(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 669 947 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
24.06.2020 Bulletin 2020/26

(51) Int Cl.:
A62B 18/00 *(2006.01)* ***A62B 18/02*** *(2006.01)*

(21) Application number: **18213522.8**

(22) Date of filing: **18.12.2018**

(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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(54) AUTOMATIC POWER CONTROLLED MASK

(57) Presented is an electrically powered mask 100 comprising a mechanism 101 configured to: switch off electric power of the mask 100 when the mask 100 is folded; and/or switch the electric power of the mask 100 on when the mask 100 is unfolded. Further, a method 200 for controlling a power supply of an electric power mask is presented.

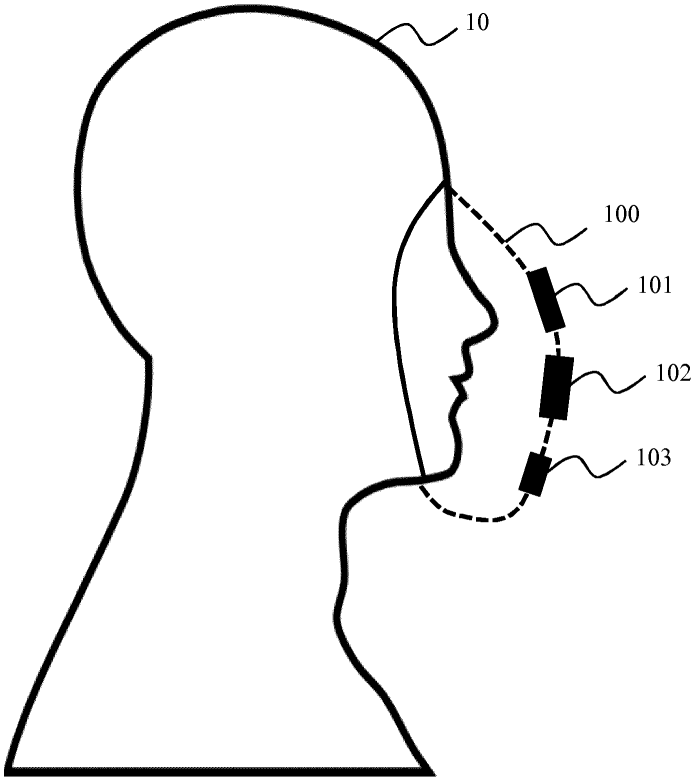

FIG 1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to mask such as pollution masks. In particular, the invention related to power saving techniques for electric power assisted masks such as fan assisted masks.

BACKGROUND OF THE INVENTION

[0002] Fan-operated masks are battery-operated devices. It is desirable to keep power consumption to a minimum. An issue with these masks is that the fan may be left on when the mask is not being worn. This results in unnecessary power consumption.

[0003] When a user wears the mask, the user typically activates a switch to power on the fan. This switch adds cost to the mask, takes up space and switching on/off is inconvenient. An automatic electronic switch-on/off function would solve these problems.

[0004] It would therefore be desirable to have a low cost solution allowing detection whether the mask is worn, to enable worn to not-worn transitions and/or not worn to worn transitions to be detected.

SUMMARY OF THE INVENTION

[0005] Throughout the description reference is made to the wording "folding". In the context of this description "folding" means bending a material, e.g. a flexible material, over on itself so that one part of it fully or partly covers another part. "folding" may mean changing the shape of a material into a smaller, more portable shape. "folding" may include bending or rolling up the material of the mask.

[0006] In a first aspect of the invention, an electrically powered mask is presented comprising a mechanism configured to switch off electric power of the mask when the mask is folded; and/or to switch the electric power of the mask on when the mask is unfolded.

[0007] Thus, in one embodiment, an electrically powered mask is presented comprising a mechanism configured to switch off electric power of the mask when the mask is folded.

[0008] In another embodiment, an electrically powered mask is presented comprising a mechanism configured to switch the electric power of the mask on when the mask is unfolded.

[0009] In another embodiment, an electrically powered mask is presented comprising a mechanism configured to switch off electric power of the mask when the mask is folded; and to switch the electric power of the mask on when the mask is unfolded.

