

TUBE DISPENSER

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This invention relates to tube dispensers for dispensing a variety of personal care and food products. More particularly this invention relates to a tube dispenser which is deformable, has at least one view window and which preferably has a nozzle spout.

Tube dispensers are usually made from an opaque flat laminate sheet or an opaque extruded tubing. The product is dispensed from a spout opening on the shoulder of the tube. Also, there is no view window to determine how much of the contents remain in the tube. This is not a problem with collapsible tubes. Such tubes when compressed retain the compressed shape and provide a clear indication of the amount of product remaining in the tube. However with deformable tubes, which are tubes that regain their original shape after being compressed, it is difficult to determine the contents remaining in a tube after the tube has been through a number of dispensing cycles. A view window on the tube provides a way to know the level of product remaining in the tube.

Tube dispensers also do not have extended nozzles at the exit of the tube portion. A nozzle is an extension which serves to deliver the product a distance above the sidewall and shoulder of the tube. This provides for greater precision in delivering the product from the tube. It also provides for control of the suckback of the product that is being dispensed after pressure is released on the tube and the tube regains its shape. It is desired that the product be

1 sucked back into the nozzle so that it does not cake
2 around the exit opening. This provides for fresher
3 product and a cleaner appearance. A nozzle of
4 particular dimensions is needed for the control of
5 suckback which is caused by the tube regaining its
6 original shape after having been compressed in order to
7 deliver a product.

8 Dispensing tubes, such as dentifrice tubes are for
9 the most part of a laminate construction. The laminate
10 tubes replaced aluminum tubes. Laminate tubes consist
11 of about three or more layers. There is usually an
12 aluminum foil layer with a polymer layer on each side.
13 There can be adhesive layers to bond the polymer layers
14 to the foil. The polymer layers are typically
15 polyethylene layers. There can also be a paper layer
16 which will carry the product information. These
17 laminate tubes are made by forming the laminate sheet
18 into a tube, forming a longitudinal seal where the
19 sheet overlaps and bonding a shoulder - spout to the
20 tube that has been formed. The tube is filled from the
21 bottom and crimp sealed. Laminate tubes have been
22 popular since they emulate the older aluminum tube in
23 that they remain deformed after being compressed to
24 dispense a product.

25 Extruded tubes have also been used for various
26 personal care and food products. These tubes are
27 formed by extruding the tube portion and bonding the
28 tube portion to the shoulder - spout. The tube is then
29 filled from the bottom and the bottom sealed by a heat
30 crimp seal. Extruded tubes differ from laminate tubes
31 in that the extruded tube will regain its shape after
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1 being compressed. This is the case since it will not
2 have a foil layer, which although functioning primarily
3 as barrier, also has the property of staying deformed.

4 The need for a view window on a tube is with tubes
5 that do not stay deformed. It is difficult to
6 determine the remaining contents of these tubes. View
7 windows are used in plastic bottles such as those that
8 contain motor oil. This permits a person to see the
9 oil remaining in the bottle since the full contents of
10 the bottle will not be used at once. However, view
11 windows have not been used with tubes, and in
12 particular with regard to dentifrice tubes. In
13 addition dentifrice tubes have not had nozzles to
14 deliver the product a distance from the tubular portion
15 of the tube and to control suckback.

16 The prior art with regard to transparent
17 dentifrice tubes is exemplified by U.S. Patent 493,616,
18 and U.S. Patent 4,376,762. In U.S. Patent 493,616 the
19 tube is made of cellulosic materials and will regain
20 its original shape after the compressing force on the
21 tube is released. The contents of this tube are fully
22 in view. In U.S. Patent 4,376,762 there is shown a
23 transparent tube which displays a dentifrice containing
24 speckles. Since these tubes are fully transparent, or
25 translucent, it is difficult to provide areas for print
26 information. A view window with most of the tube
27 opaque is a more useful tube.

