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APPARATUS FOR OPENING POUCHES

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This invention relates to an apparatus for separating the flexible side panels of pouch-type packages to open the tops of the pouches to receive a product to be packaged. More particularly, the invention has reference to an apparatus for squeezing pouches edgewise as they are advanced at high speed through a continuous motion packaging machine thereby to bow the panels away from each other and open the pouches preparatory to filling.

The general object of the present invention is to provide a new and improved pouch opening apparatus making it possible to fill pouches at a substantially faster rate than has been practical with prior devices.

A more specific object is to eliminate the clamps here-tofore used on continuous motion machines for gripping the trailing edges of pouches and shifting the trailing edges forward to open the pouches, thereby simplifying the pouch carrier and permitting the closer spacing of pouches on the carrier.

A related object is to shift the trailing edges forward without gripping the edges thereby to obtain an improved opening action.

Another object is to provide a novel pouch opening apparatus of the foregoing character that is relatively simple in construction and capable of precisely controlled high-speed operation.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which:

FIGURE 1 is a schematic perspective view of the pouch forming and filling portions of a packaging machine embodying the novel features of the present invention.

FIG. 2 is an enlarged perspective view of a representative pouch.

FIG. 3 is an enlarged fragmentary side elevational view of the pouch forming portion of the machine.

FIG. 4 is an enlarged fragmentary plan view showing a pouch immediately before it is opened, the view being taken substantially through the first line ofFIG. 3.

FIGS. 5 through 8 are views similar to FIG. 4 showing successive positions of the parts as the pouch is opened and filled.

FIG. 9 is an enlarged fragmentary cross-sectional view taken substantially along the line 9—9 of FIG. 1.

FIG. 10 is a cross-sectional view on a somewhat reduced scale taken substantially along the line 10—10 of FIG. 9.

As shown in the drawings for purposes of illustration, the invention is embodied in a machine for automatically packaging measured quantities of fluid material in pouches 10 (FIG. 2) of the type comprising two side-by-side sheets 11 of flexible material closed at the bottom as by a fold 12 and sealed as indicated at 13 and 14 along the side and top edges. The sheets are composed of or coated with thermoplastic material, and the seals are formed simply by pressing the sheets between heated seal bars 15 to form heat seals which bond the sheets together after the material has cooled.

Packages of the above character are formed cheaply and at high speeds in a succession of operations performed on a web 17 (FIG. 1) of polyethylene as the latter is drawn edgewise through the machine with a continuous motion. As shown schematically in FIG. 1, the web first is folded longitudinally at a folding station 18 to bring the two side portions together, and then is cross-sealed along spaced transverse lines 19 by gangs of orbiting seal bars 15 pressed against the opposite sides of the web to form a series of integrally joined pockets in the web. Then the web passes through a cutter 20 which separates successive pouches from the web, and the separated pouches are advanced by rollers 21 into clamps 22 (FIGS. 3 through 8) spaced along a carrier 23. As shown in FIGS. 1 and 9, the cross-seals 19 preferably terminate below the upper edges of the strips to form narrow flaps which ride on opposite sides of a stationary splitter blade 24 as the pouches are advanced to the carrier 23.

On the carrier 23, pouches 10 are opened as they pass through a filling station and beneath a dispensing device, indicated generally at 25, including a series of funnels 27 which move with the pouches and receive measured quantities of the product from a dispensing spout 28 (FIG. 3) disposed above the path of the funnels, the product being delivered to the pouches through a ducting spout 29 on the tubular lower end portions 30 of the funnels. After the pouches have been filled, the duct-in spouts are raised out of the open ends and the pouches continue on for the application of the top seals 14. The folding, sealing, severing and dispensing mechanisms of the machine are well known in the art and thus are shown and described only generally herein.

As shown in FIG. 3, the pouch carrier 23 is formed by a pair of endless chains 31 which are disposed in spaced horizontal planes and trained around sprocket wheels (not shown) on opposite sides of the dispensing device 25 with the straight runs of the chains shown in FIG. 3 disposed in a common vertical plane and adapted to be driven continuously from left to right by the main cycle shaft (not shown) of the machine. Equally spaced along and spanning these chains are a plurality of vertical bars 32 secured at their ends to the respective chains and each carrying on its upper end a clamp 22 having two vertically spaced jaws 33 pivoted to open rearwardly along the path of the web.

At the forward end of the pouch carrier 23, each clamp 22 is opened momentarily to receive the leading edge portion of a pouch 10 from the transfer rollers 21. Then the clamps are closed to grip the leading edge portions in the manner shown in FIG. 3 and carry the pouches edgewise along the horizontal path defined by the chains 31.

