

Feb. 14, 1967

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3,303,630

PACKAGING APPARATUS AND METHOD FOR CYLINDRICAL ARTICLES

Filed Feb. 27, 1964

2 Sheets-Sheet 1

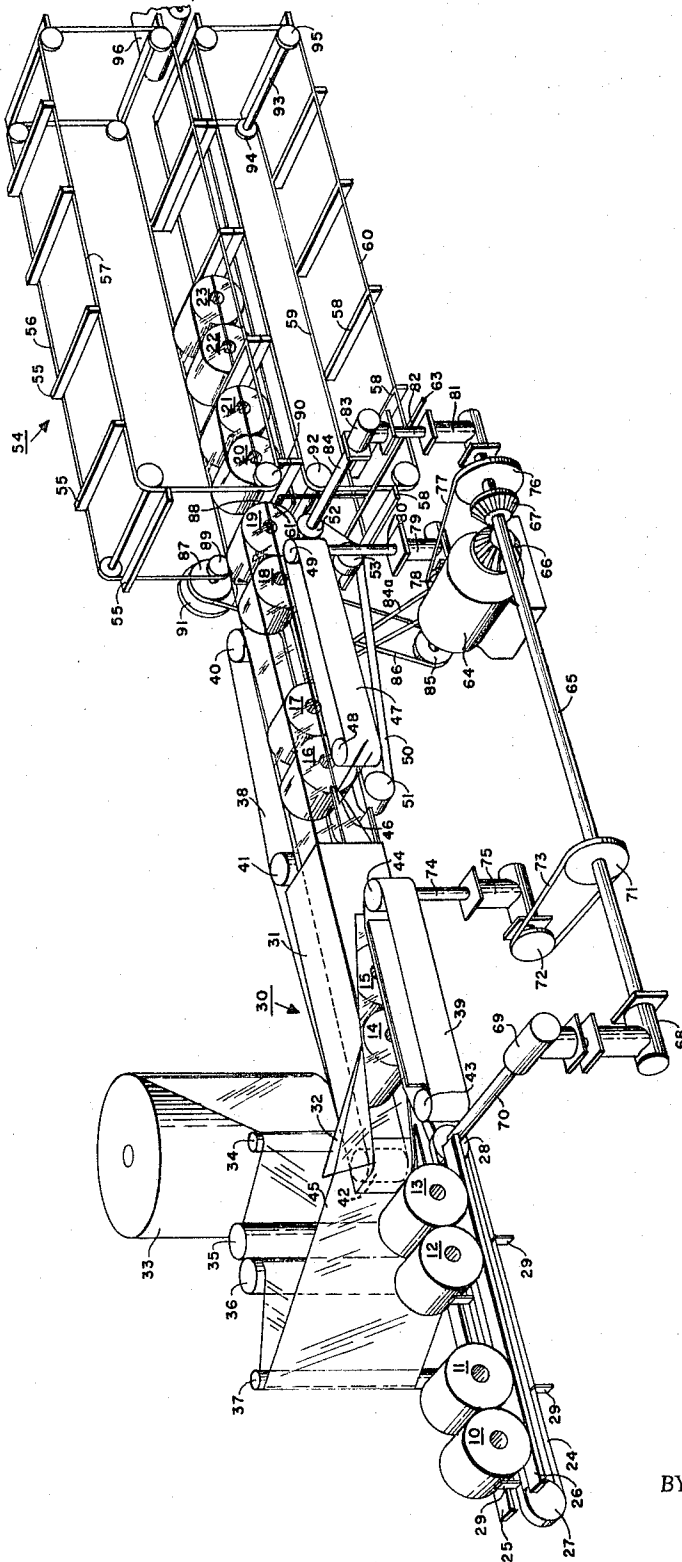


Fig. 1

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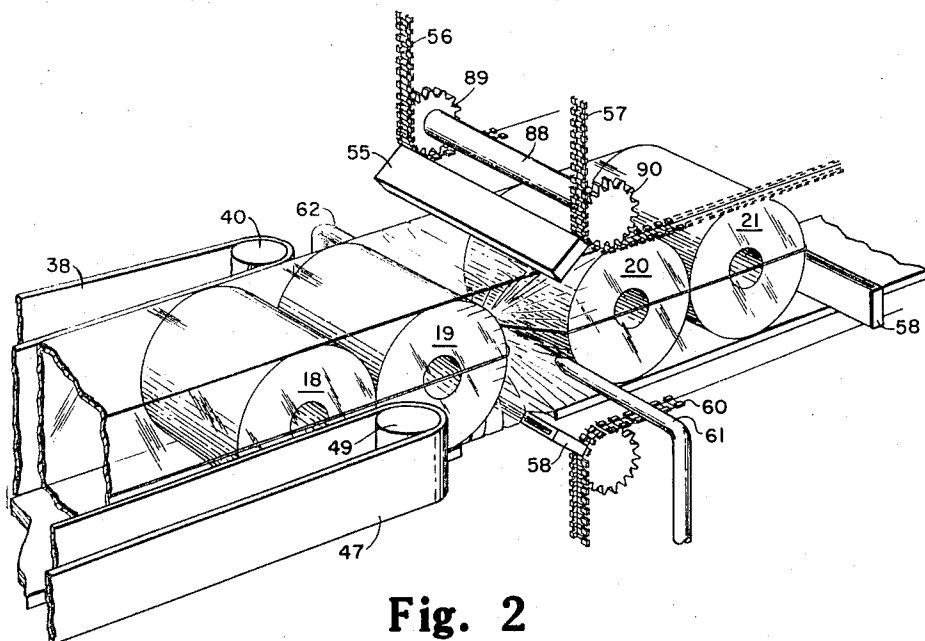


Fig. 2

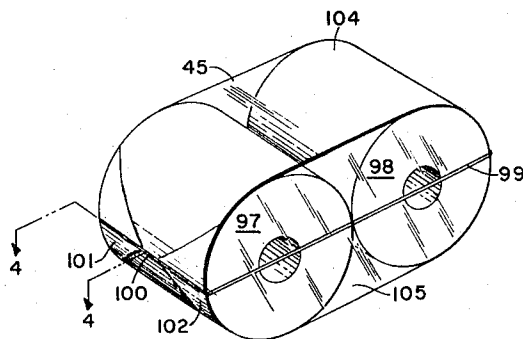


Fig. 3

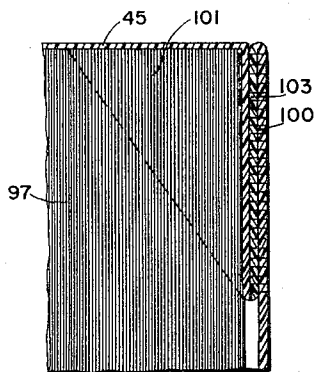


Fig. 4

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PACKAGING APPARATUS AND METHOD FOR CYLINDRICAL ARTICLES

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Filed Feb. 27, 1964, Ser. No. 347,884
3 Claims. (Cl. 53—28)

This invention relates to an apparatus and method for packaging articles in flexible, heat-sealable films. More particularly, the invention relates to the packaging of a plurality of cylindrical articles having their axes in parallel relation so that the finished package has a maximum surface area available for the printing of advertising material, instructions and the like.

In the retail marketing of cylindrical articles such as rolls of toilet tissue, hand towels or the like, it is frequently considered good marketing practice to wrap the articles in groups containing two or more articles. Many kinds of wrapping methods and machines are available for overwrapping articles of this nature in various ways. It has been found, however, that previously known methods and machines had certain disadvantages insofar as the form of the finished package is concerned. For example, in the wrapping of a pair of toilet tissue rolls or the like, the previously available methods and machines folded the loose ends of the wrapper in a way that reduced the total area available on the surface of the package for the printing of trademarks, advertising and instructional material. Furthermore, the packages made by these prior methods and machines were unattractive on the sides perpendicular to the axes of the rolls since the excess or ends of the wrapper material was folded over and adhered in such a way that it did not form an attractive package.

The principal object of this invention is the provision of an apparatus and method for packaging cylindrical articles in groups containing at least two articles so that the axes of the articles are parallel whereby the excess wrapping material is infolded and sealed at the ends of the package to provide a maximum unobstructed area on the finished package.

Another object of the invention is the provision of an apparatus and method for making packages for cylindrical articles in groups containing at least two articles which can be operated at high production speeds at a minimum cost and without any intermittent motions so that the entire wrapping and folding sequence is continuous.

