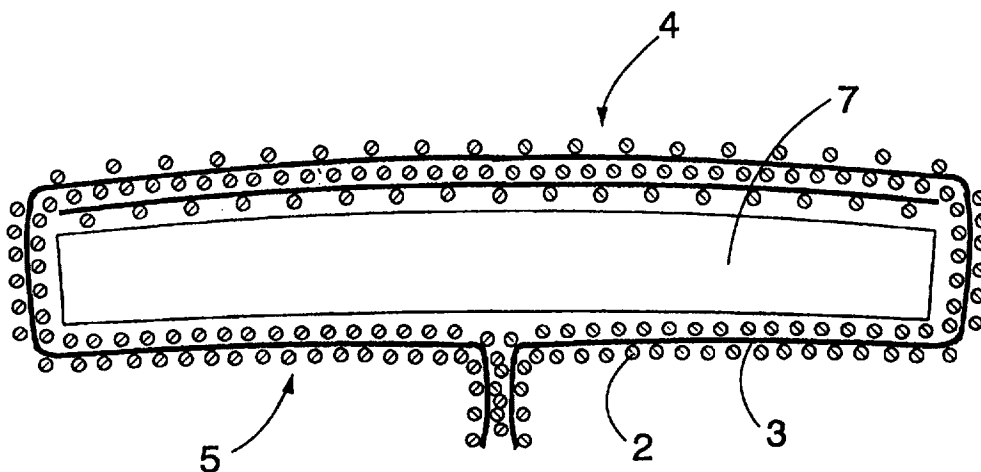




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(54) Title: METHOD OF PRODUCING FILTER BAGS, AND A FILTER BAG

**(57) Abstract**

The invention relates to a method of producing a filter bag to be positioned around the filter cassette of a drum filter, and a filter bag produced by this method. According to the method, a filter weave is woven comprising a distance of at least two inseparably interwoven weave layers alternating with at least two weave layers woven separately one on top of another. At least one of the superimposed separate weave layers is an one-layer auxiliary weave (5). Preferably, a plurality of adjacent filter bags is woven, the adjacent filter bags being separated from each other by cutting. The filter bag woven according to the method comprises a two-layer filter weave (4), intended to be arranged against the perforated filtering surface of a filter cassette (7), and a one-layer auxiliary weave (5) for the other surfaces of the filter cassette. The filter bag can be shrunk tightly around the filter cassette (7), since it is made of threads that shrink when exposed to heat.

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METHOD OF PRODUCING FILTER BAGS, AND A FILTER BAG

The invention relates to a method of producing a filter bag to be positioned around the filter cassette of a drum filter, wherein filter weave is woven of threads that at least partially shrink when exposed to heat, the filter weave being formed of warp threads running in the weaving direction and transverse weft threads.

The invention further relates to a filter bag which can be positioned around the filter cassette of a drum filter and is woven of threads that at least partially shrink when exposed to heat, such that it can be shrunk tightly around the filter cassette by means of heat.

Various filter apparatuses, such as disc filters and drum filters, are used for removal of liquid, usually water, from a mixture of liquid and dry solids. Typically, a disciform filter comprises a plurality of filter segments inserted into filter bags, and the installation openings in the filter bags have been closed. The filter disc is placed rotatably into a basin into which the mixture of water and dry solids is introduced. The liquid in the mixture is allowed to permeate through the filter bag, which is permeable to liquid, to the inside of the body of the filter segment from where the liquid is led out in a suitable manner. Doctor blades or water jets are disposed against the surfaces of the disk for removing dry solids remaining on the surfaces of the disc, whereby the filtering capacity can be continuously retained good.

A drum filter is a commonly used filtering apparatus in forestry, mining and other industries. In section, a conventionally constructed drum filter is a round tube, through whose mantle openings are arranged to allow liquid to flow from the periphery of the drum filter into its inner parts. Typically, a two-layer filter wire with good liquid permeability is woven of threads that shrink in heat and joined together in a certain manner at its seams on the periphery of the drum filter and is then shrunk tightly against the outer mantle of the drum filter by means of heat. Thread that shrinks when exposed to heat refers to thread that is used for producing weave and can be shortened in the longitudinal direction by means of heat to the extent that the change in length can be utilized in a desired manner. A drawback of the type of drum filter described above is, however, that when a small limited area only of the filter wire is damaged, the entire filter wire has to be changed or at least a new wire part has to be arranged at the damaged point around the drum. Changing a filter wire is also laborious and requires that the mixture to be filtered be removed from the

mixture tank which has to be cleaned before the change can be carried out. Another drawback is that the seam or possibly several seams of a filter wire are constantly exposed to stress on the periphery of the drum filter, this often resulting in the filter wire having to be changed owing to a damaged seam before the other parts of the filter wire require changing. Thus, the use of the above described drum filter structure is uneconomical and causes long and frequent production stoppages.

