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CHATURVEDI ASHOK

Total No. of Sheets - 5
Sheet No. 1 of 5

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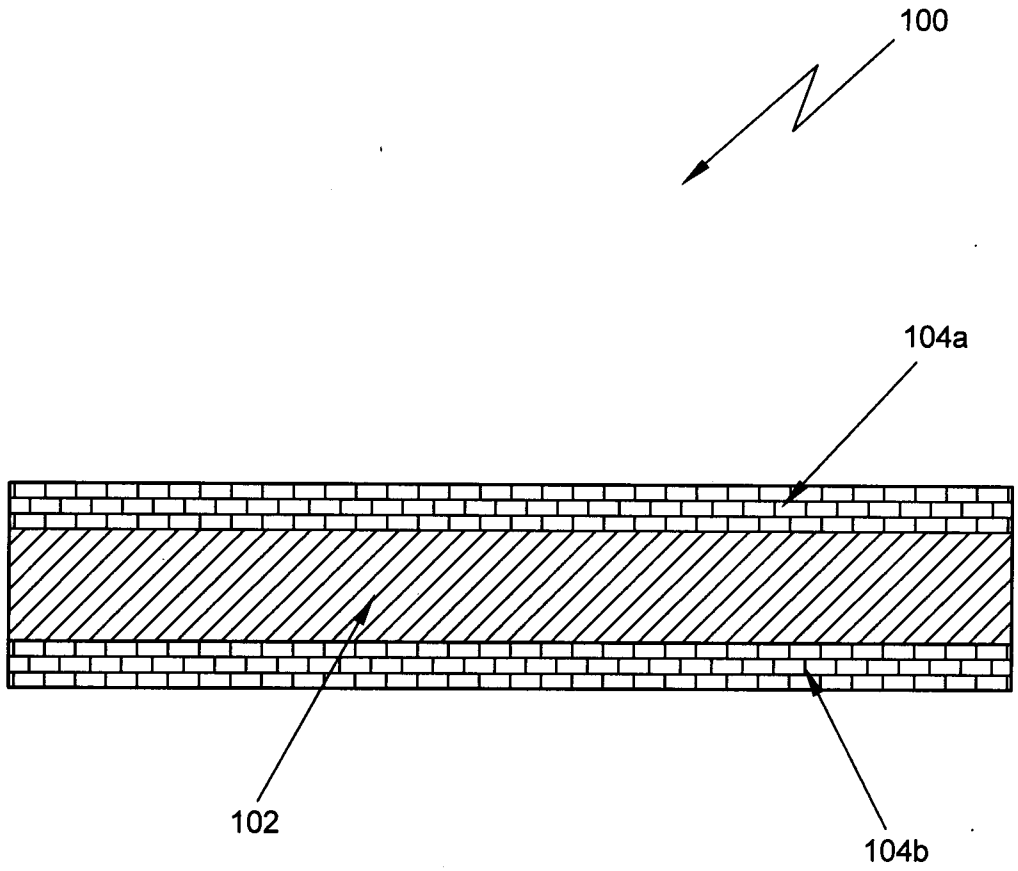

FIG. 1

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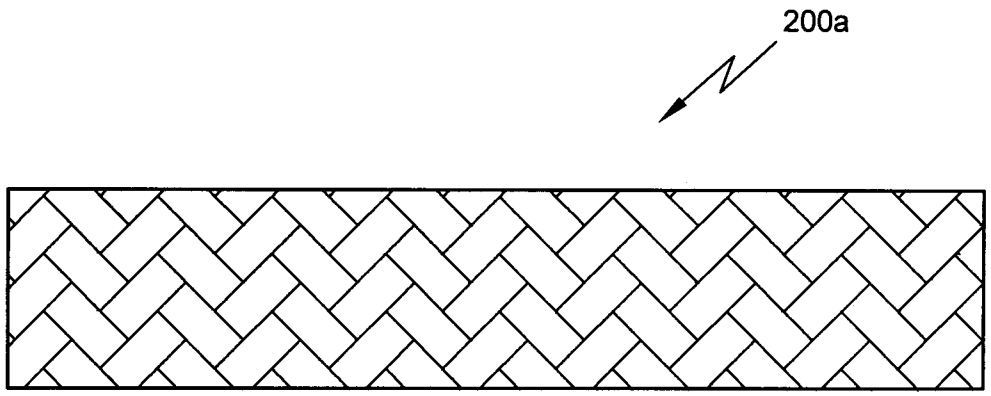

