METHOD FOR MAKING A CROSS-BOTTOM BAG HAVING A PLASTICS LINER INCORPORATED IN THE FOLDING OF THE END CLOSURE

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ABSTRACT
In the production of bags each having a folded cross-bottom end closure containing two side flaps which are successively folded over and stuck down, the bags consisting of an outer layer of at least one ply and an inner layer having adhesion properties different from those of the outer layer, a longitudinally-fed flattened tubular web consisting of the material for the two layers is produced in a tube-forming machine and divided into individual bag sections, two longitudinal incisions being applied through both layers at least near one end of the bag sections at least on the side adjacent to the side flap that is to be folded over last of all, whereby the corner folds are at least partially separated from the side flaps to define rectangular tongue portions on the side flaps. The cross-bottom end closure is formed at least at one end of each bag section during transverse feeding through a base-forming machine by opening up the or each end of the bag section and foreshortening the outer edge of the tongue portion on the side flap of the inner layer that is to be folded over last of all in comparison with the corresponding edge of the innermost ply of the outer layer, applying a suitable adhesive to the faces of the inner and outer layers that are to be stuck together and successively turning over the side flaps, such foreshortening being effected by severing a correspondingly wide strip from the tongue portion in the base-forming machine.

4 Claims, 5 Drawing Figures
METHOD FOR MAKING A CROSS-BOTTOM BAG HAVING A PLASTICS LINER INCORPORATED IN THE FOLDING OF THE END CLOSE

The invention relates to a method of making a multi-layer cross-bottom bag consisting of an outer layer of at least one ply and an inner layer having adhesion properties different from those of the outer layer, wherein a longitudinally-fed flattened tubular web consisting of the material for the inner and outer layers is produced in a tube-forming machine and divided into individual bag sections, two longitudinal incisions are applied through both layers at least near one end of the bag sections at least on the side of the section adjacent to the side flap that is to be folded over last of all, whereby the corner folds of the end closure are at least partially separated from the side flaps of the end closure to define rectangular tongue portions on the side flaps, and wherein a cross-bottom is formed on at least one end of each bag section whilst being fed transversely in a base-forming machine by opening up the or each end of the bag section, for shortening the outer edge of the tongue portion on the side flap of the inner layer that is to be folded over last of all in comparison with the corresponding edge of the innermost ply of the outer layer, applying a suitable adhesive to the faces of the inner and outer layer that are to be stuck together, and turning over the side flaps that are to be folded over first of all and last of all.

The parent patent describes a method and apparatus for making a cross-bottom bag in which a plastics liner is incorporated in the folded end closure. The material of the liner therefore has adhesion properties different from those of the outer layer material. During manufacture, a tube section forming the liner projects by a predetermined amount beyond a tube section forming the outer layer, at least at that end where cross-bottom folding is to be applied. It has been found that for certain goods with which the bags are to be filled the bags will be satisfactory even if the aforementioned projection is not provided, that is to say if the inner and outer layers of the bag material are flush at the end where the cross-bottom folding is to be applied. Having the layers coterminous brings about some manufacturing advantages. The bag sections can be cut off flush and the required excess length of the inner tube section relatively to the outer tube section can be brought about by providing a Z-shaped fold in the inner tube section.

The present invention therefore aims to provide shortening of the side flap that is to be folded over last of all, regardless of whether the layers of the bag are coterminous or one layer projects beyond the other. It is conceivable that this shortening at one end of the inner layer could be achieved by an internally-engaging tool which is supported from the outside by rollers, and an external tool co-operating with the internal tool. However, this would involve considerable disadvantages in construction and production because the cutting tool would be complicated and prone to faults and it would also be difficult to convert the apparatus to making bags of a different size. It would also be basically possible to make the tube section for the inner layer from a flat sheet, stamp out portions of the flat sheet at positions appropriate for the shortening, form the flat sheet to a tube, apply a longitudinal seam and finally flatten it. However, a sheet provided with wide punched out portions is very awkward to feed at high speeds over the tool that is to form it to a tube and, again, cumbersome conversion is necessary whenever the bag size is to be changed.