Another drum filter is known, whose periphery is provided with sector-like filter cassettes side by side covering the entire mantle of the drum filter. The filter cassettes are detachable by pulling the filter cassette at the end of the drum filter in the axle direction of the drum filter, the filter cassette being completely detachable from the drum filter. The old filter bag can be then removed, and a new filter bag arranged around the filter cassette, the filter bag being an open filter structure at least at one of its ends. The filter bag is then shrunk by means of heat around the filter cassette, and the filter cassette with the filter bag is inserted in place in the drum filter. The filtering surface of the filter bag to be arranged around the filter cassette of the drum filter has to be of a two-layer weave in order to tolerate the forces it is exposed to and to ensure a good filtering result. For efficient removal of water from the mixture of water and dry solids mass and to separate dry solids from the liquid in the desired manner, the liquid permeability and the dry solids holding capacity of the filter weave should be in appropriate proportion to each other. Furthermore, dimensional stability and durability under demanding circumstances are required of a filter wire.

In accordance with prior art, a filter bag is made by weaving a double interwoven filter wire of the width of the drum filter of threads that shrink when exposed to heat. A weaving machine is used to weave a wire weave of the width of the drum filter, and suitable pieces of filter wire extending around the filter cassette are cut from the weave. The thread ends at the cutting point are melted to eliminate unravelling. The free ends of the two-layer filter wire weave are placed one upon another and sewn together by a bonding stitch extending through both wire weaves. This way a sock-like structure, open at both ends, is formed of the filter wire piece. One end is then fastened by stitches. The resulting filter bag is arranged around the filter cassette such that the seam is placed against the outer surface of the base of the filter cassette, the seam being protected against stress. The weaving direction of the filter

sock arranged around the filter cassette is parallel to the direction of the periphery of the drum filter. Hence it is sufficient for the warp threads in the weaving direction to be made of material that shrinks when exposed to heat. The filter bag arranged around the filter cassette is shrunk by means of heat
5 against the surfaces of the filter cassette. This way the filter bag settles tightly against the shape of the cross-sectional surface of the filter cassette ensuring that the filter bag cannot essentially move or crease in spite of the forces the weave is exposed to. Threads that shrink when exposed to heat are rarely used as weft threads, since this would cause the filter bag arranged around
10 the filter cassette to shrink also in the axial direction of the drum filter when exposed to heat.

When weaving a filter weave of the length of a drum filter and intended to be formed into a filter bag by bonding stitches, unfortunately the entire capacity of the weaving machine can seldom be utilized. The width of a
15 drum filter is typically 2 to 4 metres, the width of modern weaving machines being up to 12 metres. This makes the method inefficient when a narrow filter wire is being woven by a wide weaving machine. Weaving a filter bag with a known method is not economical because of the inefficient utilization of the capacity of the weaving machine. Furthermore, using this kind of a filter bag
20 structure is uneconomical since the entire filter bag is of a two-layer weave, whereas from the point of view of usage, only the filter wire portion disposed against the upper surface of the filter cassette has to be of a two-layer weave. A filter bag made entirely of a two-layer weave wastes filter wire material.

The object of the present invention is to provide an economic and
25 efficient method of producing a filter bag, and a filter bag made by this method.

The method of producing a filter wire according to the invention is characterized by weaving a filter weave comprising a distance of an interwoven portion with at least two weave layers woven together inseparably, alternating with a distance of a portion comprising at least two separate superimposed weave layers, at least one of the separate superimposed layers comprising one layer, whereby said weave portion comprising at least two layers is
30 arranged against the filter surface of the filter cassette, and the one-layer weave portion is arranged on the opposite side of the filter surface of the filter cassette.

35 The filter bag made by the method of the invention is characterized in that the filter bag consists of filter weave comprising a distance of an inter-

woven portion with at least two weave layers woven together inseparably, alternating with a distance of a portion comprising at least two separate superimposed weave layers, at least one of the separate superimposed layers comprising one layer, whereby at least the weave portion comprising two layers
5 can be arranged against the filter surface of the filter cassette, and the one-layer weave portion can be arranged on the opposite side of the filter surface.

