

The invention relates to a substantially flat end wall, which forms the top of a liquid pack and which comprises thermoplastic material, with a pouring means which is arranged within the outside contour of the pack and comprises an opening flap with collar, for closing a pouring opening, and a handle secured to the opening flap, and with a shoulder which is displaced with respect to the outer surface of the wall of the top and which is arranged at the periphery of the top, for mounting to a side wall of the pack, wherein the opening flap is connected to the walls of the top by way of an endless weakening line which extends in a second inner plane and at a spacing from and parallel to the surface of the wall of the top and the spacing between the two planes is greater than or equal to the height of the collar of the opening flap, which collar projects outwardly out of the weakening line at the opening flap.

A top like that of the afore-mentioned kind is already known from DE-A-1 486 350. This embodiment relates to a lid of a bucket which can be manufactured from plastics material by injection moulding, and which can be clamped onto the upper edge of a bucket. The pouring means comprises a pouring tube which is movably disposed on the main wall of the top by means of a bellows-like casing part. The pouring means is loosened by removing a closure cap along a weakening line, wherein the user can grip an eye which is fixed by means of reinforcing ribs and can pull the closure cap away completely. Before pulling away the closure cap, the user must pull out the pouring pipe with the closure cap still adhering to it by deforming the bellows-like casing part, in such a way that both the upper casing part and the pouring tube and much more the closure cap project from the outside contour of the pack.

After pulling off the closure cap and emptying at least a part of the liquid from the bucket, the user can place the separate closure cap in a position wherein it has been inverted through 180° with respect to the pouring tube, thereby making closure possible.

A top of this kind must be injection moulded in a first position, it must be folded in a second position, i.e. the transporting position, inside the outside contour of the pack, and finally it must be withdrawn from this transporting position for use. For this, not only are specially manufactured tools and several manufacturing processes needed, but a certain amount of force is needed to open a top of this kind, if the user is to pull the pouring means out of the contour of the pack, and also remove the closure cap completely. Furthermore, if the closure cap is separated completely from the top, there is the drawback that the cap can become lost.

The invention also relates to a process for the production of the top of the kind mentioned in the introduction by injection moulding, wherein after the injection moulding operation the moulded article is removed early from the mould in such a way that the plastic material is still in the thermoplastic condition.

A process for manufacturing a synthetic body by injection moulding is also known from US-A-4 063 868. Hollow bodies are manufactured using this process, which have at least one undercut section such that the moulded article can only be removed from the mould by using complex moulding tools. It is proposed in this respect that the injection moulding be carried out using a conically tapering mandrel which allows injection moulding to be carried out with simple injection moulding tools. Firstly, a hollow body with thick walls can be moulded in such a way that after the injection moulding process, when the plastic is still in the thermoplastic state, the article is removed from the mould, and the injection moulded part is transported to another worktool, where it receives another shape to the inside or outside thereof by compressed air and/or a vacuum. After the plastic has solidified the casing of the second tool can be easily opened, and in this way a hollow body is created which with respect to the individual inlet has undercut sections inside the hollow cavity, and the injection or moulding tools can also be easily structured and removed.

The top according to the invention, however, is not in the form of a hollow body, and there is no alteration to the structure of the top or to the parts fixed thereto. Thus, the specialist finds nothing of interest in this

document, with respect to how a handle projecting from a disc is to be manufactured using simple injection tools, and thus be arranged in such a way that it does not project from the outside contour of the pack, particularly not from the outer surface of the upper wall of the top.

The aim of the invention is therefore to improve the tops and manufacturing processes for them known hitherto, and also the apparatus for carrying out the manufacturing process in order that in particular a top can be manufactured which can be transported favourably using simple means, wherein it is possible for the opening means to be properly liquid tight, and for it to be easily opened and closed.

With respect to the top, this problem is solved according to the invention, by having the opening flap mounted to the wall of the top by way of a hinge and the junction between the outer surface and the inner second plane being provided by inclined surfaces, preferably two oppositely disposed flat inclined surfaces.