The nature and substance of the invention can be briefly summarized as comprising a device for feeding groups of cylindrical articles having their axes in parallel relation to a wrapping station. The articles are enclosed by a web of flexible, heat-sealable plastic wrapping material at the wrapping station as they pass therethrough whereupon a heat sealing element seals the overlapped lateral edges of the web material to form an elongated tube having a plurality of spaced groups of cylindrical articles therein. The articles are moved continuously through the wrapping station to a clamping, sealing and severing station. The latter station is composed of a plurality of co-operating clamping, sealing and severing elements which come together between adjacent groups of articles to hold the wrapping material while a heated cut-off wire is passed through the clamped wrapping material to form transverse end seams and simultaneously sever adjoining groups from one another to complete the ends of the adjoining packages.

The forwarding mechanism for the articles in the elongated tube moves at a somewhat greater speed than

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the clamping, sealing and severing elements. Thus, the groups of articles in the elongated tube tend to be moved closer together as they approach the clamping, sealing and severing station, thus leaving slack material between adjoining groups. A pair of fluid jets are directed inwardly at either side of the elongated tube as the groups of articles enter the clamping, sealing and severing station. This causes the slack material to be infolded prior to being clamped by a pair of co-operating clamping, sealing and severing elements. Then, as the articles are end-sealed and severed, the excess or slack material is neatly sealed to the end seam inside the outer skin of the package.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter regarded as forming the present invention, it is believed the invention will be better understood from the following description taken in connection with the accompanying drawings in which:

FIGURE 1 is an isometric view of the entire apparatus showing all of its various elements including the complete drive for each of the several units thereof.

FIGURE 2 is a fragmentary isometric view showing the fluid delivery jets infolding the slack material between adjoining pairs of articles being delivered to the clamping, sealing and severing station.

FIGURE 3 is an isometric view of a finished package made by the apparatus and method of this invention.

FIGURE 4 is a fragmentary cross section taken on the line 4—4 of FIGURE 3 showing, in detail, the infolded slack material and the transverse end seam of the package.

Referring now to the drawings and particularly FIGURE 1 thereof, the machine is shown in operation with a plurality of pairs of articles being moved therethrough. The articles which are shown, by way of example, as being rolls of toilet tissue are indicated in pair by the reference numerals 10 and 11, 12 and 13, 14 and 15, 16 and 17, 18 and 19, 20 and 21, 22 and 23. It is to be understood that the invention is being described for wrapping toilet tissue rolls purely for convenience as it will become evident that cylindrical articles of any kind can be packaged by the herein described apparatus and method. Furthermore, while the exemplary embodiment will describe the invention as packaging the toilet tissue rolls in pairs, it will be understood that groups of three or any number can be packaged by the use of the apparatus and method to be described. Thus, the nature of the articles and the number of articles per group are not to be construed as forming any limitation on the scope of the present invention.

The pairs of articles 10, 11 and 12, 13 are supported on the infeed conveyor 24 and the stationary horizontal support surfaces 25 and 26 at the sides thereof. The conveyor 24 comprises an endless chain mounted on the sprockets 27 and 28, there being a plurality of spaced forwarding elements 29 mounted on the chain, to move the groups of articles forward in spaced relationship.

The wrapping station indicated generally at 30 includes a web folding member 31 having a plow 32. A roll of web material 33 is suitably supported on a stand (not shown) and is fed through the wrapping station 30 over the guide rolls 34, 35, 36 and 37.

The pairs of rolls delivered from the infeed conveyor 24 are carried through the wrapping station 30 by means of the forwarding belts 38 and 39 which engage the side surfaces of the articles, for example, the toilet tissue rolls 14 and 15 shown in FIGURE 1. The forwarding belt 38 is mounted on the pulleys 40, 41 and 42. The forwarding belt 39 is mounted on the pulleys 43 and 44. As the forwarding belts 38 and 39 move the pairs of articles continuously through the web folding member 31, the

web 45 is fed continuously and drawn from the roll 33 and is folded in tubular form around the articles by the folding member 31. The web 45 is preferably a flexible, heat-sealable material such as polyethylene, polypropylene or the like.

As the articles emerge from the folding member 31, they are encased in an elongated tubular member formed by the web 45 with its lateral side edges in overlapping relation. The overlapped side edges of the web 45 are heat sealed by means of the hot wire 46 at the exit of the folding member 31 to complete the formation of the elongated tube around the groups of articles.