The essential idea of the invention is that the filter bag is made by weaving a filter wire weave preferably over the whole width of the weaving machine, the filter wire weave preferably comprising in the lateral direction
10 transverse relative to the weaving direction of the wire a distance of a two-layer interwoven filter weave alternating with a distance of two separate superimposed one-layer auxiliary weaves, so that several filter bag preforms formed of the filter and auxiliary weaves are woven simultaneously in the lateral direction of the weaving machine, the preforms being separable by cutting
15 the auxiliary weave appropriately in the weaving direction near the joint of the auxiliary weave and the filter weave, so that both edges of the filter weave portions comprise one auxiliary weave portion. The free ends of the auxiliary weaves attached to the edges of the filter weave are placed one on top of another and joined together by a bonding stitch extending through the auxiliary
20 weaves thereby forming a sock-like structure, open at both ends, into which the filter cassette can be inserted. The auxiliary weaves are joined together such that the cutting seams at the edges of the filter weaves of the cut auxiliary weaves remain covered inside the filter sock, eliminating any danger of the threads starting to unravel. Furthermore, one end of the sock-like structure is
25 closed by a bonding stitch whereby a filter bag is formed.

The above described filter bag comprises a filter weave portion to be arranged against the filter surface of the filter cassette, and an one-layer auxiliary weave portion to be adapted against the sides and base of the filter cassette. Thus, the seam of the filter bag is positioned against the base of the
30 filter cassette.

The idea of another embodiment of the method according to the invention is to weave a filter wire structure extending preferably over the entire width of the weaving machine, the filter wire comprising preferably in the lateral direction of the wire weave a distance of a three-layer interwoven seam
35 weave with weft threads in three superimposed layers, alternating with a distance of a weave structure with a two-layer interwoven filter weave and a

separate one-layer auxiliary weave one on top of another, woven in the lateral direction. A three-layer seam structure forms the joint of the filter and auxiliary weaves of the filter bag. By weaving separate filter and auxiliary weaves which are joined at the seam, a bag-like structure is formed, a space remaining between the filter weave and the auxiliary weave into which the filter cassette
5 can be inserted. The two-layer filter weave is arranged against the suitably perforated surface disc of the filter cassette, and the one-layer auxiliary weave against the base of the filter cassette, the joint of the filter weave and the auxiliary weave being positioned at the side wall of the filter cassette. In this way
10 the three-layer seam weave is not exposed to any wear during the use of the drum filter.

The advantage of the method of producing a filter bag according to the idea of the invention is that the filter weave can be woven preferably over the entire width of a weaving machine and that several adjacent filter bags can
15 be woven simultaneously in the lateral direction of the filter wire weave, filter bags being produced considerably efficiently and fast. A further advantage is that in this way the capacity of the weaving machine is well utilized, whereby the price of the filter bags produced by this method is lower than that of the filter bags woven by prior methods. The method can be economically justified
20 also in that by producing filter bags according to the method, thread material savings are achieved as the auxiliary weaves of the filter bag are of an one-layer weave, and the filter weave, which is critical as to the filtering result, is of a double weave structure.

It is still an advantage that the finished filter bag weave can be
25 woven for filter cassettes with the same cross-sectional shape, whereby suitable filter bags can be provided for the filter cassettes of drum filters of different widths by changing the cutting length. Furthermore, similar filter bags can be woven side by side, or alternatively the adjacent filter bags can have different filter and auxiliary weaves widths, allowing filter bags of several different
30 filter cassette models to be woven simultaneously.

It is the advantage of still another embodiment of the invention, wherein a three-layer seam weave and two separate weaves, a filter weave and an auxiliary weave are woven alternately, that said structure requires bonding stitches only for closing one end of the filter bag, making its produc-
35 tion extremely fast. In addition, cutting different filter bags woven side by side at the seam weave is fast and easy. It is still an advantage that the filter wire

structure can be entirely utilized, i.e. the edges in the weaving direction comprise no waste weave at all.

The invention will be described more closely in the attached drawings, in which

5 Figure 1 schematically shows a partial section of a filter weave structure woven according to the invention and seen in the weaving direction,

 Figure 2 schematically shows a section of a filter bag formed of a filter wire weave woven by the method of the invention, seen in the direction of the weft threads,

10 Figure 3 schematically shows a section of a filter bag made by the method of the invention and arranged around a filter cassette, seen from the end of the filter cassette,

 Figure 4 schematically shows a section of another filter bag made by the method of the invention and arranged around a filter cassette, seen
15 from the end of the filter cassette, and

 Figure 5 shows a section of a drum filter implemented by the filter cassette structure, seen from the end of the drum filter.

