July 7, 1953 J. F. CURRIVAN 2,644,625

CARTON LOADING DEVICE

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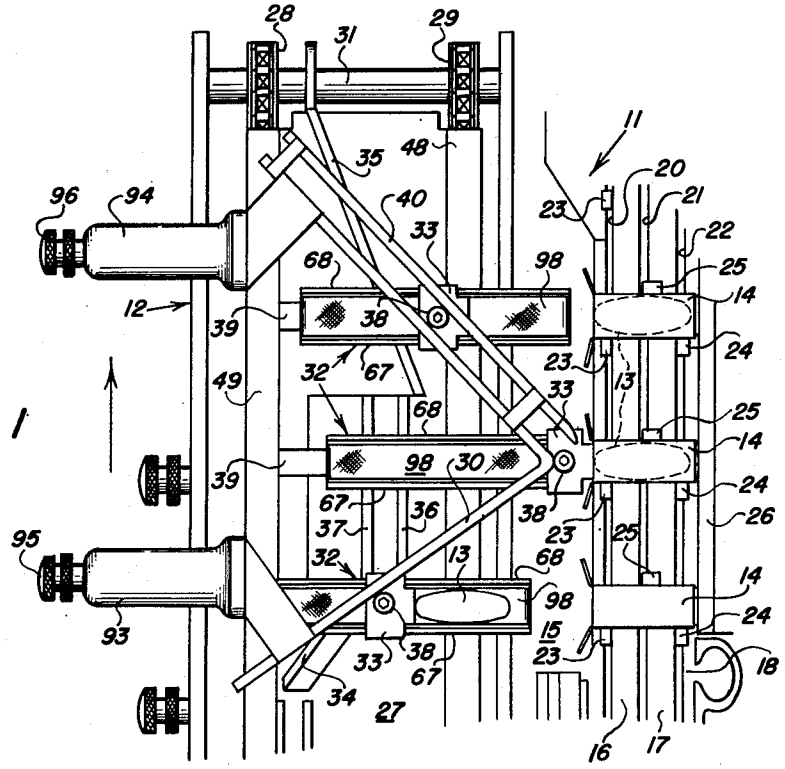


