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(54) **Spinning pack**

(57) [OBJECT] A spinning pack that is capable of minimizing polymer leakage that might be caused due to dimensional errors of gaskets and of gasket-fitted portions is provided.

[MEANS OF REALIZING THE OBJECT] A spinning pack (10) is attached to a spin block (4) of a melt-spinning apparatus (50). The spinning pack (10) includes a link member (20), a lid member (30), and a gasket (60). The link member (20) is attached to the spin block (4) and

has a plurality of first polymer conduits (20A, 20B) in the link member (20). The lid member (30) is disposed below the link member (20) and has a plurality of second polymer conduits (30A, 30B) in the lid member (30). The gasket (60) is disposed between the lid member (30) and the link member (20) and has a plurality of polymer holes (60A, 60B) in the gasket to communicate with the plurality of first and second polymer conduits (20A, 20B) and (30A, 30B).

Fig. 3A

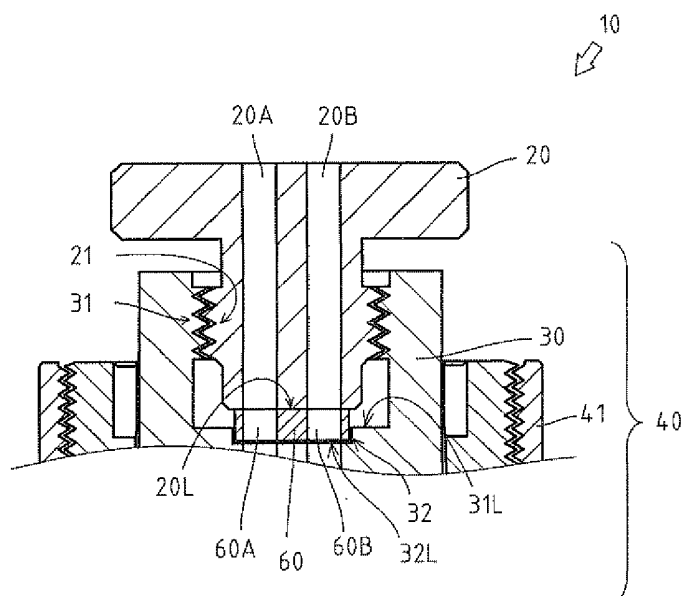
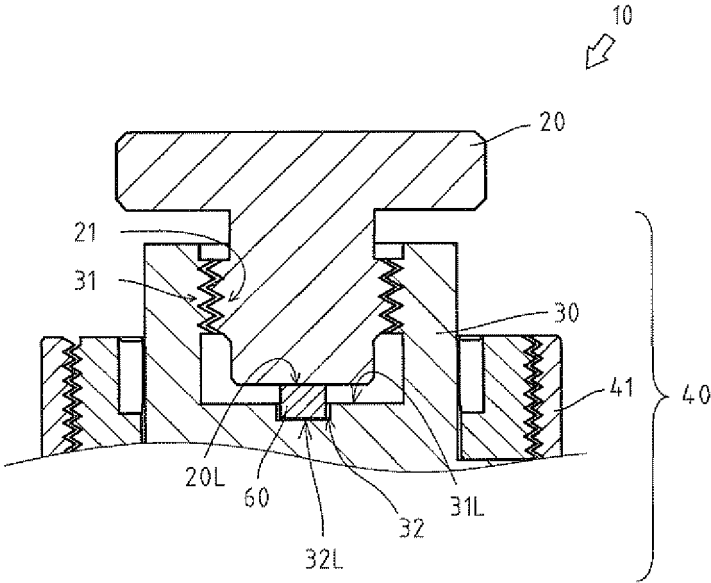


Fig. 3B



Description

[TECHNICAL FIELD]

[0001] The present invention relates to spinning packs, and more particularly, to a technique regarding configurations of gaskets for spinning packs.

[BACKGROUND ART]

[0002] Conventionally, melt-spinning apparatuses are known that melt thermoplastic resin (polymer) at high temperatures, extrude the molten polymer through fine nozzles, and wind the extruded polymer while cooling it to form it into a yarn. A spinning pack is also known to be attached to a heating barrel of the melt-spinning apparatus to filter highly heated and highly pressurized polymer and straighten the flow of the polymer, and then to discharge the filtered and flow-straightened polymer through a multiplicity of spinneret holes.

[0003] A spinning pack body is configured to be removable from a link member attached to a spin block serving as a heating barrel considering maintenance such as washing of the interior of the spinning pack body. Also, the spinning pack body is attached to the link member via a gasket to provide communication without leakage between a polymer conduit formed in the link member and a polymer conduit formed in the spinning pack body (for example, Patent document 1).

[0004] In order to improve the productivity of melt-spinning apparatuses, recently used spinning packs each have therein a plurality of polymer conduits. Conventionally, in such a spinning pack having therein a plurality of polymer conduits, a plurality of gaskets are each individually provided between the link member and the spinning pack body of each of the plurality of polymer conduits.

[0005] These gaskets, however, have dimensional errors, and corresponding gasket-fitted portions of the link member side or of the spinning pack body side also have dimensional errors. Due to such dimensional errors, when a spinning pack body is attached to a link member, differences in tightening force may occur among the gaskets of the polymer conduits, which in turn causes degradation of sealability between the link member and the spinning pack body, resulting in polymer leakage.

[RELATED ART DOCUMENTS]

[PATENT DOCUMENTS]

[0006] [Patent Document 1] Japanese Unexamined Patent Application Publication No. 9-41215.

[DISCLOSURE OF THE INVENTION]

[Problems to be Solved by the Invention]

[0007] In order to solve the problems, it is an object of

the present invention to provide a spinning pack that is capable of minimizing polymer leakage that might be caused due to dimensional errors of gaskets and of gasket-fitted portions.

