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(54) **Title:** A TEAT CUP

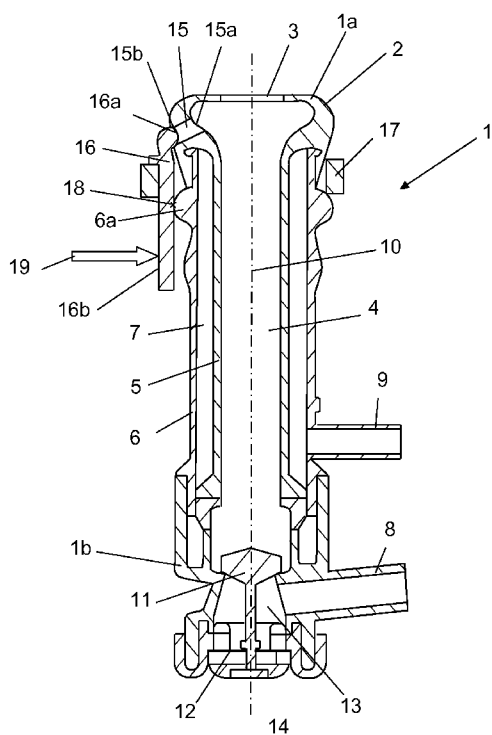


Fig 1

(57) **Abstract:** The invention relates to a teat cup (1) comprising a first end portion with an opening (3) to a recess (4) for receiving a teat of a milking animal. The teat cup (1) comprises an outer grip surface to be gripped by an operator during a detachment process of the teat cup (1) from a teat, and detaching means comprising a press surface (16b, 20b, 22b) which consists of a part of said grip surface, and pressure equalizing means adapted to establish atmospheric pressure in the recess (4) when the press surface (16b, 20b, 22b) is subjected to a predetermined pressure force (19). The pressure equalizing means comprises an air channel (15) having an extension between an inner opening (15a) to the recess (4) and an outer opening (15b) to ambient air, and a mechanism adapted to open the air channel (15) when the pressure surface (16b, 20b, 22b) is subjected to said predetermined pressure force (19).

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A teat cup

THE BACKGROUND OF THE INVENTION AND PRIOR ART

5 The present invention relates to a teat cup comprising a first end
portion with an opening to a recess for receiving a teat of a
milking animal, a passage through which a vacuum pressure is
applied to the recess, a pulsating chamber, and a grip surface of
10 the teat cup adapted to be gripped by an operator during a
detachment process of the teat cup from a teat.

A vacuum source is usually applied to the teat cup during a
milking operation in order to transport the milk from the teat cup,
via a milk tube, to a claw, milk container, etc. In certain types of
15 teat cups, vacuum is still prevailing in the teat cups when the
milking operation has been finished. The existence of the
vacuum in a teat cup makes it difficult to detach the teat cup
from the teat. One way to solve this problem is to press a thumb
into the recess of the teat cup beside the teat. Such a measure
20 results in an air supply to the teat cup and a reduced vacuum
pressure inside the teat cup. However, the thumb of an operator
is many times dirty and there is a risk that the teat will be
infected.

25 US 4,936,254 shows a milking apparatus comprising teat cups
connected to a claw via a respective short milk tube. The milking
apparatus has no air bleed upstream of the claw. Consequently,
the vacuum pressure in the teat cup is not broken when the
vacuum supply is shut off at the end of a milking operation.
30 However, the milking apparatus comprises an air tube for each
teat cup through which air can be supplied to the respective teat
cups when a milking operation has been finished and before the
teat cups are detached. The supply of air to the respective teat
cups is controlled by a manual valve member located at a
35 distance from the teat cups. In this case, an operator has to use

one hand to control the valve member and the other hand to detach a teat cup.

5 EP 903 078 shows a teat cup provided with a valve in a bottom portion of the teat cup. The valve has the task to automatically shut off the vacuum supply to the teat cup if the teat cup comes loose during a milking operation. Such a measure prevents that dirt and particles are sucked into the teat cup and the milk tube if it comes loose during a milking operation. The shut-off
10 function of the valve is initiated when ambient air flows into the teat cup and reduces the vacuum pressure in the teat cup. However, when a faultless milking operation has been finished, vacuum pressure is still prevailing in the teat cup. In order to reduce the vacuum pressure inside the teat cup, an operator
15 grips a sleeve shaped element arranged around the teat cup. The operator displaces the sleeve shaped element downwardly such that it moves the valve to a closed position. When the valve has been closed, the vacuum pressure inside the teat cup is reduced by air supply via an air bleed arranged in a wall
20 portion of the teat cup. The reduced vacuum pressure inside the teat cup facilitates the detaching process of the teat cup from the teat. However, the air supply to the teat cup is here performed via a narrow air bleed. Consequently, it takes some time to reduce the vacuum pressure inside the teat cup.
25 Therefore, it is a risk that an operator will pull loose the teat cup from the teat with a not negligible pulling force before the vacuum pressure inside the teat cup has been reduced to a suitable level.