 Figure 1 schematically shows a partial section of a filter weave structure woven according to the invention and seen in the weaving direction.
20 A filter weave 1 is formed by weaving a two-layer interwoven filter weave 4 alternating with two separate superimposed one-layer auxiliary weaves 5 of warp threads 2 in the weaving direction and of weft threads 3 in a direction transverse to the weaving direction, preferably over the entire width of the weaving machine. Figure 1 also shows the cutting points 6 of the auxiliary
25 weave 5 next to the join of the auxiliary weave 5 and the filter weave 4. A plurality of separate adjacent filter weaves 4 can be formed of the filter weave 1 by appropriately cutting the auxiliary weaves 5 at the cutting points 6 shown in Figure 1 in the weaving direction, the edges of the filter weaves 4 comprising auxiliary weave 5 over a distance.

30 The weaving width of the alternating filter weaves 4 and the auxiliary weaves 5 in the lateral direction of the filter weave 1 is adapted according to the dimensions of the filter cassette such that the width of the filter weave 4 corresponds to the perforated surface disc of the filter cassette, and that the weaving width of the auxiliary weaves 5 has to be such that the auxiliary
35 weaves 5 extend around the filter cassette. In case different filter cassettes with variable thickness are used, the weaving width of the auxiliary weaves 5

is dimensioned according to the highest filter cassette type to be used, whereby the same filter bag can be used also for lower filter cassettes by sewing the superimposed auxiliary weaves 5 at a suitable point by a bonding stitch and by cutting off the extra free ends of the auxiliary weaves 5, whereby
5 suitable filter bags for lower filter cassette types can be produced of a filter bag woven according to a higher filter cassette type, as long as the perforated surface disc of the filter cassette still has the same width.

The cutting length of the filter weave 1 in the weaving direction is dimensioned according to the width of the drum filter, whereby portions of a
10 suitable length are obtained of the same filter weave 1 by cutting suitable filter bags for drum filters of different width. The filter weave 1 may be woven complete, and suitable portions may be cut off when needed according to the purpose of use. The weaving direction of the filter weave 1 arranged around the filter cassette is in the axle direction of the drum filter, i.e. the weaving direc-
15 tion of the filter bags differs from their travel direction.

Figure 2 schematically shows how a sock structure, open at both ends, is obtained from the filter weave 1 which is woven in accordance with Figure 1 and from which the one-layer auxiliary weaves 5 have been cut off in accordance with Figure 1 by arranging the free ends of the one-layer auxiliary
20 weaves 5 one on top of another and by joining both ends by a bonding stitch, part the sock structure being a two-layer filter weave 4 and part an one-layer auxiliary weave 5. The numbering of Figure 2 corresponds to that of Figure 1. The cutting edge of the one-layer auxiliary weave 5 cut off from the edge of the two-layer interwoven filter weave 4 remains inside the filter bag, the cutting
25 edge being against the surface of the filter cassette and thus protected from wear. The bonding stitch is sewn through both one-layer auxiliary weaves 5 in a manner known per se at the ends of the weave portions. If needed, the bonding stitch can be arranged at another point than their free ends in the auxiliary weaves 5, whereby the filter bag becomes suitably tight also for lower
30 filter cassettes. One end of the filter bag preform is closed by a bonding stitch or in another manner, whereby a bag open at one end is obtained.

Figure 3 schematically shows the filter bag according to Figure 2, arranged around the filter cassette 7 and shrunk tightly against the filter cassette 7 by means of heat. The numbering of Figure 3 corresponds to that of
35 the previous Figures. The filter bag is arranged around the filter cassette 7 such that the two-layer interwoven filter weave 4 is arranged against the perfo-

rated upper disc of the filter cassette 7, whereby the seam joining the one-layer auxiliary weaves 5 is positioned against the base surface of the filter cassette 7, the seam being protected from stress under the filter cassette 7. At least the weft threads 3 have to be of a material that shrinks when exposed to heat so that the filter bag can be shrunk tightly by means of heat to correspond to the shape of the cross-sectional surface of the filter cassette 7.

The liquid having penetrated the filter weave 4 of the filter sock is carried further via the openings in the upper disc of the filter cassette 7 to the empty space between the upper disc and the base disc of the filter cassette 7, from where the filtered liquid is led forward in a suitable manner.

