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(54) Title: A TUBE-LIKE ELEMENT FOR USE IN A DUCT SYSTEM AND METHOD FOR MANUFACTURING

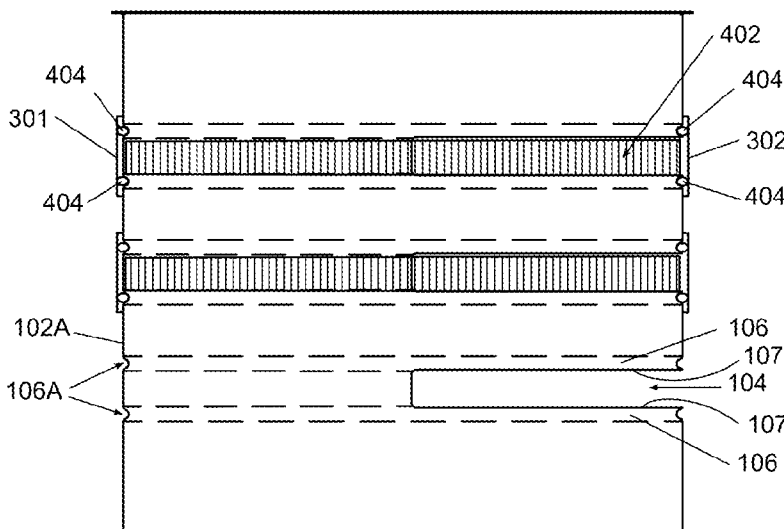


FIG. 4

(57) Abstract: The invention relates to tube-like element (100) for use in a duct system as filter holder. The tube-like element comprises a cylindrical wall component (102) which forms a duct (103). The cylindrical wall component comprises at least one oblong opening (104) configured to position a removable disc-shaped element (402) in the duct. Circular beads (106) in the cylindrical wall component form opposite longest edges (107) of the opening. The circular beads are configured to restrict movement of a removable disc-shaped element (402) that is positioned in the duct. The movement is restricted in axial direction of the duct.



A tube-like element for use in a duct system and method for manufacturing

TECHNICAL FIELD

The invention relates to a tube-like element for use in a duct system, more particularly, to a filter holder for use in a duct system. The invention further relates to a method for manufacturing a cylindrical wall component suitable for use in a duct system and the use of the tube-like element in a ventilation system.

10 BACKGROUND

With the continuous growth of the world's population, technology and industry, increasingly larger numbers and multiple types of particulate matter, also including pathogenic micro-organisms, are generated and released into the air. Particulate matter includes further all tiny pieces of solid or liquid associated with the Earth's atmosphere, such as soot, tobacco smoke, smog, oil smoke, fly ash, cement dust. The effects of inhaling particulate matter that have been widely studied in humans and animals now include asthma, lung cancer, cardiovascular issues, respiratory diseases, birth defects, and premature death. The air quality is therefore of particular importance for human health.

20 Filters are used in ventilation systems to reduce the amount of particulate matter in the air flow supplied to a building room. The filters remove particulate material from the air flow and have to be replaced regularly to guarantee a particular air quality. A tube-like filter holder is known which comprises a cylindrical wall component. The cylindrical wall component forms a duct for an air flow. The cylindrical wall component comprises an oblong opening configured to position a removable disc-shaped element in the duct. A ring shaped support structure is affixed in the duct to the cylindrical wall component. This could be done by welding. The ring shaped support structure restricts movement of the removable disc-shaped element in axial direction of the duct.

25 The assembly of cylindrical wall component and ring shaped support structure at both sides of the oblong opening makes the manufacturing process relative complex.

CN102778016A discloses a filter with a silencing function for use in an air conditioner. Filter screens and a silencing silk screen layer are arranged in a hollow and cylindrical shell between. Bumps fix the filter screens and silk screen in the middle part of the shell. The disclosure does not mention that the filter screens or silk screen have to be replaced and therefore the filter with a silencing function does not comprise means to replace them.

EP2241839A2 discloses a duct component for an air-conditioning duct for servicing an air-conditioning duct, and for air-conditioning work. The duct component comprises an opening, which is closable with a cover. The duct component is made from two end pieces, which are coupled to each other by a jacket, which forms also the cover.

SUMMARY

It is an object of the invention to provide an improved tube-like element for use in a duct system, which overcomes at least one of the disadvantages mentioned before. The invention has further at least one of the following advantages: light construction, easy to manufacture, applicable with a lot of metals for the cylindrical wall component, reduced number of components, reduced aerodynamic drag in duct, easy to clean, easy to increase the number of openings without increasing the manufacturing complexity.

According to the invention, this object is achieved by a tube-like element having the features of Claim 1. Advantageous embodiments and further ways of carrying out the invention may be attained by the measures mentioned in the dependent claims.