In view of the aforementioned disadvantages, it is preferable to start with a flattened tubular web for the inner layer of the bag material. The apparatus which is patented that shortening be achieved by folding back a side flap is a marked improvement because much simpler equipment is involved as compared with stamping out portions from a tubular layer with the aid of an internally-engaging tool or from a flat layer that is subsequently formed to a tube and welded along a longitudinal seam. Nevertheless, the crinkling resistance of the plastics film for the inner layer makes it difficult to produce a permanent fold in the film without the use of heat.

The present invention aims to provide shortening of the side flap that is to be folded over last of all by means of a simple method and apparatus which are readily adaptable to different bag sizes.

According to the invention, in a method as hereinbefore indicated, shortening is effected by severing a correspondingly wide strip from the tongue portion in the base-forming machine. Such severing may be effected by leading the leading edge of the strip to be severed out of the plane of movement of the bag section whilst the latter is passing a severing element disposed at a fixed location.

By means of this method, that is to say by postponing the severing step until the bag sections have reached the base-forming machine, much simpler and fewer equipment is required. Changes in bag dimensions are also simple to take into account, all that is required being that the severing means be displaceable upstream and downstream of the apparatus as viewed in the direction of bag travel.

To simplify the construction of the apparatus even further, severing may be effected by a severing element having a cutting edge which is stationary relatively to the fed bag section, the severing element being rotated at a peripheral speed corresponding to the feeding speed of the bag section. To facilitate severing, and in particular the first penetration of the cutting edge into the material of the inner layer, the cutting edge of the severing element may be heated. This is an important feature of the invention because, if the cutting edge were not heated and as soon as it is a little blunt, the leading edge of the strip to be severed would tend to buckle upstream of the cutting edge under a transverse folding effect, the result being that the strip, instead of being cleanly cut, is uncontrollably torn off and cause the entire bag section to become displaced.

The strip could also be severed with a circular saw effect with the aid of a severing element that is rotatable at a considerably higher peripheral speed than the feeding speed of the bag sections, in which case the element need not be heated. The high relative speed between the cutting edge and the material to be severed will cause the cutting edge to be effective even if the material is very tough and floppy and even if the blade is already somewhat blunt. Severing is enhanced by a zig-zag course of the cutting edge, which results in a somewhat more disturbed severing operation and not quite so clean a cut as with a sharp edge; but this is a small sacrifice in comparison with the faultless operation of the apparatus that is obtainable.

The apparatus for performing the method of the invention comprises a tube-forming machine and a...
base-forming machine which processes and conveys the bag sections in a transverse position at several processing stations, the base-forming machine comprising a base-opening station, wherein a station of the base-forming machine downstream of the base-opening station comprises at least one sucker, needle, hot point, gripper or the like which is displaceable out of the plane of the bag section, is disposed in the path of the strip to be severed, and engages at least the leading end of the strip, the severing station including a severing element at a fixed location. The member for engaging the leading end of the strip may be combined with gripper tongues which are particularly effective for holding the strip and resisting high severing forces.

For efficient operation, means may be provided in the path of that portion of the side flap which is not to be severed for holding said portion down. The sucker or the like may be driven in a circular path at a peripheral speed corresponding to the speed at which the bag sections are fed through the base-forming machine. The diameter of the circular path is preferably substantially the same as the blade diameter. Instead, with substantially equal diameters the circular path of the sucker or the like may be somewhat offset relatively to the circular blade; for example the circular blade may be somewhat more upstream to increase the pressure of the cutting edge against the plastics film.

Engaging the strip, severing it from the side flap and leading it out of the path of movement of the bag section could also be achieved by means of a disc which is heated to the sealing temperature, rolls on the side flap and is provided with a scraper, the strip to be severed adhering to the disc and then being scraped off again by the scraper. In this way the strip is removed by a fusing rather than a severing operation and the cutting blade that is provided acts more in the nature of a depressor rather than a cutting element.

To engage the severed strip and to take it to a depositing station there may be a conveyor having an inlet in the region of movement of the sucker or the like. An example of the invention will now be described with reference to the accompanying drawings, wherein:

FIGS. 1 to 3 are respectively a side elevation, cross-section and plan of that part of the base-forming machine which contains the equipment for severing a strip of plastics film, and

FIGS. 4, 4A, 4B, 4C, 4D, 4E, 4F, 4G are diagrammatic cross-sectional representations of two forms of cross-bottom bags having plastics liners, the liner in FIG. 4 projecting beyond the outer bag material and that in FIG. 5 being flush therewith.

