(12) UK Patent Application (19) GB (11) 2612302 (13) A

(43) Date of A Publication 03.05.2023

(21) Application No: 2114949.7

(22) Date of Filing: 19.10.2021

(51) INT CL:
A61M 35/00 (2006.01)

(56) Documents Cited:
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(58) Field of Search:
INT CL **A45D, A61H, A61M, C01B**

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(54) Title of the Invention: **Hair growth promoting device and method**
Abstract Title: **Hair growth promoting apparatus**

(57) Apparatus 10 for preserving, promoting and/or resorting hair, the apparatus comprising an applicator, mountable on at least a part of the body and fluidically connected to a supply of nitric oxide (NO) (260, Fig 4a), for directing NO onto the body. In one arrangement, the apparatus is intended to be worn on the head and may comprises a cap, or dome, portion 11 having a number of substantially radial spokes 12, each spoke extend through a hub portion 20 and down the sides of the cap. The free ends of the spokes locate into apertures in a substantially elastic headband 30. Extending between the spokes is a web material 40, optionally transparent and preferably of plastics such as polyurethane, which defines an internal space, I, when apparatus is placed on the head of a user. Hub has a first, intake tube 22 through which NO enters internal space, and a second, outlet tube 24 through which air and NO from internal space is filtered and to remove the NO, before the air exits the device into the atmosphere.

