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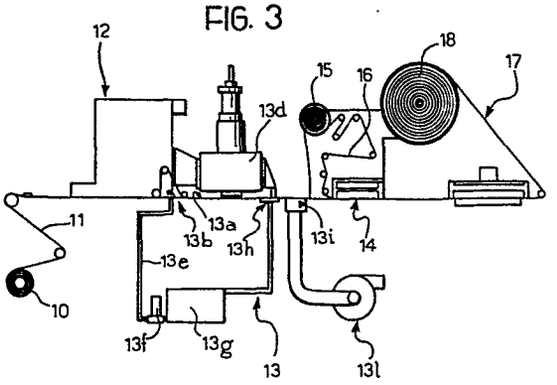
(54) Method and apparatus for packaging products formed by casting in the thermoformed wrapper of a blister package.

(57) The wrapper (2) comprises a film of thermoplastics material having cells (3) which are made by thermoforming and are each intented to receive a respective product: a metered quantity of molten product is poured into each cell (3) of the wrapper (2), while the wrapper (2) is cooled simultaneously by a flow of liquid coolant in contact with its outer surface. The machine includes a filling station (13) where the product is poured into the cells (3), which is interposed between a thermoforming station (12) where flat surface of a first sheet (11) of thermoplastics film is locally deformed to obtain longitudinal rows of cells (3), and a sealing station (14) where a second sheet (16) of thermoplastics sealing film is applied to the first sheet (11) to close the cells (3). The filling station (13) includes a channel extending in the direction of displacement of the first sheet (11) between the forming station (12) and the sealing station (13) and having a depth greater than the depth of the cells (3), and a station (13*d*) for pouring the metered quantities of molten product into the cells (3), which overlies the channel close to its inlet end (13*b*). Associated with the channel are means (13*e*, 13*f*) for supplying a liquid coolant at the inlet end (13*b*), means (13*h*) for discharging the coolant from a discharge zone close to the sealing station (14), and means (13*g*) for cooling the coolant discharged from the channel and conveying it towards the supply means (13*e*, 13*f*), so as to make the coolant flow in a closed circuit of which the channel constitutes a part.

FIG. 3



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"Method and apparatus for packaging products formed by casting in the thermoformed wrapper of a blister package"

The present invention relates to methods for packaging products formed by pouring into a thermo--formed wrapper of a blister-pack, and is concerned particularly with a method of the type in which the wrapper comprises a film of thermoplastics material having cells which are thermoformed and are each intended to receive a respective product.

In methods of the aforesaid type, there is a problem in preventing the product, which is normally hot to allow its pouring, from damaging the thermoplastics material of the wrapper, to which the pouring temperature is harmful.

For this reason, in known processes the product is poured into a mould of a material which can withstand the temperature, for example, a metal mould, and is subsequently put into the cells of the wrapper of the blister-pack after the product has been cooled to a temperature which the thermoplastics material of the wrapper can tolerate.

The technical solution described is unsatisfactory, since the separation of the formation by pouring from the packaging operation reduces the speed of the production process.

The object of the present invention is to provide a process of the type specified above which does not have the aforementioned drawbacks.

In order to achieve this object, the present invention provides a process of the type specified above, characterised in that it includes the steps of pouring a metered quantity of molten product into each cell of the wrapper and simultaneously cooling the wrapper by a flow of liquid coolant in contact with the outer surface of the wrapper.

By virtue of this characteristic, the product is formed by being poured directly into the wrapper of the pack.

A further subject of the present invention is

constituted by a machine for packaging products formed by pouring into a blister-pack, the pack comprising a film of thermoplastics material with cells which are thermoformed and are each intended to receive a respective product, comprising:

- a first reel for supplying a first sheet of thermoplastics film;

- a station for thermoforming the first sheet of thermoplastics film unwound from the first supply reel, where longitudinal rows of cells are formed by local deformation of the flat surface of the first sheet;

- a filling station where the products are intro--duced into the cells;

- a second reel for supplying a second sheet of thermoplastics film, and

- a sealing station where the second sheet of thermoplastics film is unwound from the second reel and applied to the first sheet of thermoplastics film, characterised in that the filling station includes:

- a channel which extends in the direction of displacement of the first sheet of thermoplastics film between the forming station and the sealing station and has a depth greater than the depth of the cells, the channel having an inlet end for the first, thermoformed sheet and the side walls of the channel supporting the longitudinal edges of the first sheet during its passage between the two stations with the cells in the channel;

- means for supplying a liquid coolant to the channel at the inlet end for the first, preformed sheet;

- means for discharging the coolant from a discharge zone of the channel close to the sealing station;

- means for cooling the coolant discharged from the channel and conveying it to the supply means, whereby the coolant flows through a closed circuit of which the channel constitutes a part, and

- a station for pouring metered quantities of molten product into the cells of the first thermoformed sheet,

which overlies the channel close to the inlet end.

