SUMMARY OF THE INVENTION

~~The technical problem posed and solved by the present invention is therefore that of providing~~Embodiments of the present disclosure seek to provide a face mask that allows to overcome one or more of the aforementioned drawbacks with reference to the prior art. In particular, the technical problem lies in providing a face mask, preferably a wearable filtering mask, comprising a filtering device to protect the respiratory tract (filtering device, preferably in the form of a multilayer filtering device) capable of offering improved shielding of the nose and mouth of the user wearing it, increased filtering capacity/efficiency and that has high sustainability, both with reference to materials used, such as recycled materials, for the preparation of at least one part of the face mask (such as the cover) with reference to the duration of use thereof and, thus, the possibility of disposing of a part of the face mask, for example the filtering device only.

~~Such problem is solved by a face mask according to claim 1, by means of the filtering means according to claim 10, and by means of a face mask configured to filter the air according to claim 28.~~

~~Preferred characteristics of the present invention are subject of the dependent claims.~~

According to a first aspect of the present invention, there is provided a face mask that can be worn and configured to filter the air inhaled by a user, the face mask comprising a front portion shaped so as to adhere to the face covering the mouth and nose of the user in the mask-worn condition, retaining means of the front portion to the head of the user, and filtering means comprising a bioactive component including usnic acid; wherein said front portion carries said filtering means, and wherein the front portion and the retaining means are obtained starting from a single sheet or layer made of suitably shaped material.

According to a second aspect of the present invention, there is provided a filtering means of a wearable face mask comprising a bioactive component and a plurality of layers sealed or joined together along respective perimeter edges;

wherein all layers of said plurality of layers are electrostatically charged.

In the present context, the expression “face mask” is synonymous with “filtering mask” and it is to be understood in its broadest sense to include any personal protective equipment, which can be worn on the face of a user or health worker, in the form of a mask or half-mask, it is specifically configured to protect upper airways, such as nose and mouth, by filtering inhaled air (for example inhaled and exhaled air with nose and/or mouth).

“Filtering device” is synonymous with “filtering means” “multilayer filtering means” or “refill”.

The filtering of the mask of the invention is intended to prevent the inhalation of contaminants, in the form of powders, mists, fumes, gases or vapours, and of the substances transported therewith.

Preferably, the filtering mask subject of the invention is a mask according to the UNI EN 14683:2019 standard.

Said standard, just like the other standards mentioned in this description, are to be understood in the version of validity at the priority date of the present patent application, unless otherwise specified.

The mask of the invention comprises a front portion, shaped so as to adhere to the face covering the mouth and nose of the user in the mask-worn condition, and means for retaining said front portion to the head of the user. The front portion for example may also be referred to as “cover”.

Advantageously, the means for retaining said front portion (or cover) are made in a manner such to improve the adhesion of said front portion to the face of the user so as to fully cover the face (nose, mouth and chin) and protect the user from the entry of airborne contaminants that are harmful if inhaled (for example particles, PM 10 or PM 2.5 particles, pollen, vapours and gases). A full adhesion of the front

CLAIMS

1. A face mask ~~(1)~~ that can be worn and configured to filter the air inhaled by a user, the face mask ~~(1)~~ comprising a front portion ~~(10)~~ shaped so as to adhere to the face covering the mouth and nose of the user in the mask-worn condition, retaining means ~~(20)~~ of the front portion ~~(10)~~ to the head of the user, and filtering means ~~(30)~~ comprising a bioactive component ~~(32)~~ including usnic acid;
wherein said front portion ~~(10)~~ carries said filtering means ~~(30)~~, and wherein the front portion ~~(10)~~ and the retaining means ~~(20)~~ are obtained starting from a single sheet or layer made of suitably shaped material.

2. The wearable face mask ~~(1)~~ according to claim 1, wherein said front portion ~~(10)~~ and said retaining means ~~(10)~~ are made of elastically deformable breathable fabric.

3. The wearable face mask ~~(1)~~ according to any one of the preceding claims, wherein said filtering means ~~(30)~~ are removably housed in a chamber ~~(21)~~ inside said retaining means ~~(20)~~, said chamber ~~(21)~~ being positioned at said front portion ~~(10)~~, and wherein the front portion ~~(10)~~ comprises at least one opening ~~(21a)~~, preferably two opposite eyelets, for access into said chamber ~~(21)~~, the filtering means ~~(30)~~ being partially inserted into said opening ~~(21a)~~.