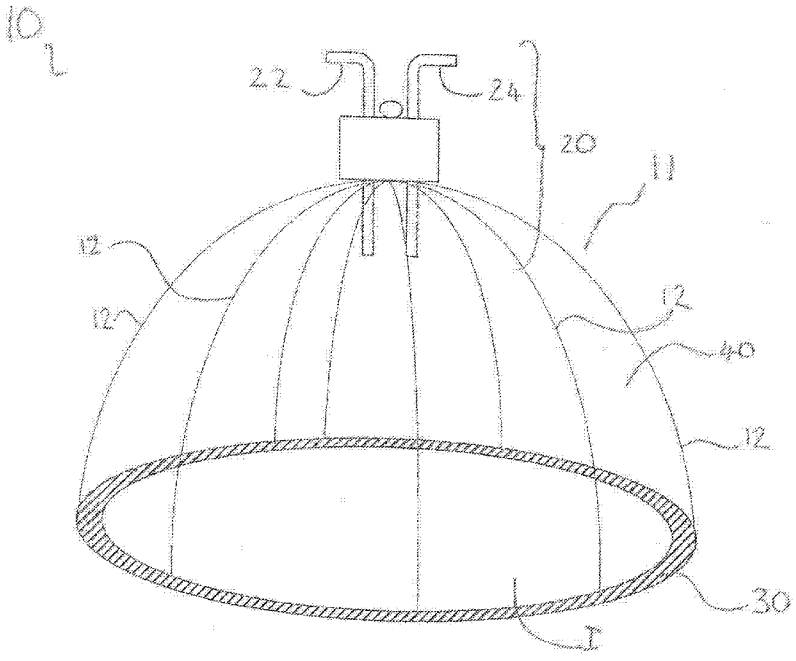

Fig 1

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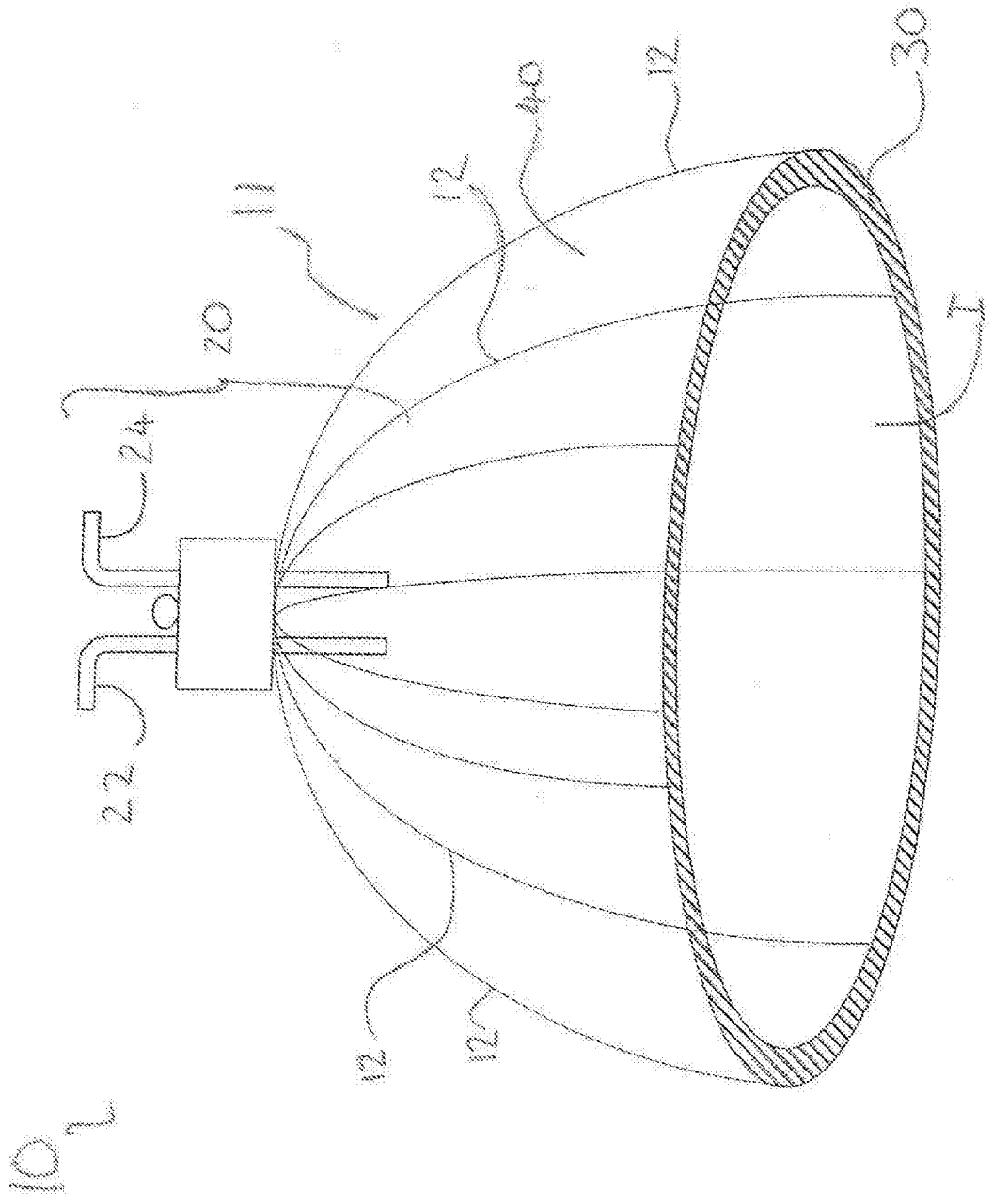

Fig 1

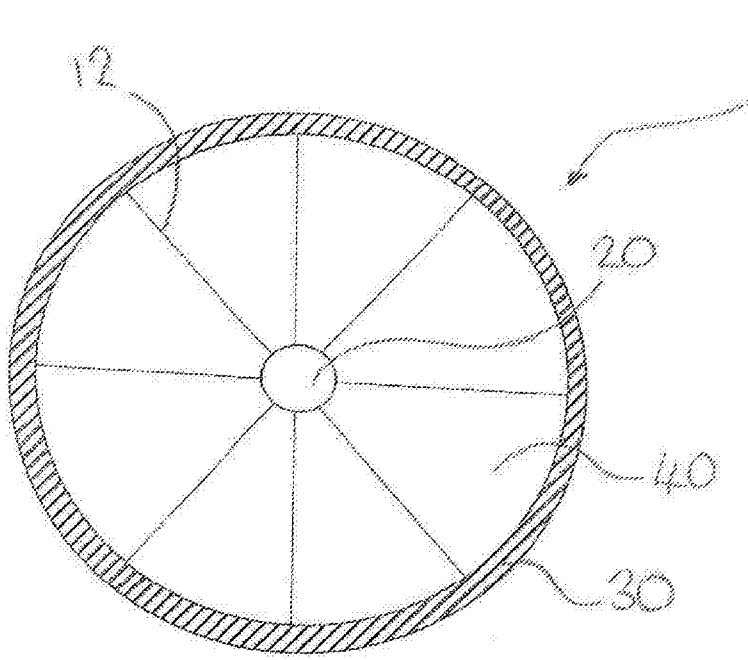

Fig 2(a)

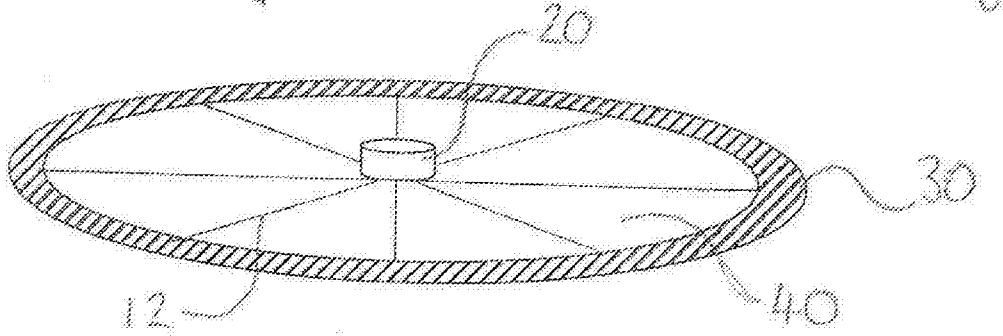

Fig 2(b)

