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(54) Benævnelse: **LED-lyspære og fremstillingsfremgangsmåde derfor**

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DESCRIPTION

BACKGROUND

Technical Field

[0001] The disclosure relates to a light emitting diode (LED) light bulb, and more particularly relates to an LED light bulb and a manufacturing method thereof.

Description of Related Art

[0002] With the improvement of the light emitting efficiency of light emitting diode (LED) dies and the advancement of production technology, the LED dies have gradually become light sources of lighting fixtures. Although light bulbs with use of tungsten filaments have been gradually replaced by LED light emitting modules, the LED light bulbs in the filament shape are still favored by designers. The LED light bulb of filament shape basically refer to bar-shaped or spiral LED light emitting modules disposed in the bulb envelopes. The LED light emitting modules are applied in the bulb envelopes having different looks and being made of various materials, and thereby users can get a completely different visual experience.

[0003] WO 2017/055115 A1 discloses a lighting module, which is mountable in a lighting device. The lighting module comprises a carrier substrate including an at least in part flexible sheet assembly. At least a portion of the sheet assembly is arranged in a rolled-up arrangement that has been rolled more than one turn so as to form a layered structure. The layered structure may comprise a tubular member having a tubular shape. The layered structure is arranged such that, at least when the lighting module is mounted in the lighting device, there is at least one intervening space between at least two adjacent, opposing surfaces of the at least a portion of the sheet assembly, wherein the intervening space permits passage of fluid through the layered structure or tubular member by the fluid passing between the at least two adjacent, opposing surfaces. The at least one light-emitting element is coupled to the sheet assembly.

SUMMARY

[0004] The present invention is provided in the appended claims. The following disclosure serves a better understanding of the invention. Accordingly, the disclosure provides a light emitting diode (LED) light bulb to be an LED light bulb of filament shape.

[0005] The disclosure provides a manufacturing method of an LED light bulb for manufacturing the LED light bulb in the filament shape.

[0006] In an example of the disclosure, an LED light bulb including a bulb envelope, a stem, at least two conductors, at least one LED light emitting module, and fluid is provided. The bulb envelope has an opening, and a material of the bulb envelope includes soda-lime glass. The stem is connected to the bulb envelope and seals the opening. Here, the stem has a supporting portion and a pipe, the supporting portion is located in the bulb envelope, and the pipe has an open end inside the bulb envelope and a sealed end outside the bulb envelope. The conductors are located through the stem. The LED light emitting module is assembled to the supporting portion and coupled to the conductors. The fluid fills the bulb envelope.

[0007] An LED light bulb of the disclosure including a bulb envelope, a stem, at least two conductors, at least one LED light emitting module, fluid, and a supporting bracket is provided. The bulb envelope has an opening, and a material of the bulb envelope includes soda-lime glass. The stem is connected to the bulb envelope and seals the opening. Here, the stem has a supporting portion and a pipe, the supporting portion is located in the bulb envelope, and the pipe has an open end inside the bulb envelope and a sealed end outside the bulb envelope. The conductors are located through the stem. The LED light emitting module is assembled to the supporting portion and coupled to the conductors. The fluid fills the bulb envelope. The supporting bracket is assembled to the supporting portion and leans against the bulb envelope. The number of contacts between the supporting bracket and the bulb envelope is equal to or greater than 2, and a maximum linear distance among the contacts is greater than a maximum inner diameter of the opening.

[0008] In an example of the disclosure, the bulb envelope has a sidewall and a bottom wall connected to the sidewall at an intersection, and at least one of the contacts between the supporting bracket and the bulb envelope is located at the intersection.

[0009] In an example of the disclosure, the supporting bracket has a trunk and a plurality of branches, the trunk extends from the supporting portion, the LED light emitting module is assembled to the trunk, and the branches extend from one end of the trunk and respectively contact the bulb envelope.

[0010] In an example of the disclosure, an LED light bulb including a bulb envelope, a stem, at least two conductors, at least one LED light emitting module, fluid, and a supporting bracket is provided. The bulb envelope has an opening, and a material of the bulb envelope includes soda-lime glass. The stem is connected to the bulb envelope and seals the opening. Here, the stem has a supporting portion and a pipe, the supporting portion is located in the bulb envelope, and the pipe has an open end inside the bulb envelope and a sealed end outside the bulb envelope. The conductors are located through the stem. The LED light emitting module is assembled to the supporting portion and coupled to the conductors. The fluid fills the bulb envelope. The bulb envelope is shaped as a bottle and extends along a central axis, and a projection length of the LED light emitting module on the central axis is greater than 40% of a

projection length of the bulb envelope on the central axis.

[0011] In an example of the disclosure, the LED light bulb further includes a bulb head assembled to the bulb envelope and coupled to the conductors.

[0012] In an example, the number of the LED light emitting module is equal to or greater than 2, and the LED light emitting modules are connected in series or in parallel.

[0013] In an example of the disclosure, the LED light emitting module is a rigid LED light emitting module or a flexible LED light emitting module.

[0014] In an example of the disclosure, the fluid is non-conductive fluid.

[0015] In an example of the disclosure, the fluid is inert gas.

[0016] In an example of the disclosure, the fluid is helium gas.

[0017] In an example of the disclosure, the LED light bulb further includes an outer bulb casing and liquid. The outer bulb casing surrounds the bulb envelope, so that the outer bulb casing and the bulb envelope together form a layered space surrounding the bulb envelope. The liquid is located in the layered space.

[0018] In an example of the disclosure, the bulb envelope has a standing portion providing a standing function.

[0019] A manufacturing method of an LED light bulb of the disclosure includes following steps. A stem and at least one LED light emitting module of a supporting portion assembled to the stem are positioned in a bulb envelope through an opening of the bulb envelope, wherein the LED light emitting module is coupled to and located through at least two conductors of the stem. The opening of the bulb envelope and a portion of a neck portion adjacent to the opening are pre-heated for a pre-heating time period, so that a temperature at which the opening and the neck portion are heated is a pre-heating temperature. After the pre-heating step, the opening of the bulb envelope and the portion of the neck portion adjacent to the opening are heated, so that the temperature at which the opening and the neck portion are heated is a main-heating temperature, and a side skirt of the stem is simultaneously sintered to the bulb envelope to seal the opening of the bulb envelope. After the heating step, residual air is pumped from the bulb envelope through a pipe of the stem. After the pumping step, fluid is introduced into the bulb envelope through the pipe of the stem. After the introducing step, the pipe is sealed, so that the bulb envelope is in an airtight state.