[0010] According to an embodiment, the mask comprises: an electrical component; a power supply for powering the electrical component; and wherein the mechanism is configured such that: electric power supplied to the electrical component is switched off when the mask is folded; and/or electric power supplied to the electrical component is switched on when the mask is unfolded.

[0011] Thus, according to an embodiment, the mask comprises: an electrical component; a power supply for powering the electrical component; and wherein the mechanism is configured such that electric power supplied to the electrical component is switched off when the mask is folded.

[0012] According to an embodiment, the mask comprises: an electrical component; a power supply for powering the electrical component; and wherein the mechanism is configured such that electric power supplied to the electrical component is switched on when the mask is unfolded.

[0013] According to an embodiment, the mask comprises: an electrical component; a power supply for powering the electrical component; and wherein the mechanism is configured such that: electric power supplied to the electrical component is switched off when the mask is folded; and electric power supplied to the electrical component is switched on when the mask is unfolded.

[0014] According to an embodiment, the mask is foldable. For example, the mask comprises folding lines for easy folding of the mask.

[0015] According to an embodiment, the electrical component is a ventilating unit for ventilating the mask.

[0016] According to an embodiment, the mechanism is located on or integrated in the mask, e.g. integrated in the material of the mask.

[0017] According to an embodiment, the mask comprises one or more folding lines for easy folding of the mask. For example, the folding line maybe a single or multiple lines allowing easy folding of the mask.

[0018] According to an embodiment, the mask comprises an air filter material.

[0019] According to an embodiment, the mechanism comprises two elements located or positioned in/on the mask such that when the mask is folded the two elements join or couple together and wherein the two elements separate or decouple from each other when the mask is unfolded; and wherein the mechanism is configured such that: electric power of the mask is switched off when the two elements are joined or coupled together; and/or electric power of the mask is switched on when the two elements are separated or decoupled from each other.

[0020] Thus, according to an embodiment, the mechanism comprises two elements located such that when the mask is folded the two elements join or couple together and wherein the two elements separate or decouple from each other when the mask is unfolded; and wherein the mechanism is configured such that: electric power of the mask is switched off when the two elements are joined or coupled together. According to an embodiment, the mechanism comprises two elements located such that when the mask is folded the two elements join or couple together and wherein the two elements separate or decouple from each other when the mask is un-

folded; and wherein the mechanism is configured such that electric power of the mask is switched on when the two elements are separated or decoupled from each other.

[0021] According to an embodiment, the mechanism comprises two elements located such that when the mask is folded the two elements join or couple together and wherein the two elements separate or decouple from each other when the mask is unfolded; and wherein the mechanism is configured such that: electric power of the mask is switched off when two elements are joined or coupled together; and electric power of the mask is switched on when the two elements are separated or decoupled from each other.

[0022] According to an embodiment, the two elements have magnetic properties thereby allowing easy attachment to each other as they attract each other.

[0023] According to an embodiment, the mechanism is foldable or bendable and wherein the mechanism switches off electric power of the mask when the mechanism itself is folded or bended; and/or wherein the mechanism switches on electric power of the mask when the mechanism is unfolded.

[0024] Thus, according to an embodiment, the mechanism is foldable or bendable and wherein the mechanism switches off electric power of the mask when the mechanism is folded or bended. According to an embodiment, the mechanism is foldable or bendable and wherein the mechanism switches on electric power of the mask when the mechanism is unfolded. According to an embodiment, the mechanism is foldable or bendable and wherein the mechanism switches off electric power of the mask when the mechanism is folded or bended; and wherein the mechanism switches on electric power of the mask when the mechanism is unfolded.

[0025] According to an embodiment, the mechanism comprises a sensor for determining a folding state of the mask: the mask being folded or unfolded. Depending on the folding state, the power of the mask is switched on or off. According to an embodiment, the sensor is a light sensor. According to an embodiment, the sensor is a proximity sensor.

[0026] According to an embodiment, the mask is a pollution mask, e.g. a stand-alone pollution mask.