By virtue of this characteristic, in the machine according to the invention, a flow of liquid coolant is kept in contact with the outer surface of the wrapper of the pack which has been made by thermoforming a sheet of thermoplastics film, while the product is poured into the cells of the wrapper itself.

The invention will now be described, purely by way of non-limiting example, with reference to the appended drawings, in which:

Figures 1 and 2 are respectively a view from below and a side view of a blister-pack;

Figure 3 is a schematic elevational view of a machine according to the invention;

Figure 4 illustrates several parts of Figure 3 in greater detail and on an enlarged scale, and

Figure 5 is a section taken on the line V-V of Figure 4.

In Figures 1 and 2, a pack of the type generally known in the art as a blister-pack is generally indicated 1. The pack 1 comprises a wrapper 2 formed by thermoforming a sheet of thermoplastics film, for example, polyvinyl chloride (PVC). The flat surface of the sheet of thermoplastics film is deformed locally to form cells 3 each of which is intended to receive a respective product, for example, a pastel formed by pouring.

In a typical example of use of the blister-pack, the cells 3 are intended to receive pastels formed by the pouring of sorbitol. In order to allow pouring, the sorbitol is heated to a temperature of the order of 85-90°C.

The polyvinyl chloride (PVC) of the wrapper 2 can normally withstand a temperature of about 70°C but is deformed at higher temperatures.

The blister-pack illustrated in Figure 1 further includes a sealing strip 4 which closes the cells 3.

In the processes of blister-packaging carried out

on an industrial scale, both the wrapper 2 and the sealing strip 4 are normally made from sheets of thermoplastics film which are unwound from corresponding supply reels.

The product of the packaging operation is also in the form of a sheet which is subsequently cut and punched to form packs of the type illustrated in Figures 1 and 2.

The pack 1 includes three parts two of which have cells 3 while the other has two flat faces which may be used, for example, for trade marks and information about the packaged product.

In Figure 3 a supply reel for a first sheet 11 of the thermoplastics film is indicated 10.

A thermoforming station for the first sheet 11 of thermoplastics film unwound from the first reel 10 is generally indicated 12.

A filling station, generally indicated 13, is interposed between the thermoforming station 12 and a sealing station 14 with which is associated a second reel 15 for supplying a second sheet 16 of thermoplastics film.

A collecting station, for the finished product, generally indicated 17, comprises a reel 18 on which the sheets 11, 16 are wound after they have passed through the sealing station 14.

As best seen in Figure 4, the filling station 14 includes a channel 13a which extends in the direction of displacement of the first sheet 11 of thermoplastics film between the forming station 12 and the sealing station 14.

The channel 13a has a depth greater than the depth of the cells formed in the first sheet 11.

The channel 13a has an inlet end 13b for the first, thermoformed sheet 11.

The channel 13a has longitudinal ribs 13c and is overlain, close to the inlet end 13b, by a station for pouring metered quantities of the product to be packaged.

A pump 13f which supplies the channel 13a with a

liquid coolant is connected to the channel 13a by a pipe 13e.

The intake side of the pump 13f is connected to a cooler 13g which is supplied with the coolant discharged from the channel 13a through an aperture 13h in the bottom of the channel 13a close to the sealing station 14.

In the end portion between the aperture 13h and the sealing station 14, the bottom of the channel 13a has a plurality of ventilation apertures 13i to which a suction pump 13l is connected.

In operation of the machine according to the invention, the first sheet 11 of thermoplastics film is supplied from the first reel 10 to the thermoforming station 12 where the flat surface of the sheet 11 is deformed locally to form longitudinal rows of cells of the type indicated 3 in Figures 1 and 2.

Downstream of the thermoforming station 12, the thermoformed first sheet 11 is passed along the channel 13a so that the side walls of the channel support the longitudinal edges of the sheet 11 during its passage along the channel 13a.

In the embodiment illustrated, the machine according to the invention is intended to package products formed by pouring into a blister-pack which includes four pairs of rows of cells 3 separated by intermediate flat portions of the thermoformed sheet 11.