The top according to the invention has an outer surface of the wall of the top, which is placed in a so-called outer first plane. Between this plane, thus the outer surface of the pack on the side of the top, on the one hand, and the inner second plane, on the other hand, in which the weakening line extends, there is formed by means of inclined surfaces a junction, wherein these inclined surfaces are preferably formed by two oppositely disposed flat surface parts. In this way, there is no bellows-like casing part, and neither the manufacturer nor the end user has to fold the generally frustoconical top which is known in or out with respect to the outside contour of the pack. These manipulations which partly necessitate a not inconsiderable amount of force are advantageously avoided by means of the design according to the invention. Use or opening of the new top is particularly comfortable both for the manufacturer and the end user because no projecting opening device within the outside contour of the pack must be pushed in or out for it to be opened. With the top according to the invention there is no need for any manipulations or considerations of this kind for transportation nor for opening the pack.

Furthermore, the opening flap can no longer become lost after the pack has been opened for the first time, because the opening flap is attached by a hinge to the wall of the top.

In addition, the newly designed top according to the invention is particularly favourable with respect to simplification of the manufacturing tools.

It is also advantageous according to the invention if in plan view the outer surface surrounding the inclined surfaces and the opening flap in a U-shape is provided in such a way that the pointed outlet end of the opening flap is disposed at the periphery of the top and between the free ends of the U. In plan view, a top which is injection moulded on a tubing of cylindrical casing configuration is round. If the main part of the circular contour of this top is occupied in the described way by the first plane, disposed in a U-shape, there is a large standing surface, and thus good possibility for transportation of the new liquid pack provided with the top according to the invention. It is advantageous if the opening device is disposed in the middle and towards one side, namely between the free limbs of the afore-mentioned U-shape, for which opening device, space is made by the two oppositely disposed inclined surfaces. If, in addition, the opening flap has a pointed end, then the collar thereof which projects from the second inner plane, can be correspondingly structured so as to form a point, thereby resulting in excellent pouring properties. Tearing forces can also be favourably introduced over the pointed end.

According to a further advantageous embodiment of the invention, in plan view the opening flap is of an elongate configuration and extends from the periphery of the top approximately to the centre thereof, wherein preferably the hinge of the opening flap is disposed approximately in the outer first plane. By means of the two planes which are parallel to one another and which are disposed at a distance from one another, the entire opening device with the opening flap (and in the final condition with the gripping strip) is in the region between the two planes so that the top of the ready and filled pack has an upper plane surface or outer first plane. No part of the opening projects over this plane surface. The surface for tearing is formed by the inner second plane.

The opening flap which in plan view is elongate is advantageous because when the opened pack is tilted the jet of fluid of the contents first begins to flow on the side with the point, whilst in the central region which comes to lie at the top when the pack is tilted, it is possible for the air required after the contents are poured out of the pack to flow into the pack from outside. By disposing the point of the opening flap on the periphery of the top, this also ensures timely interruption of the pouring jet which must not flow over a part of the top.

The hinge between the wall of the top and the opening flap is expediently long and flexible, so that the opening and closing procedures are facilitated for the end user. Furthermore, during the injection moulding procedure, the channel of the hinge in the injection moulding tool acts as a flow channel for the fluid plastic material from one volume to the other. The greater the number of flow channels of this kind present, which, for example, span the narrow tear-off edge at the edge of the collar of the opening flap, the faster and better the injection moulding process.

It is also expedient according to the invention if adjacent to the pointed end of the opening flap the periphery of the top has a radially projecting projection, at the level of the inner second plane, forming a pointed pouring spout. The aforesaid interruption of the flowing jet is considerably favoured by this projection which radially projects outwardly from the periphery of the top at one point. It is known that a flowing jet leaves a pointed end or a projection with considerably greater ease than a straight or only slightly curved edge. The periphery of the top has only a slightly curved edge so that at the one point a pointed projection considerably improves flow; the tools and measures for this improvement are very simple and therefore particularly favourable.

