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(54) **BAKED SMOKING SET AND VACUUM INSULATED HEATING ASSEMBLY**

(57) The invention relates to a baked smoking set, and a vacuum insulated heating assembly comprising an outer tube and an inner tube. The outer tube is fitted outside the inner tube, and two ends of the outer tube are fixed to an outer wall surface of the inner tube, a vacuum area is formed between an inner wall surface of the outer tube and the inner tube. The inner tube comprises an inner tube, and a heating circuit formed on a surface of the inner tube so as to generate heat after electrification; and an axial position of the heating circuit on the inner tube is within an axial interval of the vacuum area. The inner tube of the heating assembly does not participate in direct heating, so a heat dissipation rate of the inner tube to outside can be reduced, and rapid diffusion of heat to outside can be avoided. In addition, since the inner tube does not participate in direct heating, it is unnecessary to dispose a specialized heat insulation structure between the outer tube and the inner tube, so that the fixing way between the outer tube and the inner tube can be simplified, size of heating and heat insulation portions is more compact with fewer parts and simple structure design, and the product is reduced in volume for portability.

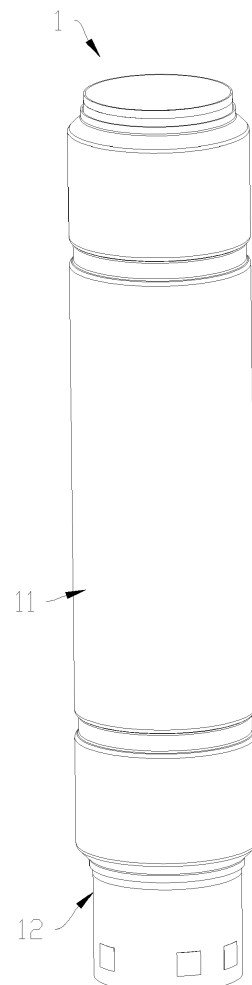


FIG. 1

Description

TECHNICAL FIELD

[0001] The invention relates to the field of cigarette substitute, and specifically to a baked smoking set and a vacuum insulated heating assembly.

BACKGROUND ART

[0002] The common heat insulation way of low temperature cigarette is by using a vacuum insulated tube, and it is often realized by a discrete manner of a heating tube and a vacuum insulated tube in the prior art. Since the heating tube is a high temperature part, in order to keep the heating tube and the vacuum insulated tube relatively fixed, other materials with high temperature resistance and low heat conductivity coefficient are required for fixing, and generally a high temperature resistant plastic is adopted.

[0003] The discrete heating tube and the vacuum insulated tube have the following disadvantages:

1. Since the heating tube is high temperature part, other materials with high temperature resistance and low heat conductivity coefficient are required for fixing, and generally a high temperature resistant plastic is adopted. However, these materials are quite expensive, causing significant increase in cost of the entire equipment.
2. Fixed parts of the heating tube bring out heat from the heating tube to make heat insulation issue complicated. The vacuum insulated tube can only solve circumferential heat insulation of the heating tube, and upper and lower heat insulations are further realized by additional thin-walled parts. As for relatively poor heat insulation of the upper fixing part, a specialized heat dissipation design is further required.
3. Due to a discrete design, only circumferential heat insulation is solved, and more escaping heat from upper and lower directions causes relatively low heat efficiency of the entire equipment.
4. It requires larger size for the two separated parts, causing that size of the entire equipment is larger.
5. The two parts themselves are relatively high in cost, which brings cost pressure to the entire equipment.

SUMMARY OF THE INVENTION

[0004] The technical problem to be solved by the invention is to provide a baked smoking set and a vacuum insulated heating assembly against the deficiencies of easy heat dissipation and complicated heat insulation structure in the prior art.

[0005] The technical solution of the invention adopted for solving the technical problem is to construct a vacuum insulated heating assembly, comprising an outer tube

and an inner tube;

the outer tube is fitted outside the inner tube, and two ends of the outer tube are fixed to an outer wall surface of the inner tube, a vacuum area is formed between an inner wall surface of the outer tube and the inner tube; the inner tube comprises a tubular substrate, and a heating circuit formed on a surface of the tubular substrate so as to generate heat after electrification; and an axial position of the heating circuit on the tubular substrate is within an axial interval of the vacuum area.

