

# NASAL BREATHING AIR FILTRATION APPARATUS

## TECHNICAL FIELD

5 [0001] The present invention relates to devices for filtering air as it is inhaled, and more particularly to a nasal breathing air filtration apparatus wearable into nasal cavities for health protection.

## BACKGROUND

10 [0002] World's air pollution becomes more and more seriously, which results in different negative effects. Human nose hairs and mucus are insufficient to filter current polluted air to protect people from exhaust gases emitted from industrial life, PM2.5, haze, dust and pollen or the like, and in the meanwhile from bacterial and viral in the air. It is desired in the art for a nasal breathing air filtration apparatus, which can filter air effectively and ensure the air inhaled cleaner and will not affect the user's appearance and daily life.

15 [0003] A typical breathing air filtration apparatus in the art includes lots of individual parts, for example, two filter nets, two strut members, connecting members or the like. These parts are assembled together after formed separately, which is not only time-consuming, labor-intensive, and costly, but also involving a lot of manual works during assembly, resulting in risks of polluting the filtration apparatus, harmful to the user's health.

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## SUMMARY

[0004] The present invention provides a low-cost and hygienic nasal breathing air filtration apparatus.

25 [0005] The present invention provides a nasal breathing air filtration apparatus comprising: a first filter and a second filter respectively adapted for being wearable in nasal cavities of a user, each of the first filter and the second filter comprising a support member and a filter member and a connecting member connecting the first filter to the second filter, and the support member and the filter member of each of the first filter and the second filter are formed integrally by means of insert molding and form an undetachable single piece, the support member of each of  
30 the first filter and the second filter comprises a support portion for holding the filter member, and a fitting portion extending from the support portion and configured for coordinating with a nasal cavity of a user.

[0006] In some embodiments, the fitting portion extends outwardly from an outer periphery

of the support portion in a flared manner, and the fitting portion has a thickness gradually reducing in its extending direction.

[0007] In some embodiments, the support portion comprises a base located at a center thereof, and a plurality of ribs extending radially outwardly from the base, the ribs are arranged at intervals along a circumferential direction, the filter member is supported on the ribs.

[0008] In some embodiments, the support portion further comprises an outer ring, the outer ring is connected to an end of the ribs, and the fitting portion extends outwardly from the outer ring.

[0009] In some embodiments, a thickness of the outer ring is greater than a thickness of the fitting portion.

[0010] In some embodiments, each of two ends of the connecting member has a hook, a fixing hole is provided in a center of the base, and the hooks of the connecting member are engaged in the fixing holes to form a connection.

[0011] In some embodiments, a stopping portion is provided at a distal end of the connecting member, the stopping portion and the hook are respectively located at opposite sides of the fixing hole.

[0012] In some embodiments, the nasal breathing air filtration apparatus further comprises an activated carbon sponge provided in a space defined by the fitting portion.

[0013] In some embodiments, a plurality of through holes are provided in the fitting portion, and the through holes are arranged along a circumference of the fitting portion.

[0014] In some embodiments, the filter member is antibacterial filter cloth.

[0015] The nasal breathing air filtration apparatus according to the present invention requires fewer steps than conventional processes to reduce cost and can reduce manual assembled steps polluting the apparatus since the support member and the filter member are formed integrally, and thus a hygienic nasal breathing air filtration apparatus is provided.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

[0016] The further features of the present invention will be apparent below with reference to the description of the preferred embodiments which are only provided by means of examples and with reference to the accompanying drawings in which:

[0017] FIG. 1 is a perspective view of a nasal breathing air filtration apparatus according to the present invention;

[0018] FIG. 2 is a top view of the nasal breathing air filtration apparatus as shown in FIG. 1;

[0019] FIG. 3 is a cross-section of the nasal breathing air filtration apparatus as shown in FIG. 1;

[0020] FIG. 4 is a front view of the nasal breathing air filtration apparatus as shown in FIG. 1; and

[0021] FIG. 5 is an exploded view of the nasal breathing air filtration apparatus as shown in FIG. 3.

## DESCRIPTION OF THE EMBODIMENTS

[0022] The present invention will be further described in detail with reference to the accompanying drawings and embodiments so that the objects and advantages of the present invention will be more apparent. It should be clear that the description here is only preferred embodiments of the present invention and is not intended to limit the present invention.

[0023] As shown in FIG. 1, a nasal breathing air filtration apparatus according to the present invention includes a first filter 1, a second filter 2 and a connecting member 3. The first filter 1 and the second filter 2 are respectively adapted for being wearable in nasal cavities of a user. When the nasal breathing air filtration apparatus is used, the inhaled air passes through the first filter 1 and the second filter 2 and is filtered and purified. The connecting member 3 connects the first filter 1 to the second filter 2 and is configured to be located at the nasal columella of the user so that the nasal breathing air filtration apparatus is fittingly wearable by a person. A profile of the connecting member 3 matches profiles of the nasal columella and the nasal septum.

