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(54) HOT-AIR HEATER AND HAIR DRYER WITH HOT-AIR HEATER

(57) The present disclosure relates to a hot-air heater and a hair dryer with the hot-air heater. The hot-air heater comprises a first heating wire and a second heating wire, the first heating wire and the second heating wire are in parallel connection between a positive electrode end point and a negative electrode end point of a power line, the first heating wire and the second heating wire are wound in the same direction and respectively form a plurality of coils, the direction of the current flowing the first heating wire and the direction of the current flowing the second heating wire are opposite, and a minimum distance between two adjacent coils of the first heating wire and the second heating wire is set to X, and the minimum distance X is in a range of 2 mm to 12 mm.

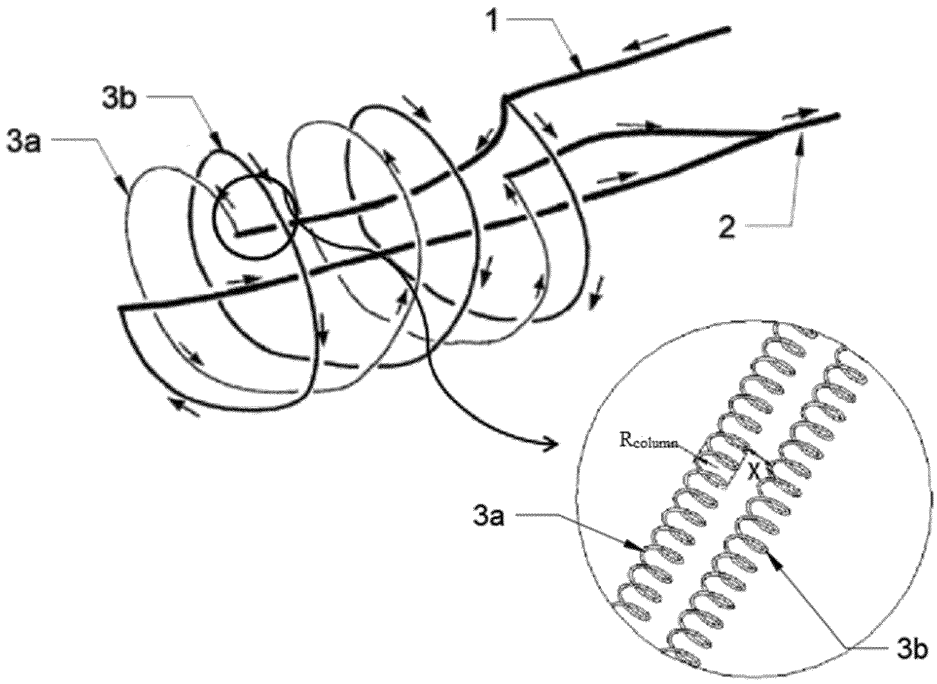

FIG. 1

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Description

TECHNICAL FIELD

[0001] The present disclosure relates to a hot-air heater, and in particular to a hot-air heater with radiationless heating wires and a hair dryer with the hot-air heater.

BACKGROUND

[0002] A hair dryer is also called an electric hair dryer. The hair dryer, especially a hot-air hair dryer, is widely applied to hair drying or functional hair care, such as far infrared hair care, negative-ion hair care and the like.

[0003] The hair dryer is a common electric appliance in people's life, is mainly used for drying and shaping the hair, and is also applied to local drying and thermal physical therapy in the lab, the physiotherapy room, art design and the like. A domestic hair dryer on the market at present is mainly composed of a shell body, heating elements, a motor, a blade and the like, and the heating elements, the motor and the blade are arranged in the shell body, wherein the heating elements mostly utilize heating wires, the heating wires are directly arranged in a ventilation channel in the shell body in a tensioning manner or is mounted in the shell body in a spiral winding manner, and the blade is arranged at the back of the heating wires; after the hair dryer is powered, the heating wires emit the heat and keep a high-temperature state, the blade sucks air behind the hair dryer into the shell body, the air are blown out of the shell body after passing through the heating wires, and then the air is blown to the head of a user; and in this process, the heating wires emit the heat and keep the high-temperature state so as to generate a large amount of electromagnetic radiation, and the generated electromagnetic radiation radiates the head of the user after passing through via holes of the shell of the hair dryer along a straight line, so, if such situation lasts for a long time, the human body of the user will be damaged.

