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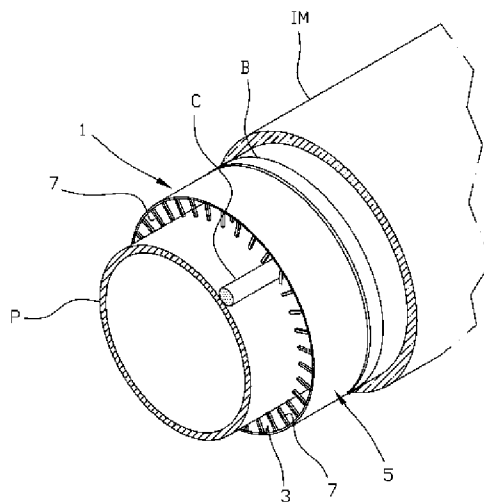
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(54) Title **A sheet and a method for providing a space between a pipeline and an insulating material**

(57) Abstract

A sheet (1) and a method for keeping a distance between an object (P) and an insulating material (IM), the sheet (1) having a first side (3) configured for facing the object (P), and a second side (5) configured for abutting the insulation material (IM). At least the first side (3) of the sheet (1) is provided with a plurality of spaced-apart protrusions (7) being integral with the sheet (1).



A SHEET AND A METHOD FOR PROVIDING A SPACE BETWEEN AN OBJECT AND AN INSULATING MATERIAL

The present invention is related to a spacing device. More particularly, the invention is related to a sheet for providing a space between an object and an insulation material.

5 In for example a process plant, it is for technical, economic or environmental reasons sometimes necessary to insulate pipelines and related equipment such as valves and pumps, from the surrounding environment. A thermal insulation is most common, but a need for insulation may also be due to sound. A thermal insulation will be discussed in this document.

10 There are two main purposes for thermal insulation of a pipeline and related equipment.

One purpose of thermal insulation of a pipeline is to reduce a heat exchange between a fluid flowing through the pipeline and the surrounding environment.

Another purpose of thermal insulation is to protect the pipeline and/or fluid flowing through the pipeline, against heat that may occur for example in the event of a fire.

15 Depending on a temperature difference between an outside of the insulation facing a surrounding environment, and an inside of the insulation facing a body such as a pipe, and a relative humidity of the air within the insulation, condensation may occur. Such condensation may represent challenges with respect to reduced effect of the thermal insulation and increased weight. However, the most serious consequence of such condensation, is in-
20 creased risk of corrosion of the insulated equipment. Such corrosion is known as CUI (Corrosion Under Insulation) and represent a safety risk in addition to increased maintenance costs.

To reduce the problem of condensation in an insulation material surrounding for example a pipeline, it is common practice to provide a space between the insulation material and

an outer surface of the insulated object, such as a pipeline.

To provide the space several types of spacing devices exist in the market.

One such type of spacing device is undulated or corrugated metal ribbons surrounding the pipe and being spaced apart in an axial direction of the pipeline. The ribbons are configured for supporting a metal sheet providing a support for the insulation material. The corrugated metal ribbon is applied around the pipe and attached to itself by means pop rivets so that the ribbon is formed as an endless. The skilled person will appreciate that a pipeline in operation may be subject to vibrations. Such vibrations may cause rubbing and damage of the surface of the pipeline abutting ridges/valleys of the undulating metal ribbon and damage the pipeline. However, such rubbing may be avoided by arranging an isolating material, for example a rubber sheet between the surface of the pipeline and the undulating metal ribbon. Mounting such rubber sheets is cumbersome and time consuming. A further disadvantage of providing such a rubber sheet is that moisture may be trapped between the rubber sheet and the surface of the pipeline.

Another type of spacing device is a split ring made of a plastic material. The split ring is provided with a plurality of inwards protruding ribs extending in parallel with a longitudinal axis of the pipeline. In use, a plurality of split rings are spaced apart in an axial direction of the pipeline. The split rings are configured for supporting a metal sheet providing a support for the insulation material. A split ring of plastic is not encumbered with the rubbing damages of the surface of the pipeline as may be the case for the metal ribbon mentioned above. However, a split ring may only be used for a limited diameter range of the pipeline. Further, depending on which type of polymer the plastic is made from, a split ring of a certain type of plastic may be used for a limited temperature range. Thus, a range of diameters wherein each range is available in several types of plastic, may be required.