FIG. 2A

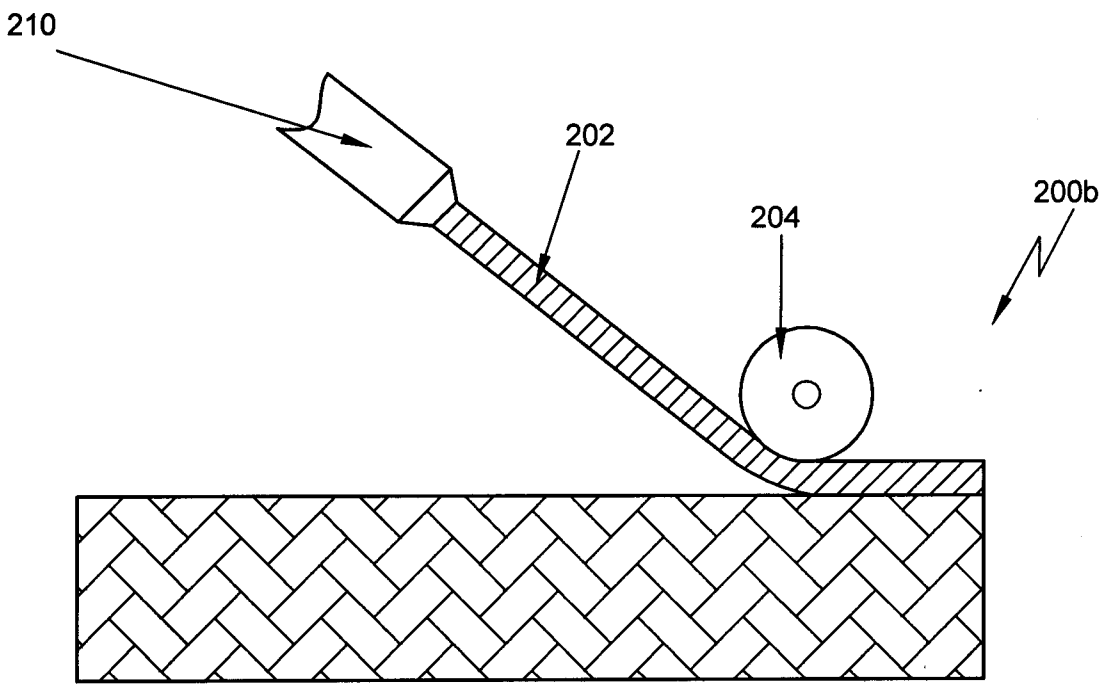

FIG. 2B

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