

PATENT SPECIFICATION

(11) 1351361

1351361

- (21) Application No. 31367/71 (22) Filed 5 July 1971
 (31) Convention Application No. 52483 (32) Filed 6 July 1970 in
 (33) United States of America (US)
 (44) Complete Specification published 24 April 1974
 (51) International Classification B65B 5/06//35/38 35/44 35/58
 43/18 43/24 43/30 43/44 53/00
 (52) Index at acceptance

B8C 10B1A 10B1D1 10B1D2A 10B1D2B 10B1D4 10B1F1
 10F2 10F3 10F4 10J2A 10K2 10S1 10S2A 10S2B
 10T1A 10T1B 10T4 3B3 X6



(54) IMPROVEMENTS RELATING TO PACKAGING MACHINES

(71) We, UNION CARBIDE CORPORATION, a corporation organised and existing under the laws of the state of New York, United States of America, of 270 Park Avenue, New York, State of New York, 10017, United States of America (assignee of LAWRENCE JAMES ULINE), 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:—

The present invention relates to a machine for packaging one or more articles in a pre-formed pouch and has particular reference to a machine for filling a preformed heat shrinkable pouch with a plurality of articles while maintaining the relative position of the articles to each other and to the pouch during filling and handling of the filled pouch.

The general object of the invention is to provide a new and improved machine of the above character in which the pouches and articles to be packaged are moved through a series of stations wherein the pouches are opened to receive the articles and are transferred onto the articles without disturbing their relative position and the pouch-article combination is ultimately removed from the machine again without disturbing the relative position of the articles to each other or to the pouch.

Articles which may be packaged with the machine of the present invention are generally but not necessarily those which are capable of standing upright on end without support. Preferably the articles are of cylindrical configuration such as soda or beer cans, flashlight batteries, cylindrical bottles and the like, but other regular and irregular shaped articles may also be packaged with a minimum of adjustment to the machine.

The term "pouch" as used herein and in the appended claims is intended to refer to a package which is generally tubular in

shape and has two open ends and a header board extending from its top. The pouch is formed from a heat shrinkable thermoplastic film but other materials, such as an open ended paper tube may also be used.

United States Patent No. 3,424,306 describes a package comprising a strip of heat shrinkable thermoplastic film folded upon itself in approximate edge-to-edge relationship having a header board of relatively rigid sheet material such as a paper board, proximate to the edge of the film and forming an appendage extending from the package.

According to the present invention there is provided a machine for packaging one or more articles in a pouch formed from a strip of thin heat shrinkable thermoplastic film folded upon itself in approximate edge-to-edge relationship and having a header board of relatively rigid sheet material heat sealed to said edges forming a tube of thermoplastic material with the header board extending therefrom; said machine comprising a multistation indexing horn assembly having at least one article receiving horn mounted thereon and extending therefrom; means being provided for indexing said horn assembly to bring said horn successively adjacent to article supply means to receive the articles to be packaged, a pouch transfer station and package removal means; a multistation indexing mandrel assembly having at least one mandrel mounted thereon and extending therefrom; means being provided for indexing said mandrel assembly to bring said mandrel successively adjacent to pouch supply means to receive a pouch and to said pouch transfer station; said horn assembly and said mandrel assembly being arranged in a manner such that said horn and said mandrel are transversely aligned when at said pouch transfer station; and transfer means being provided at said pouch transfer station for transferring a pouch from said mandrel to said horn containing the articles to be packaged.

The operation of the machine of the present invention will be described in detail with specific reference to a package in accordance with this specification but it will be obvious to those skilled in the art that other packages comprising a closed periphery of packaging material having open sides and an appendage extending from the package along its periphery and parallel to the opening through the package will also be useful.

The present invention will now be further described, by way of example, with reference to the accompanying drawings, in which:—

Fig. 1 is an isometric plan view, partially cut away, showing the general layout of a machine embodying the novel features of the present invention;

Fig. 2 is an enlarged sectional view taken along line 2—2 in Fig. 1 at the package-product work level of the machine and shows the pouch transfer carriage at the pouch feed position;

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2;

Fig. 4 is a top plan view, partially in section, showing the indexing mandrel unit of the machine of the present invention.

