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(54) **A container**

(57) A container according to the invention has a lid with a discharge portion and an elastically flexible bistable portion (20) that allows a discharge portion (15) of the container (1) to assume a retracted position and an advanced position, the bistable portion (20) extending around the discharge portion 15). The discharge portion includes a stopper (30) operable independent of the position of the discharge portion to selectively allow for or prevent discharge of the contents of the container through the discharge portion.

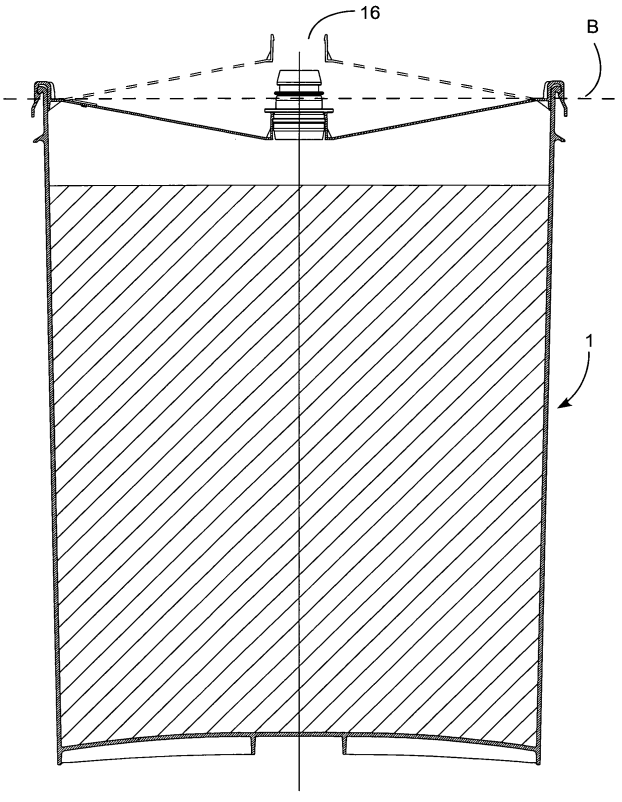


Fig. 2

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## Description

**[0001]** The present invention relates to a container according to claim 1 and to a lid according to claim 17.

**[0002]** Containers having the structural elements defined in the preamble of claim 1 are generally disclosed in DE 85 18 074 U and may be used for dispensing a material held in the container. In the container of DE 85 18 074 U discharge is controlled through the bistable part of the lid assuming a retracted or advanced position, the bistable part of the lid having discharge apertures.

**[0003]** The present invention has for its object to provide for a container which may be stacked without damage to a discharge portion of the container, which provides for a sealed environment of the contents of the container, and which by its structure may assist in emptying of the container when the container is turned upside down.

**[0004]** According to the invention, the container includes a lid with a discharge portion and an elastically flexible bistable portion that may be annular and that allows the discharge portion to assume a retracted position and an advanced position, the bistable portion extending around the discharge portion. The discharge portion includes a stopper operable independent of the position of the discharge portion to selectively allow for or prevent discharge of the contents of the container through the discharge portion.

**[0005]** The container according to the invention is of particular use where the content held within the container is of high value such that a complete or near complete discharge of all the content must be ensured during emptying. This is achieved in the surface of the bistable portion that faces the inside of the container preferably acting in the advanced position of the discharge portion as a funnel. The funnel surface along which the content of the container flows towards the discharge portion provides, by preferably being even, for a minimum of spots where any part of the content may be trapped during the emptying process.

**[0006]** Preferably the discharge portion includes a through-going opening with a valve housing including a valve structure mounted therein. The discharge portion may include a peripheral wall structure connected to the bistable surrounding portion and delimiting the through-going opening; the valve housing being mounted to the peripheral wall structure.

**[0007]** Preferably, the container is designed such that when the container is placed on another container according to the invention it will be supported by the lid of that container, preferably adjacent and along a peripheral rim portion of the lid of that container. Moreover, the bottom of the container is preferably geometrically configured to receive at least a part of the stopper of the container on which it is placed in the retracted position but not in the advanced position of the discharge portion of the latter container.

**[0008]** The lid of the container preferably is essentially circular in shape when viewed from above; other shapes such as oval, square or near square shapes may, however, also be envisaged, with the container wall having a corresponding shape to allow for the lid to be mounted thereon.

**[0009]** Conveniently, the discharge portion is located coincident with the central axis of the peripheral wall of the container. This allows for the lid to be designed as a rotationally symmetrical or near-rotationally symmetrical plastics structure.

**[0010]** A preferred embodiment of the invention will now be discussed with reference to the drawings.

Fig. 1 shows a schematic cross-sectional view of the container in an upright position,

Fig. 2 is a view similar to fig. 1, showing the two stable positions of the bistable portion,

Fig. 3 shows a schematic cross-sectional view of two of the containers shown in fig. 1, stacked upon each other,

Fig. 4 is a view similar to fig. 1, showing the container in an inverted position,

Fig. 5 is a cross-sectional view of the lid shown schematically in fig. 1,

Fig. 6 is a view similar to fig. 1, before application of the lid, and

Fig. 7 is a schematic cross-sectional view, showing two of the lid of fig. 6 in a stacked relationship.