[0027] In a second aspect of the invention, a method for controlling a power supply of an electric power mask is presented, comprising: determining whether a mask is in a folded or an unfolded state; if determined that the mask is folded, the power supply of the mask is switched off; and/or if determined that the mask is unfolded, the power supply of the mask is switched on.

[0028] Thus, in an embodiment the method comprises: determining whether a mask is in a folded or an unfolded state; if the mask is folded, the power supply of the mask is switched off. In another embodiment the method comprises: determining whether a mask is in a folded or an unfolded state; if the mask is unfolded, the power supply of the mask is switched on. In another embodiment the method comprises: determining whether a mask is in a folded or an unfolded state; if the mask is folded, the power supply of the mask is switched off; and if the mask is unfolded, the power supply of the mask is switched on.

[0029] Particular and preferred aspects of the invention are set out in the accompanying independent and dependent claims. Features from the dependent claims may be combined with features of the independent claims and with features of other dependent claims as appropriate and not merely as explicitly set out in the claims.

[0030] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiment(s) described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031]

FIG. 1 illustrates a mask as described in this disclosure worn by a user

FIG. 2 illustrates a block diagram of the components of the mask

FIG. 3 illustrates an unfolded mask as described in this disclosure

FIG. 4 illustrates a folded mask as described in this disclosure

FIG. 5 illustrates a block diagram of a method to control power supply of a mask

[0032] The drawings are only schematic and are non-limiting. In the drawings, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes.

[0033] Any reference signs in the claims shall not be construed as limiting the scope.

[0034] In the different drawings, the same reference signs refer to the same or analogous elements.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0035] This disclosure presents an electrically powered mask that provides automatic deactivation and/or activation of the power of the mask when the mask is folded or unfolded. Thus, depending on the specific implementation, the mask may contain an automatic power OFF functionality, an automatic power ON functionality or both automatic power ON and power OFF functionality depending on the folding state of the mask. The detailed embodiments are described below.

[0036] In a first aspect of the invention, an electrically powered mask is presented. The mask may be a pollution mask whereby the mask comprises an air filter which filters air entering the mask. In an embodiment, the mask is fabricated from an air filter material. Such an air filter material is capable of filtering harmful pollutants from the air such as traffic pollutants, PM 2.5 or larger particles such as pollen. The filter may also be capable of filtering bacteria, virus or other microorganisms. The mask may

cover mouth and/or nose of a user. When worn, the mask forms an enclosed mask chamber with the face of the user.

[0037] In an embodiment, the mask comprises a mechanism that is configured to switch off the electric power of the mask when the mask is folded. Thus, when the user takes of the mask and folds it, the power automatically switches off, without any further required interaction from the user.

[0038] In an embodiment, the mask comprises a mechanism configured to switch the electric power of the mask on when the mask is unfolded. Thus, when the user unfolds the mask, the electric power of the mask is automatically switched on, without any further required interaction from the user.

[0039] In an embodiment, the mask comprises a mechanism that is configured to switch off the electric power of the mask when the mask is folded; and the mechanism is configured to switch the electric power of the mask on when the mask is unfolded.

[0040] The mechanism as described above reduces the burden of the user to switch the mask on or off every time he/she wears or removes it. Further, it removes the need for mechanical on/off switches on the mask which decreases cost and increases life-time of the mask. Further, there is no inadvertent loss of power as the user does not have to switch off the mask manually.

[0041] In an embodiment, the mask may be manufactured from different parts of material that are stitched together. The stitching may allow easy folding of the mask on the stitching lines. For example, the mask may be manufactured from two or more parts that are stitched together. When the mask is folded on the stitching lines, the two or more parts at least partly cover each other. Alternatively, different parts of the mask are attached to each other using glue, heatpress or also ultra sound depending on material choice. Each of these attachment techniques may be implemented such that attachment areas of different parts may be used to allow easy folding of the mask.

[0042] According to an embodiment, the mask is manufactured using injection molding. In an embodiment, soft materials within injection molding 2D lines are constructed such that they can be folded many times without fatigue to avoid breaking of the folding line.