Fig. 5 is a cross-sectional view taken along line 5—5 of Fig. 4;

Fig. 6 is an enlarged view of an individual mandrel in its expanded position and taken along line 6—6 of Fig. 4;

Fig. 7 is a view similar to Fig. 6 but shows the mandrel in its contracted position and is taken along line 7—7 of Fig. 4;

Fig. 8 is a top plan view of an article orientor useful in conjunction with the machine of the present invention;

Fig. 9 is a cross-sectional view taken along line 9—9 of Fig. 8;

Fig. 10 is a plan view in section taken along line 10—10 of Fig. 9;

Fig. 11 is a cross-sectional view taken along line 11—11 of Fig. 8;

Fig. 12 is a top plan view, partially in section, of the indexing horn unit of the machine of the present invention;

Fig. 13 is a cross-sectional view taken along line 13—13 of Fig. 12; and

Fig. 14 is a cross-sectional view taken along line 14—14 of Fig. 12 displaying product and pouch prior to removal from the machine.

As shown in the drawings for purposes of illustration, the invention is embodied in a machine for inserting articles in preformed pouches for the purpose of attractive salability and product protection. The machine is particularly adapted for packaging free standing cylindrical articles such as flashlight batteries 20 in preformed pouches 22 (Fig. 14) comprising a loop of thermoplastic material 24 having its edges heat sealed to a header board 26 forming an appendage extending from the top of the pouch. Header board 26 is

provided with a notch at each end to enable a stack of pouches to be supported from a pair of parallel guide rails onto which the notches may rest as the pouches are processed through the pouch supply magazine.

For purposes of illustration, the drawings show a machine for packaging four flashlight batteries 20, arranged in upright position in a single row, in a pouch 22 having loop 24 formed from a heat shrinkable transparent thermoplastic film. The batteries each bear some indicia 28 on their labels and are packaged with the indicia facing in a predetermined direction to provide easy viewing of the indicia through the transparent thermoplastic film.

The machine of the present invention basically comprises an indexing horn assembly 30, an indexing mandrel assembly 32 and various transfer shuttle carriages for delivering pouches to the mandrel assembly, delivering articles to be packaged to the horn assembly, transferring pouches from the mandrel assembly to the articles on the horn assembly and transferring pouches with articles contained therein from the horn assembly at an appropriate discharge station. Also, for purposes of illustrating a preferred machine construction in accordance with the present invention, an orientor assembly, generally designated 34, is including for orienting batteries 20 such that indicia 28 faces in a predetermined direction before batteries 20 are loaded onto the indexing horn assembly 30 and prior to placing a pouch 22 over the batteries.

Referring in detail to the drawings, the preferred machine construction which is set forth for purposes of illustration comprises a pouch supply magazine 36 having parallel guide rails 28 along its top edges. The guide rails are spaced apart approximately the width of pouch 22 and are positioned in a manner such that the notches in the header board 26 of pouches 22 will rest on the guide rails 38 supporting the pouches by their header boards 26 with the loop of thermoplastic film 24 hanging in the trough of supply magazine 36. Pouches 22 are preformed and supplied to supply magazine 36 in flat condition aligned in a stack 40. Pouch supply magazine 36 has rails, 42, 44 disposed along its top on opposite sides of the trough formed by the magazine. Constant pressure pads 46, 48 are slidably mounted on rails 42, 44 and are rotatable about the rails from a position within the trough of pouch supply magazine 36 to a position clear of the trough.

A slicer assembly 50 is disposed at the inside end of pouch supply magazine 36 and engages the innermost pouch of stack 40. The slicer assembly 50 includes a vertically operating slicer blade 52 which is clear of stack 40 in its upward stroke and pushes down on the first pouch of stack 40 in its downward stroke to separate this first pouch from

the remainder of the stack. Slicer assembly 50 is also provided with a movable bar (not shown) containing a vacuum pad which bar moves vertically with the slicer blade 52 and can either assist the slicer blade by pulling downward on the loop of thermoplastic film of the pouch or can operate independently of the slicer blade. A small pin (not shown) is positioned to protrude through a hole or slot in the header board 26 and is mounted on a separate vacuum pad which grips the header board to elevate the pouch to the work level of the machine where it is transferred to an intermediate stationary vacuum header board holder.