Figure 4 schematically shows a partial section of another filter bag made by the method of the invention, arranged around the filter cassette 7 and shrunk tightly against the surface of the filter cassette 7, seen from the end of the filter cassette 7. The filter weave comprises a three-layer interwoven seam weave 8 alternating with a separate two-layer interwoven filter weave 4 and an one-layer auxiliary weave 5, one on top of another in the lateral direction. Filter bags are formed of this filter weave by cutting off the adjacent filter bags in the lateral direction of the weaving machine from each other in the weaving direction at the seam weave 8. It is simplest to cut off the filter bags woven side by side in the lateral direction by cutting in the weaving direction, whereby, if needed, the threads of the cutting edge can be melted so that the structure does not start to unravel. If desired, the seam can naturally be secured also by sewing it through all three layers. An empty space is formed between the two-layer interwoven filter weave 4 and the one-layer auxiliary weave 5, into which the filter cassette can be inserted from the open end of the filter bag such that the filter weave 4 is positioned against the perforated surface disc of the filter cassette 7, and the seam weave 8 at the join of the filter weave 4 and the auxiliary weave 5 is positioned on both sides of the filter cassette 7 against the side discs of the filter cassette 7. The filter sock according to Figure 4 is easy and fast to produce.

Figure 5 schematically shows the principle of a filter cassette type of drum filter in section and seen from the end of the drum filter. Filter cassettes are arranged side by side on the periphery of the drum filter, covering the entire mantle of the drum filter. The length of the filter cassettes essentially corresponds to the width of the drum filter. The filter cassettes are arranged into their holders such that the filter cassettes can be pulled out and pushed in in

the axial direction of the drum filter for removal of an old filter bag and for insertion of a new one.

The drawings and the related description are only intended to illustrate the idea of the invention. The details of the invention may vary within the scope of the claims. Thus, different bonding structures and combinations thereof can be used for weaving the filter bag according to the invention. Furthermore, weft and warp threads of different materials may be used according to the need, affecting the characteristics of the wire weave. Still further, weft and warp threads with different sectional shapes may be selected, e.g. round, elliptic, and rectangular, or some other shape.

The filter bags produced by the method according to the invention are by no means restricted to be used around the filter cassettes of drum filters only; the method of the invention, and the sock-like weaves produced by it can also be applied to other types of purposes, if desired.

The shape of the filter cassette does not have to be equal to that shown in the Figures, but can be shaped suitable for the purpose in each particular case. The method of producing filter bags according to the invention, and the filter bags produced by this method can be used irrespective of the shape of the filter cassette.

If needed, both ends of the filter bag may be open. Furthermore, filter bags may be woven side by side either in the lateral direction or in the longitudinal direction.

CLAIMS

1. A method of producing a filter bag to be positioned around the filter cassette (7) of a drum filter, wherein filter weave is woven of threads that at least partially shrink when exposed to heat, the filter weave being formed of
5 warp threads (2) running in the weaving direction and transverse weft threads (3), **characterized** by weaving a filter weave comprising a distance of an interwoven portion with at least two weave layers woven together inseparably, alternating with a distance of a portion comprising at least two separate superimposed weave layers, at least one of the separate superimposed layers
10 comprising one layer, whereby said weave portion comprising at least two layers is arranged against the filter surface of the filter cassette (7), and the one-layer weave portion is arranged on the opposite side of the filter surface of the filter cassette.

2. A method as claimed in claim 1, **characterized** by weaving
15 a distance of a two-layer interwoven filter weave (4) alternating with a distance of two superimposed separate one-layer auxiliary weaves (5), the filter weaves (4) woven at a distance from each other being cut off from each other such that a distance of auxiliary weave (5) remains at both edges of the filter weaves (4), and that the auxiliary weaves (5) are joined at the ends by a
20 bonding stitch.

3. A method as claimed in claim 1, **characterized** by weaving
a distance of a three-layer interwoven seam weave (6) alternating with a distance of superimposed separate two-layer interwoven filter weave (4) and an one-layer auxiliary weave (5) such that a space is formed between the filter
25 weave (4) and the auxiliary weave (5), into which the filter cassette may be inserted, and that adjacent woven filter socks are cut off from each other at the seam weave (6).

4. A method as claimed in any one of the previous claims, **characterized** in that a plurality of adjacent weave portions, interwoven and
30 separately woven, are formed in the lateral direction of the filter wire weave.

5. A method as claimed in claim 4, **characterized** in that filter bag preforms are woven side by side in the lateral direction of the wire weave, and the widths of the alternating weave portions woven in the lateral direction are adapted so that a plurality of filter bag preforms corresponding to
35 different filter cassette sizes can be woven simultaneously over the weaving

width.

6. A method as claimed in any one of the previous claims, **characterized** in that only the threads in the cross direction of the filter cassette (7) are made of a material that essentially shrinks when exposed to heat.

5 7. A method as claimed in any one of the previous claims, **characterized** in that one end of the filter bag is closed by sewing such that the filter cassette (7) can be inserted into the filter bag from the other end.