Still another type of spacing device is a ribbon made from rubber, wherein the ribbon is provided with undulating portions and "hinge type" locking means configured for providing an endless ribbon after being mounted around a pipeline. In use, a plurality of ribbons are spaced apart in an axial direction of the pipeline. The ribbons are configured for supporting a metal sheet providing a support for the insulation material. Although having a certain flexibility with regard to a dimension of the pipeline, it may in many cases be necessary to adapt the length of the ribbon in situ.

A spacing device being independent of a diameter of the pipeline are so-called spacer knobs configured for being connected to a perforated sheet. For this type of spacing

device a plurality of spacer knobs are arranged circumferentially and axially along the pipeline to keep the sheet and thus the insulation substantially equidistantly from the pipeline. The sheet serves as a support for the insulation material and is typically made of metal. The spacer knobs are typically made from polytetrafluoroethylene (PTFE), such as Teflon®. Each knob is secured to the metal sheet by means of a screw screwed through the knob and into a perforation in the metal sheet. As a minimum, three knobs are substantially equidistantly arranged around a periphery of the pipeline at predetermined intervals, for example three at each 300 mm along the pipeline, which results in a need for 1000 spacer knobs for each 100 m pipeline. Assembling of such prior art spacer knobs is a relatively time consuming and cumbersome assembly process in that the knob must be held in place by one hand while the screw is aligned with the perforation and screwed through the knob and into the perforation in the metal sheet. Experience shows that it is easy to lose a screw or a spacer knob while the assembly process is in progress.

The invention has for its object to remedy or to reduce at least one of the drawbacks of the prior art, or at least provide a useful alternative to prior art.

The object is achieved through features, which are specified in the description below and in the claims that follow.

In a first aspect of the invention, there is provided a sheet for keeping a distance between an object and an insulating material. The sheet has a first side configured for facing the object, and a second side configured for abutting the insulation material. At least the first side of the sheet is provided with a plurality of spaced-apart protrusions being integral with the sheet.

Preferably, the protrusions are made from the same material as the sheet.

The object may typically be a pipe or pipeline and/or pipeline-related items such as for example a valve forming part of a pipeline.

One effect of providing the sheet with a plurality of spaced-apart protrusions being integral with the sheet is that the sheet is ready for use "from the shelf". Thus, no time-consuming assembly of the protrusions are required, only securing the sheet with respect to the object.

The protrusions may be arranged equidistantly so that a load-bearing capacity of the sheet is uniform.

Preferably, the protrusions are flexible. By the term flexible is meant that one or a few protrusions hitting an obstruction on a surface of the object, may bend instead of driving the sheet itself outward. Preferably, the protrusions are oblong, meaning that in a preferred embodiment each protrusion is longer than it is wide.

- 5 Preferably, the protrusions extend perpendicularly with respect to the sheet. Thus, loads between the sheet and the object are transferred substantially axially through the protrusions.

To protect the object against any moisture, for example water, the sheet may be waterproof. In one embodiment the sheet is made from a rubber material.

- 10 Over time, a fibrous insulation material is prone to settlement due to for example gravity forces, vibrations, and moisture, or a combination of two or more thereof. In one embodiment, also the second side of the sheet that in a position of use abuts the insulation material, is provided with a plurality of spaced-apart protrusions being integral with the sheet and configured for penetrating a portion of the insulation material. A primary purpose of
15 such protrusions is to at least reduce settlement of fibrous insulation material such as for example fibre glass or rock wool, with respect to the second side of the sheet. Depending on inter alia the density of the insulation material, the protrusions from the second side of the sheet may be identical to the protrusions of the first side. However, the protrusions from the second side of the sheet may be longer or shorter, and/or they may have a dia-
20 meter being different from the first-side protrusions.

