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(54) MULTIPACKAGING OF CONTAINERS

(71) We, ILLINOIS TOOL WORKS INC., a corporation organized under the laws of the State of Delaware, United States of America, of 8501 West Higgins Road, Chicago, Illinois 60631, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

Prior art machines for the continuous application of mutipackaging strips to containers have generally been of the types shown in our British Patents No. 1,145,672, No. 998,736 and No. 974,619. Those machines use pin or jaw elements which engage and individually stretch each of the bands of a multipackaging strip for application to a plurality of containers. Those prior art machines and the teachings in the patents have been limited to stretching and applying a strip of two rows of container encircling bands to two adjacent rows of containers, by mechanisms that positively engage and stretch the individual bands in the strip.

Something less than positive engagement and individual band stretching is taught in United States Patent No. 3,742,677. In that patent a mechanism is shown that cuts a carrier strip into individual carrier devices and then grips each carrier device along its side marginal edges outside of the apertures of the carrier, stretches the carrier to effectively make it taut, and thereafter applies or projects it downwardly over the upper end of a group of six containers.

In contradistinction to the prior known multipackaging machines and methods for applying a strip of carrier devices to two adjacent rows of containers, the machines and methods of the subject invention apply a strip of carrier devices to three, four or more adjacent rows of containers. The invention is unique in its radical departure

from prior art teachings of positive engagement and stretching of individual carrier bands. In the subject invention, simple stretching forces are applied, e.g. by jaw assemblies, merely to those band portions which are along the sides of the appropriately formed strip, to stretch the side bands and all other bands therebetween. Thus, the subject invention teaches those skilled in the art how to apply a multipackaging strip to three, four or more adjacent rows of containers. For example, the invention contemplates a machine and method that will apply a multipackaging strip to rows of containers that might be a full pallet in width, such as fifteen rows of adjacent containers. Further, the machines and methods of the invention do not apply a strip by merely engaging the side marginal edges of a strip to effectively hold the strip taut, but operate to transversely stretch a narrow strip of elongated bands into shapes substantially complementary to the container shapes before applying the bands about the containers.

The machines and methods of the invention preferably cooperate with particular multipackaging strips which are the subject of our co-pending British Patent Application No. 20592/76 (Serial No. 1,543,994), to produce a unique system for the multipackaging of three or more adjacent rows of containers.

One aspect of the invention involves, in combination, a plurality of like containers; a strip made of a resiliently deformable sheet of a plastics material and comprising at least three rows of bands, each band surrounding and defining a band aperture, with said bands elongated in the longitudinal direction of said row, web means integrally interconnecting said bands longitudinally in said rows and transversely between said rows, the shape of said bands and the interconnections of said web means

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between said bands producing band apertures substantially complementary to the circumferential configuration of said containers responsive to the application of transversely opposed stretching forces of a certain amount solely to the side marginal portions of said strip; and a machine including a work station, first means moving at least three adjacent rows of said containers through said work station, a series of pairs of opposed stretching members, second means applying the side marginal portions of said strip onto said series of pairs of opposed stretching members, third means moving said series of pairs of opposed stretching members to apply opposed stretching forces of said certain amount to said side marginal portion of said strip, and fourth means successively moving said series of pairs of opposed stretching members with said strip applied thereon and stretched said certain amount into said work station and in a direction relatively towards said moving rows of containers and thereby circumferentially applying said bands successively about said containers.

Another aspect of the invention involves a machine for multipacking at least three substantially adjacent rows of containers with a strip made of a resiliently deformable sheet of a plastics material and comprising at least three adjacent rows of bands for encircling said containers, wherein the width of said strip when unstressed is substantially less than the width of said at least three adjacent rows of containers, said machine including an input conveyor for delivering at least three adjacent rows of containers through a work station, and an output conveyor for conveying multipackaged containers from said work station, and further having an applying drum assembly mounted at said work station for rotation about a horizontal axis perpendicular to and above the line of movement of said containers through said work station, said drum assembly comprising a plurality of jaw stations mounted on said drum assembly circumferentially thereabout, each of said jaw stations comprising a single pair of jaw assemblies, mounted for reciprocation towards and away from each other along an axis substantially parallel to the axis of rotation of said drum assembly, and extending radially from said drum assembly, means for successively reciprocating each of said pair of jaw assemblies from a strip receiving condition with a spacing between the jaw assemblies less than a predetermined dimension to a strip applying condition with a spacing between the jaw assemblies more than the said predetermined dimension, and means for directing said strip successively over said pairs of jaws assemblies while in said strip receiving condition, so that said

