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(54) **HAIR DRYER**

(57) Hair dryer for generating an air flow (AF), the hair dryer comprising a curved shape unit (100) defining an outer surface of the hair dryer, a first part (111) of the outer surface being at an angle to a desired direction of the air flow (AF), and a second part of the outer surface being aligned with the desired direction of the air flow; a fan unit (200) at the first part (111) of the outer surface, the fan unit (200) having an air inlet arranged for drawing air in a direction that is opposite to the desired direction of the air flow (AF), and an air outlet arranged for blowing air along the first part (111) of the outer surface; and a heater arranged for heating air.

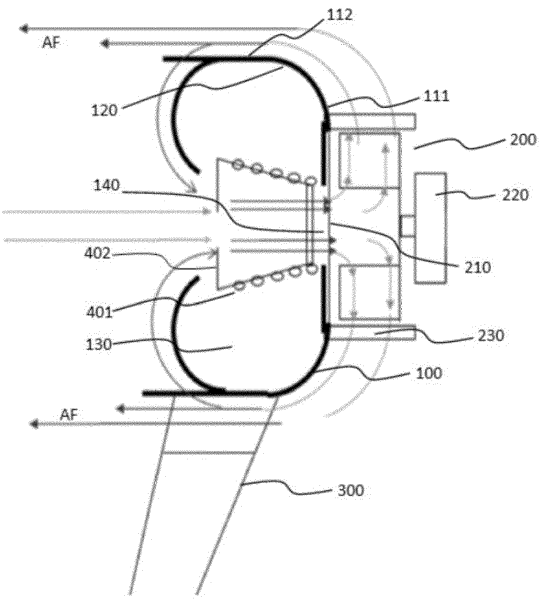

Fig.1A

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Description

FIELD OF THE INVENTION

[0001] The invention relates to a hair dryer.

BACKGROUND OF THE INVENTION

[0002] Prior art hair dryers generally comprise a housing, an air inlet allowing air to enter the housing, a fan to move the air from the air inlet via a heater to an air outlet where heated air leaves the housing.

[0003] WO2022157056A1 discloses a hair dryer for generating an air flow, the hair dryer comprising a curved shape unit defining an outer surface of the hair dryer, a first part of the outer surface being at an angle to a desired direction of the air flow, and a second part of the outer surface being aligned with the desired direction of the air flow; a fan unit at the first part of the outer surface, the fan unit having an air inlet, and an air outlet arranged for blowing air along the first part of the outer surface; and a heater arranged for heating a user's hair.

SUMMARY OF THE INVENTION

[0004] It is, inter alia, an object of the invention to provide an alternative design of a hair dryer, which is more efficient than existing hair dryers. The invention is defined by the independent claims. Advantageous embodiments are defined in the dependent claims.

[0005] As illustrated in WO2022157056A1, as a result of the Coand ă effect, ambient pressure makes the air flow follow the shape of the curved shape unit. The air flow will thus be guided from the first part of the outer surface to the second part of the outer surface into the desired direction towards a user's hair. The Coand dă ef effect may also result in that ambient air not outputted by the fan unit is made to flow along with the air flow from the fan unit, thereby resulting in a total air flow that has more impact than just the air flow generated by the fan unit. The Coand ă effect has been explained in https://en.wikipedia.org/wiki/Coand%C4%83_effect.

[0006] The invention further provides a hair dryer for generating an air flow, the hair dryer comprising a curved shape unit defining an outer surface of the hair dryer, a first part of the outer surface being at an angle to a desired direction of the air flow, and a second part of the outer surface being aligned with the desired direction of the air flow; a fan unit at the first part of the outer surface, the fan unit having an air inlet arranged for drawing air in a direction that is opposite to the desired direction of the air flow, and an air outlet arranged for blowing air along the first part of the outer surface; and a heater arranged for heating air.

[0007] The first part of the outer surface comprises an opening, and the position of the opening is aligned with the air inlet.

[0008] The opening may be in the center of the first part (111) of the outer surface.

[0009] Alternatively, the opening is in strip-shape away from the center of the first part of the outer surface.