8. A filter bag which can be positioned around the filter cassette (7) of a drum filter and is woven of threads that at least partially shrink when exposed to heat, such that it can be shrunk tightly around the filter cassette (7) by means of heat, **characterized** in that the filter bag consists of filter weave comprising a distance of an interwoven portion with at least two weave layers woven together inseparably, alternating with a distance of a portion comprising at least two separate superimposed weave layers, at least one of
10 the separate superimposed layers comprising one layer, whereby at least the weave portion comprising two layers can be arranged against the filter surface of the filter cassette, and the one-layer weave portion can be arranged on the opposite side of the filter surface.

9. A filter bag as claimed in claim 8, **characterized** in that
20 the filter bag comprises a distance of a two-layer interwoven filter weave (4) alternating with a distance of two superimposed separate one-layer auxiliary weaves (5), the filter weaves (4) woven at a distance from each other being cut off from each other such that a distance of auxiliary weave (5) remains at both edges of the filter weaves (4), and that the auxiliary weaves (5) are joined
25 at the ends by a bonding stitch.

10. A filter bag as claimed in claim 8, **characterized** in that the filter bag comprises a distance of a three-layer interwoven seam weave (6) alternating with a distance of superimposed separate two-layer interwoven filter weave (4) and an one-layer auxiliary weave (5) such that a space is
30 formed between the filter weave (4) and the auxiliary weave (5), into which the filter cassette may be inserted, and that adjacent woven filter socks are cut off from each other at the seam weave (6).

11. A filter bag as claimed in claim 8 to 10, **characterized** in that only the threads in the cross direction of the filter cassette (7) are made of
35 a material that essentially shrinks when exposed to heat.

12. A filter bag as claimed in claim 8 to 11, **characterized** in

that one end of the filter bag is closed by sewing such that the filter cassette (7) can be inserted into the filter bag from the other end.

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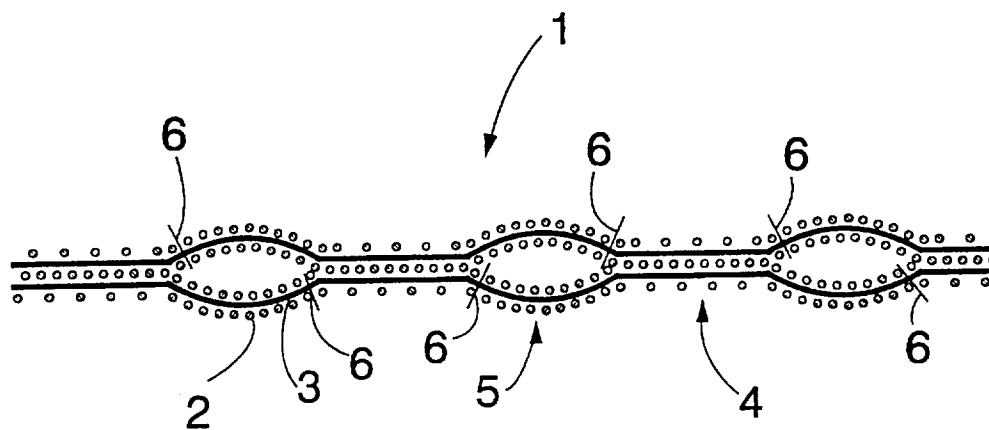


