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THREE DIMENSIONAL DESIGNS**May 26, 2006 (JP) 2006-147105
Jun. 26, 2006 (JP) 2006-175654(75) Inventors: **Yukio Nakagawa**, Shiga (JP);
Yoshio Iwasaki, Shiga (JP); **Taro**
Hiikata, Shiga (JP); **Makoto**
Ichikawa, Shiga (JP)**Publication Classification**(51) **Int. Cl.**
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(52) **U.S. Cl.** **53/451**Correspondence Address:
HOGAN & HARTSON L.L.P.
1999 AVENUE OF THE STARS, SUITE 1400
LOS ANGELES, CA 90067 (US)(57) **ABSTRACT**

The bag-making packaging machine 20 comprises a tubular former 23 having a former surface for aligning a packaging film 11, a pull-down mechanism 24, a vertical seal mechanism 21, a horizontal seal mechanism 22, and a molding apparatus 25 for molding three dimensional designs, in which the tubular former 23 has a molding surface 30 for molding the three dimensional designs at any position of the former surface, and the molding apparatus 25 is provided at the position opposite to the molding surface 30 of the former. As specific examples of the molding apparatus 25, a heater, a light irradiation apparatus, a mold, and pressing machine can be exemplified. When the molding apparatus 25 is the heater or the optical irradiation apparatus, a foamable ink is contained in the printing layer of the packaging film 11 to foam. When the molding apparatus 25 is the mold, the embossing is performed by further laminating the reinforcement sheet or the sheet for the three dimensional designs on the packaging film 11. And when the molding apparatus 25 is the pressing machine, the three dimensional sheet is laminated on the packaging film 11 beforehand.

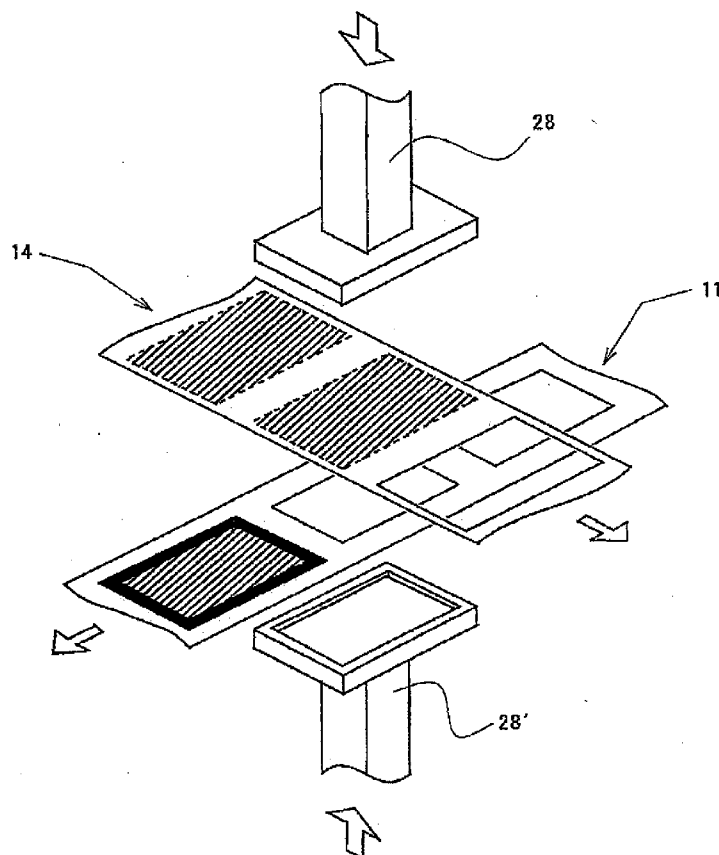
(73) Assignee: **ISHIDA CO., LTD.**, Kyoto-shi,
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Apr. 28, 2006 (JP) 2006-126059