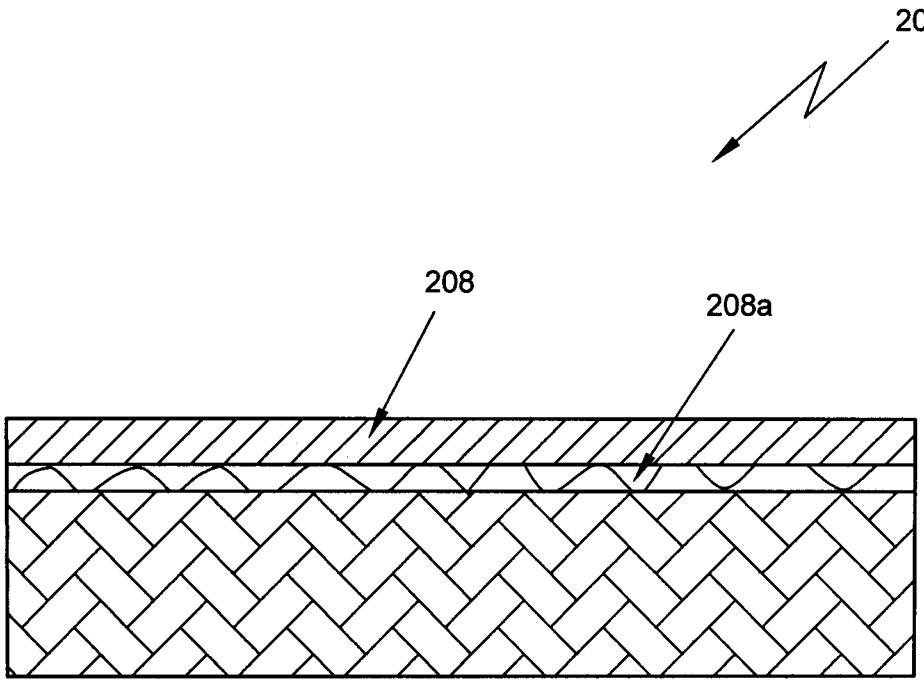

FIG. 2C

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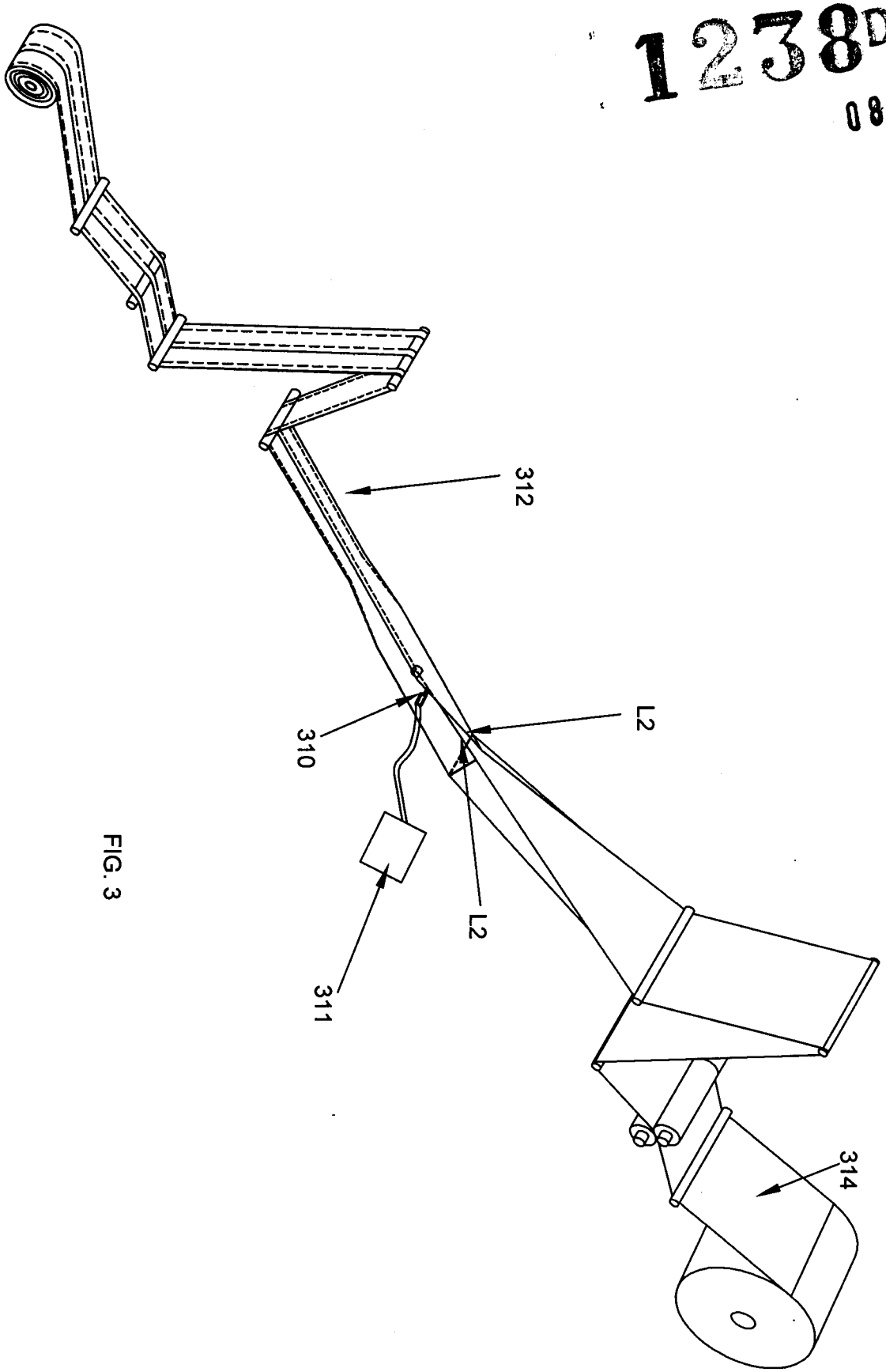

