Abstract: A tube (1) for contents such as pastes or liquids comprises a body (2), a shoulder (3), a neck (5) and an outlet (6). The shoulder (3) is made flexible such that the tube (1) can be easily squeezed by hand in the area of the shoulder (3).
Tube with flexible shoulder

Technical Field

The invention relates to a tube and to a method for producing such a tube according to the preamble of the independent claims.

Tubes of this kind are used for holding and dispensing pastes, liquids or other products, in particular pharmaceutical, dental or cosmetic products.

Background Art

Tubes are used as a way of packaging, in particular for liquids and pastes. Generally they comprise a tubular flexible body, a shoulder and a neck with an outlet.

In the present document the term "shoulder" is used to designate the portion of the tube which connects the body with the neck and should not be regarded as a part of the body. In particular the shoulder can be seen as a portion of the tube which acts as an adapter between the larger diameter of the body and the smaller diameter of the neck.

The tube body is normally, at least on the side of the outlet, substantially cylindrical. The end of the body opposite to the outlet is usually initially left open, such that the contents can be filled into the tube. After the filling, the end of the body opposite to the outlet is sealed such that it is flat. The shoulder is usually substantially conical or it has the shape of a ring. The body is flexible, such that it can be pressed for dispensing.
Known tubes have the disadvantage that emptying them completely is often difficult or even impossible. This is dissatisfactory for the user, uneconomical and environmentally questionable, since always part of the contents remain in the tube and are disposed with it.

Disclosure of the Invention

Hence, it is a general object of the invention to provide a tube which can be emptied completely in a user friendly manner.

Now, in order to implement these and still further objects of the invention, which will become more readily apparent as the description proceeds, the tube according to the invention is manifested by the feature that the shoulder is flexible.

Such a design has the advantage, that it makes it possible to remove substantially all contents from the tube, in particular the ones in the range of the shoulder, simply by compressing the tube in the range of the shoulder by hand, without applying extraordinary forces.

In an other aspect of the invention the shoulder is made substantially from a flexible material having a hardness of not more than 96 Shore A, and in particular not more than 80 or 65 Shore A.

Terms such as “upper” and “lower” in the present document are to be understood such that “upper” designates the side of the tube outlet, while “lower” designates the side which is opposite to the outlet.

Brief Description of the Drawings

The invention will be better understood and objects other than those set forth above will become ap-
parent when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings, wherein:

Fig. 1 shows a partial sectional view of an embodiment of the tube according to the invention with a flexible shoulder,

Fig. 2 shows a partial sectional view of a further embodiment of the tube according to the invention with a flexible shoulder and a flexible upper body,

Fig. 3 shows a partial sectional view of a further embodiment of the tube according to the invention with a flexible shoulder, a flexible upper body and a hard neck,

Fig. 4 shows a partial sectional view of a further embodiment of the tube according to the invention with a cannula.

Modes for Carrying Out the Invention

Fig. 1 shows a partial sectional view of an embodiment of the tube according to the invention with a flexible shoulder 4. The tube 1 comprises a body 2, a shoulder 4 and a neck 5. The tube 1 is substantially made of two components 9, 10. The first component 9 forms the body 2. The second component 10 forms the shoulder 4 and the neck 5. Preferably the two components 9, 10 are connected to each other at a rim 3 of the tube 1, in particular by an overlap 8. The neck 5 comprises a thread 7 and an outlet 6. The upper portion of the body 2 is substantially cylindrical. The lower end of the body 2 is not shown.