Fig. 1

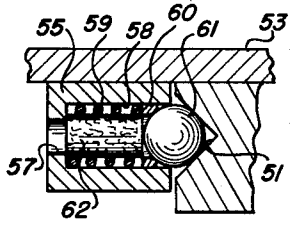


Fig. 7

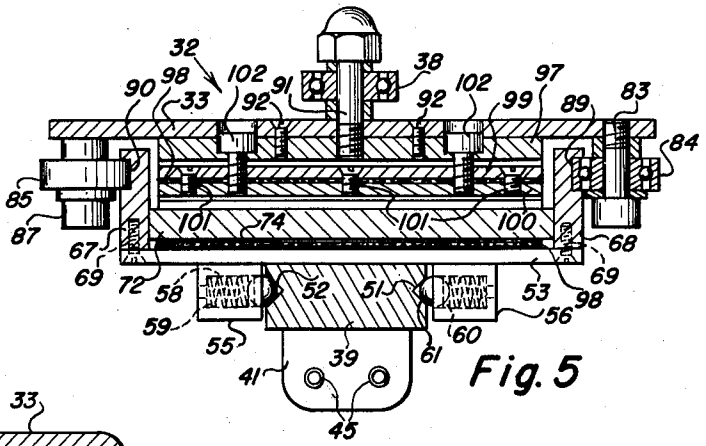


Fig. 5

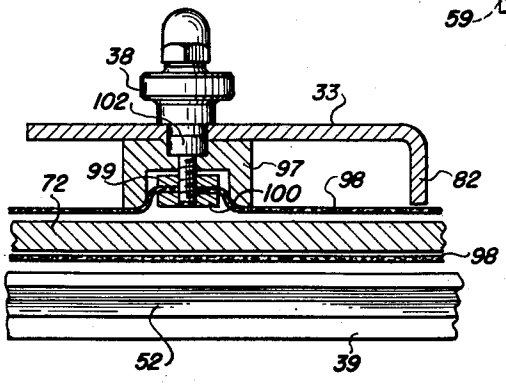


Fig. 6

INVENTOR

John F. Currivan

By Strauch & Hoffman

Attorneys

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CARTON LOADING DEVICE

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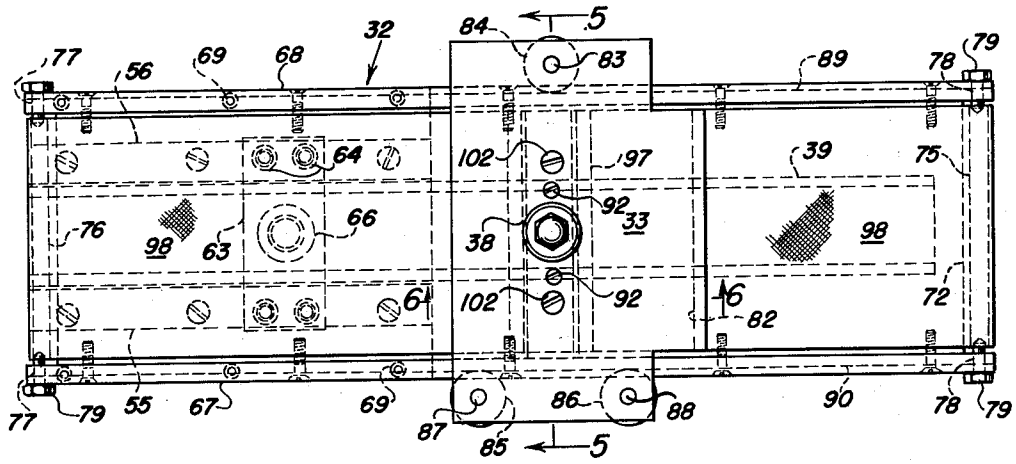


Fig. 2

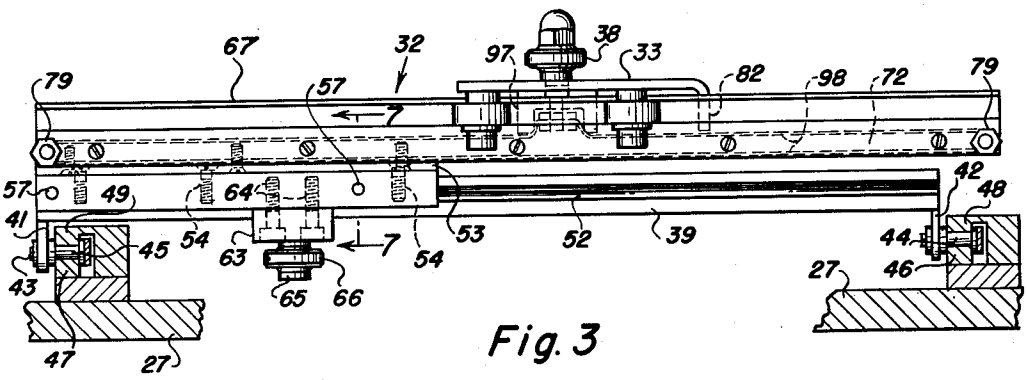


Fig. 3

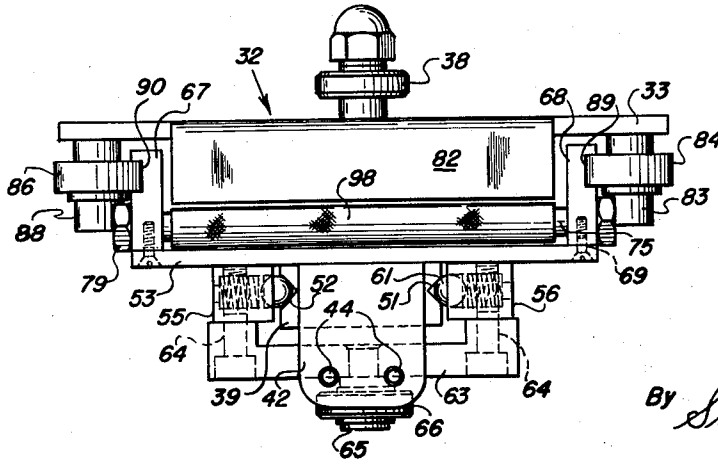


Fig. 4

INVENTOR
John F. Currivan

By Strauch & Hoffman
Attorneys

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CARTON LOADING DEVICE

John F. Currivan, Hudson, N. Y., assignor, by mesne assignments, to Emhart Manufacturing Company, a corporation of Delaware

Application July 27, 1949, Serial No. 107,121

7 Claims. (Cl. 226—2)

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This invention relates to cartoning machines, and in particular to improvements in the receptacles or buckets which convey the articles to the loading station where the articles are inserted into the cartons.