pairs of jaw assemblies extend through the apertures of the bands along the sides of said strip, said means for successively reciprocating each of said pair of jaw assemblies being arranged so that said pairs of jaw assemblies are in strip applying condition as they conclude their approach to the input conveyor, consequent on rotation of the drum.

The accompanying drawings show one example of a machine, container and strip, embodying the invention. In these drawings:—

Fig. 1 is a side elevational view of the machine;

Fig. 2 is a top plan view of the machine of Fig. 1;

Fig. 3 is an isometric view of a multipackage of containers, produced by operation of the machine;

Fig. 4 is a plan view of a multipackaging strip used in operation of the machine;

Fig. 5 is an enlarged side elevational view of the drum assembly of the machine of Figs. 1 and 2, taken substantially along the line 5—5 of Fig. 1;

Fig. 6 is an enlarged elevational view of another portion of the drum assembly of Figs. 1 and 2, taken substantially along the line 6—6 of Fig. 1;

Fig. 7 is an enlarged bottom view of the drum assembly of Figs. 1 and 2, taken substantially along the line 7—7 of Fig. 1;

Fig. 8 is an enlarged side elevational view of one of the jaw stations of Figs. 5, 6 and 7 removed from the drum assembly;

Fig. 9 is a top plan view of the jaw station shown in Fig. 8;

Fig. 10 is a cross-sectional view of the structure shown in Fig. 8, taken substantially along the line 10—10 of Fig. 8;

Fig. 11 is a chart showing the operated positions of the jaw assemblies at various positions circumferentially of the drum assembly; and

Fig. 12 is a top plan view of one end of a modified jaw station showing an alternative form of cam assembly for operating the jaw stations.

The total machine as shown in Figures 1 and 2 is substantially exemplary in form and many of the parts which are not critical to an understanding of the subject invention and for which known parts may be used are only briefly shown. The machine comprises a base 10 which may be constructed in any suitable known manner for supporting the operating elements of the machine. An input conveyor 11 of any suitable type is provided for delivering three adjacent rows of containers such as cans 12 to the work station 13 of the machine. Suitable known means may be provided in conjunction with the input conveyor 11 to move the rows of containers slightly spaced apart and in ac-

curate ranks and files through the work station 13. The work station comprises a drum assembly 14 mounted therein immediately above the three rows of cans 12 passing through the work station 13. The drum assembly 14 is mounted to rotate about a horizontal axis transversely of the three rows of cans 12. The machine further includes a suitable output conveyor 15 for receiving multipacked containers, such as package 16, from the work station 13.

One form of multipackaging strip that can be applied to the cans 12 by the machine of the invention is shown in Figure 4. That multipackaging strip, and other embodiments thereof, is shown and described in detail in the above-mentioned British Patent Application No. 20592/76 (Serial No. 1,543,994). The multipackaging strip 20 is made from a resiliently deformable sheet of a plastics material such as low density polyethylene. The strip 20 comprises an integrally interconnected row of elongated bands 21 along one side of the strip with another integrally interconnected row of elongated bands 22 along the other side of the strip 20. The bands 21 and 22 may be described as mirror images of each other. The strip 20 further comprises a plurality of substantially straight-line band segments 23 and 24. The straight-line band segments 23 and 24 intersect through integral intersecting areas 25. The straight-line band segments 23 and 24 are disposed diagonally of the longitudinal axis of the strip 20. The band segments 23 and 24 are further positioned between the bands 21 and 22, with the intersecting areas 25 being bisected by transverse lines drawn through the webs 26 between the bands 21 and the webs 27 between the bands 22. The ends of the band segments 23 and 24 are integrally interconnected to the inner band portions of the bands 21 and 22 as shown in Fig. 4. Each pair of straight-line band segments 23 and 24, in cooperation with the next longitudinally adjacent pair of straight-line band segments 23 and 24, defines an intermediate band transversely between the bands 21 and 22. The apertures 28 of the intermediate bands defined by the straight-line band segments 23 and 24, which may be described as generally lemon-shaped, are elongated in the longitudinal direction of the strip 20, and the periphery of each aperture 28 is circumferentially uninterrupted. The apertures of the bands 21 and 22 are also elongated in a direction longitudinally of the strip 20, and the inner peripheries of the bands 21 and 22 are also circumferentially uninterrupted. The apertures 28 and the apertures of the bands 21 and 22 are substantially of the same maximum length, measured in a direction longitudinally of the strip 20. Further, the peripheral circumferential measure-