In a second aspect of the invention, there is provided a method for providing a space between an object and an insulating material by means of a sheet according to the first aspect of the invention. The method comprises the steps of:

- a) adapting a size of the sheet to an area of the object to be covered; and
25 b) securing the sheet to the object with the first side of the sheet facing the object.

The sheet may be secured with respect to the object by a suitable fastening means such as for example a band, tie or tape that abut a portion of the second side of the sheet. If the sheet according to the invention is used for an object in the form of a pipe, the sheet may typically be secured with respect to the object by means of a band or tie abutting a portion
30 of the second side sheet so that the sheet is bent around the pipe.

If the sheet is made from a waterproof material, the sheet may function as a "raincoat" for protecting the object against any water or other liquids from the surroundings. To provide

such a raincoat, the sheet covering at least a top portion and side portions of the object should be continuous, i.e. without any open joints. However, especially if the waterproof material is diffusion tight, condensation may under certain circumstances arise in the space between the outer surface of the object and the surface of the sheet facing the object. To avoid or at least reduce any accumulation of condense water at a bottom portion of the object, the method may comprise providing a drainage through the sheet at a lowest portion of the object. In one embodiment two end-portions of the sheet face each other at the lowermost portion of the object, and the drainage is provided by means of providing a gap between two end-portions of the sheet.

In a third aspect of the invention there is provided an insulated object comprising the sheet according to any embodiments of the first aspect of the invention. The object may be a pipe.

The invention is defined by the independent patent claims. The dependent claims define advantageous embodiments of the invention.

In the following is described an example of a preferred embodiment illustrated in the accompanying drawings, wherein:

Fig. 1 shows a sheet according to the invention arranged in a position of use between a pipe and an insulation;

Fig. 2 shows in a larger scale a radial view of fig. 1 seen from the left;

Fig. 3 shows in a smaller scale a partly rolled-out sheet according to the invention; and

Fig. 4 shows an alternative embodiment of the sheet shown in fig. 1.

Positional specifications such as lower, upper and between refer to the positions shown in the figures.

In the figures, the relative proportions between components may be distorted.

In the figures, reference numeral 1 denotes a sheet according to the invention. The sheet 1 has a first side 3 and a second side 5.

A plurality of spaced-apart protrusions 7 extend substantially perpendicular from at least the first side 3 of the sheet 1.

In fig. 1, the sheet 1 keeps an insulation material IM radially distant from an outer surface of an object, here in the form of a pipe P. The protrusions 7 extend radially from the first side 3 of the sheet 1, and an end portion of the protrusions 7 abuts an outer surface of the pipe P. In this document, the pipe P is also denoted pipeline P.

5 The insulation material IM abuts the second side 5 of the sheet 1.

In fig. 1, the sheet has been secured with respect to the object by means of fastening means in the form of a band B or tape surrounding a portion of the second side 5 of the sheet 1 so that the sheet 1 is bent around the pipe P. Thus, in the embodiment shown wherein the object is a pipe P, the sheet 1 is secured with respect to the pipe P without
10 being in direct contact with the pipe P. The sheet 1 is clamped around the pipe P.

In fig. 1, an obstruction in the form of a cable C runs longitudinally along the outer surface of the pipe P. One of the protrusions 7 that abuts a portion of the cable C is bent sideways. The sideways bending is due to the oblong form or “slenderness” of the protrusion 7, and/or due to the protrusion being made from a flexible material such as for example
15 rubber. Due to the bending of the protrusion 7, the sheet 1 is less prone to bend outwards (into the insulation material IM) when the protrusion 7 hits the cable C or any other element on the outer surface of the pipe P. Further, a flexible protrusion 7 will not penetrate the cable C and cause any damage thereto.

The plurality of flexible, spaced-apart protrusions 7 may also function as a “locking
20 means” for substantially preventing movement of for example a cable C running on a surface of the pipe P once the sheet 1 has been secured to the pipe P. Such a cable C may typically run in parallel with respect to a longitudinal axis of the pipe P, as indicated in fig 1, or wound in helix with respect to a longitudinal axis of the pipe P.