FIG. 1A

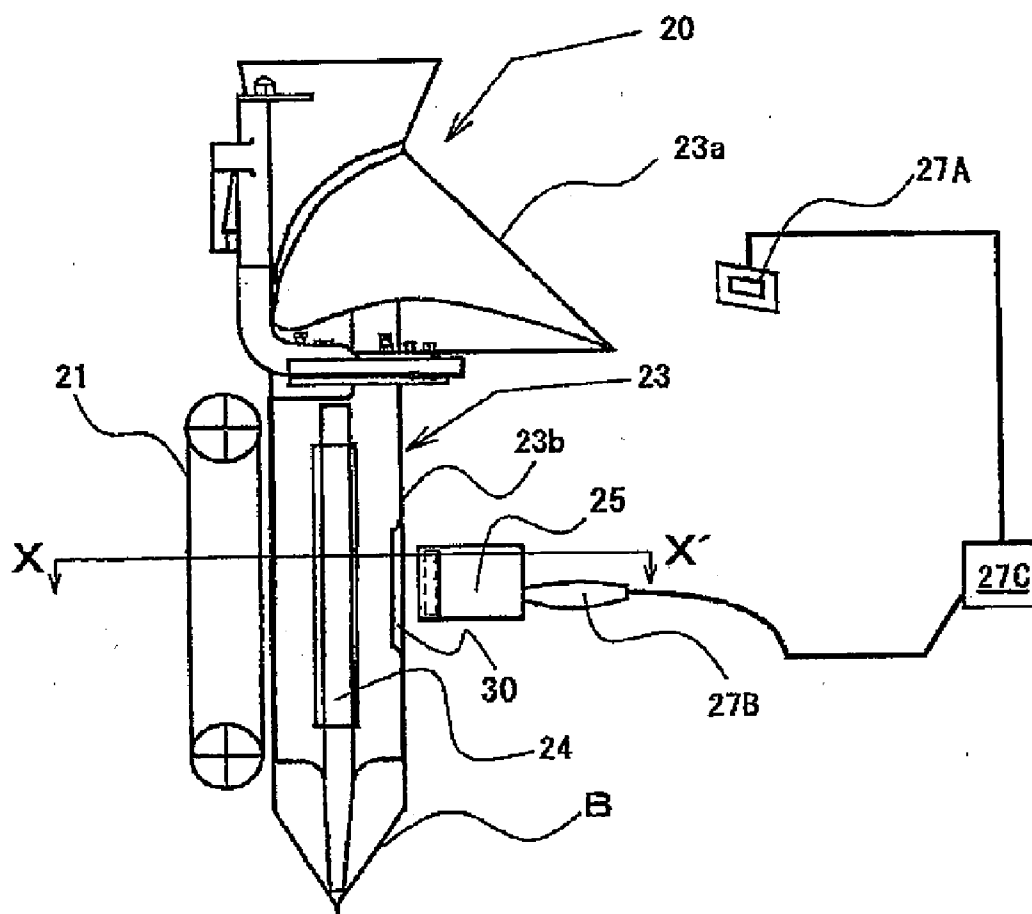


FIG. 1B

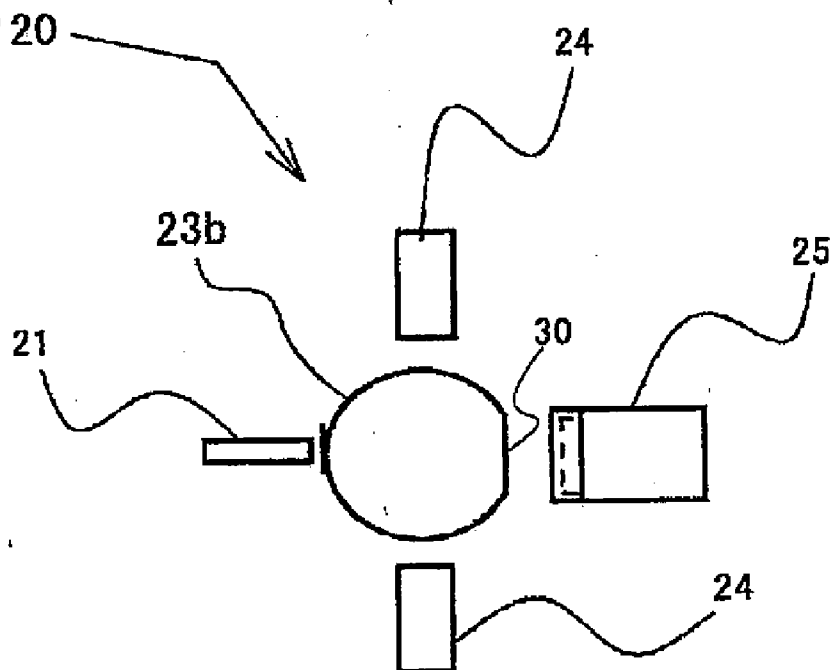


FIG. 2

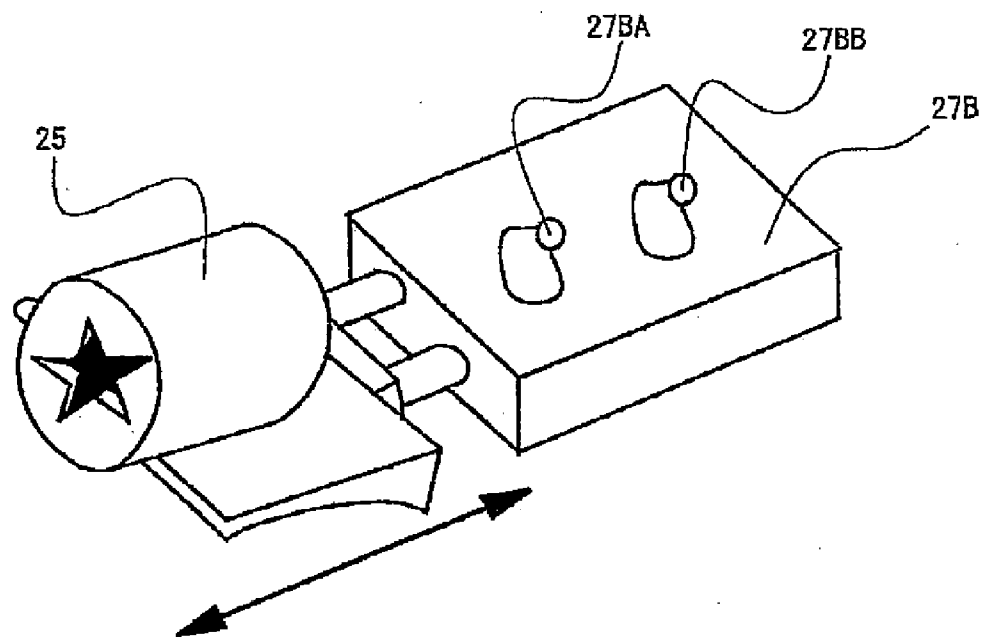


FIG. 3

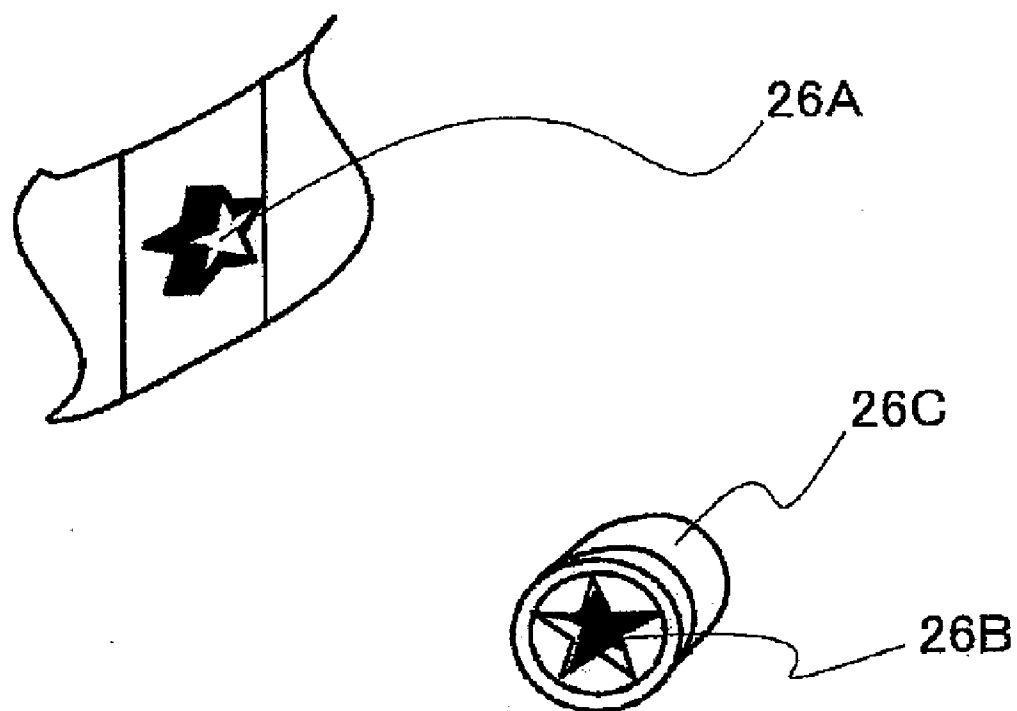


FIG. 4

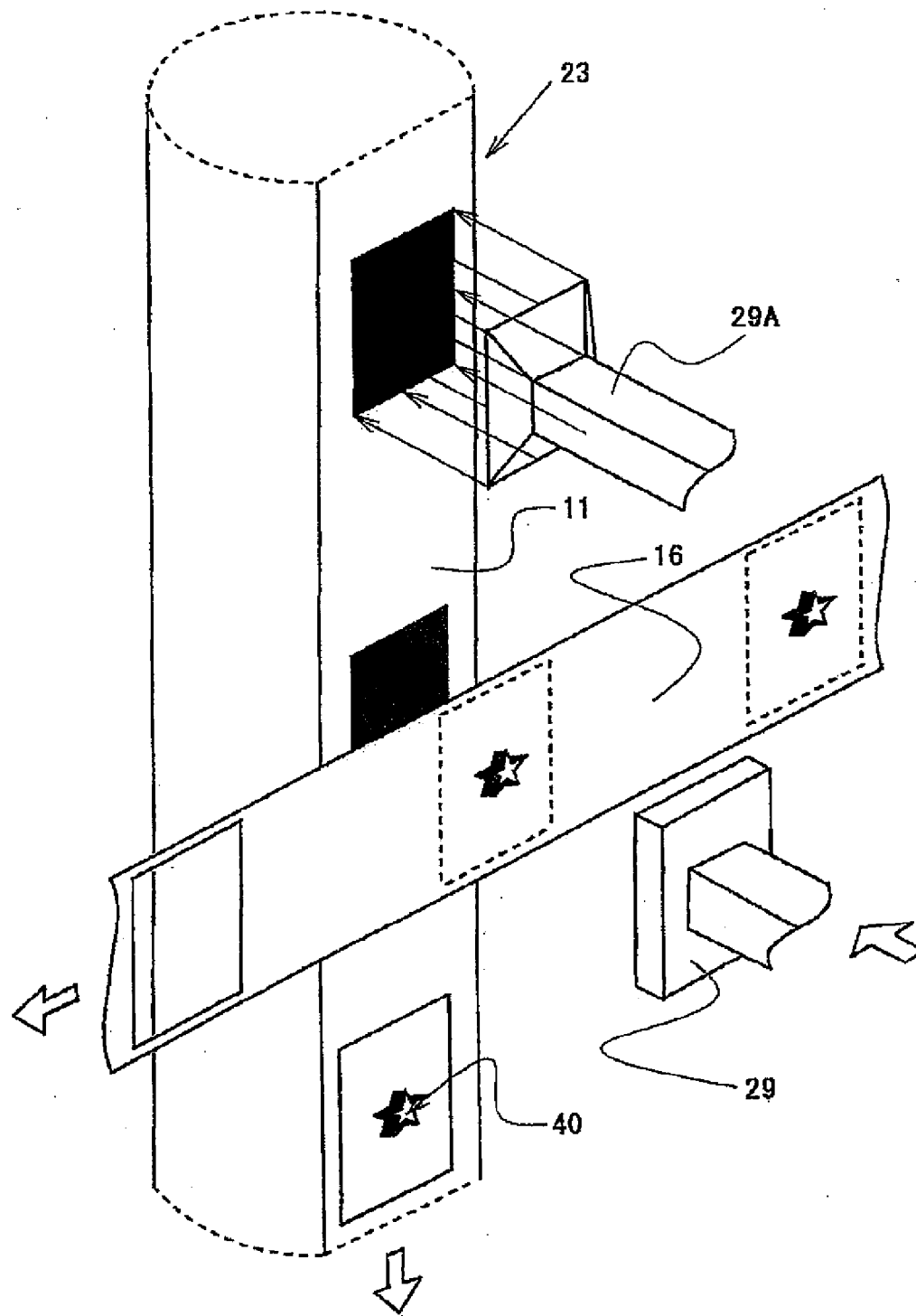


FIG. 5

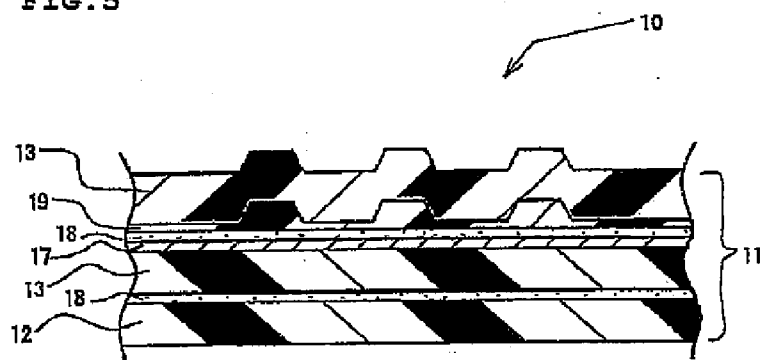


FIG. 6A

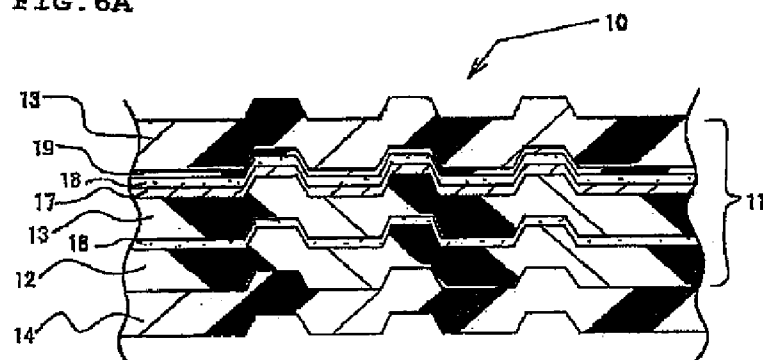


FIG. 6B

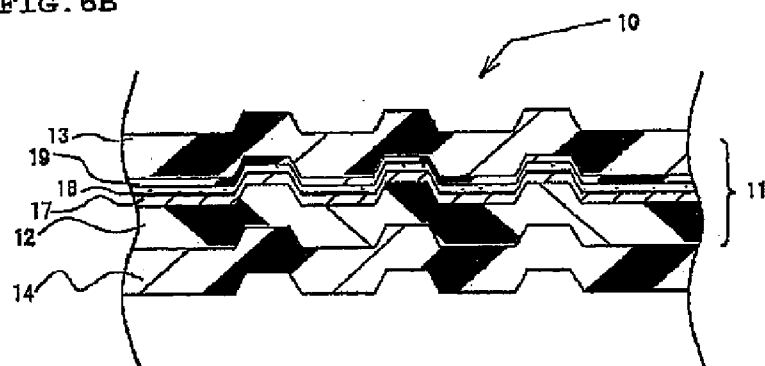


FIG. 7

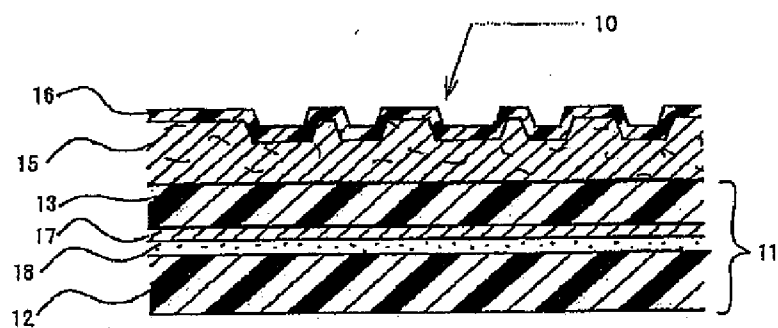


FIG. 8

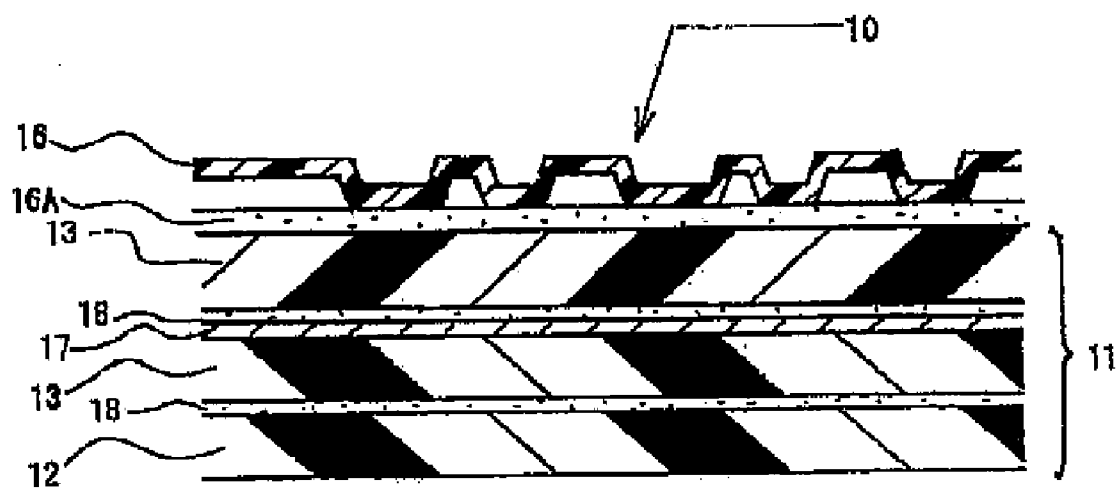


FIG. 9

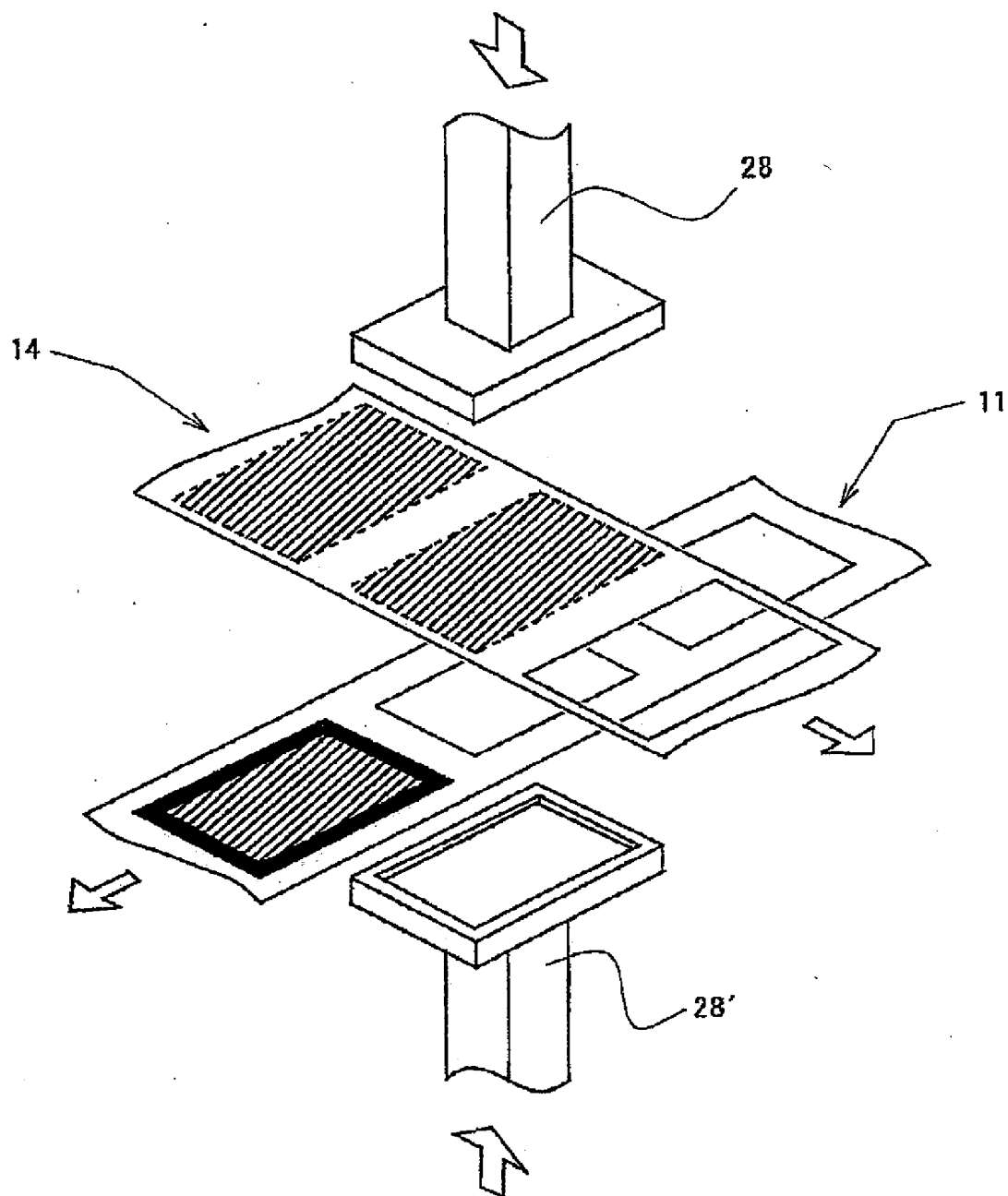


FIG. 10

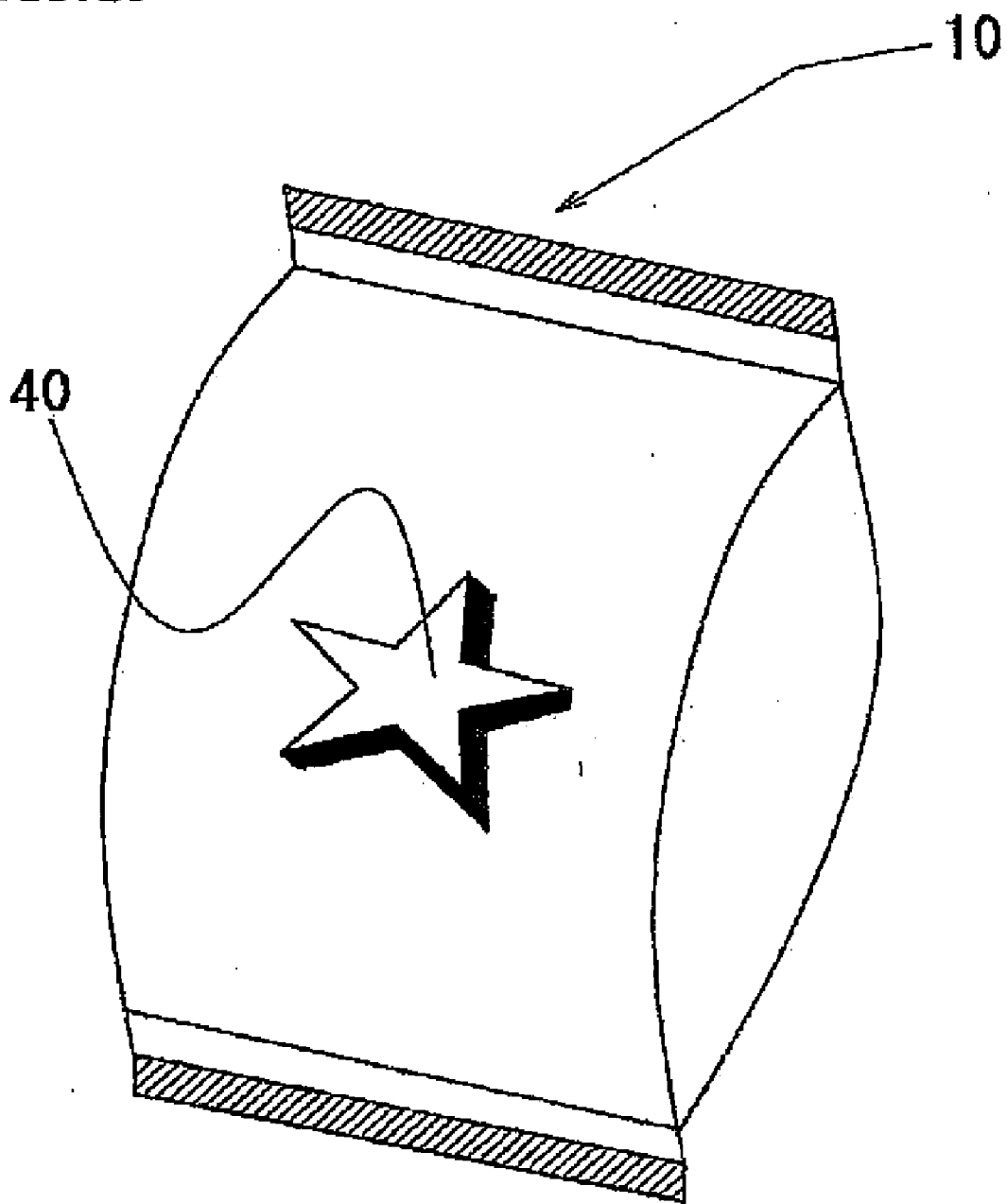