[0004] In order to solve the above problem, a patent with the application number of CN100553383C (which is called document 1 hereinafter) discloses a hot-air heater, wherein the provided hot-air heater comprises heating wires that are wound around an insulating fire-resistance substrate, the first heating wire and the second heating wire are in parallel connection between an input line and an output line of the power line and are wound around the insulating fire-resistance substrate in the same direction, so the current flows the first heating wire and the second heating wire in opposite directions, then electromagnetic waves generated by the first heating wire and the second heating wire are counteracted, and adjacent coils of the first heating wire and the second heating wire have the same or basically similar coil diameter. The patent also provides: each of the first heating wire and the second heating wire (namely twisted-pair wire) is wound around the insulating fire-resistance substrate at a preset interval and the both are arranged as close as possible.

SUMMARY

[0005] According to instruction of the document 1, it is found in practice that: in a technical scheme that a first heating wire and a second heating wire are arranged as close as possible, the possibility of contact collision of coils is increased, and if the contact collision of the coils occurs, the first heating wire and the second heating wire are short circuited, or if the current of the first heating wire and the current of the second heating wire generate shock at a contact point, electric sparks and combustion are generated.

[0006] In order to solve the above problems, the present disclosure provides a hot-air heater. The hot-air heater is characterized by comprising a first heating wire and a second heating wire, the first heating wire and the second heating wire are in parallel connection between a positive electrode end point and a negative electrode end point of a power line, the first heating wire and the second heating wire are wound in the same direction and respectively form a plurality of coils, the direction of the current flowing the first heating wire and the direction of the current flowing the second heating wire are opposite, and a minimum distance between two adjacent coils of the first heating wire and the second heating wire is set to X, and the minimum distance X is in a range of 2 mm to 12 mm.

[0007] Furthermore, the minimum distance X is in a range of 3 mm to 8 mm.

[0008] Furthermore, the wound coils of the first heating wire and the wound coils of the second heating wire are in a smoothly extending line form, the line radius of each wound coil of the first heating wire and the line radius of each wound coil of the second heating wire are the same and are set to R_{line}, and the R_{line} is less than or equal to 5 mm;
or
the wound coils of the first heating wire and the wound coils of the second heating wire are in a spin-helix column form, the column radius of each wound coil of the first heating wire and the column radius of each wound coil of the second heating wire are the same and are set to R_{column}, and the R_{column} is less than or equal to 5 mm.

[0009] Furthermore, when the X is equal to 3 mm, the R_{line} or the R_{column} is in a range of 1 mm to 3 mm;
when the X is equal to 4 mm, the R_{line} or the R_{column} is in a range of 1 mm to 4 mm;
when the X is equal to 5 mm, the R_{line} or the R_{column} is in a range of 1 mm to 5 mm;

when the X is equal to 6 mm, the R_{line} or the R_{column} is in a range of 1 mm to 5 mm.

[0010] Furthermore, the adjacent coils of the first heating wire and the second heating wire are alternatively arranged approximately in parallel in a winding direction; or

the adjacent coils of the first heating wire and the second heating wire are arranged approximately concentrically in a direction vertical to a winding direction, the first heating wire is located inside and the second heating wire is located outside.

