

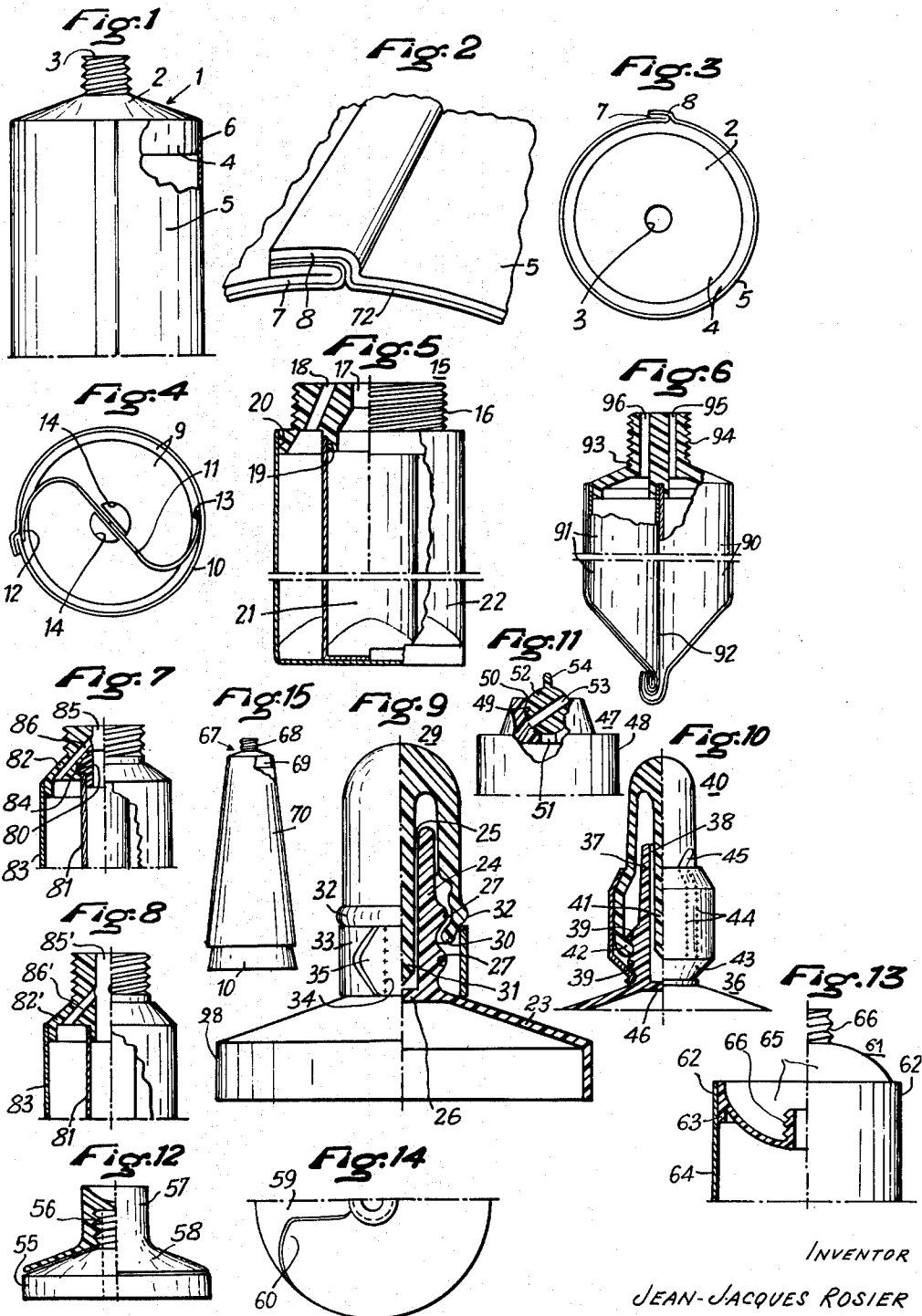
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FLEXIBLE TUBE

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FLEXIBLE TUBE

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This invention relates to a flexible tube which is emptied by squeezing, intended to receive and distribute liquids, pastes or other products.

The flexible tube forming the object of the invention comprises an end piece and a tubular element; it is characterised in that the tubular element is constituted by at least one foil which is rolled over and closed by welding along its two longitudinal edges, which are turned over on the external surface of the tubular element, and in that the end piece is fixed by moulding directly on the tube. The closure of the tubular element opposite to the end piece is executed after filling of the tube with any product by squeezing the end of said element flat and by securing the two extreme edges which are thus brought together.

