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(54) **Dispensing and evacuating devices.**

(57) A tubular dispenser for semi-liquid or pasty material such as toothpaste comprises a flexible elastic tube 1 closed at opposite ends by a nozzle member 2 and a perforated plug 6. Within the tube 1 is a ball 5 of diameter slightly greater than the tube 1 so that it is gripped by the walls of the tube 1. The ball 5 is moved towards the nozzle 2 by manually squeezing the tube 1 adjacent the ball 5 thus expelling the tube contents 4 from the tube 1. As an alternative embodiment, in an evacuator the ball is manipulated towards the plug so that liquids can be sucked into the tube through the nozzle.

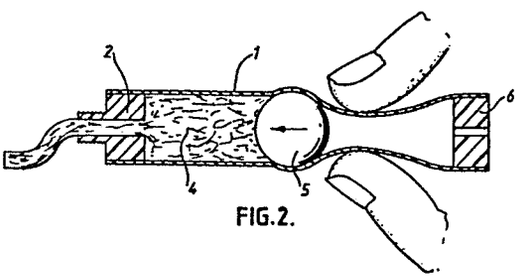

FIG.2.

EP 0 066 016 A1

DISPENSING AND EVACUATING DEVICES

This invention relates to dispensers for dispensing fluids, in particular liquid, semi-liquid or pasty materials such as toothpaste or cosmetics pastes and creams. The invention also relates to evacuating devices of the same basic form as the dispenser but in which fluids are drawn into, rather than dispensed from, the device.

This invention is based on a need for improvement in the well known collapsible tubes used for dispensing liquid, semi-liquid and pasty materials.

The problems associated with metal collapsible tubes are well known, especially the difficulty in expelling all the contents due to distortion of the metal walls, which is almost legendary in respect of toothpaste tubes. Collapsible tubes made from plastics tubes suffer from the fact that the resilience of the walls causes them to return to their original shape after manual expression of their contents. This tends either to suck back the expressed material with a risk of microbial contamination or to draw in air which may cause the contents to deteriorate. It is also difficult to assess the amount of the contents remaining in the plastics tube.

According to the present invention there is provided a dispensing device comprising a flexible elastic tube having a nozzle, which may be fixed or detachable,

at one end and containing a free piston dimensioned so that it slightly distends, and so is gripped by, the flexible tube, the flexibility of the tube being such that the piston can be moved within the tube by squeezing the tube.

This invention also provides an evacuating device having the same structure as the dispensing device.

In a dispenser the tube is squeezed or pinched adjacent the piston on its side distant from the nozzle to propel the piston towards the nozzle to expel fluid contents stored between the nozzle and the piston.

In an evacuator the tube is squeezed or pinched adjacent the piston on its side nearest the nozzle to propel the piston away from the nozzle to suck fluids into the cavity between the piston and the nozzle.

The basic structure of the dispensing and evacuating devices is the same but in practice the different applications of the two forms will result in differences of detailed structure. For example, the nozzle of the dispenser will normally be threaded for engagement with a cap. The evacuator will normally be provided with a narrower pipette-type nozzle.

In both forms the end of the tube opposite to

the nozzle is generally provided with means for preventing accidental loss of the piston, for example a peripheral flange or a closure means such a simple plug. The closure is desirably perforated to allow access of atmospheric air to prevent movement of the piston being impeded due to build-up of a vacuum between the piston and the closure.

For simplicity of production a cylindrical tube and a spherical ball as piston are preferred. The nozzle and closure may be molded in plug form to be simply inserted in the tube. Alternatively, one of the nozzle or other end closure may be formed integrally with the tube.

Illustrative embodiments of the invention are shown in the accompanying drawings in which Figure 1 shows a filled dispenser in longitudinal section, Figure 2 shows the same tube being manipulated to expell its contents, and Figure 3 shows a pipette being manipulated to suck-up a liquid.