[0010] The curved shape unit defines an inner surface which forms an inner cavity of the hair dryer, the heater is positioned in the inner cavity.

[0011] Optionally, the heater comprises a heating wire, a ceramic heater, a light source or any combination of aforementioned heater.

[0012] Optionally, the fan unit comprises a centrifugal fan.

[0013] Optionally, the fan unit comprises a flat brushless DC motor.

[0014] Optionally, a motor of the fan unit is mounted at the back of the fan unit.

[0015] The hair dryer comprises a handle coupled to the curved shape unit for the user to grip.

[0016] Optionally, the hair dryer comprises a sensor for sensing temperature of the air flow at the air outlet of the hair dryer, and the heater is controlled according to the sensed temperature of the air flow.

[0017] Optionally, the hair dryer comprises a distance sensor for sensing the distance between the hair dryer and the hair when in use, and the heater is controlled according to the distance between the hair dryer and the hair.

[0018] Optionally, the hair dryer comprises a communication unit for communicating with a mobile device.

[0019] Optionally, the hair dryer comprises a battery to supply power to the hair dryer.

[0020] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021]

Fig. 1A schematically shows a side view of an embodiments of a hair dryer according to the invention.
Fig. 1B schematically shows a rear view of the hair dryer of Fig.1A.
Fig. 2 schematically shows air flow moving path of the hair dryer according to the embodiment of Figs. 1A and 1B when in use.
Fig.3A schematically shows another embodiment of a hair dryer according to the invention.
Fig.3B schematically shows air flow moving path of the hair dryer of according to the embodiment of Fig.3A.

DESCRIPTION OF EMBODIMENTS

[0022] Fig. 1A and Fig. 1B show a side view and a rear view, respectively, of an embodiment of a hair dryer according to the invention. It is to be understood that

the drawings shown in this invention are just rough sketch for the purpose of illustrating the invention.

[0023] The hair dryer comprises a curved shape unit 100 defining an outer surface of the hair dryer. A first part 111 of the outer surface is at an angle to a desired direction of the air flow AF, and a second part 112 of the outer surface is aligned with the desired direction of the air flow AF. A fan unit 200 is mounted at the first part 111 of the outer surface.

[0024] The curved shape unit 100 also defines an inner surface 120 at the opposite side of the outer surface. The inner surface 120 forms an inner cavity 130 of the hair dryer.

[0025] The fan unit 200 has an air inlet 210 with an air inlet grill and an air outlet 230 with an air outlet grill. The air inlet is arranged for drawing air in a direction that is opposite to the desired direction of the air flow AF.

[0026] The first part 111 of the outer surface has an opening 140. The opening 140 may be positioned at the center of the first part 111 of the outer surface as shown in Fig. 1A. The opening may be in any shape, such as a round shape, square shape, etc.

[0027] Advantageously, the position of the opening 140 is aligned with the air inlet 210. Term "align" in this context means from front view or rear view, the opening 140 and the air inlet 210 has at least partial overlapping area. Preferably the opening and the air inlet has the same shape and completely overlap from front view or rear view, i.e the air inlet and the opening is coincident at the first part of the outer surface. Alternatively, the fan unit may partially protrude inwardly to the inner cavity 130 through the opening such that the air inlet is in the inner cavity.

[0028] The fan unit 200 is thus can draw air through the air inlet 210 from the side of the inner cavity 130. The fan unit 200 then blows air from the air outlet 230 along the first part 111 of the outer surface, and further, as a result of Coand ă effect, ambient pressure makes the air flow following the shape of the curved shape unit. The air flow will thus be guided from the first part 111 of the outer surface to the second part 112 of the outer surface into the desired direction towards a user's hair. The arrowed lines in Fig.1A show the direction of the air flow being drawn and blown.

