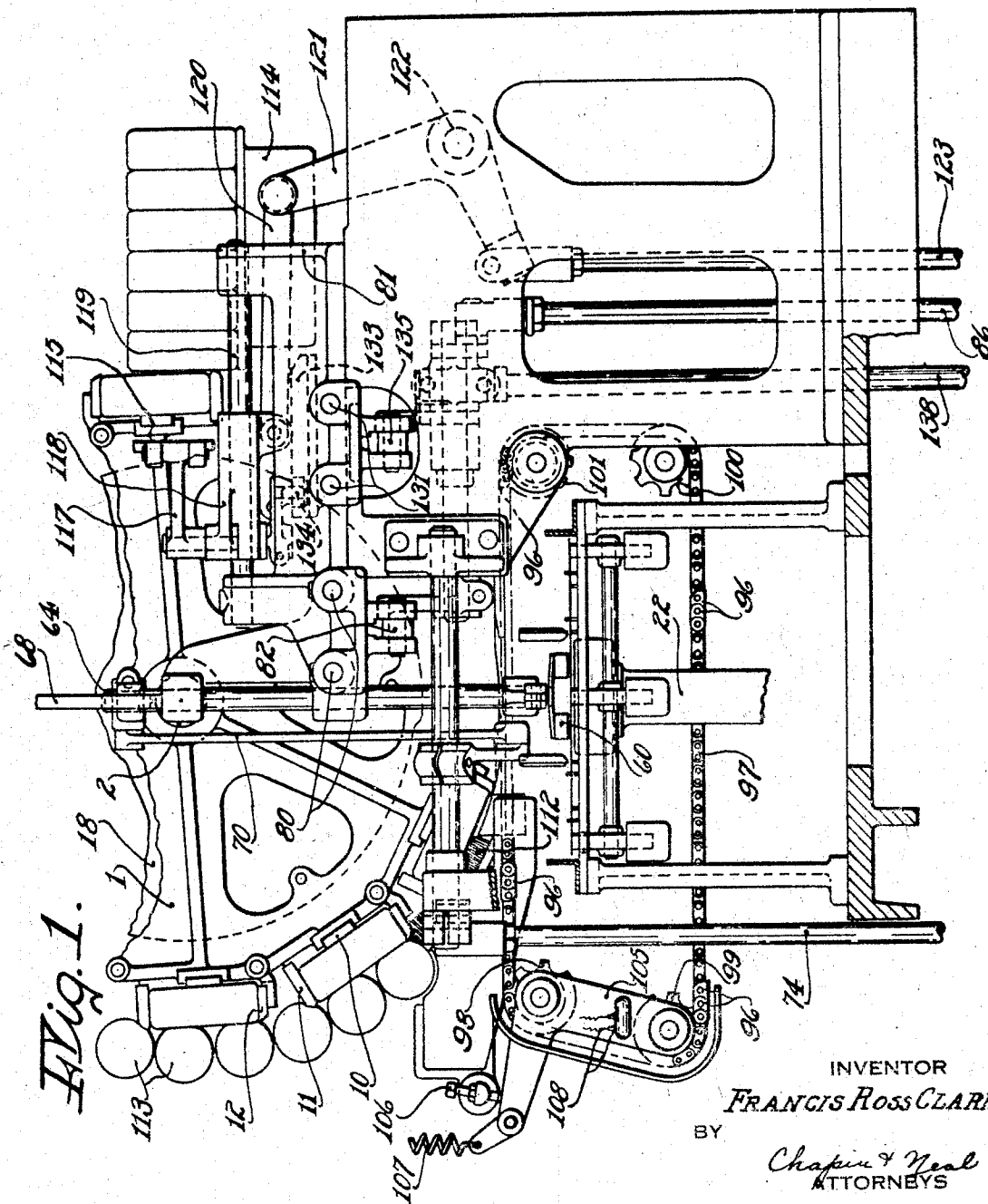
F. R. CLARK

2,304,399

BANDING MACHINE

Filed April 10, 1941

5 Sheets-Sheet 1



