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(54) **DEVICE FOR THE PERSONALISED ADJUSTMENT OF FACE-MASKS**

(57) A device for the personalised adjustment of face-masks, suited for the adjustment of a face-mask (3) against the facial contour of any user, consisting of a ring (1) manufactured from a malleable thermoplastic polymer and suited for its adaptation to the shape of the contour of the nose and mouth of the user, at a temperature of between 45°C and 60°C, and which solidifies when it cools, maintaining the adopted shape of the face of the user. The ring (1) comprises: a frontal surface (11), a rear surface (12) for contact with the face-mask (3) adjusted against the face of the user, and a number of elements (13) for the hooking of a number of elastic cords (2) suited for the anchoring of the ring (1) against the head of the user with its shape adapted to that of the user's face, and pressing against the face-mask, adjusting it to the face of said user

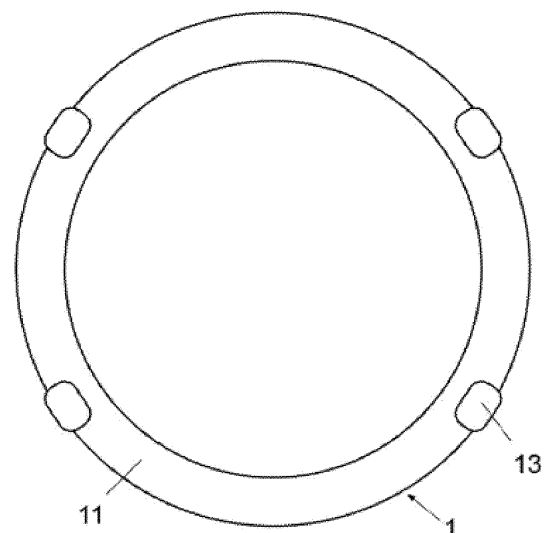


Fig. 1

Description**Field of the art**

[0001] The present invention relates to a device for custom adjustment of masks, intended for medical staff and any individual that wants to adjust a surgical mask, creating an enclosure of said mask surrounding the nose and the mouth, and securing said mask in a position of use.

Background art

[0002] Currently, surgical masks are commonly used for reducing the risk of infection of virus or air-borne pathogens.

[0003] These masks generally comprise a flexible rectangular body and lateral elastic bands for holding it against the head of the user, so that, in the position of use, said rectangular body covers widely the nose and the mouth of the user, theoretically retaining the particles entrained by the air inhaled or exhaled by the user during respiration.

[0004] These masks also incorporate a metallic strip for adjustment over the nose, however, said masks are not conveniently adjusted to the perimeter of the nose and the mouth of the patient, hence, a substantial part of the inhaled or exhaled air does not go through the filtering body of the mask, but it goes instead through the openings formed between the face and the contour of said filtering body, thus reducing considerably the protection properties of the mask.

[0005] This drawback will be determined by several factors, specifically: the flexible nature of the mask, the flat shape thereof, the difficulty of adaptation to the features of different users, and to the tension of the holding elastic bands that causes, on one hand, the definition on the sides of the mask of air-passage folds or grooves and, on the other hand, a tensile force on the upper edge of the mask, that overcomes the resistance of the metallic strip, with the resulting creation of air-passage openings on both sides of the nose.

[0006] In order to avoid these drawbacks and to achieve an adjustment of the surgical mask around the nose and the mouth of the user, the system "bellus3D" for a custom adjustment of the mask to a specific individual is known.

[0007] This system consists in:

- performing a 3D scan on the face of the user;
- designing, based on the scanned image, a tridimensional ring provided of hooks for holding bands and adjustable to the contour of the nose and mouth of said user, and
- finally, manufacturing by means of 3D printing a physical sample of the designed ring.

[0008] This system allows manufacture of a ring for adjusting a surgical mask to a specific user, but has some drawbacks, amongst which:

- physical presence of each user in need of an adjustment ring is necessary in order to perform the scanning of his/her face;
- it is not universal, but customized, since each ring is for a specific person,
- it needs the use of devices, specifically, a 3d scanner, a computer with 3D design software, and a 3d printer, which are not of common use for general public and require specific knowledge for being used, and
- the use of this system is not feasible in underdeveloped areas that do not have infrastructures or power grids for connecting the aforesaid devices.