[0020] In an example of the disclosure, after sintering the side skirt of the stem to the bulb envelope, the manufacturing method further includes a step of post-heating the opening of the bulb envelope and the neck portion for a post-heating time period, so that the temperature at which the opening and the neck portion are heated is a post-heating temperature.

[0021] In an example of the disclosure, the post-heating temperature is lower than or equal to the pre-heating temperature.

[0022] In an example of the disclosure, the manufacturing method further includes a step of assembling a bulb head to the bulb envelope, and the bulb head is coupled to the conductors.

[0023] In an example of the disclosure, a material of the bulb envelope is soda-lime glass.

[0024] In an example of the disclosure, a length of the portion of the neck portion adjacent to the opening is greater than half a maximum inner diameter of the opening.

[0025] In view of the above, in the disclosure, the bulb envelope made of soda-lime glass enhances visual effects produced by the shape, color and light reflection of the LED light bulb. Besides, the arrangement of the supporting bracket (especially the supporting bracket may be deployed after passing through the opening of the bulb envelope and may lean against an inner surface of the bulb envelope) allows the LED light emitting module to be stably positioned in the bulb envelope. Besides, when the bulb envelope is shaped as a bottle or has an elongated shape similar to the bottle shape, the length of the LED light emitting module may be greater than 40% of the length of the bulb envelope, so as to enhance the visual effects produced by the LED light bulb.

[0026] To make the above features and advantages provided in one or more of the embodiments of the disclosure more comprehensible, several embodiments accompanied with drawings are described in detail as follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0027]

FIG. 1 is a cross-sectional view illustrating a light emitting diode (LED) light bulb according to an embodiment of the disclosure.

FIG 2 is a cross-sectional view illustrating the LED light bulb depicted in FIG. 1 along Line I-I.

FIG. 3 is a cross-sectional view illustrating an LED light bulb according to another embodiment of the disclosure.

FIG. 4 is a cross-sectional view of an LED light bulb according to another embodiment of the disclosure.

FIG. 5 is a cross-sectional view of an LED light bulb according to another embodiment of the disclosure.

FIG. 6 is a cross-sectional view of an LED light bulb according to another embodiment of the

disclosure.

DESCRIPTION OF THE EMBODIMENTS

[0028] With reference to FIG. 1, in the present embodiment, a light emitting diode (LED) light bulb 100 includes a bulb envelope 110, a stem 120, a plurality of conductors 130, an LED light emitting module 140, and fluid 150. The bulb envelope 110 and the stem 120 are presented in cross-section. The bulb envelope 110 has an opening 112. The stem 120 (e.g., a side skirt 122 of the stem 120) is connected to the bulb envelope 110 and seals the opening 112. The stem 120 has a supporting portion 124 and a pipe 126, the supporting portion 124 is located in the bulb envelope 110, and the pipe 126 has an open end 126a inside the bulb envelope 110 and a sealed end 126b outside the bulb envelope 110. The conductors 130 are located through the stem 120. The LED light emitting module 140 is assembled to the supporting portion 124 and coupled to the conductors 130.

[0029] In the present embodiment, the conductors 130 may be constructed by conductors that are of different thicknesses and soldered to each other or bent so as to be coupled to the LED light emitting module 140. The fluid 150 fills the bulb envelope 110. The fluid 150 may be non-conductive fluid 150, e.g., inert gas (such as helium gas).

[0030] In the present embodiment, the LED light bulb 100 may further include a bulb head 160 assembled to the bulb envelope 110 and coupled to the conductors 130. In FIG. 1, the bulb head 160 is also presented in cross-section. In other embodiments not shown in the drawings, the LED light bulb 100 may not include the bulb head 160, and the conductors are directly connected to the power source.

[0031] Since soda-lime glass is not easy to be processed due to its property, the bulb envelope is conventionally not made of soda-lime glass but made of lead silicate glass or borosilicate glass. In the present embodiment, if certain manufacturing steps are performed, the bulb envelope 110 may be made of soda-lime glass with advantages of low manufacturing costs, and after soda-lime glass is infiltrated into certain element or substance, the soda-lime glass may be of different crystal clear colors. However, because of the large coefficient of thermal expansion of the soda-lime glass, if a certain area receives an excessive amount of heat, the area is likely to be fractured due to the excessive expansion. Hence, in a technology requiring thermal process such as manufacturing of light bulbs, the use of soda-lime glass is not considered. The more formal name of soda-lime glass is soda-lime-silica glass, and is also abbreviated as soda glass. The basic ingredients of soda-lime glass is silicon dioxide (SiO_2) containing aluminum oxide at a certain ratio and calcium oxide at a certain ratio. In the present embodiment, soda-lime glass is manufactured by melting 65%-75% of SiO_2, 12%-18% of Na_2CO_3, 5%-12% of $CaCO_3$, and other materials at a high temperature, shaping them and cooling them. The soda-lime-silica glass is the oldest glass system in production history, and is

also a kind of glass with highest output and most versatility. Soda-lime glass is often used in glass containers, especially bottles for food packaging.

[0032] In the present embodiment, the bulb envelope 110 may be a container made of soda-lime glass, especially recycled wine bottles. In addition to the purpose of environmental protection and energy conservation, the visual effects produced by the shapes, colors and light reflections of the commercially available wine bottles are extremely diverse. Hence, when the bulb envelope 110 is a wine bottle or any other container made of soda-lime glass, the bulb envelope 110 may provide richer and more diverse visual effects than the conventional bulb envelope made of lead silicate glass or borosilicate glass.

[0033] With reference to FIG. 1 and FIG. 2, in the present embodiment, to position the LED light emitting module 140 in the bulb envelope 110, the LED light bulb 100 may further include a supporting bracket 170 assembled to the supporting portion 124 and leaning against the bulb envelope 110. The number of contacts C between the supporting bracket 170 and the bulb envelope 110 is equal to or greater than 2; namely, the stability of the positioning action may be improved by multi-point contact, thereby the LED light emitting module 140 may be stably positioned in the bulb envelope. When the light bulb 100 is shaken, the LED light emitting module 140 inside the light bulb may be relatively stabilized, so as to prevent the possibility of breakage or being bent. The maximum linear distance between the contacts C is greater than the maximum inner diameter of the opening 112; that is, the supporting bracket 170 may be deployed after passing through the opening 112 of the bulb envelope 110 and may lean against the inner surface of the bulb envelope 110.