[MEANS OF SOLVING THE PROBLEMS]

[0008] The problems to be solved by the present invention have been described hereinabove, and subsequently, means of solving the problems are described.

[0009] According to one aspect of the present invention, a spinning pack is attached to a heating barrel of a melt-spinning apparatus. The spinning pack includes a link member, a lid member, and a gasket. The link member is attached to the heating barrel and has a plurality of first polymer conduits in the link member. The lid member is disposed below the link member and has a plurality of second polymer conduits in the lid member. The gasket is disposed between the lid member and the link member and has a plurality of polymer holes in the gasket to communicate with the plurality of first and second polymer conduits.

[0010] According to a second aspect of the present invention, in the first aspect of the present invention, the link member may include a groove portion on a surface thereof contacting the gasket. The groove portion is around opening portions of the plurality of first polymer conduits.

[0011] According to a third aspect of the present invention, in the first or second aspect of the present invention, the link member and the lid member may have an axial direction parallel to the plurality of first polymer conduits and to the plurality of second polymer conduits, and have a circumferential direction that is rotational about the axial direction. The gasket may include rotation restricting means for restricting rotation of the gasket in the circumferential direction.

[0012] According to a fourth aspect of the present invention, in any one of the first to third aspects of the present invention, the lid member may include a gasket engagement portion on a surface of the lid member on which the gasket is disposed, and the gasket may be engaged with the gasket engagement portion.

[0013] According to a fifth aspect of the present invention, in any one of the first to third aspect of the present invention, the gasket may have a circular outline. The lid member may include a gasket engagement portion on a surface of the lid member on which the gasket is disposed. The gasket engagement portion may include a pin engagement portion. The gasket may have a pinhole passing through the gasket. The gasket may be engaged with the lid member with a pin engaged with the pin engagement portion and the pinhole.

[EFFECTS OF THE INVENTION]

[0014] The spinning pack according to the embodiments of the present invention minimizes polymer leak-

age that might be caused due to dimensional errors of gaskets and due to processing errors of gasket-fitted portions.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0015]

[FIG. 1] FIG 1 is a schematic diagram illustrating a general arrangement of a melt-spinning apparatus including a spinning pack according to one embodiment of the present invention.

[FIGs. 2A and 2B] FIG. 2A is a cross-sectional view of the spinning pack illustrating a general arrangement thereof, and FIG. 2B is a plan view of the spinning pack.

[FIGs. 3A and 3B] FIG 3A is a cross-sectional view of the spinning pack illustrating an arrangement of a gasket of the spinning pack, and FIG. 3B is a cross-sectional view of the spinning pack from a different angle.

[FIGs. 4A and 4B] FIG. 4A is a plan view of the gasket of the spinning pack, and FIG. 4B is a cross-sectional view of the gasket of the spinning pack.

[FIGs. 5A and 5B] FIG. 5A is a cross-sectional view of a link member of the spinning pack, and FIG. 5B is a bottom view of the link member of the spinning pack.

[FIGs. 6A and 6B] FIG. 6A is a cross-sectional view of a spinning pack according to another embodiment of the present invention illustrating an arrangement of a gasket of the spinning pack, and FIG. 6B is a cross-sectional view of the spinning pack from a different angle.

[FIGs. 7A and 7B] FIG. 7A is a plan view of the gasket, and FIG 7B is a cross-sectional view of the gasket.

[FIGs. 8A and 8B] FIG. 8A is a plan view of a gasket of a spinning pack according to still another embodiment of the present invention, and FIG. 8B is a cross-sectional view of the gasket.

[BEST MODE FOR CARRYING OUT THE INVENTION]

[0016] With reference to FIG. 1, a melt-spinning apparatus 50 including a spinning pack 10, which is one embodiment of the present invention, will be described.

The melt-spinning apparatus 50 extrudes a thermoplastic resin (polymer) molten at high temperatures through fine nozzles and winds the polymer while cooling it to form it into a yarn. There are two types of melt-spinning apparatuses: POY (partially oriented yam) spinning apparatuses to wind POYs, and FDY (full drawn yarn) spinning apparatuses to wind FDYs. The spinning pack 10 according to the present invention is applicable to both a POY spinning apparatus and an FDY spinning apparatus, and in the present embodiment, the spinning pack 10 will be described as an FDY spinning apparatus.

[0017] The melt-spinning apparatus 50 includes a hopper 1 into which polymer chips dried at high temperatures are transferred; an extruder 2 to melt the polymer chips to a spinnable viscosity and to discharge the polymer at high pressure; a polymer pipe 3 to feed the discharged molten polymer to a spin block 4 as described below; a spin block 4 serving as a heating barrel that contains a heating medium and includes a gear pump (not shown) as constant quantity supplying means; and a spinning pack 10 attached to the spin block 4 to filter the heated polymer supplied at a constant quantity from the gear pump, to straighten the flow of the heated polymer, and to discharge the filtered and flow-straightened polymer at high pressure.

[0018] The melt-spinning apparatus 50 also includes a cooling chimney 5 to cool a yarn Y spun from the spinning pack 10 using a cooling pipe; an oil supplying guide 6 to supply to the yarn Y an oil solution for reducing friction with the guide and other element, for keeping static charge off the yarn Y, and for providing flexibility to the yarn Y; an entangling nozzle 7 to cause an appropriate level of turbulence to the flow of the yarn Y so as to homogenize the oil solution supplied to the yarn Y; a first roller 8a and a second roller 8b to change the direction of the yarn Y; and a winder 9 to wind the yarn Y as an undrawn yarn.