A forwarding belt 47 mounted on the pulleys 48 and 49 co-operates with the forwarding belt 38 to continue the forward movement of the groups of articles encased in the elongated tube. In addition, a conveyor 50 supports the elongated tube and the articles therein. The conveyor 50 is mounted on the pulleys 51, 52 and 53 and coacts with the forwarding belts 38 and 47 to move the entire assembly to the next machine station.

The elongated tube with the articles therein is forwarded to the clamping, sealing and severing station generally indicated at 54. The clamping, sealing and severing station 54 is composed of a plurality of equally spaced upper clamping, sealing and severing elements 55 supported by the chains 56 and 57 which run over suitable sprockets as illustrated in FIGURE 1. Similarly, a plurality of equally spaced lower clamping, sealing and severing elements 58 are supported by a pair of chains 59 and 60 which also run over a plurality of sprockets as illustrated. It will be noted that as the pairs of articles enter the clamping, sealing and severing station 54, an upper element 55 and a lower element 58 come together between each successive pair to clamp the wrapping film and to thereafter provide means for sealing and severing same. The latter means are conventional in the package machinery so that the details thereof need not be described and illustrated herein since they will be well known to those skilled in the art.

The endless chains 56, 57, 59 and 60 move at uniform speed but somewhat slower than the forwarding belts 38, 47 and the conveyor 50. Thus, as the elongated tube formed by the web 45 enters the clamping, sealing and severing station 54, the distance between adjoining pairs of articles 18, 19 and 20, 21 is reduced causing the formation of slack material in the elongated tube. It will be noted that the fluid delivery jets 61 and 62 are disposed on opposite lateral sides of the elongated tube and cause the slack material to be blown inwardly just before a mating pair of elements 55 and 58 come together to clamp the excess slack material formed between adjoining groups of articles which are to be packaged. The jets 61 and 62 can be connected to any fluid pressure source, e.g. compressed air, by the conduit 63, said source not being shown since it is conventional. Thus, when a pair of elements 55 and 58 come together the slack material has been blown inwardly and is infolded between the article and the outside material forming the outer skin of the wrapper.

The entire apparatus is driven from a motor 64 which drives the shaft 65 by means of the bevel gears 66 and 67. The infeed conveyor 24 is driven from the shaft 65 by means of the right angle drives 68 and 69 and the shaft 70 which drives the sprocket 28. Similarly, the forwarding pair 39 is driven from the drive shaft 65 by means of the sprockets 71 and 72 which are drivingly connected by the chain 73. The sprocket 72 rotates the output shaft 74 of the right angle drive 75 thus rotating the pulley 44.

The forwarding belt 47 is also driven from the drive shaft 65 by means of the sprocket 76, the chain 77, the sprocket 78, right angle drive 79 and the output shaft 80 which drives the pulley 49. The end of the drive shaft 65 is connected to a right angle drive 81 driving the output shaft 82 and the right angle drive 83, the output shaft 84 of which drives the pulley 52 of the conveyor 50. The

forwarding belt 38 is driven by the chain 84a which is driven by a sprocket (not shown) commonly mounted on the same shaft as the sprocket 78. The chain 84a drives a sprocket (not shown) which, in turn, drives a right angle drive (not shown) which is in driving engagement with the pulley 40.

The chains 56, 57, 59 and 60 which are supported by the illustrated sprockets are also driven from the motor 64. A sprocket 85 secured to the motor shaft drives the chain 86 which passes over the sprocket 87 secured to the shaft 88 to drive, in unison, the sprockets 89 and 90. A gear 91 is secured to the outer end of shaft 88 and is in driving engagement with a gear (not shown) attached to the shaft of the sprocket (not shown) opposite the sprocket 92. The shaft 93 interconnecting sprockets 94 and 95 provides uniform driving motion for the chains 59 and 60.