Other characteristics and advantages of the invention will appear in the course of the description given hereinafter with reference to the accompanying drawing, wherein:

FIGURE 1 is a partial profile view of a form of embodiment of the invention;

FIGURE 2 is a perspective view of a portion of the wall of this same form of embodiment, showing the lateral closure of the tube;

FIGURE 3 is a view of the same form of embodiment from beneath, before closure of the lower end of the tube;

FIGURE 4 is a view of a variant from beneath, before closure of the lower end of the tube;

FIGURE 5 is a profile view in half axial section with parts cut away of another variant;

FIGURE 6 is a profile view of another variant;

FIGURE 7 is a profile view in half axial section with parts cut away of a fourth variant;

FIGURE 8 is a profile view in half axial section of a fifth variant;

FIGURES 9, 10, 11, 12 and 13 are partial profile views in half axial section of five other variants;

FIGURE 14 is a half view of an eleventh variant from above; and

FIGURE 15 is a profile view of a still different variant.

In its form of embodiment as represented in FIGURES 1, 2 and 3, a flexible tube in accordance with the invention comprises an end piece 1 with an upper portion 2 equipped with a distribution nozzle 3 and with a lower cylindrical portion 4 forming a skirt. The end piece 1 is moulded to the upper end 6 of a tubular element 5. This tubular element 5 is constituted by a single or multiple foil rolled upon itself, the two longitudinal edges 7 and 8 of which are fixed to one another preferably by their respective internal faces, then folded upon the outer face of the tube thus formed. Opposite to the end piece 1 the tubular element 5 is closed in conventional fashion, after filling, by crushing and folding upon itself of its lower end or by crushing and securing of the internal faces of the two edges brought together, by sticking or heat welding.

The advantage of the manner of manufacture by direct moulding of the end piece upon the tube 5, the end piece being for example of a thermo-plastic material, is that the longitudinal fold of the wall is completely filled by the material of the end piece, which is favourable to the seal between these two parts.

FIGURE 4 represents a variant in which an end piece 9 is fixed, when it is moulded, to the upper end of a tubular element 10, the end piece being extended on

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moulding by a flexible internal wall 11 the lateral edges 12 and 13 of which are fixed by the effect of the moulding heat to the internal surface of the tubular element 10. The wall 11 divides the internal volume of the tubular element 10 and of the end piece 9 into two parts. The lower edge of the wall 11 is imprisoned between the extreme lower edges of the tubular element 10 which are squeezed together, on the occasion of the closure of the element, opposite to the end piece 10.

Thus two separate sealed volumes are obtained which can be filled with different products intended to be mixed only at the moment of their issue through the common nozzle 14. The lateral edge 12 of the separating wall 11 is preferably fixed to the internal surface of the tubular element 10 at the level of the lateral closure line of this element, increasing the sealing and solidity of the tube.

In the variant represented in FIGURE 5, an end piece 15 comprises a threaded upper part 16 provided with a central passage 17 and a set of regularly distributed passages 18. The lower part of the end piece 15 has an internal skirt 19 and an external skirt 20. The end piece 15 is fixed at the moment of its moulding to the upper end on the one hand of an internal tubular element 21 and on the other of an external tubular element 22. The tubes 21 and 22, as previously, are obtained by the winding upon itself of a wall of single or multiple foil. Opposite the end piece the tubular elements 21 and 22 can be closed simultaneously or separately. The tubular elements 21 and 22 are intended to contain distinct products to be mixed at the time of use. The volume of each of the tubular elements is selected in such manner that the quantity of the product issuing through the passage 17 is in a specific ratio with the quantity of product issuing through the passages 18, on simultaneous squeezing of the tubes.

In FIGURE 6 there is represented a variant in which two semi-cylindrical tubes 90 and 91 are disposed side by side with their respective flat faces in contact. 92 designates the plane of contact. A common end piece 93 is moulded on the upper part of the two tubes and comprises a threading 94 and two conduits 95 and 96. Each communicates respectively with the internal volume of one of the tubes 90 and 91. The closure of the lower end of the tubes 90 and 91 is executed simultaneously by welding or folding for example. As previously, the tubes 90 and 91 contain different products to be mixed at the time of use.

In the variant represented in FIGURE 7, an end piece 80 is fixed at the time of its moulding to the upper end of a tubular element 81 and a second end piece 82 is fixed in the same manner to the upper end of a tubular element 83. The end piece 80 comprises an annular rim 84 intended to penetrate by force into a corresponding groove of the end piece 82 in order to make these two end pieces fast, in such manner that the tubular elements 81 and 83 are substantially coaxial.

The end pieces 80 and 82 have a common axial conduit 85 into which there open regularly distributed passages 86 provided in the end piece 82. As previously, the tubular elements 81 and 83 are closed independently or simultaneously, and are intended to contain distinct products to be mixed on issue by the common conduit 85, at the moment of use.