30 SUMMARY OF THE INVENTION

The object of the present invention is to provide a teat cup having a design which makes it possible to detach the teat cup from a teat with one hand in a quick and careful manner.

This object is achieved with the initially mentioned teat cup which comprises detaching means comprising a press surface which consists of a part of the grip surface, and pressure equalizing means adapted to establish atmospheric pressure in the recess when the press surface is subjected to a predetermined pressure. Since the pressure surface is a part of the gripping surface, it is possible for an operator to grip the teat cup with one hand and supply the predetermined pressure force to the pressure surface with the same hand. When the operator grips and closes the hand around the teat cup, a pressure force is obtained in a simple and natural manner. The operator can use a part of the palm or a finger to accomplish this force. Said predetermined pressure force is of a magnitude such that it is easy for an operator to accomplish this force. When said pressure force has been provided on the pressure surface, atmospheric pressure will be applied to the recess by means of said pressure equalizing means. The air supply reduces the vacuum pressure in the recess and the suction force acting between the teat cup and the teat. As soon as the vacuum pressure has been reduced to a suitable level, it is possible to detach the teat cup from the teat substantially without any pulling force. The detachment process is gentle to the teat and simple to perform for an operator.

The pressure equalizing means further comprises an air channel having an extension between an inner opening to the recess and an outer opening to ambient air, and a mechanism adapted to open the air channel when the pressure surface is subjected to said predetermined pressure force. Preferably, such an air channel has a larger cross section area than a conventional air bleed. Thereby, atmospheric pressure will be established in a quick manner inside the teat cup when an operator provides said pressure force on the pressure surface. Thus, the detachment process of the teat cup may be performed in a quick manner.

According to a preferred embodiment of the invention, the teat cup comprises a centrally located longitudinal axis having an extension through the first end portion of the teat cup and an oppositely located second end portion of the teat cup, wherein
5 the pressure equalizing means is adapted to establish atmospheric pressure in the recess when the press surface is subjected to a predetermined pressure force acting in a direction towards the longitudinal axis of the teat cup. When the operator grips and closes the hand around the teat cup, a pressure force
10 directed to the longitudinal axis of the teat cup is usually obtained.

According to an embodiment of the invention, the mechanism comprises an element movably arranged between a first position
15 in which a blocking surface of the element blocks the air channel and a second position in which said blocking surface does not block the air channel. Such a blocking element may be a valve mechanism which alternately opens and closes the air channel. Preferably, said element comprises the pressure surface. The
20 mechanism may include comparatively few components if the element both comprises the pressure surface and the blocking surface.

According to a further embodiment of the invention, the
25 mechanism comprises a spring member adapted to act with a spring force on the element for moving it to the first position. It is suitable to use a spring force for holding the blocking surface in a blocking position of the air channel. The spring force guarantees that the element is moved to the first closing
30 position as soon as the pressure force on the pressure surface ceases. Furthermore, the spring force may be dimensioned such that the predetermined pressure force obtains a suitable value. Alternatively, said element has elastic properties and in that the element is movable between the first position and the second
35 position by means of elastic deformation. In this case, no separate spring member needs to be used and the mechanism

may be further simplified. Such an element may be arranged in a pre-stressed state in the first position.

5 According to another embodiment of the invention, the element is a lever pivotally mounted around an axis. Such a lever may be arranged on the outside of the teat cup in a suitable position. Advantageously, the lever comprises said press surface on one side of the pivot axis and a blocking surface on an opposite side of the axis. If an operator applies a pressure force on a
10 pressure surface on one side of the axis in a certain direction, the blocking surface on the opposite side is moved in an opposite direction. The axis may be arranged in a position between the pressure surface and the blocking surface such that a desired force ratio between the applied pressure force and the
15 lifting force of the blocking surface is achieved.

According to yet another embodiment of the invention, the element is movably arranged between the first position and the second position by means of a displacement motion in a
20 substantially straight line. Such an element may be an elongated element which is displaceable against the action of a helical spring in the form of a draw spring or a compression spring. The element may have an extension between a first end and a second end wherein the pressing surface is arranged at the first
25 end and the blocking surface at the second end. The element may comprise a push-button at the first end. Furthermore, the element may have an extension through the air channel and a blocking member located inside the recess provided with a blocking surface for blocking the inner opening of the air
30 channel when the pressure surface is not subjected to said pressure force.

According to a further embodiment of the invention, the blocking surface of the element is adapted to block the outer opening of
35 the air channel when the pressure surface is not subjected to said pressure force. Such an element may be annular and

mounted around an outer periphery surface of the teat cup wherein the annular element has at least one blocking surface located at an inner periphery and at least one pressure surface located at an outer periphery. When an operator applies the predetermined pressure force on the pressure surface on the outer periphery of the annular element, the annular element is adapted to be flexibly deflected such that the blocking surface is displaced in a manner such it uncovers an outlet opening of the air channel. Advantageously, the inner periphery of the annular element has an oval shape when it is in the first position. Preferably, the blocking surface is arranged in a part of the inner periphery of the annular element located at the smallest distance from a centre of the annular element. The pressure surface may be arranged in an outer periphery part of the annular element located radially outwardly of a part the inner periphery of the annular element located at the largest distance from the centre. The blocking surface of the annular element preferably forms an angle in the range of 70-110° to the pressure surface of the annular element. Most preferably, the blocking surface of the annular element forms an angle of about 90° to the pressure surface of the annular element.