**[0011]** Fig. 1 shows a plastics container 1, preferably made of polypropylene PP or PE, which has a first end and an opposite second end. A cylindrical or conical peripheral wall 5 extends from the first end to the second end. A lid 10 of the container 1 defines the first end while a bottom member 8 defines the second end.

**[0012]** In the shown embodiment the lid 10 is circular or essentially circular as seen from above and is mounted onto the peripheral wall 5 by snap engagement; however, a screw-thread connection may be provided for. In a less preferred embodiment, the lid 10 may be non-removably mounted. The bottom member 8 is preferably integrally moulded with the wall 5, such as in an injection molding process, and reinforcing ribs 2 are preferably a part of the bottom member 8.

**[0013]** In the drawings the content of the container 1 is schematically indicated in hatched line and designated numeral 100. The container 1 may be used for holding any material capable of flowing, liquid or granular.

**[0014]** The container 1 is shown in fig. 1 in an upright position in which the container is typically transported to the end-user in a stack comprising identical containers arranged on a pallet. After delivery the container 1 is pref-

erably placed in an inverted position with the bottom member 8 facing upwards to allow for a discharge, preferably by gravity, of the contents through a central discharge portion 15 of the lid 10 to be discussed in further details below. It is noted that the dimensions of the container may vary within a broad range; typically, however, the container may have a diameter within the range of 30 cm - 70 cm and a height defined by the wall 5 of 60 cm - 120 cm. The bottom member 8 may be flat, or preferably vaulted, preferably with a central recess, as shown.

**[0015]** As appears, in the shown embodiment the lid 10 has a shape resembling a circular vaulted or dome-shaped disc with the centre thereof coincident with the axis C of the peripheral cylindrical or conical wall 5. Moreover, the lid 10 has a central discharge portion 15 which includes a peripheral preferably cylindrical or conical wall structure 18 which delimits a through-going opening 16 in which is mounted a stopper 30. Although not preferred, the container may be filled through the through-going opening 16 after application of the lid 10 onto the rim of the wall 5 and before the stopper 30 is mounted.

**[0016]** A tiny air vent, indicated by numeral 22, may be provided to allow for a controlled in-take of air as required to assist in the emptying of the container 1. The air vent 22 should not permit discharge there-through of the granular or liquid contents 100 of the container 1.

**[0017]** Preferably, the stopper 30 is formed as a valve housing 31 that has a through-going passage and a valve structure for the controlled discharge of the contents of the container 1 through that passage; fig. 1 shows the stopper 30 before it is securely mounted to the wall structure 18 such as by snap-engagement. The stopper 30 may alternatively be a plug (not shown) inserted into the opening 16, or a lid (not shown) screwed or otherwise connected to the wall structure 18 so as to allow for controlled discharge of the contents 100 of the container by removal of the stopper 30.

**[0018]** An annular elastically flexible lid portion 20 resembling the shape of a slightly vaulted cone surrounds the opening 16 and is integrally connected at its small radius side with the peripheral wall structure 18. Near the larger radius side of the annular portion 20 the lid 10 is connected to the rim of the container 1 wall 5. Through the shape and flexibility of the portion 20 a bistable portion/structure is provided, and fig. 2 shows the lid 20 in the two shapes possible as result of the bistable structure, namely a first stable state indicated in broken line wherein the stopper (not shown) will be farthest from the bottom member 8, and another stable state wherein the portion 20 is inverted to assume the shape of a slightly vaulted cone such that the stopper 30 is retracted closer to the bottom member 8. A person may bring the stopper 30 to assume the advanced position from the retracted position by simply holding on to the rigid wall structure 18 and then applying an upward manual force resulting in the wall structure 18 popping up as the portion 20 is temporarily deformed to thereafter reassume the cone-like shape. Alternatively, the lid 10 may be brought to the advanced position by turning the container upside down so that the mass of contents 100 of the container 1 acting on the inside surface 25 of the lid 10 will force the lid 10 to assume the advanced position. The skilled person will realize that the force required to bring the lid from the one shape to the other may be affected by factors such as the thickness of the portion 20 and by the plastics material used for making the lid 10. It is noted that the lid 10 need not be applied to the wall 5 for the change of shape to be possible.

**[0019]** The lid 10 and stopper 30 may be so designed that in the retracted position the tip of the stopper 30 lies below the imaginary line B about which the annular portion 20 moves to assume the one or the other shape whereby a flat surface pallet may be placed on top of the container 1 without damaging the tip of stopper 30. Fig. 2 shows an embodiment where in the retracted position the tip of the stopper 30 lies above line B and where the bottom member 8 is geometrically configured to be capable of receiving a part of the stopper 30 of a lower identical container of a stack when the discharge portion 15 with the stopper 30 is in the retracted position but not in the advanced position. Fig. 3 shows two such containers 1, 1' in a stacked relationship wherein each stopper 30 is in the retracted position. As appears, the upper container 1' rests against the lower level container 1 in the area of the wall 5 only, and through the selected geometric configuration of the bottom member 8 the stopper 30 lies confined and protected in the space below the bottom member 8 of the upper level container 1', preferably with the bottom member 8 distant from the stopper 30. As also appears, in this embodiment the bottom member 8 is generally geometrically configured such that the stopper 30 of the lower container 1 is not nestable by the bottom member 8 of the upper level container 1' when in the advanced position. This allows for a high internal volume of the container useful for storing the contents.