FIG. 3

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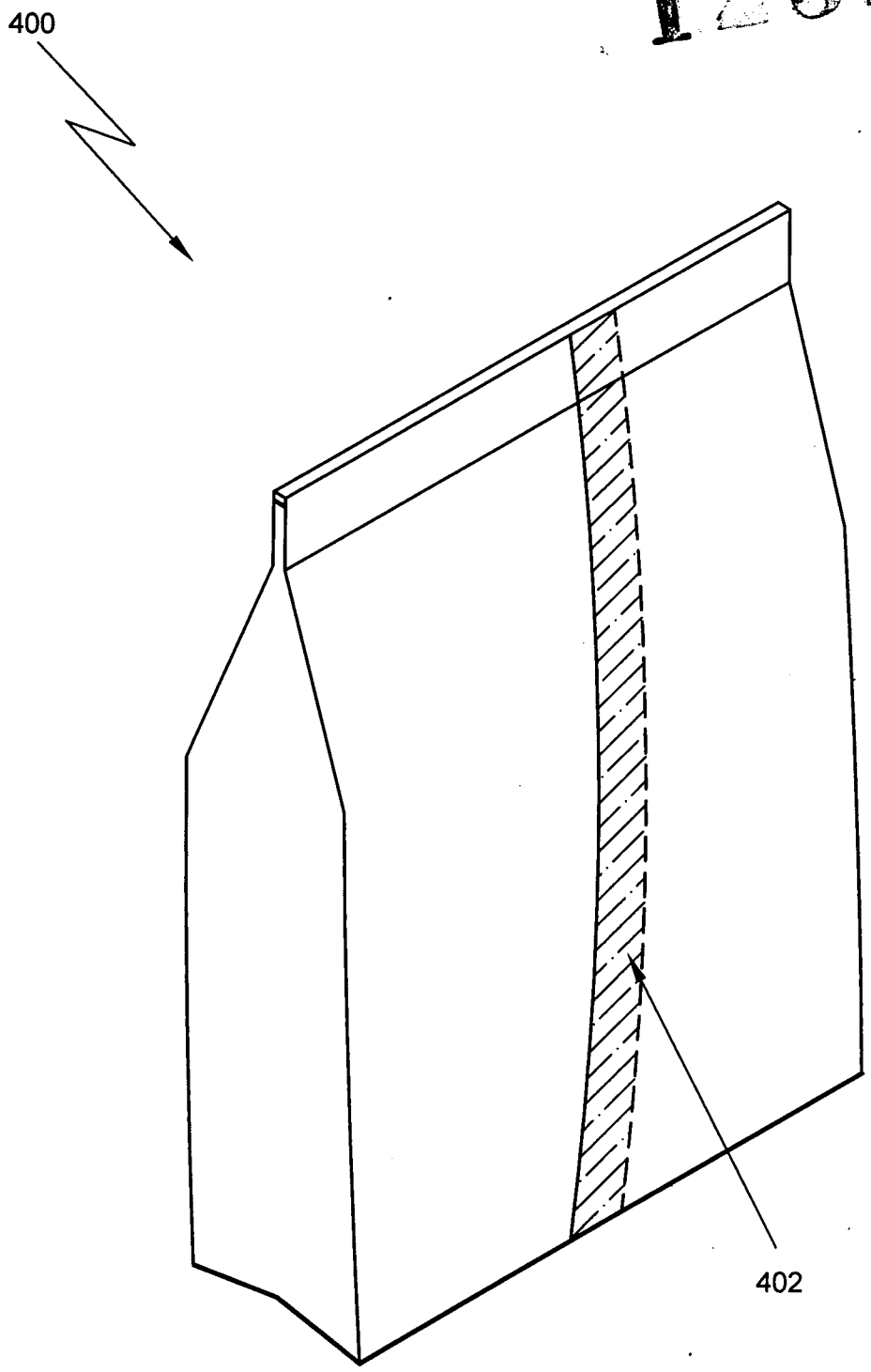