Herein, the funnels 27 are supported on another carrier 34 formed by two endless chains 35 supported above the pouch carrier 23 by sprocket wheels 37 and 38 at the opposite ends of the dispensing device 25 on two vertical shafts 39, 40, one of which has a driving connection 41 with the main cycle shaft to drive the funnel carrier. These chains carry equally spaced rectangular frameworks connected at their upper and lower ends to the respective chains with lugs 42 on the upright bars 43 of the frameworks secured to the funnels 27 to support the latter in fixed positions on the frameworks. Each duck-in spout 29 is telescoped loosely over the lower end portion 30 of the funnel and is secured to a sliding bracket 44 clamped at one end around the spout and is guided at its other end for up and down sliding between the upright bars 43 of the framework. Journalled on the back of each bracket is a follower roller 45 which rides on a cam track on the frame and is raised and lowered by the track as the funnel moves along its path, thereby raising and lowering the duck-in spout. With this arrangement, the spouts may be lowered quickly into the pouches as the latter are opened, and deposit the product in the bottom of the pouches as the spouts are raised slowly out of the pouches. This bottom-up filling reduces dusting of the product and prevents contamination of the top seal area.

Herein, the cam track is formed by an elongated bar...
having a downwardly inclined portion 47 on the left in FIG. 3 permitting each duck-in spout to be lowered into a pouch before the associated funnel 27 reaches the dispensing spout 28, a horizontal portion 48 which holds the spout in the lowered position as the funnel reaches the product, and an upwardly inclined portion 49 which raises the spout gradually out of the pouch beyond the dispensing spout as the product flows into the pouch. An inclined bar 50 above the inclined portion 47 holds the rollers against the inclined portion during lowering of the spouts. To facilitate the entry of the duck-in spouts into the pouches, the tips of the spouts preferably are tapered downwardly, herein, by cutting off the lower ends at an angle as shown in FIGS. 1 and 3.

In prior high speed packaging machines of this type, it has been the practice to provide a second clamp for gripping the trailing edge of the pouch and rocking forward to open the pouch preparatory to filling. In accordance with the present invention, the pouches are supported on the carrier 23 at their leading edges only, and are positively opened by a new and improved apparatus 51 which engages the upper portion of the trailing edge of each pouch and shifts the trailing edge forward to bow the flexible side panels away from each other. Moreover, the apparatus opens the pouches at high speeds without gripping or twisting the pouch panels and leaves the panels free to be apart around the duck-in spouts 29 as the latter are inserted in the pouches.

To these ends, the opening apparatus 51 comprises a carrier 52 extending along one side of the path followed by the pouches 10 as the latter approach and pass beneath the dispensing spout 28, and a plurality of fingers 53 equally spaced along the carrier and mounted therein to project outwardly across the path of the pouches. At the forward end of the pouch carrier, the outer end portions of the fingers are brought into engagement with the trailing pouch edges and then are moved forward relative to the clamps to squeeze each pouch edgewise between a clamp and a finger and open the pouch.

In this instance, the finger carrier 52 is formed by an endless chain (FIGS. 1, 9 and 10) disposed in a horizontal plane somewhat above the level of the pouch tops and supported and driven by two sprocket wheels 54 and 55 supported in a common horizontal plane on vertical shafts 56 spaced apart longitudinally of the pouch carrier and adapted to be rotated continuously in the direction indicated by the arrow in FIG. 10. It will be seen in FIGS. 1 and 10 that the section of the chain passing around the forward sprocket wheel 54 curves toward the upper path and then leads into a straight run parallel to the path, and the section of chain passing around the rear sprocket 55 curves away from the path. The straight runs of the chains are spaced apart by countersunk rivets 57, 58 (FIG. 9) suspended from a plate 59 above the carrier and slidably engaging the sides of the chain links.

Each finger 53 is disposed beneath a lug 60 fastened to the underside of a link of the chain, and is pivoted on the lug by means of a vertical pin 61 which supports the finger for rocking in a horizontal plane level with the upper end portions of the pouches. Herein, the fingers comprise a plurality of triangular plates each pivoted at one corner on a pin 62 and notched at 62 adjacent the outer corner to define a recess opening forward to catch and hold the trailing edge of a pouch. The thickness of the outer ends is reduced as shown in FIG. 9.

Mounted in the foregoing manner, each finger 53 is angularly related to the carrier 52 in a first position in which the bottom of the notch 62 trails the pivot pin 61 to a slight extent and the outer end portion is positioned for engagement with the trailing edge of a pouch as the finger moves along the curved section of the chain and crosses the pouch path. From this retracted position, the finger is movable into a second position in which the bottom of the notch is generally even with the pivot and is spaced from the clamp 22 a distance less than the width of the pouch. Thus, in moving from the first position to the second, the finger cooperates with the preceding clamp to squeeze the pouch edgewise. After the duck-in spout 29 has been lowered into the open pouch, the finger is retracted and permitting it to expand toward its full width after the spout is withdrawn.

To produce the desired motion of the fingers 53, a follower roller 63 is journaled on each finger at a point spaced from the finger pivot, here being the remaining corner of the triangular plate, and rides in a continuous cam track 64 (FIG. 10) generally following the chain 52, in this instance along the outside of the chain and immediately beneath the fingers. It will be seen that each finger is in the form of a bell crank with the follower 63 on the end of one crank leg, the other crank leg, and the pivot pin 61 at the juncture of the two legs. Thus, the position of the roller relative to the finger pivot determines the angular position of the finger, and inward and outward variations in the cam track move the roller and thus rock the finger about its pivot.