**[0020]** Fig. 4 shows the container 1 with the valve housing 31 in the advanced position and turned upside down, ready for being emptied by activation of the valve structure of valve housing 31. Preferably, the container 1 is supported in the upside down position by a holder device (not shown), and activation of the valve to discharge the contents 100 may take place automatically when the container is placed in the holder device through the use of a one-way ball valve; the valve may, however, be of the type that is manually activatable, such as by having a tap whereby discharge of the contents 100 follows from the tap being manipulated as required. As shown, a complete emptying of the container is assured by the inside surface 25 acting as a funnel whereby the contents of the container will run along surface 25 towards the outlet 30. For this purpose, the inside surface 25 is preferably smooth along the entire annular extension thereof, with no projecting irregularities, or as few projecting irregularities as possible.

**[0021]** Fig. 5 shows an enlarged cross-sectional view

of the preferred embodiment of the circular lid 10' which is for snap-engagement with the rim 6 of the container 1 wall 5, as shown in fig. 6. The lid 10' has a peripheral rim portion 21 integrally connected to a peripheral portion 27, along which the upper container 1' shown in fig. 3 is supported. Reinforcing ribs 26 may conveniently be provided to allow for a stable support of an overlying container 1' as shown in fig. 3. The peripheral portion 27 is integrally connected with the annular bistable portion 20 which again is integrally connected with the peripheral wall structure 18. Ribs 19 and 26 at the small and large radius sides of portion 20 also control or restrict deformation of the wall structure 18 and rim portion 21 as the annular portion 20 is deformed to assume the two stable configurations. Fig. 7 shows two lids 10' in a stacked position. A peripheral edge 12 of rim portion 21 rests on the upper surface of the rim portion 21.

## Claims

1. A container (1) having a first end (9) and a second end (7), a peripheral wall (5) extending from said first end (9) to said second end (7), a lid (10) defining said first end (9) and a bottom member (8) defining said second end (7), said lid (10) having a discharge portion (15) for discharge of a substance held in said container (1) and said lid (10) having a bistable portion (20) allowing said discharge portion (15) to assume a retracted position wherein said discharge portion (15) is closer to said second end (7) and an advanced position, **characterized in** said bistable portion (20) extending around said discharge portion (15) and said discharge portion (15) including a stopper (30) operable independent of the position of said discharge portion (15) to selectively allow for or prevent said discharge of said substance.

2. A container according to claim 1, wherein the surface (25) of said bistable portion (20) facing the inside of said container (1) is even and defines in said advanced position a funnel for essentially unrestricted flow thereon of said substance to said discharge portion (15).

3. A container according to claim 1 or 2, said stopper (30) including a valve structure.

4. A container according to the preceding claim, said discharge portion (15) including a through-going opening (16), a valve housing (31) including said valve structure being mounted within said through-going opening (16).

5. A container according to the preceding claim, said discharge portion (15) including a peripheral wall structure (18) connected to said bistable portion (20) and delimiting said through-going opening (16).

6. A container according to the preceding claim, said valve housing (31) being mounted to said peripheral wall structure (18).

7. A container according to claim 1 or 2, said discharge portion including (15) a through-going opening (16), said discharge portion (15) including a peripheral wall structure (18) connected to said bistable portion (20) and delimiting said through-going opening (15), said stopper being a cap releasably connected to said peripheral wall structure (18).

8. A container according to claim 5, 6 or 7, said discharge portion (15) including reinforcing ribs (19) for restricting deformation of said peripheral wall structure (18) on said discharge portion (15) being moved between said advanced and retracted positions.

9. A container according to any of any of the preceding claims 4-8, said valve housing (31) and/or said peripheral wall structure (18) being arranged to project from said bistable portion (20), in a direction away from said second end (7).

10. A container according to any of the preceding claims, wherein in said retracted position said stopper (30) is located in its entirety below an imaginary line (B) about which said bistable portion (20) moves when said discharge portion (15) moves between said retracted and advanced positions.

11. A container according to any of the preceding claims, said lid (10) including a rim portion (21) for snap or screw engagement with a rim (6) of said cylindrical wall (5), said lid (10) including a peripheral portion (27) connecting said rim portion (21) to said bistable portion (20), said lid (10) preferably including reinforcing ribs (26) for restricting deformation of said peripheral portion (27) on said bistable portion (20) being moved between said advanced and retracted positions.

12. A container according to any of the preceding claims, said bistable portion (20) assuming a vaulted or vault-like shape in said advanced position and an inverted vaulted or vault-like shape in said retracted position.

13. A container according to any of the preceding claims, made from PP or PE.

14. A container according to any of the preceding claims, a plurality of said containers being stackable directly on each other with said containers resting on a respective lid, said bottom member (8) being geometrically configured to receive at least a part of the stopper (30) of an identical container (1) of a stack in the retracted position but not in the advanced position.