According to a first aspect of the invention, there is provided a tube-like element which further comprises circular beads in the cylindrical wall component. The circular beads form opposite longest edges of the oblong opening in longitudinal direction, the circular beads are configured to restrict movement of a removable disc-shaped element that is positioned in the duct in axial direction of the duct. A bead is a ridge produced in a sheet metal component or a metal sheet by pressing or rolling, usually with a view to increasing stiffness of the metal sheet forming the cylindrical wall component. A swaging machine could

be used to form the beads in the cylindrical wall component. A swaging machine is a machine in which tubes are forced through rotating dies to change locally the diameter of the tube. In this way the beads, which are normally used to increase the stiffness of the tube, obtain a further function to restrict the movement in axial
5 direction of a disc-shaped element which is placed in the duct through the oblong opening in the cylindrical wall component. Furthermore, the cylindrical wall component and the circular beads are formed from one piece of metal sheet. This feature reduces the cost of material of the element.

In an embodiment, an oblong opening has a length which is
10 approximately half the circumference of the tube-like element. This feature allows positioning a disc-shaped element with a nonresilient outline in the duct formed by the cylindrical wall component.

In an embodiment, at least one end of the cylindrical wall component is shaped to form a coupling structure. This feature allows adding a filter holding
15 device to an existing duct of a ventilation system by replacing a duct part of the ventilation system by the tube-like element.

According to a second aspect of the invention, there is provided method for manufacturing a cylindrical wall component for a tube-like element suitable for use in a duct system having all technical features of a cylindrical wall
20 component described above. The shape of at least one oblong opening is laser cut in a metal sheet to obtain an intermediate sheet part and at least one strip-like parts of the metal sheet having a periphery corresponding to the shape of the at least one oblong opening. The strip-like parts are fixated to the intermediate sheet. In an embodiment the fixation is done by micro joints. The intermediate
25 sheet and strip-like parts are roll-bended and welded to obtain a tube. Subsequently, circular beads are formed in the tube along opposite longest sides of the shape in longitudinal direction of the at least one oblong opening. A bead forms a ring-shaped elevation at the inner surface of the tube. Finally, the strip-like parts are removed to make the oblong openings. In this way, a cylindrical wall
30 component is obtained with at least one oblong opening suitable to position a disk-like element in the tube-like element and wherein the cylindrical wall component consists of one piece of metal sheet.

Other features and advantages will become apparent from the following detailed description, taken in conjunction with the accompanying drawings which illustrate, by way of example, various features of embodiments.

5 BRIEF DESCRIPTION OF THE DRAWINGS

These and other aspects, properties and advantages will be explained hereinafter based on the following description with reference to the drawings, wherein like reference numerals denote like or comparable parts, and in which:

- 10 Fig. 1 illustrates a perspective view of a cylindrical wall component;
 Fig. 2 illustrates a side view of the cylindrical wall component in
 Fig. 1;
- Fig. 3 illustrates a top view of a tube like element with a first
 embodiment of sealing structure;
- 15 Fig. 4 illustrates a cross section of a tube like element with a second
 embodiment of sealing structure;
- Fig. 5 illustrates an embodiment of the manufacturing process of the
 cylindrical wall component; and,
- Fig. 6 illustrates an embodiment of a disc-shaped element with
20 sealing structure.

DETAILED DESCRIPTION

Fig. 1 illustrates a perspective view of a cylindrical wall component
25 102 suitable for use in a duct system. A duct system could be any system that
 generates a flow of fluid from an input to an output through a channel between the
 input and the output. An exemplary embodiment of a duct system is a ventilation
 system of a building. Another example of a duct system is an air cleaning device
 which comprises a tube-like element to position a filter element in the duct of the
30 air cleaning device which extends from the input to the output.

The cylindrical wall component 102 could be made from any sheet of
metal that could be processed by a swaging machine. Some examples of metal

for sheets are: steel, galvanized steel, stainless steel, aluminium, copper. A swaging machine is a machine in which tubes are forced through rotating dies to change locally the diameter of the tube. A swaging machine could be used to add beads to a metal tube. A bead is a ridge produced in a sheet metal component or a metal sheet by pressing or rolling, usually with a view to increasing stiffness of the metal sheet forming the cylindrical wall component. The cylindrical wall component 102 forms a duct 103 and consists of one piece of metal. The cylindrical wall component in the embodiment shown in Fig. 1 comprises three oblong openings 104. Each oblong opening 104 has a width suitable to position a removable disc-shaped element 402 in the duct. The disc-shaped element could be a filter to remove particulate matter from the air flow through the duct, a closing member to shut-off the duct or any other function that could be placed in the duct in the form of a disc-shaped element. A characteristic of the first examples of disc-shaped element is that the outer circumference of the element substantially corresponds with the inner circumference of the duct. In this way, the disc-shaped element extends over the entire cross-section of the duct. The disc-shaped element is positioned in the duct perpendicular to the duct axis.