In the type of cartoning machine to which the instant invention is particularly adaptable, a carton conveyor or transport carries a continuous series of open ended cartons past a loading station. A loading conveyor, travelling alongside the transport, has a series of receptacles or buckets which are maintained in alignment with the cartons on the transport and which contain the articles to be cartoned. When both a receptacle and a carton reach the loading station a plunger or other mechanism pushes the article out of the end of the receptacle or bucket and into the open end of the carton. Also, as the receptacle and the carton approach the loading station the receptacle is automatically moved closer to the open end of the carton, so that the ends of the receptacle and carton will be as close as practicable during the time that the article is being transferred from the receptacle to the carton. Figure 1 of the instant application illustrates the action of the receptacles and plungers, and reference may be had to the copending application Serial No. 731,395, filed by Alexander H. Ross on February 27, 1947, for Cartoning Machine, for a complete description of an automatic cartoning machine of a type to which the instant invention is applicable.

The receptacles or buckets of the loading conveyor extend transversely of the direction of movement of the conveyor, and they are essentially trough shaped and open at the end adjacent the cartons. The plunger is mounted for sliding movement lengthwise of the receptacle toward its open end to push the article out of the receptacle and into the carton. Thus the articles of merchandise rest directly upon the bottom of the trough shaped receptacle, and are pushed along the surface thereof while being ejected from the receptacle.

Some articles of merchandise, such as rubber heels, rubber sponges, etc., while having rigidity of body, have a high coefficient of sliding friction with the receptacle bottom, practically irrespective of the material of the receptacle. Consequently, it requires considerable thrust on the part of the plunger to push them out of the receptacle, and frequently the movement of such articles is not steady because considerable force may be required to overcome their starting friction and they deform slightly while starting friction is being overcome, and then jump ahead of the plunger after they finally start, due to their resilience. Other articles, such as surgical wrappings, sanitary napkins, etc., are so relatively fragile that they buckle or accordion while being pushed out of the receptacle by the plunger.

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In order to overcome these difficulties, the receptacle has been constructed so that the surface upon which the article of merchandise rests, will move with the plunger, to carry the article out of the receptacle without any sliding of the article over a stationary surface. In the illustrated embodiment this has been accomplished by the provision of an endless belt, which travels over the receptacle surface and has an idle run beneath the same surface, the belt being affixed to the plunger for reciprocating movement therewith. Machines of the type to which the instant invention is adapted operate at high speed, and consequently the reciprocation of the plunger during the loading operation is very rapid, and there is considerable stress and strain in the belt due to this rapid operation and due to the flexing thereof when passing around the ends of the receptacle from the working run to the idle run and vice versa. A belt of lightweight woven material has been found to be the most satisfactory for this purpose, and in particular it has been found that one woven of spun glass fibers and impregnated with a suitable binder has an extraordinarily long life under the severe use in such application. A belt of this construction which has been subjected to over a million operations is still in excellent working condition.

It is accordingly the primary object of the invention to provide a new and improved loading receptacle or bucket for a cartoning machine, which will convey the articles of merchandise out of the receptacle, thereby eliminating friction between the article and the receptacle.

Another important object of the invention is the provision of an improved loading receptacle or bucket for a cartoning machine wherein friction between relatively moving parts is reduced to a minimum.

Other objects will become apparent as the description proceeds in connection with the accompanying drawings, wherein:

Figure 1 is a top plan view of a portion of a cartoning machine adjacent the loading station.

Figure 2 is a top plan view of one of the improved receptacles or buckets.

Figure 3 is a front elevation of the receptacle shown in Figure 2.

Figure 4 is an enlarged side elevation of the receptacle as viewed from the right of Figure 2.

Figure 5 is an enlarged vertical sectional view substantially along the line 5—5 of Figure 2.

Figure 6 is an enlarged vertical sectional view substantially along the line 6—6 of Figure 2.