The first component 9 is preferably a laminate structure, in particular a Neopac Polyfoil® laminate. It has preferably a thickness in the range of 0.2 to 0.8 mm, in particular about 0.5 mm.
The second component 10 is designed flexible, preferably such that it is easily deformable by hand, i.e. without using a tool. Preferably the second component 10 and therewith the shoulder 4 is made sufficiently flexible that a diameter of the shoulder 2 measured in a particular direction can be reduced by at least fifty percent, and in particular by sixty percent, by applying a compressing force by hand. Further the shoulder 4 is preferably made sufficiently flexible that opposing sides of the shoulder 4 can be squeezed by hand such that the inner surfaces of said opposing sides contact each other. Further the second component 10 and therewith the shoulder 4 are designed, in particular regarding their flexibility, such that at least 90 percent, preferably 95 percent and in particular at least 98 percent of the contents of a completely filled tube 1 can be pressed out by hand. A typical force which can be applied "by hand" is 5 or 10 Newton. Generally the term "by hand" in this document should be interpreted such that not more than 25 Newton have to be exerted as a compressing force. Preferably the second component 10 and therewith the shoulder 4 is made from a flexible material, in particular a TPE (thermoplastic elastomere). The material has preferably a hardness in the range from 50 Shore A to 96 Shore A. In particular the hardness is not more than 80 Shore A or not more than 65 Shore A. Generally a softer material allows better emptying. However, below 50 Shore A the material becomes too sticky. The flexibility of the shoulder 4 can be implemented either by using a softer material or by making the shoulder 4 thinner than in conventional designs, or by a combination of both. Preferably the shoulder 4 has a thickness in the range of 0.5 to 1 mm, in particular about 0.75 mm. The second component 10 can be made from a transparent material and/or can be at least partially transparent such that the completeness of the emptying can be observed by the user.
A flexible shoulder 4 and, as the case may be, a flexible neck 5 and/or a flexible upper portion of the body 2 has the advantage that the tube 1 can be easily squeezed in the range of the shoulder 4, such that all contents can be pressed out, in particular by completely flattening the tube 1 in the range of the shoulder 4 at least temporarily.

Fig. 2 shows a partial sectional view of a further embodiment of the tube 1 according to the invention. In this embodiment not only the shoulder 4, but also the upper portion of body 2 is made especially flexible. Like in the embodiment of figure 2, the tube 1 is made from a first component 9, which is preferably a laminate structure and a second component 10 which is substantially made from a flexible material. However, in contrast to the embodiment of figure 1, the second component 10 forms not only the neck 5 and the shoulder 4, but also the upper portion of the body 2. The first component 9 forms the lower portion of the body 2.

Regarding the flexibility, thickness and/or transparency of the second component 10, the specifications given referring to figure 1 can be applied accordingly. However, the thickness of the second component 10 in the range of upper portion the body 2, which had not to be defined above, is preferably in the range of 0.5 to 1.5 mm and is in particular about 1 mm.

The embodiment of figure 2 has, compared to the embodiment of figure 1, the advantage that emptying the upper part of the tube 1 is even easier, because the upper part of the tube 1, which is usually the part which is most difficult to empty, is made completely from the flexible material. Further the overlap 8, by which the two components 9, 10 are connected and which might be less flexible, is not in said upper part of the tube 1 and does therefore not interfere with its emptying. In addition to that, this design is more stable since the overlap 8 is not in the region of the rim 3, which can be
exposed to especially high forces or tensions when the tube 1 is squeezed. The upper portion of the body 2 which is formed by the second component 10 has preferably a length in the range of 5 to 30 mm, in particular 20 to 30 mm, or about the same length as the shoulder, measured from the neck 5 to the rim 3, wherein "about" means +/- 5 mm.

Fig. 3 shows a partial sectional view of a further embodiment of the tube 1 according to the invention. Like in the embodiment of figure 2, not only the shoulder 4, but also the upper portion of the body 2 is made flexible. However, in contrast to the embodiments of figures 1 and 2, there is a third component 11 which forms the outer and topmost portion of neck 5. This has the advantage that the second component 10 can be made even more flexible, without interfering with the functioning of the thread 7 and the outlet 6, hence the maximum flexibility of the second component 10 is higher than in the embodiment described above. Regarding the minimum flexibility, i.e. the flexibility which is necessary to satisfyingly achieve the objective of the invention, the specification given referring to figure 1 can be applied to this embodiment accordingly. The third component 11 is made harder than the second component 10.