Circular beads 106 in the cylindrical wall component form opposite edges 107 of the opening in longitudinal direction of the opening. A bead is defined in the present application as a ridge produced in a sheet metal component or a metal sheet by pressing or rolling, usually with a view to increasing stiffness of the component. A part of circular bead 106 forms an edge of an oblong opening and provides two functions: 1) it increases the stiffness of the cylindrical wall component; and 2) it forms a ring-shaped support structure in the duct 103 formed by the cylindrical wall component 102. The support structure functions as guide when positioning a disc shaped element through the oblong opening in the cylindrical wall component. Furthermore, the support structure restricts movement of a removable disc-shaped element 402 that is positioned in the duct in axial direction of the duct.

The beads form ring-shaped elevations at the inner surface of the duct formed by the cylindrical wall component 102. An advantage of beads formed by a swaging machine in a cylindrical wall component is that the inner

surface of the cylindrical wall component is relatively smooth and consequently could easily be cleaned. In this way, the inner surface does not comprise small edges wherein particulate matter could accumulate and which could not easily be cleaned.

5 The cylindrical wall component 102 further comprises at each end a coupling structure 108. In Fig. 1 the coupling structure is in the form of a body flange. However, it is also possible that the cylindrical wall component has none or only a coupling structure at one end. For the skilled person, it's clear that other coupling structures are possible and that any kind of coupling structure to couple
10 ducts could be applied.

 Fig. 2 illustrates a side view of the cylindrical wall component shown in Fig. 1. This figure shows that the oblong openings are in a plane perpendicular to the duct axis 103A. The beads 106 form a circular groove in the outer surface of the cylindrical wall component 102 and a circular ridge at the inner surface of
15 the cylindrical wall component. The dashed lines indicate the edges of the beads. A part of a circular edge of a bead 106 coincides with a longitudinal edge of an oblong opening 104. The beads 106 are in a plane perpendicular to the cylinder axis 103A of the duct 103 formed by the cylindrical wall component 102. A bead 106 has a width D_{bead} . An oblong opening 104 has a height D_{open} . The mutual
20 distance between two oblong openings 104 is D_{mutual} .

 In an embodiment, the cylindrical wall component has an internal diameter of 320 mm. The height D_{open} of an oblong opening is 22 mm. The width of a bead D_{bead} is 7 mm and the mutual distance between two openings D_{mutual} is 45 mm. It might be clear that the dimensions of a cylindrical wall component
25 depend on the application and the metal sheet used.

 In use, the one or more oblong openings of the cylindrical wall component have to be closed. Fig. 3 illustrates a top view of a tube like element 100 comprising a cylindrical wall component and provided with a first embodiment of sealing structure 300. The sealing structure 300 is a strip-like rounded structure
30 with a first semi-circular part 301 which is attached to the cylindrical wall component 102 and a second semi-circular part 302 which forms a cover to seal an oblong opening. A hinge 306 pivotally couples the second semi-circular part

302 to the first semi-circular part 301. The second semi-circular strip-like element 302 closes in a first position at least one oblong opening. In a second position, the second semi-circular element 302 enables positioning a removable disc-shaped element in the duct through the oblong opening. Fig. 3 shows the second semi-circular part 302 in the second position. The inner side of the first and second semi-circular strip-like elements 301,302 are covered with a layer of resilient material. The resilient material 304 is attached to a surface of the strip-like element 302 facing the cylindrical wall component 102. The resilient material could be foam. In the first position of the strip-like element 302, the resilient material 304 is compressed between the strip-like element 302 and the cylindrical wall component 102. The resilient material enables to provide an air-tight sealing of the oblong opening. Each oblong opening could have a corresponding sealing structure. In another embodiment, one sealing structure closes simultaneously more than one opening up to all oblong openings in the cylindrical wall component 102. The free end of the second semi-circular element comprises a fastening structure configured to affix the free end to the first semi-circular element which is attached to the cylindrical wall component.

In another embodiment, the sealing structure comprises only the second semi-circular strip-like element. At both ends the strip-like element comprises a fastening structure cooperating with a corresponding fastening structure directly affixed to the cylindrical wall component by for example welding.

Fig. 4 illustrates a cross section of a tube like element with a second embodiment of sealing structure. In the second embodiment of the sealing structure, the foam in the embodiment of Fig. 3 is replaced by at least two ring-shaped elements 404 of a rubber-like material. A ring-shaped element 404 applied in all beads forming an edge of an oblong opening 104 will provide the best air-tight sealing. In Fig. 4, two disc-shaped electrostatic filter elements 402 are positioned in the duct. An electrostatic filter element could be in the form of an electret filter. Each bead forms a cylindrical groove 106A in the outer surface of the cylindrical wall component. The boundary of a filter element 402 rests on a circular ridge formed by a bead at the inner surface of the cylindrical wall component.