[0011] The present disclosure further provides a hot-air heater. The hot-air heater is characterized by comprising a first heating wire and a second heating wire, the first heating wire and the second heating wire are in parallel connection between a positive electrode end point and a negative electrode end point of a power line, the first heating wire and the second heating wire are wound in the same direction and respectively form a plurality of coils, the direction of the current flowing the first heating wire and the direction of the current flowing the second heating wire are opposite, and a minimum distance between two adjacent coils of the first heating wire and the second heating wire is set to X; and

the wound coils of the first heating wire and the wound coils of the second heating wire are in a spin-helix column form, the column radius of each wound coil of the first heating wire and the column radius of each wound coil of the second heating wire are the same and are set to R_{column}, and the X and the R_{column} meet a ratio relation: $T=X/(2R_{column}+X)$, wherein the value of the ratio T is in a range of 0.3 to 0.8.

[0012] Furthermore, the value of the ratio T is in a range of 0.3 to 0.5.

[0013] Furthermore, the X is in a range of 2 mm to 12 mm, and the R_{column} is less than or equal to 5 mm.

[0014] The present disclosure further provides a hair dryer with the hot-air heater arranged in a shell, and the hair dryer is characterized in that the hot-air heater is the hot-air heater according to any one of claims 1 to 8.

[0015] Furthermore, the power of the hair dryer is in a range of 480 W to 2000 W.

[0016] The present disclosure has the following beneficial effects:

(1) the hot-air heater provided by the present disclosure limits the minimum distance X between the adjacent coils of the first heating wire and the second heating wire, thereby avoiding the possibility of contact collision between the coils and further avoiding the short circuit between the first heating wire and the second heating wire or avoiding the generation of electric sparks and combustion if the current of the first heating wire and the current of the second heating wire generate shock at a contact point;

(2) according to the hair dryer provided by the present disclosure, by adjusting a corresponding relation between the X and the R_{column} and the ratio T, the electromagnetic radiation of the heating wires can be counteracted, even close to 0 mG to generate the radiationless effect, while the security is ensure and a certain operating power of the hair dryer is met.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is a schematic diagram of a structure when a first heating wire and a second heating wire are alternatively arranged approximately in parallel in a winding direction in the present disclosure, and a structure that wound coils of the first heating wire and the second heating wire are in a spin-helix column form.

FIG. 2 is a schematic diagram of a structure when the first heating wire and the second heating wire are arranged approximately concentrically in a direction vertical to the winding direction in the present disclosure.

DESCRIPTION OF THE EMBODIMENTS

[0018] The following clearly and completely describes the technical schemes of the present disclosure in conjunction with the accompanying drawings. Apparently, the described embodiments are merely a part rather than all of the embodiments of the present disclosure. All other embodiments obtained by a person of ordinary skill in the art based on the embodiments of the present disclosure without creative efforts shall fall within the protection scope of the present disclosure.

[0019] In the description of the present disclosure, it should be noted that orientations or position relationships indicated by terms "center", "upper", "lower", "left", "right", "vertical", "horizontal", "inside" and "outside", etc. are orientations or position relationships as shown in the drawings, and these terms are just used to facilitate description of the present disclosure and simplify the description, but not to indicate or imply that the mentioned apparatus or elements must have a specific orientation and must be established and operated in a specific orientation, and thus, these terms cannot be understood as a limitation to the present disclosure. Additionally, the terms "first", "second", "third" and the like are merely for the purpose of description, but should not be understood as indicating or implying relative importance.

[0020] In the description of the present disclosure, it should be noted that the term "installation" and "connection"

should be understood in a broad sense, unless otherwise specified and defined, for example, a fixed connection, a detachable connection, or an integral connection; it also may be a mechanical connection or an electrical connection; it also may be direct connection, may be an indirect connection via an intervening structure, and may be an internal connectivity of two components. The specific meaning of the above-mentioned terms in the present disclosure may be understood by those skilled in the art according to specific circumstances.