In FIGURE 8 there is represented a variant which differs from that represented in FIGURE 7 only in that one single end piece 82' is moulded on the upper end of the two coaxial tubes 81 and 83. The end piece 82' comprises an axial conduit 85' communicating with the interior of the tube 81 and a set of passages 86' communicating with the interior of the tube 83 and opening into the conduit 85'.

It will be noted that the internal tubular element can be constituted by a simple moulded extension of the end piece, the whole being fixed at the time of moulding to the external tubular element.

FIGURE 9 represents a variant of an end piece in which the latter, designated by 23, comprises an upper nozzle 24 having annular relieved portions 27 and an axial hole 25 closed at the lower end by a bottom 26. The nozzle 24 is in one single piece with the lower part of the end piece, this lower part having a cylindrical skirt 28. On the end piece 24 there is disposed a cap 29 the annular lower edge 30 of which, protruding inwards, penetrates between two of the annular relieved portions 27. The cap 29 comprises internally an axial rod 31 which is pointed at its lower end. At its lower part the cap 29 possesses an external bead 32. A ring 33 bearing upon the shoulder of the end piece 23 forms a strut between this and the bead 32. The ring 33 comprises a line 34 of reduced strength and a tear-away tongue 35. A pull exerted upon the tongue 35 causes the tearing of the ring 33 along the line 34. The ring 33 having been removed, a thrust exerted upon the cap 29 causes it to be pushed down and the lower bottom 26 of the hole 25 to be perforated by the pointed rod 31. The constituent material of the cap 29 has a relative elasticity which permits the lower edge 30 of the cap 29 to pass over the relieved portions 27 of the nozzle 24 in both directions with moderate force. The cap 29 being withdrawn, the product contained in the tube (not shown) fixed to the skirt 28 can flow through the hole 25 of the nozzle 24, the bottom 26 which formed a lid having been perforated, as mentioned above. The rod 31 prevents the obstruction of the hole 25 by product which has dried.

FIGURE 10 represents another variant of an end piece in which the latter, designated by 36, comprises an upper nozzle 37 with an axial hole 38 and annular external reliefs 39. On the nozzle 37 there is mounted a cap 40 which comprises an axial rod 41 with its lower end pointed. The cap 40 comprises a lower edge 42 protruding inwards and this edge is disposed between two relieved portions 39 of the nozzle 37. The lower part of the cap 40 is constricted into an envelope 43 which bears at the bottom on the end piece 36. The envelope 43 has two lines 44 of reduced resistance and a tear-away tongue 45. A pull exerted upon the tongue 45 causes the envelope to be torn away along the two lines 44. The envelope 43 having been removed, the lower edge 42 of the cap 40 can then pass over the relieved portions 39 of the nozzle 37, the constituent material of the cap 40 being sufficiently flexible to permit this passage by moderate force. The pushing down of the cap 40 causes the perforation of the bottom 46 of the hole 38 by the pointed rod 41. The removal of the cap 40 permits the issue of the product contained in a tube (not shown) fast with the end piece 36, through the axial hole 38 of the nozzle 37. The rod 41 prevents obstruction of the hole 38.

It will be noted that the perforation of the bottoms 26 and 46 of the holes 25 and 38 is effected by the pointed rods 31 and 41 respectively without production of debris capable of polluting the product contained in the corresponding tubes or of being carried therewith, which constitutes an important advantage in many cases, in comparison with the known device for cutting open lids.

In the variant according to FIGURE 11 there is represented an end piece 47 with which a tube 48 is made fast by its upper edge. The end piece 47 comprises a spherical cavity 49 open at the top at 50 and communicating at the bottom through a passage 51 with the interior of the tube 48. In the cavity 49 a ball 52, which is provided with a diametric channel 53 and an operating lug 54, can rotate freely. The lug 54 permits of placing the channel 53 in communication with the interior of

the tube 48 and consequently permits the product contained in this tube to issue through the channel 53. The constituent material of the body of the end piece 47 is chosen as sufficiently elastic to permit the mounting of the ball 52 in the cavity 49 by force insertion, the diameter of the opening 50 being less than that of the ball 52.

FIGURE 12 represents a variant in which an end piece 55 comprises a nozzle 56 threaded to receive a cap 57 by screwing, which cap has a lower widened portion 58 so as to cover the largest possible area of the end piece, with the aim of reducing the loss by evaporation through the walls of the end piece 55, in the case where the products are very volatile.

In the variant represented in FIGURE 14, the upper surface of an end piece 59 is covered with a film 60 of metal or other impermeable material, to prevent the losses of products capable of diffusing to the exterior through the walls of the end piece, as in the preceding case.