[0009] The technical issue set out here is the development of a device for custom adjustment of masks, that allows to solve the drawbacks of the aforesaid background art and that has a universal nature, allowing adjusting a mask to the face of any individual, regardless of the his/her location or the shape of his/her face, and without having to use specific devices for 3D scanning, designing and printing or technical knowledge for being used.

Description of the invention

[0010] The device for custom adjustment of masks which is the object of the invention has technical features suitable for adjusting a mask to the contour of the face of any user, so that the mask covers the nose and the mouth, and no air passage gaps are formed in its perimeter, and the totality of the inhaled and exhaled air passes through the mask.

[0011] Another object of the invention is that the device can be adjusted easily to any user without having to use design equipment and software that require a specific training for being used.

[0012] According to the invention, this device comprises a ring made of a thermoplastic polymer which is malleable, and suitable to be adapted to the shape of the contour of the nose and the mouth of the user, at a temperature comprised between 45 °C and 60 °C, and that solidifies when cooled, keeping the shape adopted of the face of the user.

[0013] Said ring comprises: a front surface, a rear surface contacting the mask to be adjusted over the face of the user, and hook members of elastic bands suitable to hold the ring against the head of the user, with a shape adapted to the face of the user, and to press it against the mask, adjusting the latter to the face of the user.

[0014] With the indicated features, it is only necessary

to heat the polymer to the indicated temperature in order to render it malleable, place it around the nose and the mouth, deforming it with the fingers so that it adopts the shape of said area of the user, and let it cool subsequently so that it solidifies keeping the corresponding shape.

[0015] Heating of the ring can be performed in a microwave oven, selecting the power and time indicated by the manufacturer; with hot air from a hairdryer, in an electric or gas oven controlling its temperature, or with any other source of heat available; the user itself can place and press it against the face so that said ring adopts the shape of his/her face; letting it cool subsequently so that it solidifies and keeps the shape suitable for that specific user.

[0016] Thus, it is achieved that, when placing the device over the mask and fixing it in the position of use by means of the holding bands, the ring presses with its contour the mask, adjusting it to the face of the user, securing a perimeter sealing and that the user will breathe only through the mask.

[0017] An advantage of this device is its universal nature, since it can be adjusted to any user; it being possible to manufacture three different sizes or dimensions thereof for children, young and adult individuals.

[0018] According to the invention, the ring can have any cross section, preferably, of circular, elliptical, semicircular or polyhedral shape.

[0019] According to the invention, the thermoplastic polymer is biodegradable, so that it does not constitute an environmental issue when disposed after use.

[0020] In a specific embodiment, the thermoplastic polymer is polylactic acid (PLA) obtained from corn starch, which provides said biodegradable nature.

Brief description of the drawings

[0021] In order to complement the present description, and to clarify the characteristics of the invention, the following drawings are included in the present specification, for illustrating and no limiting purposes, and in which:

- Figure 1 shows a front elevational view of the device of the invention, without the holding elastic bands for the user.
- Figure 2 shows an upper perspective view of the device of figure 1.
- Figure 3 shows a front elevational view of the device of the previous figures, in a position of use, once the shape of the ring has been adapted in a hot state to the contour of the nose and mouth of the user, and said ring performing a perimeter adjustment of a mask against the face of the user.

Detailed description of embodiments of the invention

[0022] In the example embodiment shown in figures 1 and 2, the device of the invention comprises a ring (1) of elliptical cross section, provided with a front surface (11), a rear surface (12) and hook members (13) of elastic bands (2) that are held by the head of the user in a position of use, shown in figure 3.

[0023] The hook members (13) are located symmetrically on opposite sides of the rear surface of the ring (1).

[0024] In this embodiment, the ring (1) and the hook elements (13) form a single-piece body made of a thermoplastic biodegradable polymer and, more specifically, made of polylactic acid (PLA), malleable at a temperature comprised between 45 °C and 60 °C, and that solidifies when cooled at ambient temperature.