[0019] Referring to FIGs. 2A, 2B, 3A, and 3B, the spinning pack 10 will be described. It is noted that the arrow Z shown in FIG 2B indicates the axial direction of the spinning pack 10 and the component parts of the spinning pack 10, and the pointing direction of the arrow Z is the upper side. Also, an arrow X shown in FIG. 2A indicates the circumferential direction of the spinning pack 10 and the component parts of the spinning pack 10.

FIG. 3A shows a cross-sectional view of the spinning pack 10 taken along the line A-A in FIG. 2A, and FIG 3B shows a cross-sectional view taken along the line B-B in FIG 2A, which is a 90-degree rotation of the cross section shown in FIG. 3A.

[0020] The spinning pack 10 includes a link member 20 and a spinning pack body 40. The spinning pack body 40 is configured to be removable from the link member 20 considering maintenance such as washing of the interior of the spinning pack body 40 and the like is performed. A gasket 60 is a consumable supply that is replaced every time maintenance of the spinning pack body 40 is carried out. The link member 20 joints the spin block 4 and the spinning pack body 40 to one another, and is attached to the spin block 4 in advance using a bolt (not shown). The link member 20 includes a convex portion 21 that is oriented downward, and two polymer conduits 20A and 20B in the axial direction inside the link member 20. A male screw portion is formed on the periphery of the convex portion 21.

[0021] The spinning pack body 40 is attached to the link member 20 via the gasket 60, and includes a lid member 30, a retainer 42, and a spinneret 43 inside a cylindrical contour 41 of the spinning pack body 40.

[0022] The lid member 30 is disposed as an uppermost portion of the spinning pack body 40, and includes two polymer conduits 30A and 30B respectively communicating with the above-described polymer conduits 20A and 20B of the link member 20 in the axial direction inside the spinning pack body 40. The lid member 30 has a concave portion 31 on an upper surface of the lid member 30, and a groove-shaped engagement portion 32 on a bottom surface 31L of the concave portion 31, the engagement portion 32 serving as a gasket-fitted portion to engage with the gasket 60. A female screw portion is formed on a side surface of the concave portion 31. The retainer 42 is disposed below the lid member 30 and includes polymer conduits 42A and 42B respectively communicating with the polymer conduits 30A and 30B in the axial direction inside the retainer 42. A filtering medium, a filter, and other elements are provided along the polymer conduits 42A and 42B. The spinneret 43 is disposed below the retainer 42 and includes a group of spinning hole (not shown) respectively communicating with the polymer conduits 42A and 42B.

[0023] Subsequently, a configuration of the gasket 60, and a configuration of the link member 20 and the lid member 30, which contact the gasket 60, will be described.

As shown in FIG. 4A and 4B, the gasket 60 has an elliptical outline serving as rotation restricting means in plan view of the spinning pack 10 in the axial direction. The gasket 60 includes polymer holes 60A and 60B in the axial direction to respectively communicate with the polymer conduits 30A and 30B of the lid member 30 when the gasket 60 is engaged with the engagement portion 32. The gasket 60 according to the present embodiment is made of an aluminum material, and delta gaskets 70 and 80, which will be described below, are similarly made of an aluminum material. It is noted that the rotation restricting means will be described in detail below.

[0024] The engagement portion 32 of the lid member 30 has an elliptical inner outline similarly to the outline of the gasket 60 in the axial direction, and has a depth in the axial direction that is smaller than the height of the gasket 60 in the axial direction.

[0025] As shown in FIGs. 5A and 5B, grooves 22 are formed around the polymer conduits 20A and 20B on a bottom surface 20L of the link member 20 as if to edge the opening portions of the polymer conduits 20A and 20B at a predetermined space from the edges of the opening portions of the polymer conduits 20A and 20B. Each groove 22 is formed in a V cross section in its formation direction. It is noted that the cross sectional shape of the groove 22 in its formation direction is not limited to V shapes but may be concave shapes.

[0026] Subsequently, the attachment of the gasket 60 will be described.

When the spinning pack body 40 is attached to the link member 20, the gasket 60 is engaged with the engagement portion 32 and thus disposed on the lid member 30. Then, the misalignment of the gasket 60 in the cir-

cumferential direction relative to the spinning pack body 40 is restricted. Then, the spinning pack body 40 is threaded in the circumferential and upward directions against the link member 20 to engage the concave portion 31 with the convex portion 21, thus attaching the spinning pack body 40 to the link member 20. The concave portion 31 of the spinning pack body 40 includes a positioning member (not shown) to align the positions of the polymer conduits 20A and 20B of the link member 20 with the positions of the polymer conduits 30A and 30B of the lid member 30, when the spinning pack body 40 is attached to the link member 20.

[0027] When the spinning pack body 40 is attached to the link member 20, the top surface of the gasket 60 closely fits the bottom surface 20L of the link member 20, while the bottom surface of the gasket 60 closely fits a bottom surface 32L of the engagement portion 32 of the lid member 30. The polymer holes 60A and 60B respectively communicate with the polymer conduits 20A and 20B and with the polymer conduits 30A and 30B.

[0028] Such a configuration provides the following advantages.

Conventionally, a spinning pack with two polymer conduits includes one gasket for one polymer conduit between the link member and the spinning pack body, that is, two gaskets in total. However, use of two gaskets doubles dimensional errors of products, namely of gaskets and gasket-fitted portions, as the number of the gaskets indicates. This may degrade the sealability between the link member and the spinning pack body in a spinning pack.

[0029] The spinning pack 10 of the present embodiment uses one gasket 60 with two polymer holes 60A and 60B respectively communicating with the two polymer conduits 20A and 20B (30A and 30B). This ensures a reduction in the cause of dimensional errors of the gaskets 60 and the engagement portions 32, which serve as gasket-fitted portions, and thus ensures minimized polymer leakage that might be caused due to dimensional errors of the gaskets 60 and the engagement portions 32.

