



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
11.05.2022 Bulletin 2022/19

(51) International Patent Classification (IPC):
A62B 18/10 (2006.01)

(21) Application number: **21206719.3**

(52) Cooperative Patent Classification (CPC):
A62B 18/10

(22) Date of filing: **05.11.2021**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(30) Priority: **09.11.2020 IT 202000026720**

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(54) **EXHALATION VALVE FOR A RESPIRATORY PROTECTIVE FACIAL DEVICE.**

(57) An exhalation valve for a respiratory protective facial device is described, comprising a valve body, a cover which covers the exhalation valve on the outside and an impermeable membrane positioned between valve body and cover. The valve cover comprises an internal section comprising first openings and an external section comprising second openings. The internal section and the external section are movable relative to each

other between a first position in which the first and second openings are mutually aligned so as to form a passage for the outgoing air flow, and a second position in which the first and second openings are offset with respect to each other so that the cover is closed. The second openings are in the shape of right-angled circular sectors. The cover also comprises stop means which keep the cover in the first position and in the second position.

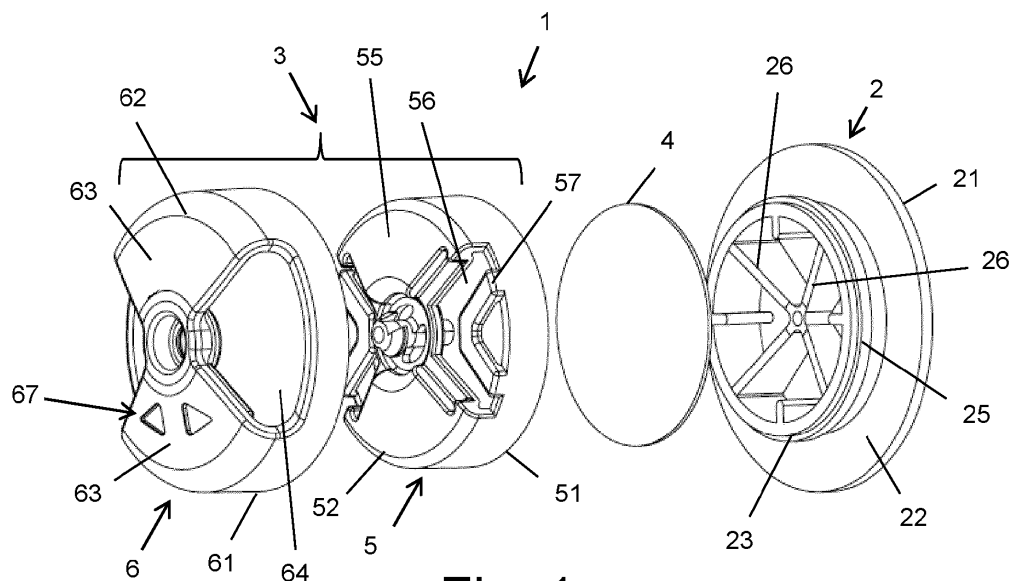


Fig. 1a

Description

Technical field

[0001] The present invention relates in general to the field of respiratory protective facial devices. In particular, the present invention relates to an exhalation valve for a respiratory protective facial device and a respiratory protective facial device comprising such a valve.

Prior art

[0002] In the present description and the claims, "respiratory protective facial device" will be understood as meaning a face mask capable of filtering microscopic particles suspended in the air. Respiratory protective facial devices are used in different environments, such as the industrial, chemical, sanitary and other environments.

[0003] The standard EN 149 defines three different filtering classes for these devices, each of which corresponds to a different filtering efficiency. The class FFP1 ensures minimum filtering of 80% of the suspended particles, the class FFP2 ensures a minimum filtering of 94% of the suspended particles, while the class FFP3 ensures a minimum filtering of 99% of the suspended particles. In the sanitary field, FFP2 or FFP3 class devices are generally used for the protection of personnel from viruses and bacteria present in the air.

[0004] Wearing a respiratory protective facial device for a long period of time may be uncomfortable, both because the filtering layers make respiration difficult and because heat and moisture tend to accumulate inside the device. In order to overcome these drawbacks, some facial devices are provided with an exhalation valve. This valve allows the air to pass in the outgoing direction (namely from the inside of the device towards the outside), thus facilitating the exhalation and reducing the formation of moisture inside the facial device, which thus becomes more comfortable to wear.

[0005] In some situations, however, the exhalation valve may exhibit drawbacks. The air which passes in the outgoing direction through the exhalation valve is not filtered by the filtering layers of the facial device. If, therefore, it in turn contains contaminants (for example in a sanitary environment, viruses or bacteria present in the respiratory droplets of the operator wearing the device) these may be transmitted from the operator to the surrounding environment.

[0006] KR 2020 0114183 describes an exhalation device for a face mask, comprising a housing fixable to the mask and suitable for housing a membrane. The housing has a plurality of holes for allowing the air to pass through. The device also comprises a control member fixed onto the outer side of the housing, also with a plurality of holes for allowing the air to pass through. The control member is rotatable between an open position, in which its holes are aligned with the underlying holes in the housing of the membrane, and a closed position, in which the holes

are out of alignment and therefore prevent the exhaled air from passing out.

[0007] The Applicant has noticed that the exhalation device described by KR 2020 0114183 exhibits some drawbacks.

[0008] Firstly, in order to determine whether the control member of the device according to KR 2020 0114183 is in the desired open or closed position, the user must be able to see the device itself. This is possible only if the user is standing in front of a mirror. Otherwise, the user must remove the mask and directly examine the device, which operation obviously may be risky for the user and/or for the other persons who are in the same environment.

[0009] Moreover, the control member of the device according to KR 2020 0114183 has many small holes which are situated relatively close together. This has the effect that the angle of rotation of the control member between the closed position and the open position is very small.

The user must therefore adjust the angle of rotation of the control member very precisely, in order to ensure that the device is in the desired open or closed position. Moreover, accidental rotation, even by a small amount, of the control member could inadvertently result in the exhalation device passing from the closed position to the open position or vice versa, something which - especially in the first case - may be risky for the user and/or for the other persons who are in the same environment.

[0010] Furthermore, the control member of the device according to KR 2020 0114183 may be difficult to rotate, in particular in the case where the user is wearing gloves.