A shuttle carriage 54 (Figs. 2 and 3) is slidably mounted on guided bearings 55 which run upon rails 56, 60 and extend the length of the working area of the machine. Rails 56, 60 are hung from supports 62, 64, 66, 68 extending from the bottom of frame member 70. Frame member 70 is supported at one end by stanchion 72 and at the other end by housing 74 and is the main support for rails 56, 60 and the transfer mechanisms which move thereon. The remaining machine parts are supported by a base 76 and work table 78 which rests thereon.

Shuttle carriage 54 comprises a pair of reciprocating lever arms 80, 82 which pivot about rail 58 in reaction to forces applied to arms 84, 86 through levers 88, 90. A plunger 92 extends between lever arms 80, 82 part of the way down the arms and forms a pair of mechanical gripper bars 94, 96 which securely grip the header board of a pouch when in a closed position. Lever arms 80, 82 each terminate in an inwardly extending vacuum shoe 98, 100 which support at their inner ends vacuum bars 102, 104 connected through hoses 106, 108, respectively, to a suitable source of vacuum, such as vacuum pump 111.

Indexing mandrel assembly 32 (Figs. 4 and 5) is an eight-station carousel comprising a hub 110 extending from a shaft 112 which is rotatably mounted through bearings 114, safety clutch 122, and indexer 124. Extending from hub 110 are eight identical arms 126 each equipped with a pair of supports 128, 140 pivotally mounted on pin 132. The lower portion of supports 128, 130 is in contact with a cam complex 134 which engages both supports and moves them from an expanded position (Fig. 6) to a contracted position (Fig. 7) against the force of spring 136. Between pivot pin 132 and cam complex 134 is the pouch receiving portion of the arm which comprises a pair of parallel bars 138, 140 having a header board holding slot 142 therebetween, and a pair of flat movable mandrel plates 144, 146. Mandrel plates 144, 146 are secured to supports 128, 130, respectively, by screws 148 and expand or contract as supports 128, 130 are expanded or contracted by pivoting about pin 132 through

the force exerted by cam complex 134. Cam complex 134 is made up of cams 135 and 137 which are joined through plate 139 and pivot about pin 141. These cams ride, through roller 143, on stationary cam 145 or between stationary cam 145 and guide shoe 147.

Shuttle carriage 54 is movable from a position above the intermediate header board holder to a position straddling bars 138, 140 and plates 144, 146 of indexing mandrel assembly 43. During its movement from the intermediate header board holder to the mandrel assembly a vacuum is drawn on vacuum bars 102, 104 and the vacuum bars are cammed outward. In this way, the loop of thermoplastic film 24, which forms the body of pouch 22 positioned between the vacuum bars will be opened slightly. In their pouch receiving position, supports 128, 130 of the mandrel assembly are in their contracted position, as shown in Fig. 7. As shuttle carriage 54 straddles mandrel plates 144, 146, the pouch is slid over the contracted mandrel plates and the header board 26 is slid into header board holding slot 142. The header board is then held in header board-holding slot 142 and the pouch is released by shuttle carriage 54 which returns to its position over the intermediate header board holder. Parallel bars 138, 140 which define header board-holding slot 142 have a plurality of rotatable discs 149 recessed therein and biased by flat leaf springs 151 to protrude into header board-holding slot 142. Upon insertion of a header board into a header board-holding slot 142 the discs 149 are rotated by the advancing header board and act to retain the header board within the slot until withdrawn therefrom by a pair of mechanical grippers.

The mandrel assembly 32 is then indexed clockwise and, while being indexed, activates cam complex 134 to spread supports 128, 130 to their expanded position.