[0021] Referring to FIG. 1, FIG. 1 is a schematic diagram of a structure when a first heating wire and a second heating wire are alternatively arranged approximately in parallel in a winding direction in the present disclosure, and a structure that wound coils of the first heating wire and the second heating wire are in a spin-helix column form. A hot-air heater provided by the present disclosure comprises a first heating wire 3a and a second heating wire 3b, the first heating wire 3a and the second heating wire 3b are in parallel connection between a positive electrode end point 1 and a negative electrode end point 2 of a power line, the first heating wire 3a and the second heating wire 3 are wound in the same direction and respectively form a plurality of coils, the direction of the current flowing the first heating wire 3a and the direction of the current flowing the second heating wire 3b are opposite, and a minimum distance between two adjacent coils of the first heating wire 3a and the second heating wire 3b is set to X, the adjacent coils of the first heating wire 3a and the second heating wire 3b are alternatively arranged approximately in parallel in the winding direction, and the directions of electromagnetic fields generated by the two heating wires are opposite in order to achieve a counteracting effect so that electromagnetic radiation generated by the heating wires is counteracted, even close to 0 mG.

[0022] As shown in FIG. 1, the wound coils of the first heating wire and the wound coils of the second heating wire are in a spin-helix column form, wherein the "spin-helix column form" represents a meaning of "spin helix approximately according to the same radius". Preferably, the column radius of each wound coil of the first heating wire and the column radius of each wound coil of the second heating wire are the same and are set to R_{column}. Besides, the wound coils of the first heating wire and the wound coils of the second heating wire may also be in a smoothly extending line form, wherein the "smoothly extending line form" does not represent a meaning of "flatly extending" but represents a meaning of "smoothly extending" or a meaning of no spin-helix extending. Preferably, the line radius of each wound coil of the first heating wire and the line radius of each wound coil of the second heating wire are the same and are set to R_{line}.

[0023] FIG. 2 is a schematic diagram of a structure when the first heating wire and the second heating wire are arranged approximately concentrically in a direction vertical to the winding direction in the present disclosure. The directions of the electromagnetic fields generated by the two heating wires are opposite in order to achieve a counteracting effect so that electromagnetic radiation generated by the heating wires is counteracted, even close to 0 mG, wherein the wound coils of the first heating wire and the wound coils of the second heating wire are in the spin-helix column form, preferably the column radiuses of the both are the same and are set to R_{column}; or they are in the smoothly extending line form, preferably the line radiuses of the both are the same and are set to R_{line}.

[0024] In two cases as shown in FIG. 1 and FIG. 2, in order to avoid the possibility of contact collision between the coils to cause the short circuit between the first heating wire 3a and the second heating wire 3b, or avoid the generation of electric sparks and combustion if the current of the first heating wire 3a and the current of the second heating wire 3b generate shock at a contact point, the present disclosure limits the minimum distance X between two adjacent coils of the first heating wire 3a and the second heating wire 3b, that is, the two adjacent coils of the first heating wire 3a and the second heating wire 3b cannot be arranged as close as possible but are provided with the minimum distance X; furthermore, the minimum distance X is in a range of 2 mm to 12 mm, preferably 3 mm to 8 mm, and the R_{line} is less than or equal to 5 mm, or the R_{column} is less than or equal to 5 mm.

[0025] In order to ensure the security of the adjacent coils of the first heating wire 3a and the second heating wire 3b, it should be ensured that obvious contact collision to cause potential security hazards is not generated among the coils after a falling test of 1.5m and a striking test are carried out for many times. The following takes coils in the spin-helix column form for example to test the minimum distance X and the column radius R_{column}, and the test results are as shown in table 1.