[0034] In the present embodiment, the bulb envelope 110 has a sidewall 114 and a bottom wall 116 connected with the sidewall 114 at an intersection B. At least one of the contacts C of the supporting bracket 170 and the bulb envelope 110 is located at the intersection B. Here, the sidewall 114 may, as shown in FIG. 1, be a flat curved surface; that is, viewed from the side cross-sectional view, two sides of the sidewall 114 appear to be an approximately straight line extending upward from the intersection B. In another embodiment, the sidewall 114 may be a curved surface; that is, the side cross-sectional view of the sidewall 114, any side of the sidewall appears to be a curved line extend upward from the intersection B. Besides, as depicted in FIG. 1, an angle between the sidewall 114 and the bottom wall 116 at the intersection B is about 90 degrees, and the form thereof is a rounded angle; in another embodiment, an angle between the sidewall 114 and the bottom wall 116 at the intersection B may be an acute angle, an obtuse angle, or in another form. From another point of view, when the bulb envelope 110 is a wine bottle or a similar elongated bottle, the bulb envelope 110 has a neck portion 110a that is tapered in shape to constitute the opening 112, a body portion 110b following the neck portion 110a, and a standing portion 110c that follows the body portion 110b but is away from the neck portion 110a. The contacts C of the supporting bracket 170 and the bulb envelope 110 are located at the standing portion 110c. The standing portion 110c may provide a standing function and is thus not limited to be in the flat shape shown in FIG. 1; namely, the type of the standing portion 110c may be a curved-surface shape, a multi-claw shape, a concentric-circle shape, and so on. In another embodiment, the standing portion may

not stand on the ground; namely, in consideration of the type of the lamp stand, the standing portion 110c may stand in the air and may be spaced from the ground or the desktop by a height. Besides, compared to the LED light bulb 100 shown in FIG. 1, the LED light bulb 100 may be turned upside down, i.e., the bulb head 160 faces down and the standing portion 110c faces up.

[0035] In the present embodiment, the supporting bracket 170 includes a trunk 172 and a plurality of branches 174. The trunk 172 extends from the supporting portion 124, the LED light emitting module 140 is assembled to the trunk 172, and the branches 174 extend from one end of the trunk 172 and respectively contact the bulb envelope 110. The branches 174 may be deployed after passing through the opening 112 of the bulb envelope 110 and may lean against the inner surface of the bulb envelope 110. In the present embodiment, the trunk 172 may be constituted by a portion of the conductors 130, and the branches 174 are resilient and may be in contact with the intersection B between the sidewall 114 and the bottom wall 116 of the bulb envelope 110. In another embodiment, if the bulb envelope 110 does not have any sidewall 114 nor any bottom wall 116, e.g., if the top (or bottom) of the bulb envelope is a curved-surface structure, the supporting bracket 170 may also fix the position of the LED light emitting module 140 through at least three branches 174 leaning against the curved surface inside the bulb envelope.

[0036] In the present embodiment, if the bulb envelope 110 is a wine bottle or a similar elongated bottle, the bulb envelope 110 appears in bottle shape and extends along a central axis A, and a projection length of the LED light emitting module 140 on the central axis A may be greater than 40% of the projection length of the bulb envelope 110 on the central axis A. As such, the light from the LED light emitting module 140 may be evenly emitted from the entire light bulb 100. If the projection length of the LED light emitting module 140 on the central axis A is less than 40% of the projection length of the bulb envelope 110 on the central axis A, the top or bottom of the light bulb may be partially bright and partially dark, which may disfigure the look of light patterns and reduce the light emitting efficacy. Besides, if the length of the LED light emitting module 140 is overly short, that causes the lengths of the trunk 172 and the branches 174 of the supporting bracket 170 become overly long, which influences the appearance and the support stability of the support. After several trials and tests, the inventor found that the light emitting efficacy, the look of light patterns, the stability of the light emitting module, and the appearance of the entire lamp may all be taken care of if the projection length of the LED light emitting module 140 on the central axis A is greater than 40% of the projection length of the bulb envelope 110 on the central axis A.

[0037] In the present embodiment, the LED light emitting module 140 may be a flexible LED light emitting module and therefore may be bent in different shapes (e.g., a spiral shape), such as the spiral shape shown in FIG. 1 or a U-shape and a heart shape shown in FIG. 3 and FIG. 4, so as to present the visual effects of filament shape. Besides, the flexibility of the flexible LED light emitting module 140 allows the LED light emitting module 140 to be compressed and deformed when it passes through the neck portion 110a, and the LED light emitting module 140 may then expand in the bulb envelope 110 after passing through the neck portion 110a. In

other words, the maximum width of the LED light emitting module 140 may be greater than the inner diameter of the neck portion 110a.

[0038] In another embodiment, as shown in FIG. 5, the LED light bulb 100 may include a plurality of LED light emitting modules 140 that may be rigid LED light emitting modules. The LED light emitting modules 140 may be connected in series. In other embodiments not shown in the drawings, the LED light emitting modules 140 may also be connected in parallel.

[0039] In still another embodiment, compared to the embodiment depicted in FIG. 1, the embodiment shown in FIG. 6 provides the LED light bulb 100 that may further include an outer bulb casing 180 and liquid 190. The outer bulb casing 180 surrounds the bulb envelope 110 so that the outer bulb casing 180 and the bulb envelope 110 together form a layered space S surrounding the bulb envelope 110. The liquid 190 is located in the layered space S. Such settings may produce different visual effects under the refraction and reflection of light.

[0040] Having described various embodiments relating to the LED light bulb, for instance, a manufacturing method of an LED light bulb is further described below in an embodiment of the disclosure.

[0041] With reference to FIG. 1, the manufacturing method of the LED light bulb 100 in the present embodiment includes following steps.

[0042] Firstly, a stem 120 and an LED light emitting module 140 of a supporting portion 124 assembled to the stem 120 are positioned in a bulb envelope 110 through the opening 112 of the bulb envelope 110, wherein the LED light emitting module 140 is coupled to and located through at least two conductors 130 of the stem 120.

[0043] Then, the opening 112 of the bulb envelope 110 and a portion of a neck portion 110a adjacent to the opening 112 are pre-heated for a pre-heating time period, so that a temperature at which the opening 112 and the neck portion 110a are heated is a pre-heating temperature. In the present embodiment, a length of the portion of the neck portion 110a adjacent to the opening 112 is greater than half a maximum inner diameter of the opening 112.