Fig. 2 shows in a larger scale a radial view of fig. 1 seen from the left and perpendicularly
25 to a longitudinal axis for the pipe P.

At a lowermost portion of the pipe P, there is a gap G between end-portions 2, 2' of the sheet 1. The end-portions 2, 2' are substantially in parallel with the longitudinal axis of the pipe P.

The purpose of the gap G is inter alia to allow drainage of any water that may otherwise
30 accumulate within the space between the outer surface of the pipe P and the sheet 1. A gap G will typically be in the range of 5-15 mm, for example 7 mm.

Due to the top and side portions of the pipe P being protected by a continuous, waterproof sheet 1, any liquid that may penetrate through the insulation material IM, will bypass the pipe P. Thus, the sheet 1 according to the invention provides a “raincoat” or “umbrella” in addition to a flexible spacing means and a “locking means” for example for a cable C arranged along an outer surface of the pipe P.

In the embodiment shown in figures 1 and 2, the sheet 1 is typically secured to the pipe P by means of a suitable fastening means tied up around the sheet 1.

Fig. 3 shows in a smaller scale a partly rolled-out sheet 1 prior to being secured to the pipe P shown in figures 1 and 2. In the embodiment shown, the sheet 1 is provided with protrusions extending from the first side 3 only.

An axial length of the oblong protrusions 7 may be relatively small as compared with prior art spacing means. By relatively small is meant in the range of 5 – 30 mm. Thus, the space between the pipe 1 and the insulation material IM may be reduced as compared with prior art spacing means. A reduced space may in some cases effect a reduced heat convection in the air within the space.

Fig. 4 shows an alternative embodiment of the sheet 1 shown in fig. 1, wherein the sheet 1 is further provided with oblong protrusions 7' extending from the second side 5 of the sheet 1. A main purpose of the protrusions 7' extending from the second side 5, is to penetrate into the insulation material IM and thereby “lock” the sheet 1 with respect to the insulation material IM. In the embodiment shown, an axial length of the protrusions 7' is smaller than the axial length of the protrusions 7 extending from the first side 3 of the sheet 1. Further, in the embodiment shown, the mutual spacing between the protrusions 7' extending from the second side 5 of the sheet 1 is larger than the mutual spacing of the protrusions 7 extending from the first side 3 of the sheet 1.

From the above the skilled person will understand that the sheet 1 according to the invention is a “one-piece” spacing means that is ready for use. Once cut into a desired size, if at all necessary, the sheet 1 may be secured with respect to the object without any tool.

When provided in a flexible material, for example rubber or other soft, flexible material, it is unlikely that the sheet 1 and its protrusions 7 may cause any cut damages to an operator. Further, a footprint of each of the protrusions 7 may be relatively small, typically 2 mm² and is therefore unlikely to entrap any water at the boundary between each protrusion and the surface of the pipe P or any other object. Protrusions 7 made of oblong rubber elements are unlikely to cause any rubbing damages on a surface of the pipe P due to

common vibrations of the pipe P.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. Use
5 of the verb "comprise" and its conjugations does not exclude the presence of elements or steps other than those stated in a claim. The article "a" or "an" preceding an element does not exclude the presence of a plurality of such elements.