[0006] Preferably, the heating circuit is arranged in segments, and each segment is electrically connected to a lead wire respectively, and each segment of the heating circuit is distributed axially on the tubular substrate, and/or each segment of the heating circuit is distributed circumferentially on the tubular substrate.

[0007] Preferably, the heating circuit is printed on the tubular substrate.

[0008] Preferably, an outer wall surface of the inner tube extending out of the outer tube is provided with a lead wire electrically connected to the heating circuit.

[0009] Preferably, the tubular substrate is made of a low heat conductive material, which comprises one of stainless steel, titanium alloy, nickel base alloy, zirconium oxide and ceramics.

[0010] Preferably, the two ends of the outer tube is fixed with the inner tube using vacuum welding.

[0011] Preferably, the heating circuit is located on an inner side of the tubular substrate, and the lead wire passes through a side wall of the tubular substrate to electrically connect to the heating circuit.

[0012] Preferably, the inner tube is curly formed.

[0013] Preferably, the tubular substrate is made of a ceramic material, an inner side of the tubular substrate is provided with a dielectric layer to isolate ceramics from phase change and high temperature ionization, and the heating circuit is located on an outer side of the dielectric layer.

[0014] Preferably, the dielectric layer is a glass layer.

[0015] Preferably, the heating circuit is located on an outer side of the tubular substrate, so that the heating circuit is located in the vacuum area.

[0016] Preferably, an outer side surface of the inner tube is further provided with a routing connected between the lead wire and the heating circuit, and an insulation layer is covered on the routing to insulate the routing from a welding material between the outer tube and the inner tube.

[0017] A baked smoking set, comprising the vacuum insulated heating assembly is provided.

[0018] Implementing the baked smoking set and the vacuum insulated heating assembly of the invention has the following advantageous effects: the tubular substrate of the heating assembly does not participate in direct heating, so a heat dissipation rate of the inner tube to outside can be reduced, and rapid diffusion of heat to outside can be avoided. In addition, since the tubular substrate does not participate in direct heating, it is un-

necessary to dispose a specialized heat insulation structure between the outer tube and the inner tube, so that the fixing way between the outer tube and the inner tube can be simplified, size of heating and heat insulation portions is more compact with fewer parts and simple structure design, and the product is reduced in volume for portability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Hereinafter, the invention is further described with reference to the accompanying drawings and embodiments. In the drawings:

FIG. 1 is a diagram of an assembled structure of a heating assembly in a first embodiment of the invention.

FIG. 2 is a diagram of a sectional structure of the heating assembly in FIG. 1.

FIG. 3 is an enlarged diagram of a local view A in FIG. 2.

FIG. 4 is a diagram of an assembled structure of a heating assembly in a second embodiment of the invention.

FIG. 5 is a diagram of an exploded structure of the heating assembly in FIG. 4.

FIG. 6 is a diagram of a sectional structure of the heating assembly in FIG. 4.

FIG. 7 is an enlarged diagram of a local view B in FIG. 6.

DETAILED EMBODIMENT OF THE INVENTION

[0020] To clearly understand technical features, objects and effects of the invention, now detailed embodiments of the invention are explicitly explained with reference to the accompanying drawings.

[0021] As shown in FIGS. 1 and 2, a baked smoking set in one preferable embodiment of the invention comprises a heating assembly 1, and the heating assembly 1 comprises an outer tube 11 and an inner tube 12.

[0022] The outer tube 11 is fitted outside the inner tube 12, and two ends of the outer tube 11 are fixed to an outer wall surface of the inner tube 12, a vacuum area 13 is formed between an inner wall surface of the outer tube 11 and the inner tube 12. A heat insulation effect can be achieved through the vacuum area 13, to prevent heat on the inner tube 12 from diffusing to outside.

[0023] The inner tube 12 comprises a tubular substrate 19, and a heating circuit 14 formed on a surface of the tubular substrate 19 as to generate heat after electrification; and an axial position of the heating circuit 14 on the inner tube 12 is within an axial interval of the vacuum area 13.

[0024] After being electrified, the heating circuit 14 may generate heat to bake and heat a low temperature cigarette inserted into the inner tube 12. The tubular substrate 19 does not participate in direct heating, so a heat dissipation rate of the inner tube 12 to outside can be reduced,

and rapid diffusion of heat to outside can be avoided. In addition, since the tubular substrate 19 does not participate in direct heating, it is unnecessary to dispose a specialized heat insulation structure between the outer tube 11 and the inner tube 12, so that the fixing way between the outer tube 11 and the inner tube 12 can be simplified, size of heating and heat insulation portions is more compact with fewer parts and simple structure design, and the product is reduced in volume for portability.

