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(54) **SELF-FILTERING PROTECTIVE DEVICE**

(57) The invention provides a self-filtering protective device, particularly a mask, comprising a main body made of a transparent or translucent plastic material, a plurality of air inlet and outlet filters coupled to said main body, and a securing band attached to the main body in order to facilitate the fastening of the protective device against the face of the user. Said device is characterized in that the main body comprises an outer layer and an inner layer, sealed together at the edges thereof, leaving an air chamber between same. Furthermore, the filters traverse both the outer layer and the inner layer of the main body of the protective device. The device provides the user with protection against airborne pathogenic agents and also acts as a containment measure in order to minimize the risk of transmission by the user.

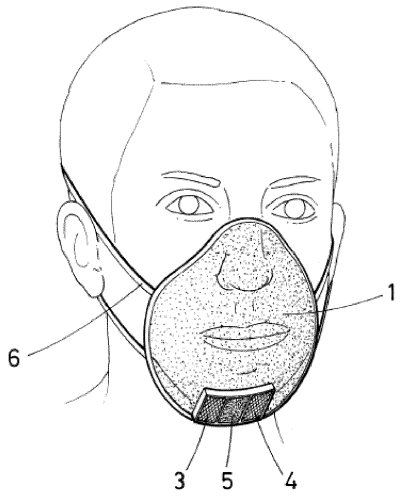

FIG.1

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of hygienic masks, particularly those used to prevent the spread of diseases through the respiratory tract.

BACKGROUND OF THE INVENTION

[0002] Following the COVID-19 coronavirus pandemic, the use of masks has become massively widespread since early 2020 as a measure for containing the spread of the virus. However, their use also protects users from other pathogenic agents (viruses, bacteria, etc.), other diseases (for example, pulmonary tuberculosis), and also contributes to improving the quality of life of people with chronic diseases (for example, people suffering from allergies and requiring protection from allergens such as pollen). Furthermore, their use is not limited to the health sector to ensure the safety of both healthcare personnel and patients, but they are also used in industry (mining or other activities where particles, aerosols, and suspended dust are common).

[0003] Masks are classified according to the degree of protection they offer, their use, valve availability, and durability. They are mainly classified into two groups:

- surgical masks which, according to the UNE-EN 14683:2019+AC:2019 standard, act to reduce the risk of the carrier spreading the infections, particularly in epidemic situations, and to thereby ensure asepsis.
- protective masks, which protect the mask wearer from inhaling hazardous particles, such as pathogenic agents, chemicals, or antibiotics. These include particle or aerosol self-filtering masks, as stated in the UNE-EN 149:2001+A1 :2010 standard. This European standard classifies self-filtering masks into three levels of protection based on filtering efficiency for particles of 0.6 microns in diameter: FFP1 (with at least 78% filtration efficiency), FFP2 (with at least 92% filtration efficiency), and FFP3 (with at least 98% filtration efficiency). Another very common standardization is the standardization of the National Institute for Occupational Safety and Health of the United States of America (NIOSH), based on the filtering capacity for particles of 0.3 microns in diameter in the USA. In particular, the N95 mask guarantees a minimum filtration of 95% and is the most recommended by the World Health Organization (WHO). Any of the self-filtering masks may or may not have an exhalation valve to reduce humidity and heat inside the mask, in order to provide greater comfort to the user.

[0004] With regard to the quality requirements to be met by plastic materials (elastomers, rubbers, etc.) used in health facilities, it is desirable that they conform to the FDA (U.S. Food and Drug Administration) regulations as set forth in CFR 21.177.2600 paragraphs A-D. Furthermore, medical grade plastics (for example, plastics for medical tubing used for fluid handling and venting, catheters, suction syringes, etc.) typically include FDA and/or USP (U.S. Pharmacopoeia) approved class VI materials. Class VI, which is the most demanding class, evaluates the suitability of plastic material intended to be used as containers for parenteral preparations or implants, and is usually considered a basic requirement to be met by medical device manufacturers. If it is for surface use, in contact with the skin, class I certification is usually sufficient, even for prolonged use. However, the globally accepted standard is the standard of the International Organization for Standardization (ISO), and more particularly the ISO 10993 standard concerning the biological evaluation of medical devices. Classification into classes depends on their biocompatibility, measured based on the response of the plastics to a series of *in vivo* biological reactivity tests (cytotoxicity tests, etc.). Among the most prominent technical characteristics evaluated by these certification standards are: toxicity, clarity, ease of sterilization (either by gamma radiation or autoclave), resistance to twisting, safe disposal by incineration, acid resistance, tensile strength, Shore hardness, etc.

[0005] Different types of plastics have been used for years in the medical industry. The most commonly used polymer was PVC (class VI according to USP), characterized by its availability, resistance to bending, and low price. Furthermore, its chemical and abrasion resistance, as well as its resilience, can be improved by means of PVC alloys (with polyurethane, polyacrylonitrile, or ethyl vinyl acetate). Thermoplastic elastomer (TPE), characterized by its great flexibility and softness to the touch, is a very common alternative to PVC.