As illustrated in Figure 5, the longitudinal ribs 13c projecting from the bottom of the channel 13a support these intermediate portions of the thermoformed sheet 11.

At the pouring station 13d, metered quantities of the product to be packaged are poured into each cell 3 of the wrapper 12 formed by thermoforming of the first sheet 11 of thermoplastics film, while the wrapper itself is immersed in the bath of liquid coolant which is present in the channel 13a.

Thus, the outer surface of each cell 3 is in contact

with the coolant which is kept at a temperature below the level which produces harmful phenomena, such as deformation of the wrapper itself.

The pump 13f supplies the channel 13a with low temperature coolant from the cooler 13c.

In its movement towards the sealing station 14 along the channel 13, the wrapper is kept immersed in the bath of coolant so as to keep the outer surfaces of the cells 3 in contact with the coolant until the product therein has set.

At the aperture 13h the coolant is discharged from the channel 13a and is directed to the cooler 13g so as to form a closed circuit for the coolant of which the channel 13a constitutes a part. The circulation of coolant in the channel 13a is facilitated by the movement of the first sheet 11 the cells 3 of which project into the channel and act as blades to push the coolant from the inlet end 13b towards the aperture 13h.

From Figure 5 it can be seen how the longitudinal edges of the thermoformed sheet 11 are kept in sliding contact with the side walls of the channel 13a so as to prevent the coolant leaving the channel itself.

Downstream of the discharge aperture 13h, the thermoformed sheet 11 is made to continue along the channel 13a towards the sealing station 14, until it reaches the apertures 13i through which drops of coolant adhering to the surface of the thermoformed sheet are removed by the suction pump 13l.

At the sealing station 14, the second sheet 16 of thermoplastics film, supplied by the second reel 15, is applied and heat-sealed to the first, thermoformed sheet 11 so as to close the openings of the cells 3 housing the poured products. At the collecting station 17, the packaged product is wound in a strip onto the collecting reel 18, preferably after it has undergone an initial cutting and/or punching operation so as to allow the separation of the pairs of rows of cells

present in the product leaving the sealing station 14, and to allow the subsequent longitudinal subdivision of the strips wound on the reel 18 to form packs of the type illustrated in Figures 1 and 2.

Naturally, the principle of the invention remaining the same, the stages of the process, the details of realisation and the forms of embodiment may be varied widely with respect to that described and illustrated without thereby departing from the scope of the present invention.

CLAIMS

1. Method for packaging products formed by pouring into a thermoformed wrapper of a blister-pack, the wrapper comprising a film of thermoplastics material having cells which are thermoformed and are each intended to receive a respective product, characterised in that it includes the steps of pouring a metered quantity of molten product into each cell of the wrapper and simultaneously cooling the wrapper by a flow of liquid coolant in contact with the outer surface of the wrapper.

2. Method according to Claim 1, characterised in that it includes the steps of:

- providing a bath of liquid coolant;
- immersing the wrapper in the bath so that the greater part of the outer surface of the wrapper is in contact with the bath;
- effecting a relative movement between the wrapper and the coolant;
- pouring a metered quantity of molten product into each cell of the wrapper, and
- keeping the wrapper in contact with the coolant until the product has solidified.

3. Method according to Claim 2, characterised in that it includes the additional steps of:

- removing the wrapper containing the solidified product from the bath, and
- removing the residual coolant from the outer surface of the wrapper.

4. Machine for packaging products formed by pouring into a blister-pack, the pack comprising a film of thermoplastics material with cells which are thermoformed and are each intended to receive a respective product, comprising:

- a first reel (10) for supplying a first sheet (11) of thermoplastics film;

- a station (12) for thermoforming the first sheet (11) of thermoplastics film unwound from the supply reel (10), where longitudinal rows of cells (3) are formed by local deformation of the flat surface of the first sheet (11);

- a filling station (13) where the products are introduced into the cells (3);

- a second reel (15) for supplying a second sheet (16) of thermoplastics film, and

- a sealing station (14) where the second sheet (16) of thermoplastics film unwound from the second reel (15) is applied to the first sheet (11) of thermoplastics film,

characterised in that the filling station (13) includes:

- a channel (13a) which extends in the direction of displacement of the first sheet (11) between the forming station (12) and the sealing station (14) and has a depth greater than the depth of the cells (3), the channel (13a) having an inlet end (13b) for the first, thermoformed sheet (11) and the side walls of the channel (13a) supporting the longitudinal edges of the first sheet (11) during its passage between the two stations (12, 14) with the cells (3) in the channel (13a);

- means (13e, 13f) for supplying a liquid coolant to the channel (13a) at the inlet end (13b) for the first, preformed sheet (11);

- means (13h) for discharging the coolant from a discharge zone of the channel (13a) close to the sealing station (14);

- means (13g) for cooling the coolant discharged from the channel (13a) and conveying it to the supply means (13e, 13f), whereby the coolant flows

through a closed circuit of which the channel (13a) constitutes a part, and

- a station (13d) for pouring metered quantities of molten product into the cells (3) of the first thermoformed sheet (11), which overlies the channel (13a) close to the inlet end (13b).