[0025] The tubular substrate 19 inside can adopt a low heat conductive material to reduce cost of the product, and possess a low heat conductivity coefficient. Material of the tubular substrate 19 may comprise one of stainless steel, titanium alloy, nickel base alloy, zirconium oxide and ceramics. Since the heating assembly 1 dissipates little heat to outside, temperature at a contact with other parts is low, and the heat insulation design is simple.

[0026] The heating circuit 14 on the inner tube 12 is arranged in segments, and each segment is electrically connected to a lead wire 15 respectively. Each segment of the heating circuit 14 can be distributed axially on the tubular substrate 19, or can be distributed circumferentially on the tubular substrate 19, or can be distributed axially and circumferentially. After being arranged in segments, the heating circuit 14 can be heated in segments, and the heated object can be sequentially heated in segments, rather than being heated once.

[0027] Preferably, the heating circuit 14 is printed on the tubular substrate 19, which can improve production efficiency, and reduce cost. In other embodiments, the heating circuit 14 also can be attached or welded or embedded onto the inner tube 12.

[0028] In order to facilitate connecting the heating circuit 14 to an external power supply, an outer wall surface of the inner tube 12 extending out of the outer tube 11 is provided with a lead wire 15 electrically connected to the heating circuit 14, and the external power supply can be connected to supply power to the heating circuit 14 via the lead wire 15. Each segment of the heating circuit 14 can be independently connected to the power supply, so as to achieve the effect of segmented controlling heating.

[0029] Two ends of the outer tube 11 are fixed with the inner tube 12 using vacuum welding in a vacuum environment, which can simplify assembly process therebetween without considering heat dissipation of the inner tube 12 to outside at the welding position.

[0030] Referring to FIGS. 1-3, in some embodiments, the heating circuit 14 is located on an inner side of the tubular substrate 19, the lead wire 15 is located on an outer side of the inner tube 12, and the lead wire 15 passes through a side wall of the inner tube 12 to electrically connect to the heating circuit 14.

[0031] Preferably, the inner tube 12 is curly formed, and the heating circuit 14 can be curled simultaneously with the tubular substrate 19 after the heating circuit 14 is formed, so that the heating circuit 14 are located within the inner tube 12.

[0032] In this embodiment, the tubular substrate 19 is made of a ceramic material, an inner side of the tubular substrate 19 is provided with a dielectric layer for insulation and heat insulation, and the heating circuit 14 is arranged outside the dielectric layer. Generally, the dielectric layer is a glass layer to prevent size change of the ceramic layer due to phase change of the ceramic layer of the inner tube 12, and change of the ceramic material into a superconducting material due to high temperature ionization. The tubular substrate 19 made of the ceramic material can reduce a heat dissipation rate to outside, and improve effect of heating the low temperature cigarette. In other embodiments, the tubular substrate 19 also can be made of above other materials.

[0033] Referring to FIGS. 4-7, in another embodiment, the heating circuit 14 is located on an outer side of the tubular substrate 19, so that the heating circuit 14 is located in the vacuum area 13. In this case, the tubular substrate 19 can be directly manufactured to a tubular shape, and the heating circuit 14 is arranged outside the tubular substrate 19. Or alternatively, the tubular substrate 19 also can be curly formed, and the heating circuit 14 can be arranged on the tubular substrate 19 before or after curling. No matter whether the heating circuit 14 is arranged on the inner side or the outer side of the inner tube 12, the material of the tubular substrate 19 in the two solutions can be the same.

[0034] The heating circuit 14 can be connected to the lead wire 15 to be powered only after being leaded out of the vacuum area 13, so an outer side surface of the inner tube 12 is further provided with a routing 16 connected between the lead wire 15 and the heating circuit 14. An insulation layer 17 is covered on the routing 16, and can insulate the routing 16 from a welding material 18 between the outer tube 11 and the inner tube 12, thereby avoiding a short circuit with the welding material 18.

[0035] It shall be understood that the above respective technical features can be combined optionally for use without limitation.

[0036] The disclosures are only embodiments of the invention, rather than limiting the extent of the invention. Any equivalent structures or equivalent flow changes using the specification and the drawings of the invention, or directly or indirectly application in other relevant technical fields shall be included in the extent of protection of the invention.