C l a i m s

1. A sheet (1) for keeping a distance between an object (P) and an insulating material (IM), the sheet (1) having a first side (3) configured for facing the object (P), and a second side (5) configured for abutting the insulation material (IM),
5 c h a r a c t e r i s e d i n that at least the first side (3) of the sheet (1) is provided with a plurality of spaced-apart protrusions (7) being integral with the sheet (1).
2. The sheet (1) according to claim 1, wherein the protrusions (7) are arranged equidistantly.
- 10 3. The sheet (1) according to claim 1 or claim 2, wherein the protrusions (7) are flexible.
4. The sheet (1) according to any of claim 1 to 3, wherein the protrusions (7) extend perpendicularly with respect to the sheet (1).
5. The sheet (1) according to any one of the preceding claims, wherein the sheet (1)
15 is waterproof.
6. Method for providing a space between an object (P) and an insulating material (IM) by means of the sheet (1) according to any one of claims 1-5, c h a r -
a c t e r i s e d i n that the method comprises the steps of:
a) adapting a size of the sheet (1) to an area of the object (P) to be covered; and
20 b) securing the sheet (1) with respect to the object (P) with the first side (3) of the sheet (1) facing the object (P).
7. The method according to claim 6, wherein the method comprises providing a drainage through the sheet (1) at a lowermost portion of the object (P).
8. The method according to claim 7, wherein two end-portions (2, 2') of the sheet (1)
25 face each other at the lowermost portion of the object, and the drainage is provided by means of providing a gap (G) between said two end-portions (2, 2') of the sheet (1).
9. An insulated object (P) comprising the sheet (1) according to any of the claims 1 - 5.
- 30 10. The insulated object according to claim 9, wherein the object (P) is a pipe.