Referring to Figure 1 of the drawings, this embodiment of the dispenser comprises a flexible cylindrical tube 1. The tube may be of flexible elastic plastics material, for example low density polyethylene or plasticized P.V.C. The material must of course be selected to be compatible with the contents of the tube. At one end of the tube 1 is a nozzle member 2 having a cap 3 over the nozzle. The tube 1 is filled with a pasty material 4 such as toothpaste

and at the end opposite to the nozzle contains a piston in the form of a ball 5 with a plug 6 preventing accidental loss of the ball from the tube. The ball 5 may for example be of plastics e.g. polystyrene, or nylon, glass or steel. It is of slightly larger diameter than the tube so that it distends the walls of the tube within their elastic recovery limits. As a result the walls of the tube grip the ball 5 to provide a peripheral seal which prevents leakage of the contents 4 past the ball. The plug 6 has a through-bore which allows air to enter the tube behind the ball, so that manipulation of the ball within the tube is not hindered by the formation of a vacuum between the ball 5 and the plug 6.

Referring to Figure 2, the cap 3 is removed and manual pressure is applied to the tube 1 by squeezing the tube adjacent the ball 5 and between the ball 5 and plug 6. This forces the ball 5 towards the nozzle member 2, so that the ball acts as a piston and expells some of the contents 4 through the nozzle. When the manual pressure is removed the ball remains in its new position still in contact with the contents, and even if the flexible tube has a resilience which returns the walls to their original position, the position of the ball can easily be seen where it is gripped by the flexible tube and this gives a visual indication of the

amount of the contents remaining in the tube. By further manipulation, substantially all the contents can be expelled, especially if the rear end of the nozzle is shaped to be complementary to the piston.

Clearly by appropriate choice of materials for the various components, the dispenser of the present invention may be used with a very wide range of liquid, semi liquid or pasty contents. Also the dimensions of the tube, piston and nozzle may be varied to suit any desired discharge amount of the contents. For difficultly accessible points of application, an extension nozzle may be provided to fit over the normal nozzle, or the nozzle member can be formed initially with an elongate nozzle. The simplicity of the component parts of the dispenser means that the components can be manufactured and assembled economically, and the dispenser can be filled with its contents without any of the complex machinery conventionally associated with collapsible tubes.

Referring to Figure 3 of the drawings an evacuator of the invention is shown as a pipette based on a flexible elastic tube 11 which may be of transparent plastics and marked with graduations. One end of the tube is closed with a tapering nozzle 12 and the other end is closed with a perforated plug 16. A ball 15 of diameter slightly larger than the tube 11 is positioned within the tube so as to slightly distend the walls of the tube, so that

the ball is gripped by the tube but is movable within the tube by manual pressure. By squeezing the tube adjacent the ball and on the nozzle side of the ball, the ball may be moved towards the plug to suck up liquid 14 into the tube when the nozzle is placed in a beaker of the liquid. The liquid may be dispensed from the tube by manipulating the ball in the opposite direction as described with respect to Figure 2.

The most important aspect of the invention is the ability to displace the tube's contents, by externally operating the ball, either positively by exerting pressure, or negatively by creating vacuum. The former is directly applicable to dispensing the contents of the tube, which in this case has a role of a container, fitted with a nozzle appropriate for the handled medium, and the intended purpose. The latter can be used for withdrawals, and would be applicable to pipettes, syringes, syphons, samplers, and generally to evacuators of all kinds.

It is possible to use standardised, modular component parts i.e. tube segments, propelling balls, bases (perforated to avoid formation of vacuum) and all sorts of nozzles, including syringes, offering tremendous advantages of flexibility, simplified production, storage, etc., In fact, by selecting materials of the component parts to meet requirements of chemical, physiological,

toxicological, and functional compatibility, as well, as using suitable dispensing fittings, the assemblies employing the system of this invention could serve equally well a variety of industries using at present collapsible tubes and at least some flexible containers.

In my development work undertaken in order to assess a variety of applications for this system I have used, successfully, apart from the conventional plastic tubes, also segments of various (with respect to material and dimensions) available elastic tubing (LDPE, rubber, plasticised PVC, PU, even closed cell foams, etc.,) fitted with a variety of balls, including ball bearings, marbles, ceramic balls, plastic balls, solid, as well as hollow ones, and finished off with a variety of nozzles, and bases.