The third component 11 is in particular made from PE-HD (Polyethylene High Density) and/or can for example be made by injection molding, in particular a two component injection molding process.

Fig. 4 shows a partial sectional view of a further embodiment of the tube according to the invention. The tube 1 comprises a cannula 6 which allows to dispense the contents of the tube 1 spatially more precisely which might for example be desirable in the case of eye drops. As in the embodiment of figure 3 there are three components. A first component 9 which forms the lower portion of the body 2, a second component 10 which forms the upper portion of the body 2, the shoulder 4,
the inner portion of neck 5 and, in contrast to the embodiment of figure 3, also the cannula 6 and a third component 12 which forms the outer portion of the neck 5 with thread 7. Hence, the cannula 6 is from the same material as the shoulder 4 and therefore flexible. A soft cannula can be an advantage, since it can reduce the risk of injuries during dispensing. The flexible shoulder and the flexible cannula being formed by the same component is an advantage regarding the production cost.

In order to produce a tube according to one of the above described embodiments of the invention first the components 9, 10 and, as the case may be, 11 or 12 are produced. Then the components are attached to each other. However, the first component 9 can also be directly injection molded onto the second component 10.

In the present document the term “flexible” is used. A flexible component may have the properties that it can be bent, that it can be expanded and/or compressed and in particular that it is elastic, such that it restores substantially its original shape after the deforming force is released. In a preferred embodiment the shoulder of the tube according to the invention has all these properties. However, in order to achieve the aim of the invention, namely to make it easier to empty a tube completely, it may also be sufficient if the material of the shoulder is solely easily deformable. A, compared to conventional tubes, thinner aluminum is for example such a material. It is substantially not self restoring, but nevertheless easily deformable. Further, for the body, and in particular also the shoulder, it is desirable that it is flexible, but substantially not, or only slightly, expansible, since an expansibility impairs the function of dispensing by applying pressure.

In the embodiments shown in figures 1 to 4 the diameter of the neck 5 is about 30 to 40 percent of the diameter of the body 2. However, the diameter of the
neck 2 can also be smaller or larger. If the diameter of the neck 2 is larger, preferably not only the shoulder, but also the neck 2 is designed flexible, as for example in the embodiments of figure 1 and 2. Further it is not necessary that neck and shoulder are clearly distinguishable portions of the tube. Neck and shoulder can for example form a continuous, in particular conical surface.

The outlet 6 of the tube according to the invention may be an opening. However, in the factory state, the outlet 6 may also be a sealed opening, which can be opened by removing the seal, for example by twisting away or breaking off the seal of the outlet 6. In the embodiments shown in the figures the tube 1 is designed with a thread 5, such that it can be closed with a cap. However, the tube according to the invention can also be designed non-reclosable or to be closed with a snap-on cap.

The tube according to the invention can be embodied in various sizes. The diameter of the body is preferably in the range from 10 to 50 mm. The length of the body is preferably in the range from 20 to 200 mm.

Further the tube can be designed such that the body has at least, where it connects to the shoulder, a substantial elliptic cross section. This further facilitates the emptying, since it predetermines the direction of the flattening.

In preferred embodiments of the invention the second component 10 and therewith the shoulder 4 is made from a flexible material having a hardness in the range of 50 to 96 shore A. However, the hardness can be varied between a flexible design, which is especially easy to empty and a more stable design, which is less easy to empty, namely in the range from 50 Shore a to 60 Shore D.

A shoulder with a hardness of about 60 Shore D can for example be made using PE-HD (Polyethylene High Density).
Preferably the material of the inside of tube and in particular of the shoulder is physiologically harmless, such that the tube can be used for medical and pharmaceutical applications.

While there are shown and described presently preferred embodiments of the invention, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously embodied and practiced within the scope of the following claims.
Claims

1. Tube for holding and dispensing products comprising a tubular flexible body (2), a shoulder (4) and a neck (5) with an outlet (6), wherein the shoulder (4) is a portion of the tube (1) which connects the body (2) to the neck (4), characterized in that the shoulder (4) is flexible.