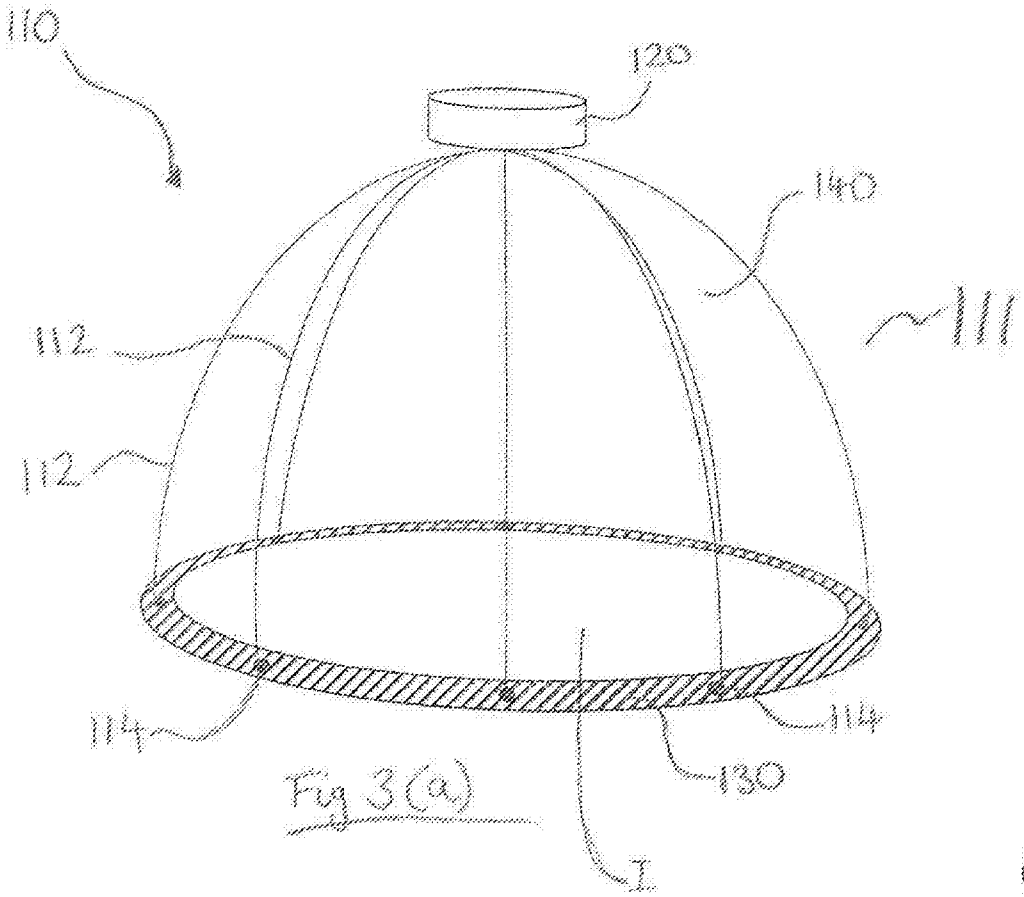

Fig 3(a)

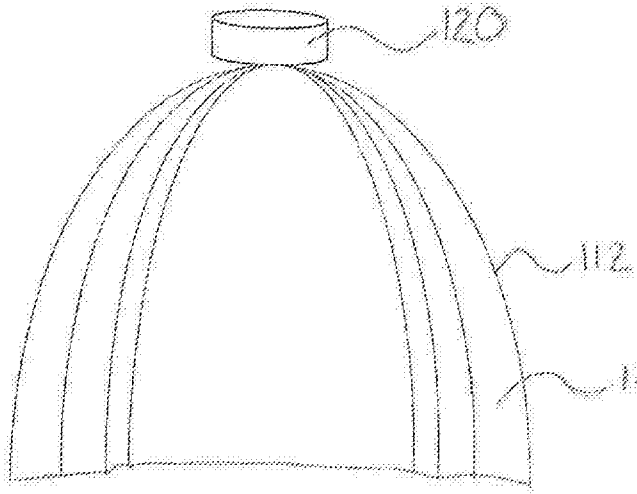

Fig 3(b)