[0030] Further, the link member 20 includes the grooves 22 on the bottom surface 20L around the opening portions of the polymer conduits 20A and 20B, which is advantageous in that when the spinning pack body 40 is attached to the link member 20, the contact area between the top surface of the gasket 60 and the bottom surface 20L reduces compared with the case of a flat bottom surface 20L, and the tightening force required when tightening the spinning pack body 40 is small compared with the case of a flat bottom surface 20L.

[0031] Furthermore, when the spinning pack body 40 is attached to the link member 20, the gasket 60 is fixed in the circumferential direction by the rotation restricting means relative to the spinning pack body 40. This eliminates the need for aligning the two polymer holes 60A and 60B of the gasket 60 respectively with the two polymer conduits 20A and 20B (30A and 30B).

[0032] In this respect, the rotation restricting means

restricts the rotation of the gasket 60 in the circumferential direction when the gasket 60 is rotated in the circumferential direction relative to the engagement portion 32. Specifically, when the gasket 60 is rotated in the circumferential direction, the rotation restricting means contacts any surface of the engagement portion 32 to disallow further movement (rotation) of the gasket 60 in the circumferential direction. That is, the rotation restricting means of the gasket 60 is assumed by the elliptical outline of the gasket 60.

[0033] For example, when the gasket has a circular outline and a protruding portion around the gasket, the protruding portion assumes the rotation restricting means. It is noted that the engagement portion 32 includes an engagement portion for the protruding portion. Alternatively, when the gasket has a circular outline and a protruding portion on the bottom portion of the gasket, the protruding portion assumes the rotation restricting means. It is noted that the engagement portion 32 includes an engagement portion for the protruding portion. Furthermore, when the gasket has an oval outline, this oval outline assumes the rotation restricting means.

[0034] Referring to FIGs. 6A and 6B, an arrangement of the delta gasket 70 according to another embodiment will be described.

FIG. 6A shows a cross-sectional view of the spinning pack 10 corresponding to the cross section along the line A-A shown in FIG. 2A, and FIG. 6B shows a cross-sectional view corresponding to the cross section taken along the line B-B in FIG. 2A, which is a 90-degree rotation of the cross section shown in FIG. 6A.

The convex portion 21 and the concave portion 31 have similar configurations to those described above, and therefore the description of the configurations will not be repeated. In the lid member 30, the engagement portion 32 in a groove shape is formed on the bottom surface 31L of the concave portion 31. The engagement portion 32 has the same circular inner periphery as the outline of the delta gasket 70, which is described below, in a cross-sectional view in the axial direction. The engagement portion 32 also includes two pin engagement portions 33 at positions corresponding to pinholes 71 and 71 of the delta gasket 70, which is described below.

[0035] Referring to FIGs. 7A and 7B, the delta gasket 70 will be described.

The delta gasket 70 has a circular outline in plan view in the axial direction and has such an outline in a cross-sectional view parallel to the axial direction that the corners of a rectangle are cut off along straight lines. The delta gasket 70 also includes polymer holes 70A and 70B through the delta gasket 70 to respectively communicate with the polymer conduits 30A and 30B of the lid member 30 when the delta gasket 70 is engaged with the engagement portion 32. Between the polymer holes 70A and 70B, the delta gasket 70 also includes therethrough pinholes 71 and 71 as rotation restricting means that are symmetrical relative to the center line L of the polymer holes 70A and 70B. The positions of the pinholes 71 and

71 in the delta gasket 70 are not limited to the present embodiment insofar as the pinholes 71 and 71 are arranged at two positions symmetrically relative to the center line L of the polymer holes 70A and 70B.

[0036] The attachment of the delta gasket 70 will be described.

When the spinning pack body 40 is attached to the link member 20, the delta gasket 70 is engaged with the engagement portion 32 to be disposed on the lid member 30 such that pins 90 are engaged with the pin engagement portion 33 and the pinholes 71 to restrict the misalignment of the delta gasket 70 in the circumferential direction relative to the spinning pack body 40. Then, the spinning pack body 40 is threaded in the circumferential and upward directions against the link member 20 to engage the concave portion 31 with the convex portion 21, thus attaching the spinning pack body 40 to the link member 20.

[0037] Such a configuration provides the following advantageous effects.

Similarly to the gasket 60, use of one delta gasket 70 with two polymer holes 70A and 70B respectively communicating with the two polymer conduits 20A and 20B (30A and 30B) ensures a reduction in the cause of dimensional errors of the delta gaskets 70 and the engagement portions 32, which serve as gasket-fitted portions. Further, use of a circular shape for the outline of the delta gasket 70 enables use of highly versatile, circular cylindrical aluminum die casts and like die casts in manufacturing produce delta gaskets 70, resulting in a reduction in production cost of the delta gasket 70.

Furthermore, all the polymer holes 70A and 70B and the pinholes 71 and 71 are through holes. This facilitates the hole processing, resulting in a reduction in production cost of the delta gasket 70.

[0038] Furthermore, the pinholes 71 and 71 are arranged at two positions in the delta gasket 70 symmetrically relative to the center line L of the polymer holes 70A and 70B.

This ensures that even though the delta gasket 70 is attached to the spinning pack 10 to allow high pressure polymer to pass through the delta gasket 70, the delta gasket 70 is uniformly deformed, thereby minimizing degradation of sealability.

[0039] Referring to FIG 8A and 8B, a delta gasket 80 according to another embodiment will be described.

