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(54) **FILTER ROD, CIGARETTE, AND METHOD OF MANUFACTURING A FILTER ROD**

(57) The present disclosure relates to an air filter rod (10), a cigarette, and a method of manufacturing an air filter rod (10). The air filter rod (10) has a tipping-paper outer layer (11) formed by rolling tipping paper into a cylindrical shape and a hollow portion defined by the tipping-paper outer layer (11). The hollow portion (12) has a plurality of resistance-increasing shape-fixing pieces (13), and the resistance-increasing shape-fixing pieces are arranged orderly in parallel to one another in the hollow portion (12). The resistance-increasing shape-fixing pieces (13) are each in a columnar structure formed by rolling tipping paper to form a rod-shaped structure and then cutting the rod-shaped structure, and a cavity (15)

is formed between every two adjacent resistance-increasing shape-fixing pieces (13) in an axial direction of the tipping-paper outer layer (11). Each resistance-increasing shape-fixing piece (13) is provided with gas flow channels (14) in the axial direction of the tipping-paper outer layer (11). Each resistance-increasing shape-fixing piece (13) has a thickness of 1 to 10 mm; and the tipping paper is regenerated cellulose cellophane. With the unique microporous design of the present disclosure, the smoke flow speed is increased, and the smoke flow state is changed, whereby some of the harmful substances such as tar are settled and adsorbed.

**Description****Technical Field**

5 **[0001]** The present disclosure relates to the technical field of tobacco leaves. More specifically, the present disclosure relates to an air filter rod, a cigarette, and a method of manufacturing an air filter rod.

**Background Art**

10 **[0002]** With the progress of society, the issue of "smoking and health" has aroused wide social concern. With the continuous improvement of living standards, people's health consciousness is getting stronger. "Smoking and health" has become one of the major challenges faced by the tobacco industry in the development process.

15 **[0003]** Mainstream smoke from a burning cigarette contains harmful substances such as CO, HCN, NNK, ammonia, benzo[a]pyrene, phenol, crotonaldehyde, tar, nicotine, etc. Practitioners in tobacco industry have used various filtering devices, such as ordinary polypropylene fiber filters, acetate fiber filters, and composite filter rods, to reduce the harm caused by smoking tobacco products. As a filtering material for cigarette mainstream smoke, a cigarette filter rod not only reduces the contents of some harmful substances, but also improves the smoking quality of tobacco.

20 **[0004]** Since various harmful substances are generated when cigarettes are burning, the harm caused by smoking tobacco products is reduced by adding various filtering materials such as ordinary propylene fiber filters, acetate fiber filters, and composite filter rods to the cigarettes. As a filtering material for cigarette mainstream smoke, a cigarette filter rod can not only reduce the contents of some harmful substances, but also improve the smoking quality of tobacco. Since the current cigarette filter rods are largely dependent on the use of acetate fibers as a filtering material, the adsorption of moisture by CA (cellulose acetate fiber tow) has become an accomplice in dry smoke.

**Summary**

25 **[0005]** An object of the present disclosure is to improve the prior conventional technical means for reducing tar and relieving harm, and to provide an air filter rod that has a simple structure, is easy to construct and use, and can effectively reduce harmful substances from cigarettes.

30 **[0006]** The present disclosure provides an air filter rod having a resistance-increasing shape-fixing piece, the air filter rod comprising a tipping-paper outer layer formed by rolling tipping paper into a cylindrical shape and a hollow portion defined by the tipping-paper outer layer, characterized in that the hollow portion has a plurality of resistance-increasing shape-fixing pieces, the resistance-increasing shape-fixing pieces are arranged orderly in parallel to one another in the hollow portion, the resistance-increasing shape-fixing pieces are each in a columnar structure formed by rolling tipping paper to form a rod-shaped structure and then cutting the rod-shaped structure, and a cavity is formed between every two adjacent resistance-increasing shape-fixing pieces in an axial direction of the tipping-paper outer layer; and each resistance-increasing shape-fixing piece is provided with gas flow channels in the axial direction of the tipping-paper outer layer.

35 **[0007]** In the present disclosure, each gas flow channel has an inner diameter of 0.2-1.0 mm, and the number of the gas flow channels in each resistance-increasing shape-fixing piece is 2-20, wherein the number of the gas flow channels in each resistance-increasing shape-fixing piece is the same as or different from number of the gas flow channels in another resistance-increasing shape-fixing piece.

40 **[0008]** Further, the plurality of resistance-increasing shape-fixing pieces are arranged in an axial direction of the cylindrical shape of the tipping-paper outer layer, and the plurality of resistance-increasing shape-fixing pieces are all located in the same linear direction.

45 **[0009]** Further, the plurality of resistance-increasing shape-fixing pieces are disposed at equal intervals in the hollow portion.

**[0010]** Further, radial outer circumferential surfaces of the resistance-increasing shape-fixing pieces are closely attached to the inner wall of the tipping-paper outer layer so that each cavity forms a sealed space.