In developing a dispenser or evacuator for a particular application, development work should be - in the first instance - directed towards finding the most "universal" container material, preferably a co-extruded laminate, which combines the necessary mechanical properties with chemical inertness of the contact surface (e.g. a suitable elastomer, or a thin layer of a closed cell foam for "cushioning" the ball) ensuring toxicological acceptance, impermeability, good slip, acceptable costs, aesthetic appearance, etc.,

The propelling balls can be solid (especially when the

dimensions are small) or hollow e.g. injection blow moulded, typically using a suitable plastic material endowed with the required physical, and chemical properties to provide thin walls, yet adequate resilience, good slip, and compatibility with the packaged medium (e.g. Polypropylene, Polyacetals, VHMW polyethylene etc.,). PTFE coating of the balls can also be conveniently employed.

Designing nozzles, and other dispensing elements, as well as bases, all of them with a good "sealing fit", is the next task.

The least involved development, requiring only an adaptation, is provided by the conventional PE collapsible tubes. Such an adaptation offers considerable advantages, both to the original user viz. a product's packager, and to the eventual consumer.

A conventional plastic tube is in many respects an inadequate container. Its production is by no means cheap, with the necessity of inside and outside lacquering, tricky marrying by spin welding of an extruded tube with a moulded shoulder, and above all, the necessity of sealing the end of tube, which is a troublesome, costly (energy, and time consuming) operation, requiring constant vigilance, and beset with a high rate of rejects, and failures in production, and after. For a consumer dispensing becomes increasingly difficult with time, the user never knows at any one time how much product there is left in the tube,

and is never able to use all its contents. The habitual "sucking-back" of the contents while dispensing is a source of annoyance, and of harmful microbial contamination. Its other disadvantage is the "fishtail" aspect of the sealed tube, which causes difficulties in packaging, and storage,

By comparison, assembly of the dispenser of the present invention requires no use of power (heating), and the existing filling machines can be easily adapted for assembly at the present heating and sealing stations. The familiar "fishtail" seal, is replaced by a "push fit" base, housing a propelling ball of a suitable size, and material. Aesthetics are improved, and storage facilitated because of the upright packing and standing. The consumer is able to avail him/herself of practically the full contents of the tube, dispensed easily, with no suck-back, by one hand operation, while leaving the other hand free to perform additional actions, like, for instance, in applying shampoo. There is also the ability to use such a container as a metering device, and there is a well defined indication of the quantity of the product still remaining in the container due to the distension of the tube by the ball.

The dispenser of the invention is equally advantageous when compared with a metal collapsible tube. Even the cheapest variety, the aluminium tube, is rapidly increasing

in price. Furthermore, aluminium, being a base metal requires internal coating to ensure compatibility with the packaged media; a costly and by no means foolproof operation. There are also other disadvantages, like the tube's vulnerability to an unsightly damage by bruising, which is no problem in a tube of a suitable laminate, fitted with a ball piston.

Some potential applications for the devices of the present invention are briefly outlined below.

FOOD INDUSTRY:

Packaging of ketchup, mustard, mayonnaise, various purees, honey, perhaps jams, sauces, relishes, etc.

COSMETICS AND TOILETRIES:

Packaging of toothpaste and shampoos has already been mentioned. Other applications are various skin creams, shaving creams, depilatories, antiperspirants, soft soaps, and many other toiletries. In the field of decorative cosmetics, in the form of viscous liquids, or pastes, using slim, long (can be coiled in packaging) highly flexible tubes fitted with suitable applicators, it is eminently easy, and convenient to apply such items like eyeliners, eyeshadows, mascaras, lip products, eyebrow cosmetics etc., using one hand for dispensing, and the other for manoeuvering the flexible tube to bring its nozzle, or applicator to the required place, and dispense accurately, and precisely, the required amount of the

product.