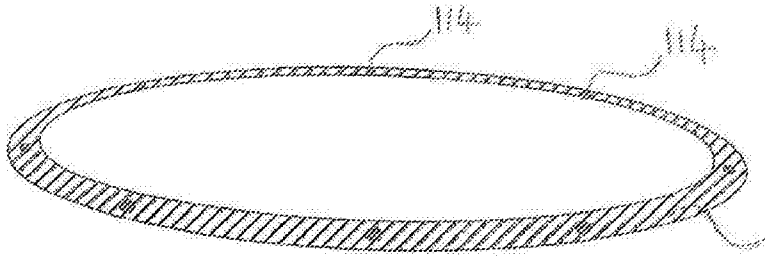

Fig 3(c)

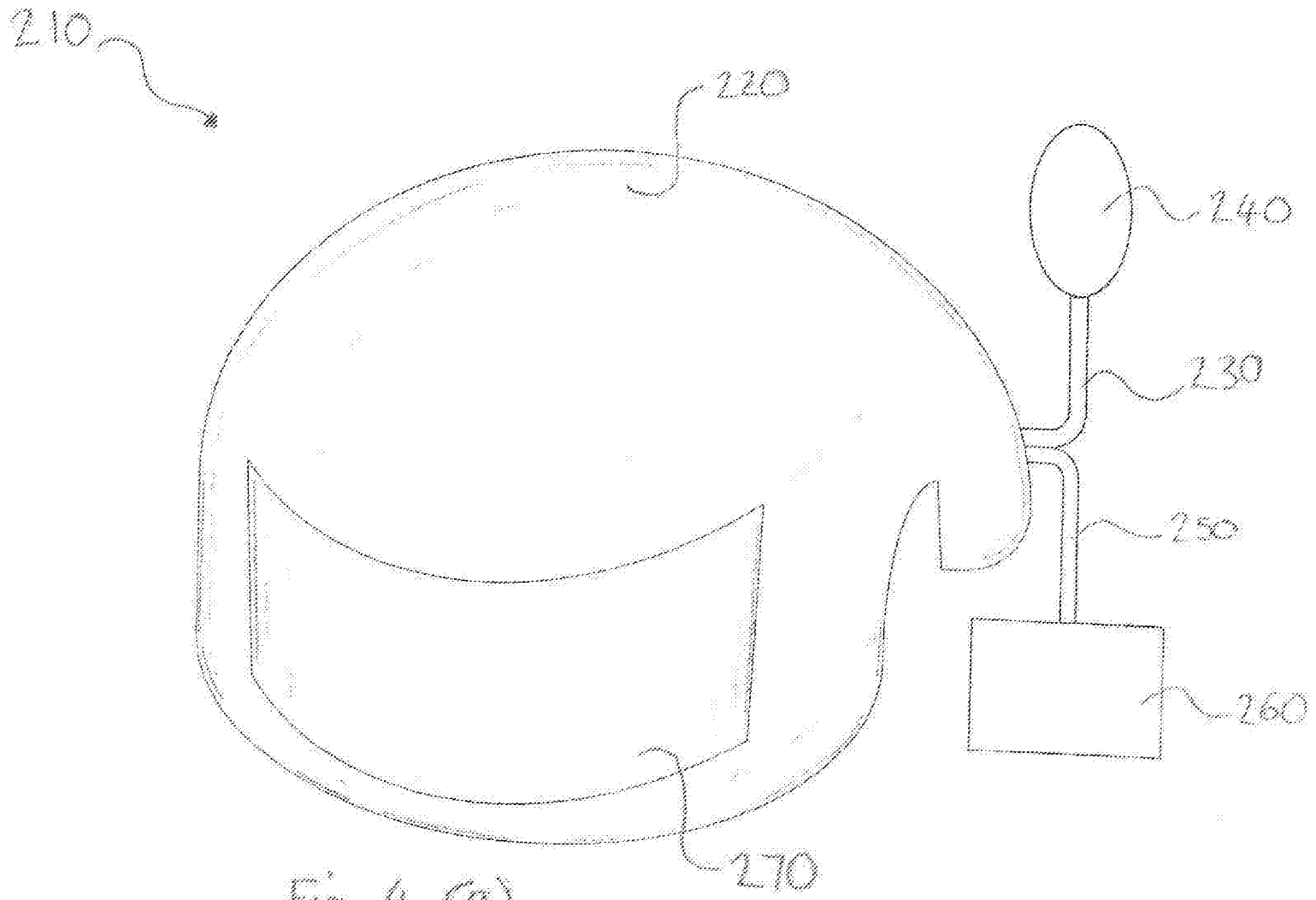

Fig 4 (a)