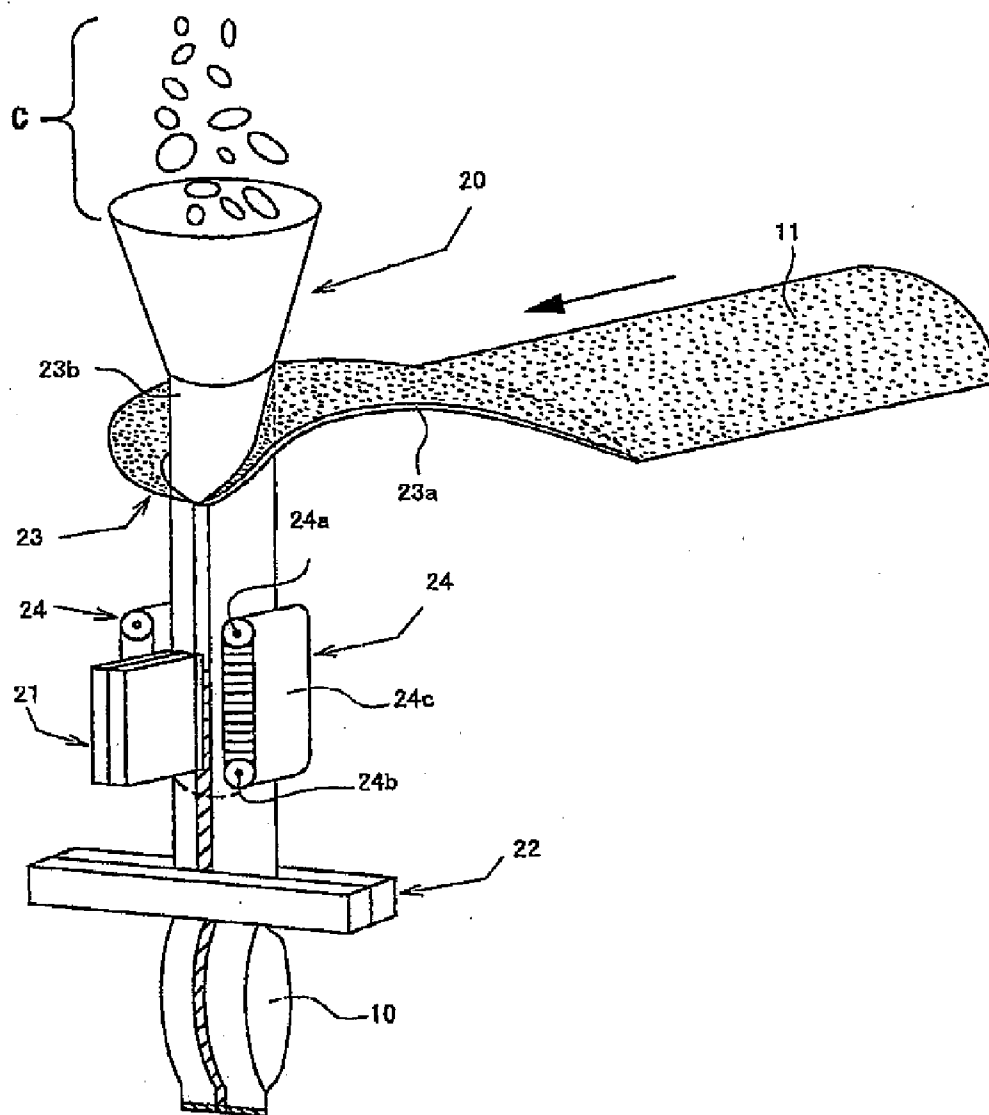


FIG. 11



APPARATUS FOR PRODUCING BAGS WITH THREE DIMENSIONAL DESIGNS

FIELD OF THE INVENTION

[0001] The present invention relates to a bag making-packaging apparatus for producing packaging bags with three dimensional designs formed. In more detail, the present invention relates to a bag making-packaging apparatus capable of filling products by making packaging films tubular and by forming three dimensional designs on the tubular surface in order to package snack foods such as potato chips and the like or sweets such as biscuits and the like.