ment of each aperture 28 is substantially equal to the inner peripheral dimension of each band 21 and 22. As described in the above-mentioned British Patent Application No. 20592/76 (Serial No. 1,543,994) a strip 20 configured as described can be stretched to produce aperture configurations approximately complementary to the circular shape of the cans 12 by opposed transverse stretching forces applied within the bands 21 and 22 and against the outer portions thereof.

At certain positions longitudinally of the strip 20, strap elements 30 and 31 integrally interconnected across a pair of straight-line band segments 23 and 24 as shown in Fig. 4 are provided as handle elements for the multipackage of containers 12. In Fig. 4 it may be seen that if the strip 20 is transversely severed through the webs 26 and 27 and the intersection area 25 therebetween at positions longitudinally of the strip 20 which are midway between the strap elements 30 and 31, individual carriers will be formed for twelve cans 12. It may be seen that with other locations of the strap elements 30 and 31 and with appropriate transverse severance of such strips, multipackages of other than twelve cans 12 may be produced. Fig. 3 shows such a modified strip 32 on six cans 12 to produce a multipackage of six containers. If a strip such as strip 20 is made without any strap elements 30 and 31, the strip may be transversely severed to produce 3-packs.

The multipackaging strip 20 is conveniently supplied to the machine from a reel 33 upon which the strip 20 has been wound after being made. The reel 33 is rotatively supported on a stand 34 on one side of the machine. From the reel 33 the strip 20 is extended over a supporting idler roller 35 mounted on the machine. From the idler roller 35 the strip 20 is carried under another idler roller 36 and from that roller the strip 20 passes about a powered feed roll 37. The powered feed roll may be of any type known in the art which automatically senses the weight of the strip loop therebelow and draws additional strip 20 from the reel 33 as needed to maintain the depending loop. From the powered feed roll 37 the strip 20 passes into the guide system 38. The guide system 38 is substantially shown in enlarged plan view in Fig. 6 and is conveniently mounted between the side frame members 40 of the machine by rods such as rods 41 of Fig. 6.

The guide assembly 38 as shown in Fig. 6 comprises a shallow U-shaped trough 42 which supports the flat strip 20 as it is moved into cooperation with the drum assembly 14. A hold-down plate 43 is carried in the trough 42 and lies on top of the strip 20 and creates a slight drag thereon. The upper end of the hold-down plate 43 is

5 pivotally connected to the upstanding side walls of the trough 42 by pivotal mounting means 44. The guide assembly 38 further includes a pair of curved plates 45 in vertical planes. The rearward ends of the plates 45 are shown in Fig. 6 and the forward ends thereof are shown in Fig. 5. The plates 45 are positioned immediately above and at transverse positions substantially longitudinally bisecting the side bands 21 and 22 to hold the strip 20 down as it enters onto the jaw stations of the drum assembly 14. The guide assembly 38 further includes forward extensions 46 on the trough 42. The forward extensions 46 each comprise a fixed pair of narrow elongated plates which are spaced-apart a distance slightly more than the thickness of the strip 20. The rearward ends of the extensions 46 are in planar alignment with the trough 42 to receive the outer band portions of the side or outboard bands 21 and 22 therebetween. From the rearward to the forward ends of the extensions 46 they are twisted about their longitudinal axes through an angle of substantially 90° to turn up the outer band portions of the side bands 21 and 22 as the bands move onto the jaw assemblies of the jaw stations of the drum assembly 14. As the upwardly bent outer band portions of the strip 20 are received upon the jaw assemblies of the drum assembly 14, annular cam members 47, 48, 50 and 51 shown in Fig. 5 begin to spread the jaw assemblies transversely apart to firmly hold the strip 20 as it leaves the guide system 38.