[0011] An object of the present invention is to provide an exhalation valve for a respiratory protective facial device and a respiratory protective facial device comprising such a valve, which solve the aforementioned drawbacks.

[0012] In particular, an object of the present invention is to provide an exhalation device for a respiratory protective facial device, which may be controlled more easily by the user and which is safer both for the user and for the other persons who are present in the same environment.

[0013] According to embodiments of the present invention, this object is achieved by an exhalation device comprising a valve body, a cover which covers and protects the valve on the outside and an impermeable membrane which is arranged between the valve body and cover. The cover comprises an internal section and an external section. Each section comprises at least one respective opening. The two sections of the cover are movable relative to each other between a first position (also referred to below as "open position"), in which the openings of the two sections are at least partially aligned with each other so as to define a passage for an outgoing air flow through the valve cover, and a second position (also referred to below as "closed position"), in which the openings of the two sections are offset so that the valve cover is closed (namely it does not allow essentially any air to

pass through). The openings in the external section of the cover are in shape of right-angled circular sectors and the cover furthermore comprises stop means configured to keep the cover in the open or closed position once it has been reached.

[0014] This exhalation valve advantageously makes the facial device comfortable to wear for a long period of time and, if necessary, allows the filtering efficiency of the facial device to be maintained also in the outgoing direction. By adjusting the valve cover (and, in particular, by moving the external section of the cover with respect to the internal section), the user of the facial device may indeed easily move the valve cover from the closed position to the open position and vice versa, depending on the situation in which he/she finds him/herself. A sanitary operator, for example, may keep the valve cover in the closed position when he/she is in the vicinity of patients and/or colleagues, so as to prevent any contaminants (viruses or bacteria) present in his/her respiratory droplets from spreading in the surrounding environment. Only when the operator is on his/her own or in any case at a distance from patients and/or colleagues, he/she may instead adjust the valve cover into the open position so as to be able to breath out more easily and allow heat and moisture present inside the device to escape.

[0015] Moreover, the openings in the shape of a right-angled circular sector in the external section of the valve cover form an easy and firm gripping point for the user. The user may indeed rest the tips of two fingers (for example the thumb and index finger) on these openings, while he/she is wearing the facial device and move them so as to rotate the external section of the cover. Advantageously, the exhalation valve may thus be adjusted into the desired open or closed position easily, even when the user is wearing gloves.

[0016] The right-angled circular sector shape of the openings in the external section of the cover also allow a large portion of the underlying internal section of the cover to be left exposed. This allows the user to feel, with the tips of his/her fingers, the presence of the openings in the underlying internal section of the cover (this indicating that the open position of the valve has been reached) or the absence thereof (this indicating that the closed position of the valve has been reached).

[0017] On the other hand, the stop means advantageously block the rotation of the external section of the cover when the open or closed position is reached, preventing for example the user from continuing the rotation and moving the valve into a position different from the desired one. The stop means also prevent any accidental rotation of the external section of the cover, thus preventing the valve from being accidentally moved from the closed position to the open position or vice versa.

[0018] The exhalation valve according to the present invention is therefore controllable by the user in a particularly easy manner and is also particularly safe both for the user and for the other persons who are present in the same environment.

[0019] According to a first aspect of the present invention, an exhalation valve for a respiratory protective facial device is provided, the exhalation valve comprising a valve body, a cover suitable for covering the exhalation valve on the outside and an impermeable membrane positioned between the valve body and the cover, wherein the cover comprises an internal section comprising at least one first opening and an external section comprising at least one second opening, wherein the internal section and the external section are movable relative to each other between a first position in which the at least one second opening is at least partially aligned with the at least one first opening so as to form a passage for the air flow through the cover, and a second position in which the at least one second opening is offset with respect to the at least one first opening so that the cover is closed, wherein the at least one second opening is in the shape of a right-angled circular sector and wherein the cover also comprises stop means configured to keep the cover in each of the first and second positions.

[0020] Preferably, the internal section of the cover comprises a first cylindrical body with a first sidewall and a first base which is substantially circular, and the external section of the cover comprises a second cylindrical body with a second sidewall and a second base which is substantially circular and comprises the at least one second opening.

[0021] Preferably, the internal section and the external section of the cover are mutually rotatably engaged so that the first base and the second base are rotatable relative to each other.

[0022] Preferably, the internal section and the external section of the cover comprise respective complementary rotatable engaging members, these complementary rotatable engaging members comprising a peg projecting from the first base and a hole in the second base, the peg being shaped so as to snap-engage with the hole.

[0023] Preferably, the at least one second opening extends up to an edge of the second base and along a portion of the second sidewall of the external section.

[0024] Preferably, the at least one first opening is in the shape of a right-angled circular sector.

[0025] Preferably, the at least one first opening extends up to an edge of the first base and along a portion of the first sidewall of the internal section.

[0026] According to one embodiment, the internal section of the cover comprises two first openings and the external section of the cover comprises two second openings, and in the first position the two second openings are at least partially aligned with the two first openings and in the second position the two second openings are offset with respect to the two first openings.

[0027] More particularly, the two first openings preferably are in shape of two opposite right-angled circular sectors and the two second openings are in the shape of two opposite right-angled circular sectors, and passing from the first position into the second position involves a substantially 90° rotation of the external section with re-

spect to the internal section of the cover.

[0028] According to one embodiment, the stop means comprise at least one groove extending radially along an edge of the at least one first opening and at least one protrusion extending radially along an edge of the at least one second opening, the at least one protrusion being suitable for engaging with the at least one groove when the cover is in the first position or in the second position.

[0029] Preferably, the internal section of the cover comprises a snap-engaging member for snap-engagement with the valve body.

[0030] According to one embodiment, the internal section of the cover comprises a locking member for locking the impermeable membrane, the locking member being configured to lock a central portion of the impermeable membrane against the valve body and leave a peripheral portion of the impermeable membrane free to move away from the valve body so as to allow the passage of the outgoing air flow around the impermeable membrane.

[0031] Preferably, the at least one first opening is provided with a tongue which is configured to protect a portion of the impermeable membrane situated behind the at least one first opening and limit lifting thereof under the effect of the outgoing air flow through the cover.