28 U.S. Patent 3,356,263 discloses a tube having a
29 separate tube section and a separate shoulder and spout
30 portion. These are joined by heat sealing. The tube
31 portion is made by extrusion. U.S. Patent 4,011,968
32 discloses the general structure of a collapsible tube.

This has a laminate multi-layer tube portion and a separate, molded shoulder and spout portion. These are joined by heat sealing. U.S. Patent 4,526,823 discloses the structure of a three layer tube. The three layer structure consists of three plastic layers, each with particular barrier properties. The center layer is disclosed to be an effective oxygen barrier. There is also disclosed the use of adhesive layers to bond the plastic layers.

The prior art with regard to the use of a nozzle on a dispenser is exemplified by U.S. Patent 4,842,165. In this patent there is disclosed a nozzle and a pump dispenser. This pump dispenser has a dentifrice or other product contained in a sack. When the outer wall of the unit is compressed the air contained between the wall and the sack is compressed and the product dispensed. There is a nozzle at the tope of the dispenser. A valve mechanism in the shoulder region controls the flow of product and the suckback of product. There is no view window in this dispenser.

According to the present invention a tube dispenser comprises a tube portion having a view window extending along the tube portion, a conical shoulder on one end of the said tube portion and the other end of the said tube portion being closed, the said shoulder having a nozzle which extends away from the said tube portion and having an aperture to deliver substances being dispensed from the said tube, the ratio of the height of the said nozzle to the diameter of the said aperture being from 1:1 to 10:1, the tube portion having a multilayer structure with memory such that when the tube portion is compressed to deliver a product the tube portion regains its original shape upon the release of compression on the tube portion, the said multilayer structure being comprised of an inner moisture barrier layer having a thickness of 75

microns to 200 microns, an organic barrier layer having a thickness of 15 to 40 microns and an outer protective layer having a thickness of 200 to 400 microns, the said outer protective layer being a polyethylene layer of low density polyethylene having a high density polyethylene content of up to 50 percent by weight.

The said organic barrier layer is preferably ethylene vinyl alcohol.

The said moisture barrier layer is preferably a layer of low density polyethylene.

The moisture barrier layer preferably has a thickness of 100 to 150 microns. The said protective layer preferably has a thickness of 250 to 325 microns.

Between each layer there is preferably a layer of an adhesive having a thickness of 5 to 25 microns.

The multi-layer structure of the said tube portion preferably creates a suckback sufficient to draw a toothpaste product in the nozzle opening inwardly at least about 0.6 cm.

The high density polyethylene content of the said protective layer is preferably up to about 25 percent by weight.

The said nozzle preferably extends 1 cm to 2.5 cm above the tube portion shoulder.

The said tube portion is preferably crimp sealed at the bottom other end thereof.

The said view window preferably has a width of about 0.2 to 2 cm.

The nozzle is of a length (A) and a maximum transverse dimension (B) at the outlet to the nozzle, the ratio of A/B preferably being at least 1:1, or at least 2.5:1, preferably at least 3:1, more preferably at least 4:1, e.g. in the range 1:1 to 9:1 or preferably 2.5:1 to 4:1.

The length (A) of nozzle is the distance from the

outlet of the nozzle to where the nozzle meets the shoulder of the outlet portion, i.e. the distance (A) shown on Figures 4, 8 and 10.

5 The invention may be put into practice in various ways and a number of specific embodiments will be described by way of example to illustrate the invention with reference to the accompanying drawings in which:

10 FIGURE 1 is a front elevational view of a first embodiment of tube dispenser in accordance with the invention having a continuous bottom,

FIGURE 2 is a side elevational view of the tube dispenser of FIGURE 1 showing the view window,

FIGURE 3 is a sectional view of the tube of FIGURE 1 showing a multilayer structure,

15 FIGURE 4 is an exploded view of the tube dispenser of FIGURE 1 showing the dispensing fitment and cap,

1 FIGURE 5 is an exploded view of a second
2 embodiment of the tube dispenser in accordance with the
3 invention which has a crimp sealed bottom,