The delta gasket 80 has such an outline in a cross-sectional view parallel to the axial direction that the corners of a rectangle including opening portions of polymer holes 80A and 80B are cut off along straight lines to result in, as a whole, approximately a diamond shape. The other configurations including that of pinholes 81 are similar to the configurations related to the delta gasket 70 described above.

[Description of the Reference Numeral]

[0040]

10	spinning pack	
20	link member	
20A	polymer conduit	5
20B	polymer conduit	
30	lid member	
30A	polymer conduit	10
30B	polymer conduit	
40	spinning pack body	15
50	melt-spinning apparatus	
60	gasket	
70	delta gasket	20
80	delta gasket	

ment portion on a surface of the lid member on which the gasket is disposed, and wherein the gasket is engaged with the gasket engagement portion.

5. The spinning pack according to any one of claims 1 to 3, wherein the gasket has a circular outline, wherein the lid member comprises a gasket engagement portion on a surface of the lid member on which the gasket is disposed, wherein the gasket engagement portion comprises a pin engagement portion, wherein the gasket has a pinhole passing through the gasket, and wherein the gasket is engaged with the lid member with a pin engaged with the pin engagement portion and the pinhole.

Claims

1. A spinning pack attached to a heating barrel of a melt-spinning apparatus, **characterized in that** the spinning pack comprises a link member attached to the heating barrel and having a plurality of first polymer conduits in the link member; a lid member disposed below the link member and having a plurality of second polymer conduits in the lid member; and a gasket disposed between the lid member and the link member and having a plurality of polymer holes in the gasket to communicate with the plurality of first and second polymer conduits. 30
2. The spinning pack according to claim 1, wherein the link member comprises a groove portion on a surface thereof contacting the gasket, the groove portion being around opening portions of the plurality of first polymer conduits. 35
3. The spinning pack according to claim 1 or 2, wherein the link member and the lid member have an axial direction parallel to the plurality of first polymer conduits and to the plurality of second polymer conduits, and have a circumferential direction that is rotational about the axial direction, and wherein the gasket comprises rotation restricting means for restricting rotation of the gasket in the circumferential direction. 40 45
4. The spinning pack according to any one of claims 1 to 3, wherein the lid member comprises a gasket engagement 50 55