[0006] However, the masks available on the market today are designed for use in particular not generalized contexts, such that safety in terms of health has taken precedence over other design criteria. In particular, they are practically opaque, which implies serious limitations in terms of widespread adoption, particularly in several common situations in which it is necessary to identify individuals, such as the following:

- identification in buildings of official organizations, public buildings (banks, courts, etc.), health centers, educational centers, public vehicles (cabs, buses, etc.);
- in facial recognition systems, which are becoming increasingly common for access to the workplace, security and border controls at airports and customs, granting of access permits to electronic devices, etc;
- security controls by State security forces;
- facilitating interaction between people and personal, professional, and affective relationships;
- facilitating lip reading for individuals who are hearing impaired;

- identification of healthcare personnel in health centers, in a context where intrusion by outsiders can be particularly serious and where, due to the common clothing adopted by the center's personnel, the chances of identity concealment are higher if quick facial identification is not possible.

[0007] Therefore, if the mask is widely adopted in the contexts where it is not possible to maintain social distance, it would be necessary for it to facilitate the identification of the person wearing it, further ensuring a long service life of said mask.

BRIEF DESCRIPTION OF THE INVENTION

[0008] The present invention provides an alternative solution to the above proposed problem by means of a protective mask according to claim 1. The dependent claims define preferred embodiments of the invention.

[0009] Unless otherwise defined, all terms (both scientific and technical) used herein are to be interpreted as a person skilled in the art would interpret them. Therefore, it should be understood that commonly used terms must be interpreted in the way a person skilled in the art would interpret them, and not in an idealized or strictly formal manner.

[0010] Throughout the text, the word "comprises" (and its derivatives, such as "comprising" or "particularly") should not be understood in an exclusive manner, but should be understood in the sense that they allow the possibility that what is defined may include additional elements or steps. In the context of this invention when reference is made to a coupling clip or to a clipping attachment it is understood as a snap-on attachment or plastic element which allows assembling or uncoupling different elements of the mask.

[0011] To overcome the aforementioned limitations related to the need for the facial identification of persons without requiring them to remove or manipulate the mask, the invention provides a mask made of a transparent plastic material.

[0012] An object of the present invention relates to a self-filtering protective device comprising:

a main body;
an air outlet filter coupled to the main body;
an air inlet filter coupled to the main body; and
a securing band attached to the main body to facilitate the fastening of the protective device on a user's face;
characterized in that
the main body comprises an outer layer and an inner layer, sealed together at the edges thereof, leaving an air chamber between same;
the outlet and inlet filters traverse both the outer layer and the inner layer, and
the outer layer and the inner layer are made of a transparent or translucent plastic material.

[0013] The protective device (for example, a mask) being made of a transparent plastic facilitates the identification the individual wearing it without having to remove or manipulate the device, which reduces the risk of the spread of any pathogen or aerosol that may be suspended in the air. This ensures facial recognition without optical distortion, allowing regular human interaction with health security in an environment where pathogens easily transmissible by air could be present. Furthermore, leaving an air chamber between the outer layer and the inner layer minimizes fog condensation on the layers, which improves visibility through same. The dimensions of the mask will be adaptable depending on whether the wearers are children or adults, and on the different typology of features, and can even be made to measure.

[0014] In particular embodiments, the mask further comprises an adjustable and transparent securing band attached to the main body and made of the same material as said main body.

[0015] This ensures that the mask is properly secured to the back of the mask user's head, tightly but without exerting excessive pressure.

[0016] In particular embodiments of the protective device, the outer layer, the inner layer, and the securing band are manufactured from a biocompatible, reusable, waterproof, washable, and sterilizable material, such as transparent silicone, thermoplastic rubber, or thermoplastic elastomer, and other materials of similar composition and purpose, for example.

[0017] This thereby ensures that the product is safe for the user of the mask, which may require prolonged time of use in contact with the skin. Furthermore, this thereby provides the mask with a long service life. It is advisable for the product to be sterilizable (to minimize the risk of there being pathogenic organisms on its surface) by means of the most common techniques, such as autoclave, alcohol baths, or gamma radiation.

[0018] In particular embodiments of the protective device, the device comprises two air outlet filters (or exhalation filters), and wherein the air inlet filter is located between the two air outlet filters and aligned therewith in order to facilitate the renewal of air inside the mask.

[0019] This facilitates the discharge of heat, humidity, and CO2 from inside the mask, facilitating air renewal and thereby minimizing sweating problems during prolonged use of the mask. Furthermore, by having two output filters on both sides of the outer layer, it is possible to talk on the phone or through any other electronic device without having to remove the mask. Another advantage of having a double exhalation filter is that the mask is safer to contain possible airborne infections (viruses, etc.) that the mask wearer may have, minimizing the possible risk of the pathogenic agents escaping to the outside.

[0020] In some particular embodiments of the mask, the air inlet and/or outlet filters are replaceable.

[0021] In this way, the service life of the mask is longer and it is not necessary to discard the entire mask so often.

[0022] In some particularly advantageous embodiments, the air inlet and/or outlet filters are configured for filtering at least 95% of particles the diameter of which is 0.3 microns or greater.

[0023] In this way, they comply with the N95 regulation, although these requirements may be relaxed depending on the particular use for which they are intended, according to the FFP1, FFP2, FFP3, etc. regulations.