50 **[0011]** Further, the resistance-increasing shape-fixing piece has a thickness of 1 to 10 mm. Optionally, the resistance-increasing shape-fixing piece has a thickness of 2 to 5 mm. Optionally, the cavity has a length of 1 to 20 mm, and optionally 4 to 12 mm.

**[0012]** Optionally, the tipping paper is regenerated cellulose cellophane, for example, a regenerated cellulose cellophane product produced and sold by Shangyu DEQING Industry & Trade Co., Ltd.

55 **[0013]** Further, the air filter rod is provided with a fiber tow segment for tobaccos at one end thereof close to tobacco shreds, and optionally, a fiber tow segment for tobaccos which is made of acetate fibers is used.

**[0014]** In the present disclosure, the resistance-increasing shape-fixing piece may be made to be transparent, be single-colored, or have a color pattern.

**[0015]** In the present disclosure, the cross-sectional shape of the gas flow channel in the resistance-increasing shape-fixing piece is a circle, an ellipse, a polygon, or an irregular shape.

**[0016]** Further, in the manufacture process, the air filter rod is processed to obtain a product with a length of 100 to 120 mm, and then divided and cut into three segments to obtain final products, each of which is then connected to a tobacco shred segment of a cigarette through a conventional manufacturing method.

**[0017]** The resistance-increasing shape-fixing piece of the present disclosure is formed by rolling and then cutting tipping paper. Specifically, regenerated cellulose cellophane is rolled at a speed of 1000 m/s into a cylindrical shape using a JK-4SD device produced by JK Machine in Korea, to obtain a rod-shaped structure having gas flow channels with an inner diameter of 0.2 to 1.0 mm, and the rod-shaped structure is cut into pieces to obtain resistance-increasing shape-fixing pieces having a thickness of 1 to 10 mm.

**[0018]** Further, the resistance-increasing shape-fixing piece of the present disclosure has a color pattern.

**[0019]** Further, the tipping-paper outer layer is formed by rolling transparent tipping paper.

**[0020]** On the basis of sufficient study of the flow speed of mainstream smoke, the direction in which the mainstream smoke flow is guided, and the pressure drop of the mainstream smoke, in the present disclosure transparent tipping paper is used to pre-prepare a plurality of resistance-increasing shape-fixing pieces having a filtering function, and the internal structures of the resistance-increasing shape-fixing pieces formed by rolling are used to filter smoke. The pore diameter and construction of microporous channels in the resistance-increasing shape-fixing piece increase the flow speed of smoke and cause the smoke to impact into a condensation cavity of the flow path. Due to large kinetic energy during smoking, through the resistance-increasing effect of the resistance-increasing shape-fixing piece, macromolecular substances such as tar in the mainstream smoke will impact on the surface of a next resistance-increasing shape-fixing piece and be absorbed by the resistance-increasing shape-fixing piece, thus achieving dilution. The cavity (air segment) between the adjacent resistance-increasing shape-fixing pieces can serve a good function of refluxing and condensing the smoke. In addition, when a colored or patterned or specially-shaped resistance-increasing shape-fixing piece is used in cooperation with the transparent tipping paper, the path and course of the smoke in the filter rod can be presented to a consumer in all directions to provide the consumer with a new visual feeling.

**[0021]** In addition, the air filter rod of the present disclosure has a simple structure, is easy to manufacture and use, and can be manufactured with the requirements for the production process of a cavity-combined filter rod, and put into production without modifying the prior filter rod equipment and processes, having a great value for industrialized production.

**[0022]** The present disclosure also provides a cigarette comprising the air filter rod described above. The cigarette comprises a tobacco shred end and any one of the air filter rods described above; and the air filter rod is connected to the tobacco shred end.

**[0023]** The present disclosure also provides a method of manufacturing an air filter rod, the method of manufacturing an air filter rod comprising at least the following steps:

rolling tipping paper into a cylindrical shape to form a tipping-paper outer layer and a hollow portion;  
rolling another tipping paper to form a rod-shaped structure and then cutting the rod-shaped structure to form a plurality of resistance-increasing shape-fixing pieces; and  
arranging the plurality of resistance-increasing shape-fixing pieces in the hollow portion, to obtain an air filter rod precursor.

**[0024]** Further, the steps of the method of manufacturing an air filter rod further include:  
disposing the plurality of resistance-increasing shape-fixing pieces in the hollow portion to obtain the air filter rod precursor with a length of 100 to 120 mm, and then dividing and cutting the air filter rod precursor into three segments to obtain final products, the air filter rods, wherein the air filter rods are each configured to be connected to a tobacco shred end of a cigarette.

**[0025]** Further, the steps of the method of manufacturing an air filter rod further include:

rolling tipping paper into a cylindrical shape at a preset speed, to obtain a rod-shaped structure having gas flow channels with an inner diameter of 0.2 to 1.0 mm; and  
cutting the rod-shaped structure into pieces to obtain resistance-increasing shape-fixing pieces having a thickness of 1 to 10 mm.