PHARMACEUTICAL, MEDICAL, AND VETERINARY USE

The description in the previous paragraph of the application of cosmetics, applies equally well to dispensing medical, and veterinary preparations, employing at present droppers, pipettes etc., For instance, pencil slim, long, graduated silicone rubber tubes can be sterilised, and used for dispensing in the same manner, accurately (metering), and conveniently, suitable pharmaceutical products into eyes, ears, mouth (teeth, and throat), and other body orifices, e.g. vagina, rectum etc., - permitting even self-medication.

Alternatively, with the system acting as an evacuator, they can be used for sampling, evacuation of body fluids etc., It is easy to see that in a pipette, a teat can be cheaply, and conveniently replaced by a piece of tubing containing a ball piston.

INDUSTRIAL PRODUCTS

The same applies to such industrial products as lubricants, greases, adhesives, various additives which can be dispensed accurately and conveniently into the places where they are needed, even if the latter are awkwardly placed, and the delivery can be against gravity.

CLAIMS:

1. A dispensing or evacuating device comprising a flexible, elastic tube; a nozzle closing one end of the tube; a free piston located within the tube, the piston being dimensioned so that it distends the tube and is gripped by the tube; the flexibility of the tube allowing the piston to be moved within the tube by squeezing the tube.

2. A device according to claim 1 wherein the free piston is a ball.

3. A device according to claim 1 wherein the other end of the tube is closed by a perforated plug.

4. A device according to claim 1 wherein the other end of the tube has a peripheral flange to prevent accidental loss of the piston.

5. A dispensing or evacuating device comprising a flexible elastic tube; a nozzle closing one end of the tube; a free piston located within the tube and dimensioned so that it distends the tube and is gripped by the tube and is movable manually within the tube by squeezing the tube; closure means closing the other end of the tube to prevent accidental loss of the piston.

6. A dispensing or evacuating device comprising a flexible, elastic tube; a nozzle closing one end of the tube; a perforated plug closing the other end of the tube; a ball within the tube having a diameter larger than the tube so as to distend the tube within its elastic recovery

limits; whereby the ball may be manipulated within the tube.

7. A dispenser comprising a flexible elastic tube; a nozzle closing one end of the tube; a cap sealing the nozzle; a ball within the tube having a diameter larger than the tube so as to distend the tube within its elastic recovery limits; a perforated plug closing the other end of the tube; fluid contents within the tube between the nozzle and the ball; whereby, on removal of the cap, the ball can be moved towards the nozzle by squeezing the tube adjacent the ball between the ball and the perforated plug to expell the fluid contents through the nozzle.

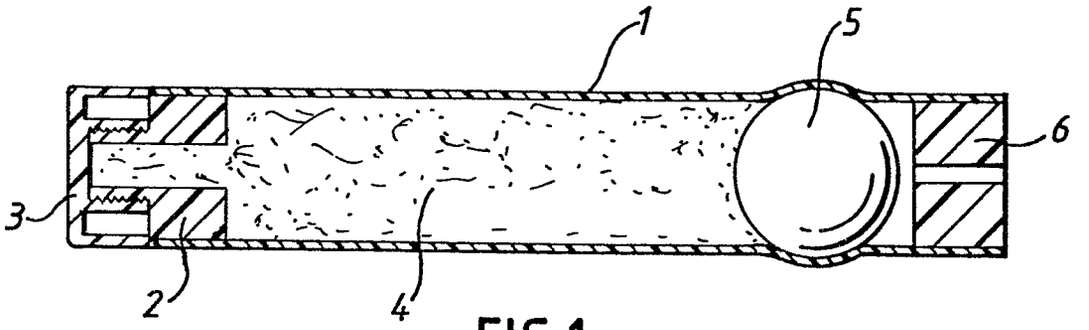

FIG.1.