Since pouch 22 is stored in a flat stack 40, a crease is present at the bottom of the loop of thermoplastic film 24. To facilitate the production of a uniform package after heat shrinking it is desirable to remove the crease before the heat shrinking is initiated. For this purpose, a crease removal unit 156 is provided two stations after the pouch receiving station of the indexing mandrel assembly. This unit comprises a housing 158 secured to work table 78 and having a thermostatically controlled heater bar 160 secured in working engagement with said housing through arm 162. Housing 158 is movable and in its operative position the heater bar 160 will be in the same plane as the crease of a pouch present on an arm of said mandrel assembly for a fraction of a second and will heat the crease to the lower limit of the softening point of the thermoplastic material thereby relaxing the crease and establishing

a symmetrical loop of thermoplastic film. To prevent damage to pouches on the mandrel assembly when the machine stops, the heater assembly housing 158 is movable sideways to remove the heater bar from the vicinity of any thermoplastic material and the creases.

Flashlight batteries 20 are supplied to the machine in a single row, standing on end, on a belt conveyor 164 from a suitable source of supply (not shown) such as a battery assembly machine. As the batteries move along conveyor 164 they contact a metering device consisting of a star wheel 166 which is connected through axle 168 to ratchet 170. Solenoid 172 is connected to pawl 174 through arm 176 and pivots the pawl about pin 178, against the force of spring 180; to momentarily disengage ratchet 170. When solenoid 172 pulls out pawl 174, ratchet 170 and star wheel 166 are permitted to revolve in a clockwise direction under the influence of the force of the batteries being moved along by conveyor 164. After permitting the required number of batteries to pass, ratchet 170 with star wheel 166 attached is automatically stopped by pawl 174. Rotation moves the required number of batteries forward by pushing until the first battery abuts locating guide 200. At this position batteries have been moved into orienting stations 182, 184, 186, 188.

In the orientor stations, the batteries are resting on a guide track comprising guide rails 190, 192 and parallel tracks 194, 196 which are secured to the guide rails by screws 198. A second locating guide 201 is activated in the trough formed by guide rails 190, 192 and reciprocates from a position withdrawn from the path of the batteries to a position contacting the outside edge of the last battery on the parallel tracks 194, 196 thereby positioning the batteries over the orienting stations on the parallel tracks without creating excessive spacing between the individual batteries. Below the orientor stations are located chucks 202, 204, 206, 208 each having a hollow core through its center communicating with a dish-shaped seat 212 of a configuration which will form a seal with the bottom of flashlight battery 20.

When flashlight batteries 20 are in position they come into contact with the rotation chucks. The batteries are held to their respective chucks by vacuum and immediately start rotating until the orientation cycle is completed. Chucks 202, 204, 206, 208 are connected at their lower ends to upper spindles 214, 216, 218, 220 which each include a clutch 222, 224, 226, 228, respectively, and a brake, 230, 232, 234, 236 respectively. Lower spindles 238, 240, 242, 244, respectively, are rotated continuously in a counter clockwise direction at a constant speed through ear belts 246, 248 by motor 250.

Above and to the side of each chuck is

positioned a photoelectric scanner 252 which projects a concentrated light beam to the label of a battery attached to and rotating with the chuck. Each photoelectric scanner 252 is linked through an appropriate photoelectric relay to the brake and clutch of the upper spindles 214, 216, 218, 220. As the light beam contacts contrasting arrangements of colors on the battery labels, impulses are sent to a photoelectric relay. This relay is programmed to react when a signal is received indicating that indicia 28 has been scanned by the beam of light. The relay then immediately disengages the clutch and applies the brake to stop the rotation of the upper spindle, chuck and battery. Stopping of each rotating unit is independent of the others and can be controlled such that the indicia are facing in any desired direction. When orientation is completed, the vacuum drawn on the bottom of the batteries is broken and guide rails 190, 192 and parallel tracks 194, 196 are raised to remove the batteries from the chucks and raise them to their initial position.

Positioned above the orientor assembly 34 is a battery transfer shuttle generally designated 254, slideably mounted on railings 256, 258 and comprising a pair of reciprocating rubber faced gripper jaws 260. This device is operated by means of a cam 262, through lever 264 and slide 266 causing cam roller 268 to move up and down with linear track 270 thereby activating the gripper jaw 260 to close upon the previously oriented cells at orienting stations 182, 184, 186, 188. Another cam (not shown) is operatively connected to battery transfer shuttle 254 through linkage 272 and causes movement of the transfer shuttle along rails 256, 258 until the shuttle is in position above a horn 274 of indexing horn assembly 30 at which point the cells are now positioned in the horn channel by being slid into position through the open front of the horn channel. The rubber faced gripper jaws are then opened to release the batteries and the mechanism is returned to its initial position over the orientor for the start of the next cycle.