40 The drum assembly 14 comprises two spider wheels (not shown) which are rotatively supported in a transversely spaced-apart relationship on a horizontal shaft 52 which in turn is rotatively carried between the upstanding frame members 40. Each jaw station 53 shown in detail in Figs. 8-10 includes a mounting plate 54. Each mounting plate 54 has a pair of holes 55 there-through as shown in Fig. 8. Fasteners 56 shown in Figs. 5 and 6 are projected through the openings 55 in the mounting plates 54 and threaded into the peripheries or rims of the spider wheels to support all of the jaw stations 53 in a cylindrical configuration about the axis of the shaft 52, with the longitudinal axes of the jaw stations 53 being parallel to the axis of the shaft 52. The circumferential spacing between jaw stations 53 is substantially equal to or slightly less than the longitudinal center-to-center distance between the bands of the strip 20.

60 Each jaw station 53 includes, in addition to the mounting plate 54, a pair of supporting blocks 57, four rods 58, 60, 61 and 62, a pair of jaw assemblies 63, a pair of cam roller assemblies 64, and a strip tucker assembly 65. The supporting blocks 57 are secured on each end of the mounting plate

53 and each supporting block 57 is provided with four holes therethrough for the rods 58, 60, 61 and 62. The four rods 58, 60, 61 and 62 are journaled through the supporting blocks 57 in a parallel spaced-apart relationship as shown in Figs. 8-10. The jaw assemblies 63 have four holes through the base portion thereof, as may be seen in Fig. 10, and the jaw assemblies 63 are journaled on the rods 58, 60, 61 and 62 between the supporting blocks 57. Each jaw assembly 63 of a jaw station 53 is fixed to two of the four rods 58, 60, 61 and 62 by a pin or other fastener 66 preferably inserted from the underside of the jaw assembly 63. As may be seen in Fig. 9, the jaw assembly 63 at the left side of the drawing is secured to rods 60 and 62, while the jaw assembly 63 at the right of the drawing is secured to rods 58 and 61. Thus, it may be seen that as the rods are longitudinally slid through the supporting blocks 57, the jaw assemblies 63 secured thereto will be carried thereby. As shown in Figs. 8 and 9, the rods 58, 60, 61 and 62 are longitudinally positioned at what can be called the maximum open position for the jaw assemblies 63, and any strip 20 mounted thereon would be stretched to a maximum in its transverse direction. The outer band portions of the side bands 20 and 21 are carried on two curved jaw segments extending upwardly from the upper end of the jaw assemblies 63. The radius of curvature of those jaw segments is preferably not less than the radius of curvature of the containers 12, but may be greater than the radius of curvature of the cans 12 under some conditions.

105 The rods 58, 60, 61 and 62 are caused to longitudinally reciprocate by the cam roller assemblies 64. Each cam roller assembly 64 comprises a block having four holes therethrough to receive the end portions of the rods 58, 60, 61 and 62, and a roller assembly 67 rotatively carried on the upper side of the block. The cam roller assembly 64 shown in the left side of Figs. 8 and 9 is fastened to rods 58 and 61 by pins 68, and cam roller assembly 64 in the right side of Figs. 8 and 9 is secured to rods 60 and 62 by pins 68. Thus, it may be seen in Figs. 8 and 9 that, if the cam rollers 67 are moved apart, the jaw assemblies 63 will be moved toward each other as the rods slide in the blocks 57 and carry the jaw assemblies 63 which are secured thereto as noted above. Fig. 5 shows one arrangement for moving the cam roller assemblies 64 toward and away from each other as the drum assembly 14 rotates. That arrangement comprises a pair of annular members 47 and 48 for one side of the drum assembly and another pair of annular members 50 and 51 for the other side of the drum assembly. The annular members 47 and 48 are axially spaced-apart