Fig. 5 illustrates an embodiment of the manufacturing process of the cylindrical wall component as shown in Fig. 1. The process starts with a metal sheet 500. Arrow indicated with A corresponds to a laser cutting process. In this process step, the shape of at least one oblong opening is laser cut in the metal sheet 500. After laser cutting, the metal sheet 500 comprises one large part, hereafter mentioned as intermediate sheet 500A, and strip-like parts 500B having a periphery corresponding to the shape of the at least one oblong opening. The strip-like parts 500B are fixated to the intermediate sheet 500A by means of so called micro-joints 504. Micro-joints (or “shake and break”) are a traditional method fabricators use to separate multiple parts from a sheet of material. The traditional micro-joint method leaves small, interconnecting tabs between parts. In the present application it leaves interconnecting tabs between the intermediate sheet 500A and the strip-like parts 500B which boundary defines the size of the oblong opening in the tube-like element. Micro joints 502 are small interruptions in the shape formed by the laser cutting process. The sheet 500 has in longitudinal direction of an oblong opening a length which is approximately two times the length of the shape of an oblong opening. The length of the metal sheet 500 corresponds to the circumference of the tube-like element to be manufactured.

Arrow indicated with B corresponds to a roll-bending and welding process to form a tube from a metal sheet. In this process step, the intermediate sheet 500A and strip-like parts 500B are treated as one metal sheet. After roll-bending the free ends of the metal sheet are coupled together by means of a welding process. In Fig. 1 the weld is indicated with reference numeral 110. After this step, we obtain a tube-like part 502 wherein the shape of the openings is carved in the metal sheet forming the duct 103, the strip-like elements are however still connected to the tube-like part by means of the micro-joints.

Arrow indicated with C corresponds to processing the tube-like part by means of a swaging machine. The swaging machine forms circular beads in the tube along opposite longitudinal sides of the shape. The beads 106 form ridges, i.e. elevations, at the inner surface of the tube 502.

Arrow indicated with D corresponds to a process to add flanges to at least one end of the tube-like part 502.

Arrows indicated with E and F correspond to the action wherein the strip-like parts are removing from the tube-like part 502. By breaking the micro-joint by bending/pulling/pushing, the strip-like parts are removed and the oblong openings suitable to position a disk-like element in the tube-like part 502 are formed. The circular beads form now opposite longitudinal sides of the oblong openings.

The reason for carving the shape of the openings in the metal sheet and keeping the remaining material forming the strip-like elements in the opening is that the remaining material enables forming beads along edges of oblong openings by means of a swaging machine. The dies of the swaging machine could only make straight beads in a duct made from a metal sheet if there is material at both sides of the location where the bead has to be formed. If there is only material at one side, the duct will not properly rotate around its cylinder axis and the dies will not form a bead in a plane perpendicular to the cylinder axis of the duct.

Fig. 6 illustrates an embodiment 600 of a filter module in the form of a disc-shaped element combined with sealing structure. A handgrip 602 is attached to disc-shaped filter element 402. Between the handgrip 602 and disc-shaped filter element 402 a strip-like element 604 is provided. The strip-like element is made from spring-steel. The strip-like element 604 extends along the circumference of the filter element 402 to form a semi-circle. When the filter module is positioned in the duct-like element forming a filter holder, the strip-like element seals the opening in the duct-like element through which the disc-shaped element is inserted in the duct.

The tube-like element comprising a cylindrical wall component with oblong openings described above could be used in a ventilation system as filter holder. The tube-like element could also be used to position a disc-shaped closure in the duct to shut-off a duct to a particular room of a building. It could also be used to position a safety grid in the duct. Fluid in the present application is defined as any continuous amorphous matter that tends to flow and to conform to the outline of its container. Some examples of a fluid are a liquid or a gas, wherein gas includes air.

The present application describes a tube-like element that could be used as filter holder for detachable filters. The tube-like element comprises a cylindrical wall component with oblong openings and beads just along the oblong openings. The beads form a support structure to restrict movement of a filter in axial direction. The cylindrical wall component and support structure are one
5 piece of material formed from one sheet of metal.

It should be noted that the tube-like element could have a size such that it is also suitable to house other devices such as fan, corona section, and safety grid.

10 While the invention has been described in terms of several embodiments, it is contemplated that alternatives, modifications, permutations and equivalents thereof will become apparent to those skilled in the art upon reading the specification and upon study of the drawings. The invention is not limited to the illustrated embodiments. Changes can be made without departing from the
15 idea of the invention.