5. Machine according to Claim 4, characterised in that the bottom of the channel (13a) has a plurality of apertures (13i) downstream of the zone for discharging the coolant, and in that aspirator means (13l) are provided for drawing drops of coolant adhering to the wall of the first, thermoformed sheet (11) through the apertures (13i).

6. Machine according to Claim 4, characterised in that the channel (13a) has a plurality of longitudinal ribs (13c) which support intermediate portions of the first, thermoformed sheet (11).

FIG. 1

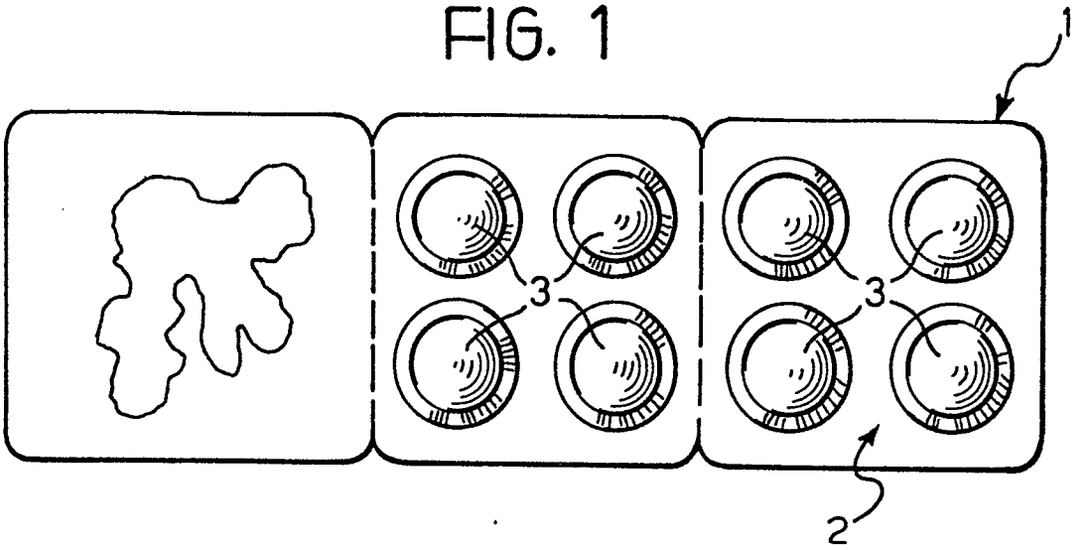

FIG. 2

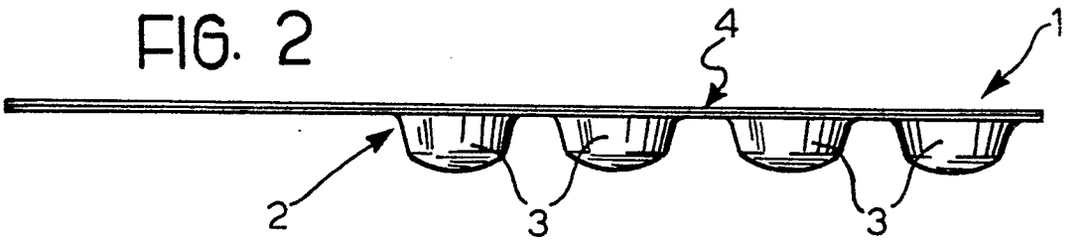

FIG. 3

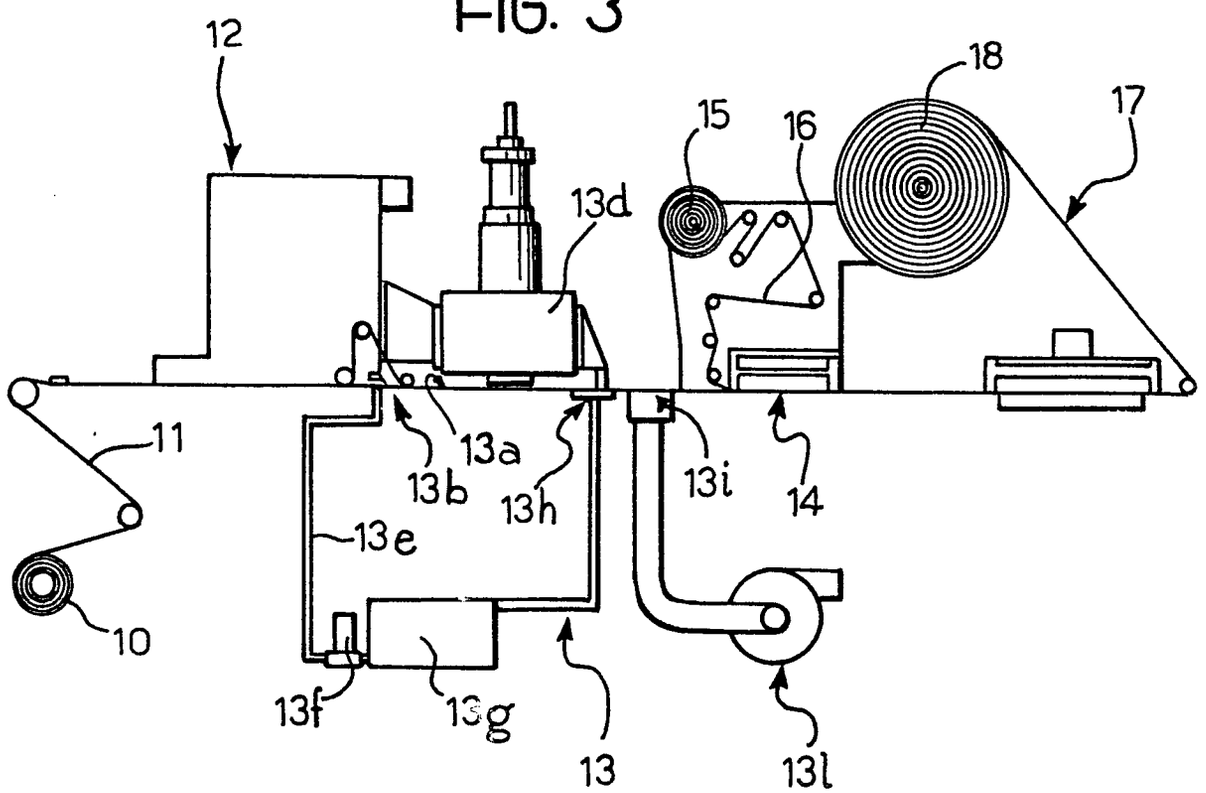

FIG. 4

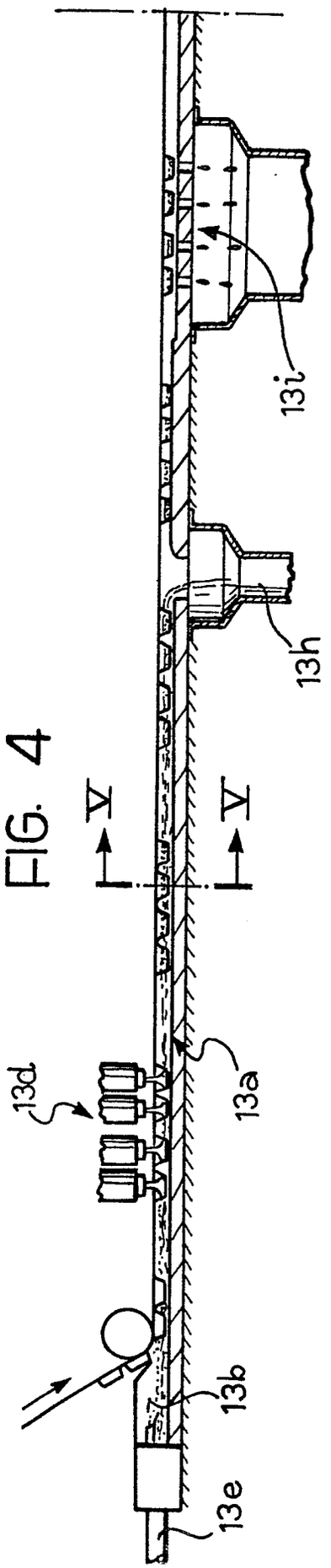

FIG. 5