

P A T E N T C L A I M S

1. A stopper (1) for an injector for delivery of a pharmaceutical composition, the stopper (1) having a stopper body (2) with an actuating surface (3) opposite an outlet surface (4), an axial length between the actuating surface (3) and the outlet surface (4), and a transverse diameter, which stopper body (2) defines an access diameter,
- the stopper (1) at an axial location from the actuating surface (3) comprising a deformable sealing element (5) surrounding the stopper body (2) and having an outer diameter, which is larger than the transverse diameter, which deformable sealing element (5) has an axial extension in the range of 5% and 95% of the axial length of the stopper body (2), and
- the stopper (1) comprising a cavity (6) at the axial location of the deformable sealing element (5),
- characterised in that the deformable sealing element (5) is made from a thermoplastic elastomer (TPE) and in that the cavity (6) has a lateral extension larger than the access diameter of the stopper body (2).
2. The stopper (1) according to claim 1, wherein the lateral extension in the range of 50% to 65% of the outer diameter of the deformable sealing element (5).
3. The stopper (1) according to claim 1, wherein the cavity (6) has an axial extension in the range of 5% and 95% of the axial length of the stopper body (2).
4. The stopper (1) according to claim 1, wherein the cavity (6) is contained in the deformable sealing element (5) or in the stopper body (2).
5. The stopper (1) according to claim 1, wherein the cavity (6) is formed at an interface between the stopper body (2) and the deformable sealing element (5).
6. The stopper (1) according to claim 1, wherein the cavity (6) has a cylindrical, an ellipsoidal or a toroidal shape.
7. The stopper (1) according to claim 1, wherein the stopper body (2) comprises an actuating stopper element (81) and an outlet stopper element (82) each comprising a deformable sealing element (5) as defined in claim 1, which actuating stopper element (81) and which outlet stopper element (82) are linked together by a resilient frame (83), the outlet stopper element (82) being located at a first axial location from the actuating surface (3), and the actuating stopper element (81) being located at a second axial location from the actuating surface (3), the stopper (1) having the cavity (6) at the first axial location.
8. The stopper (1) according to claim 7, wherein the stopper (1) comprises a second cavity (6) at the second axial location.

9. The stopper (1) according to claim 7, wherein the resilient frame (83) has a cylindrical shape.

10. The stopper (1) according to claim 1, wherein the stopper body (2) has a tubular section for housing a piston rod (10) and the cavity (6) is formed in the
5 interface between the piston rod (10) and the deformable sealing element (5)

11. The stopper (1) according to claim 1, wherein the deformable sealing element (5) is an O-ring with a recess along the inner diameter of the O-ring so that upon mounting of the O-ring on the stopper body (2) the cavity (6) is formed between the O-ring and the stopper body (2) at the recess of the O-ring.

10 12. The stopper (1) according to claim 1, wherein the stopper body (2) has a cylindrical shape and the deformable sealing element (5) is comprised on a cylindrical structure for mounting on the stopper body (2), so that upon mounting of the cylindrical structure on the stopper body (2), the cavity (6) is formed between the stopper body (2) and the cylindrical structure.

15 13. The stopper (1) according to claim 1, wherein the deformable sealing element has or the stopper body (2) and the deformable sealing element (5) have a Shore A hardness in the range of 30 to 90.

14. The stopper (1) according to claim 1, wherein the stopper body (2) is made from a thermoplastic elastomer (TPE).

20 15. The stopper (1) according to claim 1, wherein the stopper (1) comprises a first deformable sealing element (5) at a first axial location from the actuating surface (3) and a cavity (6) at the first axial location and a second deformable sealing element (5) at a second axial location from the actuating surface (3) and a second cavity (6) at the second axial location.

25 16. The stopper (1) according to claim 1, wherein the stopper (1) comprises a first deformable sealing element (5) at a first axial location from the actuating surface (3) and a second deformable sealing element (5) at a second axial location from the actuating surface (3) and the cavity (6) extends between the first axial location and the second axial location.

30 17. An injector (21) comprising a stopper (1) according to any one of claims 1 to 16, the injector (21) having a cylinder (22) with an inner wall (23), wherein the deformable sealing element (5) seals an annular gap between the inner wall (23) and the stopper body (2) when the stopper (1) is inserted into the cylinder (22).

35 18. The injector (21) according to claim 17, wherein the cylinder (22) has an inner diameter, and the outer diameter of the deformable sealing element (5)

is in the range of 1.5% to 10% larger than the inner diameter of the cylinder (22) before inserting the stopper (1) into the cylinder (22).

19. The injector (21) according to claim 17, wherein the deformable sealing element (5) has a Shore A hardness in the range of 30 to 90, and wherein the
5 injector (21) does not comprise an external lubricant.

20. The injector (21) according to claim 17, wherein the cylinder (22) is made from glass.

21. The injector (21) according to claim 17, wherein the cylinder (22) has an inner diameter in the range of 2 mm to 12 mm.

10 22. The injector (21) according to claim 17, wherein the cylinder (22) is prefilled with a pharmaceutical composition.