[0043] According to an embodiment and as illustrated in FIG 1 the mask 100 comprises at least one electrical component 102. The electrical component 102 may be a ventilator that ventilates the mask 100 by importing and/or exporting air into/from the mask chamber. The electrical component 102 may comprise sensor components such as a light sensor(s), a pressure sensor(s), a gas sensor(s), etc. The mask 100 comprises a power supply 103 for powering the electrical component 102. The power supply 103 may be a battery that is preferable but not necessarily located on the mask 100. The power supply 103 is coupled to the electrical component 102. A mechanism 101 is present on/in the mask is configured such that electric power supplied by the power supply 103 to the electrical component 102 is switched off when the mask 100 is folded. Alternatively or additionally, the mechanism 101 is configured such that electric power supplied to the electrical component 102 is switched on when the mask 100 is unfolded. Thus, the mechanism 101 comprises a means for detecting the folding state of the mask 100. In other words, the mechanism 101 comprises means for detecting whether the mask 100 is folded or not. As illustrated in FIG 2, the mechanism 101 is coupled to the power supply 103 and controls the power supply 103 in terms of switching it on or off. The power supply 103 is coupled to the electrical component 102 for supplying power.

[0044] According to an embodiment, the mechanism 101 is located on or integrated in the mask 100. For example, the mechanism 101 may be integrated in the material of the mask 100, for example integrated in an air filter material of the mask 100. It is an advantage of the invention that the mechanism 101 may be completely integrated in the mask 100 as this increases portability and usability of the mask 100.

[0045] According to an embodiment, the mask comprises a folding line 120 for easy folding of the mask. This is illustrated in FIG 3. For example, the mask 100 maybe fabricated from a semi-rigid material whereby the mask 100 comprises a line 120 where the material is more compressed or where the material is partly removed thereby allowing easy folding of the mask 100 at the folding line 120. The folding line 120 may run across the mask 100 thereby splitting the mask 100 in two or more parts that allow easy folding of the mask 100. As described above, the folding line(s) may also be formed by the stitching lines of the mask 100.

[0046] According to an embodiment, and as illustrated in FIG 3, the mechanism 101 comprises two elements 101a, 101b. These elements maybe electrodes. These elements are located such that when the mask 100 is folded the two elements 101a, 101b may join together. Thus, when the user folds the mask the two elements 101a, 101b touch each other directly or indirectly. For example when the elements 101a, 101b are integrated in the mask material the elements 101a, 101b may touch indirectly as the mask material is located in between. The two elements 101a, 101b separate from each other when the mask 100 is unfolded. Thus when the user unfolds the mask 100, the elements 101a, 101b that were previously joined detach or decouple from each other. The mechanism 101a, 101b is configured such that electric power of the mask 100 provided by the power supply is switched off when the two elements 101a, 101b are joined together. Alternatively or additionally, the mechanism 101a, 101b is configured such that the electric power of the mask 100 is switched on when the two elements 101a, 101b are separated from each other. The control over the power supply may be done by a controller, e.g. a microcontroller, which is coupled to the mechanism (the elements 101a, 101b, e.g. electrodes) and the power

supply. When the controller detects that the elements 101a, 101b touch or are coupled with each other, the controller switches the power supply off. When the controller detects that the elements 101a, 101b are not touching or are decoupled from each other, the controller may switch the power supply on.

[0047] According to an embodiment, the elements 101a, 101b may have magnetic properties whereby both elements attract each other; the elements may be magnetic elements. This is advantageous as the elements 101a, 101b function as a means for keeping the mask 100 in a folded or compact state and also function as the mechanism for detecting the folding state of the mask 100. Hence, additional components to keep the mask closed are not required. Such magnetic elements can also be easily integrated in the mask material. When two elements 101a, 101b are used to detect whether the mask 100 is folded or not, the presence of a folding line 120, e.g. stitching lines, that allow easy folding is advantageous as it allows easy alignment of the two elements. A folded mask 100 is illustrated in FIG 4. It is illustrated that the elements 101 coincide when the mask 100 is folded thereby touching or being coupled to each other or being present adjacent to each other.