The portion shown in side elevation in FIG. 1 of a base-forming machine illustrates a strip-severing station which would be located downstream of a base-opening station (not shown). At the strip-severing station unfinished bags 5 having an opened-up base portion 4 are passed through a severing apparatus 1 between conveyor belts 2 and 3. As will be evident from FIGS. 2 and 3, and as will also become apparent from the bag sections shown in FIGS. 4 and 5, the bag sections comprise an outer layer 6 which, for simplicity, is shown as consisting of a single ply of kraft paper, and a single-ply inner layer 7 (or 7' in FIG. 5) consisting of a closed tubular plastics film. The outer layer 6 is provided with longitudinal incisions 8 and the inner layer with longitudinal incisions 8' which, in the illustrated example, are shown in registry, but this is not absolutely essential. By means of the longitudinal incisions, corner folds 9 of the base portion 4 are partially separated from side flaps 11 and 12 which are intended to be folded along fold lines 10. The incisions therefore define rectangular tongue portions 13 and 14 on the side flaps. In the preferred example of FIGS. 1 to 4, the inner layer of the bag projects beyond the outer layer by an amount a which is chosen so that there will be an adequate width for secure adhesion.

At one of the two side flaps, namely that side flap which is to be turned over last of all, the projecting plastics layer must be foreshortened relatively to the outer layer by the width of the adhesive connection. Since opening of the incised bag section to form the base portion 4 causes at least one of the rectangular tongue portions to be exposed, foreshortening of the plastics layer at this position is simple in that it is merely necessary to remove a longitudinal strip, quite irrespective of the width of the tongue portion, i.e. almost entirely independently of the overall bag dimensions.

The severing apparatus 1 is provided for the purpose of such removal of a longitudinal strip. It comprises a cylindrical suction and gripper member 17 which is mounted on a hollow shaft 16 and is driven at peripheral speed corresponding to the feeding speed at which the bag sections are translated in the base-forming machine. The member 17 carries a blade holder 18 having a radially-directed electrically-heatable circular blade 19 of a diameter equal to the diameter of the member 17. The cutting edge is formed by a wire which is bent to a circle and is electrically interrupted at a circumferential position. The material of the wire has a high specific electrical resistance and can be heated to high temperatures which lie well above the melting temperature of the plastics film to be severed so that momentary contact at very little pressure causes the plastics film to fuse through.

The circumferentiallyinterrupted wire 19 can for example be secured in a wedge-shaped groove of the blade holder under spring tension, but it may also be pinned to the side of a groove or held in the groove under tension by applying a radial pull to an extension of each metal strip in a recess of the blade holder. The blade holder 18 is made from a heat-resistant electrically-insulating material. The two ends of the slotted ring of the blade 19 are connected to the body by conductors 22 which are insulated from one another and from the body of the cutting apparatus, the slip rings being seated in a round insulating member 23 on the hollow shaft 16.