[0025] For a correct use of the device by a user, it is necessary to heat the ring (1) to a temperature comprised within the mentioned range, press it against the contour of the nose and mouth of the user so that it adopts the corresponding shape, and let it cool so that it solidifies and keeps the adopted shape of the face of the user.

[0026] As shown in figure 3, once the shape of the ring (1) has been adapted to the face of the user, it is only necessary to place it over the mask (3) and fix it to the head of the user by means of elastic bands (2) fixed to the hook elements (13) and passing behind the ears or the head.

[0027] In this position of use, the ring (1) presses the mask (3) against the face of the user, adjusting it and forming a perimeter closure around the nose and mouth of the user, guaranteeing that all the breathing air passes through the mask (3), so that its functionality is assured.

[0028] Once the nature of the invention has been sufficiently described, as well as an example of preferred embodiment, it is stated that the materials, shape, size and arrangement of the described elements shall be modified, as long as it does not involve an alteration of the essential features of the invention, which are claimed below.

Claims

1. Device for custom adjustment of masks; suitable for adjusting a mask (3) to the contour of the face of any user; **characterized in that** it consists of a ring (1) made of a thermoplastic polymer which is malleable, and suitable to be adapted to the shape of the contour of the nose and the mouth of the user, at a temperature comprised between 45 °C and 60 °C, and that solidifies when cooled, keeping the shape adapted to the face of the user.
2. Device according to claim 1, **characterized in that** the ring (1) comprises: a front surface (11), a rear surface (12) contacting the mask (3) to be adjusted

over the face of the user, and hook members (13) of elastic bands (2) suitable to hold the ring (1) against the head of the user, with a shape adapted to the face of the user, and to press it against the mask (3), adjusting the latter to the face of said user.

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3. Device according to any of the previous claims; **characterized in that** the ring (1) has a circular, elliptical, semicircular or polyhedral cross section.

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4. Device according to any of the previous claims; **characterized in that** the thermoplastic polymer is biodegradable.

5. Device according to any of the previous claims, **characterized in that** the thermoplastic polymer is polylactic acid (PLA).

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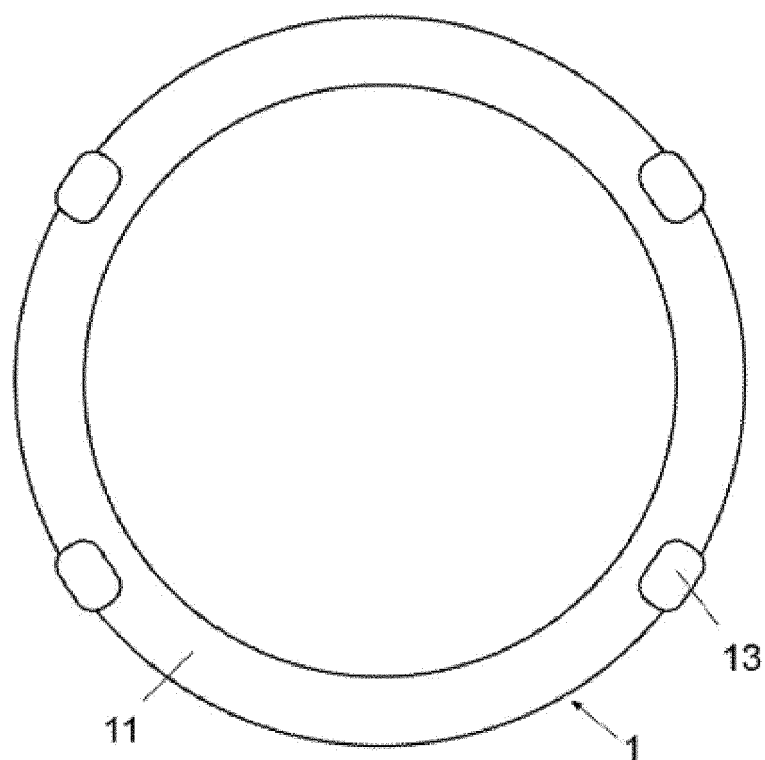