As shown in FIGS. 9 and 10, the cam track 64 is defined by the adjacent edges of two bars 65 and 66 spaced apart in a common plane to lie on opposite sides of the rollers 63, the bars being supported on posts 67, 68 standing from a horizontal frame plate 69 beneath the pouch-opening apparatus 51. Along the curved sections and the return run of the chain 52, the cam track is positioned to hold the fingers 53 in the retracted position. As the fingers enter the active run of the chain, the cam track curves outwards at 70 to move the rollers 63 outwardly and thereby rock each roller and finger clockwise (FIG. 10) about the finger pivot. It will be seen that this advances the outer ends relative to both the finger carrier 52 and the pouch carrier 23 and shifts them from the positions shown in FIG. 5 to that shown in FIG. 6. The amount of such swinging is determined by the extent of the outward step 70 in the cam track which is selected in accordance with the amount of edgewise squeezing desired for the particular pouch being handled.

In addition to the edgewise squeezing, an air jet is directed between the panels 11 of the pouch 10 as the latter is squeezed, thereby to insure that the panels bow away from each other rather than in the same direction. Herein, the jet is applied through passages 71 (FIG. 9) opening through the underside of the splinter blade and positioned longitudinally of the blade to lie over the approximate center of each pouch as the squeezing is applied. The air from the jet acts on the inner surfaces of the narrow flaps at the tops of the panels to urge the panels away from one another and toward the outwardly bowed positions shown in FIG. 6.

It will be seen that the pouch-opening apparatus 51 described herein eliminates the need for a set of clamps at the trailing edges of the pouches 10, and may be used whenever the packaging material has sufficient strength or body to support its own weight and that of the product in the pouch. The elimination of the trailing clamps not only reduces the weight of the pouch carrier 23 but also makes it possible to space the pouches more closely along the carrier for an increased rate of pouch production. The new opener shifts the trailing edges directly forward at the precise instant desired and without gripping the pouch edges, thereby eliminating the twisting of the pouch panels that was produced when the opening was accomplished by pivoted clamps. In addition, the trailing pouch edges remain free to move forward independently of the opening apparatus as the duck-in spouts 29 enter the pouches. After an initial separation the carrier permits the tipped tips into the pouches, the opening can be completed by the spouts alone and is not limited by the ability of the opening elements to move forward. Thus, relatively large spouts can be used for optimum filling rates.

As the duck-in spout 29 is inserted in the pouch 10
and having clamps thereon for gripping the leading edge portions of a succession of equally spaced pouches and advancing the pouches edgewise along said path, a second carrier on one side of said path comprising an endless chain having a section curved toward said path and a run extending alongside said path, a plurality of fingers equally spaced along said chain and projecting outwardly therefrom to extend across said path behind one of said clamps for engagement with the trailing edge of a pouch when on said run, said fingers being pivoted on said chain for swinging movement of their outer ends toward and away from the clamps, a cam track extending along said chain section and said run, and a follower on each finger riding on said cam track and holding said fingers in a predetermined position for engagement with said trailing edges as said fingers enter said run, said cam track having a step therein adjacent the forward end of said run for swinging said outer end portions forward relative to said clamps thereby to squeeze the pouches edgewise between the fingers and the clamps.

7. In an apparatus for opening pouches having flexible side panels, the combination of, a first carrier movable along a predetermined path and having clamps thereon for gripping the leading edge portions of a succession of spaced pouches and carrying the pouches edgewise along said path, a plurality of fingers spaced along and pivoted on said chain for rocking in a horizontal plane level with the upper edge portions of said pouches and projecting outwardly from said run across said path between adjacent pouches on said carrier, said sprocket wheels being rotatable in a direction to move said fingers along said path in the same direction as said pouches and at the same speed, each of said fingers having an outer end portion shaped to catch the trailing edge of the pouch held by the preceding clamp on said carrier, and means for holding each finger in a predetermined angular position for engagement with a trailing edge as the finger enters the forward end of said run and then rocking the outer end portion of the finger forward relative to said chain to squeeze the pouch edge-wise between the finger and the clamp.

8. In an apparatus for opening pouches having flexible side panels, the combination of, a first carrier movable along a predetermined path and having clamps thereon for gripping the leading edge portions of a succession of spaced pouches and carrying the pouches edgewise along said path, a second carrier disposed on one side of said path and movable alongside the latter at the same speed as said first carrier, a plurality of fingers spaced along said second carrier and projecting outwardly therefrom across said path between adjacent pouches on said first carrier, and means for bringing the outer end portions of successive fingers into engagement with the trailing edges of successive pouches in said clamps and then rocking each finger forward relative to the preceding clamp, said outer end portions being shaped to catch said trailing edges and squeeze the pouches edgewise and open the pouches as the outer end portions swing forward.

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