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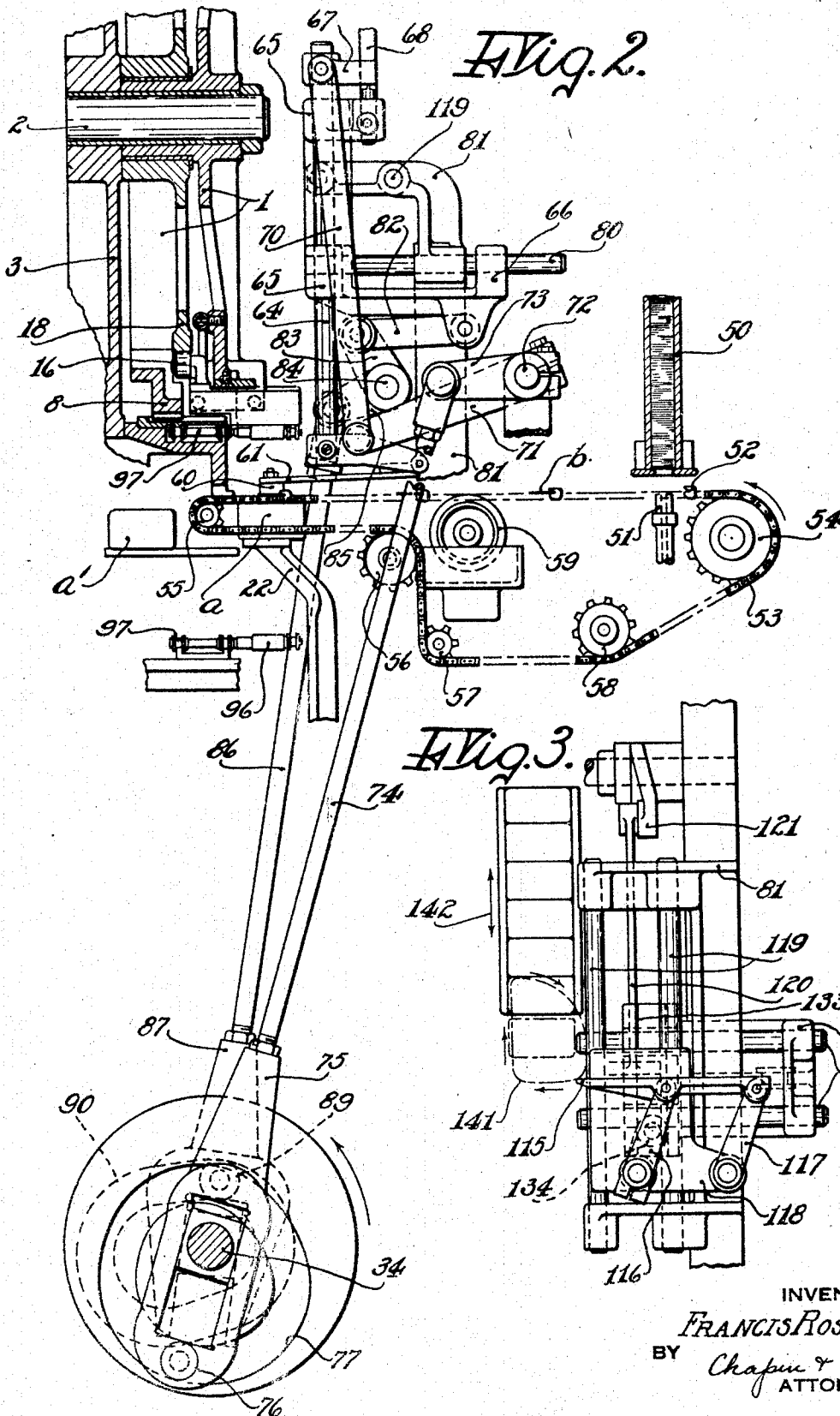
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BANDING MACHINE