Claims

1. A vacuum insulated heating assembly (1), comprising an outer tube (11) and an inner tube (12); the outer tube (11) is fitted outside the inner tube (12), and two ends of the outer tube (11) are fixed to an outer wall surface of the inner tube (12), a vacuum area (13) is formed between an inner wall surface of the outer tube (11) and the inner tube (12); the inner tube (12) comprises a tubular substrate

(19), and a heating circuit (14) formed on a surface of the tubular substrate (19) so as to generate heat after electrification; and an axial position of the heating circuit (14) on the tubular substrate (19) is within an axial interval of the vacuum area (13).

2. The vacuum insulated heating assembly (1) according to claim 1, **characterized in that** the heating circuit (14) is arranged in segments, and each segment is electrically connected to a lead wire (15) respectively, and each segment of the heating circuit (14) is distributed axially on the tubular substrate (19), and/or each segment of the heating circuit (14) is distributed circumferentially on the tubular substrate (19).
3. The vacuum insulated heating assembly (1) according to claim 1, **characterized in that** the heating circuit (14) is printed on the tubular substrate (19).
4. The vacuum insulated heating assembly (1) according to claim 1, **characterized in that** an outer wall surface of the inner tube (12) extending out of the outer tube (11) is provided with a lead wire (15) electrically connected to the heating circuit (14).
5. The vacuum insulated heating assembly (1) according to claim 1, **characterized in that** the tubular substrate (19) is made of a low heat conductive material, which comprises one of stainless steel, titanium alloy, nickel base alloy, zirconium oxide and ceramics.
6. The vacuum insulated heating assembly (1) according to any one of claims 1-5, **characterized in that** the two ends of the outer tube (11) is fixed with the inner tube (12) using vacuum welding.
7. The vacuum insulated heating assembly (1) according to claim 6, **characterized in that** the heating circuit (14) is located on an inner side of the tubular substrate (19), an outer wall surface of the inner tube (12) extending out of the outer tube (11) is provided with a lead wire (15) electrically connected to the heating circuit (14), and the lead wire (15) passes through a side wall of the tubular substrate (19) to electrically connect to the heating circuit (14).
8. The vacuum insulated heating assembly (1) according to claim 7, **characterized in that** the inner tube (12) is curly formed.
9. The vacuum insulated heating assembly (1) according to claim 8, **characterized in that** the tubular substrate (19) is made of a ceramic material, an inner side of the tubular substrate (19) is provided with a dielectric layer to isolate ceramics from phase change and high temperature ionization, and the heating circuit (14) is located on an outer side of the

dielectric layer.

10. The vacuum insulated heating assembly (1) according to claim 9, **characterized in that** the dielectric layer is a glass layer. 5
11. The vacuum insulated heating assembly (1) according to claim 6, **characterized in that** the heating circuit (14) is located on an outer side of the tubular substrate (19), so that the heating circuit (14) is located in the vacuum area (13). 10
12. The vacuum insulated heating assembly (1) according to claim 11, **characterized in that** an outer wall surface of the inner tube (12) extending out of the outer tube (11) is provided with a lead wire (15) electrically connected to the heating circuit (14), an outer side surface of the inner tube (12) is further provided with a routing (16) connected between the lead wire (15) and the heating circuit (14), and an insulation layer (17) is covered on the routing (16) to insulate the routing (16) from a welding material (18) between the outer tube (11) and the inner tube (12). 15 20
13. A baked smoking set, comprising the vacuum insulated heating assembly (1) according to any one of claims 1-12. 25