[0032] According to a second aspect of the present invention, a respiratory protective facial device comprising an exhalation valve as described above is provided.

Brief description of the drawings

[0033] The present invention will become clearer from the following detailed description, given by way of a non-limiting example, to be read with reference to the accompanying drawings, in which:

- Figures 1a and 1b are two front and rear exploded perspective views, respectively, of the exhalation valve according to an embodiment of the present invention;
- Figures 2a-2d are axonometric front views of the four components of the exhalation valve according to an embodiment of the present invention;
- Figures 3a and 3b are two longitudinally sectioned views of the exhalation valve according to an embodiment of the present invention, in the closed position and open position, respectively;
- Figures 4a and 4b are two front perspective views of the exhalation valve according to an embodiment of the present invention, in the closed position and open position, respectively;
- Figure 5 shows in greater detail the stop mechanism of the valve, according to an embodiment of the present invention; and
- Figure 6 shows a respiratory protective facial device comprising the exhalation valve according to an embodiment of the present invention.

Detailed description of embodiments of the invention

[0034] In the following description and the claims, the adjectives "front" and "rear" will be used with reference to the direction of operation of the valve 1. Therefore, the terms "front" and "rear" will indicate elements which are located respectively further downstream and further upstream along the air flow which passes through the valve 1. Similarly, the expressions "front/outgoing direction" and "rear/incoming direction" will indicate respectively a direction parallel to the air flow through the valve 1 and the opposite direction.

[0035] Herein below, with reference to the drawings, an exhalation valve 1 according to an embodiment of the present invention will be described.

[0036] The exhalation valve 1 comprises a valve body 2, a cover 3 suitable for covering and protecting the valve 1 on the outside and an impermeable membrane 4 arranged between the valve body 2 and the cover 3.

[0037] The valve body 2 (see Figs. 1a, 1b and 2a) preferably comprises a flat annular member 21 which has a surface 22 for the fixing to the facial device. The body 2 also comprises a tubular portion 23 which extends from the surface 22 of the annular member 21 along the front or outgoing direction. The annular member 21 and the tubular portion 23 define an air passage 24. The outer surface of the tubular portion 23 has a member for engagement with the cover 3, preferably in the form of a step 25 which extends circumferentially around the tubular portion 23. Two partitions 26 perpendicular to each other cross the air passage 24, dividing it longitudinally into four substantially identical sectors. On the rear side of the body 2 (visible in Fig. 1b) the edges of the two partitions 26 are rectilinear, while on the front side (visible in Fig. 1a) the edges of the two partitions 26 have a "V" shape with the vertex at their intersection. This shape is such that on the front side the two partitions 26 are inset with respect to the tubular portion 23 at their intersection, such as to form a conical shaped seat 27 for the membrane 4.

[0038] The impermeable membrane 4 preferably has a circular shape and has an internal diameter substantially corresponding to the diameter of the air passage 24 (i.e. the internal diameter of the tubular portion 26). It is preferably thin and flexible, so as to flex when the air passes in the outgoing direction (exhalation) and so as to return into the original position when the air passes in the incoming direction (inhalation).

[0039] The cover 3 preferably comprises an internal section 5 and an external section 6. The latter is accessible manually by a user who wears a facial device comprising the valve 1.

[0040] The internal section 5 preferably has a substantially cylindrical body, with a sidewall 51 and a base 52 arranged so as to close the front side of the cylindrical body.

[0041] The internal section 5 comprises a member for

engagement with the valve body 2. This engaging member is of the snap-engaging type and preferably is in the form of a projection 53 which extends circumferentially around the inner surface of its sidewall 51. As can be seen in Figs. 3a and 3b, in order to engage the internal section 5 of the cover 3 with the valve body 2, said section is fitted onto the tubular portion 23 of the body 2 and pushed until the projection 53 passes over the step 25 on the outer surface of the tubular portion 23 and remains locked underneath it.

[0042] The internal section 5 of the cover 3 preferably also comprises a membrane locking member 4. This locking member is preferably in the form of a peg 54 which projects from the base 52 in the rear direction. When the internal section 5 of the cover 3 is fitted onto the valve body 2 and engaged with it as described above, with the membrane 4 positioned in the conical seat 27, the rear end of the peg 54 presses the membrane 4 against the front V-shaped edges of the partitions 26 so as to close the air passage 24. The central portion of the membrane 4 remains locked between the peg 54 and the intersection of the partitions 26, while its peripheral portion is not locked and may therefore move away from the front V-shaped edges of the partitions 26, for example under the thrust of the air exhaled by the user of the facial device comprising the valve 1, so as to allow the exhaled air to flow in the outgoing direction across the passage 24 and about the perimeter of the membrane 4.

[0043] The internal section 5 of the cover 3 preferably has at least one opening for allowing passage of the air which flows across the passage 24 in the valve 2 and around the perimeter of the membrane 4. According to one embodiment, the base 52 of the internal section 5 comprises two opposite partitions 55 in the shape of right-angled circular sectors, which define two opposite openings 56 which are also in the shape of right-angled circular sectors (namely circular sectors with a substantial right angle at the centre). Preferably, the openings 56 extend through the base 52 of the internal section 5 in the radial direction up to the edge of the base 52, and also along a portion of the sidewall 51 of the internal section 5.

[0044] Each opening 56 is preferably provided with a tongue 57 suitable for providing the membrane portion 4 situated behind the opening 56 with a mechanical protection and to limit its lifting under the effect of the exhaled air. The tongues 57 are preferably in a retracted position with respect to the partitions 55.

[0045] Also the external section 6 of the cover 3 preferably has a substantially cylindrical body with a sidewall 61 and a base 62 arranged so as to close the front side of the cylindrical body.

[0046] The external section 6 preferably has at least one opening for allowing the passage of the air which flows across the passage 24 in the valve body 2 and around the perimeter of the membrane 4. According to one embodiment, the base 62 of the external section 6 comprises two opposite partitions 63 in the shape of right-angled circular sectors which define two opposite open-

ings 64, which are also in the shape of right-angled circular sectors (namely circular sectors with a substantial right angle at the centre). Preferably, the openings 64 extend through the base 62 of the external section 6 in the radial direction up to the edge of the base 62, and also along a portion of the sidewall 61 of the external section 6.