[0044] After the pre-heating step, the opening 112 of the bulb envelope 110 and the portion of the neck portion 110a adjacent to the opening 112 are main-heated, so that the temperature at which the opening 112 and the neck portion 110a are heated is a main-heating temperature, and a side skirt 122 of the stem 120 is simultaneously sintered to the bulb envelope 110 to seal the opening 112 of the bulb envelope 110. In the present embodiment, the main-heating temperature (e.g., 500°C-600°C) is higher than the pre-heating temperature (e.g., 300°C-400°C). The soda-lime glass is characterized by its large coefficient of expansion, and therefore partial heating may easily cause glass cracks and cannot serve as a means of sealing. However, by using the method of the present embodiment, the temperature distribution in the soda-lime glass is even while the soda-lime glass is heated and sintered under the above conditions, which significantly reduces the cracks caused by uneven heating.

[0045] After the main-heating step, residual air is pumped from the bulb envelope 110 through a pipe 126 of the stem 120.

[0046] After the air-pumping step, fluid 150 is introduced into the bulb envelope 110 through the pipe 126 of the stem 120.

[0047] After gas-introducing, the pipe 126 is sealed, so that the bulb envelope 110 is in an airtight state.

[0048] In an embodiment, it may further include that, after the side skirt 122 of the stem 120 is sintered to the bulb envelope 110, the opening 112 and the neck portion 110a is post-heated for a post-heating time period so that the temperature at which the opening 112 and the neck portion 110a are heated is a post-heating temperature. In an embodiment, the post-heating temperature may be lower than or equal to the pre-heating temperature.

[0049] In the present embodiment, the manufacturing method of the LED light bulb may further include a step of assembling a bulb head 160 to the bulb envelope 110, and the bulb head 160 is coupled to the conductors 130.

[0050] To sum up, in the disclosure, the bulb envelope made of soda-lime glass enhances visual effects produced by the shape, color and light reflection of the LED light bulb. Besides, the arrangement of the supporting bracket (especially the supporting bracket may be deployed after passing through the opening of the bulb envelope and may lean against an inner surface of the bulb envelope) allows the LED light emitting module to be stably positioned in the bulb envelope. Besides, when the bulb envelope is shaped as a bottle or has an elongated shape similar to the bottle shape, the length of the LED light emitting module may be greater than 40% of the length of the bulb envelope, so as to enhance the visual effects produced by the LED light bulb.

[0051] It will be apparent to those skilled in the art that various modifications and variations can be made to the structure described in the disclosure without departing from the disclosure. In view of the foregoing, it is intended that the disclosure cover modifications and variations provided they fall within the scope of the following claims.

REFERENCES CITED IN THE DESCRIPTION

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PATENTKRAV

1. LED-lyspære (100), omfattende:

en pæreindkapsling (110);

en stilk (120) med en bærende del (124) placeret i pæreindkapslingen (110);

i det mindste to ledninger (130) anbragt igennem stilken (120); og

i det mindste ét LED-lysemitterende modul (140) samlet med den bærende del (124) og forbundet med de i det mindste to ledninger (130), hvor

et materiale for pæreindkapslingen (110) omfatter kalknatronglas, idet pæreindkapslingen (110) har en åbning (112) og en halsdel (110a), og stilken (120) og pæreindkapslingen (110) er smeltede ved en høj temperatur, således at et sideskørt (122) på stilken (120) er forbundet med pæreindkapslingen (110) og forsegler åbningen (112), hvilken LED-lyspære (100) er **kendetegnet ved, at** en længde af en del af halsdelen (110a) i tilstødning til åbningen (112) er større end halvdelen af en maksimal indvendig diameter af åbningen (112).

2. LED-lyspære (100) ifølge krav 1, hvor stilken (120) har et rør (126), og røret (126) har en åben ende (126a) i pæreindkapslingen (110) og en forseglet ende (126b), som vender mod en udvendig side af pæreindkapslingen (110).

3. LED-lyspære (100) ifølge krav 1, som yderligere omfatter:
fluid, som fylder pæreindkapslingen (110).

4. LED-lyspære (100) ifølge krav 1, hvor pæreindkapslingen (110) har form som en flaske med en flad bund og strækker sig langs en central akse (A), og en projektionslængde af det LED-lysemitterende modul (140) på den centrale akse (A) er større end 40% af en projektionslængde af pæreindkapslingen (110) på den centrale akse (A).

5. LED-lyspære ifølge krav 1, som yderligere omfatter et støttebeslag (170), hvor støttebeslaget (170) er samlet med den bærende del (124) og hviler imod pæreindkapslingen (110), idet støttebeslaget (170) har en stamme (172) og adskillige grene (174), idet stammen (172) strækker sig fra den bærende del (124), det LED-lysemitterende modul (140) er samlet med stammen (172), de adskillige grene (174) er bueformede og har hver især to ender, én ende forbundet med stammen (172) og den anden ende i kontakt med pæreindkapslingen (110), idet antallet af kontakter imellem

støttebeslaget (170) og pæreindkapslingen (110) er lig med 2 eller større end 2, og en maksimal lineær afstand mellem kontakterne er større end en maksimal indvendig diameter af åbningen (112).

6. LED-lyspære (100) ifølge krav 5, hvor pæreindkapslingen (110) har en sidevæg og en bundvæg forbundet med sidevæggen ved en skæring, og i det mindste én af kontakterne for støttebeslaget (170) og pæreindkapslingen (110) er placeret ved skæringen.

7. LED-lyspære (100) ifølge krav 5, hvor stilken (120) har et rør (126) og røret (126) har en åben ende (126a) indvendigt i pæreindkapslingen (110) og en forseglet ende (126b), som vender imod en yderside for pæreindkapslingen (110).

8. LED-lyspære (100) ifølge krav 5, som yderligere omfatter:
fluid, som fylder pæreindkapslingen (110).

9. LED-lyspære (100) ifølge krav 5, hvor pæreindkapslingen (110) har form som en flaske med en flad bund og strækker sig langs en central akse (A) og en projektionslængde af det LED-lysemitterende modul (140) på den centrale akse (A) er større end 40% af en projektionslængde af pæreindkapslingen (110) på den centrale akse (A).

10. LED-lyspære (100) ifølge ethvert af kravene 1-9, som yderligere omfatter:
et pærehoved (160) samlet med pæreindkapslingen (110) og forbundet med de i det mindste to ledninger (130).