CLAIMS:

1. A tube-like element (100) for use in a duct system, the tube-like element comprising a cylindrical wall component(102) forming a duct (103), the
5 cylindrical wall component comprises at least one oblong opening (104) configured to position a removable disc-shaped element (402) in the duct,
characterized in that
circular beads (106) in the cylindrical wall component form opposite edges (107) of
an oblong opening in longitudinal direction, the circular beads are configured to
10 restrict movement of a removable disc-shaped element (402) that is positioned in
the duct in axial direction of the duct, and the cylindrical wall component consists
of one piece of metal sheet.
2. The tube-like element according to claims 1, wherein an oblong
15 opening has a length which is approximately half the circumference of the tube-like
element.
3. The tube-like element according to any of the claims 1 – 2, wherein
at least one end of the cylindrical wall component is shaped to form a coupling
20 structure (108).
4. The tube-like element according to any of the claims 1 – 3, wherein
the tube-like element further comprises a sealing structure (300) configured to seal
an oblong opening.
25
5. The tube-like element according to claim 4, wherein the sealing
structure (300) comprises a strip-like element (302) which in a first position closes
an oblong opening and in a second position enables positioning a removable disc-
shaped element in the duct through the oblong opening.

6. The tube-like element according to claim 5, wherein in the first position of the strip-like element a resilient material (304) is compressed between the strip-like element (302) and the cylindrical wall component (102).
- 5 7. The tube-like element according to claim 6, wherein a bead (106) forms a cylindrical groove (106A) in the outer surface (102A) of the cylindrical wall component (102) and at least two rings (404) of rubber-like material which are positioned in corresponding cylindrical grooves form the resilient material.
- 10 8. The tube-like element according to claim 6, wherein the resilient material (304) is a foam (304A) attached to a surface of the strip-like element (302) facing the cylindrical wall component (102).
9. Method for manufacturing a cylindrical wall component for a tube-like
15 element suitable for use in a duct system, wherein the cylindrical wall component consists of one piece of metal sheet, the method comprising:
- laser cutting (A) the shape of at least one oblong opening in a metal sheet (500) to obtain an intermediate sheet (500A) and strip-like parts (500B) of the metal sheet having a periphery corresponding to the shape of the at least one oblong
20 opening, the strip-like parts are fixated to the intermediate sheet;
- roll-bending and welding (B) the intermediate sheet of metal and strip-like parts to obtain a tube (502);
- forming circular ridges (C) in the tube along opposite longest sides of the shape of the at least one oblong opening, wherein the ridges are elevations at the inner
25 surface of the tube;
- removing the strip-like parts (E,F) to obtain a cylindrical wall component with at least one oblong opening suitable to position a disk-like element in the cylindrical wall component.
- 30 10. Method according to claim 9, wherein the strip-like parts (500B) are fixated to the intermediate sheet (500A) by micro joints (504) which are small interruptions in the shape formed by the laser cutting process.

11. Method according to any of the claims 9 – 10, wherein the circular ridges are formed by a swaging machine.
- 5 12. Method according to any of the claims 9 – 11, wherein the method further comprises adding flanges to at least one side of the tube.
13. Method according to any of the claims 9 – 12, wherein the intermediate sheet is roll-bended in longitudinal direction of the shape of the at
10 least one oblong opening.
14. Method according to claim 13, wherein prior to roll-bending and welding the intermediate sheet has in longitudinal direction a length which is approximately two times the length of the shape of an oblong opening.
- 15 15. Use of a tube-like element according to any of the claims 1 – 8 in a ventilation system.
16. Use of a tube-like element according to any of the claims 1 – 8 as
20 filter holder.

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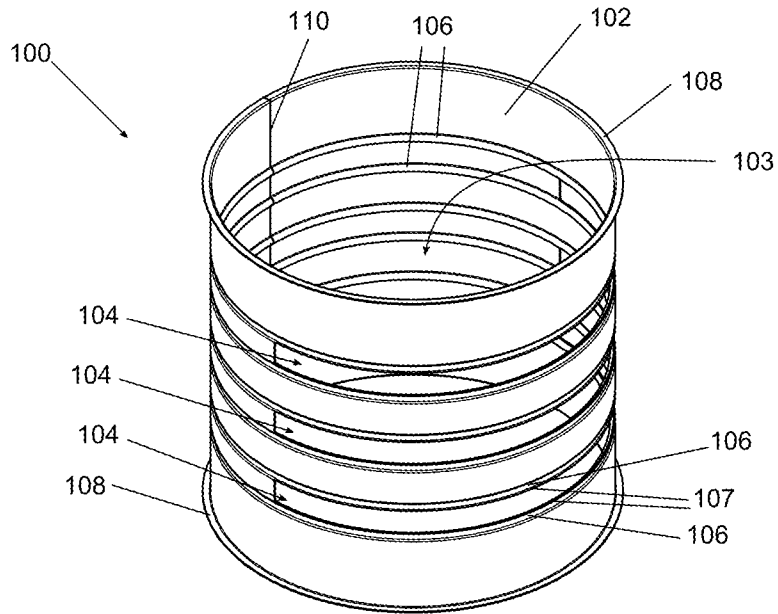