**15.** A container according to any of the preceding claims, said discharge portion (15) being located centrally of said lid (10), with the centre thereof coincident with the axis (C) of said cylindrical wall (5).

**16.** A container according to any of the preceding claims, said bistable portion (20) extending annularly around said discharge portion (15).

**17.** A lid (10') for engagement with a rim portion of a container, said lid (10') having a discharge portion (15) for discharge of a substance held in said container (1) and said lid (10') having a bistable portion (20) allowing said discharge portion (15) to assume a retracted position wherein said discharge portion (15) is closer to a bottom member (8) of the container and an advanced position, **characterized in** said bistable portion (20) extending around said discharge portion (15) and said discharge portion (15) including a stopper (30) operable independent of the position of said discharge portion (15) to selectively allow for or prevent said discharge of said substance.

**18.** A lid according to claim 17, wherein the surface (25) of said bistable portion (20) adapted to face the inside of said container (1) is even and defines in said advanced position a funnel for essentially unrestricted flow thereon of said substance to said discharge portion (15).

**19.** A lid according to claim 17 or 18, said stopper (30) including a valve structure.

**20.** A lid according to the preceding claim, said discharge portion including (15) a through-going opening (16), a valve housing (31) including said valve structure being mounted within said through-going opening (16).

**21.** A lid according to the preceding claim, said discharge portion (15) including a peripheral wall structure (18) connected to said bistable portion (20) and delimiting said through-going opening (16).

**22.** A lid according to the preceding claim, said valve housing (31) being mounted to said peripheral wall structure (18).

**23.** A lid according to claim 17 or 18, said discharge portion including (15) a through-going opening (16), said discharge portion (15) including a peripheral wall structure (18) connected to said bistable portion (20) and delimiting said through-going opening (15), said stopper being a cap releasably connected to said peripheral wall structure (18).

**24.** A lid according to claim 21, 22 or 23, said discharge portion (15) including reinforcing ribs (19) for restricting deformation of said peripheral wall structure (18) on said discharge portion (15) being moved between said advanced and retracted positions.

**25.** A lid according to any of any of the preceding claims 20-24, said valve housing (31) and/or said peripheral wall structure (18) being arranged to project from said bistable portion (20), in a direction away from said bottom member (8).

**26.** A lid according to any of the preceding claims 17-25 wherein in said retracted position said discharge portion (15) is located in its entirety below an imaginary line (B) about which said bistable portion (20) moves when said discharge portion (15) moves between said retracted and advanced positions.

**27.** A lid according to any of the preceding claims 17-26, said bistable portion (20) assuming a vaulted or vault-like shape in said advanced position and an inverted vaulted or vault-like shape in said retracted position.

**28.** A lid according to any of the preceding claims 17-27, made from PP or PE.

**29.** A lid according to any of the preceding claims 17-28, said bistable portion (20) extending annularly around said discharge portion (15).