BACKGROUND OF THE INVENTION

[0002] Snacks such as potato chips and the like or sweets such as biscuits and the like are filled in bags formed of plastic packaging films by vertical or horizontal bag making-packaging machines at factories where these foods are produced, and are shipped, and then are sold at stores such as super markets and the like.

[0003] On both front and rear surfaces of the packaging bags, information is printed that includes not only basic information on products such as the products' names, ingredient tables for foods, best-before dates, manufacturers' names, and the like, but also other information for the manufacturers to stimulate consumer appetite. Consumers see the packaging bags of the products and the information and the like printed thereon and judge whether they should buy the products. Therefore, each of the food manufacturers is dedicated to printing designs so that they catch the consumers' eyes since the printings of the packaging bags affect greatly on purchase judgment by the consumers.

[0004] Generally, a packaging film that forms a bag is basically formed of a sealant layer, a barrier layer, and a substrate layer laminated, and each of the layers shares the different functions for the bag. The sealant layer allows heat seal for forming a bag. The barrier layer is generally constituted of a ceramic vapor deposition layer such as aluminum, aluminum oxide, silicon oxide, or the like, an ethylene-vinyl alcohol copolymer resin layer, and an oxygen-absorption layer that includes reduced iron, and the like and the barrier layer protects the foods therein against water and oxygen. Lastly, the substrate layer provides mechanical properties to the bag.

[0005] This packaging film is supplied from a film roll to a packaging machine and the packaging bag is formed. As one example of such a packaging machine, a vertical bag-making and packaging machine is shown in FIG. 11. The vertical bag-making and packaging machine 20 has a former 23 for receiving a plane packaging film 11 to form it into tubular and the former 23 has a shoulder portion 23a and a tubular portion 23b.

[0006] Conveyed by a pull-down belt 24c, the packaging film 11 is formed into cylindrical in the process of running from the shoulder portion 23a of the former 23 to the tubular portion 23b and a vertical seal is formed by the vertical seal mechanism 21 with both end surfaces in the running direction (vertical direction) of the film overlapped. Subsequently, horizontal seal is performed by horizontal seal mechanism 22 perpendicular to the running direction with spaces that depend on bag length, while the food C put in the tubular packaging film 11 is filled through a inside cavity of the tubular portion 23b of the former 23, and is cut to form a bag. Since the packaging bag is formed by the above mentioned

process, on a surface in the side of the former 23 of the packaging film 11, a sealant layer is provided and on a surface that is outside of the former 23, a substrate layer is provided. In addition, between the sealant layer and the substrate layer, a barrier layer is provided.

[0007] In a packaging film with such a basic structure, generally, a printing layer is provided to the surface of the bag, outside of the substrate layer, or between the substrate layer (transparent) and barrier layer (opaque) so that consumers see it at stores. However, printing is plane after all no matter how diversified in colors and its impression on the consumers has not been satisfactory enough.

[0008] Examples of performing three dimensional printings include the display in Braille on bags (Patent Document 1: Japan Unexamined Patent Publication H11-292091), however, the display remains secondary after all and it is hoped to differentiate the products by performing three dimensional designs that would give strong impression to the consumers.

[0009] Therefore, the object of the present invention is to form three dimensional designs for a packaging bag formed of a packaging film that packages food and the like so that it could appeal the product to the consumers and to provide a bag making-packaging machine for producing the packaging bag with such three dimensional designs formed.

[0010] In order to solve the above mentioned problems, the bag making-packaging machine of the present invention has its most important characteristics in that it is provided with a tubular former having a former surface along which a packaging film is placed, a pull-down mechanism, a vertical seal mechanism, a horizontal seal mechanism and a molding apparatus performing three dimensional design molding, wherein the tubular former has a molding surface for molding the three dimensional designs on either one of the positions of the former surface and the molding apparatus is provided to the position opposite to the molding surface of the former.

[0011] To be specific, it is preferable that the molding apparatus is provided with any of the apparatus (1) to (4) below.

[0012] (1) A heater for heating the packaging film positioned on the molding surface of the former.

[0013] (2) A light irradiation apparatus for irradiating the packaging film positioned on the molding surface of the former.

[0014] (3) A mold for molding unevenness on the packaging film positioned on the molding surface of the former.

[0015] (4) A pressing machine for laminating the three dimensional sheet that is the sheet with the three dimensional design formed on the packaging film positioned on the molding surface of the former.

[0016] In addition, it is preferable that a plate of the pressing machine is a heater plate. It is also preferable that an adhesive, laminate apparatus for laminating the adhesive in a certain range of a packaging film prior to the stage of pressing by the pressing machine. It is also preferable that the former has a cavity cylindrical shape and that the molding surface is plane. It is also preferable that the molding apparatus is provided with a moving mechanism that moves the molds or the pressing machine toward and away from the molding surface. It is also preferable that the bag-making and packaging apparatus of the present invention is provided with the molds whose shapes enable the molding surface of the former and the molding apparatus to be mutually engaged and it is further preferable that the mold of the molding surface of the former is a male mold and the mold of the molding apparatus is a

female mold. It is also preferable that a heater is built in the female mold. It is also preferable that a vacuum apparatus is further provided in the molding apparatus.

EFFECT OF THE INVENTION

[0017] Since in the packaging bag produced by the bag making-packaging machine of the present invention, three dimensional designs are provided at predetermined positions on its outer surface, it easily catches consumers' eyes and therefore, the appealing effect of the products is great and it can enhance the advertisement effect of the products.

[0018] In addition, since the bag making-packaging machine of the present invention enables to incorporate the formation of the three dimensional designs in a series of bag making-packaging process and therefore, the formation of the designs can be performed in the consistent process of producing the packaging bags, and utilization is easily made.

BRIEF EXPLANATION OF DRAWINGS

[0019] FIG. 1A is a schematic view, viewed from the side direction of the bag-making packaging machine of the present invention with the molding apparatus built in.

[0020] FIG. 1B is a sectional view taken along the line X-X' in FIG. 1A.

[0021] FIG. 2 is a schematic view of the molding apparatus.

[0022] FIG. 3 is a schematic view showing an example of the mold used in the present invention.

[0023] FIG. 4 is a schematic view of a pivotal portion of the bonding mechanism that bonds the three dimensional sheet.

[0024] FIG. 5 is a schematic sectional view showing the structure of the bag produced by the bag-making packaging machine of the present invention.

[0025] FIG. 6A is a schematic sectional view showing another structure of the bag produced by the bag-making packaging machine of the present invention.

[0026] FIG. 6B is a schematic sectional view showing another structure of the bag produced by the bag-making packaging machine of the present invention.

[0027] FIG. 7 is a schematic sectional view showing another structure of the bag produced by the bag-making packaging machine of the present invention.

[0028] FIG. 8 is a schematic sectional view showing another structure of the bag produced by the bag-making packaging machine of the present invention.

[0029] FIG. 9 is a schematic view of a heater plate to which the reinforcement sheet is bonded.

[0030] FIG. 10 is a schematic view showing the appearance of the packaging bag of the present invention.

[0031] FIG. 11 is a schematic view of a general vertical bag making-packaging machine used for producing the packaging bag.

EXPLANATION OF LETTERS OR NUMERALS

[0032] 10 shows a bag with three dimensional designs

[0033] 11 shows a packaging film

[0034] 12 shows a sealant layer

[0035] 13 shows a substrate layer

[0036] 14 shows a reinforcement sheet

[0037] 15 shows a sheet for three dimensional designs

[0038] 16 shows a three dimensional sheet

[0039] 16A shows a hot melt adhesive

[0040] 17 shows a barrier layer

[0041] 18 shows an adhesive

[0042] 19 shows a printing layer

[0043] 20 shows a bag making-packaging machine

[0044] 21 shows a vertical seal mechanism

[0045] 22 shows a horizontal seal mechanism

[0046] 23 shows a former

[0047] 23a shows a shoulder portion

[0048] 23b shows a cylindrical portion

[0049] 24 shows a pull-down mechanism

[0050] 24a and 24b show a roller, respectively

[0051] 24c shows a belt

[0052] 25 shows a molding apparatus

[0053] 26A shows a male (mold)

[0054] 26B shows a female (mold)

[0055] 26C shows a blower (of the mold)

[0056] 27A shows a sensor

[0057] 27B shows a moving mechanism

[0058] 27C shows a controlling mechanism

[0059] 28 and 28' show a heater plate, respectively

[0060] 29 shows a pressing machine

[0061] 29A shows an adhesive laminate apparatus

[0062] 30 shows a molding surface

[0063] 40 shows a three dimensional design

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Basic Structure of a Bag Making-Packaging Apparatus

[0064] As types of the bag making-packaging apparatus used for forming the packaging bag from the aforementioned packaging film, both vertical and horizontal may be used. The present invention is hereby explained in the present specification taking the vertical packaging machine as an example. As a driving form of the packaging apparatus, an intermittent type is preferable to a continuous type since it is easier to form three dimensional designs by a mold in a static state.

[0065] (Bag Making-Packaging Machine)

[0066] An example of a general vertical packaging machine is shown in FIG. 11. The vertical bag making-packaging machine for vertical packaging is generally constituted of a former 23 for molding the packaging film 11 supplied from a roll (not illustrated) into tubular, a pull-down mechanism 24 for forwarding the tubularly shaped packaging film 11 downward along the former 23, a vertical seal mechanism 21 for sealing the overlapped portions of the tubular packaging film 11 in the length direction on the former 23, and a pair of horizontal seal mechanisms 22 for horizontally sealing the vertically sealed tubular packaging film 11 at predetermined intervals.

[0067] (Former, Pull-Down Apparatus)

[0068] Former 23 is a guide for placing the packaging film 11 along and is constituted of a shoulder portion 23a with a curved surface and a tubular portion 23b with a tubular shape. A pull-down apparatus 24 is an apparatus for forwarding the tubularly formed packaging film 11 downward along the former 23. The pull-down apparatus 24 is generally constituted of a belt 24c and a plurality of rollers 24a and 24b for driving the belt.

