

PATENT SPECIFICATION

(11)

1 359 125

1 359 125

- (1) Application No. 6288/73 (22) Filed 8 Feb. 1973
 (31) Convention Application No. 289 908 (32) Filed 18 Sept. 1972 in
 (33) United States of America (US)
 (44) Complete Specification published 10 July 1974
 (51) International Classification B65B 15/00 61/00
 (52) Index at acceptance
 B8C 10B1A 10B1E 10J1 10J4E 10T1A 10T2 10U 11 29A 8
 (72) Inventors DAVID FREDERICK SCHLUETER
 JOHN EDWARD MORGAN



(54) CONTAINER AND CARRIER ASSEMBLING MACHINE

(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:—

This invention is concerned with improvements in container and carrier assembling machines of the type shown in our British Patents Nos. 998,736 and 974,619. Those machines, whilst relatively efficient for applying carriers at a speed of up to 1200 containers or cans per minute have been found to have a number of disadvantages when attempts have been made to run the machines at applying speeds above 1200 cans per minute. The improvements according to this invention allow the machines to run at speeds of up to 1800 cans per minute. These improvements also have the effect that the service and maintenance of the machines is greatly simplified.

The prior carrier applying machines described and illustrated in the above patents have had systems for delivering the succession of carriers to a rotary assembly station. When the machines were used at high speeds the carriers were malformed by the shoe assemblies.

According to this invention a machine for assembling containers into packages held together by resilient sheet-like carriers having a longitudinal series of transverse pairs of container encircling bands includes means for directing a procession of containers to a carrier and container assembly station, rotary means adjacent the assembly station and a guide system for receiving, folding and directing a succession of carriers to the rotary means at a location circumferentially spaced from the assembly

station, the rotary means including a number of shoe assemblies on its periphery of receiving successive carriers from the guide system and stretching and applying the carriers to embrace containers in the assembly station, and further includes a guide system comprising a unitary assembly of guide rails arranged to fold the longitudinal sides of the succession of carriers and the central port of the succession of carriers into a V-shaped fold before the carriers are stretched by the shoe assemblies, and each of the shoe assemblies comprises a unitary assembly fixed to the periphery of the rotary means solely by two spaced apart fasteners, the shoe assemblies cooperating with the guide system to receive the carriers as they are folded.

Preferably, the guide system is a unitary assembly carried on a pair of rods, and in this case adjustment, removal and maintenance of the guide system is greatly simplified.

Further, according to the present invention, the rotary means may be constructed as an axially spaced apart pair of spider assemblies firmly secured to a rotating shaft. Individual shoe assemblies are formed as simple units of a mounting plate carrying a number of cam operated reciprocating rods which are secured to carrier stretching and applying shoes, and simple fixed tuckers which help to apply the carriers to the cans. The individual shoe assemblies are bolted to the spiders by a pair of fasteners. Because of this construction and arrangement higher applying speeds are possible.

The individual shoe assemblies are removed from the spiders by simply unscrewing a pair of bolts, so that the maintenance of the machine is greatly simplified.

A particular example of a machine in accordance with our invention will be described with reference to the accompanying drawings, in which:—

[Price 25p]

90

Figure 1 is a side elevation of part of the machine;

Figure 2 is a plan of the machine shown in Figure 1;

5 Figure 3 is a section along line 3-3 in Figure 1 showing the rotary carrier-applying station;

Figure 4 is a side elevation of an individual shoe assembly;

10 Figure 5 is a plan of the assembly shown in Figure 4;

Figure 6 is a cross section through the assembly shown in Figure 4 taken along the line 6-6 of Figure 4;

15 Figure 7 is a plan of a unitary guide system;

Figure 8 is a cross section of the guide system shown in Figure 7 taken along the line 8-8 of Figure 7; and,

20 Figure 9 is an end elevation of the guide system shown in Figure 7.

A complete machine for the assembly of containers and carriers of the type for which the present invention is intended will not be
25 described. For a detailed description of such a machine reference is made to the aforementioned British Patent Specification No. 998,736.