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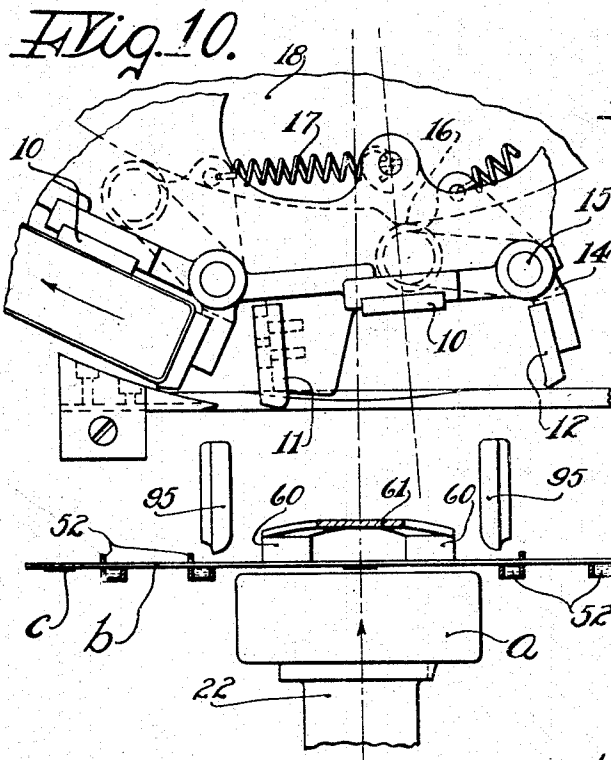
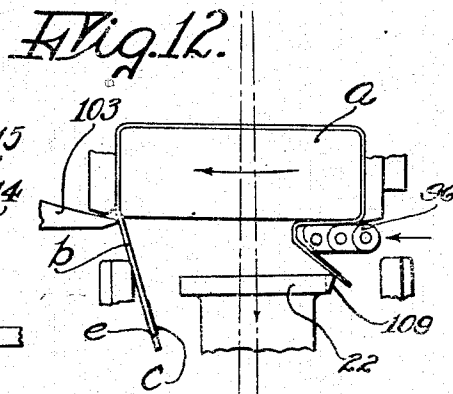
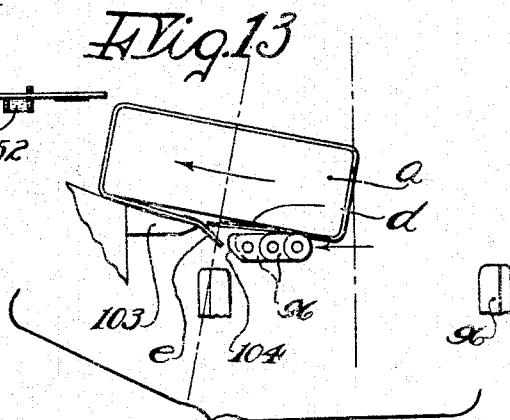
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UNITED STATES PATENT OFFICE

2,304,399

BANDING MACHINE

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Application April 10, 1941, Serial No. 387,909

13 Claims. (Cl. 216—55)

This invention relates to machines for applying to articles a band extending completely around the article and overlapped and adhesively secured at its ends. One object of the invention is to provide such a mechanism in which the output is materially increased by reason of an improved coordination between the several devices which supply and associate the band and article and those which fold the band upon the article into overlapping relation. A further object is to improve the several feeding, assembling, and folding devices. A further object is to improve the ejecting mechanism which moves the banded article from the machine. Additional objects will appear from the following description and claims.

Referring to the drawings,

Fig. 1 is a fragmentary side elevation of a machine embodying the invention;

Fig. 2 is a transverse sectional elevation showing the mechanism for feeding a band and an article into association and into the pocketed banding wheel;

Fig. 3 is a detail plan of the ejector for removing the banded article from the wheel;

Fig. 4 is a sectional elevation showing the operating mechanism for an elevator, which has been omitted from Fig. 2 for clarity;

Fig. 5 is an elevation showing the driving mechanism for the ejector shown in Fig. 3;

Figs. 6, 7, 8, and 9 are details corresponding to a portion of Fig. 2 and showing successive stages in the association of a band and an article and their delivery into the banding wheel;

Fig. 10 is a view corresponding to Fig. 7 but at right angles thereto; and

Figs. 11, 12, 13 and 14 are similar details showing successive stages in the folding and overlapping of the ends of the band.

The banding machine is built around a pocketed banding wheel 1, mounted upon a shaft 2 in a suitable frame 3 and driven intermittently by any desired mechanism. Since the particular form of intermittent drive forms no part of the present invention it has not been illustrated herein; but it is preferably constructed in accordance with the Smith Patent 2,210,734, August 6, 1940. The wheel has a body portion 4 (Fig. 8) and an overhanging portion 5 bolted to it at 6, rotatable together on the shaft 2. The body 4 is preferably provided with a peripheral gear 8 which may be coupled in any suitable way to the intermittent drive.