**[0026]** It should be noted that such air filter rods can be used both in heat-not-burn (i.e., HNB) cigarettes and in general cigarettes, which is not limited herein.

## Brief Description of Drawings

5 [0027] For illustrating technical solutions of embodiments of the present disclosure more clearly, drawings required for use in the embodiments will be introduced briefly below. It is to be understood that the drawings below are merely illustrative of some embodiments of the present disclosure, and therefore should not to be considered as limiting the scope of the disclosure. It would be understood by those of ordinary skill in the art that other relevant drawings could also be obtained from these drawings without any inventive effort.

10 FIG. 1 is a schematic view of a first structure of an air filter rod provided in embodiments of the present disclosure; FIG. 2 is a schematic view of a second structure of an air filter rod provided in embodiments of the present disclosure; and  
 FIG. 3 is a schematic view of a third structure of an air filter rod provided in embodiments of the present disclosure.

15 [0028] Reference numerals: 10-air filter rod; 11-tipping-paper outer layer; 112-division line; 12-hollow portion; 13-resistance-increasing shape-fixing piece; 14-gas flow channel; 15-cavity.

## Detailed Description of Embodiments

20 [0029] In order to make the objects, technical solutions and advantages of the embodiments of the present disclosure more clear, the technical solutions of the embodiments of the present disclosure will be described below clearly and completely with reference to the drawings of the embodiments of the present disclosure. It is apparent that the embodiments to be described are some, but not all of the embodiments of the present disclosure.

25 [0030] Thus, the following detailed description of the embodiments of the present disclosure is not intended to limit the scope of the present disclosure as claimed, but is merely representative of selected embodiments of the present disclosure. All the other embodiments obtained by those skilled in the art in light of the embodiments of the present disclosure without inventive efforts would fall within the scope of the present disclosure as claimed.

[0031] It should be noted that the embodiments in the present disclosure and the features and technical solutions in the embodiments may be combined with each other without conflict.

30 [0032] It should be noted that similar reference numerals and letters refer to similar items in the following figures, and thus once an item is defined in one figure, it may not be further defined or explained in the following figures.

[0033] The implementation of the solutions of the present disclosure will be specifically described below by way of example with reference to the accompanying drawings.

### Example 1

35 [0034] As shown in FIG. 1, it can be seen from FIG. 1 that an air filter rod 10 comprises a tipping-paper outer layer 11 formed by rolling tipping paper into a cylindrical shape and a hollow portion 12 defined by the tipping-paper outer layer 11, wherein the hollow portion 12 has a plurality of resistance-increasing shape-fixing pieces 13, the resistance-increasing shape-fixing pieces 13 are arranged orderly in parallel to one another in the hollow portion 12, the resistance-increasing shape-fixing pieces 13 are each in a columnar structure formed by rolling tipping paper to form a rod-shaped structure and then cutting the rod-shaped structure, and there is a cavity 15 between every two adjacent resistance-increasing shape-fixing pieces 13 in an axial direction of the tipping-paper outer layer 11; each resistance-increasing shape-fixing piece 13 is provided with gas flow channels 14 in the axial direction of tipping-paper outer layer 11, and the resistance-increasing shape-fixing piece 13 has a thickness of 1 to 10 mm; and the tipping paper is regenerated cellulose cellophane.

40 [0035] The regenerated cellulose fiber is a regenerated cellulose fiber with better performance manufactured by using natural cellulose (cotton, hemp, bamboo, tree, shrub, or the like) as a raw material and changing only the physical structure of the natural cellulose without changing its chemical structure. Its structural composition is similar to that of cotton, except that its hygroscopicity and breathability are better than those of cotton fibers. It can be said to be one having the best hygroscopicity and breathability among all chemical fibers, and it is known as a "breathable fabric".

50 [0036] The cellophane is a thin film prepared by a gluing method using natural fibers such as cotton pulp, wood pulp or the like as raw materials. It is transparent, non-toxic, and odorless. The cellophane is a thin-film-like product processed from regenerated fibers.

55 [0037] In the present disclosure, transparent (the regenerated cellulose cellophane is a transparent material) tipping paper is used to pre-prepare a plurality of resistance-increasing shape-fixing pieces 13 having a filtering function, and the internal structures of the resistance-increasing shape-fixing pieces 13 formed by rolling are used to filter smoke. The gas flow channel 14 in the resistance-increasing shape-fixing piece 13 increases the flow speed of smoke and causes the smoke to impact into the cavity 15 of the flow path. Due to large kinetic energy during smoking, through the resistance-

increasing effect of the resistance-increasing shape-fixing piece 13, macromolecular substances such as tar in the mainstream smoke will impact on the surface of a next resistance-increasing shape-fixing piece 13 and be absorbed by the resistance-increasing shape-fixing piece 13, so as to be diluted. The cavity 15 (air segment) between the adjacent resistance-increasing shape-fixing pieces 13 can serve a good function of refluxing and condensing the smoke.