FIG. 4

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FIELD OF THE INVENTION

The invention generally relates to packaging bags and more particularly to packaging bags made of woven tapes flexible substrates.

BACKGROUND OF THE INVENTION

In flexible packaging industry, there are various methods of making a package / bag from different substrates. Woven substrates such as Woven Polypropylene (WPP) fabrics are widely used as they have high bursting and puncture strength, good chemical and wear resistance, and are light in weight as compared to non-woven substrates.

Woven fabric is made in the tube form and converted to bags after lamination and printing by flattening the tube. In some processes of making a bag, an essential step is to make a tube. The process of making a tube from a web involves overlapping and sealing together the longitudinal edges of the woven substrate after lamination and printing.

One of the ways of sealing is by using hot air. However, using hot air sealing method is disadvantageous because the method requires very high temperature in the range of 700 deg. C. Further, the sealing achieved is not so good as the material of the woven substrate such as WPP has poor sealing property. The overall speed of the process is slow to achieve proper sealing.

Another method of sealing is using hot melt adhesive. However, the hot melt adhesive has a tendency to overflow and leaves excess material overflowing out of the center seal band. However, the sealing strength is not enough for heavy bags.

Another method of sealing is by ultrasonic method. However, sealing by ultrasonic method is very sensitive and hermetic sealing is not ensured due to

less compatible properties of material of woven fabric for ultrasonic sealing and speed of the sealing operation is also slow.

Yet another method of sealing is by extrusion lamination. However, the strength of the seal is lower than what is desired especially for heavy bags and speed of the process of sealing is also slow.

Few common disadvantages with the known methods of center sealing the web to make the tube are that the quality of sealing is not good and it is very difficult to achieve hermetic sealing at high speeds.

Therefore, there exists a need to develop an improved method for making tube while forming bag made up of woven tapes substrate such as WPP that ensures proper sealing as well high processing speed offering hermetic sealing and overcomes the disadvantages listed above.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross sectional view of a co-extruded multi-layer tape, in accordance with an embodiment of the invention.

FIGS. 2A-2C show various embodiments of a woven substrate of the co-extruded multilayer tape, in accordance with an embodiment of the invention.

FIG. 3 illustrates a process of forming a continuous tube from a web of the woven substrate of the co-extruded multilayer tapes, in accordance with an embodiment of the invention.

FIG. 4 illustrates a bag formed from the tube made by overlapping the longitudinal edges of web in accordance with an embodiment of the invention.

Like reference numerals refer to like parts throughout the description of several views of the drawings.

DESCRIPTION

A process for manufacturing co-extruded multi-layer tapes and packages / bags made from flexible woven substrate made thereof is disclosed.

The process includes extruding a multilayer film such that one of the extruder forms a central layer (102) of said film and the remaining extruders form respective external co-extruded layers (104a and 104b) of the multilayer film. Layers (104a and 104b) are extruded with low temperature sealable material such as metallocene PE on both sides. The co-extruded layers are meant for efficient sealing purpose.