[0024] Referring to FIG. 2 and FIG. 3, the second filter 2 and the first filter 1 are preferably identical, which respectively includes a support member 11 and a filter member 8 which are formed integrally by means of insert molding and form an undetachable single piece. The support member 11 includes a support portion 5 for holding the filter member 8, and a fitting portion 4 extending from a periphery of the support portion 5 and configured for coordinating with the nasal cavities of the user. The fitting portion 4 extends outwardly from an outer periphery of an outer ring of the support portion 5 in a flared manner, and the fitting portion 4 has a thickness gradually reducing in its extending direction.

[0025] Preferably, the support member 11 is made of thermoplastic elastomer material (TPE) which is safe and non-toxic with high strength and high resiliency. The support member 11 is complying with approval standards of FDA, and does not contain synthetic latex harmful for

bodies, to which normal skin is not allergic.

**[0026]** Preferably, the support portion 5 includes an outer ring, a base located at a center of the outer ring, and a plurality of ribs extending radially outwardly from the base. In the embodiment, the ribs are connected between the base and the outer ring. For further supporting the fitting portion 4, the ribs may extend to the fitting portion 4 and is supported thereon. Preferably, there are four ribs cooperatively arranged in a cruciform shape, so that the filter member 8 is not shielded by the support portion 5 too much while reliably fitted on the support portion 5 through the ribs. Preferably, a profile of the outer ring of the support portion 5 in the present invention is a circular or oval ring, similar to a profile of a nostril to thereby improve comfort in use.

**[0027]** Preferably, the filter member 8 is provided on an upper side of the ribs of the support portion 5 of the support member 11, and the filter member 8 is spaced from a top end of the support member 11 by a distance, avoiding direct contact between the filter member 8 and an inner wall of the nasal cavities of the user, and thereby protecting the filter member 8 from the snot and ensuring the filtering effect of the nasal breathing air filtration apparatus.

**[0028]** Preferably, the filter member 8 provided by the present invention is antibacterial filter cloth. Preferably, the antibacterial filter cloth 8 is circular or oval, and has a perimeter matching with a perimeter of the support portion 5. In this embodiment, the antibacterial filter cloth 8 is pharmaceutical or hygienic non-woven fabric which is a new generation environmental protection material of high strength, waterproofness and breathability, environment protection, flexibility, poisonless and tasteless, low-cost, and nonirritant or the like. The antibacterial filter cloth 8 is capable of filtering the inhaled air effectively, and effectively filtering poisonous gases, bacterial and viral, pollen, haze and dust or the like.

**[0029]** The fitting portion 4 extends outwardly from the outer periphery of the outer ring in a direction substantially perpendicular to the support portion 5 with a thickness thereof gradually reducing, and the thickness of the fitting portion 4 is less than a thickness of the support portion 5. On one hand, since the support portion 5 is required to provide support to the filter member 8, the support portion 5 can support the filter member 8 well by a thicker thickness; on the other hand, since the thickness of the fitting portion 4 is relatively thinner, so that the fitting portion 4 is flexible and the fitting portion 4 can coordinate with the inner walls of the nasal cavities well and make the user comfortably when wearing the nasal breathing air filtration apparatus. Especially when the support member 11 is made of TPE material, its rigidity and flexibility are affected by the thickness greatly, and the required rigidity and flexibility can be easily achieved by different thicknesses. The support member 11 formed by such material is ergonomical in

design and will be well fitted on the inner walls of the nasal cavities.

**[0030]** Preferably, through holes 6 may be provided in the fitting portion 4 of the support member 11, the through holes 6 allow air flow passing through during exhalation of the user to make the exhaling more smoothly. Preferably, there is a plurality of through holes 6, and specifically eight in this embodiment. Preferably, the through holes 6 are evenly arranged along the circumference of the fitting portion. Specifically, on one hand, when the user is inhaling, the fitting portion 4 recesses inwards under the action of the air flow and the through holes 6 is blocked so that the inhaled air is only passed through the filter member 8 to ensure the filtered efficiency of the inhaled air; on the other hand, when the user is exhaling, the fitting portion 4 evaginates outwardly and the through holes 6 is separated from the inner walls of the nasal cavities to discharge the exhalant air smoothly. The above beneficial effects can be particularly presented when the fitting portion 4 is made of TPE. The design of the fitting portion 4 considerably increases the contact area with the nasal cavities, ensures a well fit on the inner walls of the nasal cavities, and in the meanwhile, ensures smooth discharge of the air during user's exhalation. This not only considerably improves the filtering effect of the nasal breathing air filtration apparatus but also assists the smooth discharge of the exhaled air, and thus improves user experiences.

**[0031]** Referring to FIG. 4 and FIG. 5, the connecting member 3 is connected between the first filter 1 and the second filter 2. In this embodiment, the connecting member includes a head which is substantially C shaped, two necks respectively connected to two ends of the head, and two shoulders respectively connected to bottom ends of the necks. The shoulders are respectively connected to the first filter and the second filter. A shortest distance between the necks is less than a distance between the ends of the head. Therefore, the constructions of the necks and the head of the connecting member match the nasal columella and the nasal septum to improve comfort level. Besides, the structure of the connecting member 3 can make the nasal breathing air filtration apparatus stably wearable in the nasal cavities to avoid dropping of the apparatus and ensure an appropriate location of the filters in the nasal cavities. The structure of the connecting member 3 can make the nasal breathing air filtration apparatus stably wearable in the nasal cavities so that the drop of the worn nasal breathing air filtration apparatus is avoided when the user is having large amplitude motions or strenuous exercise during using the apparatus. The nasal breathing air filtration apparatus can be kept in the nasal cavities, and is more convenient and more comfortable without causing any inconvenience in speaking, eating or the like.