Table 1

Minimum distance X (mm)	Column radius R_{column} (mm)	Whether to explode
2	1	NO
	2	NO
	3	YES
	4	YES
	5	YES

(continued)

Minimum distance X (mm)	Column radius R_{column} (mm)	Whether to explode
3	1	NO
	2	NO
	3	NO
	4	YES
	5	YES
4	1	NO
	2	NO
	3	NO
	4	NO
	5	YES
5	1	NO
	2	NO
	3	NO
	4	NO
	5	NO
6	1	NO
	2	NO
	3	NO
	4	NO
	5	NO
7	1	NO
	2	NO
	3	NO
	4	NO
	5	NO
8	1	NO
	2	NO
	3	NO
	4	NO
	5	NO

[0026] Impulse is generated during falling, so a spring wire generates movement under the inertia effect, wherein such movement meets the simple harmonic motion rule, and the coils generate a certain displacement in the same direction of the force. The test data in table 1 represents: when the minimum distance X is 2 mm and the R_{column} respectively is 3 mm, 4 mm and 5 mm, explosion occurs; when the minimum distance X is 3 mm and the R_{column} respectively is 4 mm and 5 mm, explosion occurs; and when the minimum distance X is 4 mm and the R_{column} is 5 mm, explosion occurs. Therefore, the two adjacent coils of the first heating wire 3a and the second heating wire 3b need to be provided with a minimum distance X, but are not arranged as close as possible.

[0027] For the coils in the smoothly extending line form, the test result is as same as the above.

[0028] For the above coils in the spin-helix column form, in practice, it is further found that there is a certain ratio relation T between the column radius R_{column} and the minimum distance X, specifically: $T=X/(2R_{column}+X)$; and in order

to verify the above ratio relation, the ratio T is added to the tests and its testing procedure is as same as the testing procedure of the tests of table 1.

[0029] In order to ensure the security of the adjacent coils of the first heating wire 3a and the second heating wire 3b, it should be ensured that obvious contact collision to cause potential security hazards is not generated among the coils after the falling test of 1.5m and the striking test are carried out for many times. The following tests the minimum distance X and the column radius R_{column}, and calculates the value of the ratio T, and the test results are as shown in table 2.

Table 2

Minimum distance X (mm)	Column radius R_{column} (mm)	Ratio T	Whether to explode
2	1	0.50	NO
	2	0.33	NO
	3	0.25	YES
	4	0.20	YES
	5	0.17	YES
3	1	0.60	NO
	2	0.43	NO
	3	0.33	NO
	4	0.27	YES
	5	0.23	YES
4	1	0.67	NO
	2	0.50	NO
	3	0.40	NO
	4	0.33	NO
	5	0.29	YES
5	1	0.71	NO
	2	0.56	NO
	3	0.45	NO
	4	0.38	NO
	5	0.33	NO
6	1	0.75	NO
	2	0.60	NO
	3	0.50	NO
	4	0.43	NO
	5	0.38	NO
7	1	0.78	NO
	2	0.64	NO
	3	0.54	NO
	4	0.47	NO
	5	0.41	NO

(continued)

Minimum distance X (mm)	Column radius R_{column} (mm)	Ratio T	Whether to explode
8	1	0.80	NO
	2	0.67	NO
	3	0.57	NO
	4	0.50	NO
	5	0.44	NO

[0030] The test data in table 2 represents: when the minimum distance X is 2 mm and the R_{column} respectively is 3 mm, 4 mm and 5 mm, explosion occurs; when the minimum distance X is 3 mm and the R_{column} respectively is 4 mm and 5 mm, explosion occurs; and when the minimum distance X is 4 mm and the R_{column} is 5 mm, explosion occurs. Therefore, the two adjacent coils of the first heating wire 3a and the second heating wire 3b need to be provided with a minimum distance X, but are not arranged as close as possible. In the present disclosure, by considering the practical application of the products, the minimum distance X is set in a range of 2 mm to 12 mm, preferably a range of 3 mm to 8 mm, and the column radius is set to be less than or equal to 5 mm. However, the value of the ratio T needs to be greater than or equal to 3 in order to ensure that the explosion does not occur.