Figures 1 and 2 show the general arrangement of such a machine. Containers 10
30 are supplied to the machine from a container filling station ahead of the machine. In this example the containers 10 are cylindrical cans with beaded ends. A container
35 and carrier assembling machine is shown generally at 11. Carrier stock 12 is fed from above to the assembling machine 11. The assembling machine 11 comprises a
40 rotary drum shown generally at 13 which receives the carrier stock 12 and applies the stock to the tops of the cans at what may be called the assembly station beneath the
drum 13.

45 In this example the carrier stock 12 is a flexible plastic sheet material which has been formed as shown in Figures 2 and 3 by cutting or punching.

The carrier stock is formed with a series of transverse pairs of holes, the periphery
50 of which is less than the periphery of the cans 10. The carrier stock 12 surrounding the holes forming container encircling bands which must be stretched before application to the cans 10. Because of the stretching of
55 the bands during application to the cans 10, the carrier bands usually assume a somewhat cylindrical or frusto-conical shape in the assembled container and carrier package. Container and carrier packages of this
60 type are described with reference to Figures 22 and 23 of British Patent Specification No. 914,202. If the assembly of the carrier and the cans is to be properly achieved, especially at high speed, the assembling
65 machine must properly fold or shape the

carrier and the container encircling bands of the carrier prior to and during assembly of the carrier and the cans. Prior machines have not been able to successfully
70 apply such carriers to cans at speeds of 1800 cans per minute because the guide system for the carrier stock to the rotary drum could not properly fold and direct the carrier to the rotary drum at such speeds. Further, the shoe assemblies in the rotary
75 drum for receiving, stretching and applying the carrier to the cans have been excessively complicated for efficient high speed application of the carrier stock to the cans.

The carrier stock 12 is normally supplied
80 on a reel 14. The reel 14 is rotatably supported on a reel stand 15. The reel stand 15 is shown in the drawings in a diagrammatic form. As the carrier stock 12 is
85 drawn from the reel 14 it is directed through a tensioning system to provide a uniform feed of the carrier to the rotary drum. The tensioning system shown in Figures 1 and 2 comprises a roller 16 supported from the stand 15, and a drum 17
90 and two rollers 18 and 19 supported from the applying machine.

Two lanes of cans 10 are directed towards the assembling machine 11 and a suitable
95 conveyor system is provided for carrying the cans 10 through the assembling machine 11 in step with the feed of the carrier stock 12. After the carrier stock 12 has been applied to the cans 10, the carrier stock 12 is severed transversely between selected
100 adjacent container gripping bands, in this example between every third pair of bands. This forms the individual packages, each containing six cans. The carrier stock 12 is severed by any known severing means.
105

This invention is directed to two improvements in the assembling machine 11. One of these improvements which is shown in
110 detail in Figures 3, 7, 8 and 9 is the construction and arrangement of a guide system for guiding and folding the carrier stock 12 at high speeds onto the shoes or jaws positioned around the rotary drum 13. The other improvement is concerned with the
115 construction of a unitary guide assembly which is easily removed for maintenance and adjustment.

The rotary drum 13 is supported by the machine frame 30, parts of which are shown
120 in Figure 3. A driven shaft 31 is rotatably mounted in the frame 30. A pair of spaced apart discs called spiders 32 are secured onto the shaft 31. The outer periphery of each spider 32 is provided with a series of screw-threaded holes 33 so that a shoe
125 assembly 34 may be fixed to them by screw-threaded bolts. Only two shoe assemblies 34 are shown in Figure 3, one of which is at the top of the spiders 32 and the other
130 at the bottom.