**[0032]** The bottom ends of the connecting member 3, i.e. the ends of the shoulders, are

respectively connected to the bases of the support portion 5 of the two support member. Preferably, a fixing hole is provided in the center of the base, the bottom ends of the connecting member each have a hook 9 engaged in the fixing hole to form a snap-fit connection by which the connecting member 3 is connected to the filters. Since a size of each end of the shoulders of the connecting member 3 is greater than a size of the fixing hole of the support member, the ends can abut against the filter member and an inner side of the fixing hole of the support member.

**[0033]** Preferably, a stopping portion 10 is provided adjacent to the hook 9 at the bottom ends of the connecting member. The stopping portion 10 is spaced from the hook. The stopping portion 10 extends radially outwardly and has an outer diameter greater than the diameter of the fixing hole, so that the stopping portion 10 will press against the outer side of the fixing hole after the filters have been assembled with the connecting member. The hook 9 and the stopping portion 10 cooperate with each other and press against either side of the fixing hole during breathing to prevent unfiltered air to pass through the fixing hole. In this embodiment, the stopping portion 10 provided at each end of the connecting member 3 has two spaced stopping sheets. For providing further filtering effect, an activated carbon sponge is provided in a space defined by the fitting portion 4, and the activated carbon sponge is positioned by the spaced stopping portion 10.

**[0034]** Preferably, the connecting member 3 is made of hard polypropylene plastic (PP) with high transparency and complies with approval standards of FDA, and does not contain synthetic latex harmful for bodies, to which normal skin is not allergic. The connecting member is stiff, elastic and hard to be broken, and can be repeatedly used. Moreover, the connecting member has high transparency which is hardly visible after the user wears the apparatus.

**[0035]** The nasal breathing air filtration apparatus according to the present invention is light with small size, easy to carry, and low cost. It is easy for the user to wear and remove the apparatus. In normal use, the user can wash the apparatus after it is removed and use it repeatedly. The nasal breathing air filtration apparatus has significant filtering and sterilizing effects. The nasal breathing air filtration apparatus is comfortable for use without any influence for appearance of the user as well as inconvenience in daily life.

**[0036]** In summary, the above are only preferred embodiments of the present invention, which are not intended to limit the scope of the present invention. That is, equivalent changes and modifications made according to the contents of the present invention should also be within the technical scope of the present invention.

## Claims

### WHAT IS CLAIMED IS:

1. A nasal breathing air filtration apparatus, comprising:  
a first filter and a second filter respectively adapted for being wearable in nasal cavities of a user,  
5 each of the first filter and the second filter comprising a support member and a filter member and  
and  
a connecting member connecting the first filter to the second filter,  
wherein the support member and the filter member of each of the first filter and the second filter  
are formed integrally by means of insert molding and form an undetachable single piece, the  
10 support member of each of the first filter and the second filter comprises a support portion for  
holding the filter member, and a fitting portion extending from the support portion and  
configured for coordinating with a nasal cavity of a user.
2. The nasal breathing air filtration apparatus according to claim 1, wherein the fitting portion  
15 extends outwardly from an outer periphery of the support portion in a flared manner, and the  
fitting portion has a thickness gradually reducing in its extending direction.
3. The nasal breathing air filtration apparatus according to claim 1, wherein the support portion  
comprises a base located at a center thereof, and a plurality of ribs extending radially outwardly  
from the base, the ribs are arranged at intervals along a circumferential direction, the filter  
member is supported on the ribs.
- 20 4. The nasal breathing air filtration apparatus according to claim 3, wherein the support portion  
further comprises an outer ring, the outer ring is connected to an end of the ribs, and the fitting  
portion extends outwardly from the outer ring.
5. The nasal breathing air filtration apparatus according to claim 4, wherein a thickness of the  
outer ring is greater than a thickness of the fitting portion.
- 25 6. The nasal breathing air filtration apparatus according to claim 3, wherein each of two ends of  
the connecting member has a hook, a fixing hole is provided in a center of the base, and the  
hooks of the connecting member are engaged in the fixing holes to form a connection.
7. The nasal breathing air filtration apparatus according to claim 6, wherein a stopping portion is  
provided at a distal end of the connecting member, the stopping portion and the hook are  
30 respectively located at opposite sides of the fixing hole.
8. The nasal breathing air filtration apparatus according to claim 1, further comprising an  
activated carbon sponge provided in a space defined by the fitting portion.

9. The nasal breathing air filtration apparatus according to claim 1, wherein a plurality of through holes are provided in the fitting portion, and the through holes are arranged along a circumference of the fitting portion.

5 10. The nasal breathing air filtration apparatus according to claim 1, wherein the filter member is antibacterial filter cloth.