The finished packages are removed from the clamping, sealing and severing station 54 and delivered to a take-away conveyor 96. These finished packages are shown in FIGURES 3 and 4. It will be noted that the toilet tissue rolls 97 and 98 have a skin-tight film wrapped therearound having a lateral side seam 99 which intercepts the axes of the two articles. The end seam 100 is formed by a hot-wire cut-off mounted in one of each of the pairs of elements 55 and 58. It will be noted that the excess slack material outlined at 101 and 102 has been infolded beneath the outer skin of the package at the ends of the end seam 100. FIGURE 4 illustrates the manner in which the end seam 100 is commonly seamed to the intermediate layer 103 of the excess material thus folding it neatly in place and preventing its becoming dislodged when the package is handled prior to being opened. It will also be noted that by infolding the excess material and sealing it to the end seam 100, the upper surfaces 104 and the lateral side surfaces 105 are substantially free of excess material thus allowing a maximum area to display the item when a transparent wrapping film is used and for printing of advertising copy and other retailing information.

While particular embodiments of the invention have been illustrated and described, it will be obvious to those skilled in the art that various changes and modifications can be made without departing from the spirit and scope of the invention and it is intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

What is claimed as new is:

1. Apparatus for forming a package for a plurality of cylindrical articles comprising the combination of a conveyor for feeding said cylindrical articles in spaced pairs to a wrapping station, means for continuously feeding a web of flexible, heat-sealable web material to said wrapping station, means at said wrapping station for continuously enclosing said pairs of articles in an elongated tube formed from said flexible, heat-sealable web material with the lateral edges of said web material in overlapping relation along one lateral side of the elongated tube, means for heat sealing said overlapped lateral side edges, means for moving said articles and said elongated tube forward at substantially constant speed to a transverse heat sealing station, said articles being spaced in pairs within said tubular wrapper with a gap between each pair, said heat sealing station including clamping, sealing and severing means and means for moving the articles forward at a slower speed than the speed at which they are delivered to said clamping, sealing and severing means, said speed differential causing slack material to be formed between adjoining pairs of articles just before entering said clamping, sealing and severing means, a pair of oppositely disposed air delivery jets directed at the lateral side faces of the tubular wrapper to infold the slack material just prior to the actuation of the clamping, sealing and severing means thereby infolding the slack material beneath the wrapping

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material and simultaneously positioning the slack material to be sealed to the end seam formed by said sealing means thereby preventing dislodgment of said infolded slack material when the package is completed.

2. A method of forming a package for a plurality of cylindrical articles comprising the steps of feeding said articles in spaced pairs to a wrapping station, continuously feeding a web of flexible, heat-sealable web material to said wrapping station, continuously enclosing said pairs of articles at said wrapping station in an elongated tube formed from said flexible, heat-sealable web material so that the lateral edges of said web material are in overlapping relation along one lateral side of the elongated tube, heat sealing said overlapped side edges, moving said articles and said elongated tube forward at substantially constant speed to a transverse heat sealing station, moving said pairs of articles forward at reduced speed at said transverse heat sealing station, said speed differential causing slack web material to form between consecutive pairs of articles before said pairs of articles enter said transverse heat sealing station, infolding the slack material by a pair of oppositely disposed fluid pressure jets, thereafter clamping, sealing and severing the material at said heat sealing station between adjoining pairs of articles so that the slack material remains infolded and is sealed between the arcuate surface of the cylindrical articles and the end portions of said wrapping material joined by said end seam.

3. Apparatus for forming a package for a plurality of cylindrical articles comprising the combination of means for enclosing the articles in an elongated tubular wrapper of flexible, heat-sealable material, means for spacing said articles within said tubular wrapper in groups so that each group is composed of the number of articles to be enclosed in the finished package, means for infolding the slack material of the tubular wrapper between adjoining groups of articles, means for there-

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after clamping, sealing and severing the tubular material between the adjoining groups to form an end seam parallel to the axes of the cylindrical articles, said infolding means comprising a pair of oppositely disposed fluid delivery jets directed at the lateral side faces of the tubular wrapper to infold the slack material just prior to the actuation of the clamping, sealing and severing means thereby infolding the slack material beneath the outer wrapper material surfaces and simultaneously positioning the slack material to be sealed to the end seam to prevent dislodgment of said infolded slack material when the package is completed, said clamping, sealing and severing means acting to move the seamed packages forward to the discharge end of the apparatus, whereby excess package material is folded and sealed between the arcuate surface of the cylindrical articles and the end portions of said wrapping material joined by said end seam, and means for feeding the groups of articles to the clamping, sealing and severing means, said feeding means moving the articles at a higher rate of speed than said clamping, sealing and severing means whereby the slack material between adjoining groups of articles can be readily infolded by said fluid delivery jets prior to the formation of the end seam.

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