[0047] According to the present invention, the internal section 5 and the external section 6 of the cover 3 are movable relative to each other so as to be able to adjust the cover 3 from an open position to a closed position and vice versa.

[0048] In the open position (shown in Figs. 3b and 4b), the internal section 5 and the external section 6 of the cover 3 are positioned with respect to each other so that the openings 64 of the external section 6 are at least partially aligned with the openings 56 of the internal section 5. In this position, the openings 64 and 56 aligned with each other form a passage through the cover 3, which allows the air which flows through the passage 24 and around the perimeter of the membrane 4 to flow out of the valve 1 through the cover 3.

[0049] In the closed position (shown in Figs. 3a and 4a), instead, the internal section 5 and the external section 6 of the cover 3 are positioned with respect to each other so that the partitions 63 of the external section 6 are arranged to close the openings 56 of the internal section 5, while the partitions 55 of the internal section 5 are arranged to close the openings 64 of the external section 6. In this position, the partitions 55 and 63 of the two sections 5 and 6 basically are arranged adjacent to each other and close the cover 3, namely do not allow substantially any air to pass through the cover 3.

[0050] Preferably, the external section 6 is engaged rotatably with the internal section 5 of the cover 3, such that passing between the closed position and the open position of the cover 3 is obtained by the user of the facial device by rotating the external section 6 substantially through 90° with respect to the internal section 5, which is in turn fixed with respect to the valve body 2.

[0051] In particular, the internal section 5 and the external section 6 comprise respective complementary rotatable engaging members which allow the rotation of the external section 6 with respect to the internal section 5. According to one embodiment, in particular, the peg 54 of the internal section 5 has at its front end a shaped head 58 which forms a step 59. The base 62 of the external section 6 on the other hand has a central hole with an edge 65 which extends in the rear direction and forms a tooth 66. In order to engage rotatably the internal section 5 and the external section 6, the latter is fitted onto the internal section 5 and pushed until the tooth 66 passes over the step 59 and remains locked underneath it.

[0052] The user may therefore open and close the valve 1 by rotating the external section 6 of the cover 3, which will rotate about an axis coinciding with the axis of the peg 54 of the internal section 5. The operation is easy and may be repeated by the user whenever the need

arises.

[0053] The openings 64 in the shape of a right-angled circular sector in the external section 6 of the cover 3 of the valve 1 indeed form an easy and firm gripping point for the user. The user may indeed rest the tips of two fingers (for example the thumb and index finger) on these openings 64, while he/she is wearing the face mask, and move them so as to rotate the external section 6 of the cover 3. Advantageously, the valve 1 may thus be adjusted into the desired open or closed position easily, even when the user is wearing gloves.

[0054] The right-angled circular sector shape of the openings 64 also allows a large portion of the underlying internal section 5 of the cover 3 to be left exposed. This allows the user to feel, with the tips of his/her fingers, the presence of the openings 56 in the underlying internal section 5 of the cover 3 (this indicating that the open position of the valve 1 has been reached) or the absence thereof (this indicating that the closed position of the valve 1 has been reached).

[0055] In order to further facilitate gripping by the operator, the external section 6 may have one or more knurled areas.

[0056] The outer surface of the base 62 of the external section 6 may be provided with (e.g. have printed thereon) visual symbols 67 (for example, two opposite arrows) which indicate to the user the possibility of rotating the external section 6.

[0057] Preferably, the cover 3 has stop means, which are configured to stop the cover 3 in its closed position or in its open position. In particular, the front surface of the base 52 of the internal section 5 is provided with at least one groove. This groove is preferably straight and extends radially from the centre of the base 52. According to the embodiment shown in the drawings, four radial grooves 70 are provided, perpendicular to each other, each groove being arranged at the boundary between a partition 55 and an opening 56. On the other hand, the rear surface of the base 62 of the external section 6 is provided with at least one protrusion suitable for engaging with the at least one groove of the internal section 5. This protrusion is preferably straight and extends radially from the centre of the base 62. According to the embodiment shown in the drawings, two radial protrusions 71 are provided, perpendicular to each other, each protrusion being arranged at the boundary between a partition 63 and an opening 64.

[0058] When the external section 6 is rotated, for example so as to bring the valve 1 into the open position, the protrusions 71 rotate with it. As shown in Fig. 5, when the openings 64 moves towards a position of alignment with the underlying openings 56, each protrusion 71 moves towards a respective groove 70. Once the alignment has been completed, the edges of each opening 63 are aligned with the edges of a respective underlying opening 56, such that each protrusion 71 engages with a respective groove 70. This engagement acts as an end run for the rotation of the external section 6, and moreover

keeps the external section 6 in the open position.

[0059] Similarly, when the external section 6 is rotated to bring the valve 1 into the closed position, the partitions 63 move towards a position of alignment with the underlying openings 56, such that in this case also each protrusion 71 moves towards a respective groove 70. Once alignment has been completed, the edges of each partition 63 are aligned with the edges of a respective underlying opening 56, such that each protrusion 71 engages with a respective groove 70. This engagement acts as an end run for the rotation of the external section 6 and moreover keeps the external section 6 in the closed position.

[0060] The stop means, therefore, advantageously block the rotation of the external section 6 of the cover 3 when the open or closed position is reached, preventing for example the user from continuing the rotation and moving the valve 1 into a position different from the desired one. The stop means also prevent any accidental rotation of the external section 6 of the cover 4, thus preventing the valve 1 from being accidentally moved from the closed position into the open position or vice versa.

[0061] Figure 6 shows a respiratory protective facial device 100 comprising the exhalation valve 1 according to embodiments of the present invention. The valve 1 may be used on different types of facial devices, also disposable devices, having any shape and belonging to any filtering class.

[0062] The valve 1 is preferably fixed to the device 100 during the process for manufacture of the device itself. For example, the valve 1 may be fixed to the device 100 by means of ultrasounds.