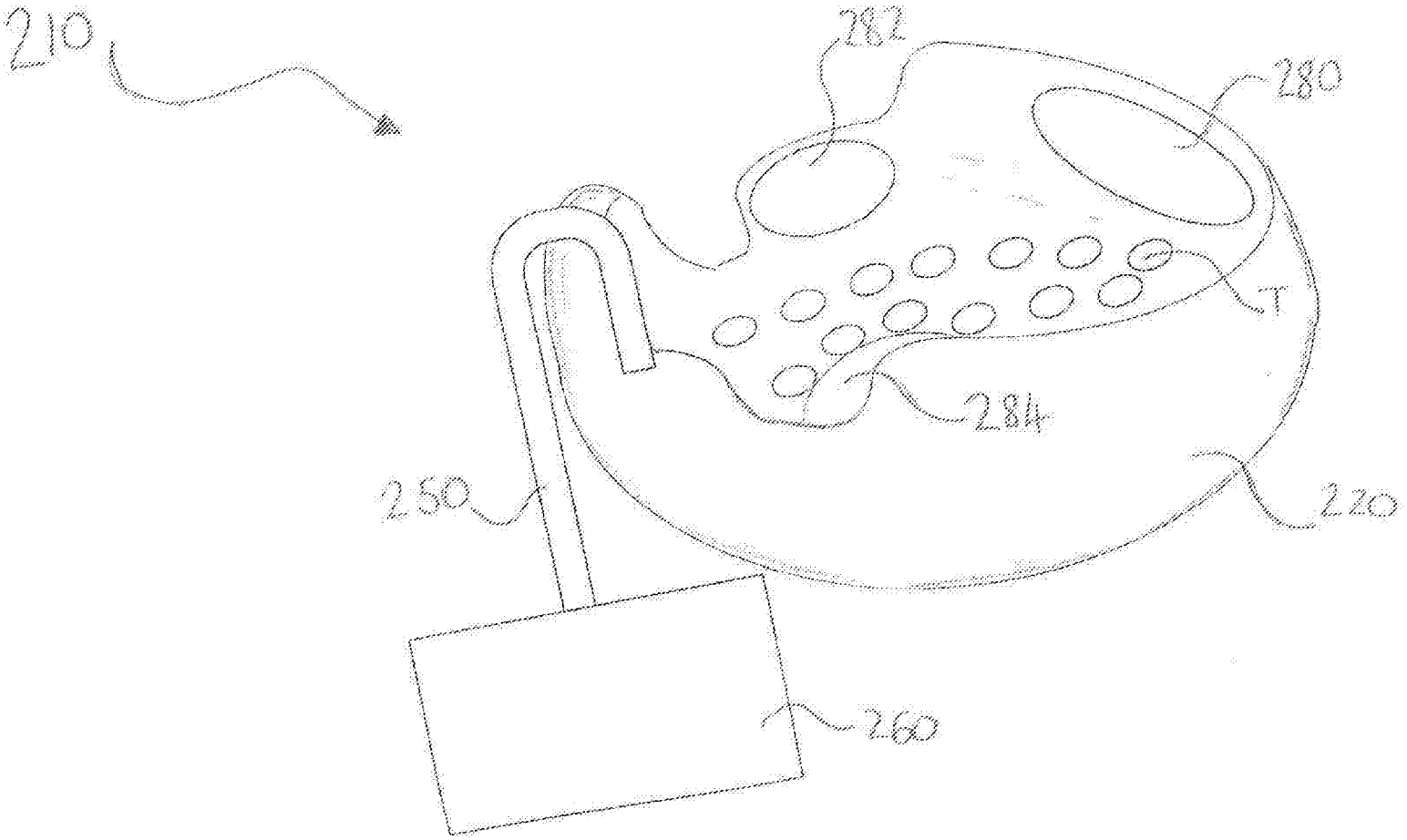

Fig 4(b)

HAIR GROWTH PROMOTING DEVICE AND METHOD

The present invention relates to a device and a method for promoting hair growth.

Hair loss can occur as a result of congenital conditions or can be acquired, for example from stress, iron deficiencies, weight loss or cancer treatments such as chemotherapy.

Hair may also naturally thin as a person ages, and the hairline can recede.

Loss of hair can be distressing for a person and so there has been an interest in the development of products and techniques for preserving, promoting or restoring hair growth.