4. The wearable face mask ~~(1)~~ according to any one of the preceding claims, wherein the filtering means ~~(30)~~ are releasably connected to the front portion ~~(10)~~ by means of complementary coupling means, wherein said complementary coupling means comprise at least one opening ~~(21a)~~ passing through, from side to side, a thickness of the front portion ~~(10)~~ and at least one projection ~~(24)~~ protruding from a filtering body ~~(25)~~ of the filtering means ~~(30)~~, wherein preferably each projection ~~(24)~~ delimits at least one undercut ~~(26)~~ partly housing the front portion ~~(10)~~.

5. The wearable face mask ~~(1)~~ according to any one of the preceding claims, wherein said filtering means ~~(30)~~ comprise a plurality of layers ~~(31, 32, 33, 34)~~ sealed or joined together along the respective perimeter edges, wherein a single layer ~~(32)~~ of said plurality comprises said bioactive component ~~(32)~~.

6. The wearable face mask ~~(1)~~ according to claim 5, wherein all layers ~~(31, 32, 33, 34)~~ of said plurality of layers ~~(31, 32, 33, 34)~~ are electrostatically charged.

7. The wearable face mask ~~(1)~~ according to any one of the preceding claims, wherein said retaining means ~~(20)~~ protrude from opposite sides of said front portion ~~(10)~~ and comprise flaps ~~(21)~~ shaped so as to be

constrained to the ears of the user, said flaps ~~(22)~~ being closed in a ring with the front portion ~~(10)~~ so as to circumscribe a pair of eyelets ~~(23)~~.

8. The wearable face mask ~~(1)~~ according to any one of the preceding claims, characterised in that it is a duckbill mask.

9. The wearable face mask ~~(1)~~ according to any one of the preceding claims, characterised in that it has a bacterial filtration efficiency according to the UNI EN 14683:2019 standard.

10. Filtering means ~~(30)~~ for the wearable face mask ~~(1)~~ according to any one of the preceding claims, the filtering means ~~(30)~~ comprising a bioactive component ~~(32)~~ including usnic acid.

11. Filtering means ~~(30)~~ according to the preceding claim, wherein said bioactive component ~~(32)~~ comprises a usnic acid complex comprising or, alternatively, consisting of usnic acid or a salt thereof, and a cyclodextrin, preferably a β-cyclodextrin.

12. Filtering means ~~(30)~~ according to claim 10 or 11, wherein said bioactive component ~~(32)~~ comprises usnic acid or a salt thereof in an enantiomerically pure dextrorotatory form, preferably a usnic acid sodium salt in an enantiomerically pure dextrorotatory form.

13. Filtering means ~~(30)~~ according to any one of claims 10-12, comprising a plurality of layers ~~(31, 32, 33, 34)~~ sealed or joined together along respective perimeter edges, wherein all the layers ~~(31, 32, 33, 34)~~ of said plurality of layers ~~(31, 32, 33, 34)~~ are electrostatically charged.

14. Filtering means ~~(30)~~ according to any one of claims 10-13, wherein the single layer ~~(32)~~ of said plurality comprises said bioactive component ~~(32)~~.

15. Filtering means ~~(30)~~ according to any one of claims 10-14, comprising a filtering body ~~(25)~~ comprising at least two second margins ~~(35)~~, converging with respect to each other and extending toward the internal of the filtering body ~~(25)~~ so as to delimit – in a two-dimensional configuration of the filtering body ~~(25)~~ – a second recess ~~(36)~~, said second margins ~~(35)~~ being suitable to be joined together – in a three-dimensional configuration – so as to eliminate a space of said second recess ~~(36)~~.

16. Filtering means ~~(30)~~ according to any one of claims 10- 15, wherein said bioactive component ~~(32)~~ is made of non-woven fabric of the spun-bonded type, preferably made of polypropylene, impregnated with usnic acid, or a salt thereof, or a complex or compound thereof, or mixtures thereof.

17. An assembly comprising:
- a wearable face mask ~~(1)~~ according to any one of claims 1-9;
- a mask casing housing said wearable face mask ~~(1)~~ partially or substantially completely.

18. Filtering means ~~(30)~~ of a wearable face mask ~~(1)~~ comprising a bioactive component ~~(32)~~ and a plurality of layers ~~(31, 32, 33, 34)~~ sealed or joined together along respective perimeter edges;
wherein all layers ~~(31, 32, 33, 34)~~ of said plurality of layers ~~(31, 32, 33, 34)~~ are electrostatically charged.