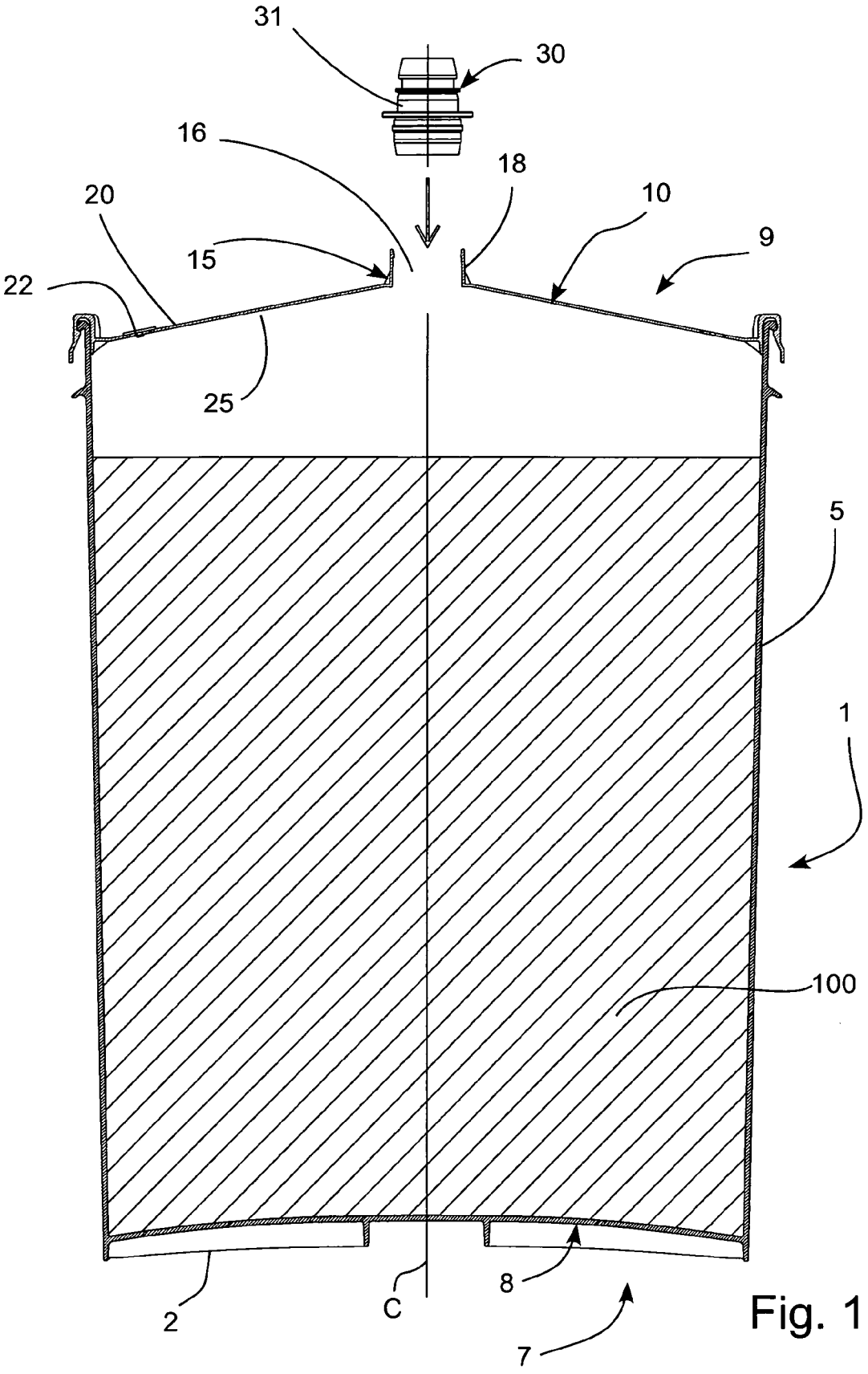


Fig. 1

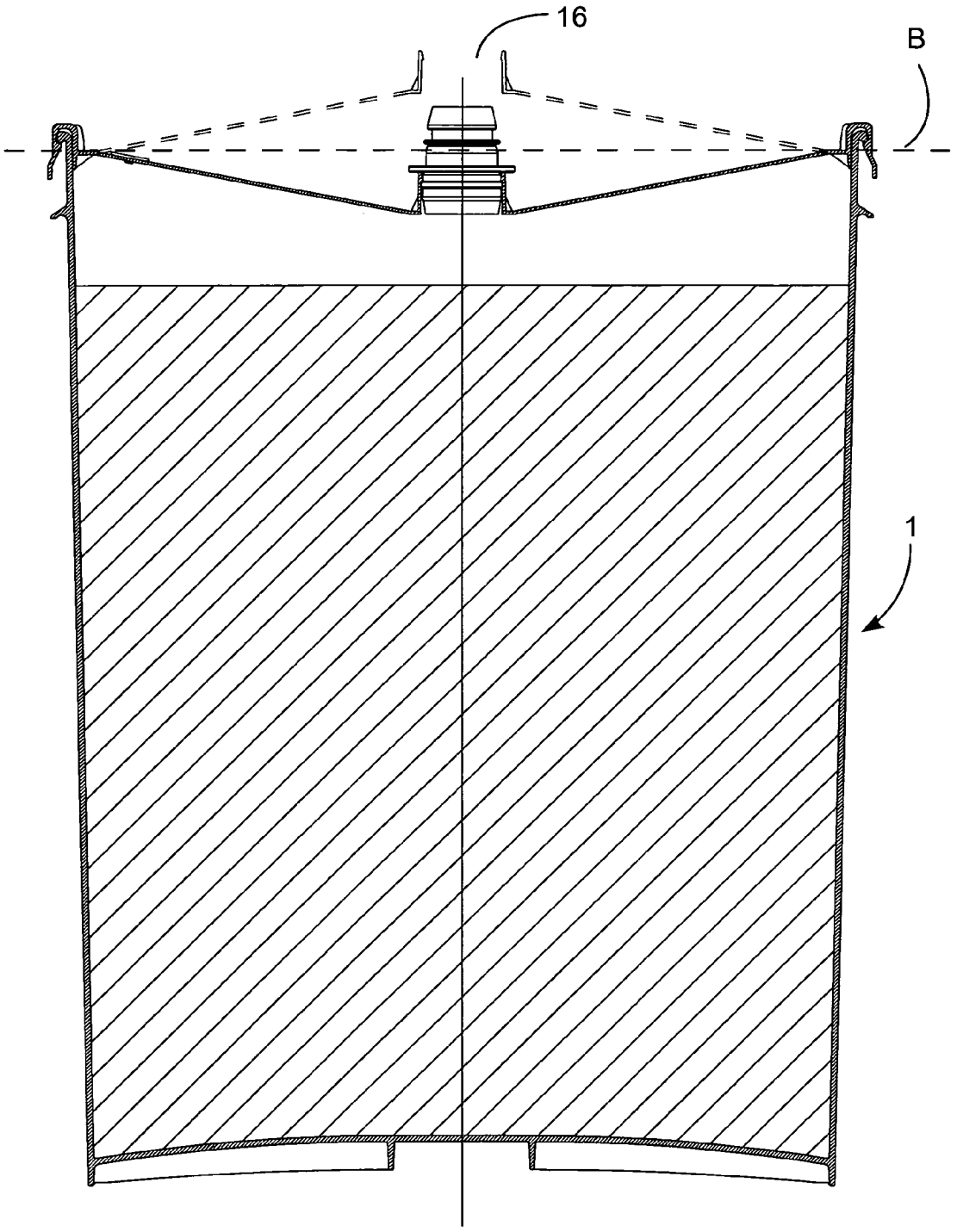


Fig. 2

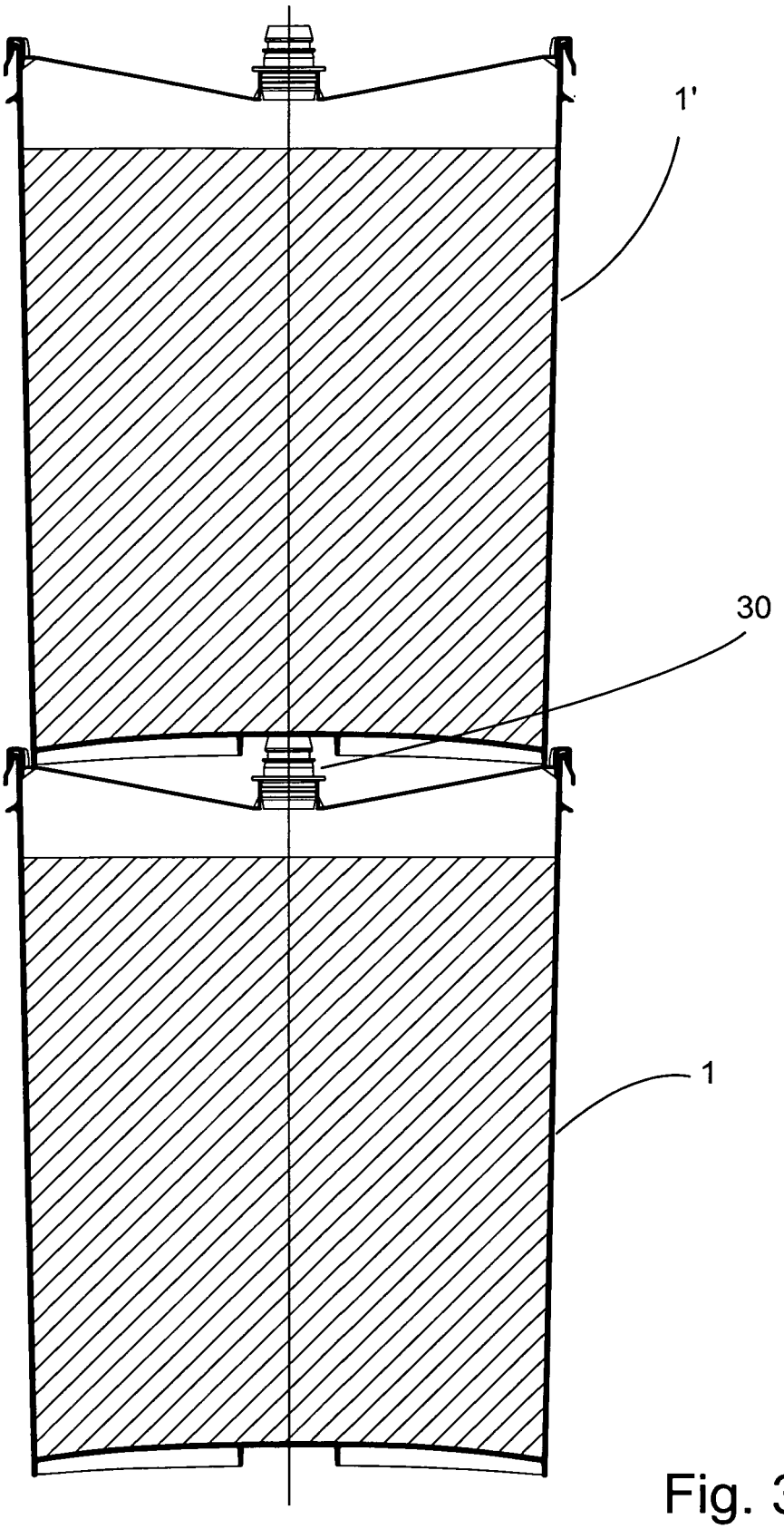


Fig. 3

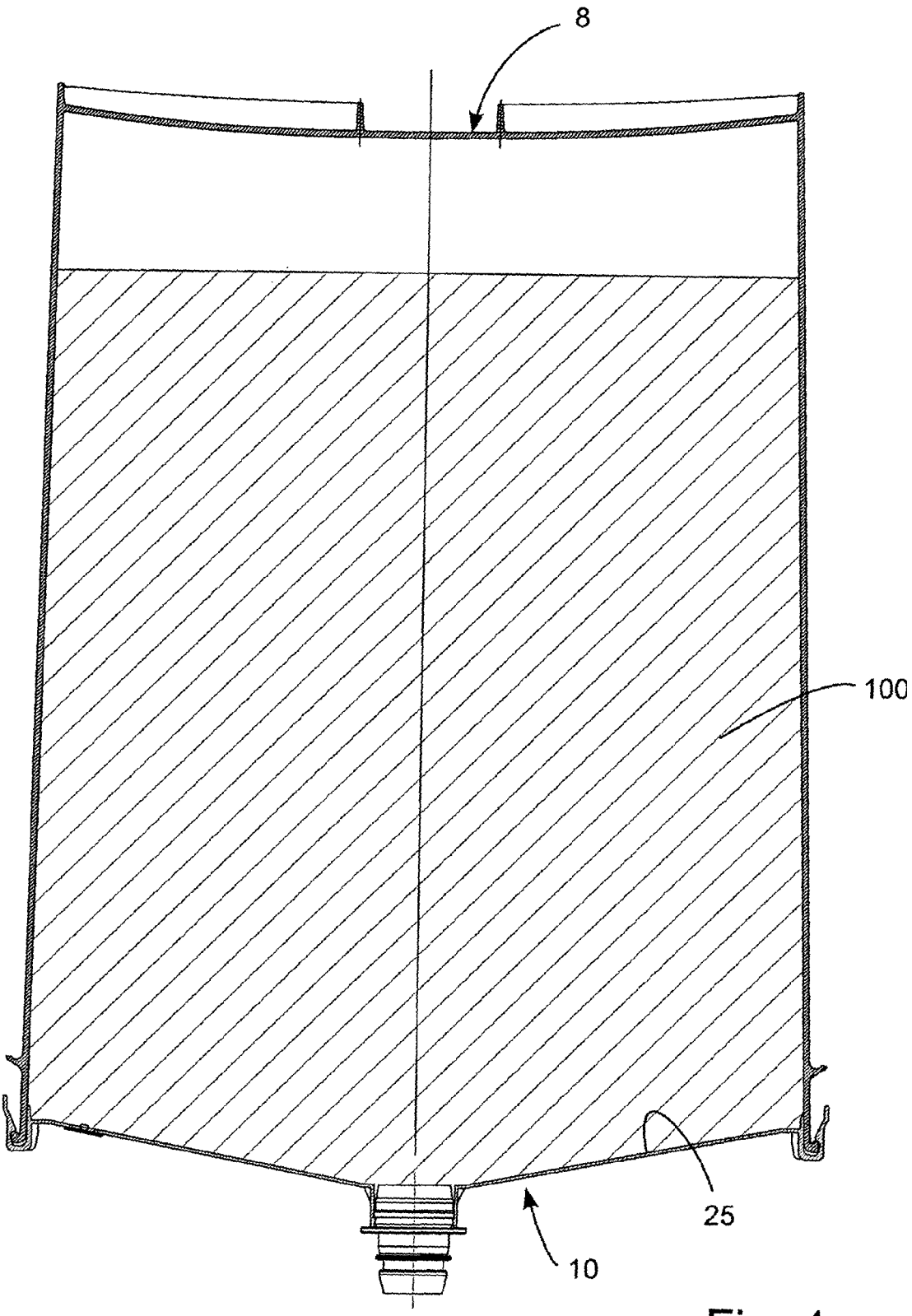


Fig. 4