[0024] In particular embodiments, the inlet and/or outlet air filters of the protective device are manufactured from activated carbon, said filters further comprising a writing surface to allow their identification.

[0025] In this way, the pathogenic agents that may be present in the air inhaled by the user remain adhered to the carbon. Furthermore, the mask therefore complies with the recommendations of the N95 regulation. Another advantage is that these filters require minimal maintenance and have a long service life. Moreover, the date of first use or the name of the owner of the mask can be easily noted on the writing surface to avoid confusion which may increase the risk of infection. Preferably, the writing surface is located on the contour of the air inlet and/or outlet filters, producing a minimal visual impact.

[0026] In other particular embodiments, the protective device further comprises a plurality of silicone supports attached to the adjustable securing band.

[0027] This therefore reduces the pressure on the ears and the back of the head of the mask user, particularly during prolonged use of the mask.

[0028] In other particular embodiments, the protective device further comprises a transparent valve suitable for receiving a tube, said valve being made of the same material as the main body.

[0029] This therefore allows the user to drink without removing the mask. Furthermore, the tube is preferably introduced in locations that have minimal visual impact in order to facilitate the recognition of the mask user, for example, right below the mouth. The hole for the insertion of the tube is optional, such that for applications where said tube is not necessary, it is advisable not to include it, so as to minimize the risk of airborne pathogenic agent transmission.

[0030] In some embodiments of the invention, the inner and outer layers of the main body are manufactured with a double-sided plastic or by means of an attachment with silicone thread.

[0031] This therefore ensures that the air chamber is hermetically sealed.

[0032] In some embodiments, the mask further comprises protective glasses coupled by means of a clip-type attachment which allows coupling and uncoupling said glasses, said attachment being made of the same material as the main body and located on the contour thereof.

[0033] The assembly of glasses and mask therefore acts in an integral manner, contributing to the fixing of the glasses and minimizing the risk of the glasses falling or requiring manipulation, which thereby minimizes the risk of infection. Once the mask and the glasses have been put on, it is advisable to minimize the readjustment thereof because it could involve a risk of infection, particularly if the user is exposed to a contaminated atmosphere. In this sense, this realization is particularly useful in industrial or clinical contexts.

[0034] In other particular embodiments, the mask has an eye protection shield coupled thereto by means of a clipping attachment, said attachment being made of the same material as the main body and located on the contour of said main body.

[0035] This shield can be of any shape (rectangular, circular, etc.), as long as it is adapted to cover the eye area. Again, this model can be useful in industrial contexts, for example, to protect against splashes of hazardous substances.

[0036] In some embodiments, the inlet filter (5) has a circular shape for coupling thereof to standard oxygen therapy tubing, with outer diameters in the range of 4.5-5 mm and inner diameters of between 2.5 and 3.2 mm.

[0037] This therefore facilitates its adoption by health centers, where it can facilitate the monitoring and treatment of patients.

[0038] In some embodiments, the mask is further characterized in that the material with which it is manufactured has been subjected to an oleophobic and/or anti-fog treatment.

[0039] The mask can therefore be used for a prolonged time with minimal visual distortion. For example, the oleophobic treatment minimizes finger marks on the mask. The fact that the mask is an anti-fog mask minimizes fatigue due to stress or sweating during prolonged use of the mask.

[0040] In some embodiments, the protective device further comprising a nose clip for adjusting the main body to the user's face, wherein the plastic from which said nose clip is manufactured is furthermore transparent, and the main body is made of a flexible material.

[0041] This thereby ensures a better fit of the mask according to the morphology of the face of the mask user.

[0042] In some preferred embodiments, the nose clip is manufactured from transparent silicone.

[0043] In this way, the fog produced inside the mask does not escape to the outside fogging up the wearer's glasses, which facilitates its use for prolonged periods of time and facilitates visibility.

[0044] In some preferred embodiments of the invention, the clip acting as an attachment to the glasses comprises one or more magnets.

[0045] These magnets will preferably be neodymium magnets and have a flat circular shape, and serve to contribute to a better fixing of the glasses.

[0046] In other particular embodiments, the plastic constituting the main body of the protective device has been subjected to a vitrification, anti-scratch, and bactericidal treatment.

[0047] In this way, the mask loses rigidity but gains strength, which can be useful, for example, in industrial contexts where the mask is required to act as a protective

barrier.

DESCRIPTION OF THE FIGURES

[0048] To complete the description and facilitate a better understanding of the invention, a set of figures is added to the description. These figures are part of the description and illustrate a particular example of the invention, which should not be construed as limiting the scope of the invention, but merely as an example of how the invention can be carried out. This set of figures comprises the following:

Figure 1 shows a front view of a possible realization of the object of the invention, being a mask model including three air filters (one inlet filter and two outlet filters) and the securing band.
Figure 2 shows a rear view of the mask, in which the securing band of the mask and a series of stops or supports (in this case three circular-shaped stops or supports) to improve comfort on the back of the mask wearer's head can be seen.
Figure 3 shows a side view of the mask, in which the air chamber can be seen.
Figure 4 shows a front view of the mask with the valve for the drinking tube.
Figure 5 shows a particular embodiment of the mask of the invention in which the coupling clip for coupling to protective glasses is included.
Figure 6 shows a particular embodiment of the mask with a more detailed view of the writing area for the identification of the owner, date of use, etc.