If, in accordance with another advantageous embodiment of the top, the collar of the opening flap, which partially projects inwardly from the weakening line of the second inner plane, is of a conical configuration at its outer periphery, then the resulting shape of this collar is that of an insertion cone. After the opening flap has been lifted up, and the pouring process has ended, in order to close the pack again the opening flap can very easily be

introduced by using this insertion cone into the opening which has resulted from this tearing open operation, and it can be secured there by a snapping shut operation.

It is also very advantageous according to the invention if the portion of the collar of the opening flap, which portion stands up outwardly from the weakening line of the second inner plane, is of a conical configuration, and is of a degree which increases outwardly and upwardly towards the flat wall of the opening flap, and if an undercut configuration is disposed between the flat wall of the opening flap and the upper end of the externally conical collar. These features serve to close the pack again expediently. The former collar of the opening flap, which collar is of conical configuration and projecting outwardly, offers a small resistance during closure, and this resistance is advantageous for the snapping effect, and for the pack to be fastened well during closure. This takes effect particularly due to the latterly described undercutting between the flat wall of the opening flap and the upper end of the outer conical collar. The endless tear-off edge of the opening is actually snapped into this under-cut section after this conical outer collar has been surmounted, and is held there.

Closure is also favoured if according to the invention the wall of the opening flap is provided radially outwardly with a projecting edge, forming a closure support. Opening devices are particularly expedient if the end user does not need to read any instructions or think about how to use them. With the opening device according to the invention the end user holds the gripping strip and pulls it. By means of the pointed configuration of the opening flap on one side, the pulling forces there are introduced with particular force, so that the tip begins to tear and with further force continues to tear to the centre i.e. to the oppositely disposed end of the opening flap. After opening and pouring, the user can then introduce the opening flap by means of the afore-mentioned insertion cone back into the hole, and use the snapping shut effect such that he presses the flat upper wall of the opening flap into the opening without any special attention being paid to it. By means of the projecting edge, a closure support is formed which is practically disposed along the entire periphery of the opening flap, so that the user can push his finger on the opening flap to snap it shut in any way, until the pack is closed again as desired by means of it audibly snapping shut.

The process for the production of the top, as described in the introduction, is characterised according to the invention in that after the injection moulding operation the moulded article is removed early from the mould in such a way that the plastic material is still in the thermoplastic condition, that the top is held on the mould portion and the gripping strip which projects vertically from the main plane of the top is bent over through about 90° , and hardens in that position. We are dealing here with different kinds of simple tools and a simple production process. If only two outer moulded parts are used for injection moulding the top according to the invention, the gripping strip is expediently injected in a plane which is vertical to the main plane of the top, in which plane the gripping strip then however projects to a considerable extent from the outside contour, i.e. from the outer upper plane of the pack; this form is undesirable as far as transportation is concerned. However, if a gripping strip is injected in the bent-over position, additional pushers are needed in the injection mould whereby this makes for complications which is disadvantageous.

Now, if the process according to the invention is used, such that the gripping strip is actually in vertical position vertical to the outer first plane, then it is removed from the mould very early when the plastics material is viscous, and the free moulded article can then be formed by a pressing device. A pressing device which is designed or activated in some way or other, according to the invention, places the gripping strip at approximately 90° in the space between the two afore-mentioned planes of the top, wherein a corresponding pressure is only to be exerted on the base of the gripping strip. If the pressing is done quickly enough after the article has been removed from the mould and before the plastics material stabilises or hardens, it is very easy to reliably ensure that the outer contour is as desired.

According to the invention, there is also provided an apparatus for the production of the top of the kind mentioned in the introduction, wherein with the apparatus the top can be injected on to a portion of flexible material in web form, with a core and a two-part outer mould portion, the two mould parts of which are pivotable about an axis of rotation. In the introduction, reference was already made to the known embodiment of a

device of this kind, wherein the advantages sought by the invention are only obtained if according to the invention the mould parts have only one common separation plane in which the mould for the gripping strip is formed.