The indexing horn assembly 30, like the indexing mandrel assembly 32, is an eight-station carousel and comprises a hub 276 extending from a shaft 278 which is rotatably mounted through bearings 280, 282, 284, 286, safety clutch 288, and indexer 290. Extending from hub 276 are eight identical arms 292 each including a header board holder 294 and a horn 274.

The header board holder is a pair of parallel bars 296, 298 having a header board-receiving slot 300 therebetween. Each horn 274 is a long U-shaped trough 302 slightly wider than a flashlight battery welded at ends 304, 306 near center to a metal V-shaped mounting plate 308. The mounting plate forms a V-shaped channel 310 below

U-shaped trough 302 which acts as a vacuum chamber and is generally separated from the U-shaped trough by the bottom of the trough. Channel 310 is connected to a source of vacuum through mechanically controlled metal passages 312. When applied, this vacuum acts, through holes in the bottom of trough 302 to hold the batteries in their positions and alignment on the trough 302.

Horn assembly 30 indexes in a clockwise direction and two index stations after receiving batteries from battery transfer shuttle 259 is aligned with arm 126 of the indexing mandrel assembly 32 at its pouch transfer station 150. A pouch transfer carriage 314 straddles the aligned arms of horn assembly 30 and mandrel assembly 32 in their pouch transfer stations 150 and 56, 60 from a position above the arm of the mandrel assembly to a position of the arm of the horn assembly. Carriage 314 includes a pair of reciprocating gripper bars 316 for grasping a header board held by parallel bars 138, 140 of said mandrel assembly and a pair of reciprocating vacuum bars 318 for grasping a loop of thermoplastic material 24 surrounding mandrel plates 144, 146 and retaining the loop of material in its open position. In operation, the pouch transfer carriage 314 moves into position over parallel bars 138, 140 and mandrel plates 144, 146 of arm 126 of said mandrel assembly and closes gripper bars 316 on the header board of a pouch on the arm of the mandrel assembly while vacuum bars 318 close on the loop of the thermoplastic material of said pouch which now been fully opened by mandrel plates 144, 146. A vacuum is then drawn on vacuum bars 319 to retain the loop of thermoplastic material in its opened position and the pouch transfer carriage is slid along rails 56, 60 to a position straddling the horn of said assembly which is at the pouch transfer station. The header board of the pouch is thereby slid into header board holder 294 while the loop of thermoplastic material straddles horn 274 and the batteries resting thereon. At this point the pouch transfer carriage 314 releases the pouch and it is supported entirely by header board holder 294. The carriage is then moved off the horn and back to the mandrel assembly after the mandrel assembly indexes one station.

The indexing horn assembly 30 is then indexed clockwise through four index stations until it arrives at package removal station 320. At this point there is located a package transfer shuttle 322 which is slideable on rails 56, 60 from a position above the horn assembly which is at its package removal station to a position above a belt conveyor 325 which runs through housing 74 to a heat shrink tunnel (not shown) wherein the loop of thermoplastic material is heat shrunk

around the flashlight batteries to form the finished package.

Package transfer shuttle 322 comprises two pairs of reciprocating gripper bars 326, 328, one pair 326 for gripping the header board of a package and other pair 328 for gripping the loop of thermoplastic material and flashlight batteries contained therein. In operation, the gripper bars are closed about a pouch-battery combination at package removal station 320 in a manner such that the relative alignment of the batteries to each other, to the header board and to the loop of thermoplastic material is not disturbed. The shuttle is then slid along rails 56, 60 until clear of horn 274 and the package is released onto belt conveyor 324 by first allowing the batteries to drop to the bottom of the pouch followed in quick succession by releasing the header board to drop the entire unit onto the conveyor.