[0063] This exhalation valve 1 advantageously makes the facial device comfortable to wear for a long period of time and, if necessary, allows the filtering efficiency of the facial device to be maintained also in the outgoing direction. By adjusting the cover 3 (and, in particular, by rotating the external section 6 of the cover 3 with respect to the internal section 5), the user of the facial device may indeed easily move the valve cover 3 from the closed position to the open position and vice versa, depending on the situation in which he/she finds him/herself. A sanitary operator, for example, may keep the cover 3 in the closed position when he/she is in the vicinity of patients and/or colleagues, so as to prevent any contaminants (viruses or bacteria) present in his/her respiratory droplets from spreading in the surrounding environment. When the operator is on his/her own or in any case at a distance from patients and/or colleagues, he/she may instead adjust the cover 3 into the open position, so as to be able to breath out more easily and allow heat and moisture present inside the facial device to escape.

Claims

1. Exhalation valve (1) for a respiratory protective facial device (100), said exhalation valve (1) comprising a

- valve body (2), a cover (3) suitable for covering said exhalation valve (1) on the outside and an impermeable membrane (4) positioned between said valve body (2) and said cover (3), wherein said cover (3) comprises an internal section (5) comprising at least one first opening (56) and an external section (6) comprising at least one second opening (64), wherein said internal section (5) and said external section (6) are movable relative to each other between a first position in which said at least one second opening (64) is at least partially aligned with said at least one first opening (56) so as to form a passage for an outgoing air flow through said cover (3), and a second position in which said at least one second opening (63) is offset with respect to said at least one first opening (56) so that said cover (3) is closed, wherein said at least one second opening (64) is in the shape of a right-angled circular sector and wherein said cover (3) also comprises stop means configured to keep said cover (3) in each of said first and second positions.
2. Exhalation valve (1) according to claim 1, wherein said internal section (5) of said cover (3) comprises a first cylindrical body with a first sidewall (51) and a first base (52) which is substantially circular and wherein said external section (6) of said cover (3) comprises a second cylindrical body with a second sidewall (61) and a second base (62) which is substantially circular.
 3. Exhalation valve (1) according to claim 2, wherein said internal section (5) and said external section (6) of said cover (3) are mutually rotatably engaged so that said first base (52) and said second base (62) are rotatable relative to each other.
 4. Exhalation valve (1) according to claim 3, wherein said internal section (5) and said external section (6) of said cover (3) comprise respective complementary rotatable engaging members, said complementary rotatable engaging members comprising a peg (54) projecting from said first base (52) and a hole in said second base (62), said peg (54) being shaped to snap-engage with said hole.
 5. Exhalation valve (1) according to any one of claims 2 to 4, wherein said at least one second opening (64) extends up to an edge of said second base (62) and along a portion of said second sidewall (61) of said external section (6).
 6. Exhalation valve (1) according to any one of claims 2 to 5, wherein said at least one first opening (56) is in the shape of a right-angled circular sector.
 7. Exhalation valve (1) according to claim 6, wherein said at least one first opening (56) extends up to an edge of said first base (52) and along a portion of said first sidewall (51) of said internal section.
 8. Exhalation valve (1) according to claim 7, wherein said internal section (5) of said cover (3) comprises two first openings (56) and wherein said external section (6) of said cover (3) comprises two second openings (64), wherein in said first position said two second openings (64) are at least partially aligned with said two first openings (56) and wherein in said second position said two second openings (64) are offset with respect to said two first openings (56).
 9. Exhalation valve (1) according to claim 8, wherein said two first openings (56) are in the shape of two opposite right-angled circular sectors and wherein said two second openings (64) are in the shape of two opposite right-angled circular sectors, and wherein passing from said first position to said second position involves a substantially 90° rotation of said external section (6) with respect to said internal section (5).
 10. Exhalation valve (1) according to any one of the preceding claims, wherein said stop means (5) comprise at least one groove (70) extending radially along an edge of said at least one first opening (56) and at least one protrusion (71) extending radially along an edge of said at least one second opening (64), said at least one protrusion (71) being suitable for engaging with said at least one groove (70) when said cover (3) is in said first position or in said second position.
 11. Exhalation valve (1) according to any one of the preceding claims, wherein said internal section (5) comprises a snap-engaging member (53) for snap-engagement with said valve body (2).
 12. Exhalation valve (1) according to any one of the preceding claims, wherein said internal section (5) comprises a locking member (54) for locking said impermeable membrane (4), said locking member (54) being configured to lock a central portion of said impermeable membrane (4) against said valve body (2) and leave a peripheral portion of said impermeable membrane (4) free to move away from said valve body (2) so as to allow the passage of said outgoing air flow around said impermeable membrane (4).
 13. Exhalation valve (1) according to claim 12, wherein said at least one first opening (56) is provided with a tongue (57) configured to protect a portion of said impermeable membrane (4) situated behind said at least one first opening (56) and to limit lifting thereof under the effect of said outgoing air flow through said cover (3).
 14. Respiratory protective facial device (100) comprising

an exhalation valve (1) according to any one of claims 1 to 13.

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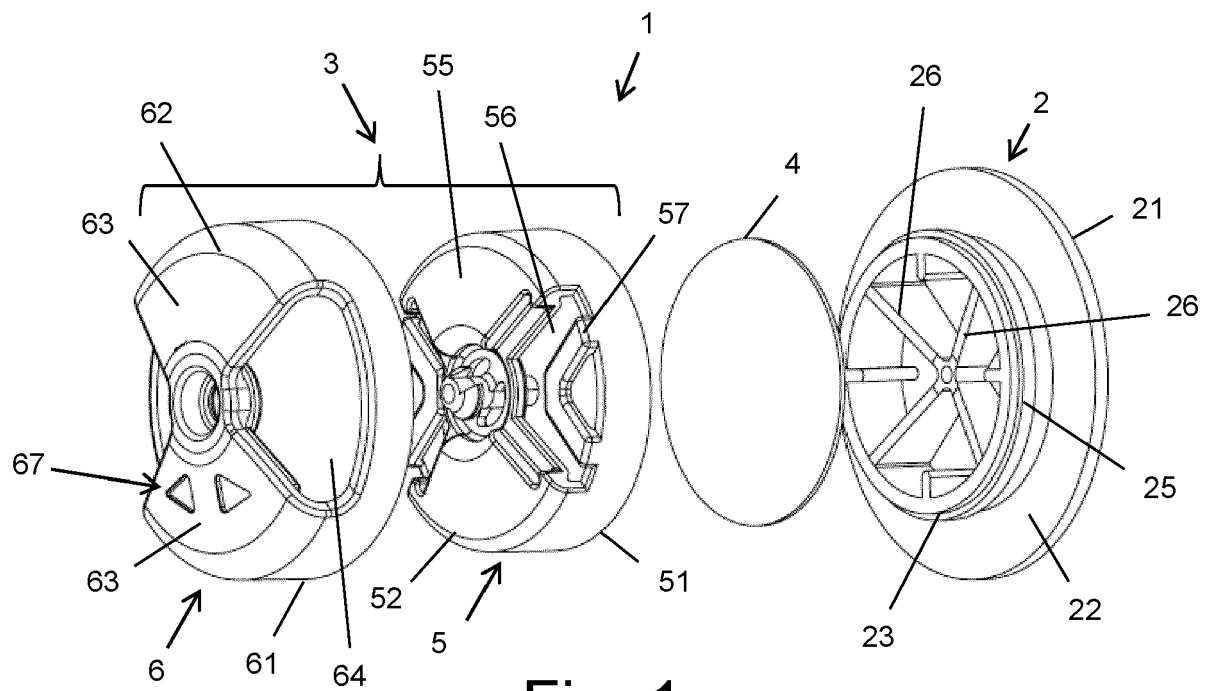