4 FIGURE 6 is top plan view of the tube of FIGURE 5,

5 FIGURE 7 is a bottom plan view of the tube of
6 FIGURE 5,

7 FIGURE 8 is a front or rear view of a modified
8 form of the tube of FIGURE 5 showing the view window in
9 the front or rear wall,

10 FIGURE 9 is a side view of the tube of FIGURE 5
11 with the view window in the sidewall, and

12 FIGURE 10 is an exploded view of the components of
13 an extruded tube.

14 The tubes of the present invention are preferably
15 made by blow molding. In this way the nozzle, shoulder
16 and walls can be formed in a single operation. This
17 would be the case even when the tube is to have an open
18 bottom end and is to be filled through the open bottom
19 end. Although the tube can be blown in a single piece,
20 including the bottom, this is not feasible when the
21 tube is to be used for a paste-like substance such as a
22 dentifrice. It would not be feasible to fill a tube
23 through the small nozzle opening. The filling time
24 would be prohibitively long. Thus in blow molding the
25 tubes would be blown without either the upper nozzle
26 portion or without the permanent lower bottom portion
27 depending on whether they are to be bottom or top
28 filled. When blow molded without the nozzle portion
29 the tube would be filled from the top and a nozzle
30 fitment attached. When blow molded without the
31 permanent bottom portion the tube will be filled from
32 the bottom and crimp sealed.

1 The tubes can also be formed by extrusion. When
2 formed by extrusion the tube will be extruded in a
3 continuous length and cut into sections of the desired
4 length. The shoulder - nozzle portions will be
5 separately formed by injection molding or an equivalent
6 technique. Then in a separate step the shoulder is
7 heat sealed to the tube. The tube is open at the
8 bottom and is thus bottom filled. After filling the
9 bottom is sealed by a crimp heat seal.

10 In the use of either blow molding or extrusion the
11 tubes are provided with at least one view window and a
12 nozzle. The view window is a translucent or clear or
13 substantially clear transparent stripe longitudinally
14 along the tube wall. This can be along any wall of the
15 tube. It need only be of a clarity, width and length
16 so that the amount of contents remaining in a tube can
17 be determined. In most instances the tube will be
18 opaque with a narrow view window. The tube will
19 usually be opaque since it is easier to put printed
20 instructions and decorations onto an opaque surface.
21 The view window desirably will be from about 0.20 to
22 2.0 centimeters in width. Preferably the view window
23 is about 0.35 to 1 cm in width. It will usually be of
24 the same material as the opaque portion, but with the
25 opacifying substances deleted from the formulation.
26 Whether the tube is made by blow molding or extrusion
27 the view window is formed at the same time as the
28 remainder of the tube wall.

29 As has been discussed the nozzle will be
30 separately formed when the tube is to be formed by
31 extrusion. When the tube is to be blow molded the
32 nozzle will be formed along with the tube walls for a

1 bottom filled unit and produced as a separate fitment
2 for a top filled unit. In any case the nozzle
3 desirably will extend about 1 to 2.5 cm above the
4 shoulder and desirably have a dispensing opening of
5 about 0.25 to 1 cm diameter. The nozzle exterior
6 surface will preferably carry threads for the
7 attachment of a cap. The preferred cap is one that has
8 a diameter such that the tube can stand upright on the
9 cap, e.g. approximating that of the tube.

10 Figure 1 shows the blow molded tube 10 which has a
11 front side 11, continuous bottom portion 13 and cap 12.
12 The junction between the cap and body is shown at 14.
13 This tube is continuous through its body portion
14 including lower portion 13. There are no crimp, heat
15 or adhesive seals at 13. The tube is to be filled from
16 the top opening. The nozzle was not formed in the blow
17 molding process.

18 Figure 2 is a side view of the tube showing side
19 15 with view window 16. The material of the tube is
20 opaque except for the view window. The view window
21 extends from the bottom of the tube to the top of the
22 tube. The view window is comprised of the same plastic
23 material as the rest of the tube.