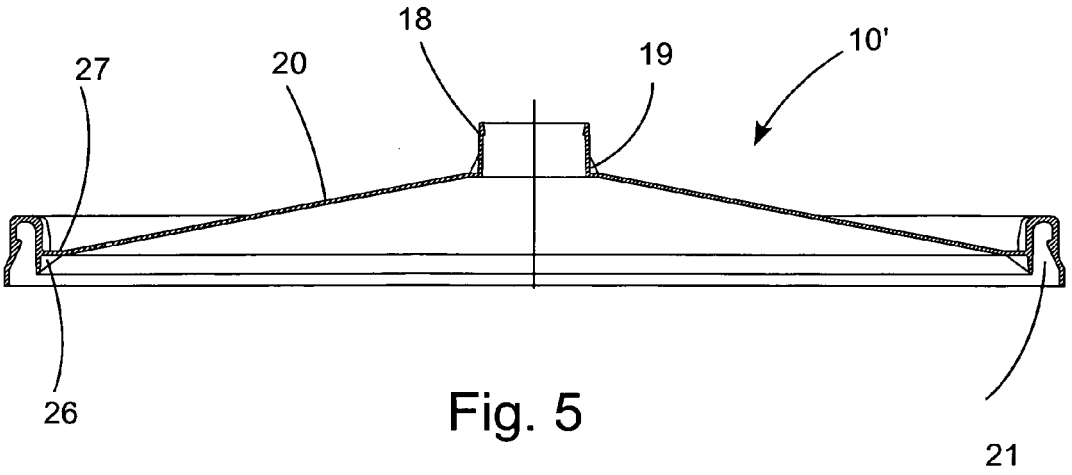


Fig. 5

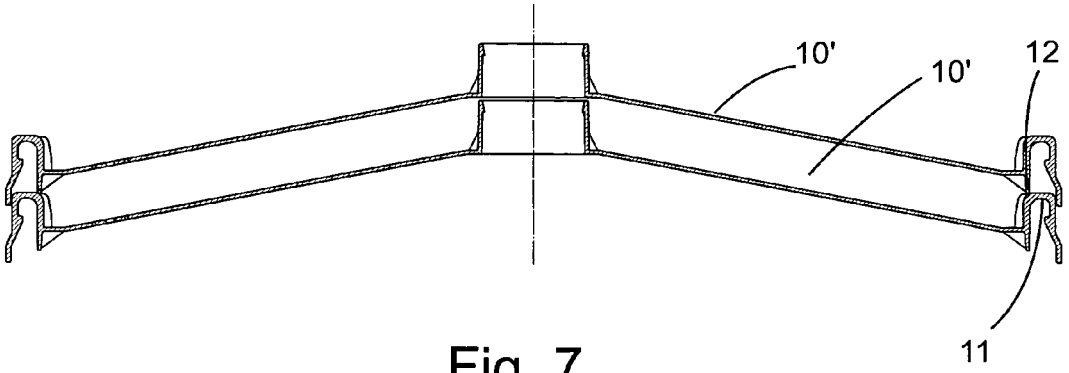


Fig. 7

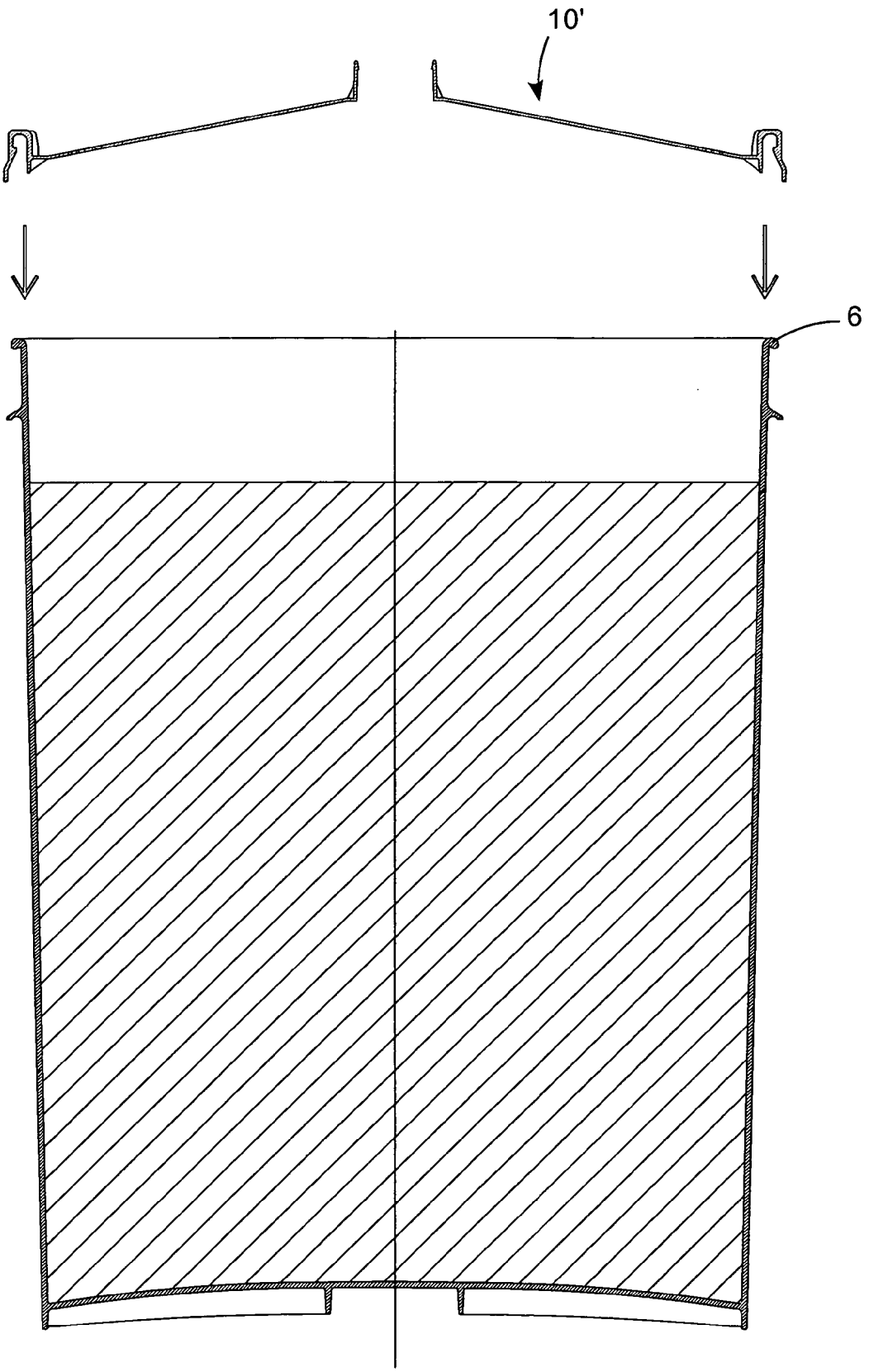


Fig. 6

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Application Number
EP 07 38 8082

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The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 26 March 2008 | Fitterer, Johann |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 07 38 8082

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

## REFERENCES CITED IN THE DESCRIPTION

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