Figure 7 is an enlarged partial sectional view substantially along the line 7—7 of Figure 3.

Referring to Figure 1, the sections of a carton conveyor or transport indicated generally at 11, and a loading conveyor indicated generally at 12, are shown in the region of the loading station where the articles 13 are loaded into the cartons 14. In the illustrated embodiment the transport comprises a series of parallel horizontal spaced table plates 15, 16, 17 and 18 which form a supporting surface for the cartons 14. The spaces between the table plates form three parallel slots 20, 21 and 22. Endless chains, not shown, travel horizontally and directly beneath these slots. Two series of trailing fingers 23 and 24, attached to the outermost chains, protrude upwardly through the slots 20 and 22. The fingers in the series 23 are equally spaced, as are those of the series 24, and each finger in the series 24 is directly laterally opposite a finger in the series 23. Each pair of opposite fingers in the series 23 and 24 engages the rear wall of a carton 14 upon the transport, the cartons thereby being pushed along the transport from bottom to top as viewed in Figure 1. As in the aforesaid application Serial No. 731,395, each carton 14 may be confined against the fingers which push it, by a leading finger 25 which protrudes upwardly through the central slot 21, the fingers being attached to the chain which runs along beneath the slot 21. As will be understood, all three chains are driven at the same speed, thereby moving the cartons along the surface formed by the table plates 15—18. As viewed in Figure 1, the left ends of the cartons are open to receive the articles of merchandise to be inserted at the loading station, and a back up bar 26, adjacent their right ends, backs them up to prevent them from being pushed to the right during insertion of the articles.

As described in detail in the aforesaid application Serial No. 731,395, the loading conveyor 12 comprises a horizontal wall 27 having a pair of endless chains 28 and 29 travelling over it on their upper run and beneath it during their idle run. At 31 is indicated the driving shaft for these chains, which has a pair of spaced sprockets to carry the chains around the edge of the wall 27 and start them on their lower run. A similar shaft and sprockets brings the chains back on top of the wall 27 at the other end, to begin their working run. The chains 28 and 29 are driven at the same speed as the cartons 14 on the transport, and they carry an endless series of receptacles or buckets 32 (see also Figure 2) which are mounted transversely of the chains and so spaced therealong that there is one receptacle directly opposite each carton 14 on the transport 11. With the loading conveyor 12 and the transport 11 both moving at the same speed, and from bottom to top as viewed in Figure 1, when the receptacles approach the loading station they are automatically moved to the right to a point adjacent the open end of their respective carton, and simultaneously the sliding plungers 33 within the receptacles are automatically moved to the right to push the articles out of the receptacles 32 and into the cartons 14. After the cartons have thus been loaded, and as each receptacle passes the loading station, it is moved back to the left to its normal position and its plunger is simultaneously moved back. This movement of the receptacles is accomplished in a manner to be described, by stationary cam tracks 34 and 35 affixed to the top of the horizontal wall 27 and lying beneath the receptacles 32. Another pair of spaced parallel tracks 36 and 37 hold the receptacles 32 adjacent the end of the cartons while the articles 13 are being loaded into the cartons. Another pair of tracks 30 and 40, lying over the receptacles, engage rollers 38 on the plungers to move them toward their cartons and then away from them.

The details of construction of the improved buckets or receptacles are shown in Figures 2 to 7. Referring particularly to Figures 3 and 5, a transverse slide member 39 has a pair of downwardly depending ears 41 and 42 at its ends, and each of these ears has a pair of pins 43 and 44 protruding horizontally therefrom. The spacing of each pair of pins 43 and 44 is such that they, together with their integral ear 41 or 42, form a connecting link between a pair of adjacent rollers in the sprocket chains 28 or 29. During their working runs the rollers 45 of the chains rest upon tracks 46 and 47 secured to the top of the wall 27, and they are confined against these rollers by a pair of upper tracks 48 and 49, also secured to the wall 27. This construction assures that the slide member 39 and the receptacle 32 carried thereby will always remain horizontal during the working run of the loading conveyor.