11. LED-lyspære (100) ifølge ethvert af kravene 1-9, hvor antallet af LED-lysemitterende moduler (140) er lig med eller større end 2, og de LED-lysemitterende moduler (140) er forbundet i serie eller parallelt.

12. LED-lyspære (100) ifølge ethvert af kravene 1 til 9, hvor det LED-lysemitterende modul (140) er et stift LED-lysemitterende modul eller et fleksibelt LED-lysemitterende modul.

13. LED-lyspære (100) ifølge ethvert af kravene 3 og 8, hvor fluidet er et ikke-ledende fluid.

14. LED-lyspære (100) ifølge ethvert af kravene 3 og 8, hvor fluidet er en inaktiv gas.

15. LED-lyspære (100) ifølge ethvert af kravene 3 og 8, hvor fluidet er heliumgas.

16. LED-lyspære (100) ifølge ethvert af kravene 1-9, som yderligere omfatter:

en udvendig pærekappe, som omgiver pæreindkapslingen (110), således at den udvendige pærekappe og pæreindkapslingen (110) tilsammen danner et lagformet rum, som omgiver bæreindkapslingen (110); og
væske, placeret i det lagformede rum.

17. LED-lyspære (100) ifølge ethvert af kravene 1-9, hvor pæreindkapslingen (110) har en foddel, som tilvejebringer en stående funktion.

18. Fremstillingsfremgangsmåde for en LED-lyspære (100), omfattende:

anbringelse af en stilk (120) og i det mindste et LED-lysemitterende modul (140) af en bærende del (124) samlet med stilken (120) i en pæreindkapsling (110) via en åbning (112) i pæreindkapslingen (110), hvor det LED-lysemitterende modul (140) er forbundet med og placeret via i det mindste to ledninger (130) i stilken (120);
hvilken fremgangsmåde er **kendetegnet ved** yderligere at omfatte:

for-varmning af åbning (112) på pæreindkapslingen (110) og en del af en halsdel (110a) af pæreindkapslingen (110) i tilstødning til åbningen (112) i en for-varmningstidsperiode, således at en temperatur, ved hvilken åbningen (112) og halsdelen (110a) er opvarmet, er en for-varmningstemperatur, hvor en længde af den del af halsdelen (110a), som er i tilstødning til åbningen (112) er større end halvdelen af en maksimal indvendig diameter af åbningen (112);
efter for-varmningstrinnet, hoved-opvarmning af åbningen (112) på pæreindkapslingen (110) og den del af halsdelen (110a), som er i tilstødning til åbningen (112), således at temperaturen, ved hvilken åbningen (112) og halsdelen (110) opvarmes, er en hoved-opvarmningstemperatur, og et sideskørt (122) af stilken (120) samtidigt sintres til pæreindkapslingen (110) for at forsegle åbningen (112) i pæreindkapslingen (110), hvor hoved-opvarmningstemperaturen er højere end for-varmningstemperaturen;
efter hoved-opvarmningstrinnet, pumpning af restluft fra pæreindkapslingen (110) via et rør (126) i stilken (120);

efter luft-pumpningstrinnet, indføring af fluid i pæreindkapslingen (110) via røret (126) i stilken (120); og

efter gas-indføringstrinnet, forsegling af røret (126), således at pæreindkapslingen (110) foreligger i en lufttæt tilstand.

19. Fremstillingsfremgangsmåde ifølge krav 18, som yderligere omfatter:

efter sintring af sideskørtet (122) på stilken (120) til pæreindkapslingen (110), efter-opvarmning af åbningen (112) på pæreindkapslingen (110) og halsdelen (110a) i en efter-opvarmningstidsperiode, således at temperaturen, ved hvilken åbningen (112) og halsdelen (110a) opvarmes, er en efter-opvarmningstemperatur.

20. Fremstillingsfremgangsmåde ifølge krav 19, hvor efter-opvarmningstemperaturen er lavere end eller lig med for-varmningstemperaturen.

21. Fremstillingsfremgangsmåde ifølge krav 18, som yderligere omfatter:

samling af et pærehoved (160) på pæreindkapslingen (110), hvilket pærehoved (160) er forbundet med de i det mindste to ledninger (130).