According to another embodiment of the invention, the air channel is located above the pulsating chamber when the teat cup is in a position with the first end portion directed upwardly. It is many times natural to grip an upper part of a teat cup when it is to be detached from a teat. Therefore, it is preferable to arrange the pressure surface and the air channel in an upper part of the teat cup. Alternatively, the air channel is located in a position below the pulsating chamber when the teat cup is in a position with the first end portion directed upwardly. However, it is of course also possible to arrange the air channel such that it has an extension through the pulsation chamber.

According to a preferred embodiment of the invention, the teat cup comprises a valve mechanism which is adapted to close the

vacuum pressure supply to the recess when ambient pressure prevails in the recess. The object of such a valve mechanism is to prevent dirt and particles from being sucked into the teat cup if it comes loose and falls to the ground during a milking operation. In this kind of teat cup, the above mentioned problem arises and it is suitable to provide such a teat cup with detaching means according to the above.

BRIEF DESCRIPTION OF THE DRAWINGS

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The present invention is now to be explained more closely by means of preferred embodiments, which are disclosed as examples, and with reference to the attached drawings.

- 15 Fig. 1 shows a teat cup with detaching means according to a first embodiment of the invention,
Fig. 2 shows a teat cup with detaching means according to a second embodiment of the invention
Fig. 3 shows a teat cup with detaching means according to a third embodiment of the invention
20 Fig. 4 shows a teat cup with detaching means according to a fourth embodiment of the invention and
Fig. 5 shows a cross section view of the teat cup in Fig. 4 in the plane A-A.

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DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS OF THE INVENTION

Fig. 1 shows a teat cup 1 adapted to be attached to a teat of milking animal. The teat cup 1 comprises a mouthpiece 2 having an opening 3 to a recess 4 for receiving a teat of an animal during a milking operation. The recess 4 is defined by an inner surface of a flexible liner 5. A rigid shell 6 is arranged around the flexible liner 5 such that a pulsation chamber 7 is created in the radial space between the flexible liner 5 and the shell 6. The mouthpiece 2 and the flexible liner 5 are in this case formed in

35

one piece. The teat cup 1 comprises a first nipple member 8 for connecting a milk tube to the teat cup 1. A vacuum pressure is adapted to be applied to the recess 4, via the milk tube, from a vacuum source for transporting milk from the teat cup 1. The
5 teat cup 1 comprises a second nipple member 9 for connecting a pulse tube to the teat cup 1. The pulse tube is adapted to transfer a pulsating vacuum pressure from a pulsator to the pulsation chamber 7. A centrally located longitudinal axis 10 of the teat cup has an extension through a first end portion 1a of
10 the teat cup 1 comprising the opening 3 and an oppositely located second end portion 1b of the teat cup 1.

The teat cup 1 is provided with a valve mechanism in the second end portion 1b. The valve mechanism comprises a displaceable
15 valve body 11 connected to a flexible membrane 12. The membrane 12 is arranged between a space 13 in the second end portion of the teat cup 1 and a surrounding area 14 with atmospheric air pressure. Due to the difference between the pressures in the space 13 and in the surrounding area 14, the
20 membrane 12 will displace the valve body 11 between an open position and a closed position. The valve mechanism allows a flow of milk and air between the recess 4 and the space 13 when the valve body 11 is in the open position and it shuts off this flow when the valve body 11 is in the closed position. During a
25 milking operation, a vacuum source applies a vacuum pressure in the space 13. The difference between the vacuum pressure in the space 13 and the atmospheric pressure in the surrounding area 14 acts on the membrane 12 such the valve body 11 is set in an open position. A vacuum pressure prevails in the recess 4
30 which sucks milk from the teat cup 1 to the milk tube. The teat of the animal fills up the opening 3 to the recess 4 substantially completely such that no air will flow into the recess 4, via the opening 3, during a milking operation. In the event that the teat cup 1 accidentally comes loose from the teat during a milking
35 operation, ambient air will flow into the recess 4. The valve body 11 has a larger active surface than the active surface of the

membrane 13. Therefore, the valve body 11 is automatically displaced to the closed position as soon as air with atmospheric pressure flows into the recess 4. This automatic shut off of the vacuum supply to the recess 4 prevents that dirt and particles are sucked into the teat cup 1 and the connected milk tube.