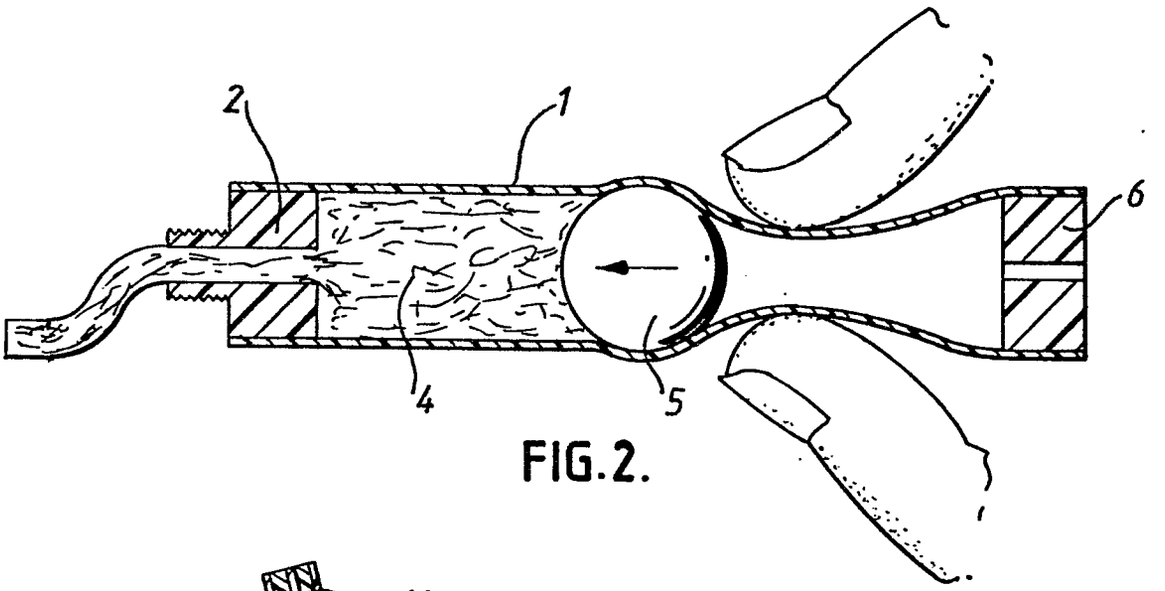

FIG.2.

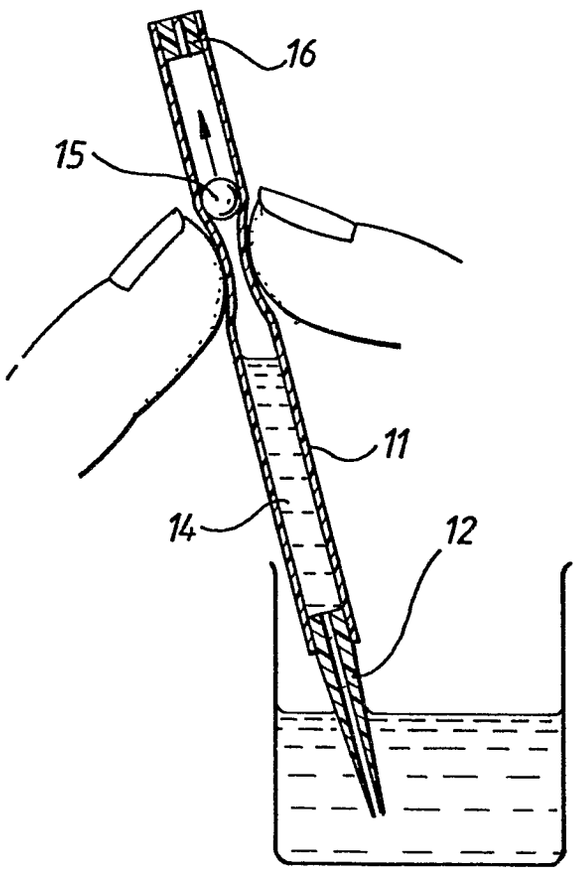

FIG.3.

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Application number

EP 81302314.0

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	US - A - 3 521 795 (LANGHJELM) * Totality * --	1-7
X	CH - A - 459 875 (CIBA) * Totality * --	1-7
	US - A - 3 698 561 (BABSON) * Fig. 2 * ----	3,6,7

CLASSIFICATION OF THE APPLICATION (Int Cl ³)

B 65 D 35/30
B 01 L 3/02

TECHNICAL FIELDS SEARCHED (Int. Cl.³)

B 65 D 35/00
B 01 L
A 45 D

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	22-10-1981	NETZER