[0069] (Vertical Seal Mechanism, Horizontal Seal Mechanism)

[0070] A vertical seal mechanism 21 is a mechanism for sealing by overlapping the end surfaces in the length direction of a tubularly formed packaging film 11. It is general that the vertical seal mechanism 21 is provided with a heating belt and

a heating roller. On the other hand, a horizontal seal mechanism 22 is a mechanism for horizontally sealing the vertically sealed tubular packaging film at predetermined intervals. Since the molding of the three dimensional designs to the packaging film 11 is more easily conducted when performed intermittently by a mold 26 in the present invention, it is preferable to perform seal formation by the vertical seal mechanism 21 and the horizontal seal mechanism 22 as well in accordance with, the timing. One of the horizontal seal mechanisms 22 has a knife for cutting the packaging film vertically and the other is provided with a groove to receive the knife and after sealing the packaging film 11, it is cut vertically and the bottom portion of the next bag is formed as well as letting the formed bag fall downward.

[0071] (Molding Apparatus)

[0072] In the bag making-packaging machine 20 of the present invention, in addition to the mechanism of the general packaging machine as shown in FIG. 11, the tubular former 23 has the molding surface 30 for forming the three dimensional designs at any position on the former surface and also, the molding apparatus 25 for forming the three dimensional designs to the packaging film 11 is arranged at the position opposed to the molding surface of the former. In other words, the packaging film 11 that reaches the molding surface 30 along the former surface is provided three dimensional designs by the molding apparatus 25.

[0073] In FIGS. 1A and 1B, in order to show the positional relationship of the molding surface 30 and the molding apparatus 25 of the former 23 in the bag making-packaging machine 20, the schematic side view (FIG. 1A) and the schematic sectional view (FIG. 1B) taken along the line X-X' are shown. In the general bag making-packaging machine 20, since the vertical seal mechanism 21 is at the front side of the former 23 and the pull-down mechanism 24 is at the both lateral sides of the former 23, the molding surface 30 is preferably provided at the rear side of the former 23 as shown in FIG. 1A. Such arrangement allows the formation of the three dimensional designs at predetermined portions. As shown in FIG. 1A, it is preferable that the molding surface 30 with which the molding apparatus 25 contacts is plane.

[0074] (Positioning Mechanism)

[0075] Since in many cases register marks are printed at predetermined intervals in the packaging film 11, it is preferable that the bag-making packaging machine 20 of the present invention is provided with a positioning mechanism utilizing the register marks that are printed on the packaging film 11 in order to form the three dimensional designs at the accurate positions of the packaging film 11.

[0076] Basically, the positioning mechanism is constituted of a sensor 27A for detecting the register marks of the packaging film 11, a moving mechanism 27B for moving the molding apparatus 25, and a controlling mechanism 27C for controlling the movement. By providing such a positioning mechanism, the movement of the molding apparatus 25 can be controlled. The register marks need not be detected for the cylindrical packaging film 11 placed along the former 23 but can be detected for the plane packaging film 11 before the introduction of the former 23 as shown in FIG. 1A.

[0077] (Moving Mechanism)

[0078] The moving mechanism 27B is a mechanism for making the molding apparatus 25 contact with or separate from the packaging film 11 positioned at the molding surface 30 of the former 23.

[0079] To be specific, as shown in FIG. 2, a shaft attached to the molding apparatus 25 moved back and forth by an air cylinder that is the moving mechanism 27B can be shown. The molding apparatus 25 can be moved by introducing air to one of the two air introducing openings 27BA and 27BB and by exhausting the air from the other.

[0080] In addition, as the other mechanism, the molding apparatus 25 can also be moved by passing a screw shaft attached to the heater through a bearing of an apparatus frame thereby moving the shaft back and forth by the normal and reverse rotation of a motor.

[0081] (Sensor)

[0082] The sensor 27A is for detecting the eye marks of the packaging film 11 and outputting a detection signal to the later mentioned controlling mechanism 27C. The controlling mechanism 27C moves the moving mechanism 27B so that the molding apparatus 25 contacts with the packaging film 11 positioned on the molding surface 30 of the former 23.

[0083] In order to surely detect and precisely position the location to provide the three dimensional molding, it is preferable that the packaging film 11 is provided with eye marks that can be sensed by a sensor at appropriate intervals. The eye marks are not necessarily visible and for example, when the sensor 27A of the eye marks is infrared ray sensor, it may be the eye marks provided by infrared ray absorbing inks. Also, as long as the eye marks can be sensed by the sensor 27A, they need not be present on the outer surface of the packaging film 11, and chemical compounds that can be the eyemarks may be included in a printing layer 19.

[0084] (Controlling Mechanism)

[0085] The controlling mechanism 27C is a mechanism that commands a series of operations of making the molding apparatus 25 contact with the outer surface of the packaging film 11 positioned on the molding surface thereby firmly embossing the three dimensional designs for a certain period of time by the molding apparatus 25, followed by separating the molding apparatus 25 from the packaging film 11.

[0086] As specific examples of the molding apparatus, the following apparatus (1) to (4) can be exemplified.

[0087] (1) heater

[0088] (2) light irradiation apparatus

[0089] (3) mold

[0090] (4) pressing machine

[0091] (Heater)

[0092] A heater that is one of the molding apparatus 25 foams foamable inks included in the printing layer 19 by heating the predetermined portions where the printing layer 19 of the packaging film 11 is present in order to form the three dimensional designs at the time that the packaging film 11 that runs along the former 23 reaches the molding surface 30. In the present invention, the heater is provided at a position opposite to the molding surface 30 of the former 23 and heats the packaging film 11 from the outer surface (from the side of the substrate layer). The heating surface of the heater has a shape that corresponds to the three dimensional designs to be formed.

[0093] (Light Irradiation Apparatus)

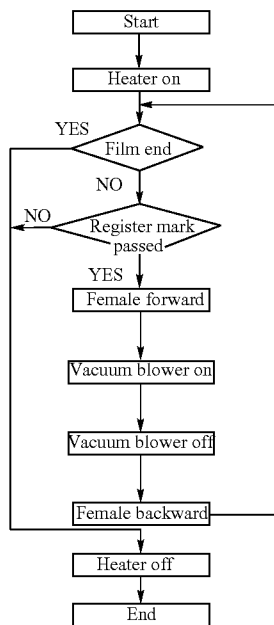
[0094] The light irradiation apparatus that is also one of the molding apparatus 25 can be used taking the same role as that of the heater. When the foamable inks included in the printing layer 19 of the packaging film 11 have a property of foaming by the specified wavelength of light, the light irradiation apparatus is used more preferably to the heater is.

[0095] (Mold)

[0096] The mold 26 can also be used as the molding apparatus 25. In FIG. 3, the schematic view of the mold 26 used in the present invention is shown. As molding methods by the mold 26, any of vacuum molding, air pressure molding, pressing molding, or emboss molding that are used in plastic molding are applicable. When the three dimensional designs are provided to the packaging film 11 using the mold 26, it is preferable to use the mold 26 that is constituted of a male mold 26A and a female mold 26B with a shape engaged with the shape of the male mold 26A and use one of them for the molding surface 30 of the former 23, although only the molding apparatus 25 can be used as a mold 26 (herein after, indicated simply as “male 26A” and “female 26B”).

[0097] The controlling mechanism controls the movement of the female 26B based on the detection signal of the register mark of the packaging film 11 and by this, the three dimensional designs are formed on the packaging film positioned at the molding surface 30. Further, it is preferable that the female 26B is provided with a vacuum apparatus such as a blower 26C for depressurizing the space between both molds when the male 26A and the female 26B are engaged. It is preferable that the female 26B is provided with a moving, pressurizing mechanism so as to emboss (pressurize) the packaging film 11 with the movement of the female 26B. When the male 26A and the female 26B are engaged, the space between the molds is made into a depressurized state by the blower 26C, and in molding, it is preferable that a heater is embedded in the female 26B so as to make the three dimensional designs more beautiful. In this case, the female 26B is molded after heated to an appropriate temperature beforehand. As the moving, pressurizing mechanism, such a method of positioning the female 26B toward and away from the male 26A either by driving the shaft that supports the female 26B by an air cylinder method or by changing the relative positions to the frame by engaging the screw of the shaft with the screw of the frame and rotating the shaft by a motor. A flow sheet is shown in Table 1 in which female 26B is heated and is moved toward the male 26A thereby molding is conducted with a depressurized state between the molds.

TABLE 1



[0098] (Pressing Apparatus)

[0099] The pressing machine 29 can also be used as the molding apparatus 25. The pressing machine 29 is a mechanism for bonding the three dimensional sheet 16 with the three dimensional shape provided by using the mold 26 to the packaging film 11. A schematic view of the pressing machine 29 and the adhesive laminate apparatus 29A is shown in FIG. 4.

[0100] It is preferable that the pressing machine 29 is provided at a position opposite to the former 23 of the bag making-packaging machine 20. When the three dimensional sheet 16 is bonded to the plane packaging film 11 before introduced to the former 23, defects such as collapses of the three dimensional designs and the like are likely to occur when the packaging film 11 is deformed into cylindrical along the former 23.

[0101] In the producing method in which a sealant layer 12 or a hot melt adhesive 16A are formed beforehand at a back surface of the three dimensional sheet 16 and the three dimensional sheet is heated thereby bonding is made, it is preferable that the pressing machine 29 is provided with a heating plate (not illustrated) capable of pressing down the three dimensional sheet 16 at predetermined portions and heating the three dimensional sheet 16 as well. In the heating plate, a heating mechanism is built in. The heating plate is capable of heating the three dimensional sheet 16 by the contact of the three dimensional sheet 16 and the packaging film 11 even before the three dimensional sheet 16 and the packaging film 11 contact with each other. In the step where the three dimensional sheet 16 contacts with the packaging film 11 thereafter, since the sealant layer or the hot melt adhesive has strong bonding force, both can be integrated to a full extent even if the contact time period of the three dimensional sheet 16 and the packaging film 11 is short. In addition, in FIG. 4, black surfaces on the packaging film 11 show the predetermined portions to which the three dimensional sheet is bonded.

[0102] (Adhesive Laminate Apparatus)

[0103] In the producing method in which the melted hot melt adhesive is laminated on a surface of the packaging film 11 in the process right before the three dimensional sheet 16 is bonded by the pressing machine 29, followed by bonding the three dimensional sheet 16 thereby integrating both while the hot melt adhesive is melted, the bag making-packaging machine 20 can be provided with the adhesive laminate apparatus 29A for laminating a further melted hot melt adhesive at predetermined positions of the packaging film 11 by such methods as spraying, coating, or the like. Black surface on the packaging film 11 in FIG. 4 show the portions on which the hot melt adhesive 16A is sprayed or coated.

[0104] It is preferable that the spraying-type adhesive laminate apparatus 29A is provided with a storage portion (not illustrated) for storing the hot melt adhesive, a heating mechanism (not illustrated) for melting the hot melt adhesive, and a nozzle (not illustrated) for spraying the melted hot melt adhesive.

[0105] In addition, it is preferable that a moving mechanism (not illustrated) is provided as is the pressing machine 29 so as to be close to the packaging film 11 on the surface of the former 23 only at the time of spraying or coating. When the moving mechanism is provided, for determining the accurate positions for spraying, as is the case of the bonding mechanism, the adhesive laminate mechanism 29A can be controlled.

[0106] By the producing method of this embodiment, both the packaging film 11 and the three dimensional sheet 16 can be integrated to a full extent even if the contact time period for the two is short since the hot melt adhesive is subject to heating in the storage portion beforehand.