5 **[0038]** It should be noted that such air filter rods can be used both in heat-not-burn (i.e., HNB) cigarettes and in general cigarettes, which is not limited herein.

**[0039]** Continued reference is made to FIGS. 1 to 3 for understanding more details of the air filter rod 10.

10 **[0040]** Further, the plurality of resistance-increasing shape-fixing pieces 13 are arranged in the axial direction of the cylindrical shape of the tipping-paper outer layer 11, and the plurality of resistance-increasing shape-fixing pieces 13 are all located in the same linear direction. In this way, the convenience in the mounting of the resistance-increasing shape-fixing pieces 13 is ensured, and at the same time, it is also possible to ensure sufficient kinetic energy during smoking to allow the smoke to pass through the air filter rod 10.

**[0041]** Optionally, the plurality of resistance-increasing shape-fixing pieces 13 are disposed at equal intervals in the hollow portion 12, thus ensuring the full absorption of smoke.

15 **[0042]** Optionally, radial outer circumferential surfaces of the resistance-increasing shape-fixing pieces 13 are closely attached to the inner wall of the tipping-paper outer layer 11 so that each cavity 15 forms a sealed space. In this way, the amount of macromolecular substances in the smoke absorbed by the resistance-increasing shape-fixing piece 13 is increased, and at the same time the function of refluxing and condensing the smoke is also improved.

20 **[0043]** In the present embodiment, the number of the gas flow channels 14 in each resistance-increasing shape-fixing piece 13 is the same as or different from number of the gas flow channels in another resistance-increasing shape-fixing piece. It can be adjusted correspondingly according to different types of tobaccos and customer preferences.

**[0044]** In the present embodiment, the air filter rod 10 is provided with a fiber tow segment for tobaccos at one end thereof close to tobacco shreds. Optionally, the fiber tow segment for tobaccos is made of acetate fibers.

25 **[0045]** Cellulose acetate tow is formed by acetifying natural wood pulp as a raw material into a cellulose acetate sheet and processing the same by production processes such as dissolving, filtering, spinning, crimping and drying, and is a precision filtering material. The cellulose acetate tow is a regenerated cellulose fiber, with the characteristics of good hygroscopicity, adsorption, etc.

**[0046]** The section of the cellulose acetate tow is "Y"-shaped, and the fiber has a relatively large specific surface area, which has a good effect of adsorbing and intercepting harmful ingredients in cigarette smoke.

30 **[0047]** In the embodiment of the present disclosure, the gas flow channel 14 has an inner diameter of 0.2 to 1.0 mm, and the number of the gas flow channels 14 in each resistance-increasing shape-fixing piece 13 is 2 to 20.

**[0048]** Optionally, the cavity 15 between the adjacent resistance-increasing shape-fixing pieces 13 has a length of 1 to 20 mm. Further, the cavity 15 between the adjacent resistance-increasing shape-fixing pieces 13 may have a length of 4 to 12 mm.

35 **[0049]** Optionally, the cross-sectional shape of the gas flow channel 14 is a circle, an ellipse, a polygon, or an irregular shape (as shown in FIG. 3), as long as the gas flow channel enables the smoke to pass therethrough.

**[0050]** Optionally, the resistance-increasing shape-fixing piece 13 has a color pattern. When a colored or patterned or specially-shaped resistance-increasing shape-fixing piece 13 is used in cooperation with the transparent tipping-paper outer layer 11, the path and course of the smoke in the filter rod can be shown to a consumer in all directions to provide the consumer with a new visual feeling.

40 **[0051]** In the above, in the present embodiment, the plurality of resistance-increasing shape-fixing pieces 13 are obtained by rolling and cutting regenerated cellulose cellophane, wherein each resistance-increasing shape-fixing piece 13 has a diameter of 8 mm and a single piece thickness of 2 mm, 10 to 20 gas flow channels 14 are distributed in each piece, and the gas flow channels 14 have an average inner diameter of 0.2 mm.

45 **[0052]** Nine resistance-increasing shape-fixing pieces 13 are disposed in tipping paper having a width of 100 mm, which is rolled into a cylindrical shape, wherein a cavity 15 is provided between two adjacent resistance-increasing shape-fixing pieces 13, and the cavity 15 has a length of 8 mm.

50 **[0053]** An air filter rod 10 of 100 mm in length is cut into three segments along division lines. As shown in FIG. 1, the air filter rod has 12 resistance-increasing shape-fixing pieces 13 and is divided equally into three segments along the division lines 112, and then each segment has three resistance-increasing shape-fixing pieces 13. Moreover, the length of the cut air filter rod 10 is corresponding to the length of the filter of the prior cigarette.

#### Example 2

55 **[0054]** This example is the same as Example 1 in manufacture process, and is different therefrom in that the resistance-increasing shape-fixing piece 13 has a single piece thickness of 5 mm, 6 to 8 gas flow channels 14 are distributed in each piece, and the gas flow channels 14 have an average inner diameter of 0.5 mm.