FIG. 1 shows the cross sectional view of the co-extruded multilayer tape (100) obtained after co-extruding the layers (104a and 104b) with the central layer (102). The central layer (102) may be a single layer of polyolefin's such as polypropylene (PP) or High Density Polyethylene (HDPE) or other suitable polymeric materials.

The co-extruded multi layer film is slit into tapes on the tape line and stretching and tempering operations are performed inline. The final co-extruded multi layer tapes are wound on bobbins for weaving the fabric on the looms thereby forming a woven fabric / substrate of co-extruded tapes (100).

The co-extruded multi layer tapes typically have a width between 1.5 mm to 7 mm, and a denier between 300 and 2,500.

The fabric is either woven as a tube, flattened by pinching, cut on both sides to get two flat webs on rolls or directly flat web is woven to roll. The coextruded multi layer tapes have same sealing layers on both sides since it is not possible to ensure that the tapes winding on bobbins or during weaving on looms have a same layer always on one side of the fabric.

FIGS. 2A-2C shows some of the embodiments of woven substrates (200a, 200b, and 200c) of the co-extruded tapes. **FIG. 2A** shows a bare woven substrate (200a) of the co-extruded tapes without any additional layer coated or laminated to it. **FIG. 2B** shows another woven substrate (200b) of the co-extruded tapes is extrusion laminated with a molten layer (202) on its surface extruded through a flat extrusion die (210).

Molten layer (202) fills in the gaps and troughs on the woven fabric surface thereby ensuring a smooth surface. It also makes the woven fabric (200b) hermetic. The plain and smooth surface provides a conducive surface for printing. The molten layer (202) comprises Polypropylene or Polyethylene or a combination of both. **FIG. 2C** shows yet another woven substrate (200c) of the co-extruded tapes laminated with a film of reverse printed BOPP/PET film (208). BOPP/PET film (208) has a reverse printed layer (208a).

It may be apparent to person skilled in the art that other known surface treatments may be applied to the woven substrate of the co-extruded tapes over printing such as Ultraviolet curing, E-beam curing and the like to provide rub resistance, increase gloss or enhance barrier properties. **FIGS. 2A-2C** show some of the embodiments of the many such possibilities.

FIG. 3 illustrates a process of forming a continuous tube (312) from a web of woven fabric (314) of co-extruded tapes. In the process, overlapping and sealing of two longitudinal edges (L1 and L2) of the web of the woven fabric (314) is done to form tube (312). Sealing is achieved by blowing hot air through a nozzle (310) which is positioned such that as the longitudinal edges (L1 and L2) overlap, hot air from the nozzle (310) is blown between the overlapping longitudinal edges. In an embodiment the hot air nozzle (310) is connected to a hot air generator (311). Subsequently, the edges are pressed and cooled to form the continuous tube (312). The continuous tube may be

wound in the form of a roll for further processing or may be slit / perforated inline into cut pieces of required bag length.

The tube so formed is further processed to make bags / packages of various designs and shapes such as valve bags, gusset bags, pinch bottom bags, stitched bags, standup bags etc.

In accordance with an embodiment of the invention, the sealing of the two longitudinal edges (L1 and L2) can also be done by hot melt adhesive, ultrasonic sealing method or extrusion lamination method.

FIG. 4 shows a bag (400) which is formed after the formation of the continuous tube (312) with a longitudinal seal (402). During the process of longitudinal sealing while making tube using such a woven substrate / flat fabric, the sealing obtained is hermetic and the sealing can be performed at much lower temperature and much higher speeds and thus production rate increases in various methods of sealing.

The foregoing descriptions of specific exemplary embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teachings. The exemplary embodiments were chosen and described in order to explain certain principles of the invention and their practical application, to thereby enable others skilled in the art to make and utilize various exemplary embodiments of the present invention, as well as various alternatives and modifications thereof.

Dated this 8th day of May, 2014

FOR CHATURVEDI, ASHOK

By His Agent

AMIT KUMAR SINGH