At periodic intervals plates 10 are secured to the overhanging part of the wheel, forming the bottom of spaced, radially opening pockets each

having a fixed side plate 11 (Fig. 10) and a movable side plate 12. The movable side plates are secured as by screws 13 (Fig. 8) to bell cranks 14 pivoted to the wheel at 15 (Fig. 10) and bearing at their ends a cam roll 16. Each roll is held by a spring 17 against a stationary disk cam 18 having its contour so formed as to close the pocket after an article has been received at a loading station, and to open it again when the wheel has turned to bring it to the discharging station.

Articles *a*, such as wrapped cakes of soap, are fed in a direction parallel to the axis of the wheel along a slotted table 20 (Fig. 7) by transporter fingers 21 preferably forming part of the wrapping machine discharge conveyor and having the usual motion in a closed path along and back below the table. The last finger of the series leaves the article upon an elevator 22 (Figs. 6 and 7) driven as will appear best from Fig. 4. The elevator is pivoted at 23 to a slide 24 vertically movable on a rod 25 carried in brackets 26 in the frame, and has a fork 27 sliding upon a guide 28 extending between the same brackets. The slide 24 is connected by a link 29 with a bell crank 30 rockable on a shaft 31 and pivoted to the stem 32 of an eccentric strap 33 surrounding an eccentric on the main cam shaft 34. Also on this shaft is a face cam 35 operating a roll 36 on a forked member 37 pivoted at 38 to a rocker 39 on shaft 31. The upper end of the rocker is coupled by a link 40 with a slide 41 running in guideways 42 suitably supported on the frame. The slide 41 bears a guideway 43 extending vertically and receiving a roll 44 carried by the elevator below the pivot 23. The eccentric and cam are so coordinated that the elevator moves in a path 45 (Fig. 6) in order to raise the article *a* into the wheel and to avoid the next advancing article *a'* as it descends.

As the article *a* is raised by the elevator it picks up a band *b* which may be fed by any suitable mechanism into position with its longest dimension perpendicular to the wheel's axis, as is best shown in Fig. 2. The bands are stored in a magazine 50 having a restricted opening through which the bands are drawn by one or more vertically reciprocable suction pickers 51 and deposited in front of pushers 52 carried by an intermittently advancing chain conveyor 53. This conveyor passes over guide sprockets 54, 55, 56, 57, and 58, one of which is driven in any suitable way in timed relation to the wrapping wheel. In their passage along the straight run between sprockets 54 and 55 the bands pass a gluing de-

vice 59 of usual form, by which the bands receive one or more stripes of adhesive to cause their overlapping ends to be secured together and if desired secured as well to the underlying wrapper when the band is folded around the article.

When the band and article come into registration above the elevator they are clamped together by a bifurcated pad 60 preferably of rubber, on the end of an arm 61 (Fig. 7) pivoted at 62 to a bracket 63 extending laterally from the lower end of a rod 64 slidable vertically in bearings 65 (Fig. 2) formed in a bracket 66. To prevent the rod from turning it has a forked projection 67 engaging a vertical guide rail 68 also carried by the bracket. A link 70 connects the upper end of the rod with an arm 71 fast on a cross shaft 72, and a second arm 73 on this shaft is joined by a link 74 with a forked member 75 bearing a roll 76 engaging a cam 77 on the shaft 34. This gives a vertical motion to the pad in timed relation to the motion of the elevator.

The rod 64 is also given a bodily movement toward and away from the wheel. For this purpose the bracket 66 slides on rods 80 mounted in a bracket 81 arising from the frame. The sliding bracket 66 is joined by a link 82 with an arm 83 fixed on a shaft 84. A second arm 85 on this shaft is coupled by a link 86 with a forked member 87 embracing the shaft 34 and having a roll 89 running in the groove 90 of a face cam. The combined action of the vertical and horizontal displacements is shown at 91 in Fig. 7. It will be seen that the pad 60 moves vertically upwardly through a wheel pocket, the plate 10 being left short to permit the pad to pass it, and then withdraws in a direction axially of the wheel to permit the latter to rotate without interference. In order that the pad 60 may make yielding contact with the article its supporting arm 61 is preferably connected to the member 63 through a compression spring 92 as shown in Fig. 7. In contrast with this motion the elevator 22 goes through a path 93 having its greater horizontal displacement near the bottom of its stroke.