In this type of teat cup, vacuum is still prevailing in the recess 4 when a faultless milking operation has been finished. The existence of the vacuum pressure in the recess 4 makes it difficult to detach the teat cup 1 from the teat. In order to facilitate the detaching process of the teat cup, the teat cup is provided with detaching means adapted to establish atmospheric pressure in the recess 4 during the detachment process of the teat cup. The detaching means comprises an air channel 15 having an extension between an inner opening 15a to the recess 4 and an outer opening 15b to ambient air. In this case, the air channel 15 is located above the pulsating chamber 7 in the first end portion of the teat cup 1. Furthermore, the detaching means comprises a lever 16 mounted on the outside of the teat cup 1 by means of an elastic annular element 17. A projecting portion 6a on the rigid shell 6 forms an axis 18 around which the lever 16 is pivotably mounted. The lever 16 comprises a blocking surface 16a at an end portion adapted to block the outer opening 15b of the air channel 15. The lever 16 comprises a press surface 16b for turning the lever 16 around the axis 18. The blocking surface 16a and the press surface 16b are located on different sides of the axis 18.

When a milking operation has been finished and the teat cup has to be detached from the teat, an operator grips, with one hand, an outer grip surface of the teat cup 1. Preferably, the operator grips with one hand the teat cup 1 in a position above the second nipple 9. The grip surface is adapted to comprise the press surface 16b of the lever 16. The operator closes the hand around the teat cup 1 such that a pressure force 19 is applied on the press surface 16b which turns the lever 16 around the

projecting portion 18 against the action of the elastic element 17. The pressure force 19 is directed in a radial direction towards the longitudinal centre axis 10 of the teat cup 1. The turning motion of the lever 16 results in that the blocking surface 5 16a of the lever 16 is displaced in a manner such that the outer opening 15b of the air channel 15 is uncovered. Ambient air flows to into the recess 4 via the air channel 15. Atmospheric pressure is now established in the recess 4 and the teat cup 1 can be detached from the teat substantially without any pulling 10 force in a careful manner. Consequently, the operator only has to grip a grip surface of the teat cup comprising the press surface 16b with one hand and applying a pressure force 19 on the press surface 16b before the teat cup is detached from the teat. An operator can detach two such teat cups substantially at 15 the same time by using both hands. The necessary pressure force for opening the air channel 15 is accomplished in a simple and natural manner when the operator grips and closes the hand around the teat cup 1. Alternatively, the operator can use one or several fingers to accomplish this force.

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Fig. 2 shows a teat cup 1 provided with an air channel 15 located below the pulsating chamber 7 in the vicinity of the second end portion 1b of the teat cup 1. The lever 16 has here a protruding portion 16c which is arranged in a correspondingly 25 shaped recess 6b on the casing 6. These portions 16c, 6b form a pivot axis 18 for the lever 16. The press surface 16b is here located on an upper side of the pivot axis 18 and the blocking surface 16a on a lower side of the pivot axis 18. If an operator grips the teat cup 1 above the second nipple 8 the gripping 30 surface will comprise the pressure surface 16b. The function of the detaching means is the same as in the embodiment shown in Fig. 1.

Fig. 3 shows a teat cup 1 provided with an air channel 15 35 located above the pulsating chamber 7 in the vicinity of the first end portion 1a of the teat cup 1. In this case, the casing 6 is

provided with a projecting arm 6d. An elongated element 20 has an extension through a hole in the projecting arm 6d and through the air channel 15. The elongated element 20 comprises a push button 20a at an outer end provided with a press surface 20b. The elongated element 20 comprises a valve body 20c at an opposite end in the recess 4. The valve body 20c comprises a blocking surface 20d adapted to block the inner opening 15a of the air channel 15. A draw spring 21 is adapted to act with a spring force on the valve body 20c for moving it to a closed position in which the blocking surface 20d blocks the inner opening 15a of the air channel 15.

When a milking operation has been finished and the teat cup 1 has to be detached from the teat, an operator grips, with one hand, a grip surface of the teat cup 1 comprising the press surface 20b of the press button 20a. The operator applies a pressure force 19 on the press surface 20b such that the elongated element 16 is displaced in a substantially straight-line direction against the action of the spring 21. In this case, the pressure force 19 is directed in an inclined direction towards the longitudinal centre axis 10 of the teat cup 1. The displacement motion of the elongated element 20 results in that the blocking surface 20d is displaced from the inner opening 15a such that ambient air flows to into the recess 4 via the air channel 15. Atmospheric pressure is established in the recess 4 and the teat cup 1 can be detached from the teat in a simple manner. Also in this case, an operator only has to grip a grip surface of the teat cup comprising the press surface 20b with one hand and applying a pressure force 19 on the press surface 20b for elimination of the vacuum pressure inside the recess 4 such that the teat cup 1 come loose from the teat.