[0107] (Basic Structure of the Packaging Film)

[0108] A basic structure provided at least with the packaging film 11 used for the bag making-packaging machine 20 of the present invention has the sealant layer 12 of the inner side surface and the substrate layer 13 of the outer side surface. Further, in order to enhance the sealing property of the bag 10 produced with the bag making-packaging machine 20 of the present invention, it is preferable to provide the barrier layer 17 between the sealant layer 12 and the substrate layer 13. In addition, from a commercial view point, the printing layer 19 is provided at a position visible from the outer side of the bag 10 such as the outermost layer of the bag 10, for example.

[0109] (Sealant Layer)

[0110] Since it is preferable that the sealant layer 12 is melted under a low melting point (not higher than 160° C., and preferably not higher than 120° C.), through a common procedure, a cast polypropylene (CPP) is used for the sealant layer 12 of the packaging film 11 used in the present invention, however, a heat-sealable biaxial oriented polypropylene (OPH) can also be used. It is preferable that a heat-sealable layer of a cast polypropylene and a heat-sealable biaxial oriented polypropylene is formed by a copolymer of propylene and other olefin (ethylene, butane, and the like) or that a layer that includes low density polyethylene (straight-chain low density polyethylene and the like polymerized by metallocene catalyst) and an ethylene-vinyl acetate copolymer is formed on a cast and biaxial oriented polypropylene so that they can be melted at a low temperature. In addition, the sealant layer 12 may also be formed not only of polyolefin but also of polyester with low melting point. As polyester with low melting point, copolymerized polyester of ethylene terephthalate and cyclo hexanediol of EASTMAN KODAK CO. can be exemplified.

[0111] Also, as a film for the sealant layer 12, the one with the polymers with a high melting point (biaxial oriented polypropylene and biaxial oriented polyester) laminated on the above mentioned polymers with a low melting point may be used. As thickness of such a sealant layer 12, 20 to 50 μm is preferable.

[0112] (Barrier Layer)

[0113] As aforementioned, it is preferable that the packaging film 11 used in the present invention has an ordinary barrier layer 17 formed by vapor depositing metals such as aluminum, iron, magnesium, and the like or by vapor depositing ceramics such as silicon oxide and the like. As a thickness for the barrier layer 17, in view of a light blocking property and an oxygen-water vapor blocking property, not less than 300 Å is preferable and the thickness is selected among 300 to 1500 Å. The barrier layer 17 formed by the method of this vapor deposition and the like can be formed on either of the surfaces of the substrate layer side of the sealant layer 12 or of the sealant layer side of the substrate layer 13. When the barrier layer 17 is formed on the surface of the sealant layer, it is preferable to laminate the polymer layer as the material used for the sealant layer 13 on the polymer layer with low melting point with the former having higher melting point than the latter and to form the barrier layer 17 in the polymer layer side with high melting point by such methods as vapor deposition and the like. Also, the barrier layer 17 may

be formed not of the above mentioned vapor deposited layer but of an ethylene vinyl alcohol film or a film that includes reduced iron or cobalt in combinations with the vapor deposited layer.

[0114] (Substrate Layer)

[0115] Since the substrate layer 13 is a main constituent that forms the bag 10, the substrate layer 13 is required to have high tensile strength and appropriate hardness as well as to have a heat resistant property durable for heat seal at the time of forming bags, and it is preferable that the substrate layer is constituted of a biaxial oriented polypropylene film (OPP) and of a biaxial oriented polyester film. In addition, when a heat-sealable property is also required for the outer surface of the bag 10, a sealant layer is further formed on the outer surface of the OPP film or of the biaxial polyester film or a heat-sealable biaxial oriented polypropylene film (OPH) or a heat-sealable biaxial polyethylene terephthalate film is used. As thickness of the substrate layer, the range of 15 to 50 μm is preferable.

[0116] (Adhesive)

[0117] When the sealant layer 12 and the substrate layer 13 are laminated, the packaging film 11 is obtained. As methods for laminating, dry-lamination laminating with an adhesive interposed or sandwich-lamination laminating by extruding polyethylene between both layers at a thickness of around 10 to 30 μm can be exemplified. As adhesives 18 used for lamination, two-liquid solution whose main ingredients are polyether and polyurethane, adhesives with the polymer of aromatic polyether series, aromatic polyester series, aliphatic polyester series, aliphatic polyurethane series, aliphatic polyether series dissolved in the solvent, and the adhesives 18 of hot melted type such as copolymer of ethylene acrylic acid, copolymer of ethylene methacrylate, copolymer of ethylene acrylate, and the like can be used.

[0118] (Constituent for Imparting Three Dimensional Designs)

[0119] Although intension is made to impart a three dimensional shape by the molding apparatus 25 on the surface of the bag 10 manufactured using the packaging film 11 constituted only of the above mentioned basic structure, by itself, it is difficult to realize the three dimensional designs with excellent appearance. Therefore, it is necessary to additionally provide the structure for developing the effect by the molding apparatus 25 of the above mentioned (1) to (4). Or, it is preferable to provide the additional structure for further developing the effect by the molding apparatus 25 of the above mentioned (1) to (4).

[0120] To be specific, when imparting the three dimensional designs by (1) the heater and (2) the light irradiation apparatus, the printing layer 19 of the packaging film 11 needs to include foamable inks. In addition, when imparting the three dimensional designs by (3) the mold, it is preferable that the reinforcement sheet 14 is laminated in the inner side (sealant layer side) of the packaging film 11 or the sheet for three dimensional designs 15 is laminated in the outer side (substrate layer side) of the packaging film 11. Further, both of the reinforcement sheet 14 and the sheet for three dimensional designs 15 may be laminated on the packaging film 11.

[0121] Moreover, when imparting the three dimensional designs by (4) the pressing machine, aside from the packaging film 11, the three dimensional sheet 16 is required in which the three dimensional designs are formed by the mold beforehand.

[0122] (Printing Layer)

[0123] The printing layer **19** is a layer for providing letters and patterns on the outer surface of the packaging bag. The printing layer **19** can be formed by using the publicly known printing methods such as screening printing methods and the like. It is necessary that the printing layer **19** is in the outer side than the opaque barrier layer **17**. In order to arrange the printing layer in the outer side than the barrier **17**, for example, the substrate layer **13** is prepared as a double-layered film structure, one film of which is subject to the printing by a known printing method such as screen printing and the like, and the other film of which is subject to the formation of the barrier layer **17** by such methods as vapor deposition method and the like, thereby capable of laminating the both films to form the substrate layer **13** so that the printing layer is in the outer side.

[0124] (Foamable Ink)

[0125] When the molding apparatus **25** is the heater or the light irradiation apparatus, in the packaging film **11**, foamable inks are contained as inks used for the printing layer **19**. Foaming agents are contained in foamable inks. As the foamable inks, the commercially available foamable inks can be used.

[0126] As the foaming agents, for example, other than the thermally decomposable chemical foaming agents such as azodicarbonyl diamide and azobisisobutyronitrile, the thermally expanding microcapsule forming agents with hydrocarbon with a low boiling point enclosed can also be used. As specific examples, Matsumoto microspheres F-30, F-50, F-80S, and F-85 (all are manufactured by Matsumoto Yushi-Seiyaku Co., Ltd.) can be exemplified. In addition, no problem occurs when no foaming agents are contained but the gas generated by oxidation and decomposition by laser light is contained. These can be used alone or in combinations. Also, for example, such foamable inks are used compounding 5 parts by weight of ammonium bicarbonate as the foaming agents in the ink constituted of 5 parts by weight of zeolite, 5 parts by weight of oxidative polymerization products, and 90 parts by weight of alkyd resin varnish.

[0127] As microcapsule foaming agents, for example, such microcapsules can be used in which the surface of the core material that evaporates or generates gas by heating is coated with a shell wall of a resin that hardly allows the air passage. To cite specific examples, microcapsules with a particle diameter of 5 to 40 μm in which hydrocarbons being liquid with a low boiling point such as butane, pentane, and the like are used as core materials and thermosetting resins whose main ingredients are vinylidene chloride, acrylonitrile, vinylidene chloride-acrylonitrile copolymer, acrylic resin, aromatic vinyl compounds such as styrene and the like as shell walls can be exemplified.

[0128] The foamable inks that contain microcapsules provide three dimensional unevenness on the surface of the packaging film **11** by the heater or the light irradiation apparatus for the core material evaporates (or generates gas), expands, and breaks the shell wall, thereby leaving the broken traces of the foamable inks on the substrate layer **13** that contacts with the printing layer **19**.

[0129] A schematic sectional view is shown in FIG. 5 as an example of the structure of the packaging bag **10** when the three dimensional designs are formed by letting the printing layer contain the foamable inks. The structure of the layer of the bag **10** shown in the FIG. 5 is, starting from the inner side, the sealant layer **12**/the adhesive or a polyethylene layer

18/the substrate layer **13**/the barrier layer **17**/the adhesive **18**/the printing layer **19**/the substrate layer **13**.

[0130] (Reinforcement Sheet)

[0131] When the molding apparatus **25** is the mold, it is preferable that a reinforcement sheet **14** is further laminated on the inner surface (sealant layer side) of the packaging film **11** in addition to the basic structure of the packaging film **11**. The reinforcement sheet **14** is a layer for reinforcing the portion of the packaging film **11** subject to the three dimensional designs from the back surface in order to apply the three dimensional design decoration to the bag **10**. For the reinforcement sheet **14** used in the present invention, materials with a thermoplastic property are selected as materials with a high retaining shape property under a room temperature and with light weight. In other words, at the time of embossing the packaging film **11**, the three dimensional designs can be easily imparted by heating while when cooled to the room temperature, the three dimensional designs have a relatively high retaining shape property.

[0132] As specific materials, thermoplastic resins such as polyethylene or polypropylene can be exemplified. Further, it is preferable that the thickness of the reinforcement sheet **14** is 30 to 200 μm . When the reinforcement sheet is too thin, the effect of providing the three dimensional decoration to the surface of the packaging bag is not satisfactory enough, while on the other hand, when the reinforcement sheet is too thick, since the reinforcement sheet **14** is partially formed on the packaging film **11**, it gets difficult to form the packaging film **11** in tubular and the process passing capability is likely to be disrupted.

[0133] The reinforcement sheet **14** can be laminated by bonding to the packaging film **11** with general structures by adhesives and the like. However, bonding the reinforcement sheet over the whole surface of the packaging film **11** is not applicable since it becomes difficult to vertically seal or horizontally seal the packaging sheet film **11**. In other words, it is necessary that the sealant layer **12** is provided to the outermost surface of the inner side of the portions subject to the vertical sealing or horizontal sealing of the bag. Therefore, in the present invention, when the reinforcement sheet **14** is provided, lamination is performed within the range that includes the range where the three dimensional designs are formed and that excludes the sealed range. In other words, it is preferable that the three dimensional designs for the bag **10** of the present invention is performed at predetermined portions within the range where the reinforcement sheet **14** is laminated in the inner side surface corresponding to the outer side surface of the bag **10**.