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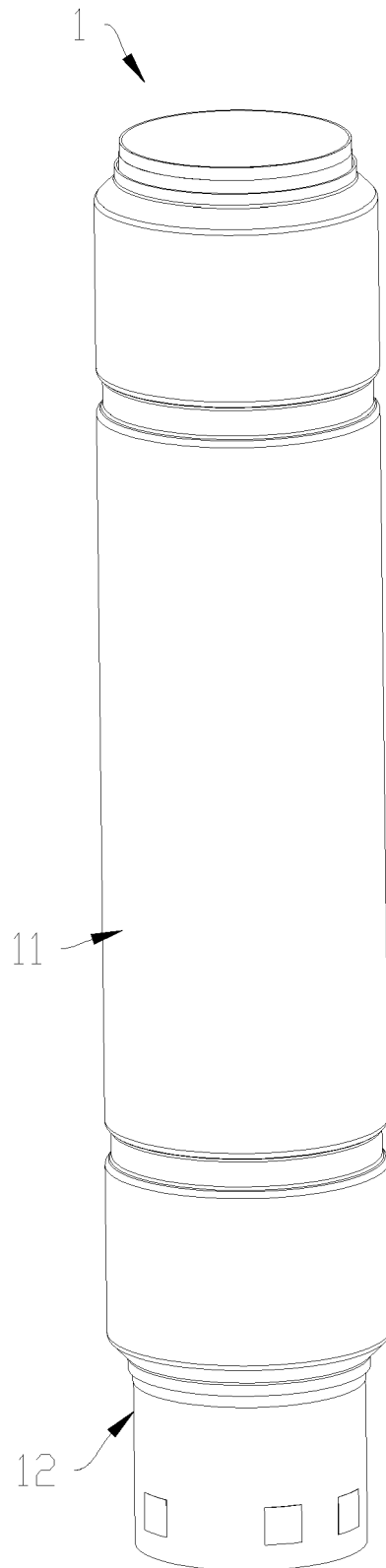