2. Tube according to claim 1, characterized in that the shoulder (4) is made substantially from a flexible material having a hardness of not more than 96 Shore A and in particular not more than 80 or 65 Shore A.

3. Tube according to one of the preceding claims, characterized in that the shoulder (4) is made sufficiently flexible that a diameter of the shoulder (2) measured in a particular direction can be reduced by at least fifty percent by applying a compressing force by hand.

4. Tube according to one of the preceding claims, characterized in that the shoulder (4) is made sufficiently flexible that opposing sides of the shoulder (4) can be squeezed by hand such that the inner surfaces of said opposing sides contact each other.

5. Tube according to one of the preceding claims, characterized in that the shoulder (4) and in particular an upper portion of the body (2) and/or the neck (5) are designed such, in particular by being made from a flexible material, that, once the tube (1) is filled with contents, at least 95 percent of said contents of the tube (1) can be pressed out by hand.

6. Tube according to one of the claims 2 to 5, characterized in that the body (2) is formed substantially by a first component (9) and the shoulder (4) and the neck (5) are formed substantially by a second component (10).

7. Tube according to one of the claims, 2 to 5, characterized in that the body (2) comprises a first
portion and a second portion, wherein the first portion of the body (2) is formed substantially by a first component (9) and the second portion of the body (2), the shoulder (4) and the neck (5) are formed substantially by a second component (10).

8. Tube according to one of the claims 2 to 5, characterized in that the body (2) comprises a first portion and a second portion and the neck (5) comprises an inner portion and an outer portion, wherein the first portion of the body (2) is formed substantially by a first component (9), the second portion of the body (2), the shoulder (4) and the inner portion of the neck (5) are formed substantially by a second component (10) and the outer portion of the neck (5) is formed substantially by a third component (11, 12), wherein the third component (11, 12) is harder than the second component (10).

9. Tube according to claim 8, characterized in that the third component (11, 12) is substantially made from PE-HD, i.e. polyethylene high density.

10. Tube according to one of the claims 6 to 9, characterized that the second component (10) has a hardness in the range of 50 to 96 Shore A and in particular in the range of 50 to 80 or 65 Shore A.

11. Tube according to one of the claims 6 to 10, characterized in that the second component (10) is softer than the first component (9).

12. Tube according to one of the claims 6 to 11, characterized in that the second component (9) is substantially made from a flexible material, in particular a TPE, i.e. a thermoplastic elastomere.

13. Tube according to one of the claims 6 to 12, characterized in that the second component (9) is substantially made from a transparent material and/or is at least partially transparent.
14. Tube according to one of the claims 6 to 13, characterized in that the first component (9) is a laminate.

15. Tube according to one of the claims 6 to 14, characterized in that there is an overlap (8) between the first component (9) and the second component (10).

16. Tube according to one of the claims 2 to 15, characterized in that the neck (5), in particular an outer portion of the neck (5), comprises a thread (7).

17. Tube according to one of the claims 2 to 16, characterized in that the neck (5) comprises a cannula (13), in particular a flexible cannula which is made from the same material as the shoulder (4) and which is formed by the same component as the shoulder (4).

18. Tube according to one of the claims 2 to 17, characterized in that the tubular flexible body (2) has, at least where it connects to the shoulder (4), a substantially elliptic cross section.

19. Method for producing a tube (1) according to one of the claims 2 to 18, characterized by the steps of

   - producing a first component (9), wherein the first component (9) is designed to substantially form the body (2) or at least a lower part of the body (2) of the tube (1),

   - producing a second component (10), wherein the second component is designed to substantially form the shoulder (4), at least part of the neck (5) and, as the case may be, an upper part of the body (2) of the tube (1), wherein the shoulder (4) is flexible,

   - attaching the first component (9) to the second component (10).
A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B65D35/10 B65D35/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of box C.

Patient family members are listed in annex.

* Special categories of cited documents:
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Name and mailing address of the ISA

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Fitterer, J
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