[0049] In order to help to better understand the technical features of the invention, the mentioned figures are accompanied by a series of reference numbers in which the following is depicted in an illustrative and non-limiting manner:

1	Outer layer of the mask
2	Inner layer of the mask
3	Left air outlet filter
4	Right air outlet filter
5	Air inlet filter
6	Securing band
7	Silicone supports
8	Air chamber
9	Valve for tube insertion
10	Protective glasses
11	Coupling clip for coupling glasses to the mask
12	Writing surface

DETAILED DESCRIPTION OF THE INVENTION

[0050] A preferred embodiment of the present invention, provided for illustrative but non-limiting purposes with respect to the invention is described below.

[0051] Figures 1 to 3 show respectively a front, rear, and side view of a particular embodiment of the invention. This mask comprises these elements:

a main body formed by an outer layer 1 and an inner layer 2;
an air inlet filter 5 coupled to the outer layer 1;
two exhaled air outlet filters 3 and 4 coupled to the outer layer 1 and arranged on both sides of the filter 5;
a securing band 6 attached to the main body; and
silicone supports 7 attached to the band 6;
an air chamber 8 comprised between the outer layer 1 and the inner layer 2.

[0052] The outer layer 1 and inner layer 2 are manufactured from a flexible material (such as, for example, acetate, transparent silicone, thermoplastic rubber, or thermoplastic elastomer, and others of similar composition and purpose). Furthermore, it has a rubber or thermoplastic elastomer perimeter securing band 6 to facilitate the adaptation thereof to the face contour. Said material will meet the necessary safety standards for continuous use in contact with the skin, particularly those described by the ISO 10993 standard. Other embodiments of the mask can be manufactured with a translucent material, for example, translucent polycarbonate, meeting the same safety regulation.

[0053] With regard to the inhaled or exhaled air filters of the embodiment of Figures 1 to 3, they are transparent and manufactured from periodically replaceable activated carbon, and fixed by means of a plastic clip or thread. It will be located at chin level or below same, so as not to obstruct the image. In particular, the embodiment of Figures 1 to 3 has two exhaled air outlet filters 3 and 4 and one inlet filter 5, arranged aligned together at mouth level. All filters of the mask will be unidirectional and will verify the required safety regulation according to the particular use for which they are intended (N95, FFP2, FFP3, etc.). Having multiple outlet filters makes it easier to discharge CO2, heat, moisture, and fog from inside the mask, thereby facilitating the replacement of hot air from inside the mask with cooler air from outside and improving the wearer's comfort. Furthermore, having two air outlet filters on the sides facilitates communication via telephone or other electronic devices (microphones, etc.) without the need to remove the mask. The mask is fastened by means of a transparent trans-auricular or cephalo-perimetral silicone band 6, as illustrated in Figure 1, which is adjustable and allows it to be comfortably adjusted to the contour of the wearer's head. This band can have a series of silicone stops or supports 7 to improve comfort and reduce pressure on the back of the mask wearer's head. These stops act as ear savers and

relieve the strain on the ears, so they are particularly useful if prolonged use of the mask is required.

[0054] The mask has an air chamber 8 to prevent fog condensation, as shown in Figure 3. Said air chamber is achieved by manufacturing the mask with a double-sided transparent plastic, or by using silicone thread to achieve the hermetic sealing of the air chamber.

[0055] Another preferred embodiment of the invention further comprises a transparent and flexible valve 9 for the introduction of a tube so that the user can drink, as shown in Figure 4. The valve will be made of the same material as the main body and will be sterilizable. The location of this valve will not prevent correct visual recognition, so it will preferably be located just below the mouth.

[0056] Figure 5 shows another particular embodiment of the mask, which is coupled to glasses 10 that are also transparent and may additionally incorporate protection against solar radiation (for example, anti-UV). The glasses may have arms or may lack said arms so as to reduce the weight of the protective device as a whole. The assembly or connection system between the glasses and the mask, as shown in Figure 5, is an easily removable, retractable, resistant, transparent, anti-bacterial clip 11 made of the same material as the main body of the mask, located on the upper contour thereof. This model is particularly useful for use in the industry, further providing eye protection. Furthermore, the system of anchoring the mask to the glasses helps to fix the position of the glasses, so it minimizes the need to readjust them, avoiding the inherent risk of infection associated with it. Like the mask, in this embodiment of the invention the glasses will preferably be made of a durable, hygienic, washable, reusable, and hypoallergenic material.

[0057] In some embodiments of the object of the invention, the air inlet filter 5 is adapted with a standard female universal connector to the dimensions of oxygen tubing applied in health centers (typically, with outer diameters of about 4.5-5 mm and inner diameters of between 2.5 and 3.2 mm), in order to facilitate its adoption in clinical contexts. This valve can be threaded or snap-fitted.