Fig. 1

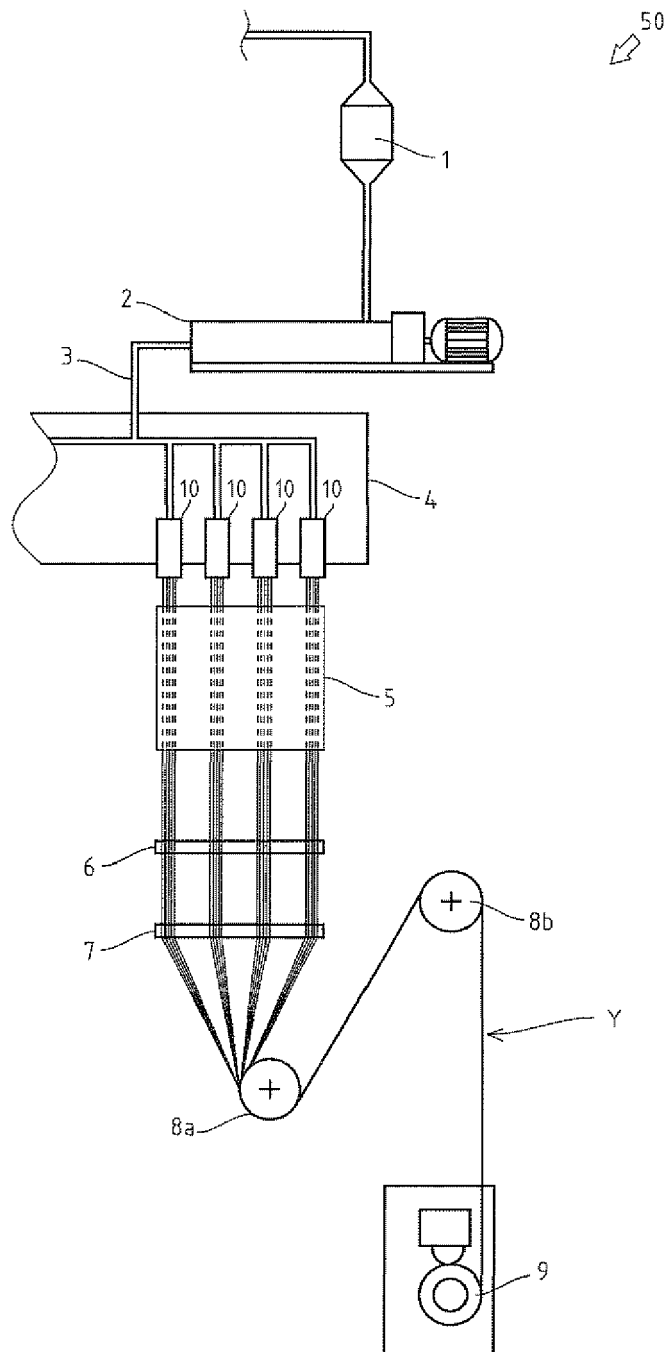


Fig. 2A

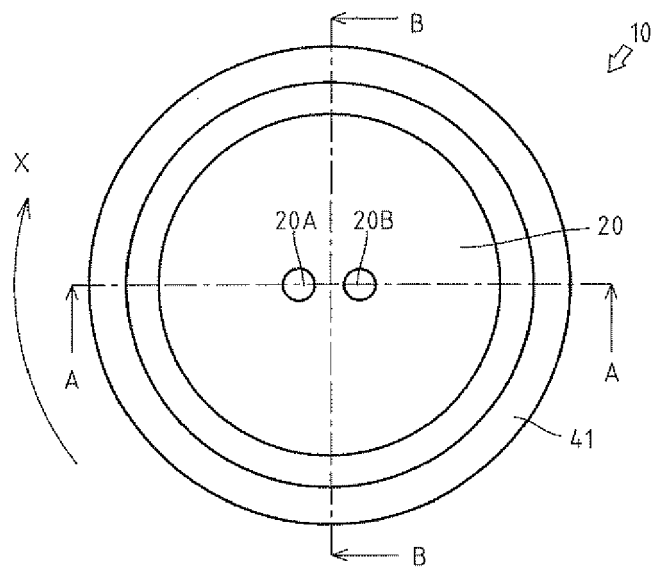


Fig. 2B

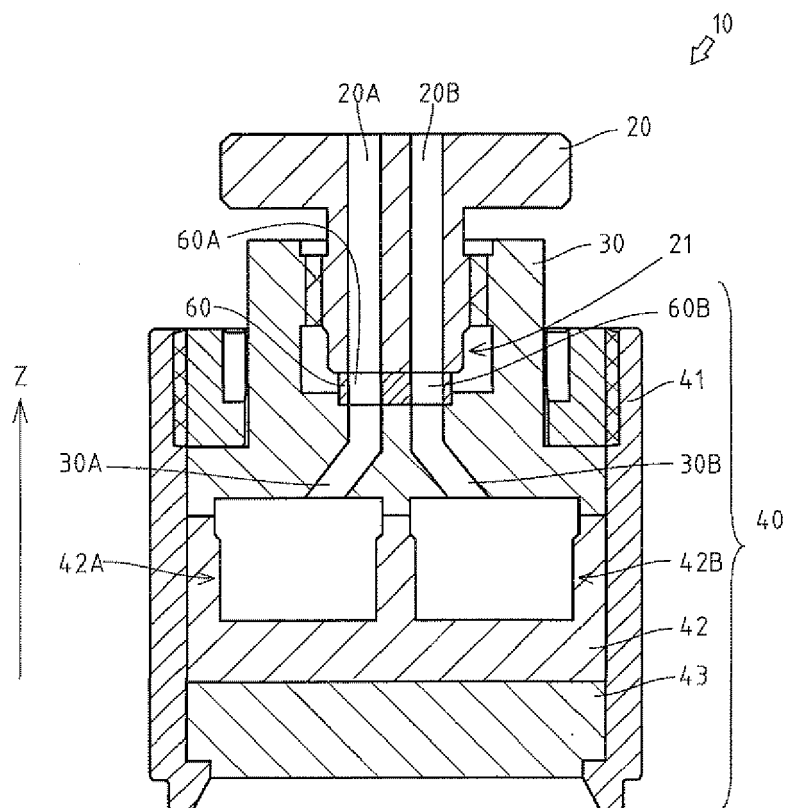


Fig. 3A

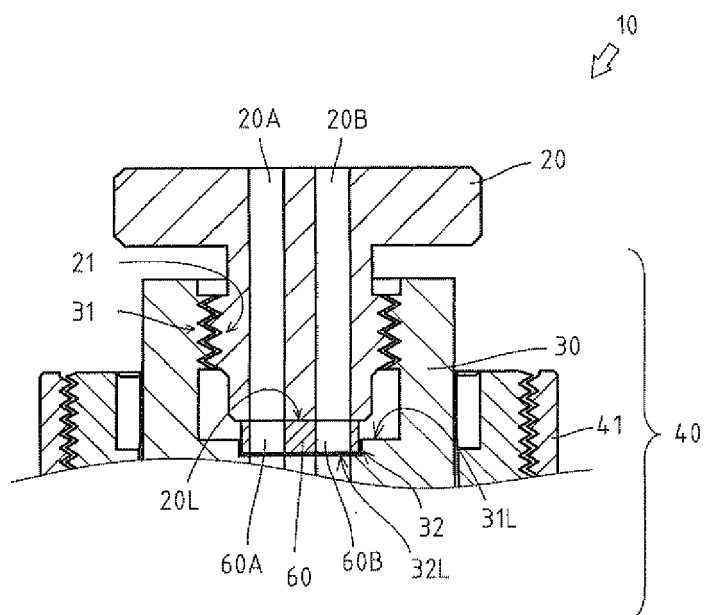


Fig. 3B

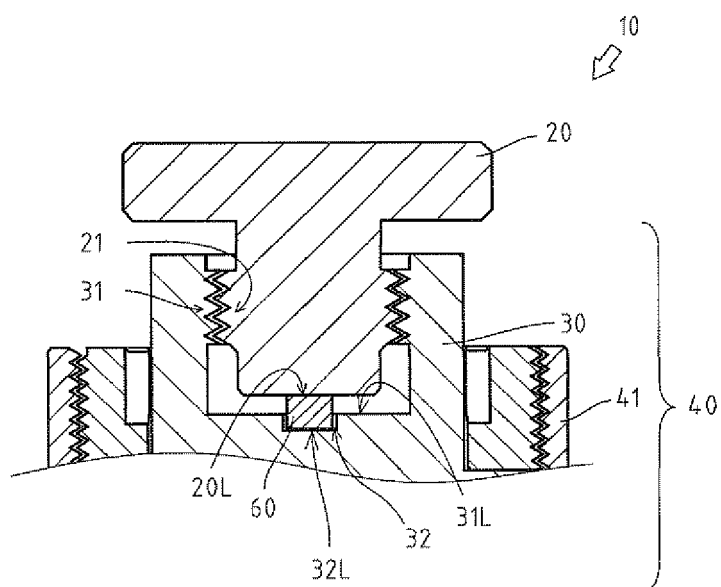


Fig. 4A

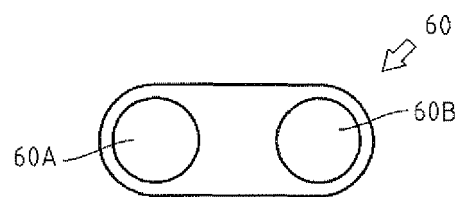


Fig. 4B

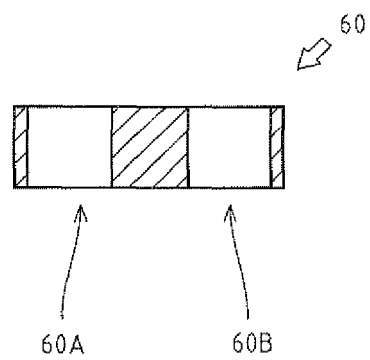


Fig. 5A

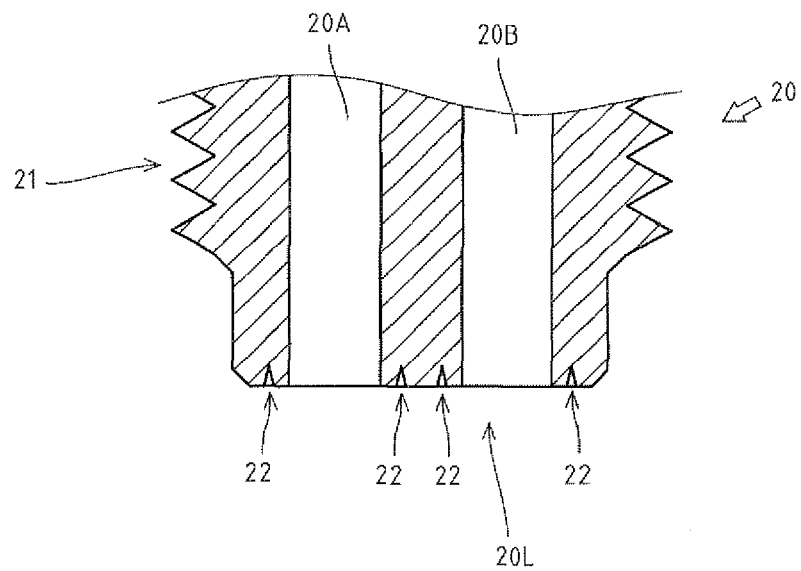


Fig. 5B

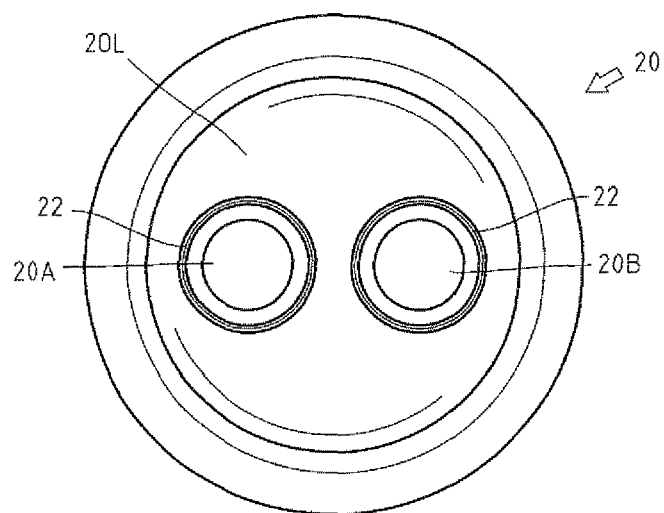


Fig. 6A

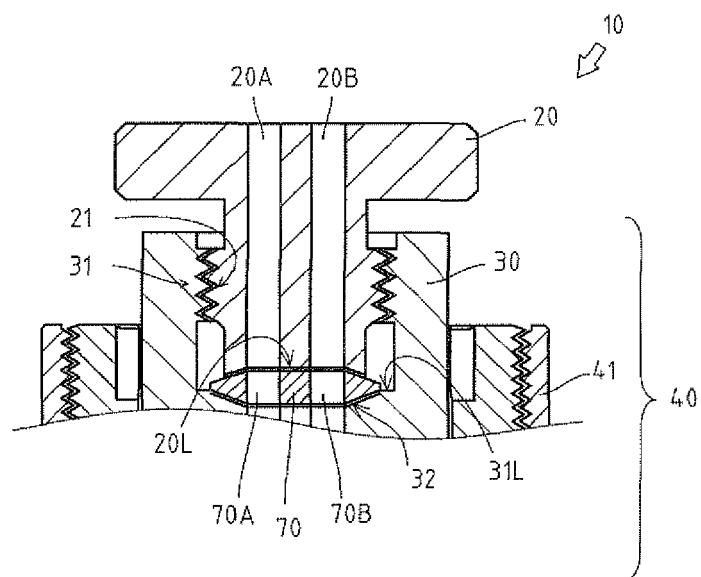


Fig. 6B

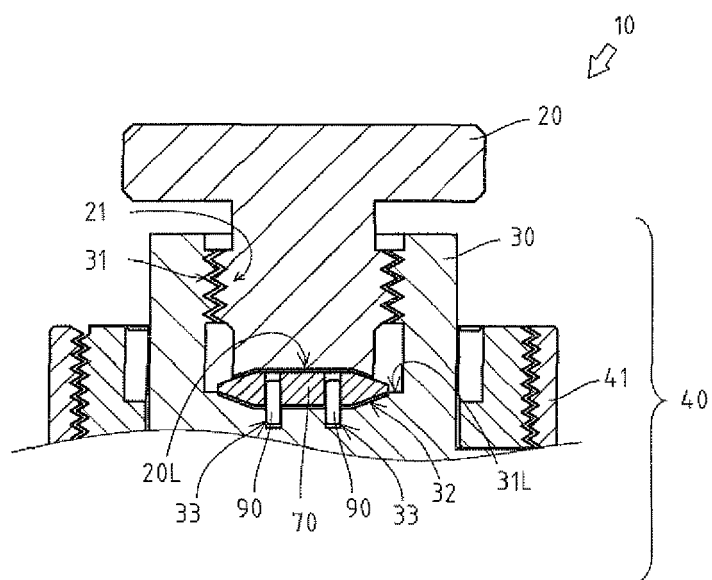


Fig. 7A

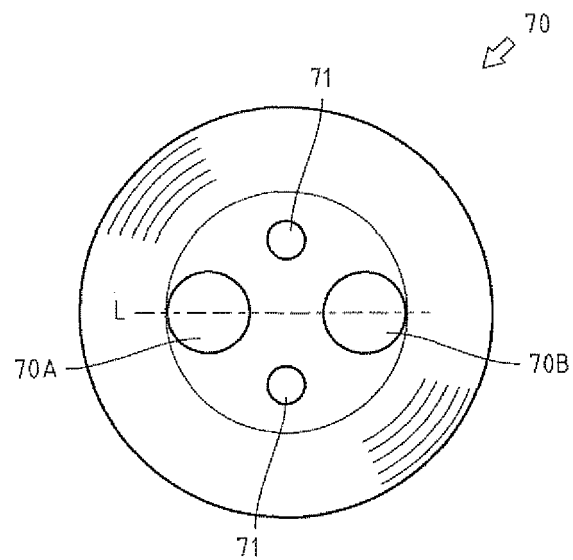


Fig. 7B