The interior of the hollow shaft is connected to a vacuum pump (not shown) via an intermittently-actuated valve (not shown). The interior of the shaft communicates with a radial hole 24 extending to the periphery of the gripper member 17 and consequently the vacuum is intermittently effective at the periphery of the gripper member. The diameter of the severing apparatus is selected so that its circumference is exactly equal to one station length of the base-forming machine, i.e. exactly equal to the spacing between successive bag sections passing through the base-forming machine. The severing apparatus can therefore be driven at a constant speed and a certain point on the periphery of the cutting apparatus will always coincide with a certain point on the side flap of successive bag sections. The drive of the cutting apparatus is therefore set so that a suction orifice 25 of the cutting apparatus will always register with the leading end of the side flap.
The valve controlling the application of suction to the suction orifice is opened just prior to application of the suction orifice to the side flap so that it is fully open when the suction orifice meets the side flap and a vacuum can be built up rapidly. By reason of the electrically heated blade coming into contact with the film material, the latter is fused along a line and the now severed leading end is carried along with the suction orifice. The part of the bag section remaining attached to the film is held down by the upper belt. The lower belt gives the necessary counterpressure so that the heated blade can penetrate through the plastic material. To ensure removal of the severed strip even when the film material is tough and a cut has not been effected entirely through the film, provision may be made as shown in FIG. 1 for an intermittently-actuated gripper which supplements the action of the sucker, precedes the suction orifice in the circumferential direction and closes shortly after the strip to be severed has been lifted. This gripper clamps the leading end of the strip so tightly that any remaining connection of the strip to the rest of the material is torn apart. In the illustrated example, the inlet 27 of a double belt conveyor is provided in association with the cutting apparatus at a position opposite to that where the cutting apparatus cuts and contacts the bag section. Just before the suction orifice reaches the inlet 27, the application of vacuum is terminated and those parts which were previously subjected to vacuum are connected to atmospheric pressure. If a gripper is provided, the latter is opened at the same time as the vacuum is shut off. The previously retained leading end of the strip is therefore released and stands up to be engaged by the double belt conveyor at the inlet 27. Standing up of the leading end of the strip may be enhanced by cams on the pivotal shaft of the gripper or by a transfer rake (not shown) which is provided at the inlet 27 and engages in circumferential grooves of the suction and gripper member. The inlet 27 should be circumferentially spaced from the position at which the strip is to be severed by a distance equal to the longest strip that is to be severed. This is because reliable feeding of the strip to be severed during the entire cutting time can generally be ensured only in that the strip is slung about the suction and gripper member. The conveyor takes the severed strips to a depositing station where they are collected. Discharge of the severed strips could alternatively take place with the aid of a pneumatic conveyor having suction members.

Regardless of whether the inner tubular layer projects to a certain extent beyond the outer layer (FIGS. 1 to 4) or whether the inner layer is cut flush with the outer layer (FIG. 5), a strip must be cut from the last side flap to be turned over and the width of this strip should be such that the plastics inner layer is foreshortened relatively to the innermost ply of the outer layer by an amount equal to the width of the adhesive connection. In the bag section shown in FIGS. 1 to 4, the outer layer is completely screened even at the base portion from the material with which the bag is to be filled and the penetration of humidity to the filling material as a result of the wick effect of the paper of the outer layer is excluded. This is not the case in the FIG. 5 example but the very small portions where the outer layer makes contact with the filling material may be acceptable in certain cases where the manufacturing advantages of providing a flush cut outweigh the disadvantages in use.

We claim:

1. A method of making a multi-layer cross-bottom bag consisting of an outer layer of at least one ply and an inner layer having adhesion properties different from those of the outer layer, wherein a longitudinally fed flattened tubular web consisting of the material for the inner and outer layers is produced in a tube-forming machine and divided into individual bag sections, two longitudinal incisions are applied through both layers at least near one end of the bag sections at least on the side of the section adjacent to the side flap that is to be folded over last of all, whereby the corner folds of the end closure are at least partially separated from the side flaps of the end closure to define rectangular tongue portions on the side flaps, and wherein a cross-bottom is formed on at least one end of each bag section whilst being fed transversely in a base-forming machine by opening up the or each end of the bag section, foreshortening the outer edge of the tongue portion on the side flap of the inner layer that is to be folded over last of all in comparison with the corresponding edge of the innermost ply of the outer layer by severing a correspondingly wide strip from the tongue portion, leading the leading edge of the strip being severed out of the plane of movement of the bag section whilst the latter is passing a severing element disposed at a fixed location, applying a suitable adhesive to the faces of the inner and outer layers that are to be stuck together, and turning over the side flaps that are to be folded over first of all and last of all.

2. A method according to claim 1, wherein severing is effected with the aid of a severing element that is rotatable at a considerably higher peripheral speed than the feeding speed of the bag sections.

3. A method according to claim 1, wherein severing of the strip is effected by a severing element having a cutting edge which is stationary relatively to the fed bag section, the severing element being rotated at a peripheral speed corresponding to the feeding speed of the bag section.

4. A method according to claim 3, wherein the cutting edge of the severing element is heated.

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