[0058] Figure 6 shows another particular embodiment, further comprising a writing surface 12 on the perimeter of the air inlet and outlet filters which can be used for identifying the mask (for example, the owner's name to avoid confusion, or date of first use to control expiration).

[0059] Optionally, in some embodiments of the invention a nose clip (not shown in the figures) made of the same material as the mask can be included for adjusting the mask to the nose, intended for achieving the maximum possible airtightness between the user's face and the protective equipment itself. These embodiments require the mask material to be flexible.

[0060] In other preferred embodiments of the invention, the material from which said nose clip is manufactured is silicone. The use of this material prevents the fog produced inside the mask from escaping and fogging up the wearer's glasses.

[0061] In some preferred embodiments of the invention, the clip acting as an attachment to the glasses is coupled to one or two magnets. These magnets, manufactured from neodymium and preferably have flat circular shape, contribute to a better fixing of the glasses without obstructing the clip system.

[0062] In other preferred embodiments of the object of the invention, the mask material is replaced by a material with less flexibility than in the preceding models, being subjected to an anti-scratch and bactericidal vitrification treatment, in order to make it safer and more resistant. These embodiments are particularly useful, for example, in industrial environments or to allow the use thereof while driving a vehicle, where the mask is required to act as a barrier. These mask models lack an adjustable nose clip.

[0063] In other preferred embodiments of the invention, the protective glasses are replaced by an eye protection shield. The attachment between the shield and the body of the mask allows all the options mentioned above (optional magnetization, etc.).

[0064] In some embodiments of the object of the invention, an oleophobic treatment has been applied to the material of the mask to minimize the accumulation of grease on the surface of the mask (e.g., finger marks). In other embodiments of the mask, the plastic forming said mask has received an anti-fog treatment (for example, a permanent polyurethane or silicone oligomer coating, or a temporary non-toxic spray treatment).

Claims

1. A self-filtering protective device comprising:

a main body;
an air outlet filter (3) coupled to the main body;
an air inlet filter (5) coupled to the main body; and
a securing band (6) attached to the main body to facilitate the fastening of the protective device on a user's face;
characterized in that
the main body comprises an outer layer (1) and an inner layer (2), sealed together at the edges thereof, leaving an air chamber (8) between same;
the outlet filter (3) and the inlet filter (5) traverse both the outer layer (1) and the inner layer (2), and
the outer layer (1) and the inner layer (2) are made of a transparent or translucent plastic material.

2. The protective device according to the preceding claim, further comprising, an adjustable and transparent securing band (6) attached to the main body and made of the same material as said main body.

3. The protective device according to the preceding claim, wherein the outer layer (1), the inner layer (2), and the securing band (6) are manufactured from a biocompatible, reusable, waterproof, washable, and sterilizable material, such as transparent silicone, thermoplastic rubber, or thermoplastic elastomer, for example.

4. The protective device according to any of the preceding claims, comprising two air outlet filters (3, 4), and wherein the air inlet filter (5) is located between the two air outlet filters (3, 4) and aligned therewith, in order to facilitate the renewal of air inside the mask.

5. The protective device according to any of the preceding claims, wherein the air inlet and/or outlet filters are replaceable.

6. The protective device according to any of the preceding claims, wherein the air inlet and/or outlet filters are configured for filtering at least 95% of particles the diameter of which is 0.3 microns or greater.

7. The protective device according to any of the preceding claims, wherein the air inlet and/or outlet filters are manufactured with activated carbon, said filters further comprising a writing surface (12) to allow their identification.

8. The protective device according to any of the preceding claims, further comprising a plurality of silicone supports (7) attached to the adjustable securing band (6).

9. The protective device according to any of the preceding claims, further comprising a transparent valve (9) suitable for receiving a tube, said valve being made of the same material as the main body.

10. The protective device according to any of the preceding claims, the inner and outer layers of the main body are manufactured with double-sided plastic or by means of attachment with silicone thread.

11. The protective device according to any of the preceding claims, further comprising protective glasses (10), with or without arms, coupled by means of a clipping attachment (11) which allows coupling and uncoupling said glasses, said attachment being made of the same material as the main body and located on the contour of said main body.

12. The protective device according to any of claims 1 to 10, further comprising an eye protection shield coupled by means of a clipping attachment, said attachment being made of the same material as the main body and located on the contour of said main body.

13. The protective device according to any of the preceding claims, wherein the inlet filter (5) has a circular shape for coupling thereof to standard oxygen therapy tubing, with outer diameters in the range of 4.5-5 mm and inner diameters of between 2.5 and 3.2 mm.

14. The protective device according to any of the preceding claims, further **characterized in that** the material with which it is manufactured has been subjected to an oleophobic and/or anti-fog treatment.

15. The protective device according to any of the preceding claims, further comprising a nose clip for adjusting the main body to the user's face, the main body being made of a flexible material.

16. The protective device according to the preceding claim, wherein the nose clip is made of transparent silicone.

17. The protective device according to any of claims 11 or 12, wherein the clipping attachment (11) comprises one or more magnets.

18. The protective device according to any of claims 1-14, **characterized in that** the plastic constituting the main body has been subjected to a vitrification, anti-scratch, and bactericidal treatment.