[0031] Additionally, the minimum distance X is involved in the winding density of the heating wire, so the setting of the R_{column} is involved in the length of the heating wire. It should be known according to the above ratio relation $T=X/(2R_{column}+X)$: the greater the ratio T is, the less the X is, and the greater the R_{column} is, so the total length of the heating wire is greater. The thinner and longer the heating wire is, the greater the resistance is, and the power is less under the same voltage. Therefore, the value range of the ratio T is 0.3-0.8, preferably 0.3-0.5, in order to ensure that the hair dryer can effectively keep its operating power (such as 480-2000W) and obtains effects that the electromagnetic radiation of the heating wires is counteracted, the security is ensured and the explosion does not occur.

[0032] The above are preferred embodiments of the present disclosure, but are not intended to limit the embodiments of the present disclosure. Any other alternations, modifications, replacements, combinations and simplifications made without deviations from the spiritual essence and principle of the present disclosure can be equivalent replacements and all are intended to be included in the protection scope of the present disclosure.

Claims

1. A hot-air heater, **characterized by** comprising: a first heating wire and a second heating wire, wherein the first heating wire and the second heating wire are in parallel connection between a positive electrode end point and a negative electrode end point of a power line, the first heating wire and the second heating wire are wound in the same direction and respectively form a plurality of coils, the direction of the current flowing the first heating wire and the direction of the current flowing the second heating wire are opposite, and a minimum distance between two adjacent coils of the first heating wire and the second heating wire is set to X, and the minimum distance X is in a range of 2 mm to 12 mm.

2. The hot-air heater according to claim 1, **characterized in that**: the minimum distance X is in a range of 3 mm to 8 mm.

3. The hot-air heater according to claim 1 or 2, **characterized in that**: the wound coils of the first heating wire and the wound coils of the second heating wire are in a smoothly extending line form, the line radius of each wound coil of the first heating wire and the line radius of each wound coil of the second heating wire are the same and are set to R_{line}, and the R_{line} is less than or equal to 5 mm;
or
the wound coils of the first heating wire and the wound coils of the second heating wire are in a spin-helix column form, the column radius of each wound coil of the first heating wire and the column radius of each wound coil of the second heating wire are the same and are set to R_{column}, and the R_{column} is less than or equal to 5 mm.

4. The hot-air heater according to claim 3, **characterized in that**:

   when the X is equal to 3 mm, the R_{line} or the R_{column} is in a range of 1 mm to 3 mm;
   when the X is equal to 4 mm, the R_{line} or the R_{column} is in a range of 1 mm to 4 mm;

when the X is equal to 5 mm, the R_{line} or the R_{column} is in a range of 1 mm to 5 mm; and
when the X is equal to 6 mm, the R_{line} or the R_{column} is in a range of 1 mm to 5 mm.

5. The hot-air heater according to any one of claims 1 to 4, **characterized in that**: the adjacent coils of the first heating wire and the second heating wire are alternatively arranged approximately in parallel in a winding direction; or
the adjacent coils of the first heating wire and the second heating wire are arranged approximately concentrically in a direction vertical to a winding direction, the first heating wire is located inside and the second heating wire is located outside.

6. A hot-air heater, **characterized by** comprising: a first heating wire and a second heating wire, wherein the first heating wire and the second heating wire are in parallel connection between a positive electrode end point and a negative electrode end point of a power line, the first heating wire and the second heating wire are wound in the same direction and respectively form a plurality of coils, the direction of the current flowing the first heating wire and the direction of the current flowing the second heating wire are opposite, and a minimum distance between two adjacent coils of the first heating wire and the second heating wire is set to X; and
the wound coils of the first heating wire and the wound coils of the second heating wire are in a spin-helix column form, the column radius of each wound coil of the first heating wire and the column radius of each wound coil of the second heating wire are the same and are set to R_{column}, and the X and the R_{column} meet a ratio relation: $T=X/(2R_{column}+X)$, wherein the value of the ratio T is in a range of 0.3 to 0.8.