[0048] According to an embodiment, the mechanism is foldable or bendable. The mechanism is located in the mask such that when the mask is folded, for example on the folding or stitching line, the mechanism folds or bends. When the mechanism folds or bends, electric power of the mask is switched off. Alternatively or optionally, when the mechanism is unfolded or un-bended, electric power of the mask is switched on. An implementation of such a mechanism may comprise a light source coupled to a waveguide whereby it is detected when light transmitted through the waveguide exits the waveguide when the waveguide is bended. The waveguide is located in the mask such that when the mask is folded, the waveguide bends. When light exits the waveguide, power is shut down as this means that the mask is folded. When light does not exit the waveguide, power may be activated as this means that the mask is unfolded. Alternatively, the mechanism may also comprise a material that is not electrically conductive when bended, thus when the mask is folded.

[0049] According to an embodiment, the mechanism comprises a sensor for determining a folding state of the mask. For example, the mechanism maybe a light sensor located in the mask such that when the mask is folded, the light sensor is covered with the material of the mask. Thus, the mask is manufactured such that when the mask is folded, the material of the mask covers the sensor. When detected light is below a pre-defined threshold, electric power is switched off as this means that the mask is folded. Alternatively or optionally, when detected light is above a pre-defined threshold, electric power is switched on as this means that the mask is unfolded. For all embodiments described, a controller may be coupled to the sensor and to the power supply to perform this control of the power of the mask. Alternatively, a proximity sensor capable of sensing nearby material of the mask may be used. Alternatively, a sensing mechanism may be used whereby a sensor detects whether a detectable element is detected or in close proximity to the sensor. When detected, the mask can be considered in a folded state and power can be shut off. When not detected, the mask can be considered in an unfolded state and power could be activated.

[0050] According to a second aspect of the invention, a method 200 for controlling a power supply of an electric power mask as presented in the first aspect is presented. The method comprises: determining whether a mask is folded or unfolded 201; if the mask is folded, switch the power supply off 202. Alternatively or optionally, if the mask is unfolded, switch the power supply on 203. Determining whether the mask is folded or not may be performed by checking whether two elements in the mask are joined together or not, as described above. Alternatively, it may be done by checking whether detected light is above or below a certain threshold when the mask is folded as described above. It may also be done by checking whether the mechanism in the mask is folded or not. Any of the techniques described in the first aspect of the invention may be used in the method to control the power supply of the mask.

Claims

1. An electrically powered mask (100) comprising a mechanism (101) configured to:

   switch off electric power of the mask (100) when the mask (100) is folded; and/or
   switch on the electric power of the mask (100) when the mask (100) is unfolded.

2. The mask (100) according to claim 1, comprising:

   an electrical component (102);
   a power supply (103) for powering the electrical component (102); and
   wherein the mechanism (101) is configured such that:

      electric power supplied to the electrical component (102) is switched off when the mask (100) is folded; and/or
      electric power supplied to the electrical component (102) is switched on when the mask (100) is unfolded

3. The mask (100) according to claim 2, wherein the electrical component (102) is a ventilating unit for ventilating the mask (100).

4. The mask (100) according to any of the preceding

claims, wherein the mechanism (101) is located on or integrated in the mask.

5. The mask (100) according to any of the preceding claims, comprises a folding line for easy folding of the mask (100).

6. The mask (100) according to any of the preceding claims, wherein the mask (100) comprises an air filter material.

7. The mask (100) according to any of the preceding claims, wherein the mechanism (101) comprises two elements (101a, 101b) located such that when the mask (100) is folded the two elements (101a, 101b) join together and wherein the two elements (101a, 101b) separate from each other when the mask (100) is unfolded; and wherein the mechanism (101) is configured such that
electric power of the mask (100) is switched off when the two elements (101a, 101b) are joined together; and/or
electric power of the mask (100) is switched on when the two elements (101a, 101b) are separated from each other.

8. The mask (100) according to claim 7, wherein the two elements (101a, 101b) have magnetic properties and attract each other.

9. The mask according to any of claims 1 to 6, wherein the mechanism (101) is foldable and wherein:

the mechanism (101) switches off electric power of the mask (100) when the mechanism (101) is folded; and/or
the mechanism (101) switches on electric power of the mask (100) when the mechanism (101) is unfolded.