shown in Figures 4, 5 and 6, each assembly 34 comprises a rectangular mounting plate 35, four shoes 36, four operating rods 37, a tucker assembly 38, and two cam follower assemblies 39. The mounting plate 35 is provided with two holes through it which are adjacent the opposite ends and through which pass screw-threaded bolts 40. Each shoe assembly 34 is secured to the spiders 32 by fixing the bolts 40 into the threaded holes 33. A guide 41 is secured at each end of the mounting plate 35 by bolts 42. Each guide 41 has four parallel spaced apart bores therethrough for guiding and supporting the rods 37. The four rods 37 are slidably carried by both guides 41 and the ends of the rods 37 extend into the cam follower assemblies 39. One pair of the rods 37 are secured into one of the cam follower assemblies 39 by grub screws 43 while the other pair are slidable within bores in that cam follower assembly. The other pair are secured in the opposite cam follower assembly 39 by grub screws 44 and the first pair are slidable within bores in the opposite cam follower assembly. The four rods 37 also extend through bores formed in each of the shoes 36. Each of the shoes 36 is fixed to one pair of the rods 37 the corresponding shoes being fixed to the same pair of rods, so that as the cam follower assemblies 39 are moved toward and away from each other, cooperating pairs of the shoes 36 will be moved toward and away from each other. The shoes 36 are fixed to the rods 37 by pins 45 to the two rods 37 secured to cam follower 39 by fasteners 43 and, one shoe 36 of the other cooperating pair to those same rods 37 by pins 46. The other shoe 36 of each cooperating pair of shoes 36 is secured to the rods 37 which are secured to the cam follower 39 by fasteners 44. The shoe 36 which cooperates with the shoe 36 fixed by pins 45 is fixed to the rods 37 by pins 47, and the shoe 36 which cooperates with the shoe 36 pinned to the rods 37 by the pins 46 is fixed to the rods 37 by pins 48. Thus, when the cam followers 39 are moved toward each other, the cooperating pairs of shoes 36 are moved apart and when the cam followers 39 are moved apart the cooperating pairs of shoes 36 are moved toward each other. The cam followers 39 are provided with rollers 52 which run in cam tracks 51 around the periphery of annular cam assemblies 50, which are shown in Figure 3. The cam assemblies 50 are secured to the frame structure 30 co-axially with and on the outside of the spiders 32. Thus as the spiders 32 are rotated by the shaft 31 the cooperating pairs of shoes 36 of each shoe assembly 34, carried on the spiders 32, will be moved toward and away from each other by the cam tracks 51 to perform a shoe opening

and closing operation. The shoes 36 are closed when they are at the upper side of the drum 13 and in this position the shoes 36 enter the carrier stock 12. The shoes 36 are completely opened at the bottom of the drum 13 so that the carrier stock is fully stretched when it is applied to the cans 10.

A tucker assembly 38 on each shoe assembly 34 is provided which forms the carrier stock 12 into proper configuration before application and for pushing the carrier onto the cans 10. Each tucker assembly 38 is secured to the mounting plate 35 of a shoe assembly 34 by three bolts 55 shown in Figures 4 and 6. Each tucker assembly 38 includes a pair of tucker fingers 56 which protrude from the mounting plate 35 in the same direction as the shoes 36 and are parallel to the axis of reciprocation of the shoes 36. Each tucker assembly 38 also includes a plate 57 which again protrudes in the same direction as the shoes 36 but it is aligned perpendicular to the axis of reciprocation of the shoes 36 and is positioned mid-way between the cooperating pairs of shoes 36. The plate 57 cooperates with the guide assembly 60 to be described later to form or fold the longitudinal central portion of the carrier stock 12.

In practice, the with construction of the shoe assembly 34 as described above it has been found that the repair and maintenance of the shoe assembly 34 is more simple than before. To remove a shoe assembly 34 from the drum 13, it is only necessary to unscrew the bolts 40, before the shoe assembly is removed.

The improved guide system is shown cooperating with the rotary drum 13 in Figure 3 and in further detail in Figures 7, 8 and 9. One of the important features of the improved guide system over those systems previously known is that the outer longitudinal edges and the central part of the carrier stock 12 are both folded before the carrier stock 12 is stretched by the shoes 36. This feature enables the assembling machine to be operated at high speed without the carrier stock being malformed by the shoes 36. A further advantage of this improved system is that it is formed as a unit sub-assembly of the machine and consequently is easily removed for maintenance and particularly, adjustment. The guide system can be completely set up before being installed in the machine and is stronger and more robust and so less likely to be damaged by a material jam than previous guide systems.