~~19. Filtering means (30) according to claim 18, wherein said layers (31, 32, 33, 34) are electrostatically charged with a positive-sign charge.~~

~~20. Filtering means (30) according to any one of the preceding claims, wherein said bioactive component (32) is a single layer (32) of said plurality of layers (31, 32, 33, 34).~~

~~21. Filtering means (30) according to any one of the preceding claims, wherein said bioactive component (32) includes, or comprises, or alternatively consists of usnic acid, or a salt thereof, or a complex or compound thereof, or mixtures thereof.~~

~~22. Filtering means (30) according to any one of the preceding claims, wherein said bioactive component (32) comprises a usnic acid complex comprising or, alternatively, consisting of usnic acid or a salt thereof, and a cyclodextrin, preferably a β-cyclodextrin.~~

~~23. Filtering means (30) according to claim 21 or 22, wherein said bioactive component (32) comprises usnic acid or a salt thereof in an enantiomerically pure dextrorotatory form.~~

~~24. Filtering means (30) according to claim 23, wherein said bioactive component (32) comprises a usnic acid sodium salt in an enantiomerically pure dextrorotatory form.~~

~~25. Filtering means (30) according to any one of the preceding claims, wherein said bioactive component (32) is made of non-woven fabric of the spun-bonded type, preferably made of polypropylene, impregnated with usnic acid, or a salt thereof, or a complex or compound thereof, or mixtures thereof.~~

19~~26~~. A wearable face mask ~~(1)~~ comprising the filtering means ~~(30)~~ according to any one of the preceding claims.

2~~0~~7. A wearable face mask ~~(1)~~ according to the preceding claim, wherein the filtering means ~~(30)~~ are connected to a front portion ~~(10)~~ of said wearable face mask ~~(1)~~ by means of complementary coupling means of the mechanical type, wherein said front portion ~~(10)~~ is shaped so as to adhere to the face covering the mouth and nose of a user in the mask-worn condition.

~~28. A face mask (1) that can be worn and configured to filter the air inhaled by a user, the face mask (1) comprising a front portion (10) shaped so as to adhere to the face covering the mouth and nose of the user in the mask-worn condition, means (20) for retaining the front portion (10) to the head of the user and filtering means (30);~~

~~wherein the filtering means (30) are arranged in a chamber (21) partly delimited by said front portion (10) and they are releasably connected to the front portion (10) by means of complementary coupling means of the geometric type.~~

~~29. The wearable face mask (1) according to claim 28, wherein said complementary coupling means comprise at least one opening (21a), preferably two opposite eyelets, passing through - from side to side - a thickness of the front portion (10), and at least one projection (24) protruding from a filtering body (25) of the filtering means (30).~~

~~30. The wearable face mask (1) according to claim 29, wherein each projection (24) delimits at least one undercut (26) partly housing the front portion (10).~~

~~31. The wearable face mask (1) according to any one of the preceding claims, wherein the front portion (10) and the retaining means (20) are made starting from a single sheet or layer made of suitably shaped material, preferably, wherein said front portion (10) and said retaining means (10) are made of elastically deformable breathable fabric.~~

~~32. The wearable face mask (1) according to any one of the preceding claims, wherein said filtering means (30) comprise a plurality of layers (31, 32, 33, 34) sealed or joined together along respective perimeter~~

edges, wherein all the layers (31, 32, 33, 34) of said plurality of layers (31, 32, 33, 34) are electrostatically charged.

33. The wearable face mask (1) according to any one of the preceding claims, wherein said retaining means (20) protrude from opposite sides of said front portion (10) and comprise flaps (21) shaped so as to be constrained to the ears of the user, said flaps (22) being closed in a ring with the front portion (10) so as to circumscribe a pair of eyelets (23).

34. The wearable face mask (1) according to any one of the preceding claims, wherein the filtering means (30) comprise a bioactive component (32) including, or comprising, or alternatively consisting of usnic acid, or a salt thereof, or a complex or compound thereof, or mixtures thereof.

35. The wearable face mask (1) according to any one of the preceding claims, characterised in that it is a flexible duckbill mask.

36. The wearable face mask (1) according to any one of the preceding claims, characterised in that it has a bacterial filtration efficiency according to the UNI EN 14683:2019 standard.

37. The wearable face mask (1) according to the preceding claim, characterised in that it has a bacterial filtration efficiency according to the UNI EN 14683:2019 standard in both directions of through-flow of said mask (1).

38. Use of usnic acid, or a salt thereof, or a complex or compound, or mixtures thereof, in air filtering means (30), characterised in that said usnic acid and/or a salt thereof is present as D(+) enantiomer, preferably of natural origin; or it is present as a complex or compound combined with a cyclodextrin, preferably β-cyclodextrin, more preferably in a 1:1 by weight ratio.