[0134] The schematic sectional view as one example of the structure of the packaging bag **10** when the three dimensional designs are formed providing the reinforcement sheet **14** on the packaging film **11**, is shown in FIGS. 6A and 6B. The layer structure of the bag **10** shown in FIG. 6A is, starting from the inner side, the reinforcement sheet **14**/the sealant layer **12**/the adhesive or the polyethylene layer **18**/the substrate layer **13**/the barrier layer **17**/the adhesive **18**/the printing layer **19**/the substrate layer **13**. As another example of the structure, the example shown in FIG. 6B is constituted of, starting from the inner side, a reinforcement sheet **14**/a sealant layer **12**/a barrier layer **17**/an adhesive or a polyethylene layer **18**/a printing layer **19**/substrate layer **13**. However, as mentioned above, in the both structures, the outermost layer in the inner side at positions where the vertical seal or hori-

zontal seal are performed is a sealant layer **12** and the reinforcement sheet is not laminated on this portion.

[0135] (Sheet for Three Dimensional Designs)

[0136] When the molding apparatus **25** is the mold, it is preferable that the sheet for the three dimensional designs **15** is laminated on the substrate layer side of the packaging film **11** and that the three dimensional design is formed by the mold to the packaging film **11** in which the sheet for the three dimensional designs **15** is laminated. In addition, when the sheet for the three dimensional designs **15** is used, the packaging film **11** with the sheet for the three dimensional designs **15** laminated may be prepared by preparing the laminate with the substrate layer **13** and the sheet for the three dimensional designs **15** laminated beforehand before forming the packaging film **11** and by laminating the sealant layer **12** in the substrate layer side of the laminate.

[0137] As materials for the sheet for the three dimensional designs **15**, paper can be used. In particular, the paper with extendable property provided by fine unevenness is preferable. Such paper, by being used laminated on the packaging film **11**, can provide mechanical properties to the bag **10** such as strength, hardness, and the like and also, due to the excellent processing property of paper with extendable property, can easily form the three dimensional designs on the surface of the packaging bag for its uniquely shaped mold during the bag molding process. In addition, since the paper with extendable property provided by the fine unevenness has a high retaining shape property, the paper once formed with the three dimensional designs can keep the three dimensional designs for a long period of time.

[0138] As the paper used in the present invention with the extendable property provided by fine unevenness, Clupak paper utilizing shrinkage of a rubber belt and produced by making the rubber belt shrink, crepe paper produced by wrinkling wetted paper on a press roll or a drier roll using a doctor blade, paper with lateral and longitudinal stretches imparted at once by making it condense between a pair of rollers, and the like can be exemplified. Further details of such paper are disclosed in Patent Documents 2 (Re-disclosure in Japanese text WO2004/028802) and 3 (Japanese Patent Publication H11-509276).

[0139] As specific measures for obtaining the paper with the above mentioned properties, it is easy to obtain the trade name "wavywavy" manufactured and sold by Nippon Paper Group, Inc. Since this paper has strength of 4 kN/m in 100 g/m² and has stretch of 15%, it can have usability alone as the sheet for the three dimensional designs **15** and the substrate layer **13**, however, it is preferable to use polyethylene, polypropylene, polyester film as materials for the substrate layer **13** and laminate them with the substrate layer **13**. Regarding the laminating methods of the sheet for three dimensional designs **15** and the substrate layer **13** for the paper substrate used in the present invention to which the extensible property is imparted, it can be performed by publicly known methods and for example, it is stated in Patent Document 3. It is preferable that the weight of the paper used in the present invention is 50 to 300 g/m².

[0140] A schematic sectional view showing one example of the structure of the packaging bag **10** when the sheet for the three dimensional designs is provided is shown in FIG. 7. The structure of the layer of the bag **10** shown in the FIG. 7 is, starting from the inner side, the sealant layer **12**/the adhesive **18**/the barrier layer **17**/the substrate layer **13**/sheet for three dimensional designs **15**/the printing layer-**19**. In addition, the

embodiment shown in FIG. 7 shows the embodiment in which the sheet for three dimensional designs **15** and the printing layer **19** are different layers, however, when the paper printed with the ink jet is used as the sheet for three dimensional design **15**, the illustrated printing layer **19** is integrated with the illustrated sheet for three dimensional design **15**.

[0141] In addition, in the present invention, when the sheet for three dimensional designs **15** is laminated on the packaging film **11** and the material of the sheet for three dimensional designs **15** is paper, printing can easily be made to the paper for three dimensional designs **15** by such publicly known methods as ink jet methods without providing the printing layer separately.

[0142] (Three Dimensional Sheet)

[0143] A three dimensional sheet **16** is a sheet imparted with the three dimensional designs beforehand by such methods as embossing by the molds and the like. Since the three dimensional sheet **16** is required to retain the three dimensional designs even when some shocks are applied to the surface of the bag **10**, it is preferable that the materials used for the three dimensional sheet **16** are materials with a certain degree of strength. To be specific, it is preferable that the three dimensional sheet **16** is constituted of the same materials as those used for the substrate layer **13** such as polypropylene, polyester, and the like. The three dimensional sheet **16** can be made into a bag **10** integrated with the packaging film **11**, by being bonded with the packaging film **11** at the portion where no three dimensional designs is provided that is the surrounding portion of the three dimensional designs provided in the three dimensional sheet **16**. In addition, the size of the three dimensional sheet **16** can appropriately be selected by the size of the bag and that of the three dimensional designs formed on the surface of the bag.

[0144] In the bag **10** of the present invention, the three dimensional sheet **16** provided with printing can also be used. In this case, instead of providing the printing layer on the packaging film **11**, the three dimensional sheet provided with the printing can be used or, the printing can be provided to the three dimensional sheet **16** as well as to provide the printing layer **19** with the packaging film **11**.

[0145] (Hot Melt Adhesive)

[0146] As adhesives for bonding the three dimensional sheet **16** to the packaging film **11**, hot melt adhesives **16A** can preferably be used. Hot melt adhesives **16A** are adhesives based on a thermoplastic polymer being solid at a room temperature with a property of showing fluidity in a liquid state when heated and restoring the original solid state when cooled. To be specific, reactive hot melt urethane series adhesives and copolymer polyester series hot melt adhesives can preferably be used.

[0147] A schematic sectional view as one example of the bag **10** produced by the apparatus of the present invention when the three dimensional sheet **16** is provided to the packaging film **11** using the hot melt adhesive **16A** is shown in FIG. 8. The structure of the layer of the bag **10** shown in the FIG. 8 is, starting from the inner side, the sealant layer **12**/the adhesive or a polyethylene layer **18**/the substrate layer **13**/the barrier layer **17**/the adhesive **18**/the substrate layer **13**/the hot melt adhesive **16A**/the three dimensional sheet **16**. In addition, the schematic sectional view in FIG. 3 shows the embodiment of the three dimensional sheet **16** provided with printing without providing the printing layer to the packaging film **11**.

[0148] (Production of Bags with Three Dimensional Designs 1)

[0149] A producing method of bags provided with the three dimensional designs to the packaging film 11 using the bag making-packaging machine 20 by the heater is as follows. For information, the producing method of bags provided with three dimensional designs using the light irradiation apparatus can be conducted by the same method as when the heater is used.

[0150] First of all, the packaging film 11 is provided to the bag making-packaging machine 20 taking out the packaging film 11 from the feed roll with the packaging film 11 rolled. The packaging film 11 is formed in tubular by the pull-down belt 24c in the process of conveying the packaging film 11 from the shoulder portion 23a of the former 23 of the bag making-packaging machine 20 to the tubular portion 23b, and then both film ends are overlapped in the film running direction while moving downward along the former surface, thereby performing vertical seal by the vertical seal mechanisms 21. As types of vertical seal, either an envelope seam sealing or a butt seam sealing is applicable.

[0151] When the above mentioned vertical seal is performed to the tubular packaging film 11, heating by the heater for the three dimensional designs can be performed together. In order to heat the packaging film 11 positioned on the molding surface 30 of the former 13 at the former 23, it is necessary to determine positioning the portion to be heated. In positioning, the sensor 27A senses the eye marks provided to the packaging film 11 and the detection signal is output to the controlling mechanism 27C. By the input of the detection signal, the controlling mechanism 27C gives instructions to move the heater 15 by the moving mechanism 27B so as to make the heater that is the molding apparatus 25 contact with the packaging film 11 on the molding surface 30 of the former 13. The moved heater heats the packaging film 11 on the molding surface 30 from its outer surface. Foamable inks contained in the printing layer 19 foam by heating and the three dimensional decoration is provided at predetermined positions of the substrate layer 13. After heating for a certain period of time, by the instructions of the controlling mechanism 27C, the heater is moved away from the packaging film 11 and the packaging film 11 is moved downward again by the pull-down belt 14c.

In addition, the signal detection of the eye marks for the positioning is not necessarily conducted on the surface of the former 13 to be heated, but rather, it is easier in process to conduct the signal detection of the eye marks when the packaging film 11 is plane and before it is provided to the bag making-packaging machine 20 as shown in FIG. 1A.

[0152] Next, in the tubular packaging film 11, firstly, the lower end is sealed with appropriate intervals by the horizontal seal mechanism 22 and at the same time of being formed to the uncompleted packaging bag 10 in which the upper end of the tubular packaging film 11 is opened, the product C passes through the inner side cavity of the tubular portion 13b of the former and is supplied to the uncompleted packaging bag 10. In the next step, when the upper end of the uncompleted packaging bag 10 is sealed by the horizontal seal mechanism 22 as well, as the packaging bag 10 is cut off to the separate bags by the knife of the horizontal seal mechanism 22, the three dimensional designs are provided on the surface and the packaging bag 10 with the product C tightly packed and filled is completed.

In addition, in the producing method, although the process for performing the three dimensional designs at the time of vertically sealing the packaging film 11 is shown, the process for performing the three dimensional designs can be provided before and after the vertical seal.

[0153] (Production of Bags with Three Dimensional Designs 2)

[0154] A producing method of bags provided with the three dimensional designs to the packaging film 11 with the mold 26 using the bag-making and packaging machine 20 is as follows. First, the packaging film 11 is supplied to the bag-making and packaging machine 20 rolling out the packaging film 11 from the supply rolls with the packaging film 11 rolled. The packaging film 11 is conveyed by the pull-down belt 24c of the bag-making and packaging machine 20 and moves toward the shoulder portion 23a of the former 23. In the embodiment of bonding the reinforcement sheet 14, in the process so far, the reinforcement sheets 14 are bonded to the predetermined portions of the packaging film 11 at certain intervals. However, the reinforcement sheets are not bonded to the positions subject to the vertical seal and the horizontal seal in later process. Subsequently, the packaging film 11 is shaped into tubular in the process of being conveyed from the shoulder portion 23a of the former of the bag-making and packaging machine 20 to the tubular portion 23b, moved downward along the former surface, and the both ends of the film are overlapped and by the vertical seal mechanism 21, the vertical seal is performed. As types of vertically seal, either an envelope seam sealing or a butt seam sealing is applicable.