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a distance slightly greater than the diameter of the cam rollers 67 and are secured to one of the frame members 40 and concentrically about the axis of the shaft 52 by a number of bracket and fastener assemblies 70. In a like manner, the annular members 50 and 51 are secured to the other frame member 40. The space between the members 47 and 48 and between the members 50 and 51 defines a cam track for the cam rollers 67. Alternatively, the members 47, 48, 50 and 51 may be made of a smaller diameter than the circles traced by the jaw stations 53 in rotating, and the cam rollers 67 may be mounted on the underside of jaw stations 53.

The chart in Fig. 11 shows how the cam tracks are circumferentially shaped to open and close each of the jaw assemblies 63 of each of the jaw stations 53 circumferentially of the drum assembly 14. The camming action on the jaw assemblies 63 is shown by the circle 71. As shown the drum assembly 14 is rotated in the direction of the arrow 72 with the can flow being in the direction indicated so that the view in Fig. 11 is taken from the side of the machine shown in Fig. 1. With zero degrees being shown at the top dead center of the chart, the various camming actions of the members 47, 48, 50 and 51 producing a complete cycle are shown by the six arcuate sections of the circle "A" through "F". Arcuate section A from about 290° to 315° is the section where, as shown in Fig. 6, the jaw assemblies 63 of successive jaw stations 53 are receiving the strip 20 near the upper end of the hold-down plate 43 in Fig. 6. During that arcuate section of rotation of the jaw stations 53, the jaw assemblies 63 are closed or at their position of closest spacing between each other. During arcuate section B from about 315° to 345°, the jaw assemblies 63 are partially opened against the folded outer band portions of the side bands 21 and 22 to firmly hold the strip with no appreciable transverse stretching. That area is not shown in the drawings, but would be above the view in Fig. 6. Arcuate section C extends from about 345° before top center to 60° thereafter. That section is shown in the upper quarter of Fig. 5 and during the period of passage of the jaw stations 53 through that section there is substantially no relative movement of the jaw assemblies 63, with the cam profile of the members 47, 48, 50 and 51 being in a dwell period. Arcuate section D, which extends from about 60° to 150° is substantially completely shown in Fig. 5 and during the period of passage of the jaw stations 53 through that section the successive jaw assemblies 63 are gradually moved to the full open position. The full open position is reached at about 150°, and from 150° to 215° the cam profile of the members 47, 48, 50 and 51 is

in a dwell situation. That section is shown as arcuate section E in Fig. 11, and about half of that section is shown in Fig. 7. The showing in Fig. 7 would be from about 140° to about 180°. During the period of passage of the jaw stations 53 through that section the arcuate segments of the jaw assemblies 63 are moved below the upper margin of the cans 12 to apply the bands of the strip 20 about the cans 12. From about 180° to about 215°, the multipackaged containers 12 are leaving the work station along the line of can flow, and the relative upward movement of the jaw stations 53 caused by the rotation of the drum assembly 14 draws the arcuate segments of the jaw assemblies 63 from the applied strip 20. The last arcuate section, section F, extends from about 215° to 290°, and during the period of passage of the jaw stations 53 through that section, the cam profile of the members 47, 48, 50 and 51 causes the jaw assemblies 63 to return to the closed position preparatory to again receiving the strip 20. It should be understood that the chart of Fig. 11 is exemplary of one cam profile and that portions of the profile can be changed within the defined scope of operation.

Figs. 5 and 7 are intended to show the configuration that the strip 20 assumes as it is being stretched by the jaw assemblies 63 of the jaw stations 53 as the drum assembly 14 rotates. Reductions to practice of the invention have established that the final configurations shown in Fig. 7 substantially approximate the circular configuration of the cans 12 to the extent that the bands of the strip are easily projected downwardly over the cans 12 to apply the bands about the cans.