**[0055]** Nine resistance-increasing shape-fixing pieces 13 are disposed in tipping paper having a width of 100 mm,

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which is rolled into a cylindrical shape, wherein a cavity 15 is provided between two adjacent resistance-increasing shape-fixing pieces 13, and the cavity 15 has a length of 5 mm.

### Example 3

**[0056]** This example is the same as Example 1 in manufacture process, and is different therefrom in that the resistance-increasing shape-fixing piece 13 has a single piece thickness of 8 mm, 6 to 8 gas flow channels 14 are distributed in each piece, and the gas flow channels 14 have an average inner diameter of 1.0 mm.

**[0057]** Nine resistance-increasing shape-fixing pieces 13 are disposed in tipping paper having a width of 100 mm, which is rolled into a cylindrical shape, wherein a cavity 15 is provided between two adjacent resistance-increasing shape-fixing pieces 13, and the cavity 15 has a length of 2 mm.

### Example 4

**[0058]** This example is the same as Example 1 in manufacture process, and is different therefrom in that the resistance-increasing shape-fixing piece 13 has a single piece thickness of 10 mm, 20 gas flow channels 14 are distributed in each piece, and the gas flow channels 14 have an average inner diameter of 0.3 mm.

**[0059]** Six resistance-increasing shape-fixing pieces 13 are disposed in tipping paper having a width of 100 mm, which is rolled into a cylindrical shape, wherein a cavity 15 is provided between two adjacent resistance-increasing shape-fixing pieces 13, and the cavity 15 has a length of 10 mm.

### Comparative Example

**[0060]** 60 commercially available ordinary cigarettes were selected as control sample.

**[0061]** The air filter rod of Example 1 was taken to make a filter rod by combining cavities, and another 60 commercially available ordinary cigarettes were collected, and the tow portions thereof were pulled out and replaced by the air filter rod of Example 1.

**[0062]** Similarly, the air filter rods of Examples 2 and 3 were taken to make filter rods by combining cavities, respectively, and another 60 commercially available ordinary cigarettes were collected, and the tow portions thereof were pulled out and replaced by the air filter rod of Example 2 and the air filter rod of Example 3, respectively (The filter rod in Example 4 was not used at this time). For the above four groups of a total of 240 cigarettes, smoke test was performed. The results were as follows:

Item	TPM mg/cigarette	H <sub>2</sub> O mg/cigarette	NIC mg/cigarette	NFDPM mg/cigarette	CO mg/cigarette
Control Sample	13.34	1.44	0.92	10.98	10.1
Example 1	12.98	1.21	0.82	10.56	10.0
Example 2	13.00	1.10	0.86	10.80	9.8
Example 3	12.75	1.34	0.79	10.74	9.9

**[0063]** In the above, TPM refers to the total particulate matter in smoke, NIC refers to the content of nicotine in smoke, and NFDPM refers to tar content (nicotine-free dry particulate matter). The test methods are all conventional methods available in the art, and for example, the test is carried out according to the method described in national standard GB/T19069-2004.

### Data Analysis:

**[0064]** According to the conventional detection of smoke from cigarettes, Examples 1 to 3 according to the present disclosure, compared to the control sample, have a certain effect of reducing tar, and specifically show certain reduction in each of the TPM, the NIC, and the NFDPM, and also have a certain effect of adsorbing nicotine, acetone, gas-phase free radicals, benzopyrene, and nitrite without affecting the aroma.

**[0065]** Further, Examples 1 to 3 do not show significant reduction in moisture, compared to the control sample.

**[0066]** Compared with the prior cigarette filter rods which are largely dependent on the use of acetate fibers as a filtering material and which result in dry smoke due to the adsorption of moisture by the acetate fibers, in the solution of the present disclosure, acetate fibers are used only in a fiber tow segment for tobaccos provided at one end of the air filter rod close to tobacco shreds, therefore the smoking quality of tobacco will not be reduced while the air filter rod can adsorb more harmful substances.

[0067] Thus, the air filter rod of the present disclosure has the following effects:

The air filter rod of the embodiments of the present disclosure can be directly applied to a cavity-combined filter rod due to its unique external structural design, and the air filter rod of the present disclosure has good mechanical processability.

[0068] The air filter rod of the embodiment of the present disclosure, due to its unique internal structural design, extends the length of the flow channel for the smoke, improves the flow speed of the smoke, and enhances the efficiency of collision of the smoke, thereby achieving the reduction of harmful substances such as tar in the smoke.

[0069] The materials used in the air filter rod of the embodiment of the present disclosure are all food-grade raw materials, and the raw materials have such properties as odorless, tasteless, and heat-resisting properties, hence bad odors will not be introduced or produced while harmful substances such as tar in the smoke are effectively reduced.

[0070] The present disclosure also provides a cigarette comprising a tobacco shred end and any one of the air filter rods described above, the air filter rod being connected to the tobacco shred end.

[0071] Such cigarette can filter out most of the harmful substances in the smoke, and can improve the smoking quality of tobacco.