Fig. 1

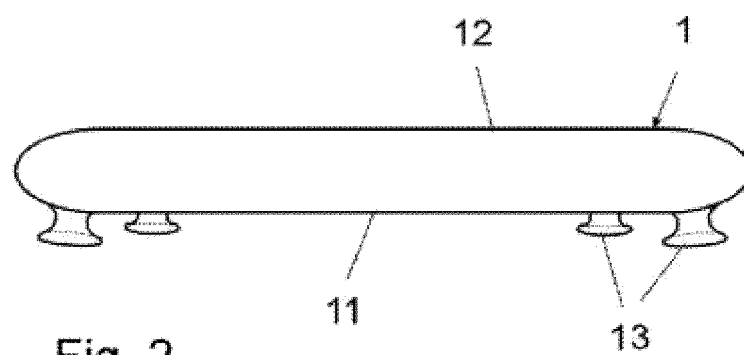


Fig. 2

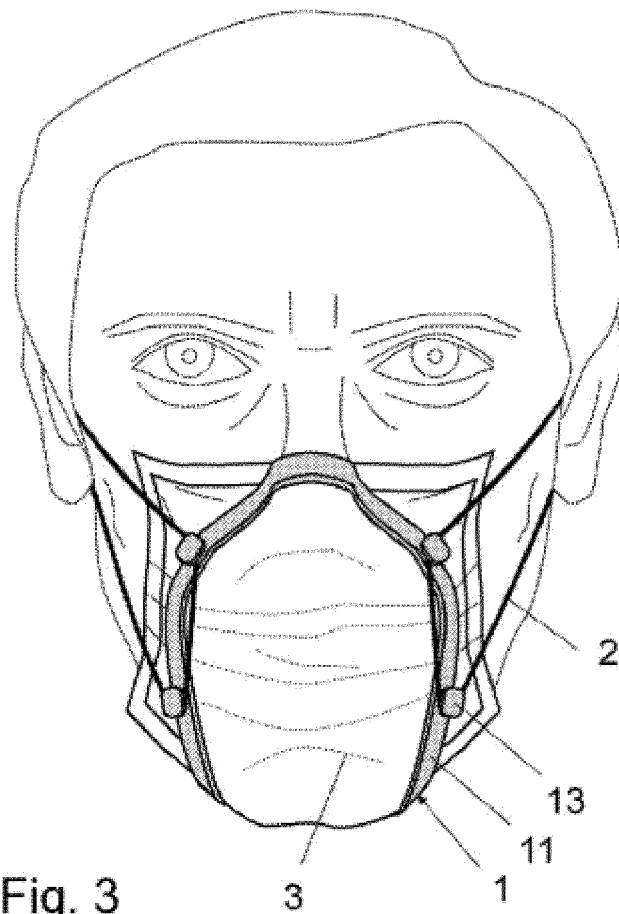


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ES2021/070132

5	A. CLASSIFICATION OF SUBJECT MATTER	
	A41D13/11 (2006.01)	
	According to International Patent Classification (IPC) or to both national classification and IPC	
10	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 INTERNET	
15	Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPODOC, INVENES, DWPI	
	C. DOCUMENTS CONSIDERED TO BE RELEVANT	
20	Category*	Citation of document, with indication, where appropriate, of the relevant passages
		Relevant to claim No.
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25	Y	US 2019223578 A1 (LAGHI ALDO) 25/07/2019, The whole document.
30	Y	WO 202008253 A1 (GEREMTZES CHARALAMPOS ET AL.) 09/01/2020, Claims 1, 17
35	A	US 2015257918 A1 (LAUBACH ADAM ET AL.) 17/09/2015, Claims 1-17, 20
40	<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.	
45	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance. "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure use, exhibition, or other means. "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
50	Date of the actual completion of the international search 08/06/2021	Date of mailing of the international search report (10/06/2021)
55	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 A. Santos Díaz Telephone No. 91 3495569

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International application No.

Information on patent family members

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