Hair transplants offer a long lasting opportunity to restore hair by transferring new hair follicles to a desired area so that a person may re-grow hair in this area. This technique is used predominantly for the treatment of receding hair lines. Either donor hair from the patient or artificial hair can be used. Another surgical option is scalp reduction surgery, where sections of scalp are stretched and stitched together. However, while these methods may offer lasting and permanent treatment for hair loss, they can be expensive and require the patient to undergo surgery.

Chemical treatments for hair loss have also been developed including the application of products such as Finasteride

RTM and Minoxidil RTM. However, these treatments are effective only as long as they are continued, and they can be expensive. Further, it is not recommended that women of child-bearing age use Finasteride because the drug is potentially teratogenic.

Nitric Oxide (NO) has been investigated in recent years for its ability to promote hair growth via the promotion of hair follicle formation. However, excessive amounts of NO can be harmful, so its delivery within a controlled environment and in carefully prescribed and monitored quantities is important. Topical nitric oxide can be released by chemical reactions occurring after application of precursors within gels or lotions, but where concentrations are not strictly controlled, negative side effects can occur. For example, when NO is mixed with water, the chemical reactions on the surface of skin will produce a weak nitric acid and this can be harmful if produced in uncontrolled quantities.

Embodiments of the present invention aim to provide a device for promoting hair growth and a method for the same, wherein at least some of the aforementioned problems are addressed.

According to one aspect of the present invention, there is provided apparatus for preserving, promoting and/or restoring hair in humans or animals, the apparatus comprising:

a supply of nitric oxide; and

an applicator, mountable on at least a part of the

body and fluidically connected to the supply of nitric oxide, for directing the nitric oxide onto the body part.

Preferably, the applicator is arranged in use to direct a sterilizing dose of nitric oxide, more preferably a plasma and/or a gas, onto the body part.

Preferably the apparatus comprises a generator of nitric oxide as the supply. The applicator may be fluidically, preferably releasably, connected to the supply/generator.

The applicator is preferably detachable from the supply so that the applicator may be disposed of and/or reused and/or recycled.

The generator may be arranged in use to generate nitric oxide as a plasma and/or a gas.

In a preferred arrangement, the nitric oxide is supplied from a single source/generator and distributed across an area of the body part and/or within a substantially enclosed volume above the body part.

The single source/generator may be self-contained and is preferably arranged in use to supply a pre-mixed and/or pre-cooled plasma and/or gas of nitric oxide.

The applicator preferably comprises one or more outlets for nitric oxide, more preferably one or more nozzles.

The applicator may comprise one or more conduits for conveying the nitric oxide from the generator to the or

each outlet.

The apparatus may comprise a source of power, more preferably of electrical power, still more preferably a battery, for the generator.

The apparatus may comprise a control unit for controlling the operation of the apparatus. Preferably the control unit is electrically connected to the apparatus and may conveniently be electrically connected to the generator.

The connection may be wired or, alternatively or additionally, the connection may be wireless.
The apparatus is preferably arranged for preserving, promoting and/or restoring hair on the head of a human.

The distribution device preferably comprises an article of wearable headgear.

The applicator may comprise a cap for placing on the head of a user.

In one arrangement, the cap may be collapsible. The cap may comprise a band portion for extending around the head and may comprise a dome portion for extending over the head.

The band portion and the dome portion are preferably connectable, preferably releasably connectable.

The dome portion may include spoke portions.

There may be a web extending between the spoke portions, which web may comprise a filmic material, such as of

plastics material.

The spoke portions may connect to a common hub portion.

The spoke portions may be movably connected to the hub portion, more preferably connected for swivel engagement with the hub portion, so that the spoke portions may be at least partly aligned to collapse the dome portion.

The apparatus may include a first pump/fan for drawing air into the generator, from which to generate nitric oxide. The apparatus may include a second pump/fan for expelling nitric oxide from the applicator and may include a filter stage through which the nitric oxide is arranged to pass before being expelled.

According to another aspect of the present invention, there is provided a method for preserving, promoting and/or restoring hair in humans or animals, the method comprising mounting an applicator to at least part of the body, fluidically connecting the applicator to a supply of nitric oxide and directing the NO onto the body part.

The method may include drawing air into/through a NO generator to produce the supply of nitric oxide.

The method may include expelling nitric oxide from the applicator through a filter.

The method may include sterilizing the body part using nitric oxide.

The present invention is defined in the attached

independent claims, to which reference should now be made. Further, preferred features may be found in the sub-claims appended thereto.

The invention may include any combination of the features or limitations referred to herein, except such a combination of features as are mutually exclusive, or mutually inconsistent.