FIG. 1

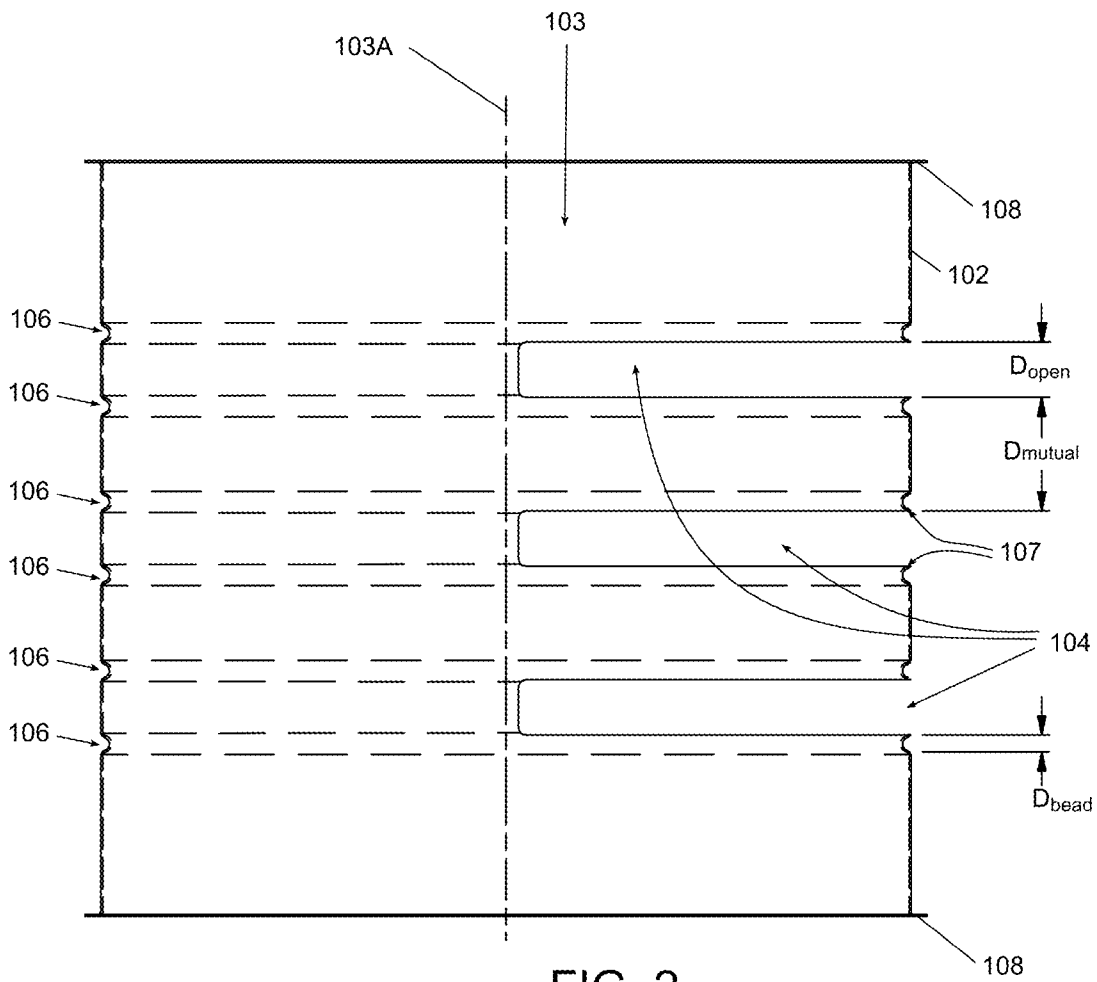
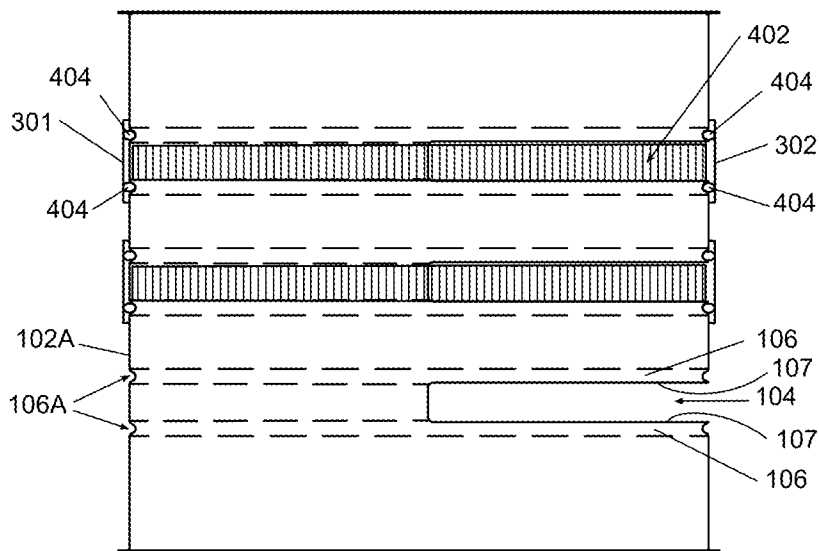
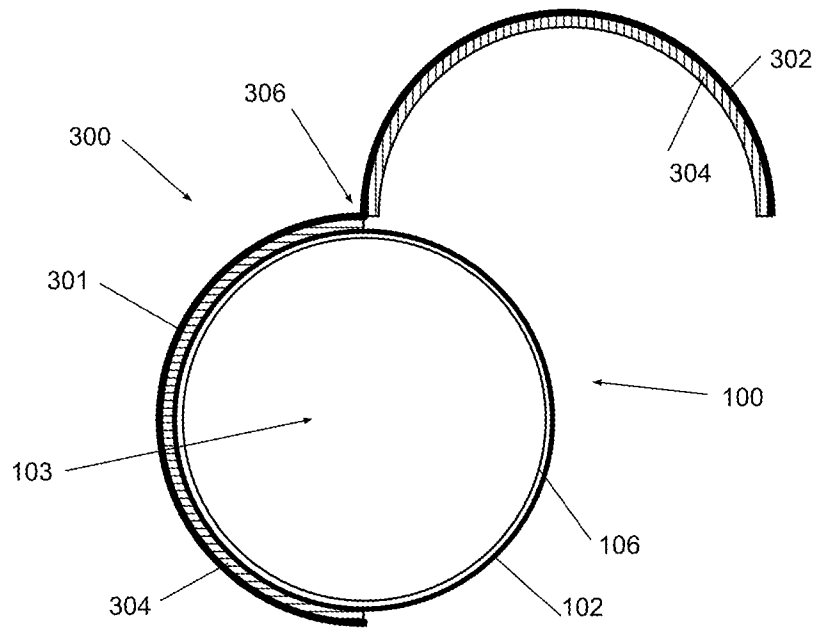