The longitudinal side walls of the slide member 39 are provided with V-shaped grooves 51 and 52 (Figure 5). A horizontal mounting plate 53 has secured to it as by screws 54 a pair of parallel downwardly depending bars 55 and 56 which embrace, but are slightly spaced from the slide member 39. Adjacent their ends each bar 55 and 56 has a pair of counter-bored holes 57 and 58 (see also Figure 7) each of which receives a coil spring 59 and a steel ball 61 and seat 60, the ball being resiliently urged into its V-groove 51 or 52 by its spring 59. The springs are retained in their bores by the shoulders at the end of the counter-bores, the smaller bores forming oil holes into which oil can be squirted into the counter-bores to lubricate the steel balls. Oil retaining wicks 62 are also located in the counter-bores, preferably within the coils of the springs 59, and engaging the steel balls 61 to lubricate them. The spring pressed steel balls thus support the mounting plate 53 for sliding movement upon the slide member 39 with a minimum of friction, since the force of springs is not large enough to keep the balls from rolling in the grooves in the slide member.

A yoke 63 (see Figure 4) is attached to the underside of the bars 55 and 56, as by screws 64, and has a central stud 65 which clamps the inner race of a ball bearing assembly 66 to form the roller which engages cam tracks 34—37 (Figure 1) to shift the receptacle toward and away from the transport 11.

The receptacle itself, which is in the form of an open topped trough, as previously mentioned, has a pair of side walls 67 and 68 which are secured to the top of the mounting plate as by screws 69. These side walls overhang the mounting plate 53 by a considerable extent, and in fact protrude beyond the other end of the slide member 39 as best shown in Figure 3. The trough bottom wall 72 is secured to the side walls 67 and 68 as by screws 73 and the bottom surface of the bottom wall is spaced from the top surface of the mounting plate

53 to provide a space 74 (Figures 4 and 5) therebetween for the passage of the woven glass fiber belt mentioned previously. The bottom wall 72 does not extend the full length of the side walls, but terminates just short of their ends to provide spaces for a pair of rollers 75 and 76 (Figure 2) which are coplanar with the bottom wall and are each journalled for rotation in pairs of pointed screws 77 and 78 threaded through the side walls and locked in adjusted position by lock-nuts 79. The rollers extend substantially the full distance between the side walls.

Each receptacle is provided with a sliding plunger 33 in the form of a flat plate having a downturned flange 82 on its right end as viewed in Figure 3, the sides of the plunger overhanging the side walls 67 and 68 of the receptacle, but the flange 82 extending downwardly between them. One of the overhanging sides has a downwardly depending stud 83 which passes through and secures the inner race of a ball bearing assembly 84 to the plunger. On the other overhanging side of the plunger a pair of spaced bearing assemblies 85 and 86 are similarly secured by studs 87 and 88.

The outer race of bearing assembly 84 rolls in a groove 89 in the outer surface of the receptacle side wall 68 and the outer races of bearing assemblies 85 and 86 roll in a similar groove 90 in the other side wall 67. Protruding from the top of the plunger 33 is a stud 91 (Figure 5) upon which is mounted the inner race of a ball bearing assembly forming the roller 38, which during the movement of the receptacle past the loading station, is engaged by the cam tracks 30 and 40 (Figure 1) to move the plunger toward and away from the transport. It will be noted that normally when the plunger 33 is at the end of its stroke toward the transport, its downwardly depending flange will protrude beyond the end of the receptacle. This is usually necessary because there is ordinarily a gap between the open end of the carton and the adjoining end of the receptacle, and the plunger should push each article 13 fully into its respective carton 14. The exact end of the stroke of the plunger is determined by the positions of the cam tracks 30 and 40, which are mounted as a single unit upon a pair of compounds 93 and 94 which are mounted on the wall 27 but have manually adjustable screw members 95 and 96 which when rotated adjust the cam tracks 30 and 40 toward or away from the transport.

Secured to the underside of the plunger 33 as by a pair of screws 92 and extending crosswise thereof between the side walls 67 and 68 of the receptacle is an inverted channel member 97. There is a clearance between the bottoms of the legs of the channel member and the top surface of the receptacle bottom wall 72.