The plane of each mould part which comes into contact with the plane of the oppositely disposed outer mould part thus forms the separation plane which between them form the space for the gripping strip. If, by using a particularly simple tool of this kind the gripping strip then projects vertically from the main plane of the top, this drawback can still be compensated for by the afore-mentioned procedure for bending the gripping strip in the thermoplastic condition. A particularly simple tool can then be used, and the aims of the invention are therefore obtained.

According to a further advantageous embodiment of the invention, a separately arranged and synchronously controlled pressure piston for bending over the still partially plastic gripping strip inwardly of the outside contour within the first outer surface is provided in the operating direction downstream of the overall injection unit. The pressing can be done by using any device, and if necessary, even by hand, but it is expedient if a pressure piston is disposed separately from the injection station and entire injection unit and synchronously controlled. A piston can, for example, activate the pressure piston pneumatically, so that the pressing operation can be carried out using very simple means.

The snapping shut operation of the pack, described in connection with the closure operation, is, in addition to the undercutting feature and the closure support also advantageous because along the weakening line a zig-zag tear edge is formed after the pack has been opened. The zig-zag configuration is a result of tearing by partly extending the plastics material in the region of the weakening line, so that to complete the effect of undercutting, there is also a partial reduction to the opening itself with respect to the opening flap and the collar thereof. Thereby, closure is advantageously more secure and the pack is not only sealed against dust but also partly to liquid seeping out, if it is possible to speak of liquid tight properties after the pack has been closed again.

It is also interesting with respect to the process and apparatus for producing the top according to the invention, to consider that the gripping strip can merely be moulded using residual heat. The gripping strip is able to be formed so as to be very flat using both outer mould parts, and if necessary can comprise one pull ring, and to form this there is no need for an additional, particularly high supply of heat energy. Thereby, the moulded article can be removed from the mould more quickly, and the capacity of the entire machine is increased.

Further advantages, features and possible applications of the present invention can be seen from the following description of preferred embodiments, given with the aid of the drawings, where:

- Figure 1 shows a sectional view through the top directly after the article has been removed from the mould, without the tool with the projecting gripping strip,
- Figure 2 shows a plan view of the top shown in Figure 1, partly broken away,
- Figure 3 shows a sectional view along the line III-III in Figure 2,
- Figure 4 shows an enlargement of the section IV in Figure 3,
- Figure 5 shows a similar section to that in Figure 4, but after opening and closing,
- Figure 6 shows a part illustration of the pressure piston of the production apparatus with drive mechanism before the bending operation,
- Figure 7 shows the same illustration, but broken away further, during the bending over operation, and
- Figure 8 shows the pressure piston of the production apparatus in the position shown in Figure 6, but after the handle has been bent.

Figures 6 to 8 show the tube 1 in the form of a cylindrical casing, of the side walls of the liquid pack, not shown, to one circular end of which tube, the top generally labelled 2 is injection moulded as a flat end wall of the liquid pack. Figures 1 to 3 show different views of this top without the pack and without the tool. The wall 3 of the pack is disposed both in an outer first plane 4 and in an inner second plane 5, wherein the junction between these is made by inclined surfaces 6. The pouring opening, generally labelled 7, comprises an opening flap 9 disposed on a hinge 8, which opening flap 9 is joined to the wall 3 of the top disposed in the inner second plane 5 by means of an endless weakening line 10. Figures 1 to 3 and Figure 6 show an illustration of a gripping strip 11 in the injecting position, in which the gripping strip 11 is disposed so that it is vertical to the parallel planes 4 and 5. Figures 7 and 8 show the gripping strip 11 when it has been bent through approximately 90° , in which position the gripping strip is disposed within the outer contour of the pack i.e. within the outer first plane 4. The gripping strip is formed from loop traction eyes, and connecting eyes 12 which also serve as flow channels or injection moulding channels during the injection moulding process, and filling membranes 13 and openings for engagement 14.