To avoid malformation of the carrier stock 12 by the shoes 36 when these are opened the outer longitudinal sides of the carrier stock must be formed or bent upwards, the centre of the carrier stock must also be folded. The centre of the carrier is folded to form a "V"-shaped longitudinal

groove with its vertex uppermost. With the carrier stock 12 folded in this way the shoes 36, which have already entered the apertures of the carrier 12 before the top of the rotary drum 13, start to open, as the drum 13 is rotated further and the shoes engage with the folded faces of the carrier stock rather than the edge of the stock.

Arrows 61 in Figure 7, and 62 in Figure 8, indicate the direction in which the carrier stock 12 moves through the guide system 60. Initially the carrier stock 12 passes between a pair of plates 64 and 65 as shown in Figure 3. The plates 64 and 65 have been removed from Figures 7, 8 and 9 for clarity. The plates 64 and 65 and forming rails 66, 67 and 68 are secured to and supported by a pair of rods 70 to form a complete assembly. The rods 70 are supported in sleeves 71. To support the sleeves 71 in the machine, four bosses 72 are provided on the supporting frame 30 of the machine as shown in Figure 3. The sleeves 71 are slidable on the rods 70 and are secured in place by grub screws 73. Thus, to remove the guide assembly 60 from the machine it is merely necessary to loosen the grub screws 73 and slide the sleeves 71 along the rods 70 away from the ends of the rods 70 so that they are free of the bosses 72.

Two supporting plates 74 are secured on the rods 70 in parallel to and spaced apart from each other. Four lengths of U-section channels 75, 76, 77 and 78 are secured between the supporting plates 74. The guide rails 66, 67 and 68 are supported from the channel members 75, 76, 77 and 78 by upright hangers 80, 81, 82 and 83. A hanger 80 is secured to each of the rails 68 and terminates at its upper end in a fastener 85 carried in a slot in the channel member 75. A hanger 81 is secured to each of the guide rails 67 and the upper end of each hanger 81 terminates in a fastener 86 in slots in the channel member 76. A hanger 82 is secured to each of the guide rails 66, 67 and 68 and terminates at its upper end in a fastener 87 in a slot in the channel member 77. A hanger 83 is secured adjacent the rearward end of each of the rails 66, 67 and 68 and terminates at its upper end in a fastener 88 in a slot in the channel member 78. The fasteners 85, 86, 87 and 88 permit the relative spaces between the rails 66, 67 and 68 to be adjusted, so that the carrier stock is guided and folded in the desired manner.

The outer fold forming rails for the carrier 12 are the rails 66. The initial portion of each of the rails 66 is formed as two flat sections with a space 89 therebetween as shown in Figure 8. The two sections are rotated through an angle of 90° substantially in the area of the rearward rod 70 and the upper section of each of the rails

66 terminates at that point. The outer longitudinal edges of the carrier stock 12 pass through the spaces 89 between the forming rails 66 and are folded generally upwardly at the end of the upper section of the rails 66. From the point at which the outer longitudinal edges of the carrier 12 are folded generally upwardly to the point at which the shoes 36 open to stretch the carrier apertures, the outer longitudinal edges of the carrier are maintained in the generally upwardly folded condition by the now vertical portions of the rails 66, and a downwardly holding action provided by the rails 67.

The rails 67 are arranged above the longitudinal centre lines of the apertures in the carrier stock 12, and the carrier stock 12 passes therebelow. Thus it may be seen that the rails 67 hold these portions of the carrier stock 12 down.

The centre pair of rails, rails 68, also lie over the carrier stock 12 as it passes through the guide system 60. The guide rails 68 may be called the centre forming rails and cooperate with the previously described plate 57 of the tucker assembly 38 of the shoe assemblies 34 to form the longitudinal central portion of the carrier stock 12 so that its cross section is V-shaped having an upright vertex.