A thin flexible belt 98 has its two ends secured to channel member 97, and the belt passes (in Figure 3) horizontally to the right over the receptacle bottom wall 72, around the roller 75, beneath the wall 72 in the clearance space 74 to the left, and around the roller 76, thence back over the wall 72 to the channel member 97. The two ends of the belt are folded over to reinforce them against tearing, and then the folded end portions are overlapped and clamped between a pair of plates 99 and 100 which are secured together with the belt ends clamped therebetween, by screws 101 (Figure 5). The belt 98 should be substantially without any slack after its ends are secured in this manner. As seen in Figures 3 and 6 the plates 99 and 100 are narrower than the space between the legs of the channel member

97. A pair of screws 102 pass snugly through holes in the web of the channel member and are threaded through the pair of plates 99 and 100 to positively secure the belt to the plunger 33. Any remaining slack in the belt 98 may then be taken up by drawing the connected plates 99 and 100 upward by turning the screws 102. This arrangement provides an adjustment (screws 102) which is accessible from the top of the plunger 33 to control the tension in the belt. It has been found that the most satisfactory material for the belt 98 is a thin flexible material woven of spun glass fibers and impregnated with a suitable binder. Such a belt has an extremely long life under the severe operating conditions to which it is subjected.

While the improved receptacle with the bottom moving with the plunger has particular advantage in the case of loading fragile articles or those having high coefficients of friction, the improved assembly is of lighter weight and has very little friction to overcome during its movements. For that reason it is also eminently suitable for use even when the articles to be loaded do not have the fragile or frictional characteristics described, because it considerably reduces the stresses in the machine due to inertia and friction forces in the rapidly reciprocating receptacles and plungers.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. In a cartoning machine, a first conveyor; a second conveyor; means for driving said conveyors; said first and second conveyors being relatively disposed to convey merchandise and cartons respectively in such relative alignment that the merchandise may be shifted transversely from said first conveyor for insertion into the cartons on said second conveyor; a series of open topped receptacles on said first conveyor arranged transversely thereof and each having an open end in alignment with a carton on said second conveyor; means providing a movable bottom in each receptacle for supporting an article in each receptacle; and means responsive to the movement of said first conveyor for shifting said movable bottom toward said second conveyor to transfer the articles from said receptacles to the cartons on said second conveyor.

2. In a cartoning machine, a first conveyor; a second conveyor adapted to hold a series of cartons to be loaded, said first conveyor having a series of open topped receptacles open at the ends facing the cartons and spaced so that there is a receptacle in alignment with each carton on said second conveyor; means for driving said conveyors at the same speed; means providing a movable bottom in each receptacle for supporting an article in each receptacle; means responsive to the movement of said first conveyor for shifting said movable bottoms toward said second conveyor to transfer the articles from said receptacles to the cartons on said second conveyor; and means on each receptacle and movable with the movable bottom thereof arranged

to protrude from the open end of the receptacle and towards the cartons to push the articles into the cartons as they leave said receptacles.

3. In a cartoning machine, a first conveyor; a second conveyor adapted to hold a series of cartons to be loaded; means for driving said conveyors at the same speed; said first conveyor having a series of open topped receptacles open at the ends facing the cartons and spaced so that there is a receptacle in alignment with each carton on said second conveyor, each receptacle having a movable bottom wall for supporting an article while in the receptacle and a pusher operable to push the article as it leaves the receptacle; and means operable to shift said movable wall and said pusher in response to the movement of said first conveyor.

4. In a cartoning machine, a first conveyor; a second conveyor adapted to hold a series of cartons to be loaded; means for driving said conveyors at the same speed; said first conveyor having a series of open topped receptacles open at the ends facing the cartons and spaced so that there is a receptacle in alignment with each carton on said second conveyor, each receptacle having a bottom comprising an endless belt, the top run of which is adapted to support an article to be cartoned; and means operable in response to the movement of said first conveyor to operate said belt to convey the article resting thereon out of the receptacle and into the carton on said second conveyor.

5. In the apparatus described in claim 4, each receptacle including a pusher member connected to said endless belt and operable to push the article into the carton as it leaves the belt.

6. In a cartoning machine having a loading station for placing articles in erected cartons, a movable conveyor having a series of open-ended article carrying receptacles extending transversely of its path of movement, a bottom wall for each of said receptacles mounted for movement toward and from said open end and means for so moving said bottom wall at said loading station.

7. In the cartoning machine defined in claim 6, an article pusher in each receptacle secured to said bottom wall.

JOHN F. CURRIVAN.

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