7. The hot-air heater according to claim 6, **characterized in that**: the ratio T is in a range of 0.3 to 0.5.

8. The hot-air heater according to claim 6 or 7, **characterized in that**:

the X is in a range of 2 mm to 12 mm; and
the R_{column} is less than or equal to 5 mm.

9. A hair dryer, comprising a hot-air heater which is arranged in a shell; and **characterized in that** the hot-air heater is the hot-air heater according to any one of claims 1 to 8.

10. The hair dryer according to claim 9, **characterized in that** the power of the hair dryer is in a range of 480 W to 2000 W.

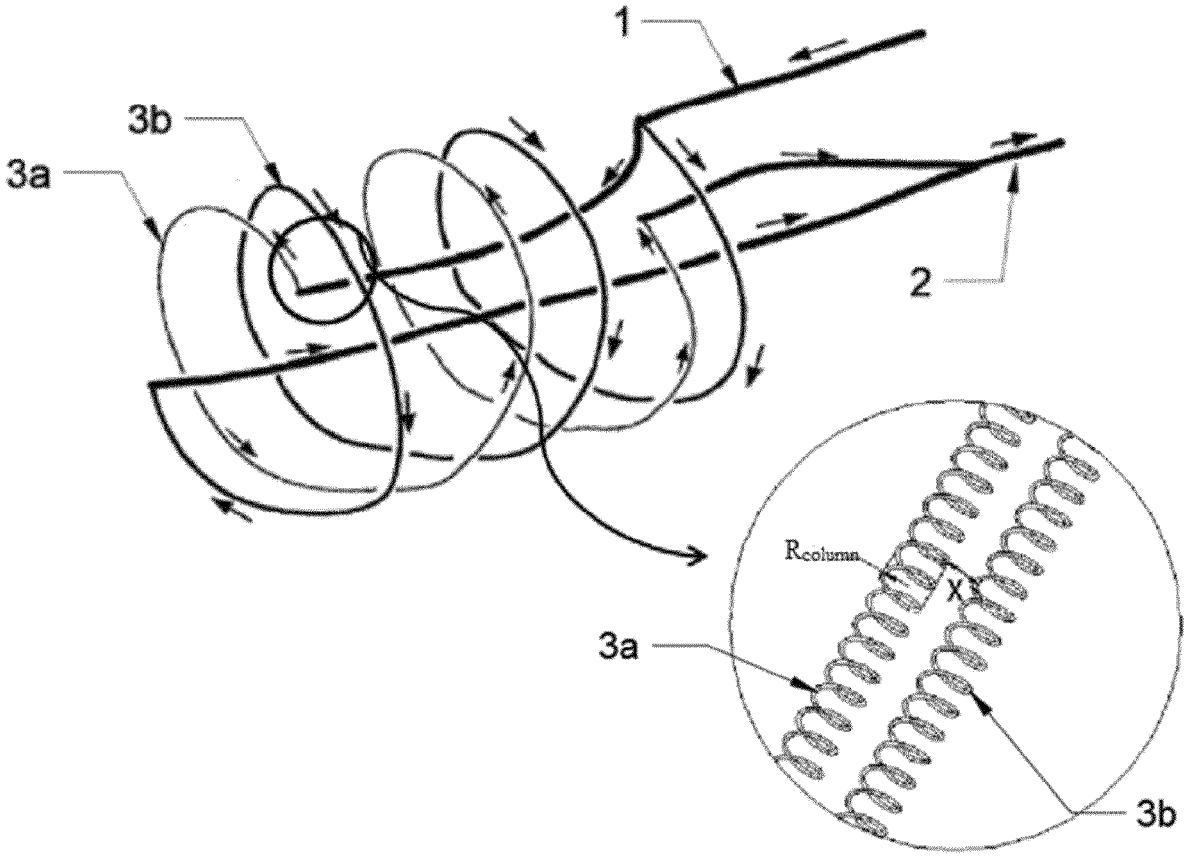

FIG. 1

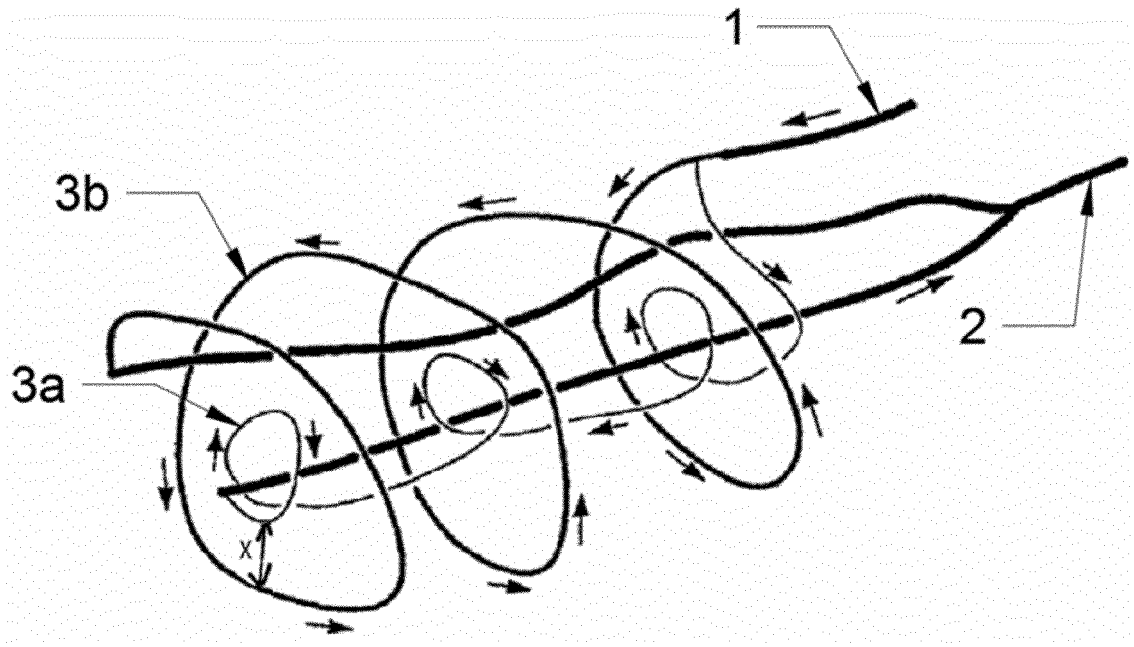

FIG. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 19 16 9366

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 Y	CN 201 403 705 Y (XIAMEN YUANXIN ELECTRICAL APPLIANCES CO LTD) 17 February 2010 (2010-02-17) * claim 1; figures 4,6 *	1-5 6-10	INV. A45D20/10 H05B3/16
X	CN 206 462 582 U (XU XINYI) 5 September 2017 (2017-09-05) * claim 1; figure 2 *	1-5	
Y	GB 2 010 058 A (GILLETTE CO) 20 June 1979 (1979-06-20) * page 1, line 127 - line 129; claim 15; figures 1,2 * * page 2, line 40 - line 41 *	6-10	

TECHNICAL FIELDS SEARCHED (IPC)

A45F
A45D
H05B
F24H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	22 October 2019	Garcia Congosto, M

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 19 16 9366

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
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22-10-2019

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CN 201403705 Y	17-02-2010	NONE	
CN 206462582 U	05-09-2017	NONE	
GB 2010058 A	20-06-1979	DE 2843366 A1	19-04-1979
		ES 245505 U	16-07-1980
		FR 2409655 A1	15-06-1979
		GB 2010058 A	20-06-1979

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- CN 100553383 C **[0004]**