FIG. 1

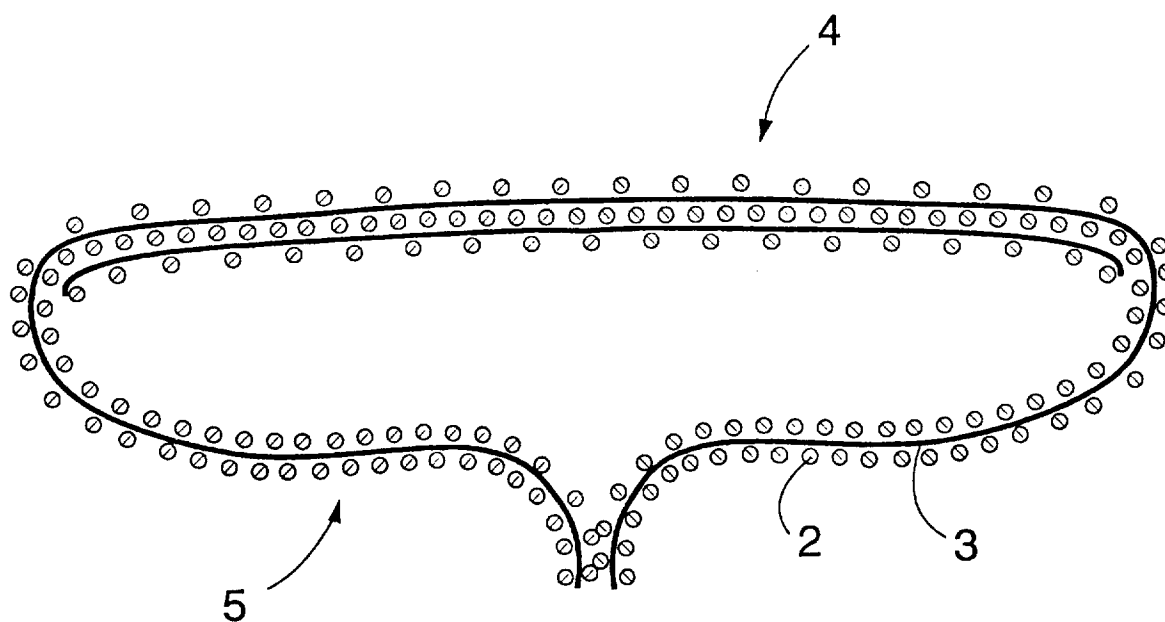


FIG. 2

2/3

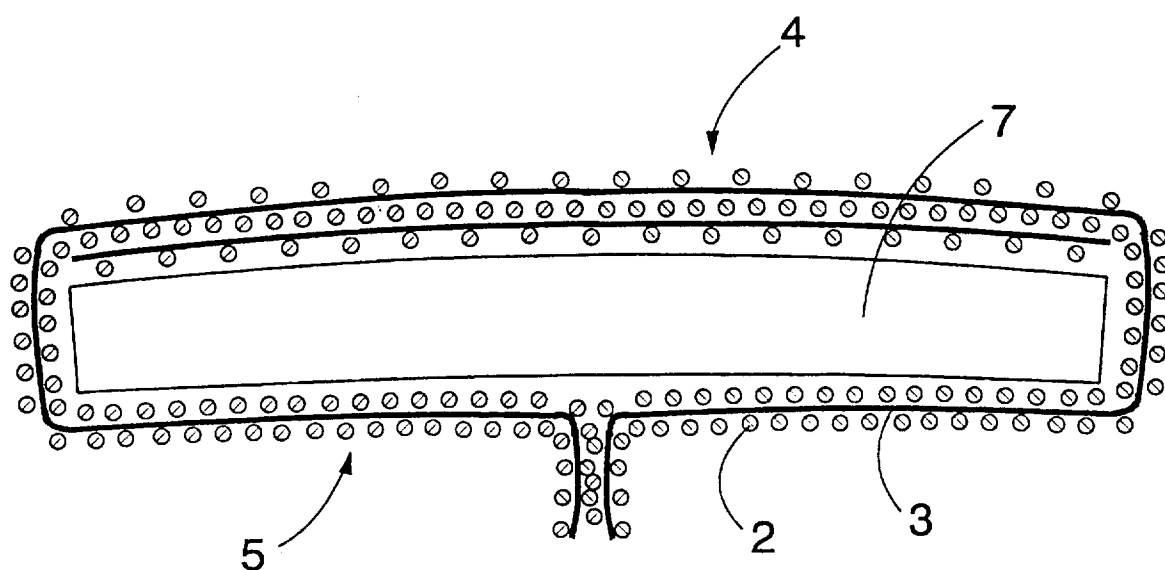


FIG. 3

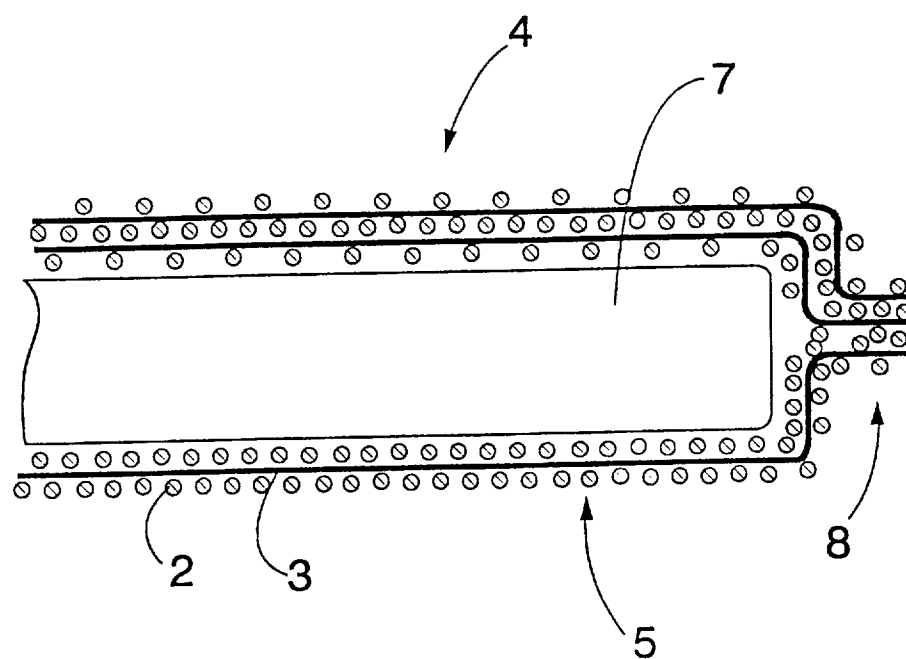


FIG. 4

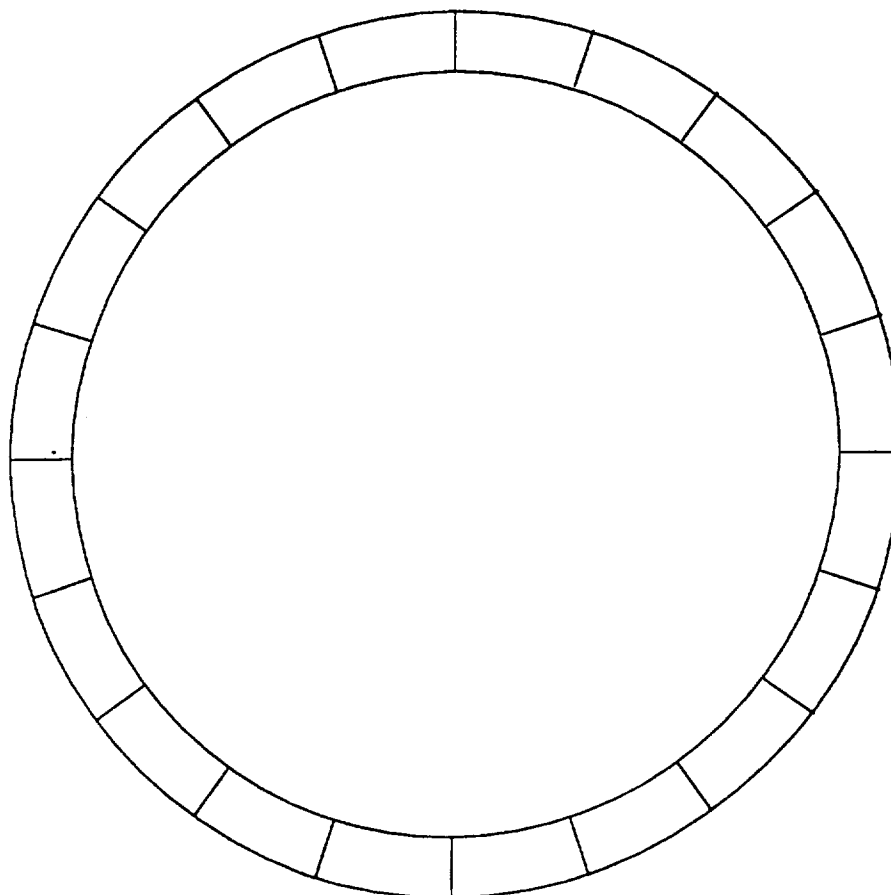


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 97/00529

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B01D 33/056, B01D 32/08, D21F 7/10

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)

IPC6: B01D, D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5377722 A (ERKKI JAALA), 3 January 1995 (03.01.95) --	1,8
A	US 4683624 A (MARCEL DUFOUR), 4 August 1987 (04.08.87), abstract --	1,8
A	US 3965011 A (JOHN A. SHEAFFER), 22 June 1976 (22.06.76), column 5, line 31 - column 6, line 9, figures 3b,6 -----	1,8



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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Patent document cited in search report			Publication date	Patent family member(s)	Publication date
US	377722	A5	03/01/95	NONE	
US	4683624	A	04/08/87	CA 1286135 A EP 0193075 A,B SE 0193075 T3 FR 2577581 A,B JP 61245395 A US 4958673 A US 5082532 A	16/07/91 03/09/86 22/08/86 31/10/86 25/09/90 21/01/92
US	3965011	A	22/06/76	AU 498042 B AU 1274576 A BR 7602781 A CA 1066635 A DE 2619537 A DK 198276 A FR 2310147 A,B GB 1486533 A IN 145095 A JP 1245645 C JP 51134471 A JP 58057964 B SE 412856 B,C SE 7604382 A ZA 7602047 A	01/02/79 13/10/77 09/11/76 20/11/79 18/11/76 06/11/76 03/12/76 21/09/77 19/08/78 25/12/84 20/11/76 22/12/83 24/03/80 06/11/76 30/11/77