Fig. 12 shows a modified construction for the jaw stations 53 and the annular cam members 47, 48, 50 and 51. In the modified form, the rods 58a, 60a, 61a and 62a are longer than those rods as above described without the suffix "a" and are provided with two cam roller assemblies 64 at each end thereof rather than a single cam roller assembly 64 as above described. Each of a pair of cam roller assemblies 64 is secured by pins 68 to the rods at the end portions thereof and the pair are spaced apart a distance substantially equal to the thickness of the member 73. The member 73 is an annular ring that is substituted in place of the annular cam members 47, 48, 50 and 51 and is mounted in a manner similar to the arrangement for those annular members. The rings 73 are bent to produce the same cam profile as that of the members 47, 48, 50 and 51.

One arrangement for aiding in the application of the strip 20 to the cans 12 is the strip tucker assembly 65 which is mounted on each of the jaw stations 53. The

assembly 65 is formed as a somewhat L-shaped member as may be seen in Fig. 10. The base of the assembly 65 is secured to the underside of the mounting plate 54 by fasteners 74, with the other portion of the assembly 65 extending upwardly along one side of the jaw station 53. The extending upper end of the assembly 65 is provided with three projections 65a. Each projection 65a is positioned longitudinally of the jaw station 53 at a position substantially midway of the area transversely spanned by one of the bands of the strip 20 in the fully stretched condition. Fig. 7 shows the longitudinal disposition of the three projections 65a. In a direction transversely of the jaw stations 53, the projections 65a are aligned to lie substantially on a line drawn between the webs 26 and 27 of the bands 21 and 22 of the strip 20, or substantially midway between adjacent jaw stations 53. The height of the projections 65a is substantially on or slightly above a line drawn between the upper ends of the base portions of the jaw assemblies 63 of each jaw stations 53. In the operation of the machine of the subject invention, the projections 65a operate as backup or trucking members for the web portions of the strip 20 between adjacent bands thereof in a longitudinal direction of the strip 20.

The assembly 65 of each jaw station 53 further includes two upright plates 75. Each plate 75 is somewhat L-shaped, with one leg thereof secured to the upstanding portion of the assembly 65 and with the other leg thereof extending horizontally across the above the rods 58, 60, 61 and 62. In the longitudinal direction of the jaw stations 53, each plate 75 is substantially midway between two adjacent projections 65a. The upper edge of the horizontal leg of each plate 75 may be curved as shown in Fig. 10. The plates 75 extend upwardly above the projections 65a, but below a line drawn between the upper edges of the band holding portions of the jaw assemblies 63 of each jaw station 53. Thus, the upper edges of plates 75 are within the planar area of the strip 20 on the jaw assemblies 63. In operation, the plates 75 operate as tucking members to ensure that the web portions between the bands of transversely adjacent bands of the strip 20 are tucked between the cans 12 in a direction longitudinally of the strip 20 contemporaneously with the application of the strip 20 to the cans 12.

Appropriately driven, known gearing mechanisms may be used to rotate the drum assembly 14 and to operate the input conveyor 11 and the output conveyor 15 in timed relationship, so that the cans 12 successively pass beneath the drum assembly 14 concentrically within successive stretched bands of the strip 20 on the underside of

the drum assembly 14 as the drum assembly 14 rotates.

Appropriate known mechanisms may be provided over the output conveyor 15 to transversely sever the applied strip 20 between selected cans 12 to produce individual packages of selected multiples of three cans 12.

From the foregoing description of the subject invention, it will be understood that the drum assembly may be made with jaw stations 53 that are longer than the jaw stations as described and with additional projections 65a and plates 75 to handle strips which are more than three bands wide. Of course, in such wider arrangements the strip must be made so that all of the bands transversely thereacross will stretch into appropriate container applying configurations upon the transverse spreading of each pair of jaws 63 of each jaw station 53. Moreover, the input conveyor must be constructed to marshal and feed as many rows of containers as there are rows of bands in the strip. Likewise, the output conveyor must be wide enough to handle the width of the packages produced.