Fig. 1a

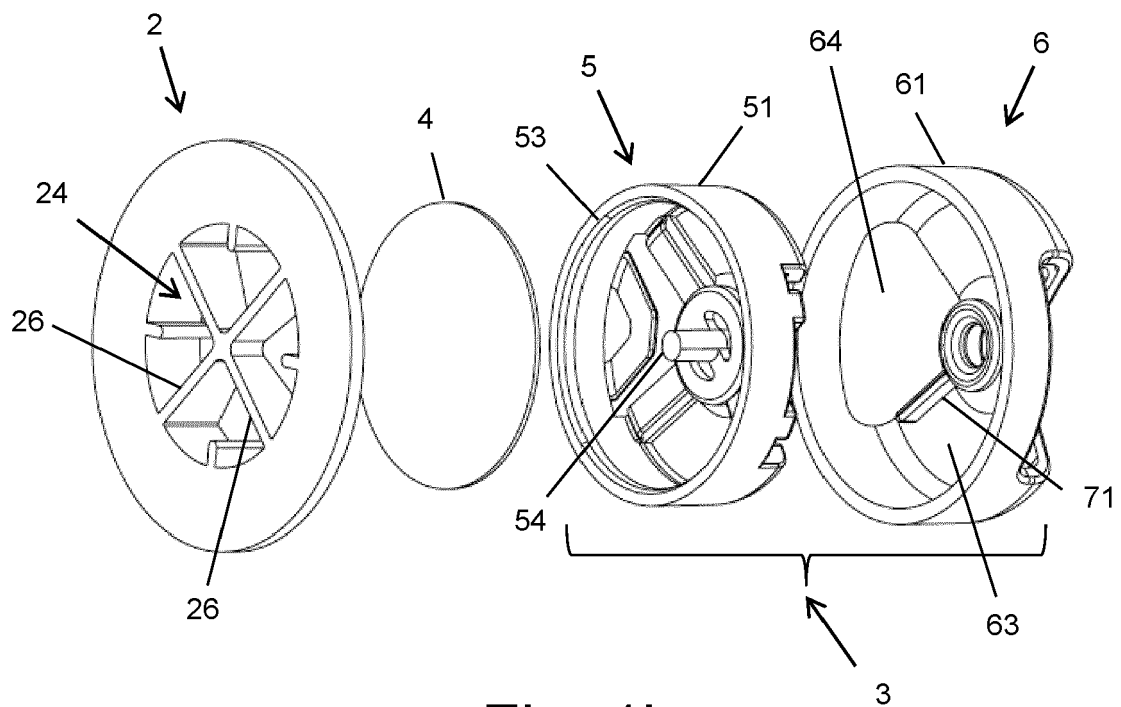


Fig. 1b

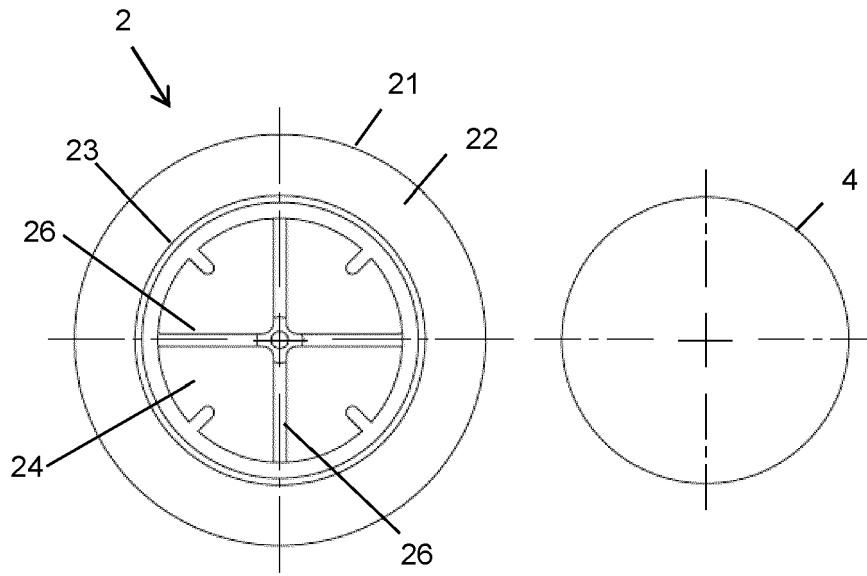


Fig. 2a

Fig. 2b

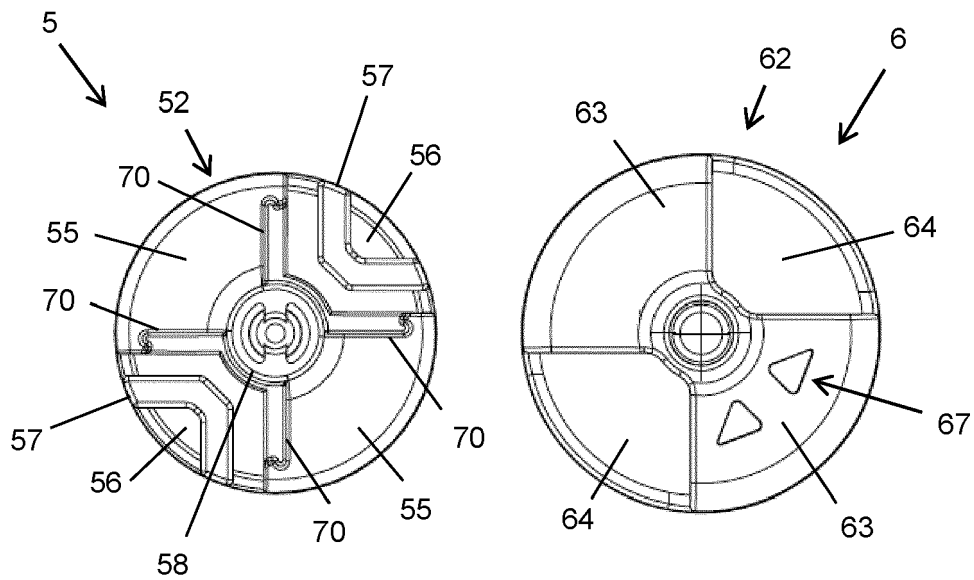


Fig. 2c

Fig. 2d

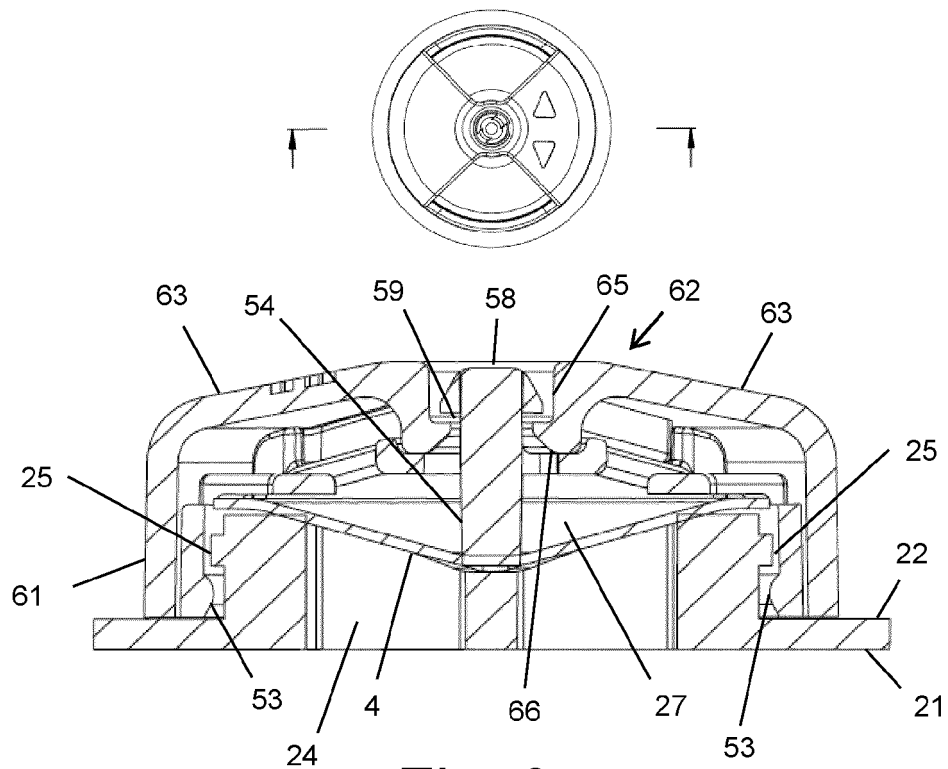


Fig. 3a

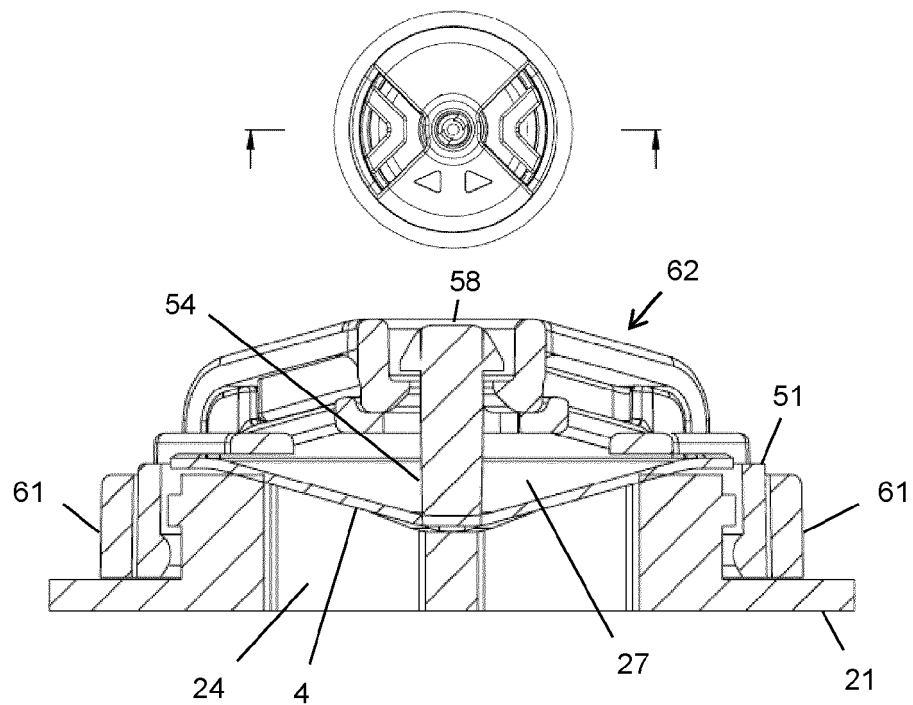


Fig. 3b

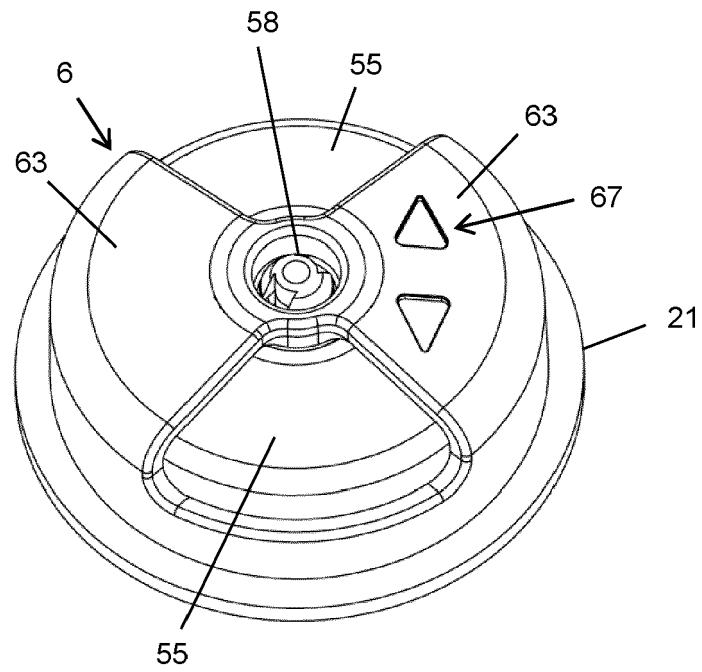


Fig. 4a

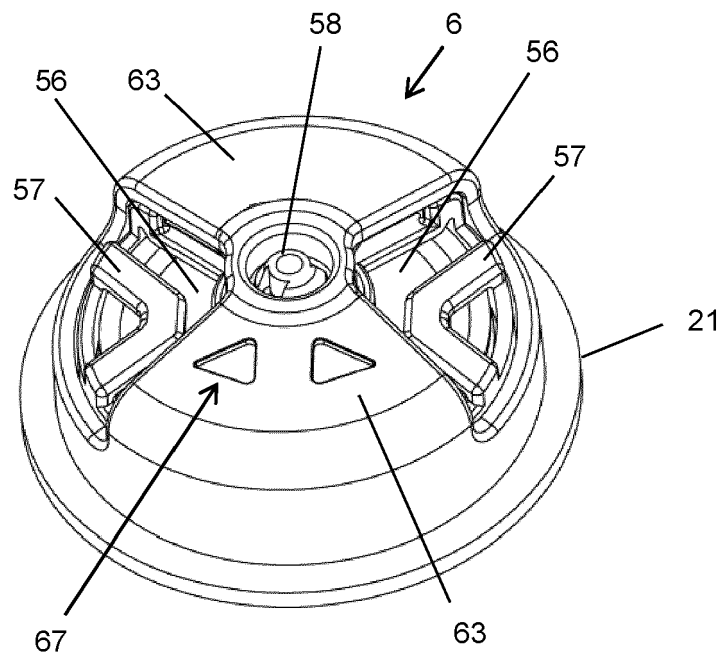