FIG. 1

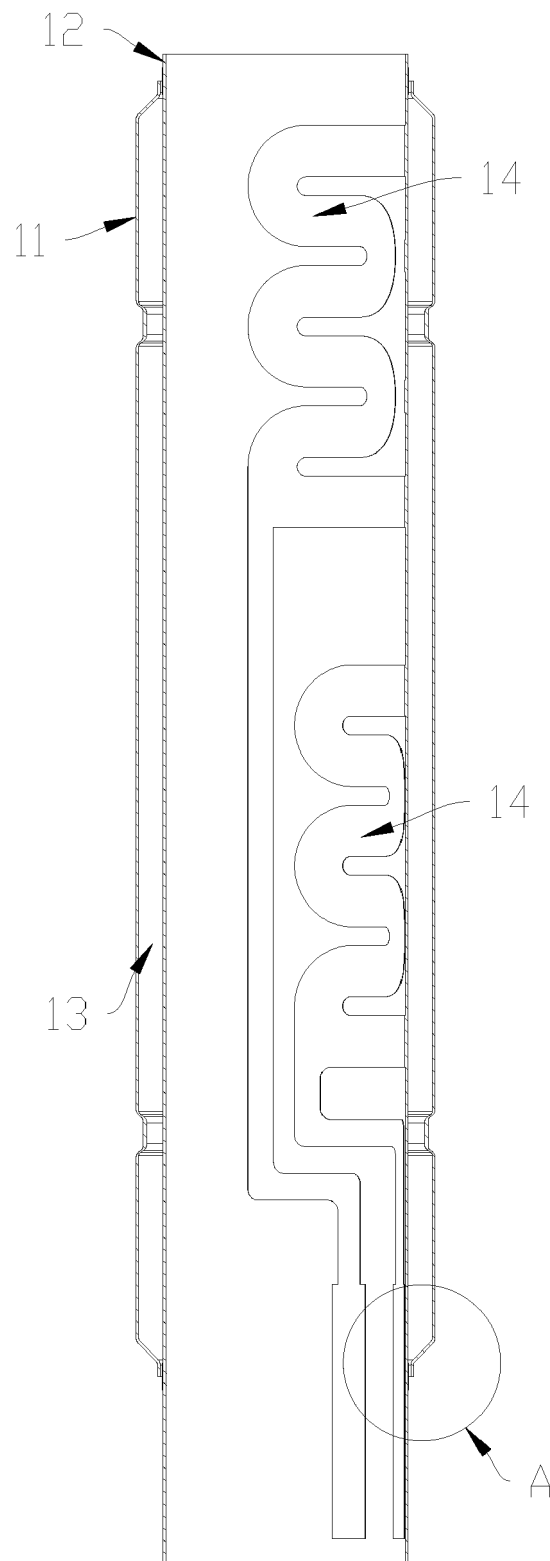


FIG. 2

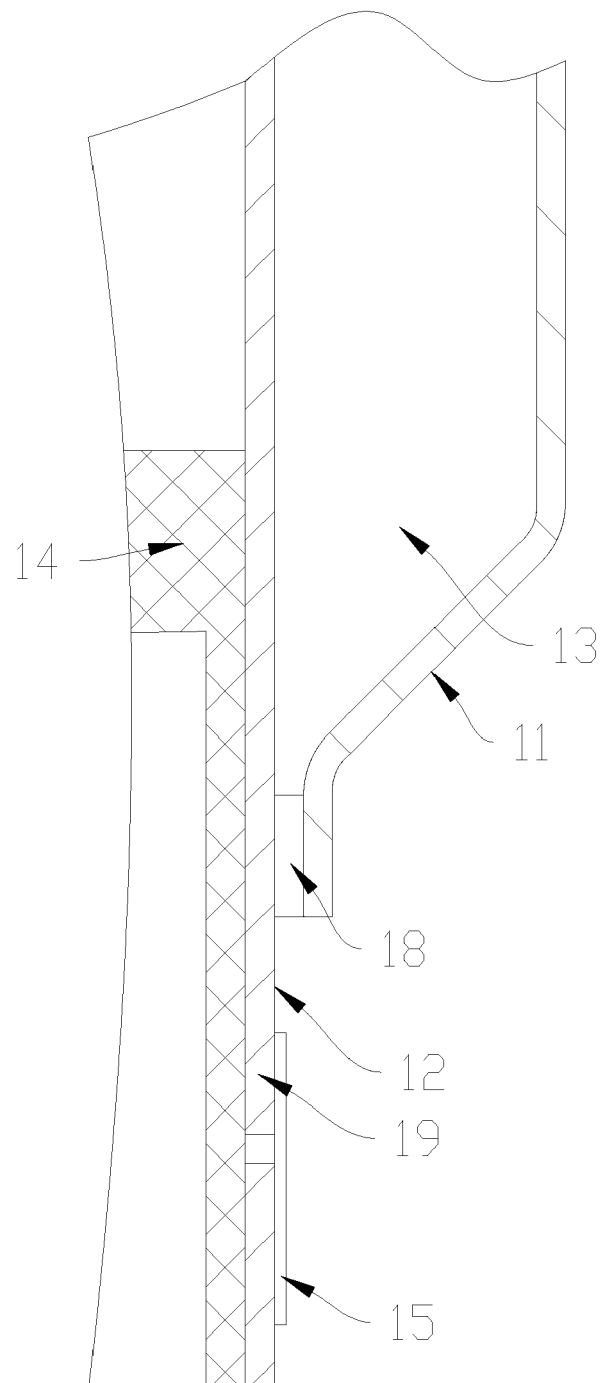


FIG. 3

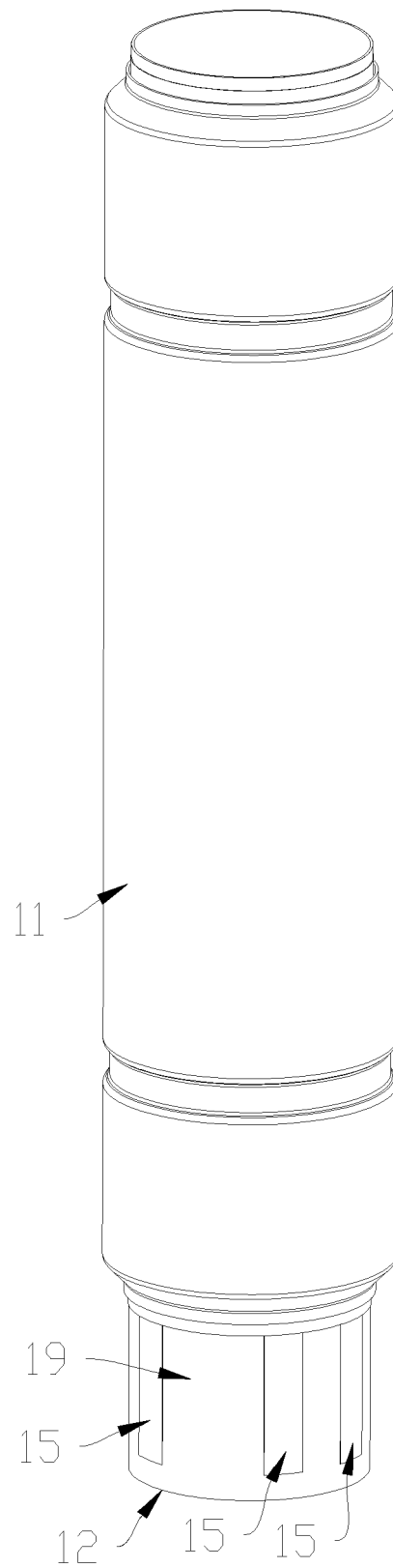


FIG. 4

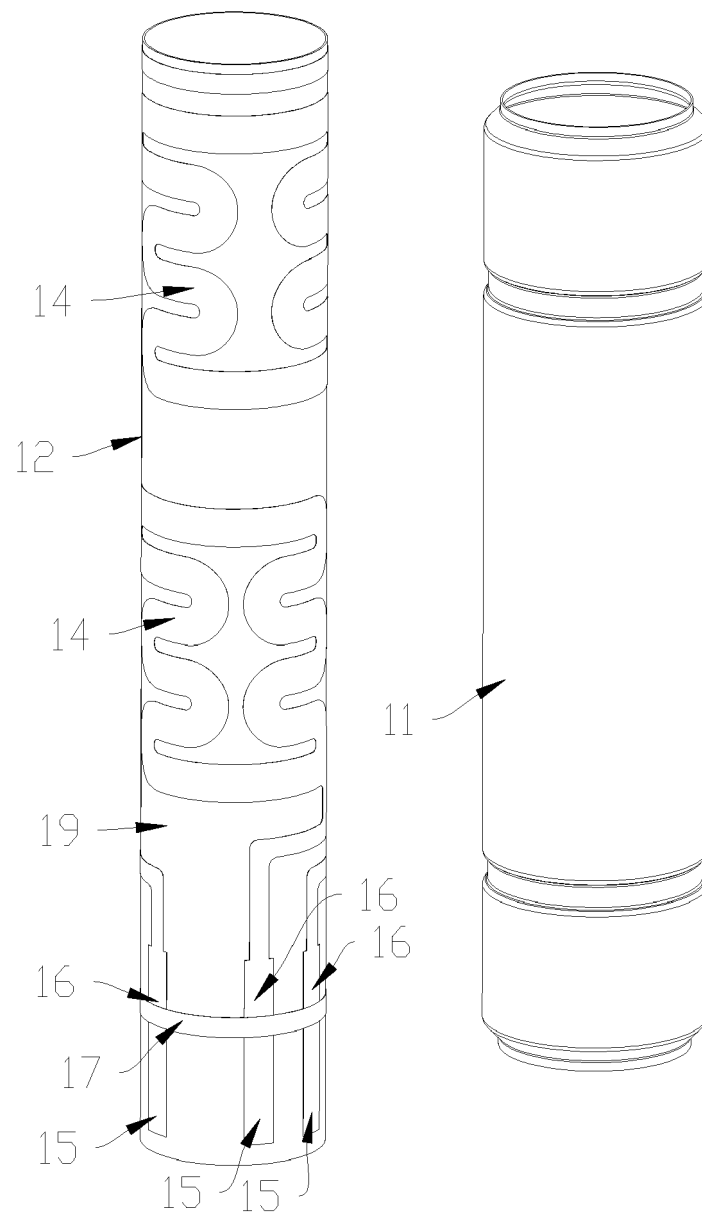


FIG. 5