WHAT WE CLAIM IS:—

1. In combination, a plurality of like containers; a strip made of a resiliently deformable sheet of a plastics material and comprising at least three rows of bands, each band surrounding and defining a band aperture, with said bands elongated in the longitudinal direction of said row, web means integrally interconnecting said bands longitudinally in said rows and transversely between said rows, the shape of said bands and the interconnections of said web means between said bands producing band apertures substantially complementary to the circumferential configuration of said containers responsive to the application of transversely opposed stretching forces of a certain amount solely to the side marginal portions of said strip; and a machine including a work station, first means moving at least three adjacent rows of said containers through said work station, a series of pairs of opposed stretching members, second means applying the side marginal portions of said strip onto said series of pairs of opposed stretching members, third means moving said series of pairs of opposed stretching members to apply opposed stretching forces of said certain amount to said side marginal portion of said strip, and fourth means successively moving said series of pairs of opposed stretching members with said strip applied thereon and stretched said certain amount into said work station and in a direction relatively towards said moving rows of containers and thereby circumferentially applying said bands successively about said containers.

assembly 65 is formed as a somewhat L-shaped member as may be seen in Fig. 10. The base of the assembly 65 is secured to the underside of the mounting plate 54 by fasteners 74, with the other portion of the assembly 65 extending upwardly along one side of the jaw station 53. The extending upper end of the assembly 65 is provided with three projections 65a. Each projection 65a is positioned longitudinally of the jaw station 53 at a position substantially midway of the area transversely spanned by one of the bands of the strip 20 in the fully stretched condition. Fig. 7 shows the longitudinal disposition of the three projections 65a. In a direction transversely of the jaw stations 53, the projections 65a are aligned to lie substantially on a line drawn between the webs 26 and 27 of the bands 21 and 22 of the strip 20, or substantially midway between adjacent jaw stations 53. The height of the projections 65a is substantially on or slightly above a line drawn between the upper ends of the base portions of the jaw assemblies 63 of each jaw stations 53. In the operation of the machine of the subject invention, the projections 65a operate as backup or trucking members for the web portions of the strip 20 between adjacent bands thereof in a longitudinal direction of the strip 20.

The assembly 65 of each jaw station 53 further includes two upright plates 75. Each plate 75 is somewhat L-shaped, with one leg thereof secured to the upstanding portion of the assembly 65 and with the other leg thereof extending horizontally across the above the rods 58, 60, 61 and 62. In the longitudinal direction of the jaw stations 53, each plate 75 is substantially midway between two adjacent projections 65a. The upper edge of the horizontal leg of each plate 75 may be curved as shown in Fig. 10. The plates 75 extend upwardly above the projections 65a, but below a line drawn between the upper edges of the band holding portions of the jaw assemblies 63 of each jaw station 53. Thus, the upper edges of plates 75 are within the planar area of the strip 20 on the jaw assemblies 63. In operation, the plates 75 operate as tucking members to ensure that the web portions between the bands of transversely adjacent bands of the strip 20 are tucked between the cans 12 in a direction longitudinally of the strip 20 contemporaneously with the application of the strip 20 to the cans 12.

Appropriately driven known gearing mechanisms may be used to rotate the drum assembly 14 and to operate the input conveyor 11 and the output conveyor 15 in timed relationship, so that the cans 12 successively pass beneath the drum assembly 14 concentrically within successive stretched bands of the strip 20 on the underside of

the drum assembly 14 as the drum assembly 14 rotates.

Appropriate known mechanisms may be provided over the output conveyor 15 to transversely sever the applied strip 20 between selected cans 12 to produce individual packages of selected multiples of three cans 12.

From the foregoing description of the subject invention, it will be understood that the drum assembly may be made with jaw stations 53 that are longer than the jaw stations as described and with additional projections 65a and plates 75 to handle strips which are more than three bands wide. Of course, in such wider arrangements the strip must be made so that all of the bands transversely thereacross will stretch into appropriate container applying configurations upon the transverse spreading of each pair of jaws 63 of each jaw station 53. Moreover, the input conveyor must be constructed to marshal and feed as many rows of containers as there are rows of bands in the strip. Likewise, the output conveyor must be wide enough to handle the width of the packages produced.