22. Fremstillingsfremgangsmåde ifølge krav 18, hvor et materiale, som danner pæreindkapslingen (110), er kalknatronglas.

DRAWINGS

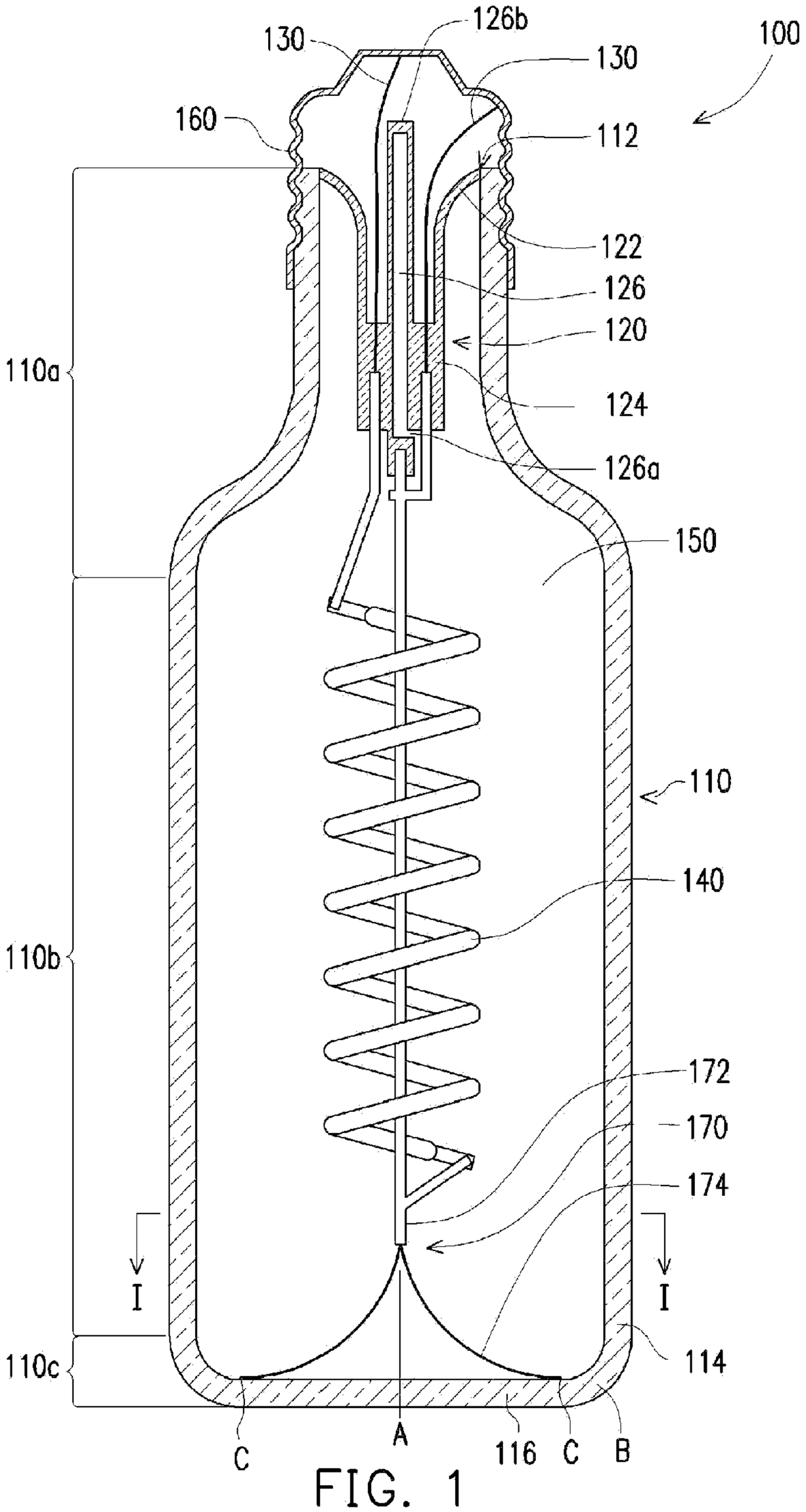


FIG. 1

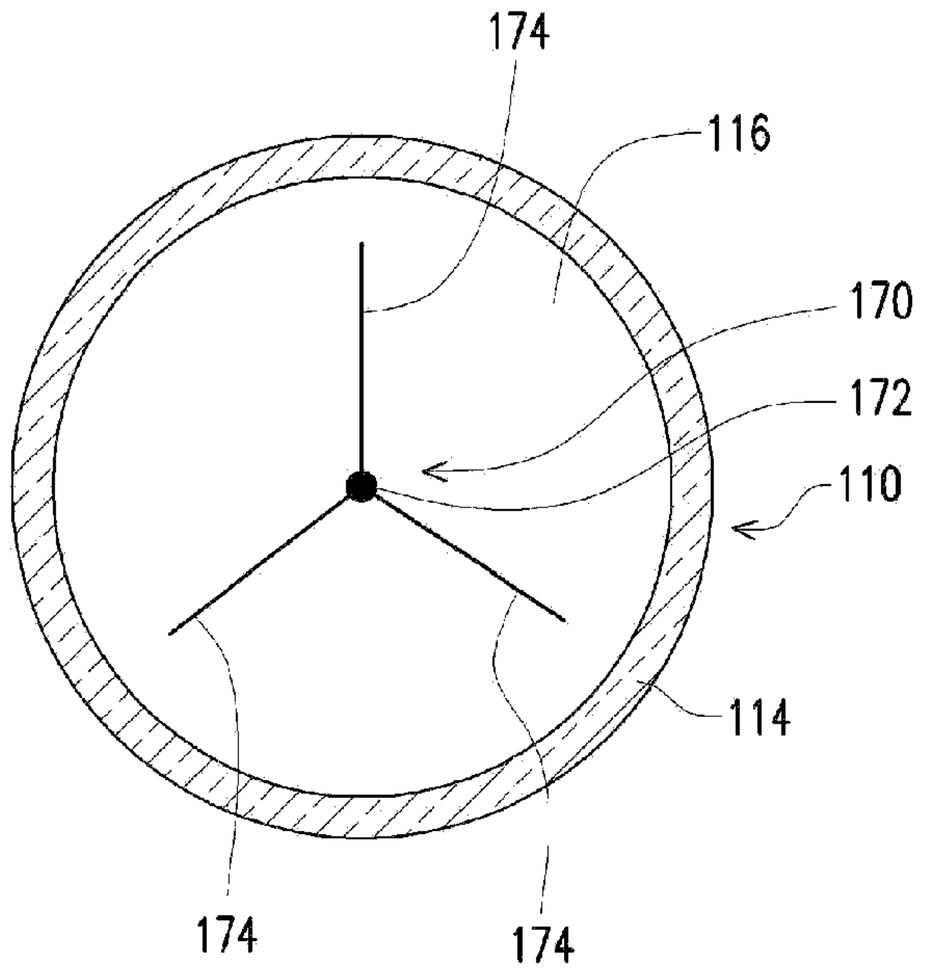


FIG. 2

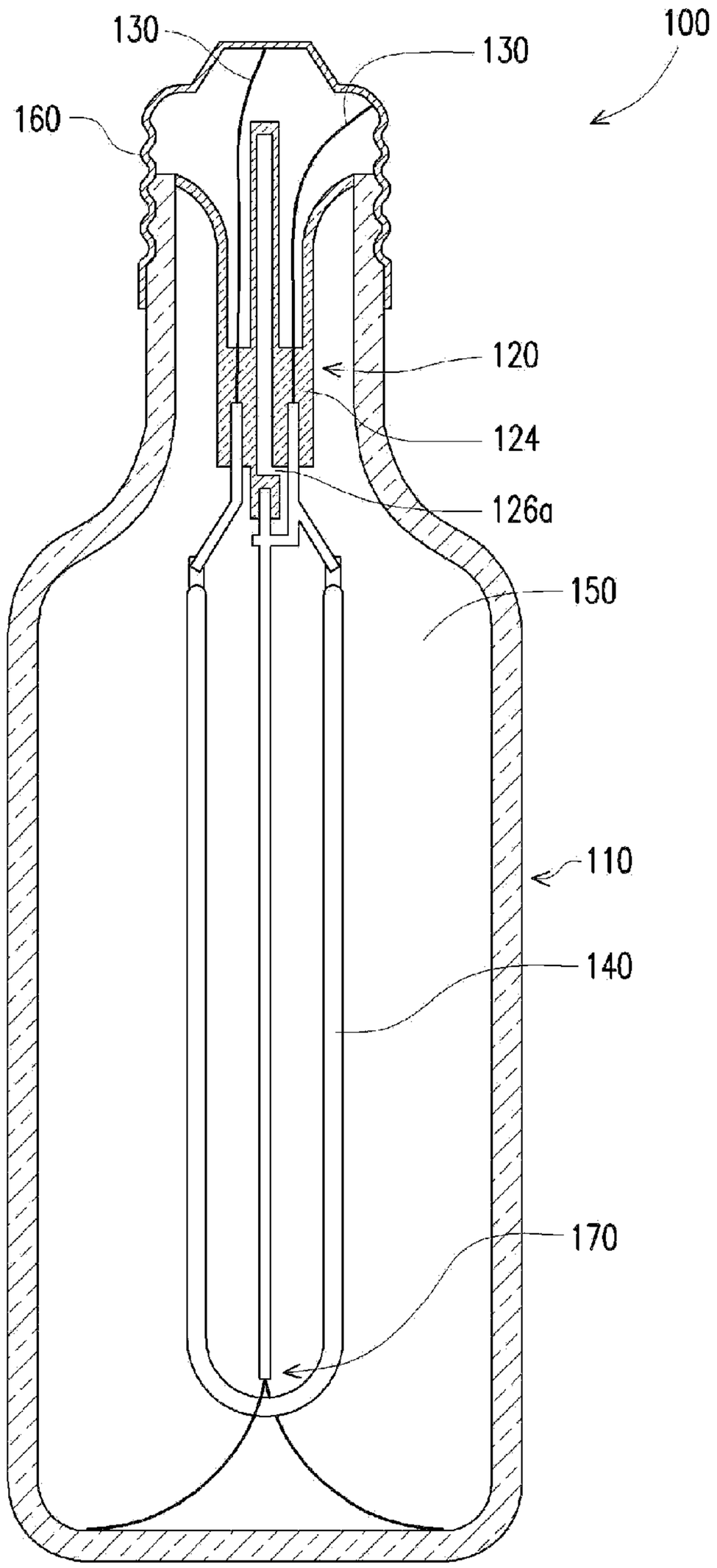


FIG. 3