The article and band are fed in directions parallel to the axis of the turret, and meet in superposed position directly under a pocket. As the article is elevated the band is draped downwardly past the article ends (Figs. 10 and 11), the folding being done by stationary plates 95. After the article has been positioned within the pocket the rear side *d* of the band is folded under the article by a folder which is constructed in general in accordance with the application for patent filed by Stephen M. Bodolay, November 4, 1940, Serial No. 364,164. In this type of folder a flexible member is caused to travel at a higher rate of speed than that of the article itself in an endless path extending in part past the article. The member is preferably formed of a plurality of interfitting segments 96 projecting laterally from endless, continuously moving chains 97 passing around sprockets 98, 99, 100, 101 (Fig. 1). Each group of segments is carried through an endless path and act as a single folder adapted to pass adjacent a package to fold a flap against it, and then to move in a divergent direction away from the package. In the present case there are four groups of segments spaced apart to form separate folders, the space between the folders permitting the elevator and article to rise to the wheel. It will be understood that each individual group of segments always acts as an individual folder, and if there are four

segment groups each group will contact and fold a flap on every fourth package. The elevator and pad 60 are mounted to retract away from the face of the wheel, or to the right as viewed in Fig. 8, while the chains 97 from which the segments 96 project are carried on guides 102 in the frame at a point in line with the periphery of the wheel. In this way interference between the elevator and pad, on the one hand, and the rear folder on the other hand is avoided. The front fold is made by a stationary folder 103 shaped to the wheel.

The operation of these folders is shown in Figs. 10 to 14. It will there appear that the rear fold is started while the wheel is still stationary, and that it continues after the wheel begins its rotation. In the present case the band is of comparatively stiff material which will fold and remain folded without pressure along its full length, so that it is unnecessary for the rear folder chains to follow a curved path conforming to the wheel. A further function of the rear folder is to block the front flap *e*, as shown in Fig. 13, so that there will be no chance of this flap getting in underneath the flap *d* instead of on top of it. Since this brings the folder into contact with the glued stripe *c* near the edge of the flap *e*, the leading segment has sharpened ribs 104 to prevent smearing. Similar ribs 109 are formed on the elevator 22 for a similar purpose (Fig. 12). As the flap *e* is folded over into position by the stationary folder 103 the segments 96 will pass under it as shown in Fig. 14.

So that the rear folders will not be broken if a misplaced article gets in their way a special arrangement is preferably made to stop the machine in such an event. For this purpose the sprocket 99 is mounted on an arm 105 pivoted about the axis of the sprocket 98 as shown in Fig. 1 and is held in normal position against a stop 106 by a spring 107. Actuated by a motion of the arm against the spring, as will occur when the segments are blocked at the entrance to the wheel (drive of the chains 97 being through sprocket 101), is a control, preferably electrical, which will stop the machine until the troublesome interference is eliminated. One manner of accomplishing this is to mount a mercury switch tube 108 on the arm as shown in Fig. 1, although other methods could be used.

Having now considered the several mechanisms which operate at the wheel loading stations, a few details of their mutual relationship and timing will be described. In Fig. 2 it will be seen that the upper and lower runs of chain 53 are brought closer together adjacent the wheel by means of the small size of sprocket 55 and the elevated position of sprocket 56 as compared with 57. This arrangement permits the chain to pass above and below the glue applying device 59, and still allows it to extend between the parallel upper and lower runs of the tucker chains 97. There are thus two chains at right angles to the other, one having both runs passing between the runs of the other. The chains 53 and their lugs 52 straddle the article, elevator, and pad 60, as is best shown in Fig. 10; so that the elevator moves up between those lugs and chains to carry the article in to the wheel. In so doing the elevator has to pass up between successive groups of segments 96. When it reaches its uppermost position a crook 110 in its stem clears the now advancing segment group, and as the elevator, as well as the pad 60, moves away from the wheel face in its downward path no interference re-

sults. The article is grasped by the closing pocket as the elevator recedes (Fig. 11) so that the rear segmental folder moves ahead under the suspended article as soon as the elevator is out of the way.