A preferred embodiment of the present invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is a schematic perspective view of an apparatus according to one embodiment of the present invention;

Figure 2(a) is a schematic view from above of the apparatus of Figure 1;

Figure 2(b) is a schematic perspective view of the apparatus of Figure 1 in a collapsed configuration;

Figure 3(a) is a schematic perspective view of an apparatus according to an alternative embodiment of the present invention;

Figure 3(b) is a schematic perspective view of a first part of the apparatus of Figure 3(a) in a collapsed configuration;

Figure 3(c) is a schematic perspective view of a second part of the apparatus of Figure 3(a);

Figure 4(a) is a schematic perspective view of an apparatus according to a further embodiment of the present invention; and

Figure 4(b) is a schematic perspective view of the underside of the apparatus of Figure 4(a).

Turning to Figure 1, an embodiment of hair growth promoting apparatus according to the present invention is shown generally at 10. The device is intended to be worn on the head of a user and comprises a cap, or dome, portion 11 having a number of substantially radial spokes 12. Each spoke 12 extend through a hub portion 20 and down the sides of the cap. The free ends of the spokes locate into apertures (not shown) in a substantially elastic headband 30. Extending between the spokes is a web material 40, optionally transparent and preferably of plastics such as polyurethane, which defines an internal space, I, when apparatus 10 is placed on the head of a user. Hub 20 has a first, intake tube 22 through which NO enters internal space I. Hub 20 has a second, outlet tube 24 through which air and NO from internal space I is filtered and to remove the NO, before the air exits the device into the atmosphere.

Figure 2 (a) shows the apparatus 10 from above, wherein the apparatus has been collapsed so that the apparatus is substantially flat. Figure 2 (b) is a perspective view of the collapsed apparatus 10.

Figure 3(a) shows an alternative embodiment of hair growth

promoting apparatus according to the present invention, generally at 110. Spokes 112 extend through a hub portion 120 and down the sides of the cap 111. The spokes are releasably connected to a headband 130 through apertures 114 in the headband and are mountable to be in a swivel engagement with hub 120. Extending between the spokes is a web material 140, which defines an internal space, I, when apparatus 110 is placed on the head of a user. The hub, spokes, and web of apparatus 110 form the cap/dome portion 111.

Figure 3 (b) shows spokes 112 rotated around hub 120, so that the spokes fall substantially flat, collapsing the dome structure for packing/storage. Figure 3 (c) shows headband 130 with apertures 114.

Figure 4(a) shows a further embodiment of the apparatus according to the present invention, generally at 210. Headgear, in the form of a semi-rigid cap 220 is connected via tubing 230 to an electronic controller 240, and is connected via tubing 250 to a supply of NO 260, in the form of a battery powered generator. Valving (not shown) is operated by the controller to control the supply of NO to an internal space within the cap in use. A space for branding, advertising or information is provided at 270.

Figure 4(b) shows the underside of the apparatus of Figure 4(a). The device has padding portions 280, 282, and 284 for the comfort of the user. The device also comprises silicone delivery/outlet tubes T, through which NO is delivered to the inside of headgear 220.

The present invention provides a non-surgical, long lasting treatment for the effects of hair loss by using NO

to help facilitate the regrowth of hair shafts by activating hair follicles. The NO is produced from atmospheric nitrogen and oxygen and is applied as a plasma, which avoids potential problems associated with topical application of NO in the forms of gels and lotions.

The apparatus described above may be supplied for home use, for example as the embodiments of Figures 1-3, and may be optionally disposable (limited use), or may be provided for use under clinical supervision, and be of a reusable form, such as the embodiment of Figure 4, for example.

The part that is worn by a user, for example on the head, may be disposable and/or recyclable. The relative simplicity of the component, and thus its low cost, lends itself to this, as does the fact that it is readily disconnectable from the more expensive source/generator of nitric oxide.

The generator may supply to the applicator a plasma and/or a gas of nitric oxide which may be pre-mixed and may be pre-cooled and which may be used to sterilise the body part – e.g. the scalp – of the user.

The exogenous nitric oxide can be supplied by a generator which produces it in the form of a nitric oxide plasma from atmospheric nitrogen and oxygen. The nitric oxide particles may be filtered from a plume of plasma produced by an electrical spark gap within the generator.

The apparatus can be worn by a user who may be suffering from any form of hair loss or of thinning of hair.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance, it should be understood that the applicant claims protection in respect of any patentable feature or combination of features referred to herein, and/or shown in the drawings, whether or not particular emphasis has been placed thereon.

CLAIMS

1. An apparatus for preserving, promoting and/or restoring hair in humans or animals, the apparatus comprising:

   a supply of nitric oxide; and

   an applicator, mountable on at least a part of the body and fluidically connected to the supply of nitric oxide, for directing nitric oxide onto the body.