FIGURE 13 represents a variant in which an end piece 61 comprises an annular portion 62 prolonged beneath a skirt 63, moulded on the upper edge of a tube 64. A flexible diaphragm 65 is integral by its peripheral edge with the annular portion 62 and comprises a threaded nozzle 66 in its centre. As shown clearly by FIGURE 13, the diaphragm 65 is movable between two positions, a re-entrant position and an outwardly protruding position. The outwardly protruding position of the diaphragm 65 corresponds to the normal condition of utilisation for the distribution of the product contained in the tube 64. When the diaphragm is in the re-entrant position, the whole of the tube can be placed on the ring 62 which then forms a base, and its bulk is reduced.

In the variant represented in FIGURE 15 the tube forming the object of the invention comprises an end piece 67 provided with a nozzle 68 and fixed during its moulding to the upper end of a frusto conical element 70 obtained, as previously, by the rolling upon itself of a wall of single or multiple foil and by securing of the longitudinal edges of this wall. The variant permits of storage of the elements 70 one within the other before filling and closure, constituting another advantage of the invention.

In order to constitute the wall of the tube, it is possible to use equally well a single foil of metal or of plastic material. It is also possible to use a double foil comprising a metallic layer 5 and a layer of plastic material 72 (FIGURE 2). It is also possible to use a foil in three layers or more with alternation of metal and plastic material.

Numerous modifications could be effected in the above crushable tube, without departing from the scope of the invention, for the understanding of which variants of embodiment have been described and represented by way of non-limitative examples.

What is claimed is:

1. A crushable flexible tube comprising a tubular element constituted by a foil rolled with two longitudinally extending edges welded together along their internal surfaces and folded on the external surface of the tubular element to form a seam extending longitudinally full length of the tubular element, and a cap secured to one end of the tubular element directly by moulding, the moulded material of the cap filling and closing the seam at said one end of the tubular element.

2. Crushable flexible tube according to claim 1, characterised in that the foil of the tubular element is single and constituted by an impermeable flexible material which is chemically inert in relation to the product contained in the tube.

3. Crushable flexible tube according to claim 1, characterised in that the foil of the tubular element is double and constituted by two superimposed foils fast with one another, the internal foil being metallic and the other foil being of weldable plastic material.

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4. Crushable flexible tube according to claim 1, characterised in that the foil is multiple and constituted by superimposed foils fast with one another with alternation of metallic foils and foils of plastic material, the internal foil being of weldable plastic material.

5. Crushable flexible tube comprising two coaxial tubular elements as in claim 1 at one end of which there is fixed by moulding an end piece provided with passages communicating with the interior of each tubular element, these two tubular elements being intended each to receive a different product and being closed either separately or together opposite to the end piece.

6. Crushable flexible tube constituted by two tubular semi-cylindrical elements as in claim 1 disposed one against the other with their flat faces in contact and in that one single end piece is moulded to the upper part of these two tubes and comprises two conduits communicating respectively with the interior of the two the lower ends of which are closed together; the two tubular elements being intended to receive two different products respectively.

7. Crushable flexible tube comprising two tubular coaxial elements as in claim 1 to one end of each of which an end piece is fixed by moulding, the end piece of the interior tube being connected by a connection element to the end piece of the outer tube and each of the end pieces possessing at least one passage communicating with the interior of its respective tubular element, each tubular element being intended to receive a product different from that of the other.

8. Crushable flexible tube comprising two coaxial tubular elements as in claim 1 to the upper part of which there is fixed by moulding a single end piece comprising an axial conduit communicating with the interior of the inner tubular element and at least one passage communicating with the interior of the outer tubular element and opening into the said axial conduit; the lower ends of the two tubular elements being closed together or separately and the two tubular elements being intended to receive two different products.

9. Crushable flexible tube according to claim 1, characterised in that the cap comprises a widened portion intended to cover almost the whole of the area of the end piece, in the closure position.

10. Crushable flexible tube according to claim 1, characterised in that the end piece is lined internally or ex-

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ternally by a metallic or other film intended to ensure total impermeability to the products contained in the tube.

11. Crushable flexible tube according to claim 1, characterised in that the end piece is constituted by a relatively rigid crown and by a deformable diaphragm rendered fast at its periphery with the said crown in the bore thereof and carrying a nozzle, the deformation of the said diaphragm having two extreme limits, an outwardly protruding position permitting the ordinary utilization of the tube and a re-entrant position, with retraction of the nozzle, permitting of standing the tube upright on the said crown.

12. A tube as claimed in claim 1, said cap having an annular skirt that is disposed in and directly connected by moulding to said one end of said tubular element.

13. A tube as claimed in claim 1, said cap being constituted by an upper relatively rigid crown carrying a nozzle and a lower deformable diaphragm, the diaphragm being deformable between two positions comprising an outward position permitting the ordinary utilisation of the tube and it snozzle and a re-entrant retracted position in which said crown is disposed outermost whereby the tube may be stood upright on said crown.

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