As the carrier stock 12 approaches the end of the guide system 60 the shoes 36 open and stretch the apertures during the further rotation of the shoes 36, the pair of shoes 36 in each aperture are moved apart to engage the generally vertically directed inner and outer longitudinally extending portions of the container encircling bands of the carrier stock 12. As the rotor means 13 continues to rotate, the stretched and folded carrier stock is applied over the upper beads of the cans 10 to assemble the carrier stock 12 on the cans 10. From the foregoing it may be seen that when the carrier stock 12 is applied to the cans 10, the inner peripheral edge of the container encircling bands is above the outer peripheral edges so that the container encircling bands in the stretched condition on the cans 10 assumes a substantially frusto-conical configuration about the cans 10.

Because of the above described construction and arrangement of the guide system 60 relative to the shoe assemblies 34, high speed operation of the machine is possible whilst maintaining the desired application of the carrier stock 12 to the cans 10. The unitary arrangement of the guide rails in the guide assembly 60 permits easy and exact adjustment of the guide rails for efficient, rapid operation of the machine.

WHAT WE CLAIM IS:—

1. A machine for assembling containers into packages held together by resilient



groove with its vertex uppermost. With the carrier stock 12 folded in this way the shoes 36, which have already entered the apertures of the carrier 12 before the top of the rotary drum 13, start to open, as the drum 13 is rotated further and the shoes engage with the folded faces of the carrier stock rather than the edge of the stock.

Arrows 61 in Figure 7, and 62 in Figure 8, indicate the direction in which the carrier stock 12 moves through the guide system 60. Initially the carrier stock 12 passes between a pair of plates 64 and 65 as shown in Figure 3. The plates 64 and 65 have been removed from Figures 7, 8 and 9 for clarity. The plates 64 and 65 and forming rails 66, 67 and 68 are secured to and supported by a pair of rods 70 to form a complete assembly. The rods 70 are supported in sleeves 71. To support the sleeves 71 in the machine, four bosses 72 are provided on the supporting frame 30 of the machine as shown in Figure 3. The sleeves 71 are slidable on the rods 70 and are secured in place by grub screws 73. Thus, to remove the guide assembly 60 from the machine it is merely necessary to loosen the grub screws 73 and slide the sleeves 71 along the rods 70 away from the ends of the rods 70 so that they are free of the bosses 72.

Two supporting plates 74 are secured on the rods 70 in parallel to and spaced apart from each other. Four lengths of U-section channels 75, 76, 77 and 78 are secured between the supporting plates 74. The guide rails 66, 67 and 68 are supported from the channel members 75, 76, 77 and 78 by upright hangers 80, 81, 82 and 83. A hanger 80 is secured to each of the rails 68 and terminates at its upper end in a fastener 85 carried in a slot in the channel member 75. A hanger 81 is secured to each of the guide rails 67 and the upper end of each hanger 81 terminates in a fastener 86 in slots in the channel member 76. A hanger 82 is secured to each of the guide rails 66, 67 and 68 and terminates at its upper end in a fastener 87 in a slot in the channel member 77. A hanger 83 is secured adjacent the rearward end of each of the rails 66, 67 and 68 and terminates at its upper end in a fastener 88 in a slot in the channel member 78. The fasteners 85, 86, 87 and 88 permit the relative spaces between the rails 66, 67 and 68 to be adjusted, so that the carrier stock is guided and folded in the desired manner.

The outer fold forming rails for the carrier 12 are the rails 66. The initial portion of each of the rails 66 is formed as two flat sections with a space 89 therebetween as shown in Figure 8. The two sections are rotated through an angle of 90° substantially in the area of the rearward rod 70 and the upper section of each of the rails

66 terminates at that point. The outer longitudinal edges of the carrier stock 12 pass through the spaces 89 between the forming rails 66 and are folded generally upwardly at the end of the upper section of the rails 66. From the point at which the outer longitudinal edges of the carrier 12 are folded generally upwardly to the point at which the shoes 36 open to stretch the carrier apertures, the outer longitudinal edges of the carrier are maintained in the generally upwardly folded condition by the now vertical portions of the rails 66, and a downwardly holding action provided by the rails 67.