[0072] The present disclosure also provides a method of manufacturing an air filter rod. The method of manufacturing an air filter rod comprises at least the following steps:

rolling tipping paper into a cylindrical shape to form a tipping-paper outer layer and a hollow portion;  
 rolling another tipping paper to form a rod-shaped structure and then cutting the rod-shaped structure to form a plurality of resistance-increasing shape-fixing pieces; and  
 arranging the plurality of resistance-increasing shape-fixing pieces in the hollow portion, to obtain an air filter rod precursor.

[0073] Such method of manufacturing an air filter rod is simple and rapid, and can produce and obtain a large number of air filter rods with good adsorption capability.

[0074] Further, the steps of the method of manufacturing an air filter rod further include:  
 arranging the plurality of resistance-increasing shape-fixing pieces in the hollow portion to obtain the air filter rod precursor with a length of 100 to 120 mm, and then dividing and cutting the air filter rod precursor into three segments to obtain to obtain final products, the air filter rods, wherein the air filter rods are each configured to be connected to a tobacco shred end of a cigarette.

[0075] The air filter rod obtained after the dividing and cutting can be more conveniently connected to the tobacco shred end of the cigarette, which facilitates the processing of the cigarette.

[0076] Further, the steps of the method of manufacturing an air filter rod further include:

rolling tipping paper into a cylindrical shape at a preset speed to obtain a rod-shaped structure having gas flow channels with an inner diameter of 0.2 to 1.0 mm; and  
 cutting the rod-shaped structure into pieces to obtain resistance-increasing shape-fixing pieces having a thickness of 1 to 10 mm.

[0077] Optionally, in the present embodiment, regenerated cellulose cellophane is rolled at a speed of 1000 m/s into a cylindrical shape using a JK-4SD device produced by JK Machine in Korea, to obtain a rod-shaped structure having gas flow channels with an inner diameter of 0.2 to 1.0 mm, and the rod-shaped structure is cut into pieces to obtain resistance-increasing shape-fixing pieces each having a thickness of 1 to 10 mm.

### Industrial Applicability

[0078] The present disclosure relates to an air filter rod, a cigarette, and a method of manufacturing an air filter rod. The air filter rod has a plurality of resistance-increasing shape-fixing pieces which are arranged orderly in parallel to one another in the hollow portion. With the unique design of the present disclosure, the smoke flow speed is increased, and the smoke flow state is changed, whereby some of the harmful substances such as tar are settled and adsorbed. Moreover, such an air filter rod can also improve the smoking quality of tobaccos.

### Claims

1. An air filter rod (10), comprising a tipping-paper outer layer (11) formed by rolling tipping paper into a cylindrical shape and a hollow portion (12) defined by the tipping-paper outer layer (11),  
**characterized in that** the hollow portion (12) has a plurality of resistance-increasing shape-fixing pieces (13), and the resistance-increasing shape-fixing pieces (13) are arranged orderly in parallel to one another in the hollow portion

(12);

the resistance-increasing shape-fixing pieces (13) are each in a columnar structure formed by rolling tipping paper to form a rod-shaped structure and then cutting the rod-shaped structure, and a cavity (15) is formed between every two adjacent resistance-increasing shape-fixing pieces (13) in an axial direction of the tipping-paper outer layer (11);

each resistance-increasing shape-fixing piece (13) is provided with gas flow channels (14) in the axial direction of the tipping-paper outer layer (11); and

each resistance-increasing shape-fixing piece (13) has a thickness of 1 to 10 mm; and the tipping paper is regenerated cellulose cellophane.