24 Figure 3 depicts a multi-layer structure for this
25 tube. This is a cutaway of the bottom of the tube.
26 The layer 17 is a moisture barrier and the layer 18 an
27 organic barrier. The layer 19 is a combination
28 protective and print layer. The moisture barrier is
29 preferably a polyolefin, and most preferably a low
30 density polyethylene or a polypropylene. The organic
31 barrier layer will be a layer such as ethylene-vinyl
32 alcohol. The outer protective print layer is

a polyethylene layer of a low density polyethylene having a high density polyethylene content of up to 50 percent by weight. It can be the same or different from the inner layer. The layer adjacent the dentifrice preferably will be low density polyethylene and is of a thickness of 75 to 200 microns (micrometers), preferably about 100-150 microns (micrometers), and most preferably about 125 microns (micrometers). The next layer will be the ethylene-vinyl alcohol organic barrier layer. This will be in a thickness of 15 to 40 microns (micrometers), and preferably about 25 microns (micrometers). The outer layer will preferably also be a low density polyethylene layer and has a thickness of 200 to 400 microns (micrometers), preferably about 250 to 325 microns (micrometers) and most preferably about 280 microns (micrometers). Between each layer there can be an adhesive having a thickness of about 5 to 25 microns (micrometers), and preferably about 10 to 15 microns (micrometers). Suitable adhesives are ethylene - acrylic acid copolymers and ethylene - vinyl acetate copolymers.

The polymer layers besides providing the moisture barrier and the organic barrier also provide the structural properties of the tube. The tube wall should rapidly return to its original shape when the compressing pressure is released. Also the tube wall should not show any permanent creases or deflections. The tube wall must be flexible and have a memory so as to return its original shape. Thus the plastic components of the tube wall must be able to provide this memory. Low density polyethylene and polypropylene exhibit this property. High density polyethylene does not have a sufficient memory to be

1 used as one of the layers. It can result in permanent
2 creases and permanent deflections. However, it can be
3 used in combination with low density polyethylene in an
4 amount of about up to 50 percent by weight, and
5 preferably up to about 25 percent by weight.

6 The memory of the tube sidewall must be sufficient
7 to produce an essentially simultaneous suckback of
8 product at the nozzle exit, i.e. as the pressure on the
9 tube is released the contents are sucked back down the
10 nozzle. The suckback should be at least about 0.3 cm
11 and preferably at least about 0.6 cm down into the
12 nozzle.

13 Figure 4 is an exploded view of the full tube
14 dispenser. This has the tube portion 10, a fitment 20
15 and a cap 12. The cap has grip roughening grooves
16 12(a). The fitment consists of a spout 21 which has a
17 lower attachment region 22. The tube is shown having
18 an opening 23. The lip 24 of the tube interacts with a
19 groove in the fitment to keep the fitment secured to
20 the tube. Threads 25 on the fitment cooperate with
21 threads in the cap to keep the cap on the fitment. The
22 cap is of a size so that the tube can be inverted and
23 can then be supported on the cap.

24 Figure 5 shows an embodiment of the tube where the
25 tube 30, the shoulder 31 and the nozzle 32 are blow
26 molded as a single piece. The bottom is open when
27 molded or comprised of flashing that is cut off to open
28 the bottom end. The view window 33 extends up the
29 side, across the shoulder and in a narrow band up the
30 nozzle 32. The nozzle has an opening 35 and threads 37
31 for holding the cap 36 on the tube. The cap has
32 gripping serrations 36 (a). The cap is essentially the

1 same diameter as the tube. In this way the tube can
2 stand on the cap when inverted. The bottom of the tube
3 is crimp heat sealed at 34 after the tube has been
4 filled from the bottom. The front surface is
5 designated as 38. Figure 6 shows a top plan view of
6 the tube without the cap. A bottom plan view is shown
7 in Figure 7. The rear surface of the tube is
8 designated as 39. In Figure 8 there is shown the
9 embodiment of the tube having the view window 33 in the
10 front wall 38. In Figure 9 the view window 33 is shown
11 as being on a sidewall.