Fig. 4 and 5 shows a teat cup 1 provided with two air channels 15 located above the pulsating chamber 7 in the vicinity of the first end portion 1a of the teat cup 1. In this case, an annular element 22 with flexible properties is mounted around an outer

periphery the mouthpiece 2 of the teat cup 1. The mouthpiece 2 has here an outer periphery with a substantially circular shape. The annular element 22 has an oval shape. The annular element 22 has an inner periphery comprising two blocking surfaces 22a
5 located on opposite sides of the annular element 22. The two blocking surfaces 22a are adapted to block the outer openings 15b of the air channels 15. The annular element 22 has two press surfaces 22b located on opposite sides of the annular element 22. The areas of the annular element 22 located radially
10 internally of the press surfaces 22b are located at a distance from the corresponding outer periphery of the mouthpiece 2. The blocking surfaces 22a form an angle of about 90° to the pressure surfaces 22b of the annular element 22. The annular element 22 may be attached to the outer periphery of the
15 mouthpiece 2 in a pre-stressed state such that the blocking surfaces 22a acts with a pressure against the outer openings 15b of the air channels 15.

When a milking operation has been finished and the teat cup 1
20 has to be detached from the teat, an operator grips, with one hand, a grip surface of the teat cup 1 comprising the press surfaces 22b of the annular element 22. The operator closes the hand such that pressure forces 19 are applied on the press surfaces 22b such that they are displaced radially inwardly
25 towards the outer periphery of the mouthpiece 2. The pressure forces 19 are directed in a radial direction towards the longitudinal centre axis 10 of the teat cup 1. Due to the flexible properties of the annular element 22, the blocking surfaces 22b are displaced radially outwardly such they will uncover the outer
30 openings 15a of the air channels 15. Ambient air flows to through the air channel 15 to the recess 4. Atmospheric pressure is established in the recess 4 and the teat cup 1 can be detached from the teat in a simple manner. The flexible annular element 22 returns to its original shape when the
35 pressure force on the pressure surfaces ceases.

The invention is not restricted to the described embodiments of the invention but may be varied freely within the scope of the claims. In the above embodiments, the air channel is located above and below the pulsating chamber 7 but it is of course
5 possible to arrange the air channel 15 such that it has an extension through the pulsation chamber 7.

Claims

1. A teat cup (1) comprising a first end portion with an opening (3) to a recess (4) for receiving a teat of a milking animal, a
5 passage (8, 13) through which a vacuum pressure is applied to the recess (4), a pulsating chamber (7) and a grip surface of the teat cup (1) adapted to be gripped by an operator during a detachment process of the teat cup (1) from a teat, wherein the teat cup (1) comprises detaching means comprising a press
10 surface (16b, 20b, 22b) which consists of a part of said grip surface, and pressure equalizing means adapted to establish atmospheric pressure in the recess (4) when the press surface (16b, 20b, 22b) is subjected to a predetermined pressure force (19), characterised in that the pressure equalizing means
15 comprises an air channel (15) having an extension between an inner opening (15a) to the recess (4) and an outer opening (15b) to ambient air and a mechanism adapted to open the air channel (15) when the pressure surface (16b, 20b, 22b) is subjected to said predetermined pressure force (19).

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2. A teat cup according to claim 1, characterised in that it comprises a centrally located longitudinal axis (10) having an extension through the first end portion of the teat and an oppositely located second end portion of the teat cup (1),
25 wherein said pressure equalizing means is adapted to establish atmospheric pressure in the recess (4) when the press surface (16b, 20b, 22b) is subjected to a predetermined pressure force (19) acting in a direction towards the longitudinal axis (10) of the teat cup.

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3. A teat cup according to claim 1 or 2, characterised in that said mechanism comprises an element (16, 20, 22) movably arranged between a first position in which a blocking surface (16a, 20d, 22a) of the element (16, 20, 22) blocks the air
35 channel (15) and a second position in which said blocking surface (16a, 20d, 22a) does not block the air channel (15).

4. A teat cup according to claim 3, characterised in that said element (16, 20, 22) comprises the pressure surface (16b, 20b, 22b).
- 5
5. A teat cup according to claim 3 or 4, characterised in that the mechanism comprises a spring member (17, 21) adapted to act with a spring force on the element (16, 20) for moving it to the first position.
- 10
6. A teat cup according to claim 3 or 4, characterised in that said element (22) has elastic properties and in that the element (22) is movable between the first position and the second position by means of elastic deformation.
- 15
7. A teat cup according to any one of the claims 3 to 6, characterised in that the element is a lever (16) pivotally mounted around an axis (18).
- 20
8. A teat cup according to claim 7, characterised in that the lever (16) comprises said press surface (16b) on one side of the axis (18) and a blocking surface (16a) on an opposite side of the axis (18).
- 25
9. A teat cup according to claim 3 or 4, characterised in that the element (20) is movably arranged between the first position and the second position by means of a substantially straight line displacement motion.
- 30
10. A teat cup according to claim 9, characterised in that the element (20) has an extension between a first end and a second end wherein the pressing surface (20b) is arranged at the first end and the blocking surface (20d) at the second end.
- 35
11. A teat cup according to any one of claims 3 to 10, characterised in that the blocking surface (20d) is adapted to

block the inner opening (15a) of the air channel (15) when the pressure surface (20b) is not subjected to said pressure force (19).