With the foregoing arrangement the machine cycle begins by the first pouch 22 of stack 40 being raised by slicer assembly 50 and subsequent mechanisms to a position where it is grasped by shuttle carriage 54 and loop of thermoplastic material 24 is slightly opened by vacuum bars 102, 104 while mechanical gripper bars 94, 96 securely hold header board 26. The shuttle carriage 54 is then moved to a position over closed mandrel plates 144, 146 in a manner such that header board 26 is grasped by parallel bars 138, 140 and loop of thermoplastic material 24 is around the closed mandrel plates. The shuttle carriage is then moved back to receive another pouch and the mandrel assembly is indexed 45°. During this movement supports 128, 130 are spread to their open position by cam complex 134.

At this point flashlight batteries 20 have been fed along belt conveyor 164 to a point where they engage star wheel metering device 166 which is allowed to rotate a sufficient distance under the influence of the force of the batteries being moved along by conveyor 164 to move four flashlight batteries into orientor stations 182, 184, 186, 188 and orientation is accomplished as previously described. The mandrel assembly is then indexed another 45° to a position above crease removal unit 156 where the crease in the loop of thermoplastic material 24 is contacted by heater bar 160 and the plastic is relaxed to eliminate the crease. While this is being accomplished battery transfer shuttle 254 moves into position above orientor stations 182, 184, 186, 188, gripper jaws 260 are closed on the four batteries at the orienting stations and the shuttle is moved along rails 256, 258 until the batteries are positioned on horn 274 where they are released by the gripper jaws and the transfer shuttle returns to its original position. While off the horn the batteries are held in place by a vacuum being drawn

through the holes in the bottom of U-shaped trough 302.

From the crease removal station and the battery receiving station the mandrel assembly and horn assembly, respectively, are each indexed through two 45° clockwise movement until both are aligned at pouch transfer station 150.

Pouch transfer carriage 314 is then slid along rails 56, 60 into position above mandrel arm 126 and gripper bars 316 are closed about the header board of the pouch at this station while a vacuum is drawn on vacuum bars 318 to hold the loop of thermoplastic material which is in its fully expanded condition. The transfer carriage is then slid along the rails until the header board has been inserted into header board holder 294 of the horn assembly and the loop of thermoplastic material has been positioned about horn 274 and the batteries thereon. The gripper bars then release the pouch and the transfer carriage moves clear of the horn assembly.

The horn assembly is indexed through four 45° advances until it arrives at package removal station 320. At this point transfer shuttle 322 comes into position above the horn and, through two pairs of mechanical grippers grasps the header board and the body of the package including both the loop of thermoplastic material and the four batteries therein. The shuttle then glides along rails 56, 60 to a position removed from the horn assembly and above a belt conveyor 324 onto which the package is deposited to be carried to a heat shrink tunnel where the loop of thermoplastic material is shrunk tightly around the flashlight batteries to form the finished package. Preferably, two heat shrink tunnels are used, the first being set at a lower temperature than the second. In this way the plastic is first preheated without shrinking and subsequently is quickly heat shrunk. This procedure has been found to yield a more uniformly shrunk wrapper and consequently a more visually appealing package.

Through each of the transfers and manipulations of the pouch and the batteries they are held against unwanted movement and the relative position and orientation of the batteries is preserved as well as their position within the pouch and the relationship of the header board and the pouch to the row of batteries.

If desired, a multiplicity of packages may be formed during each cycle of the machine. For example, the above describes in detail how a package containing four batteries is produced, but the teachings set forth will be equally applicable to the formation of two packages each containing two batteries. To accomplish this end it is necessary merely to insert a spacer midway between rails 38 of

pouch supply magazine 36 and position two rows of pouches, each approximately one half the width of the pouches shown in the drawings, in the magazine in place of the single track 40. The handling of the pouches is the same as described above except that, instead of grasping a single header board, the various gripper bars will hold two aligned header boards. Likewise, instead of holding open a single loop of thermoplastic material by means of vacuum, two aligned loops are held open.

With regard to the batteries, it is merely necessary to modify battery transfer shuttle 254 in a manner such that upon transfer of batteries from their orientor stations to horn 274 they are separated into two groups of two batteries each rather than a single group of four batteries. This alignment can be maintained by all the transfer mechanisms until finally, at package removal station 320, two packages of two batteries each are deposited on the conveyor rather than a single package of four batteries.