FIG. 2

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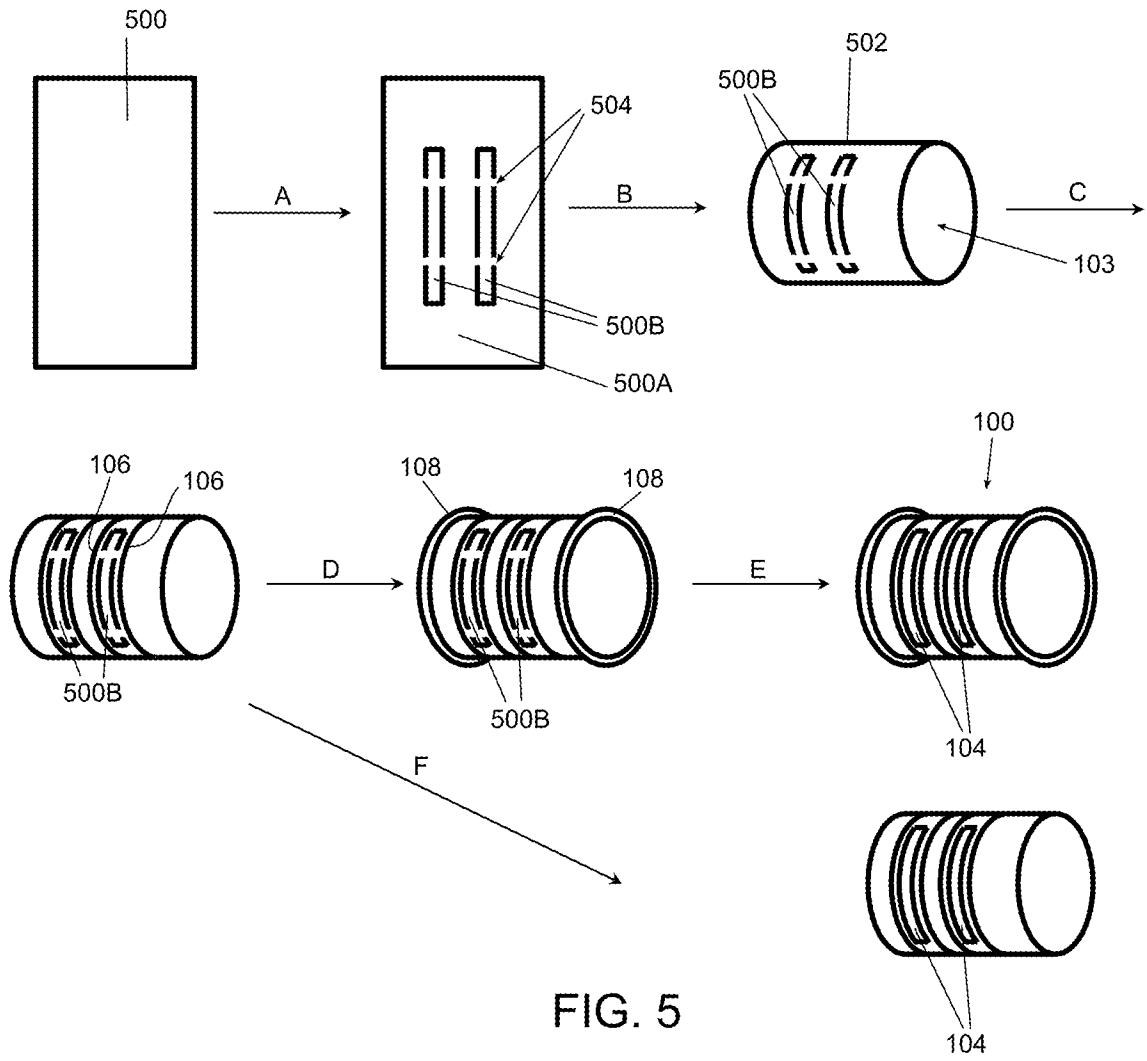