The rails 67 are arranged above the longitudinal centre lines of the apertures in the carrier stock 12, and the carrier stock 12 passes therebelow. Thus it may be seen that the rails 67 hold these portions of the carrier stock 12 down.

The centre pair of rails, rails 68, also lie over the carrier stock 12 as it passes through the guide system 60. The guide rails 68 may be called the centre forming rails and cooperate with the previously described plate 57 of the tucker assembly 38 of the shoe assemblies 34 to form the longitudinal central portion of the carrier stock 12 so that its cross section is V-shaped having an upright vertex.

As the carrier stock 12 approaches the end of the guide system 60 the shoes 36 open and stretch the apertures during the further rotation of the shoes 36, the pair of shoes 36 in each aperture are moved apart to engage the generally vertically directed inner and outer longitudinally extending portions of the container encircling bands of the carrier stock 12. As the rotor means 13 continues to rotate, the stretched and folded carrier stock is applied over the upper beads of the cans 10 to assemble the carrier stock 12 on the cans 10. From the foregoing it may be seen that when the carrier stock 12 is applied to the cans 10, the inner peripheral edge of the container encircling bands is above the outer peripheral edges so that the container encircling bands in the stretched condition on the cans 10 assumes a substantially frusto-conical configuration about the cans 10.

Because of the above described construction and arrangement of the guide system 60 relative to the shoe assemblies 34, high speed operation of the machine is possible whilst maintaining the desired application of the carrier stock 12 to the cans 10. The unitary arrangement of the guide rails in the guide assembly 60 permits easy and exact adjustment of the guide rails for efficient, rapid operation of the machine.

WHAT WE CLAIM IS:—

1. A machine for assembling containers into packages held together by resilient



5 shoe-like carriers having a longitudinal
 series of transverse pairs of container en-
 circling bands, the machine including means
 for directing a procession of containers to a
 10 carrier and container assembly station,
 rotary means adjacent the assembly station
 and a guide system for receiving, folding and
 directing a succession of carriers to the
 rotary means at a location circumferentially
 15 spaced from the assembly station, the rotary
 means including a number of shoe assem-
 blies on its periphery for receiving successive
 carriers from the guide system and stretch-
 ing and applying the carriers to embrace
 20 containers in the assembly station, the rotary
 means including a number of shoe assem-
 blies on its periphery for receiving successive
 carriers from the guide system and stretch-
 ing and applying the carriers to embrace
 25 containers in the assembly station, wherein
 the guide system comprises a unitary
 assembly of guide rails arranged to fold
 the longitudinal sides of the succession of
 carriers and to fold the central part of the
 succession of carriers into a V-shaped fold
 before the carriers are stretched by the shoe
 assemblies, and each of the shoe assemblies

comprises a unitary assembly fixed to the
 periphery of the rotary means solely by two
 spaced apart fasteners, the shoe assemblies 30
 cooperating with the guide system to receive
 the carriers as they are folded.

2. A machine according to claim 1, in
 which the unitary assembly of guide rails is
 mounted on a pair of rods, and means are 35
 provided to secure the ends of the rods in a
 fixed position in the machine so that the
 guide rails are held at their location circum-
 ferentially spaced from the assembly station.

3. A machine according to claim 1 or 40
 claim 2, in which each of the shoe assem-
 blies include a mounting plate carrying the
 remainder of the shoe assemblies, and the
 spaced apart fasteners project through the
 mounting plate and into the rotary rotor 45
 means at both ends of the mounting plate.

4. A machine according to claim 1, con-
 structed substantially as described with refer-
 ence to the accompanying drawings.

For the Applicants:—

GILL, JENNINGS & EVERY,
 Chartered Patent Agents,
 51/52 Chancery Lane,
 London, WC2A 1HN.