It is therefore seen that there is provided an improved machine for filling preformed pouches which machine will be particularly useful in packaging free standing articles into pouches having an appendage extending therefrom.

However, while the foregoing description sets forth a preferred embodiment of the invention, it is apparent that numerous changes may be made in the mechanism described without departing from the present invention. It is therefore desired that the present embodiment be considered in all respects as illustrative rather than restrictive, reference being had to the appended claims rather than the foregoing description to indicate the scope of the invention.

WHAT WE CLAIM IS:—

1. A machine for packaging one or more articles in a pouch formed from a strip of thin heat shrinkable thermoplastic film folded upon itself in approximate edge-to-edge relationship and having a header board of relatively rigid sheet material heat sealed to said edges forming a tube of thermoplastic material with the header board extending therefrom, said machine comprising a multi-station indexing horn assembly having at least one article receiving horn mounted thereon and extending therefrom; means being provided for indexing said horn assembly to bring said horn successively adjacent to article supply means to receive the articles to be packaged, a pouch transfer station and package removal means; a multi-station indexing mandrel assembly having at least one mandrel mounted thereon and extending therefrom; means being provided for indexing said mandrel assembly to bring said mandrel successively adjacent to pouch supply means to receive a pouch

through the holes in the bottom of U-shaped trough 302.

From the crease removal station and the battery receiving station the mandrel assembly and horn assembly, respectively, are each indexed through two 45° clockwise movement until both are aligned at pouch transfer station 150.

Pouch transfer carriage 314 is then slid along rails 56, 60 into position above mandrel arm 126 and gripper bars 316 are closed about the header board of the pouch at this station while a vacuum is drawn on vacuum bars 318 to hold the loop of thermoplastic material which is in its fully expanded condition. The transfer carriage is then slid along the rails until the header board has been inserted into header board holder 294 of the horn assembly and the loop of thermoplastic material has been positioned about horn 274 and the batteries thereon. The gripper bars then release the pouch and the transfer carriage moves clear of the horn assembly.

The horn assembly is indexed through four 45° advances until it arrives at package removal station 320. At this point transfer shuttle 322 comes into position above the horn and, through two pairs of mechanical grippers grasps the header board and the body of the package including both the loop of thermoplastic material and the four batteries therein. The shuttle then glides along rails 56, 60 to a position removed from the horn assembly and above a belt conveyor 324 onto which the package is deposited to be carried to a heat shrink tunnel where the loop of thermoplastic material is shrunk tightly around the flashlight batteries to form the finished package. Preferably, two heat shrink tunnels are used, the first being set at a lower temperature than the second. In this way the plastic is first preheated without shrinking and subsequently is quickly heat shrunk. This procedure has been found to yield a more uniformly shrunk wrapper and consequently a more visually appealing package.

Through each of the transfers and manipulations of the pouch and the batteries they are held against unwanted movement and the relative position and orientation of the batteries is preserved as well as their position within the pouch and the relationship of the header board and the pouch to the row of batteries.

If desired, a multiplicity of packages may be formed during each cycle of the machine. For example, the above describes in detail how a package containing four batteries is produced, but the teachings set forth will be equally applicable to the formation of two packages each containing two batteries. To accomplish this end it is necessary merely to insert a spacer midway between rails 38 of

pouch supply magazine 36 and position two rows of pouches, each approximately one half the width of the pouches shown in the drawings, in the magazine in place of the single track 40. The handling of the pouches is the same as described above except that, instead of grasping a single header board, the various gripper bars will hold two aligned header boards. Likewise, instead of holding open a single loop of thermoplastic material by means of vacuum, two aligned loops are held open.

With regard to the batteries, it is merely necessary to modify battery transfer shuttle 254 in a manner such that upon transfer of batteries from their orientor stations to horn 274 they are separated into two groups of two batteries each rather than a single group of four batteries. This alignment can be maintained by all the transfer mechanisms until finally, at package removal station 320, two packages of two batteries each are deposited on the conveyor rather than a single package of four batteries.