[0029] Fig.2 shows a hair dryer being in use to dry hair according to an embodiment of the invention. Arrowed lines in Fig.2 show the air flow moving path including the directions of the air flow being drawn and blown. The inner cavity 130 of the curved shape unit when in use faces user's hair, and the fan unit will suck air from the side of the inner cavity, i.e. from side of the user's hair, and the air is heated by the heater before entering to the fan unit, and then the fan unit blows hot air along the first part of the outer surface to the second part of the outer surface and towards the user's hair. In other words, when in use, the desired direction of the air flow of the hair dryer is the direction towards the user's hair, and the direction opposite to the desired direction of the air flow is the direction away from the user's hair.

[0030] An advantage of this embodiment is that the user's hair will not fly away because the force of blowing the hot air flow towards hair is balanced by the force of sucking air into the fan unit.

[0031] It can be seen from Fig 2, at least part of the hot air blowing from the second part of the outer surface towards hair can be re-circulated to the fan unit through air inlet, thus a further advantage of this embodiment is that faster and efficient drying can be archived.

[0032] Moreover, in this embodiment, air flow can escape like normal hair dryer, and the device can be put on hair and scalp closely to further allowing more efficient drying.

[0033] Alternatively, the opening may be in strip-shape positioned away from the center of the first part 111 of the outer surface. For example, the opening 140 is an annular strip shaped opening and is close to the second part 112 of the outer surface as shown in Figs. 3A. Having a strip shaped opening allows high pressure air flow.

[0034] Similarly with the embodiment of Figs. 1A and 1B, when in use, the fan unit 200 will suck air from the side of the user's hair, and the air is heated by the heater before entering the fan unit, and then the fan unit blows hot air along the first part of the outer surface to the second part of the outer surface and towards the user's hair. The arrowed lines in Fig.3B show the direction of the air flow being drawn and blown. The opening positioned close to the second part of the outer surface allows the fan unit re-circulating the hot air blowing along the second part easily.

[0035] According to an embodiment of the invention, the hair dryer comprises a heater for heating air. The heater may be positioned in the inner cavity 130. The heater in this position is safer than to wound it around the outer surface of the curved shape unit. Preferably, the heater may comprise a heating wire 401 wound around a supporter 402. Preferably, the supporter 402 is mounted in the inner cavity adjacent to the opening 140 and is coaxial with the opening as shown in Fig.1. As a result, the air can be heated before the air is drawn into the fan unit. Alternatively, the heater may also be any other type of heater, such as a ceramic heater, PTC heater, a light source, or the combination of different types of heaters.

[0036] The fan unit 200 may be a centrifugal fan. The fan unit comprises a motor 220. The motor 220 of the fan unit 200 may be positioned at the back of the fan unit as shown in Fig. 1. Alternatively, the motor 220 may be positioned at the front of the fan unit 200, or at the center of the fan unit 200, or any other suitable position as long as it can draw air in through air inlet and blow air out through air outlet. It is to be understood that term "front" in the context of the invention means the side faces the user or is closer to the user than "back". In the embodiment of the Fig. 1A, the back of the fan unit is at the righthand side, while the front of the fan unit is at the left-hand side.

[0037] According to an embodiment of the invention, the hair dryer comprises a sensor (not shown in the

Figures) for sensing temperature of the air flow at the air outlet of the hair dryer. The temperature sensor may be an infrared temperature sensor, or any other type of temperature sensor known in the art. As mentioned above, the hair dryer according to the present invention may re-circulate the hot air, therefore, the hair dryer may need less power. With the temperature senor, it allows the heater to be controlled according to the sensed temperature of the air flow.

[0038] When in use, the distance between the hair dryer and the hair may impact the amount of re-circulate air flow, for example, the hot air might escape more when the hair dryer touches to the hair. The hair dryer according to one embodiment of the invention may comprise a distance sensor (not shown in the Figures) for sensing the distance between the hair dryer and the hair when in use. The distance sensor may be any type known in the art, for example, infrared distance sensor, laser-based distance sensor, ultrasound distance sensor, camera-based distance sensor, etc. The heater thus may be controlled based on the distance between the hair dryer and the hair when in use.

[0039] Optionally, the hair dryer comprises a communication unit (not shown in the Figures) for communicating with a mobile device, and hence the sensing signal may be sent from the hair dryer to the mobile device and the control signal may be sent from the mobile device to the hair dryer.