10. The mask (100) according to any of claims 1 to 6, wherein the mechanism (101) comprises a sensor for determining a folding state of the mask (100).

11. The mask (100) according to claim 10, wherein the sensor is a light sensor.

12. The mask (100) according to claim 10, wherein the sensor is a proximity sensor.

13. The mask (100) according to any of the preceding claims, wherein the mask (100) is a pollution mask.

14. A method (200) for controlling a power supply of an electrically powered mask, comprising:

determining whether a mask is folded or unfolded (201);
if the mask is folded, switch the power supply off (202); and/or
if the mask is unfolded, switch the power supply on (203).

15. The method (200) or the mask (100) according to any of the preceding claims, wherein switching power on or off is performed automatically without interaction of a user wearing the mask (100) apart from unfolding or folding the mask (100).

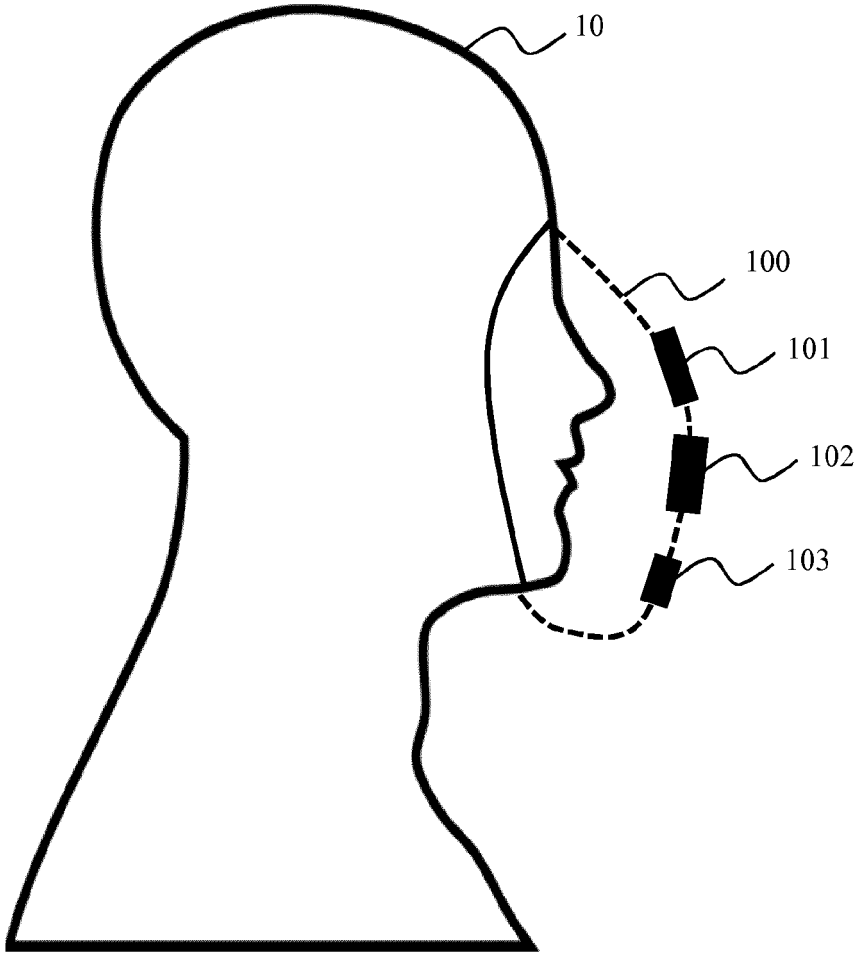

FIG 1

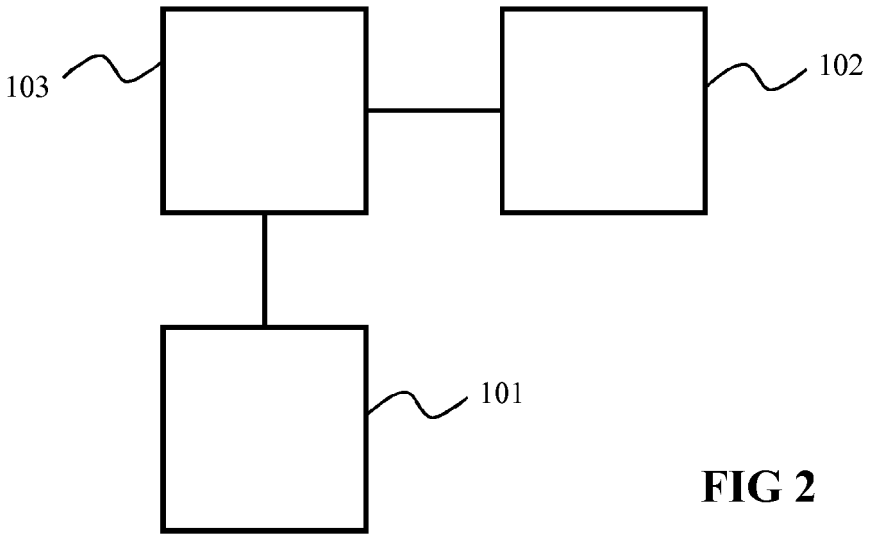

FIG 2

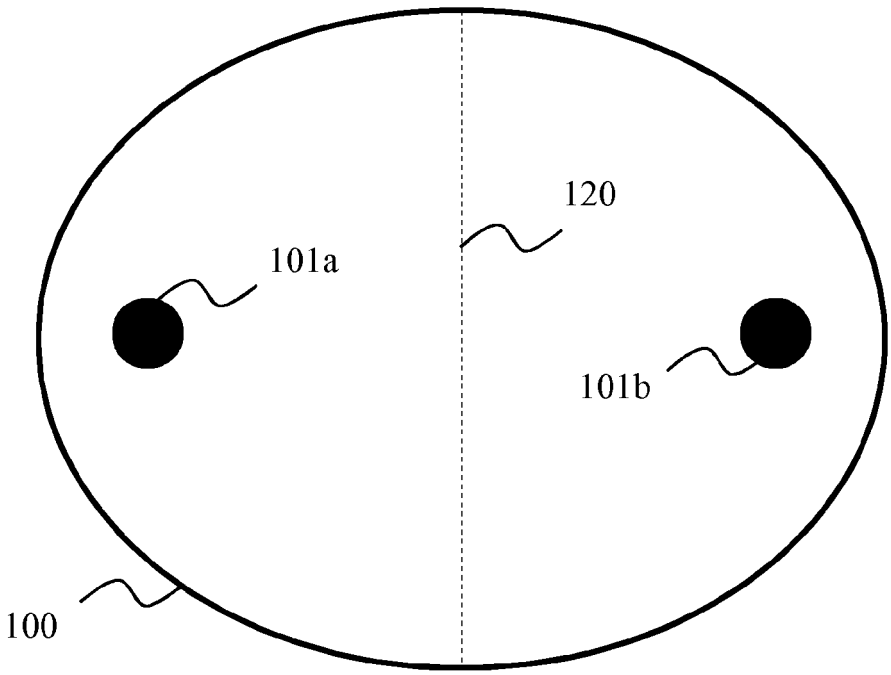

FIG 3

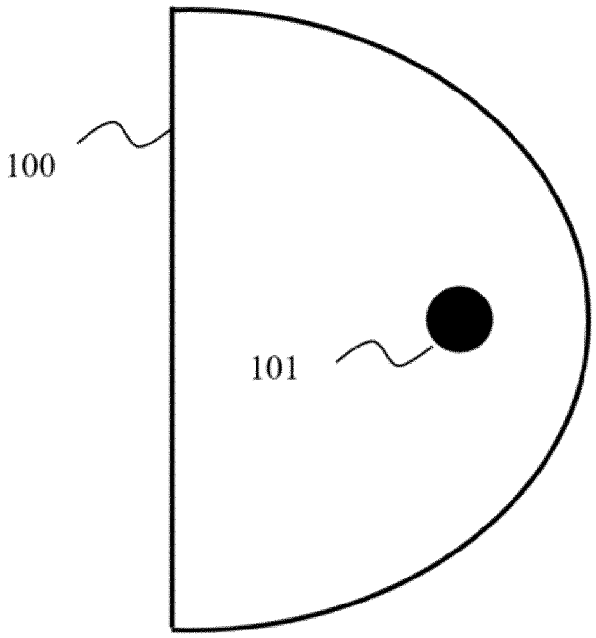

FIG 4