It is therefore seen that there is provided an improved machine for filling preformed pouches which machine will be particularly useful in packaging free standing articles into pouches having an appendage extending therefrom.

However, while the foregoing description sets forth a preferred embodiment of the invention, it is apparent that numerous changes may be made in the mechanism described without departing from the present invention. It is therefore desired that the present embodiment be considered in all respects as illustrative rather than restrictive, reference being had to the appended claims rather than the foregoing description to indicate the scope of the invention.

WHAT WE CLAIM IS:—

1. A machine for packaging one or more articles in a pouch formed from a strip of thin heat shrinkable thermoplastic film folded upon itself in approximate edge-to-edge relationship and having a header board of relatively rigid sheet material heat sealed to said edges forming a tube of thermoplastic material with the header board extending therefrom, said machine comprising a multi-station indexing horn assembly having at least one article receiving horn mounted thereon and extending therefrom; means being provided for indexing said horn assembly to bring said horn successively adjacent to article supply means to receive the articles to be packaged, a pouch transfer station and package removal means; a multi-station indexing mandrel assembly having at least one mandrel mounted thereon and extending therefrom; means being provided for indexing said mandrel assembly to bring said mandrel successively adjacent to pouch supply means to receive a pouch



* C L N S *

and to said pouch transfer station; said horn assembly and said mandrel assembly being arranged in a manner such that said horn and said mandrel are transversely aligned when at said pouch transfer station; and transfer means being provided at said pouch transfer station for transferring a pouch from said mandrel to said horn containing the articles to be packaged.

2. A machine as claimed in claim 1 in which said article supply means including means for randomly aligning in single file a plurality of articles to be packaged and a shuttle for gripping said articles and transferring same to a horn of said horn assembly.

3. A machine as claimed in claim 2 in which said article supply means further includes means for orienting said article to face in a predetermined direction before transfer to said horn.

4. A machine as claimed in claim 3 in which said article orienting means includes a plurality of vacuum chucks each individually rotatable and controlled by a clutch-brake assembly, a photosensitive scanner associated with each chuck and means controlling operation of said clutch-brake assembly to permit rotation of said chuck when an article is seated thereon and to brake said chuck when said article has been rotated to a predetermined position as indicated by a signal from said photosensitive scanner.

5. A machine as claimed in claim 1 in which said article supply means includes means for randomly aligning in single file a plurality of indicia bearing articles to be packaged, means in combination with indicia detecting means for orienting such articles to face said indicia in a predetermined desired direction, means for actuating said orienting means in response to a signal from said indicia means; and a shuttle for gripping oriented articles and transferring same in their predetermined orientation to said horn.

6. A machine as claimed in claim 1 in which said pouch supply means includes a

shuttle for transferring said pouch onto a mandrel of said mandrel assembly and means for supplying said pouch to said shuttle in a flat condition.

7. A machine as claimed in claim 6 in which said pouch supply means includes means associated with said shuttle for partially opening said flat pouch before transferring same to said mandrel.

8. A machine as claimed in claim 1 in which said pouch supply means includes a pouch supply magazine for storing a plurality of pouches, and a pouch separator for separating a single pouch from said magazine and delivering same to a pouch holder, a shutter being provided for transferring said held pouch onto a mandrel of said mandrel assembly.

9. A machine as claimed in claim 8 in which said pouch supply means further includes means associated with said shuttle for partially opening said pouch before transferring same to said mandrel.

10. A machine as claimed in claim 1 in which said package removal means includes at least one pair of mechanical grippers transversely aligned with an article and pouch containing horn and movable from a position above said horn to a position above a conveyor in a manner such that closing the grippers in their position above said horn gives a positive clamping of said article containing pouch, and opening said grippers in their position above the conveyor releases said article containing pouch onto the conveyor in the same relative alignment present on said horn.

11. A machine for packaging one or more articles in a pouch, constructed and arranged substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

W. P. THOMPSON & CO.,
12, Church Street,
Liverpool, L1 3AB,
Chartered Patent Agents.

Printed for Her Majesty's Stationery Office, by the Courier Press, Leamington Spa, 1974.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



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