5 12. A teat cup according to any one of claims 3 to 10, characterised in that the blocking surface (16a, 22a) of the element (16, 22) is adapted to block the outer opening (15b) of the air channel (15) when the press surface (16b, 22b) is not subjected to said pressure force (19).

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13. A teat cup according to claim 12, characterised in that the element (22) is annular and mounted around an outer periphery surface the teat cup (1) wherein the annular element (22) has at least one blocking surface (22a) located at an inner periphery and at least one pressure surface (22b) located at an outer periphery.

15

14. A teat cup according to claim 13, characterised in that the inner periphery of the annular element (22) has an oval shape when it is in the first position.

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15. A teat cup according to claim 14, characterised in that the blocking surface (22a) of the annular element (22) forms an angle in the range of 70-110°, preferably about 90° to the pressure surface (22b) of the annular element (22).

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16. A teat cup according to any one of the preceding claims, characterised in that the air channel (15) is located above the pulsating chamber (7) when the teat cup is in a position with the first end portion directed upwardly.

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17. A teat cup according to any one of the preceding claims, characterised in that the air channel (15) is located in a position below the pulsating chamber (7) when the teat cup is in a position with the first end portion directed upwardly.

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18. A teat cup according to any one of the preceding claims, characterised in that the teat cup comprises a valve mechanism (11-13) in the teat cup (1) which is adapted to close the vacuum pressure supply to the recess (4) when ambient pressure prevails in the recess (4).
- 5