12 As can be seen from Figures 6, 8 and 9, the nozzle
13 32 has a length (A) of 1.8 cms and an internal diameter
14 (B) (see Figure 6) of 0.7 cms; thus the ratio A/B is
15 2.6:1.

16 In Figure 10 there is shown a tube that has been
17 made by extrusion. In this instance the tube wall 40
18 has been continuously extruded and severed. The
19 shoulder 41 and nozzle 42 are separately produced by
20 injection molding. This shoulder and nozzle are heat
21 sealed to the extruded tube body 40, filled with a
22 product such as a dentifrice, and then crimp heat
23 sealed at the bottom edge. The cap 43 has serrations
24 44.

25 In another embodiment the dispenser may be made in
26 two parts, the body portion and the outlet portion
27 separately as described above, or the outlet portion
28 integrally with some of the body portion as one part
29 which will be provided with a view window and the
30 remainder of the body portion as the other part which
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1 need not contain a view window. The two parts can be
2 subsequently joined together. The dispenser can then
3 be filled from the bottom, which is then closed.

4 In all embodiments where the tube is filled from
5 the bottom it is filled with the cap in place. The cap
6 keeps product from escaping from the nozzle during
7 filling. When filled from the top the tube is filled
8 and then the nozzle fitment put into place. The tubes
9 are then placed in cartons for shipping.

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CLAIMS

5 1. A tube dispenser comprising a tube portion having a
view window extending along the tube portion, a conical
shoulder on one end of the said tube portion and the
other end of the said tube portion being closed, the said
10 shoulder having a nozzle which extends away from the said
tube portion and having an aperture to deliver substances
being dispensed from the said tube, the ratio of the
height of the said nozzle to the diameter of the said
aperture being from 1:1 to 10:1, the tube portion having
15 a multilayer structure with memory such that when the
tube portion is compressed to deliver a product the tube
portion regains its original shape upon the release of
compression on the tube portion, the said multilayer
structure being comprised of an inner moisture barrier
20 layer having a thickness of 75 microns to 200 microns, an
organic barrier layer having a thickness of 15 to 40
microns and an outer protective layer having a thickness
of 200 to 400 microns, the said outer protective layer
being a polyethylene layer of a low density polyethylene
25 having a high density polyethylene content of up to 50
percent by weight.

2. A tube dispenser as claimed in claim 1 wherein the
said organic barrier layer is ethylene vinyl alcohol.

30 3. A tube dispenser as claimed in claim 1 or claim 2
wherein the said moisture barrier layer is a layer of low
density polyethylene.

35 4. A tube dispenser as claimed in claim 3 wherein the
said moisture barrier layer has a thickness of 100 to 150



microns.

5. A tube dispenser as claimed in any one of claims 1 to 4 wherein the said protective layer has a thickness of 250 to 325 microns.

6. A tube dispenser as claimed in any one of the preceding claims wherein between each layer there is a layer of an adhesive having a thickness of 5 to 25 microns.

7. A tube dispenser as claimed in any one of the preceding claims wherein the multi-layer structure of the said tube portion creates a suckback sufficient to draw a toothpaste product in the nozzle opening inwardly at least about 0.6 cm.

8. A tube dispenser as claimed in any one of the preceding claims wherein the high density polyethylene content of the said protective layer is up to about 25 percent by weight.

9. A tube dispenser as claimed in any one of the preceding claims wherein the said nozzle extends 1 cm to 2.5 cm above the tube portion shoulder.

10. A tube dispenser as claimed in any one of the preceding claims wherein the said tube portion is crimp sealed at the bottom other end thereof.

11. A tube dispenser as claimed in any one of claims 1 to 10 wherein the said view window has a width of about 0.2 to 2 cm.



* C L M S *

12. A tube dispenser as claimed in claim 1 substantially as specifically described herein with reference to Figures 1-4 or Figures 5, 6, 7, 9 and 10 or Figure 8 of the accompanying drawings.

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