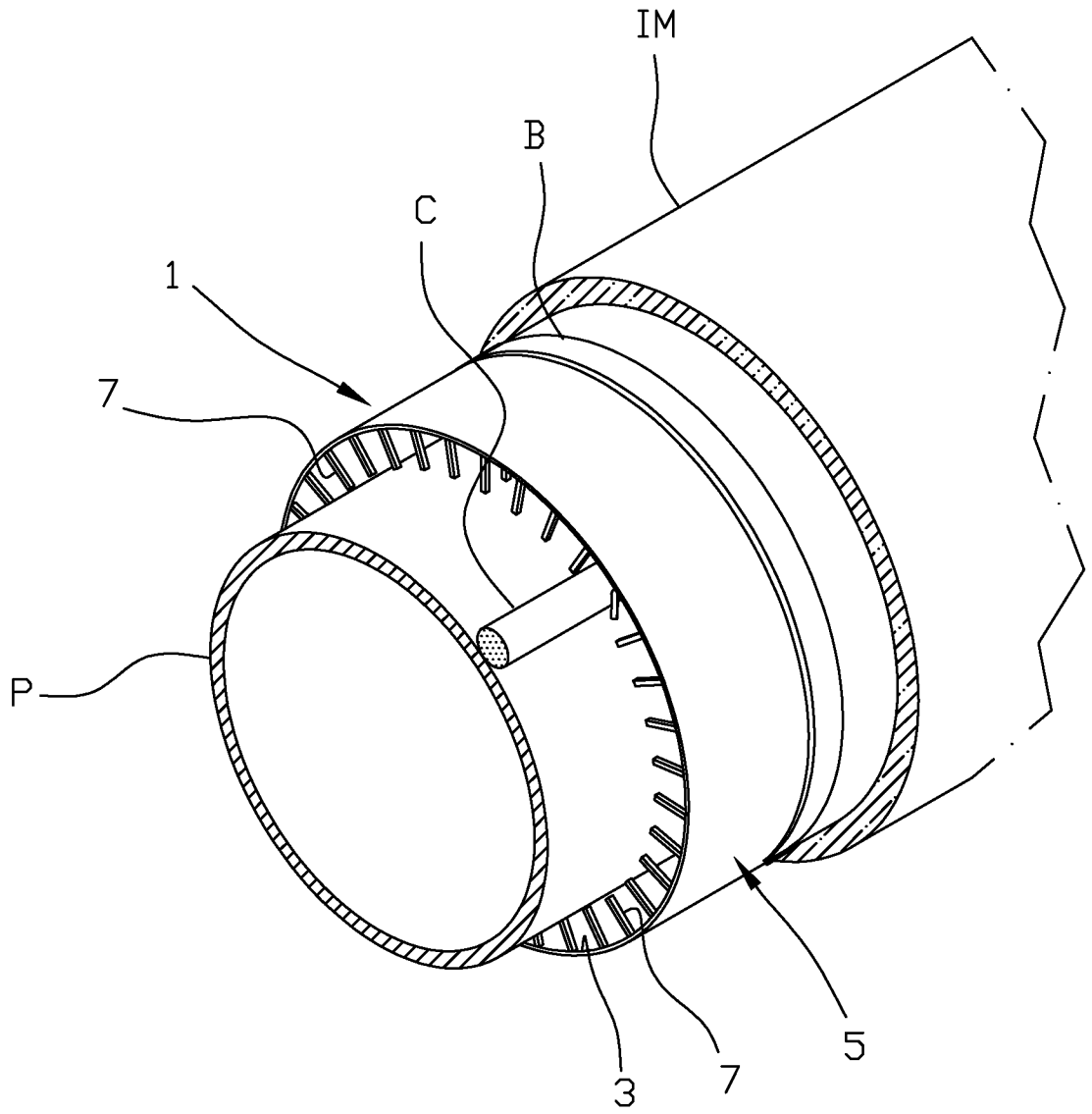


Fig. 1