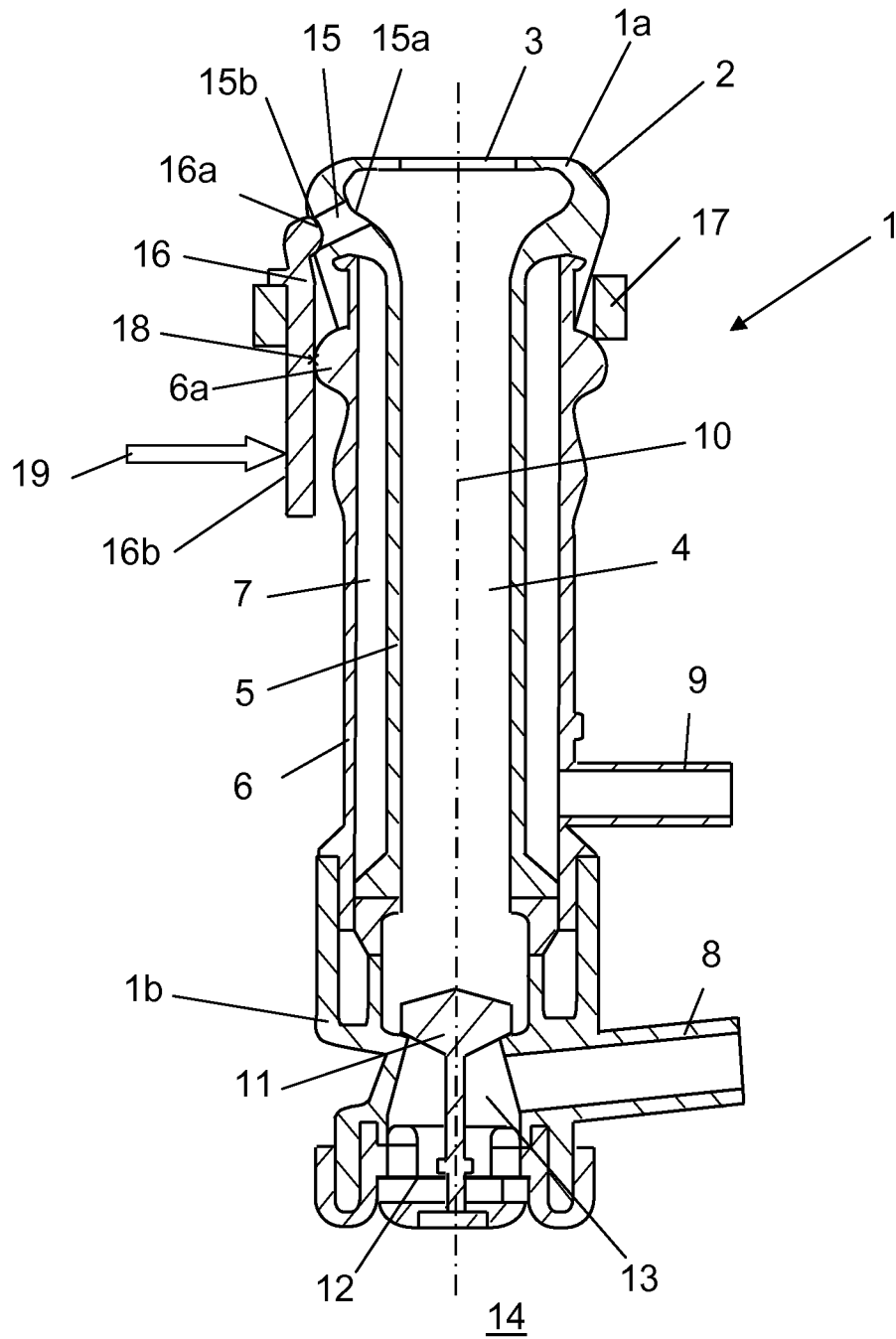


Fig 1

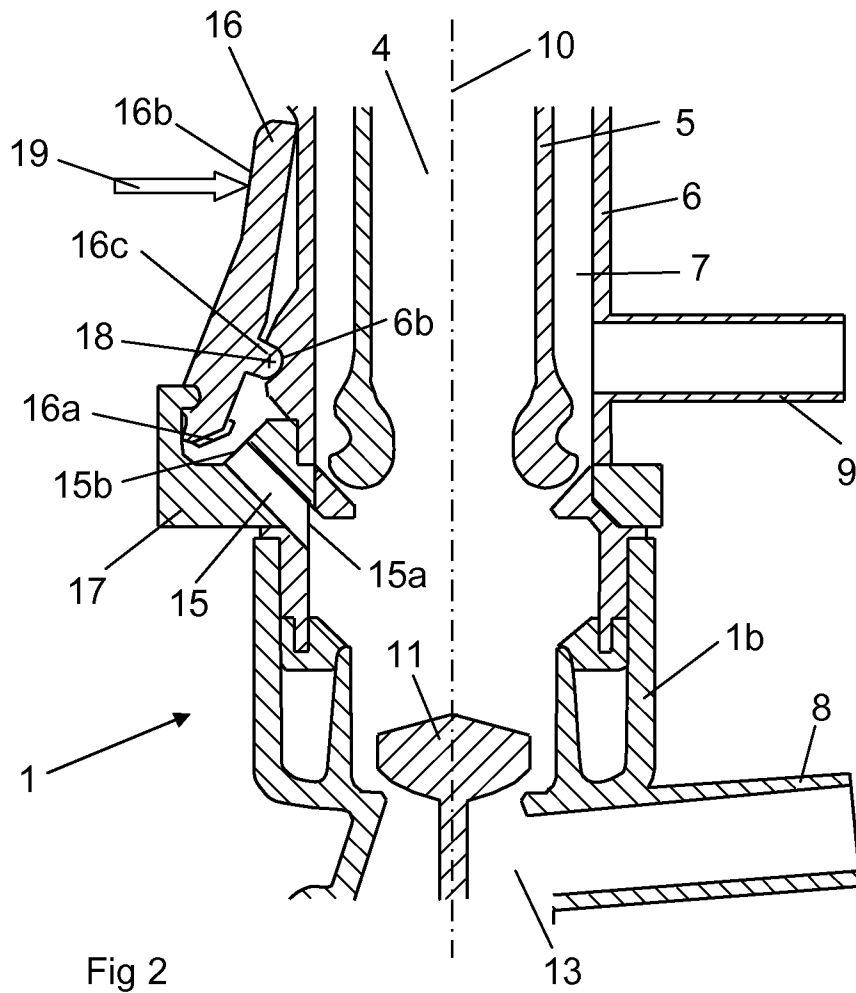


Fig 2

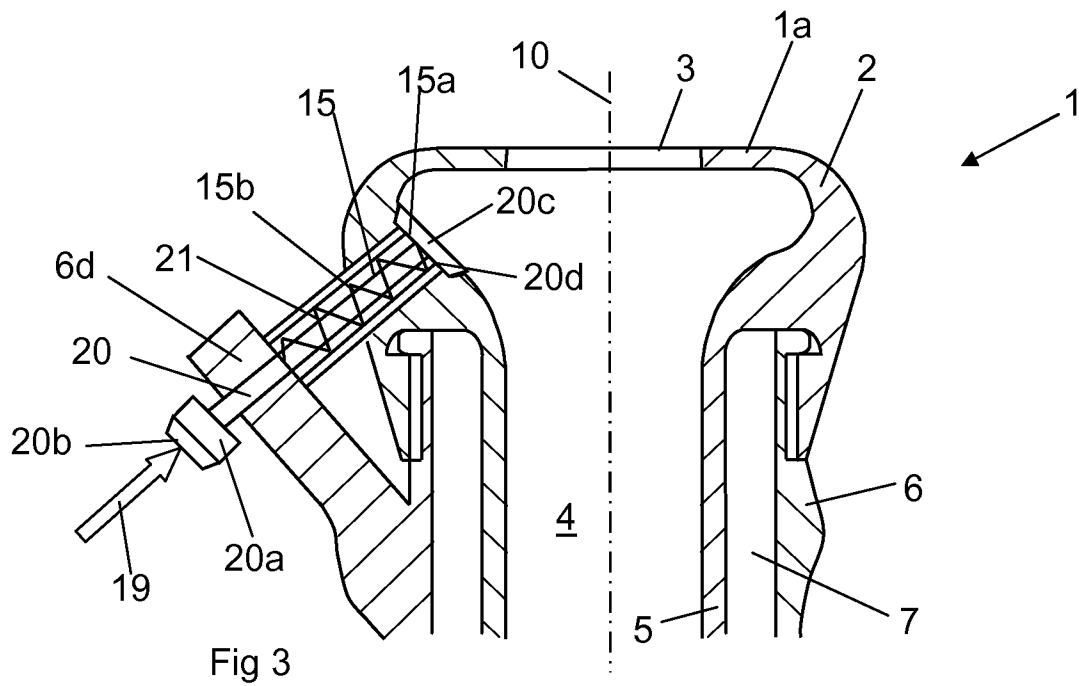