As the article is carried around by the wheel the overlapping ends of the tape are secured to each other by being pressed down by brushes 112 and by sponge rubber rolls or blocks 113. If desired the overlapped ends of the band may be further secured by a sticker or other means not forming part of the present invention. The finished article may now be discharged from the machine, which may be done at a rest station of the machine adjacent a discharge platform 114. The ejecting mechanism is shown in Figs. 1, 3, and 5. It comprises an ejector 115 mounted on links 116 and 117 pivoted on a carriage 118 to form a parallel motion linkage. The carriage 118 slides on rods 119 held in the bracket 81. A link 120 extends from the carriage to a bell crank 121 pivoted to the frame at 122 (Fig. 1) and having a link 123 extending to a second bell crank 124 (Fig. 5) pivoted on the shaft 31. This latter bell crank is coupled to the stem 126 of an eccentric strap embracing an eccentric on shaft 34.

Underneath carriage 118 is a second carriage 130 movable at right angles to it on rods 131 mounted on the bracket 81. This second carriage 130 has a slideway 133 engaging a roll 134 depending from the link 116, so that as the carriage 130 moves transversely the ejector 115 will be swung to the left or right in Fig. 3 in a manner independent of the longitudinal movement given to it by carriage 118. To give this lateral movement to carriage 130 it is coupled by a link 135 (Fig. 5) with a bell crank 136 pivoted on the shaft 84 and connected by a link 138 with a forked member 139 carrying a roll 140 engaging a cam on shaft 34.

The ejector 115 is moved by the mechanism described in a path 141 as shown in Fig. 3. It has its first movement parallel to the axis of the wheel, moving in behind an article in the pocket. For this purpose the end of the ejector is forked (not shown) to straddle the short piece 10 forming the bottom of the pocket. It then moves radially of the pocket, carrying the article onto the delivery plate 114, and finally returns to its initial position through a curved path in which it swings laterally of the wheel to clear it during the advance of the next pocket. In order that the articles need not move across a gap onto the delivery plate, and at the same time to prevent the advancing pocket from rubbing against the article previously ejected, the delivery plate is preferably mounted for reciprocation toward and away from the wheel as shown by the arrow 142 in Fig. 3 and as fully described in the Smith and Paynter Patent 1,674,026 and in the Smith and Fuller Patent 1,653,880.

What I claim is:

1. A banding device comprising conveying means constrained for movement in endless paths for advancing an article and a band respectively into registry one with another, a receiving pocket, a pusher constrained for movement in an endless path to shift registered articles and bands successively into said pocket and to clear the next succeeding article on its return stroke, and means for folding the band in overlapping relation upon the article.

2. A banding device comprising conveying means constrained for movement in endless

paths for advancing an article and a band respectively into registry one with another, an intermittently rotating pocketed wheel, a pusher constrained for movement in an endless path to shift registered articles and bands successively into pockets of said wheel and to clear the next succeeding article on its return stroke, a folder constrained for movement in an endless path adjacent the wheel for folding one end of the band against the article, and a stationary folder against which the second end of the band is carried by the rotation of the wheel to fold said second end in overlapping relation to the said end.

3. A banding device comprising conveying means constrained for movement in endless paths for advancing an article and a band respectively into registry one with another, an intermittently rotating pocketed wheel, a pusher constrained for movement in an endless path to shift registered articles and bands successively into pockets of said wheel and to clear the next succeeding article on its return stroke, a clamp holding the band upon the article during such movement, means for moving the clamp in a direction first into the pocket and then back to its initial position through a path having sufficient lateral displacement to clear the wheel during the next advancing movement thereof, and means for folding the band in overlapping relation upon the article.

4. A banding device comprising conveying means constrained for movement in endless paths for advancing an article and a band respectively into registry one with another, an intermittently rotating pocketed wheel, a pusher constrained for movement in an endless path to shift registered articles and bands successively into pockets of said wheel and to clear the next succeeding article on its return stroke, a clamp holding the band upon the article during such movement, means for moving the clamp in a direction first into the pocket and then back to its initial position through a path having sufficient lateral displacement to clear the wheel during the next advancing movement thereof, a folder constrained for movement in an endless path adjacent the wheel for folding one end of the band against the article, and a stationary folder against which the second end of the band is carried by the rotation of the wheel to fold said second end in overlapping relation to the first end.