The foot of the gripping strip 11 is formed on the flat wall 15 of the opening flap 9, wherein an edge 16 projects outwardly to form a closure support.

The opening flap 9 is long, wherein the long side is shown in Figures 1 and 2 and the narrow side is shown in Figure 3 in a view which is transverse to the view of the long side. A collar 17 projects below the flat wall 15 of the opening flap 9, which collar 17 has an upper section 17' which increases in extent outwardly from the second inner plane 5 up to the flat wall 15 of the opening flap 9, and which is of conical configuration like the lower section 17" which extends below the inner second plane 5 further inwards to the inside of the closed pack in conical configuration. Between the upper part 17' and the lower part 17" of the collar 17 there is disposed the weakening line 10, as can clearly be seen in Figure 4. Between the flat wall 15 of the opening flap 9 and the upper end 18 of the outer conical collar 17 there is disposed an undercut section 19.

Figure 5 shows how the wall 3 of the top is snapped into this undercut section 19, and is held in this engaged position by the outwardly projecting cone of the upper section 17' of the collar 17.

The top 2 has outwardly on the periphery thereof a shoulder 20 which receives the free cut edge of the tube 1 and engages over it such that the plastics material of the top 2 comes into contact at least in the peripheral region with both oppositely disposed outer sides coated with plastics material of the coated tube material, and so it is secured in this region on both the outer layers. The conical shape shown as 21 of the edge of the top makes removal from the mould easier.

From Figures 1 and 3 it can clearly be seen that the distance a between the first outer plane 4 and the second inner plane 5 is greater than the height H of the upper section 17' of the collar 17 of the opening flap 9 which upper section projects outwardly from the weakening line 10 on the opening flap 9.

Figure 2 clearly shows that the outer first plane 4 surrounds the inclined surfaces 6 and the opening flap 9 in a U-shape, wherein the two free portions of the U are disposed to the right in Figure 2. The point of the opening flap 9 is also disposed there, to which the loop traction eye 12 is attached, and during opening, the tear begins along the tear edges 22.

Figure 2 shows the radially projecting projection 23 in the region of the circumference of the top and in the height of the inner second plane 5 (see also Figure 1, right), which projection acts as a pointed pouring spout.

Reinforcing ribs 24 which do not form basic parts of the invention are illustrated in various places.

With respect to the apparatus for producing a top according to Figures 1 to 5, reference is made to the document already cited, DE-OS 32 07 701, and there in particular to Figure 4. A mandrel wheel is rotated about an axis, of which mandrel wheel the mandrel disposed in the upper position is arranged in the entire injection moulding unit. In this position, above two arms which move about the afore-mentioned parallel

and horizontally disposed axes, there are provided the outer mould parts which embrace the upper free end of the mandrel. In order to remove the article from the mould, the two protective arms rotate outwardly about the axes, whereby the path of rotation is released for the mandrel to move. As soon as the mandrel wheel has rotated further by a specific angular distance, the top 2 which has been removed from the mould attains the position shown in Figures 6 to 8. A pressure cylinder 27 with pressure piston 28 is secured to the frame part 25 by means of a holder 26, which frame part 25 is shown in a broken-off illustration in Figures 6 to 8, and the piston is driven by hydraulic or pneumatic circuits 29. A guide rod 30 is responsible for guiding the pressure piston 28 exactly in the direction of the axis 31 shown by broken lines. In Figures 6 to 8 it is also possible to see the contoured surface 32 of the pressure piston 28 which allows there to be an oblique surface for the flat installation of the opening flap 9 on the flat wall 15. Furthermore, the outer, and correspondingly oblique, surface 32 of the pressure piston 28 is provided with a stage in which the gripping strip 11 can be disposed for the bending over operation, and is disposed in the bent position, as shown in Figure 7.