WHAT WE CLAIM IS:—

1. In combination, a plurality of like containers; a strip made of a resiliently deformable sheet of a plastics material and comprising at least three rows of bands, each band surrounding and defining a band aperture, with said bands elongated in the longitudinal direction of said row, web means integrally interconnecting said bands longitudinally in said rows and transversely between said rows, the shape of said bands and the interconnections of said web means between said bands producing band apertures substantially complementary to the circumferential configuration of said containers responsive to the application of transversely opposed stretching forces of a certain amount solely to the side marginal portions of said strip; and a machine including a work station, first means moving at least three adjacent rows of said containers through said work station, a series of pairs of opposed stretching members, second means applying the side marginal portions of said strip onto said series of pairs of opposed stretching members, third means moving said series of pairs of opposed stretching members to apply opposed stretching forces of said certain amount to said side marginal portion of said strip, and fourth means successively moving said series of pairs of opposed stretching members with said strip applied thereon and stretched said certain amount into said work station and in a direction relatively towards said moving rows of containers and thereby circumferentially applying said bands successively about said containers.

2. A combination as defined in claim 1, and fifth means in said work station relatively moving said series of pairs of opposed stretching members away from said moving rows of containers after application of said bands of said strip circumferentially about said containers and thereby successively separating said series of pairs of opposed stretching members from said applied strip.
3. A combination as defined in claim 1 or claims 2, wherein said strip comprises a total of three rows of bands, and said first means is moving a total of three rows of said containers.
4. A combination as defined in any of claims 1 to 3, wherein said containers are cylindrical.
5. A combination as defined in any of claims 1 to 4, including further means severing said strip transversely between selected longitudinally adjacent bands to form packages of a selected number of containers.
6. A combination as defined in any of claims 1 to 5, wherein said bands, when unstressed, are flat and planar, and of substantially greater width than thickness, there being further means folding the outward side portions of the transversely outermost bands to approximately a right angle to the plane of the bands when unstressed, as the bands are applied by the second means onto the stretching members.
7. A machine for multipackaging at least three substantially adjacent rows of containers with a strip made of a resiliently deformable sheet of a plastics material and comprising at least three adjacent rows of bands for encircling said containers, wherein the width of said strip when unstressed is substantially less than the width of said at least three adjacent rows of containers, said machine including an input conveyor for delivering at least three adjacent rows of containers through a work station, and an output conveyor for conveying multipackaged containers from said work station, and further having an applying drum assembly mounted at said work station for rotation about a horizontal axis perpendicular to and above the line of movement of said containers through said work station, said drum assembly comprising a plurality of jaw stations mounted on said drum assembly circumferentially thereabout, each of said jaw stations comprising a single pair of jaw assemblies, mounted for reciprocation towards and away from each other along an axis substantially parallel to the axis of rotation of said drum assembly, and extending radially from said drum assembly, means for successively reciprocating each of said pair of jaw assemblies from a strip receiving condition with a spacing between the jaw assemblies less than a predetermined dimension to a strip applying condition with a spacing between the jaw assemblies more than the said predetermined dimension, and means for directing said strip successively over said pairs of jaw assemblies while in said strip receiving condition, so that said pairs of jaw assemblies extend through the apertures of the bands along the sides of said strip, said means for successively reciprocating each of said pair of jaw assemblies being arranged so that said pairs of jaw assemblies are in strip applying condition as they conclude their approach to the input conveyor, consequent on rotation of the drum.
8. A machine as defined in claim 7, for multipackaging a total of three adjacent rows of containers with a strip of a total of three rows of bands, each of said jaw stations further including a pair of plates, means fixedly mounting said pair of plates in each jaw station perpendicular to the axis of reciprocation of each of said single pairs of jaw assemblies and extending in a radial direction of said drum assembly to an extent substantially coinciding with a plane through the strip carrying portions of said jaw assemblies, and said pair of plates being further fixedly mounted between said single pair of jaw assemblies at positions of substantially one third of the maximum spacing between each of said single pair of jaw assemblies.
9. A combination as defined in claim 1, substantially as described with reference to the accompanying drawings.
10. A machine as defined in claim 7, substantially as described with reference to Figures 1, 2 and 5 to 12 of the accompanying drawings.

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