2. The air filter rod (10) according to claim 1, **characterized in that** the plurality of resistance-increasing shape-fixing pieces (13) are arranged in an axial direction of the cylindrical tipping-paper outer layer (11), and the plurality of resistance-increasing shape-fixing pieces (13) are all located in a same linear direction.
3. The air filter rod (10) according to claim 1 or 2, **characterized in that** the plurality of resistance-increasing shape-fixing pieces (13) are disposed at equal intervals in the hollow portion (12).
4. The air filter rod (10) according to any one of claims 1 to 3, **characterized in that** radial outer circumferential surfaces of the resistance-increasing shape-fixing pieces (13) are closely attached to an inner wall of the tipping-paper outer layer (11), so that each cavity (15) forms a sealed space.
5. The air filter rod (10) according to any one of claims 1 to 4, **characterized in that** each gas flow channel (13) has an inner diameter of 0.2 to 1.0 mm, and number of the gas flow channels (13) in each resistance-increasing shape-fixing piece (13) is 2 to 20.
6. The air filter rod (10) according to any one of claims 1 to 5, **characterized in that** number of the gas flow channels (13) in each resistance-increasing shape-fixing piece (13) is the same as or different from number of the gas flow channels (13) in another resistance-increasing shape-fixing piece (13).
7. The air filter rod (10) according to any one of claims 1 to 6, **characterized in that** one end of the air filter rod (10) close to tobacco shreds is provided with a fiber tow segment for tobaccos.
8. The air filter rod (10) according to claim 7, **characterized in that** the fiber tow segment for tobaccos is made of acetate fibers.
9. The air filter rod (10) according to any one of claims 1 to 8, **characterized in that** the cavity (15) between the adjacent resistance-increasing shape-fixing pieces (13) has a length of 1 to 20 mm, preferably, the cavity (15) between the adjacent resistance-increasing shape-fixing pieces (13) have a length of 4 to 12 mm.
10. The air filter rod (10) according to any one of claims 1 to 9, **characterized in that** a cross-sectional shape of each gas flow channel (13) is a circle, an ellipse, a polygon, or an irregular shape.
11. The air filter rod (10) according to any one of claims 1 to 10, **characterized in that** each resistance-increasing shape-fixing piece (13) has a color pattern.
12. A cigarette, **characterized by** comprising a tobacco shred end and the air filter rod (10) according to any one of claims 1 to 11, wherein the air filter rod (10) is connected to the tobacco shred end.
13. A method of manufacturing an air filter rod, **characterized by** comprising:
- rolling tipping paper into a cylindrical shape to form a tipping-paper outer layer and a hollow portion;  
 rolling another tipping paper to form a rod-shaped structure and then cutting the rod-shaped structure to form a plurality of resistance-increasing shape-fixing pieces; and  
 arranging the plurality of resistance-increasing shape-fixing pieces in the hollow portion, to form an air filter rod precursor.
14. The method of manufacturing an air filter rod according to claim 13, **characterized by** further comprising:
- arranging the plurality of resistance-increasing shape-fixing pieces in the hollow portion to obtain the air filter



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rod precursor with a length of 100 to 120 mm, and then dividing and cutting the air filter rod precursor into three segments to obtain final products which are the air filter rods, wherein the air filter rods are each configured to be connected to a tobacco shred end of a cigarette.

5 **15.** The method of manufacturing an air filter rod according to claim 13, **characterized by** further comprising:

rolling tipping paper into a cylindrical shape at a preset speed to obtain a rod-shaped structure having gas flow channels with an inner diameter of 0.2 to 1.0 mm; and

10 cutting the rod-shaped structure into pieces to obtain resistance-increasing shape-fixing pieces having a thickness of 1 to 10 mm.

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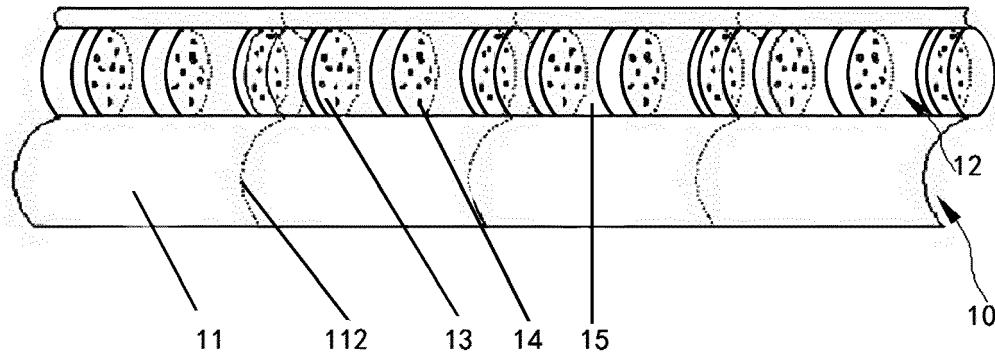