FIG. 5

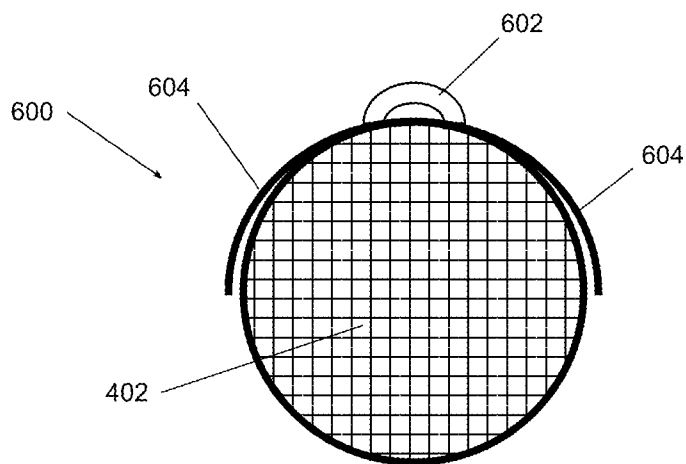


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER INV. F24F13/28 F24F13/02 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) F24F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	CN 102 778 016 A (GUANDONG MIDEA HVAC EQUIPMENT) 14 November 2012 (2012-11-14) page 2 - page 3; figures 2,6 -----	1-8,15, 16 9-14
X A	EP 2 241 839 A2 (IVK TUOTE OY [FI]) 20 October 2010 (2010-10-20) paragraph [0014] - paragraph [0037]; figures	1-8,15, 16 9-14
A	CA 2 573 515 A1 (GAETZ MICHAEL LESLIE [CA]) 9 July 2008 (2008-07-09) the whole document	1-16
A	DE 196 54 683 A1 (ZUBLER GERAETEBAU [DE]) 2 July 1998 (1998-07-02) abstract; figures 1A,1B,3 -----	1-16
-/--		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.		
<input checked="" type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search <div style="text-align: center; font-size: 1.2em;">31 July 2014</div>	Date of mailing of the international search report <div style="text-align: center; font-size: 1.2em;">06/08/2014</div>	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer <div style="text-align: center; font-size: 1.2em;">Vuc, Arianda</div>	

INTERNATIONAL SEARCH REPORT

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PCT/NL2014/050345

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FI 851 835 A (RUUSUVIRTA ONNI KALEVI [FI]) 10 November 1986 (1986-11-10) figures -----	1-16

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/NL2014/050345

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CN 102778016	A	14-11-2012	NONE	

EP 2241839	A2	20-10-2010	EP 2241839 A2	20-10-2010
			FI 20095390 A	09-10-2010

CA 2573515	A1	09-07-2008	NONE	

DE 19654683	A1	02-07-1998	NONE	

FI 851835	A	10-11-1986	NONE	