[0040] Optionally, because of the re-circulate hot air, less power is needed, the hair dryer may only comprise a battery (not shown in the Figures) to supply power to the hair dryer. The battery may be a replaceable battery or a rechargeable battery.

[0041] A handle 300 may be coupled to the curved shape unit 100 for the user to grip.

[0042] It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. The word "comprising" does not exclude the presence of elements or steps other than those listed in a claim. The word "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. In the device claim enumerating several means, several of these means may be embodied by one and the same item of hardware. Measures recited in mutually different dependent claims may advantageously be used in combination.

Claims

1. Hair dryer for generating an air flow, the hair dryer comprising:

a curved shape unit (100) defining an outer surface of the hair dryer, a first part (111) of the outer surface being at an angle to a desired direction of the air flow (AF), and a second part (112) of the outer surface being aligned with the desired direction of the air flow (AF);

a fan unit (200) at the first part (111) of the outer surface, the fan unit having an air inlet (210) arranged for drawing air in a direction that is opposite to the desired direction of the air flow (AF), and an air outlet (230) arranged for blowing air along the first part (111) of the outer surface; and

a heater arranged for heating air.

2. Hair dryer as claimed in claim 1, wherein the first part of the outer surface comprises an opening (140), and the position of the opening is aligned with the air inlet.

3. Hair dryer as claimed in claim 2, wherein the opening (140) is in the center of the first part (111) of the outer surface.

4. Hair dryer as claimed in claim 2, wherein the opening (140) is in strip-shape away from the center of the first part (111) of the outer surface.

5. Hair dryer as claimed in any of the preceding claims, wherein the curved shape unit (100) defines an inner surface (120) which forms an inner cavity (130) of the hair dryer, the heater is positioned in the inner cavity.

6. Hair dryer as claimed in claim 5, wherein the heater comprises at least one of the following: heating wire, ceramic heater, light source.

7. Hair dryer as claimed in any of the preceding claims, wherein the wherein the fan unit comprises a centrifugal fan.

8. Hair dryer as claimed in any of the preceding claims, wherein a motor (220) of the fan unit (200) is mounted at the back of the fan unit.

9. Hair dryer as claimed in any of the preceding claims, wherein the fan unit comprises a flat brushless DC motor.

10. Hair dryer as claimed in any of the preceding claims, wherein the hair dryer comprises a handle (300) coupled to the curved shape unit (100).

11. Hair dryer as claimed in any of the preceding claims, wherein the hair dryer comprises a sensor for sensing temperature of the air flow at the air outlet of the hair dryer, and the heater is controlled according to the sensed temperature of the air flow.

12. Hair dryer as claimed in any of the preceding claims,

wherein the hair dryer comprises a distance sensor for sensing the distance between the hair dryer and the hair when in use, and the heater is controlled according to the distance between the hair dryer and the hair.

13. Hair dryer as claimed in any of the preceding claims, wherein the hair dryer comprises a communication unit for communicating with a mobile device.

14. Hair dryer as claimed in any of the preceding claims, wherein the hair dryer comprises a battery to supply power to the hair dryer.