[0155] On the former rear side, the three dimensional designs are performed to the packaging film 11 by the mold 26, while the vertical seal is conducted to the packaging film on the former front side. The flow chart of molding with the molds 26 (26A, 26B, and 26C) shown in FIG. 3, applied to the apparatus shown in FIGS. 1A and 1B is as shown in the Table 1.

[0156] As above mentioned, preferable embodiment of the present invention is that the mold 26 provided to the former 23 is the male 26A and the opposing mold is the female 26B. In the female 26B, a heater (not illustrated) for heating the packaging film 11 is built in, and the blower 26C for depressurizing inside of the mold when molding, and the moving mechanism 27B for forwarding and reversing the female toward the male 26A are provided. The register mark is detected in the process where the packaging film 11 is supplied to the former 23, and the detection signal is output to the controlling mechanism 27C. Based on the information from the sensor 27A, the position of the packaging film 11 at which the three dimensional designs are formed is specified. By the instructions of the controlling mechanism 27C, so that the three dimensional designs are formed at specified positions, the female 26B moves forward and at the same time, the vacuum blower 26C starts operation, thereby inside of the mold 26 is made vacuum and the molding is conducted. After the three dimensional designs are formed, with the instructions of the controlling mechanism 27C, the operation of the blower 26C stops and the female 26B moves backward and the packaging film 11 is conveyed downward again by the pull-down belt 14c.

[0157] Next, the packaging film 11, with its lower end sealed by the horizontal seal mechanism 22 at appropriate intervals, is processed to be formed as an uncompleted bag with its upper end opened and at the same time, the product C is supplied to the uncompleted bag passing through the inner

side cavity of the cylindrical portion **23b**. Lastly, when the upper end of the uncompleted bag is sealed by the horizontal seal mechanism **22** and is cut out into separate bags by the knife of the horizontal mechanism **22**, the three dimensional designs are provided on the surface and the bag **10** tightly packed and filled with the product **C** is completed.

[0158] In the embodiment of bonding the reinforcement sheet **14**, it is preferable that the packaging film **11** is provided with a bonding mechanism for bonding the reinforcement sheet **14** to the side of the substrate layer before the packaging film **11** reaches the tubular portion **13b** of the former.

[0159] In FIG. 9, an outline is shown on one example of the bonding mechanism for the reinforcement sheet **14**. The bonding mechanism of the reinforcement sheet is the mechanism for bonding the reinforcement sheet intermittently to the packaging film **11**. Before the packaging film **11** is supplied to the vertical bag-making and packaging machine **20**, the reinforcement sheet **14** is laminated at predetermined portions that are the surfaces of the sealant layer of the packaging film **11** and that exclude the portions where the vertical seal and the horizontal seal are formed, and the example in the FIG. 9 shows that the surfaces laminated on the packaging film **11** of the reinforcement sheet have a heat-sealable property. As shown in the FIG. 9, the reinforcement sheet **14** is supplied on the packaging film **11** as a continuous film, and the region laminated on the packaging film **11** is divided by the perforation, and the divided portions are laminated to the packaging film **11** by the hot press machine provided with heater plates **28** and **28'** as shown in the FIG. 9. The heater plates **28** and **28'** of the hot press machine may be the one that fixes the peripheral portions of the reinforcement sheet to the packaging film **11** as shown in the FIG. 9, or may be the one that fixes the whole surface.

[0160] The reinforcement sheet **14** is bonded to its inner surface of the packaging film **11** at predetermined portions at constant intervals by the bonding mechanism for the reinforcement sheet. However, the reinforcement sheet **14** is not bonded at positions where the vertical seal and the horizontal seal are performed. Subsequently, the packaging film **11** is tubularly shaped in the process where it is conveyed from the shoulder portion **23a** of the bag-making and packaging machine **20** to the tubular portion **23b** and moves downward along the former surface, and the both ends of the film are overlapped and by the vertical seal mechanism **21**, the vertical seal is performed. As types of vertical seal, either an envelope seam sealing or a butt seam sealing is applicable.

[0161] In addition, although the process for the three dimensional designs at the time of the vertical seal of the packaging film **11** are shown, the process for performing the three dimensional designs can be provided before and after the vertical seal.

[0162] (Production of Bags with Three Dimensional Designs 3)

[0163] A producing method of bags provided with the three dimensional designs to the packaging film **11** by the pressing machine **29** using the bag-making and packaging machine **20** is as follows.

[0164] It is common with the producing method using the mold **26** in that the packaging film **11** moves downward along the former surface and is vertically sealed.

[0165] In parallel with the vertical seal of the packaging film **11**, at the rear side of the former **23**, the three dimensional sheet **16** is bonded at predetermined portions by the bonding mechanism of the three dimensional sheet **16**. This time, by

making the bonding position of the rear side of the former **23** plane, the three dimensional sheet **16** can be bonded without failure. However, this time, the three dimensional sheet **16** is not bonded on the positions subject to the horizontal seal in later process.

[0166] Methods for bonding the three dimensional sheet **16** to the packaging film **11** include the one which uses the three dimensional sheet **16** provided with the sealant layer or the hot melt adhesive **16A** beforehand on the back surface of the three dimensional sheet, that is the surface bonded to the packaging film **11**, followed by heating this three dimensional sheet **16** to bond it or the one in which the melted hot melt adhesive is sprayed or coated to form the hot melt adhesive **16A** at predetermined portions on the surface bonded to the surface of the packaging film, that is, the surface bonded to the three dimensional sheet **16** in the process right before bonding the three dimensional sheet **16** as shown in FIG. 4, thereby bonding the three dimensional sheet **16** while the hot melt adhesive **16A** is being melt.

[0167] The three dimensional sheet **16** before bonded to the packaging film **11** can be prepared as, as shown in FIG. 4, a continuous sheet in which the sheet portion to be bonded to the bag is divided by the perforation. The portions divided by the perforation break by applying force by the pressing machine **29** thereby bonded to the surface of the packaging film **11**.

[0168] In the methods in which the sealant layer or hot melt adhesive is provided at the back surface of the three dimensional sheet **16**, while pressurizing the positions divided by the perforations of the three dimensional sheet **16** and heating, and while the three dimensional sheet **16** moves to the predetermined positions of the packaging film **11**, the three dimensional sheet **16** is bonded by the adhesive force of the sealant layer or the hot melt adhesive at the back surface of the three dimensional sheet **16**.

[0169] On the other hand, in the methods in which the hot melt adhesive is formed by such methods as spraying, coating, or the like, first, a hot melt adhesive is laminated by the adhesive laminate apparatus **29A** with the heating mechanism built in as shown in FIG. 4, on the predetermined portions in the front surface side of the packaging film **11** made into tubular by the former **23**. Next, while the hot melt adhesive **16A** maintains the melted state, the three dimensional sheet **16** is bonded by the pressing machine **29**.

[0170] After the completion of the bonding process, the pressing machine **29** retires. Such operation of the pressing machine **29** or that of the adhesive laminate apparatus **29A** is controlled by cooperation of the moving mechanism **27B**, the sensor **27A** and of the controlling mechanism **27C**.

[0171] (Bags to be Produced)

[0172] An example of the appearance of the bag **10** with the three dimensional designs **30** formed by the producing method is shown in FIG. 10. Contents of the three dimensional designs **30** include product images, designs that form corporate images providing the products, and catchphrases that become advertisements of the products, and as the three dimensional designs **30**, it is effective to mark the depth of 1 to 20 mm, and in particular, not less than 10 mm.

[0173] (Shapes of the Bags)

[0174] Since the producing methods by the vertical packaging machines have been exemplified, the vertical bags with the three dimensional designs are produced, however, the packaging bags in the present invention are not limited to

these vertical bags, and square bags with gussets or rectangular sealed bag can also be produced.

INDUSTRIAL APPLICABILITY

[0175] Since the packaging bags with the three dimensional designs formed on the bag surfaces by the bag making-packaging apparatus of the present invention, by the provision of such packaging bags, the consumer appetite is stimulated and the sales of the merchandizes are improved by employing these packaging bags.

[0176] Also, when the three dimensional indications are provided to bags, the consumers come to see the indication attentively. Therefore, the apparatus of the present invention can be used extensively for producing bags and specifically for producing the packaging bags for foods.

What is claimed:

1. A bag making-packaging apparatus provided with a tubular former having a former surface along which a packaging film is placed, a pull-down mechanism, a vertical seal mechanism, a horizontal seal mechanism and a molding apparatus performing three dimensional design molding, wherein the tubular former has a molding surface for molding the three dimensional designs on either position of the former surface and the molding apparatus is provided to the position opposite to the molding surface of the former.

2. The bag making-packaging apparatus as set forth in claim 1, wherein the molding apparatus is provided with a heater for heating the packaging film positioned on the molding surface of the former.

3. The bag making-packaging apparatus as set forth in claim 1, wherein the molding apparatus is provided with a light irradiation apparatus irradiating the packaging film positioned on the molding surface of the former.

4. The bag making-packaging apparatus as set forth in claim 1, wherein the molding apparatus is provided with a mold for forming unevenness on the packaging film positioned on the molding surface of the former.

5. The bag making-packaging apparatus as set forth in claim 1, wherein the molding apparatus is provided with a pressing machine for laminating the three dimensional sheet that is a sheet with three dimensional designs formed on the packaging film positioned on the molding surface of the former.

6. The bag making-packaging apparatus as set forth in claim 1, wherein the molding apparatus is provided with a

pressing machine for laminating the three dimensional sheet on the packaging film positioned at the molding surface of the former, and the plate of the pressing machine is a heater plate.

7. The bag making-packaging apparatus as set forth in claim 1, wherein the molding apparatus is provided with the adhesive laminate apparatus for laminating the adhesive on a certain range of the packaging film positioned at an earlier stage than the molding surface of the former and the pressing machine for laminating the three dimensional sheet on the packaging film on which the adhesives are laminated and positioned at the molding surface of the former, and the plate of the pressing machine is a heater plate.

8. The bag making-packaging apparatus as set forth in claim 1, wherein the former has a cavity cylindrical shape and the molding surface has a plane surface.

9. The bag making-packaging apparatus as set forth in claim 1, wherein the pressing machine for laminating the mold or the three dimensional sheet for forming the unevenness on the packaging film positioned at a molding surface of the former and a moving mechanism for moving the mold or the pressing machine toward and away from the molding surface.

10. The bag making-packaging apparatus as set forth in claim 1, wherein the molding surface of the former and the molding apparatus are provided with molds with shapes so that the molding surface of the former and the molding apparatus can be mutually engaged.

11. The bag making-packaging apparatus as set forth in claim 1, wherein the molding surface of the former and the molding apparatus are provided with molds with shapes so that the molding surface of the former and the molding apparatus can be mutually engaged and the mold of the molding surface of the former is a male and the mold of the molding apparatus is a female.

12. The bag making-packaging apparatus as set forth in claim 1, wherein the molding surface of the former and the molding apparatus are provided with molds with shapes so that the molding surface of the former and the molding apparatus can be mutually engaged and the mold of the molding surface of the former is a male and the mold of the molding apparatus is a female, and a heater is built in the female.

13. The bag making-packaging apparatus as set forth in claim 1, wherein the molding apparatus is provided with a vacuum apparatus.

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