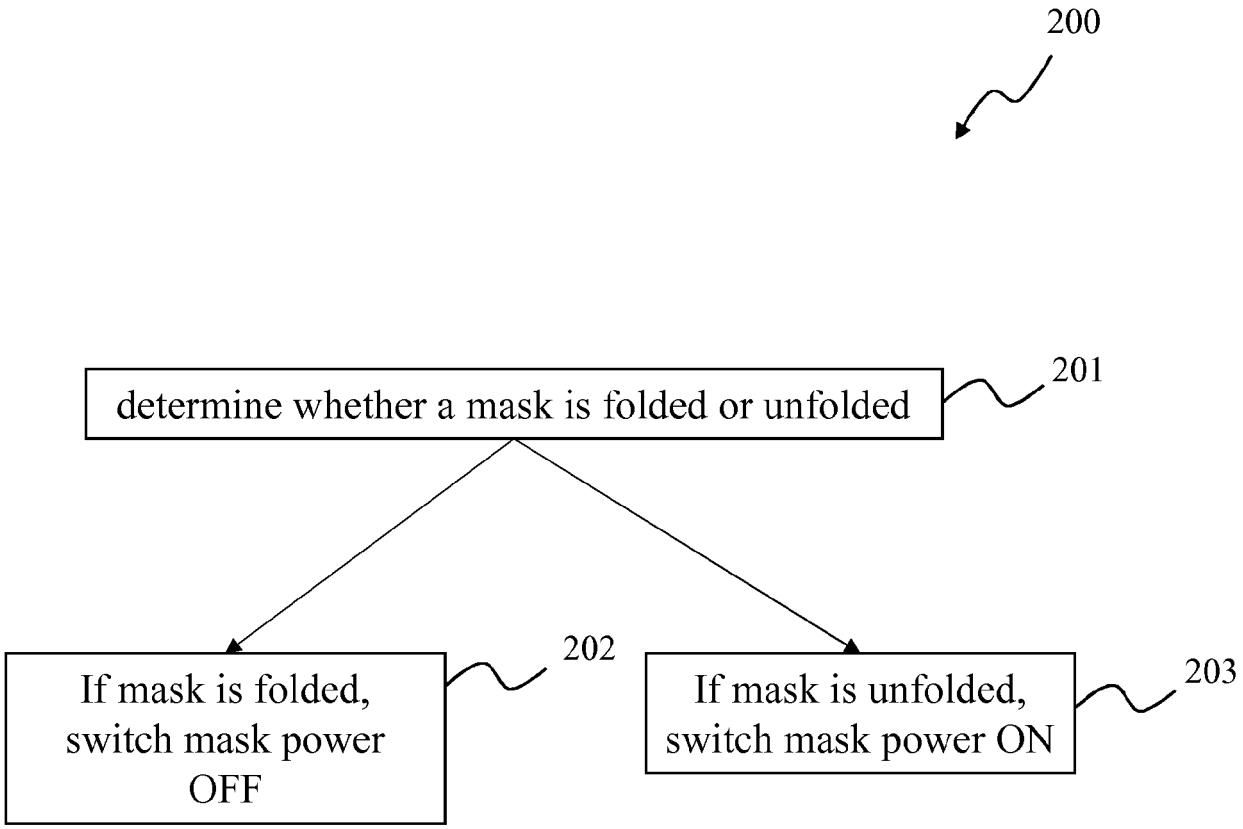
200
determine whether a mask is folded or unfolded
201
If mask is folded, switch mask power OFF
202
If mask is unfolded, switch mask power ON
203

FIG 5

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EUROPEAN SEARCH REPORT

Application Number
EP 18 21 3522

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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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	10 May 2019	Andlauer, Dominique

CATEGORY OF CITED DOCUMENTS

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