2. Apparatus according to Claim 1, wherein the supply of nitric oxide comprises a generator of nitric oxide.

3. Apparatus according to Claim 1 or 2, wherein the applicator is releasably connectable to the supply of nitric oxide.

4. Apparatus according to any of Claims 1-3, wherein the supply is arranged in use to provide nitric oxide as a plasma and/or a gas.

5. Apparatus according to any of the preceding claims, wherein the nitric oxide is supplied from a single source and distributed across an area of the body part and/or within a substantially enclosed volume above the body part.

6. Apparatus according to any of the preceding claims, wherein the applicator comprises one or more outlets for nitric oxide.

7. Apparatus according to Claim 6, wherein the applicator comprises one or more conduits for conveying the nitric oxide from the supply to the or each outlet.

8. Apparatus according to any of the preceding claims, wherein the apparatus comprises a source of electrical power.

9. Apparatus according to any of the preceding claims, comprising a control unit for controlling the operation of the apparatus.

10. Apparatus according to any of the preceding claims, wherein the apparatus is arranged for preserving, promoting and/or restoring hair on the head of a human.

11. Apparatus according to any of the preceding claims, comprising a cap for placing on the head of a user.

12. Apparatus according to Claim 11, wherein the cap is collapsible.

13. Apparatus according to Claim 11 or 12, wherein the cap comprises a band portion for extending around

the head and a dome portion for extending over the head.

14. Apparatus according to Claim 13, wherein the band portion and the dome portion are releasably connectable.

15. Apparatus according to Claim 13, wherein the dome portion includes spoke portions.

16. Apparatus according to Claim 15, wherein the dome includes a web extending between the spoke portions.

17. Apparatus according to Claim 15, wherein the spoke portions connect to a common hub portion.

18. Apparatus according to Claim 17, wherein the spoke portions are movably connected to the hub portion for swivel engagement with the hub portion, so that the spoke portions may be at least partly aligned to collapse the dome portion.

19. Apparatus according to Claim 2, wherein the apparatus includes a first pump for drawing air into the generator, from which to generate nitric oxide.

20. Apparatus according to Claim 19, wherein the apparatus includes a second pump for expelling nitric oxide from the applicator, and a filter stage through which the nitric oxide is arranged to pass before being expelled.

21. Apparatus according to Claim 2, wherein the generator is arranged in use to generate nitric oxide from ambient air.

22. Apparatus according to any of the preceding claims, wherein the applicator is arranged in use to direct a sterilizing dose of nitric oxide plasma and/or gas onto the body part.

23. A method for preserving, promoting and/or restoring hair in humans or animals, the method comprising mounting an applicator to at least part of the body, fluidically connecting the applicator to a supply of nitric oxide and directing the nitric oxide onto the body part.

24. A method according to Claim 21, including drawing air into/through a NO generator to produce the supply of nitric oxide.

25. A method according to Claim 23 or 24, wherein the method includes sterilizing the body part using nitric oxide.

Intellectual Property Office

Application No:	GB2114949.7	**Examiner:**	Contract Unit Examiner
Claims searched:	1-25	**Date of search:**	14 June 2022

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,Y	X: 1-11, 19-25 Y: 6, 7, 11-18	US2014/088490 A1 (MCCANEY FRANK J) paragraphs [0028], [0057], [0066], [0079] - [0082]; claims 1, 21; figure 1
X	1, 4	WO03/003989 A2 (CERAMATEC INC) page 3, line 11 - line 12, figures 1-6
Y	6, 7	KR20090087147 A (BANG GUANG HEUY) figures 1, 4, 10
Y	11-13	KR20130072229 A (KIM BOK DONG) figures 2-3
Y	11-14	US5848998 A (MARASCO JR PATRICK V) figure 5
Y	11, 13, 15-18	US2019/201713 A1 (SEGAL KIM ROBIN) figures 8A-8E
Y	11, 13, 15-18	WO2013/067512 A1 (IVIVI HEALTH SCIENCES LLC) figures 14-16E
X	1	WO2016/174192 A1 (BSN MEDICAL GMBH) page 40, line 1 - line 11, figures 3-5
X	1	WO2011/121482 A2 (KONINKL PHILIPS ELECTRONICS NV ET AL) page 7, line 13 - line 22, figures 1-4
A	-	US2012/065576 A1 (STRYKER MARTIN W ET AL) paragraph [0068] - paragraph [0069], figures 1, 8
A	-	US2017/165461 A1 (YEMINI ZVI) paragraph [0092], figure 17

Intellectual Property Office

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

A45D; A61H; A61M; C01B

The following online and other databases have been used in the preparation of this search report

International Classification:

Subclass	Subgroup	Valid From
None		