Fig. 4b

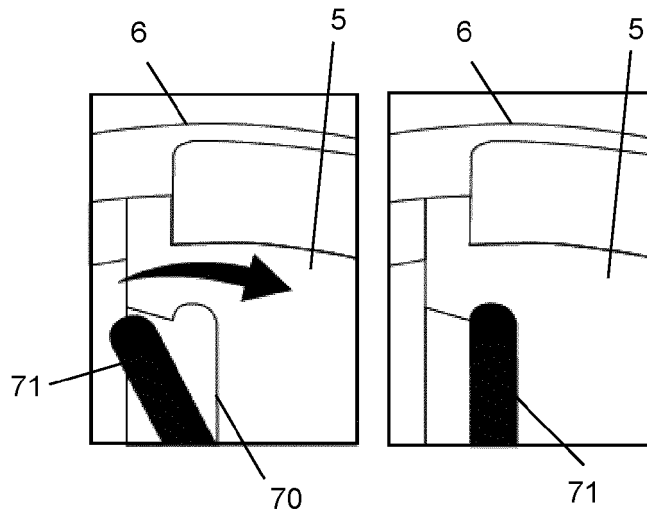


Fig. 5

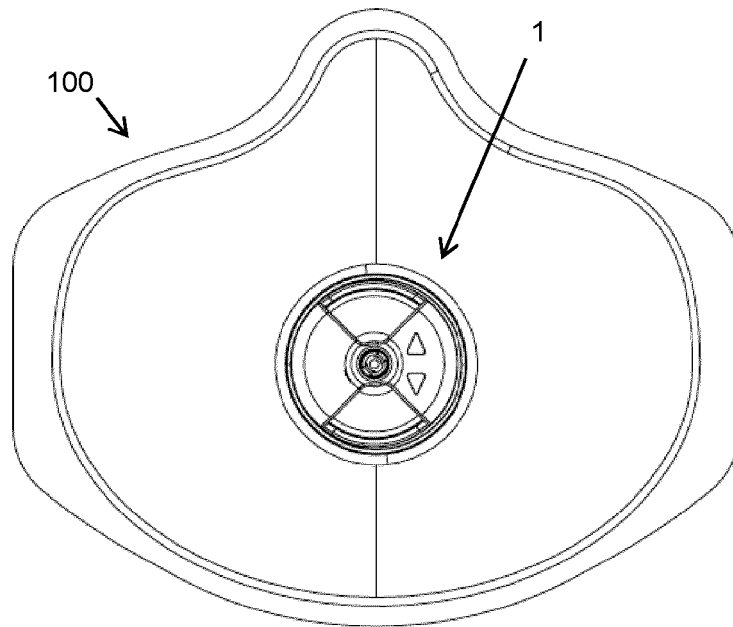


Fig. 6



EUROPEAN SEARCH REPORT

Application Number

EP 21 20 6719

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A	* paragraph [0030] - paragraph [0063] * * figures 1-4 *	10, 13	

Y	US 2020/061399 A1 (WADE MARTIN T [US]) 27 February 2020 (2020-02-27)	1-9, 11, 12, 14	
A	* paragraph [0029] - paragraph [0040] * * figures 1-5 *	10, 13	

			TECHNICAL FIELDS SEARCHED (IPC)
			A62B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		21 March 2022	Ong, Hong Djien
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The members are as contained in the European Patent Office EDP file on
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