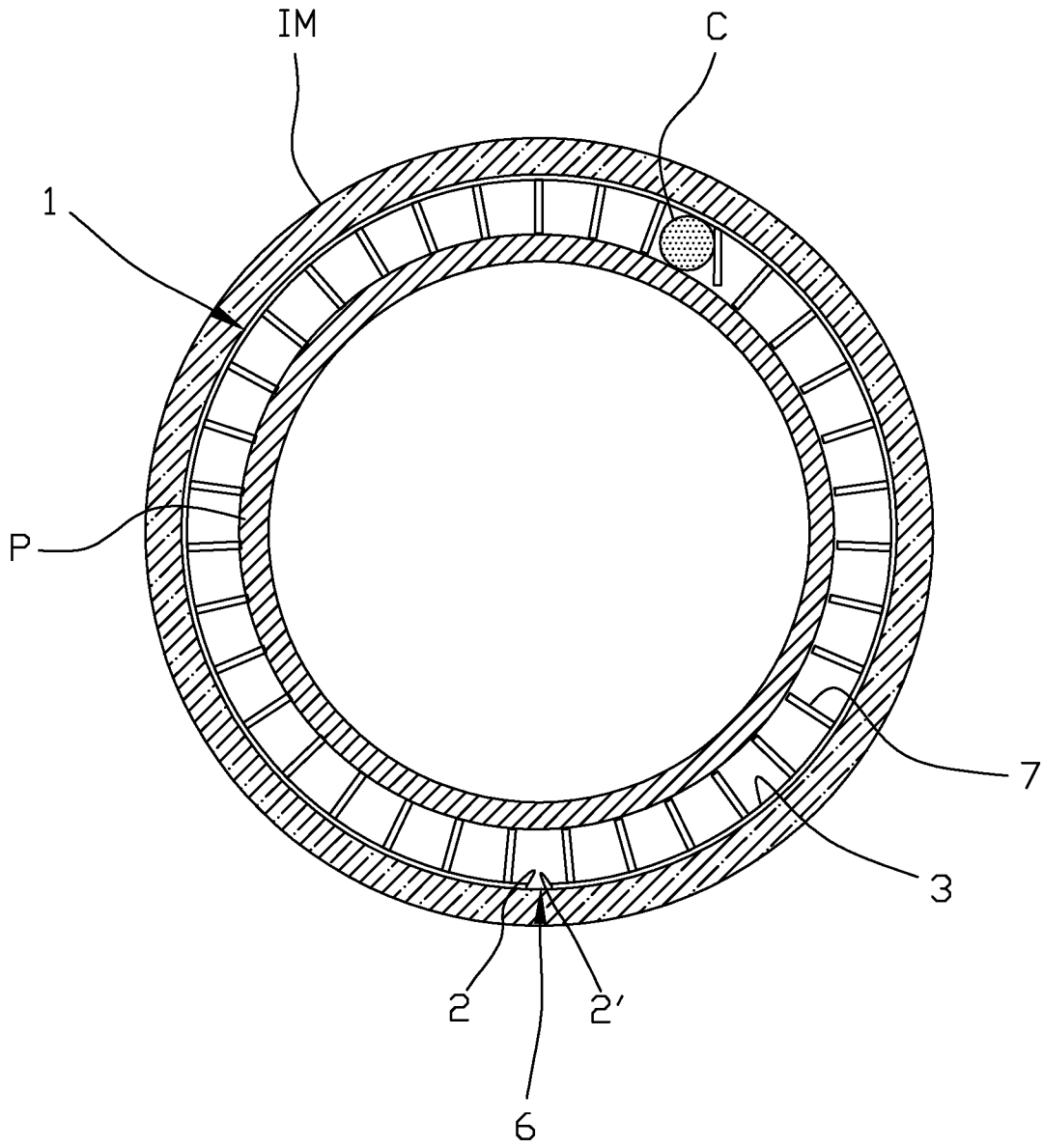


Fig. 2

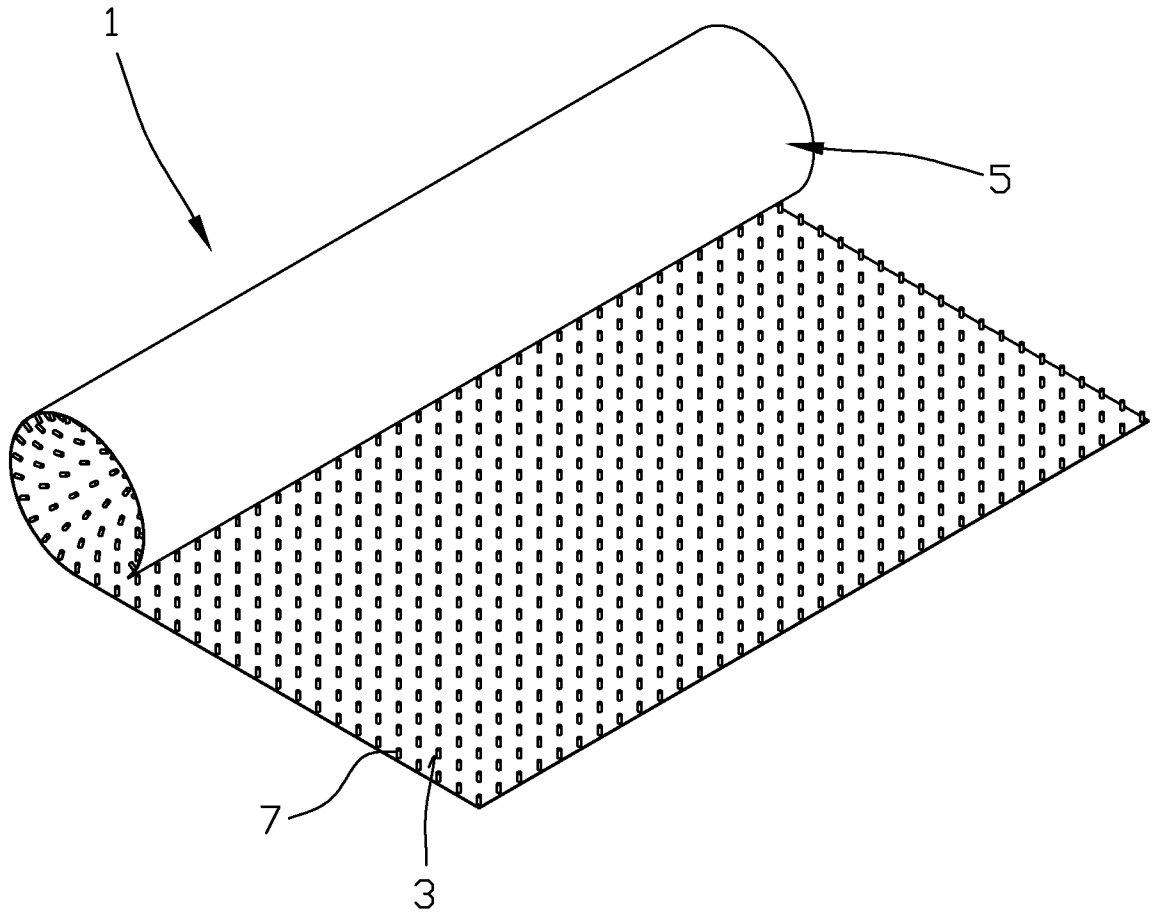