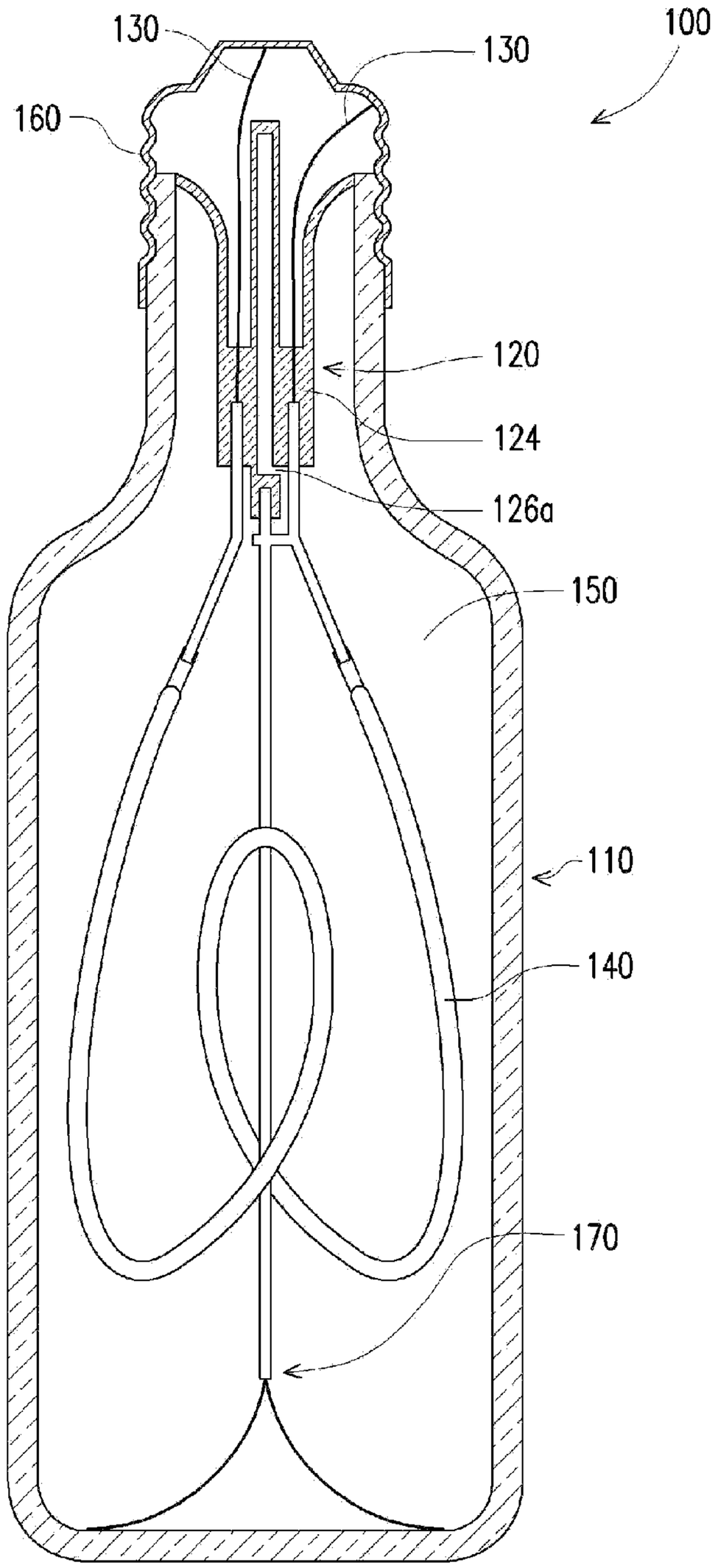


FIG. 4

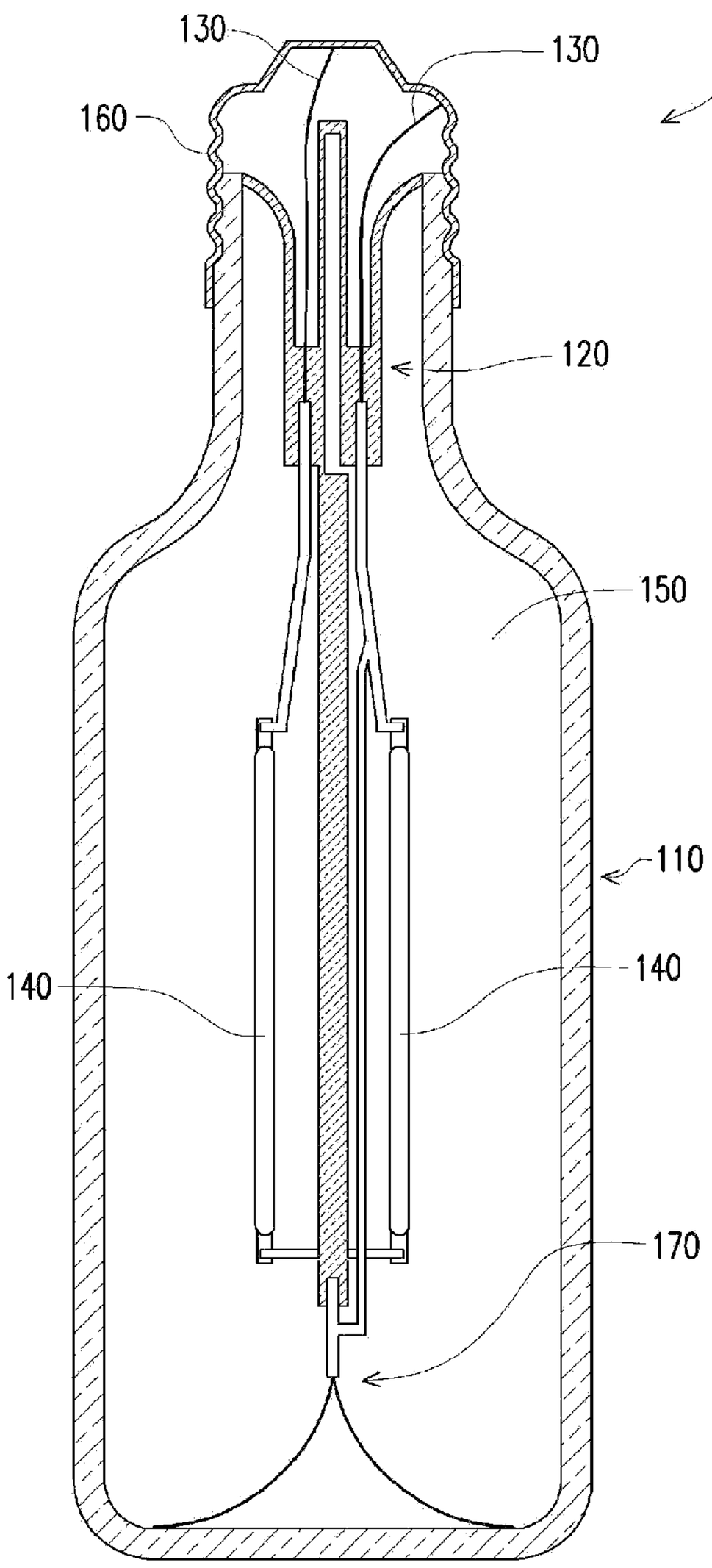


FIG. 5

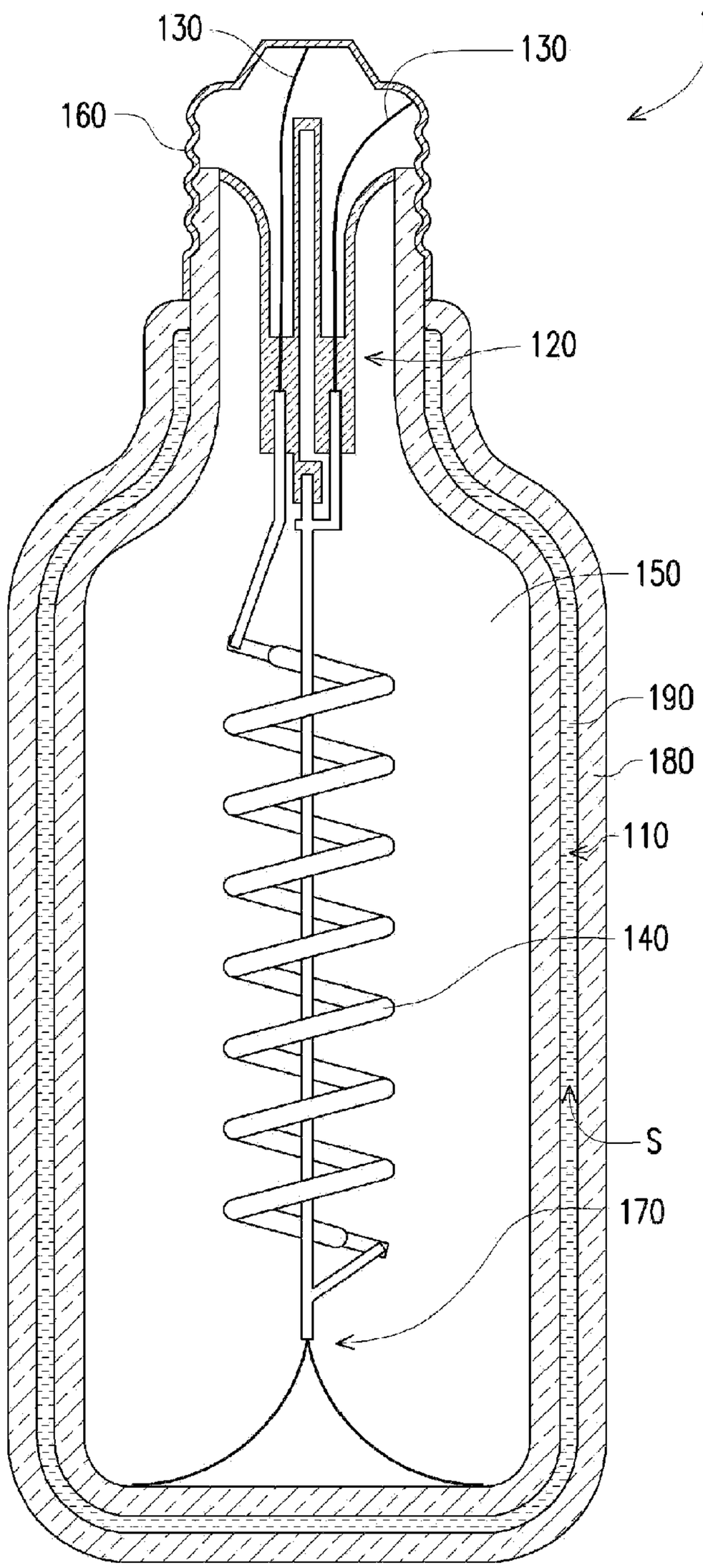


FIG. 6