Figure 6 illustrates the starting position when the top 2 and also the gripping strip 11 have just been removed from the mould, and when the plastics material is still viscous. By loading the pressure cylinder 27 through a supply line 29, the pressure piston 28 is brought out of the position shown in Figure 7, and it thereby pushes the gripping strip 11 through about 90° inside the outer contour of the pack. When the pressure piston 28 is withdrawn again, so that it reaches the position in Figure 8, the gripping strip 11 remains in the bent condition so that the desired plane surface of the pack is obtained in the outer first plane 4.

CLAIMS

1. A substantially flat end wall, which forms the top of a liquid pack and which comprises thermoplastic material, with a pouring means which is arranged within the outside contour of the pack and comprises an opening flap (9) with collar (17), for closing a pouring opening (7), and a handle (11) secured to the opening flap (9), and with a shoulder (20) which is displaced with respect to the outer surface (4) of the wall (3) of the top and which is arranged at the periphery of the top, for mounting to a side wall (1) of the pack, wherein the opening flap (9) is connected to the wall (3) of the top by way of an endless weakening line (10) which extends in a second inner plane (5) and at a spacing (a) from and parallel to the surface (4) of the wall (3) of the top and the spacing (a) between the two planes (4, 5) is greater than or equal to the height (H) of the collar (17) of the opening flap (9), which collar projects outwardly out of the weakening line (10) at the opening flap (9), characterised in that the opening flap (9) is mounted to the wall (3) of the top by way of a hinge (8) and that the junction between the outer surface (4) and the inner second plane (5) is provided by inclined surfaces (6), preferably two oppositely disposed flat inclined surfaces (6).

2. A top according to claim 1 characterised in that in plan view the outer surface (4), surrounding the inclined surfaces (6) and the opening flap (9) in a U-shape, is provided in such a way that the pointed outlet end of the opening flap is disposed at the periphery of the top and between the free ends of the U (Figure 2).

3. A top according to claim 1 or claim 2 characterised in that in plan view the opening flap (9) is of an elongate configuration and extends from the periphery of the top approximately to the centre thereof, wherein preferably the hinge (8) of the opening flap (9) is disposed approximately in the outer surface (4).



4. A top according to one of claims 1 to 3 characterised in that beside the pointed end (at 16) of the opening flap (9) the periphery of the top (2) has a radially projecting projection (23), at the level of the inner second plane (5), forming a pointed pouring spout.

5. A top according to one of claims 1 to 4 characterised in that the collar (17") of the opening flap (9), which partially projects inwardly from the weakening line (10) of the second inner plane (5), is of a conical configuration at its outer periphery.

6. A top according to one of claims 1 to 5 characterised in that the portion (17') of the collar (17) of the opening flap (9), which portion stands up outwardly from the weakening line (10) of the second inner plane (5), is of a conical configuration, of a degree which increases outwardly and upwardly towards the flat wall (15) of the opening flap (9), and that an undercut configuration (19) is disposed between the flat wall (15) of the opening flap (9) and the upper end (18) of the externally conical collar (17).

7. A top according to one of claims 1 to 6 characterised in that the wall (15) of the opening flap (9) is provided radially outwardly with a projecting edge (16), forming a closure support.

8. A process for the production of the top according to claim 1 by injection moulding wherein after the injection moulding operation the moulded article is removed early from the mould in such a way that the plastics material is still in the thermoplastic condition characterised in that the top (2) is held on the mould portion and the gripping strip (11) which stands up vertically out of the main plane of the top is laid over through about 90°, preferably by applying pressure to the base of the gripping strip (11), and hardens in that position, whereupon the top is also removed from the mould.



9. Apparatus for the production of the top according to claim 1 wherein with the apparatus the top (2) can be injected on to a portion of flexible material in web form, with a core and a two-part outer mould portion, the two mould parts of which are pivotable about an axis of rotation, characterised in that the mould parts have only one common separation plane in which the mould for the gripping strip (11) is formed, and that a separately arranged and synchronously controlled pressure piston (28) for bending over the still partially plastic gripping strip (11) inwardly of the outside contour within the outer surface (4) is provided in the operating direction downstream of the overall injection unit.