Fig. 3

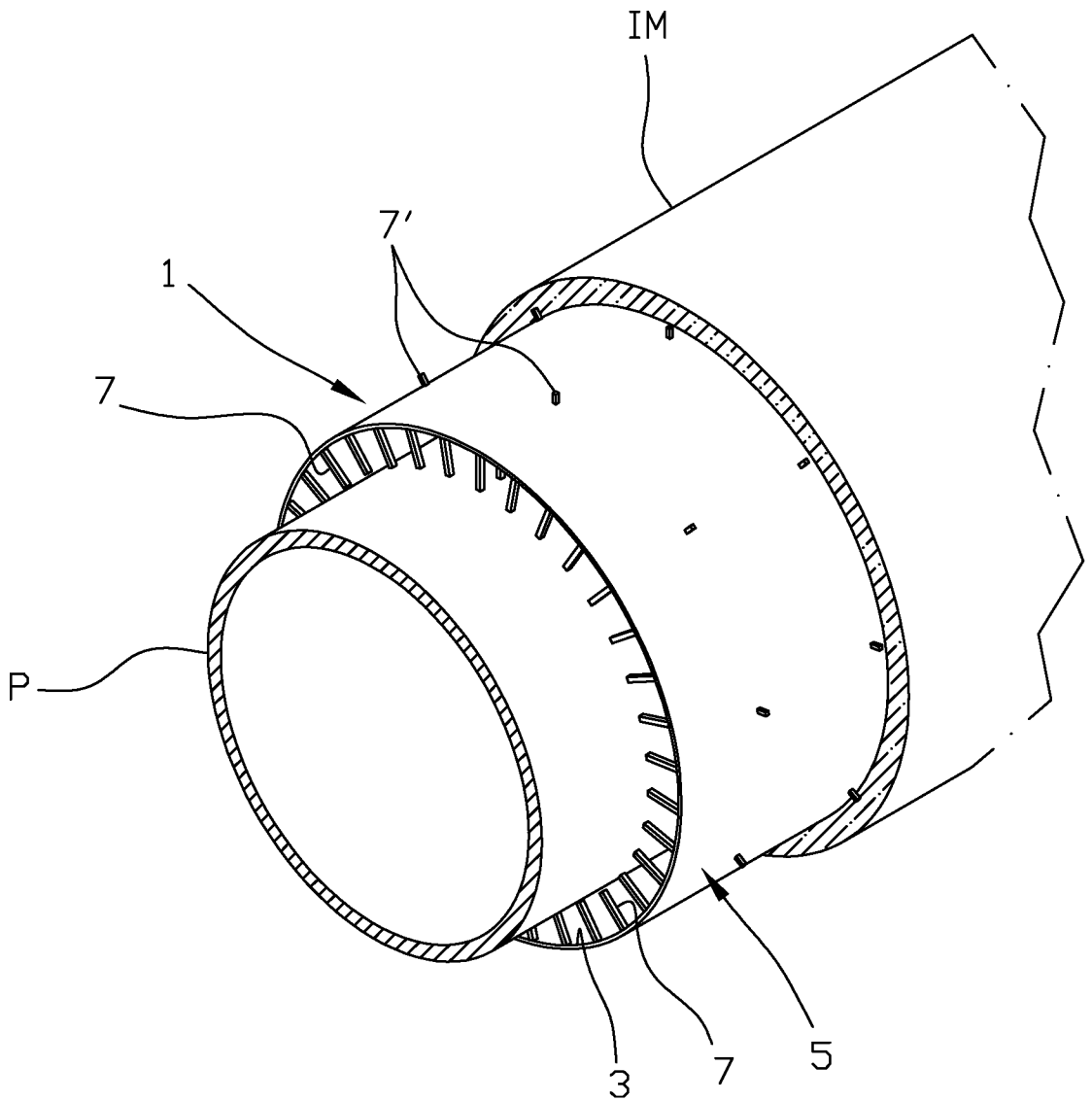


Fig. 4