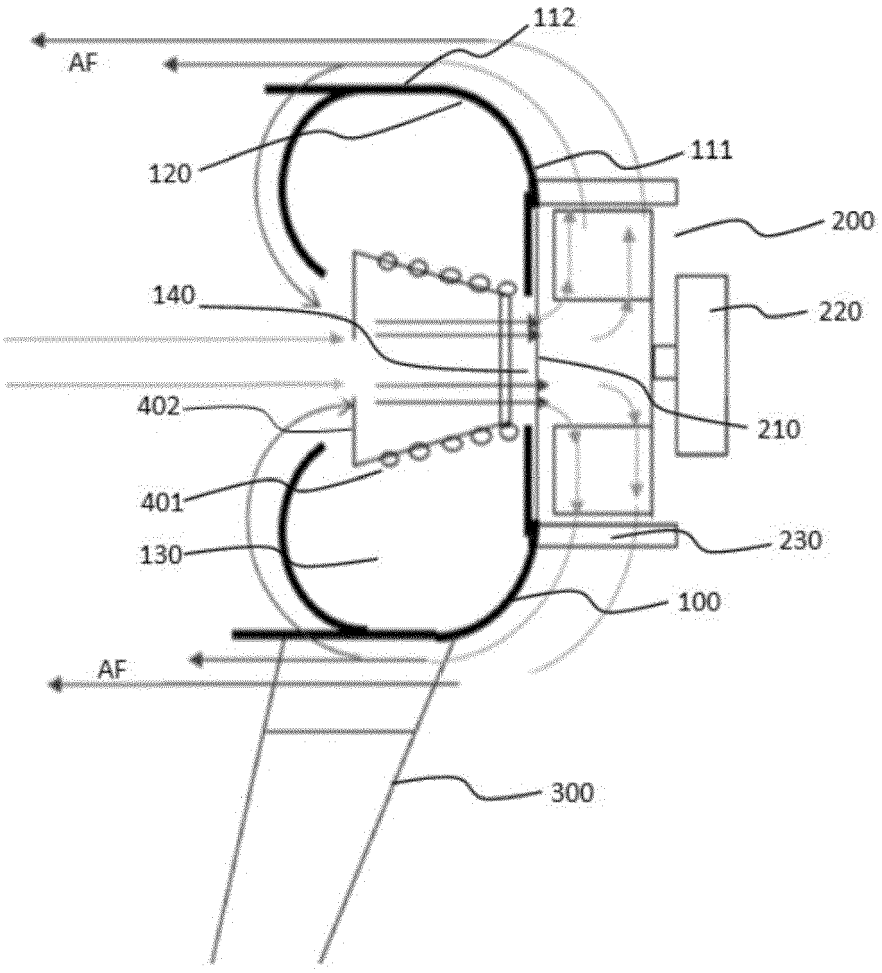

Fig.1A

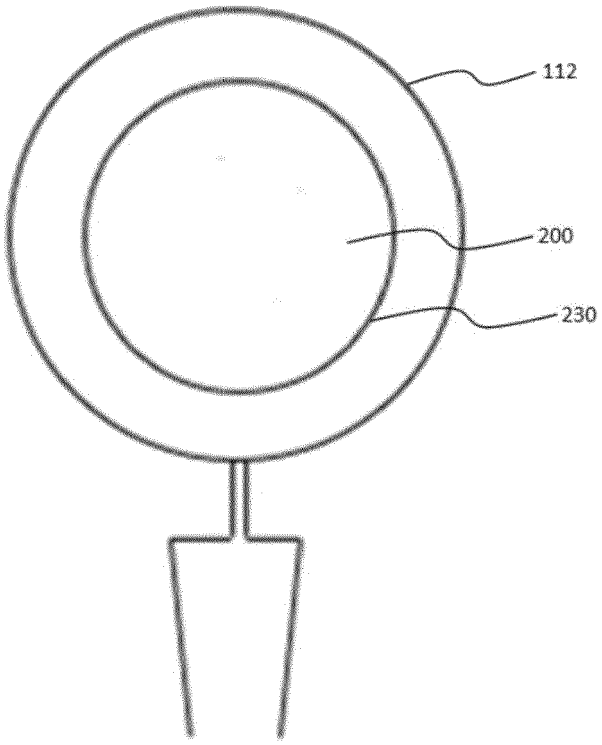

Fig.1B

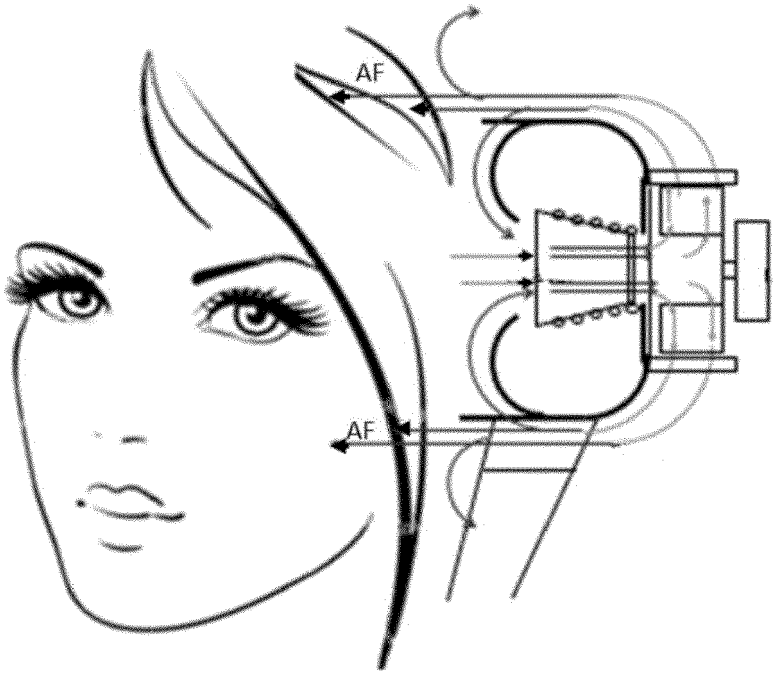

Fig.2

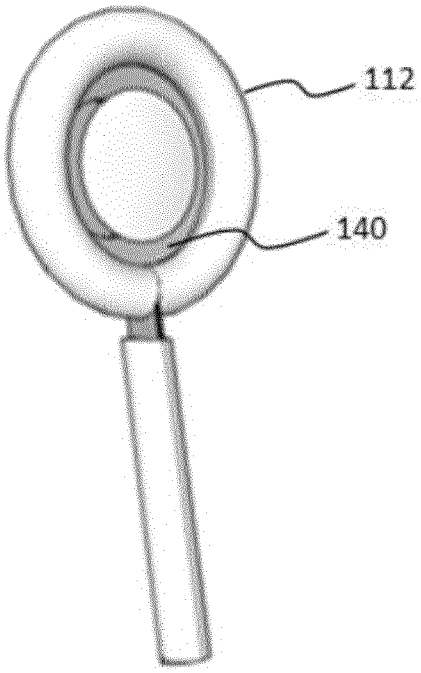

Fig.3A

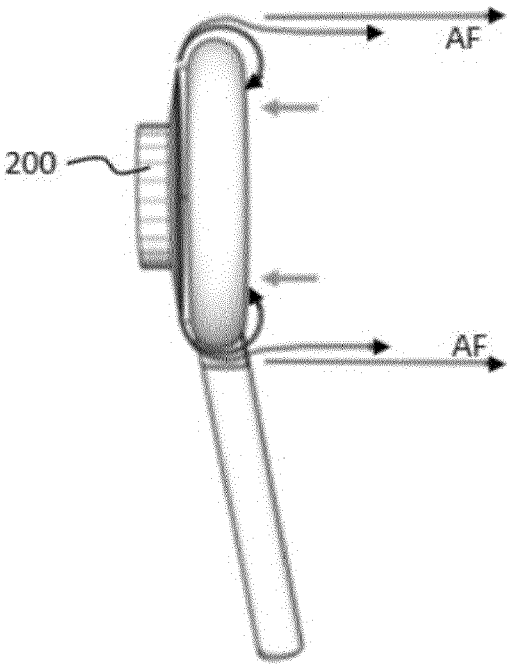

Fig.3B

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EUROPEAN SEARCH REPORT

Application Number
EP 23 19 8259

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2021/307479 A1 (CONRAD WAYNE ERNEST [CA]) 7 October 2021 (2021-10-07) * the whole document *	1-14	INV. A45D20/10 A45D20/12
X	WO 2022/157056 A1 (KONINKLIJKE PHILIPS NV [NL]) 28 July 2022 (2022-07-28) * the whole document *	1-14	

TECHNICAL FIELDS SEARCHED (IPC)

A45D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	5 February 2024	Frank, Lucia

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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05-02-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		KR 20230131277 A	12-09-2023
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2022157056 A1 **[0003] [0005]**