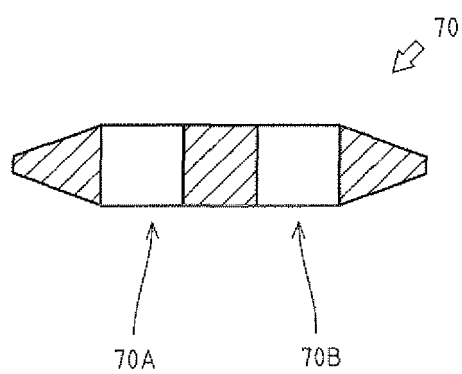


Fig. 8A

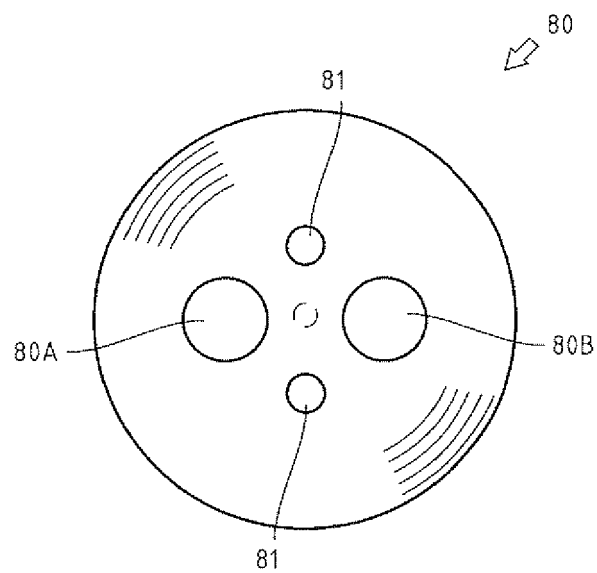
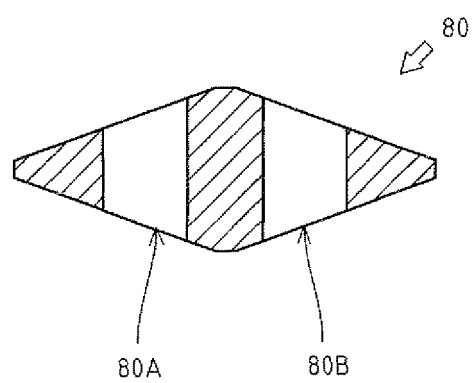


Fig. 8B





EUROPEAN SEARCH REPORT

Application Number
EP 11 15 6156

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 3 237 245 A (KUNIJIRO NONAMI ET AL) 1 March 1966 (1966-03-01) * figure 1 * * column 2, lines 7-21 * -----	1-5	INV. D01D4/02
X	WO 2005/068691 A1 (KIMBERLY CLARK CO [US]; HAYNES BRYAN D [US]; COOK MICHAEL CHARLES [US]) 28 July 2005 (2005-07-28) * figures 2-4 * * page 6, line 34 - page 9, line 4 * -----	1-4	
A	EP 0 436 105 A2 (BARMAG BARMER MASCHF [DE]) 10 July 1991 (1991-07-10) * figures 1-3 * * page 3, line 19 - page 5, line 45 * -----	1-5	
A	US 5 690 971 A (BULUSCHEK BRUNO [CH]) 25 November 1997 (1997-11-25) * figure 6 * * column 4, line 62 - column 5, line 26 * -----	1-5	
A	DE 20 2008 015313 U1 (OERLIKON TEXTILE GMBH & CO KG [DE]) 30 April 2009 (2009-04-30) * figures 1-4 * * paragraphs [0001], [0038] * -----	1-5	TECHNICAL FIELDS SEARCHED (IPC) D01D B29C
A	DE 44 47 420 A1 (FISCHER KARL IND GMBH [DE]) 4 July 1996 (1996-07-04) * figures 9-10 * * column 2, line 56 - column 3, line 17 * -----	1-5	
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 13 September 2011	Examiner Verschuren, Jo
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