Fig 3

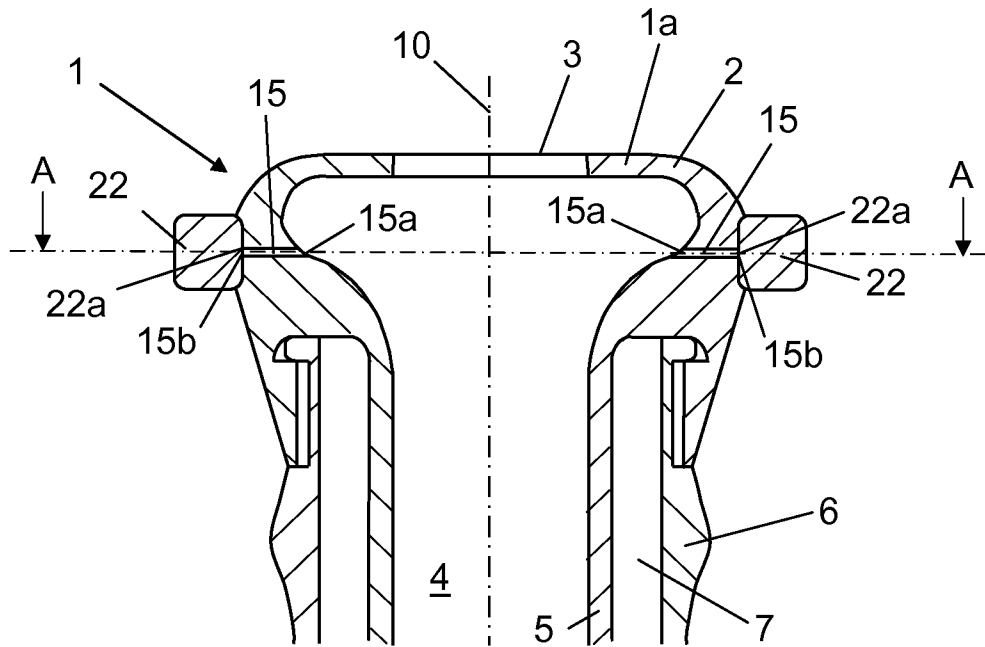


Fig 4

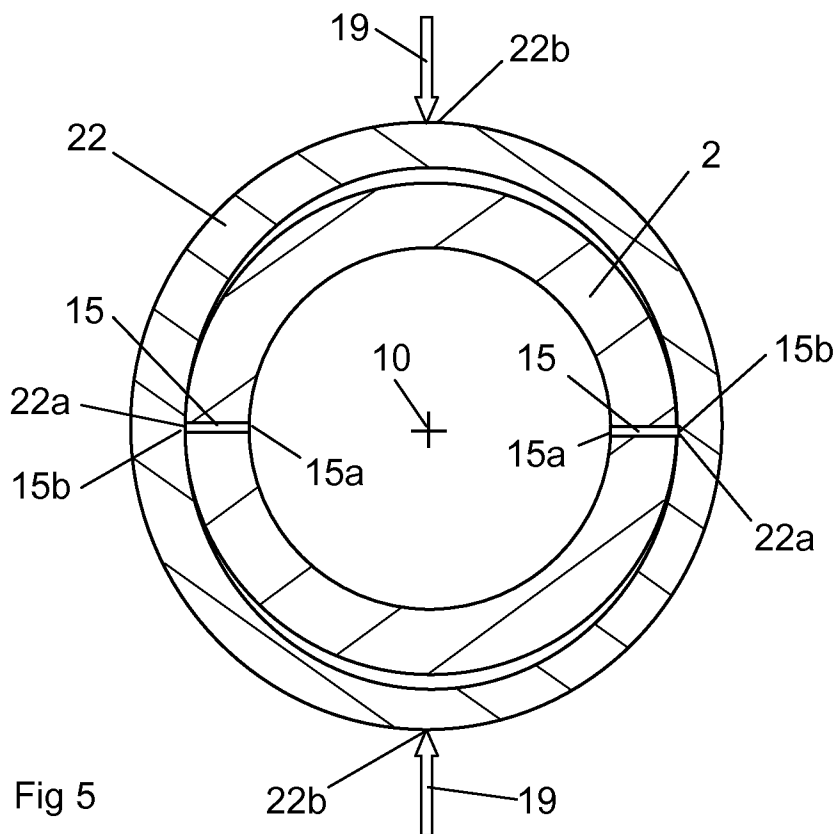


Fig 5