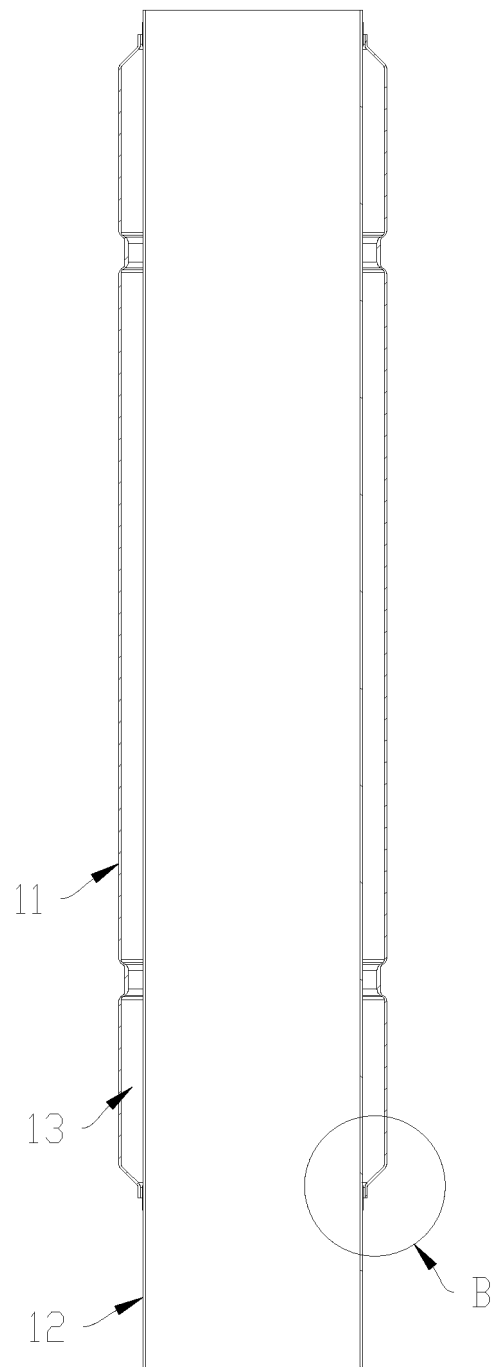


FIG. 6

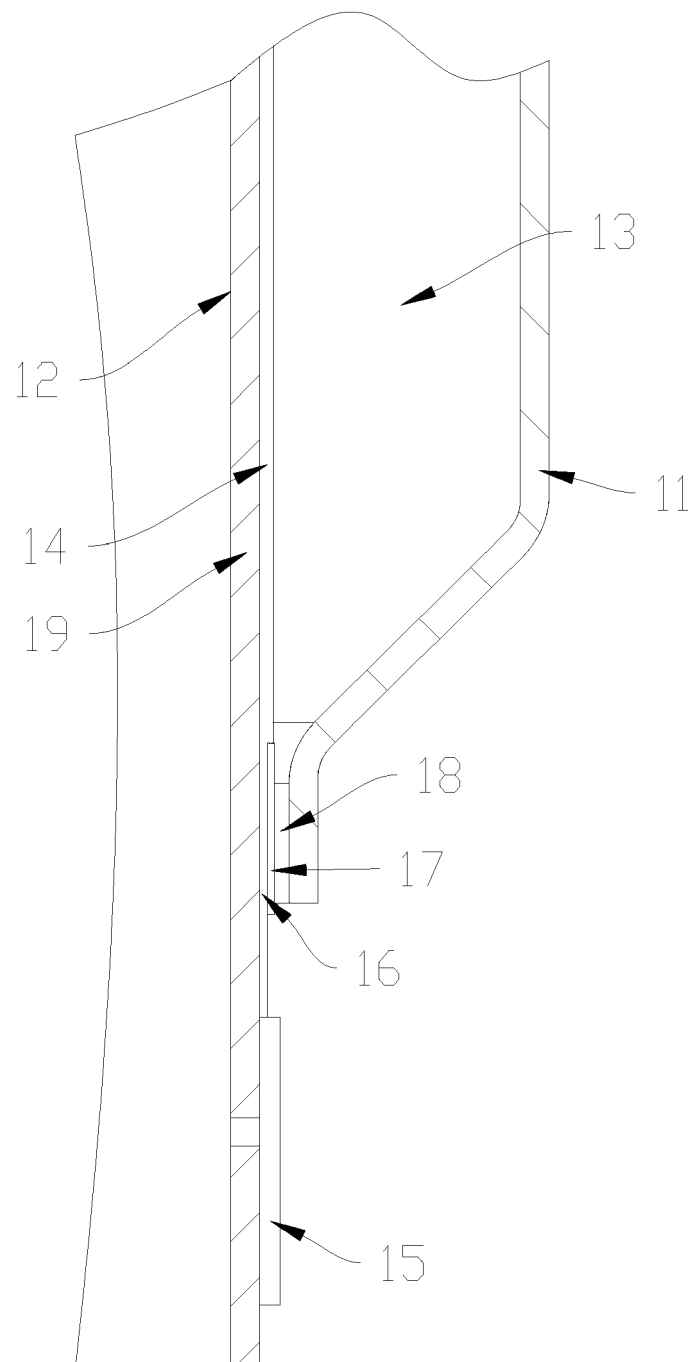


FIG. 7



EUROPEAN SEARCH REPORT

Application Number
EP 19 18 8016

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 29 November 2019	Examiner Dessaux, Christophe
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention 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	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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