5. A banding device comprising conveying means constrained for movement in endless paths for advancing an article and a band respectively into registry one with another, an intermittently rotating pocketed wheel, a pusher constrained for movement in an endless path to shift registered articles and bands successively into pockets of said wheel and to clear the next succeeding article on its return stroke, a clamp holding the band upon the article during such movement, means for moving the clamp in a direction first into the pocket and then back to its initial position through a path having sufficient lateral displacement to clear the wheel during the next advancing movement thereof, an endless carrier provided with one or more groups of laterally extending articulated segments movable by said carrier past the opening of the pockets in said wheel during the retracting movement of said pusher, said groups of segments acting as a folder for folding one end of the band against the article, and a stationary folder against which the second end of the band is carried by the ro-

tation of the wheel to fold said second end in overlapping relation to the first end.

6. A banding device comprising conveying means constrained for movement in endless paths for advancing an article and a band respectively into registry one with another, an intermittently rotating pocketed wheel, a pusher constrained for movement in an endless path to shift registered articles and bands successively into pockets of said wheel and to clear the next succeeding article on its return stroke, a folder constrained for movement in an endless path adjacent the wheel for folding one end of the band against the article, and a stationary folder against which the second end of the band is carried by the rotation of the wheel to fold said second end in overlapping relation to the first end and an ejector movable laterally to a position behind an article in the wheel, then radially to eject the article, and then laterally out of the way of the wheel during the continued rotation of the latter.

7. A banding device comprising conveying means constrained for movement in endless paths for advancing an article and a band respectively into registry one with another, an intermittently rotating pocketed wheel, a pusher constrained for movement in an endless path to shift registered articles and bands successively into pockets of said wheel and to clear the next succeeding article on its return stroke, a clamp holding the band upon the article during such movement, means for moving the clamp in a direction first into the pocket and then back to its initial position through a path having sufficient lateral displacement to clear the wheel during the next advancing movement thereof, a folder constrained for movement in an endless path adjacent the wheel for folding one end of the band against the article, a stationary folder against which the second end of the band is carried by the rotation of the wheel to fold said second end in overlapping relation to the first end, and an ejector movable laterally behind an article in the wheel, radially to eject the article, and laterally out of the way of the wheel during the continued rotation of the latter.

8. A banding device comprising an intermittently rotating pocketed wheel having pockets projecting parallel to its axis beyond one end thereof to form an annular assembly accessible both from inside and outside, article and band feeding means grasping an article and a band and movable in part radially of the wheel and in part parallel to the axis thereof beyond said assemblage of pockets.

9. A banding device comprising an intermittently rotating pocketed wheel having pockets projecting parallel to its axis beyond one end thereof to form an annular assembly accessible both from inside and outside, article and band feeding means grasping an article and a band

and movable in part radially of the wheel and in part parallel to the axis thereof beyond said assemblage of pockets, and an ejector movable in part radially outwardly and in part parallel to the axis of the wheel to a point beyond said assemblage of pockets to permit continued rotation thereof.

10. A banding device comprising an article feeding carrier, an endless band-feeding conveyor feeding a band in a direction opposite to the carrier to carry a band into registration with the article, a pocket displaced laterally from the direction of travel of the article and band, means for carrying the registered article and band into the pocket, a folding conveyor at right angles to the band feeding conveyor and encircling it, and one or more flexible folders extending from the conveyor and movable by said conveyor past the opening of said pocket.

11. A banding device comprising an article feeding carrier, an endless band-feeding conveyor feeding a band in a direction opposite to the carrier to carry a band into registration with the article, a pocket displaced laterally from the direction of travel of the article and band, means for carrying the registered article and band into the pocket, a folding conveyor at right angles to the band feeding conveyor and encircling it, and one or more flexible folders extending from the conveyor and movable by said conveyor past the opening of said pocket, said carrying means being movable towards the pocket in the intervals between passages of the folder groups and being movable back out of the plane of passage of said groups.

12. A banding device comprising a pocketed wheel, mechanism for positioning articles and bands in the pockets of the wheel, an ejector, and mechanism for moving the ejector in an endless path first parallel to the axis of the wheel into a position behind an article in a pocket, then radially through the wheel to eject the article, and then laterally out of the way of the wheel and radially inward to its starting point during the continued rotation of the latter.

13. A banding device comprising an intermittently rotating pocketed wheel having a space radially inside of the pockets and an opening radially through each pocket, means for positioning articles and bands successively within the pockets and for folding the band about the article, an ejector, and mechanism for moving the ejector in an endless path first parallel to the axis of the wheel into said space behind a pocket, then radially through the opening through the pocket to eject the article therefrom, and then laterally out of the way of the wheel and radially inward to its starting point during the continued rotation of the latter.

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