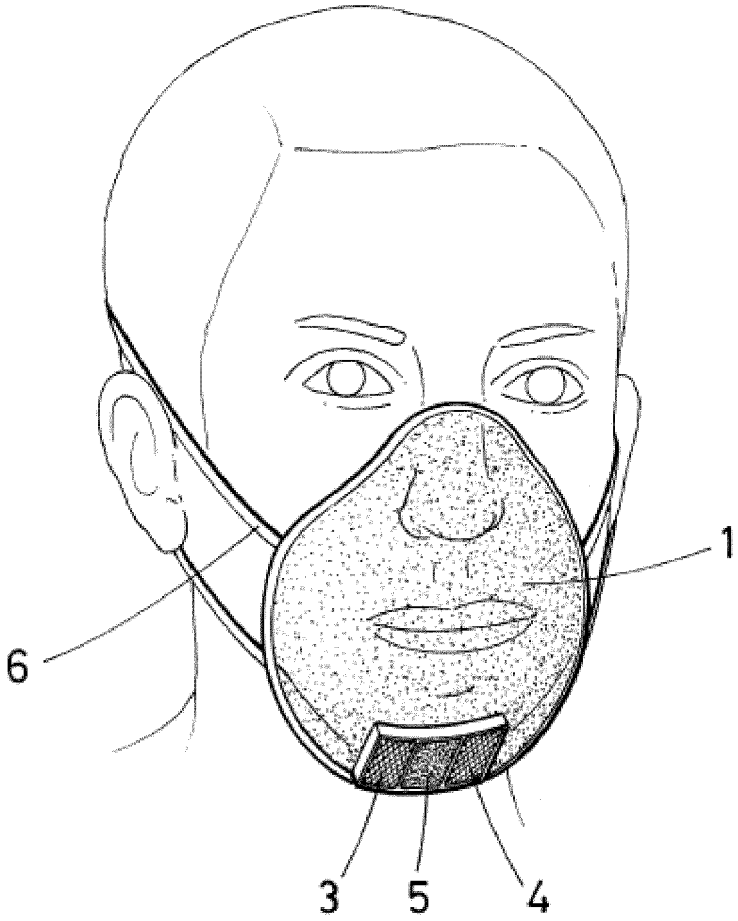

FIG.1

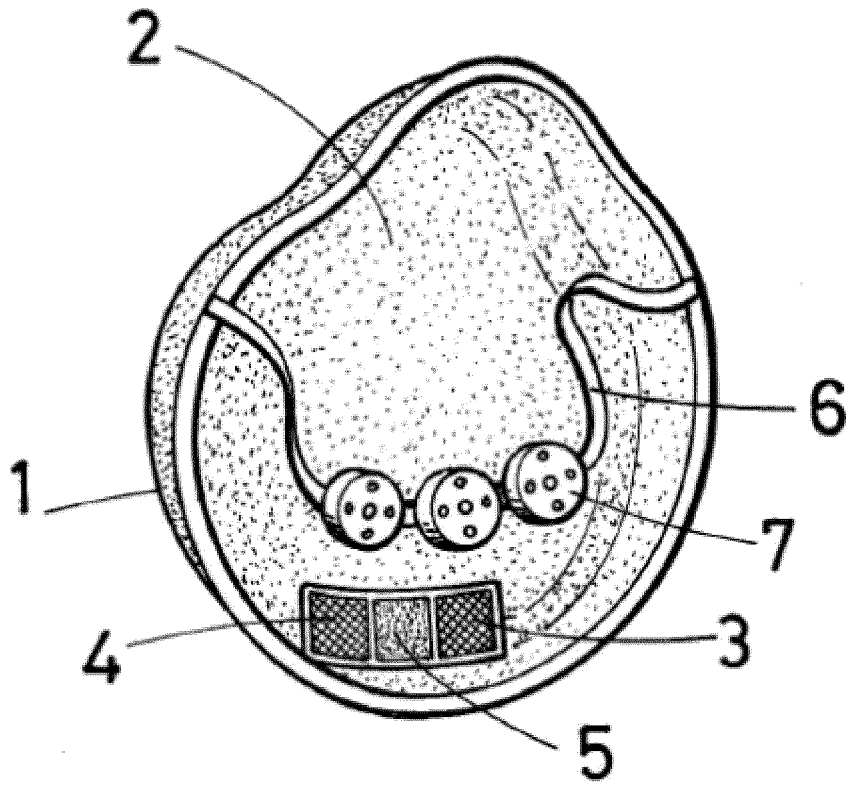

FIG. 2

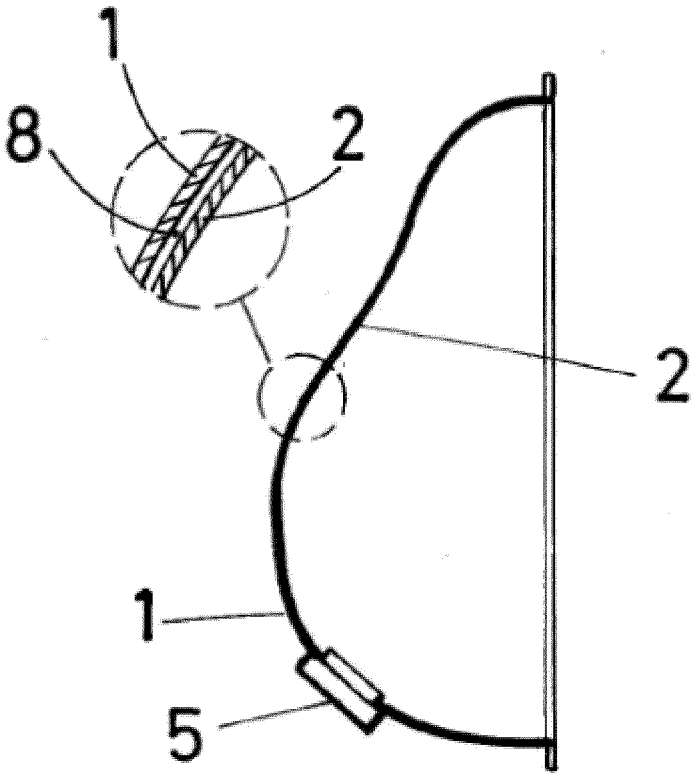

FIG.3

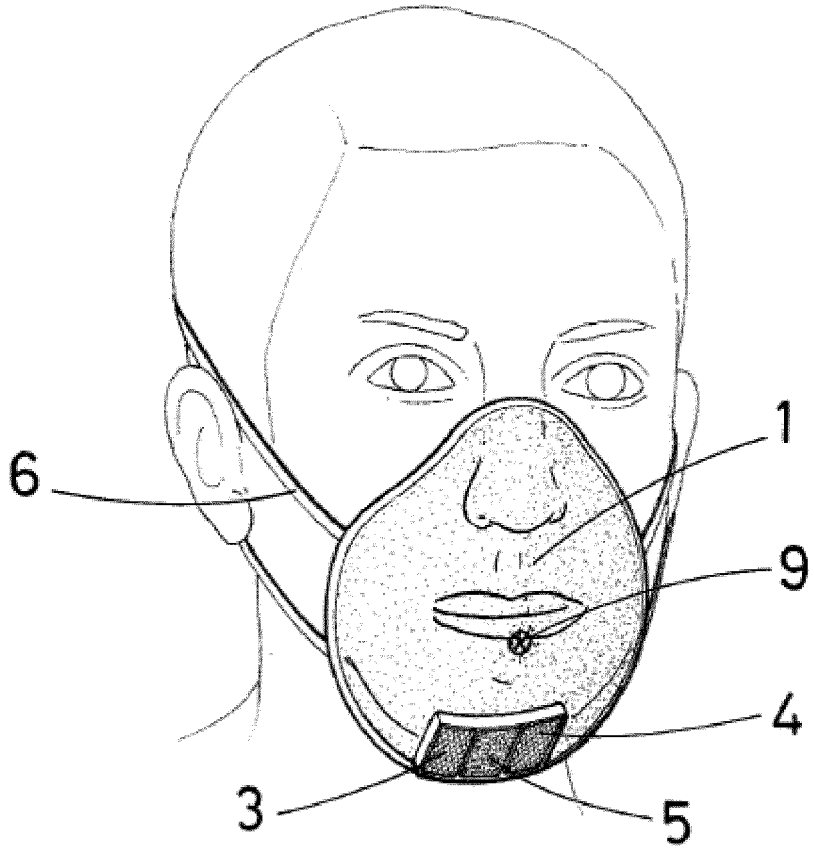

FIG.4

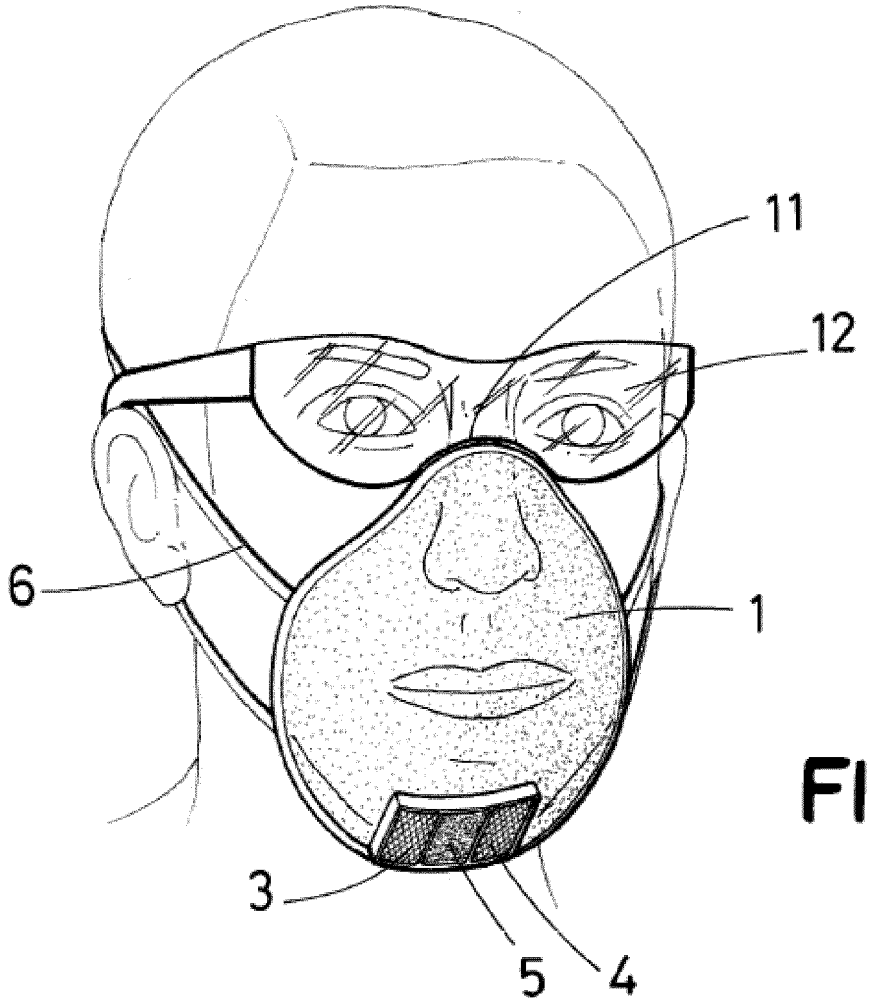

FIG.5

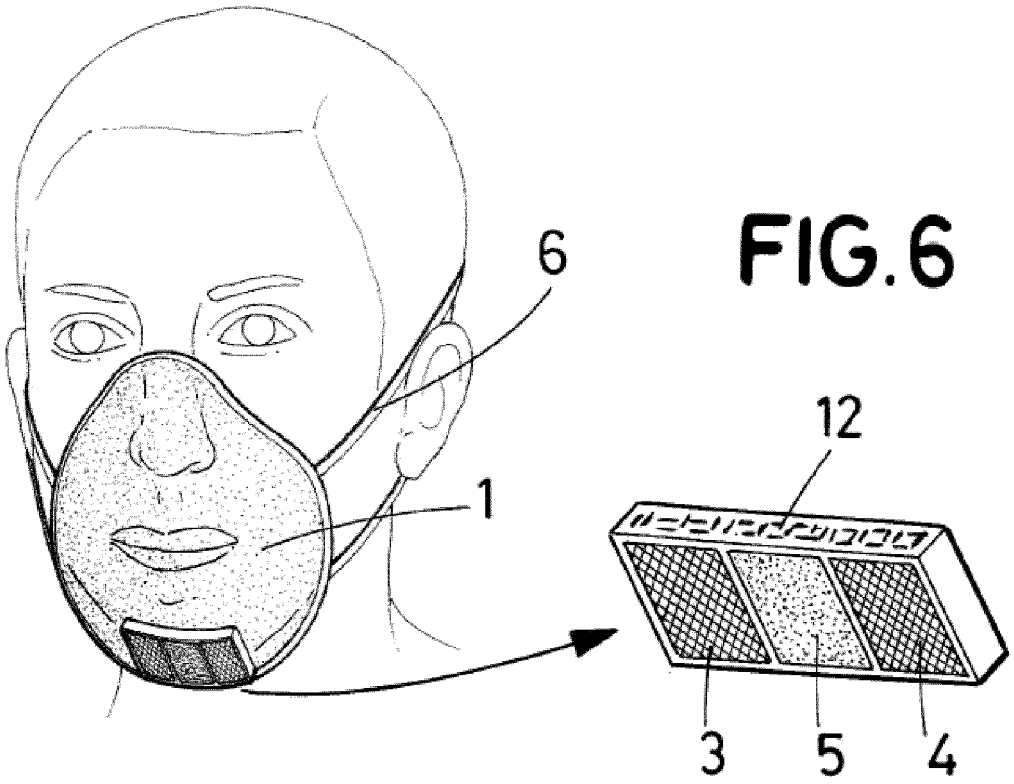

FIG.6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2021/070452

A. CLASSIFICATION OF SUBJECT MATTER

A41D13/11 (2006.01)
A41D13/11 (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A41D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, INVENES

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6102040 A (TAYEBI AMAD ET AL.) 15/08/2000, figure 2, claim 1	1-18
A	EP 3178525 A1 (CHOI CHONG-SIK CHOI CHONG SIK) 14/06/2017, figure 1	1-18
A	WO 2015168077 A1 (SCOTT TECH INC) 05/11/2015, figure 2b	1-18
A	WO 2015092583 A1 (KONINKL PHILIPS NV) 25/06/2015, figure 3	1-18

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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Date of the actual completion of the international search	Date of mailing of the international search report
05/10/2021	**(06/10/2021)**
Name and mailing address of the ISA/ OFICINA ESPAÑOLA DE PATENTES Y MARCAS Paseo de la Castellana, 75 - 28071 Madrid (España) Facsimile No.: 91 349 53 04	Authorized officer C. González Valdespino Telephone No. 91 3498541

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/ES2021/070452

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
US6102040 A	15.08.2000	NONE	
EP3178525 A1	14.06.2017	NONE	
WO2015168077 A1	05.11.2015	NONE	
WO2015092583 A1	25.06.2015	NONE	

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