FIG. 1

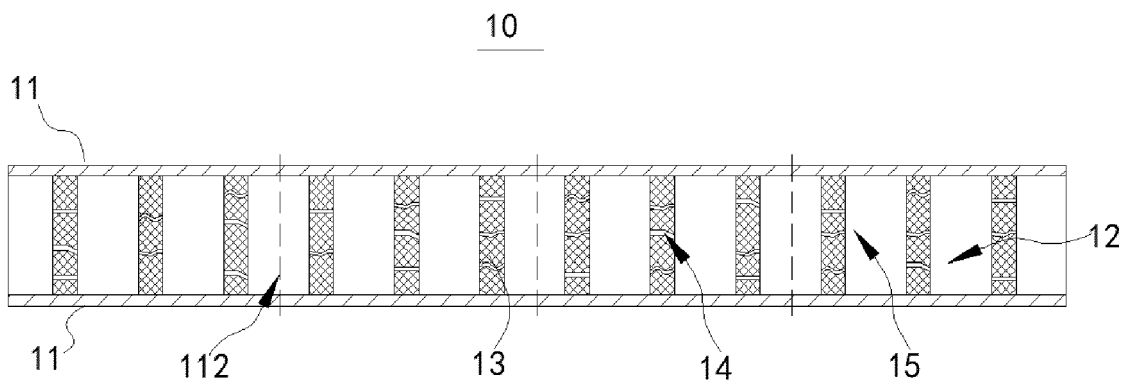


FIG. 2

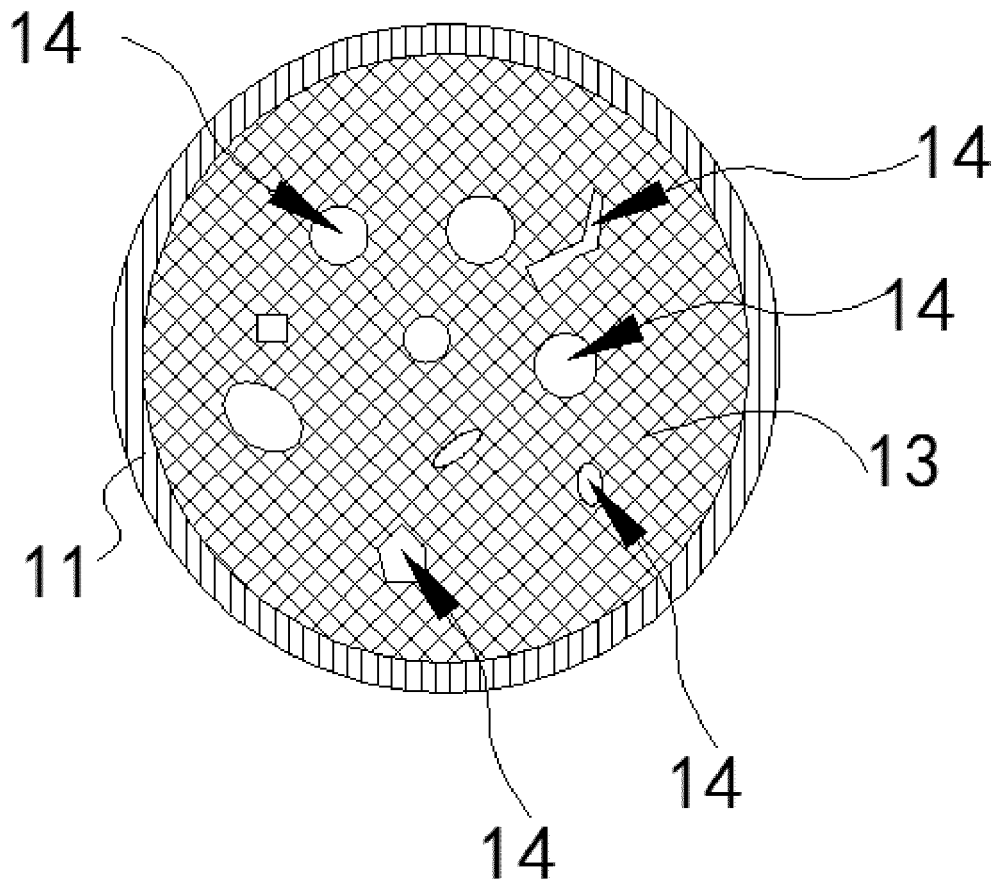


FIG. 3



EUROPEAN SEARCH REPORT

Application Number  
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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	KR 2015 0105168 A (SHANGHAI HUABAO BIOLOG TECHNOLOGY CO LTD [CN]) 16 September 2015 (2015-09-16) * paragraphs [0007] - [0016]; figure 1 * -----	1-15	INV. A24D3/04 A24D3/02
A	EP 2 462 820 A1 (PHILIP MORRIS PROD [CH]) 13 June 2012 (2012-06-13) * paragraph [0009]; figure 1 * -----	1-15	
A	DE 879 823 C (REINACHER OTTO) 15 June 1953 (1953-06-15) * the whole document * -----	1-15	
A	US 6 814 786 B1 (ZHUANG SHUZHONG [US] ET AL) 9 November 2004 (2004-11-09) * column 5, lines 27-37; figures 1,2 * -----	1-15	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			A24D
Place of search		Date of completion of the search	Examiner
Munich		21 February 2019	Schwarzer, Bernd
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ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.

EP 18 18 9800

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
KR 20150105168 A	16-09-2015	CN 103783667 A KR 20150105168 A	14-05-2014 16-09-2015
EP 2462820 A1	13-06-2012	AU 2011101752 A4 AU 2011340546 A1 BR 212013014455 U2 CN 203709248 U CZ 26648 U1 DK 201300106 U1 EE 01248 U1 EP 2462820 A1 ES 1135130 U HU 4933 U KR 20130005328 U PH 22013500003 U1 PL 122402 U1 RU 138230 U1 SG 191095 A1 SK 50352013 U1 UA 88174 U WO 2012076649 A1	12-02-2015 04-07-2013 15-05-2018 16-07-2014 02-04-2014 26-07-2013 15-10-2014 13-06-2012 29-12-2014 28-12-2018 10-09-2013 04-05-2016 21-07-2014 10-03-2014 31-07-2013 06-05-2014 11-03-2014 14-06-2012
DE 879823 C	15-06-1953	NONE	
US 6814786 B1	09-11-2004	US 6814786 B1 WO 2004086888 A2	09-11-2004 14-10-2004

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82