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- **PELLIKKA, Risto**
41310 Leppävesi (FI)
- **SALMINEN, Samppa J.**
40500 Jyväskylä (FI)
- **MÄKINEN, Juha T.**
02150 Espoo (FI)
- **PESONEN, Vilho**
02150 Espoo (FI)
- **GINSBURG, Alex**
02150 Espoo (FI)

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(71) Applicant: **Valmet Technologies, Inc.**
02150 Espoo (FI)

(74) Representative: **Genip Oy**
Heikinkatu 7
48100 Kotka (FI)

(72) Inventors:
• **SALMINEN, Martti J.**
40640 Jyväskylä (FI)

(54) **DEWATERING APPARATUS FOR A FIBER WEB MACHINE**

(57) Invention relates to a dewatering apparatus for a fiber web machine comprising a body (22) being greater in its length than width, and a number of brackets (22.4) attached to the body (22) spaced along the longitudinal direction (L) of the body, and at least one foil blade attachment rail (28) that is parallel to the body (22) and fixed to the body (22) via the brackets (22.4) for supporting a foil blade (26) in the apparatus. The dewatering

apparatus further comprises a number of support ribs (30) parallel to the brackets (22.4), which the foil blade attachment rail (28) is attached to, and in which the support ribs (30) are fixed to the brackets (22.4) such that one or more support ribs (30) are partly overlapping with, and against to one or more brackets (22.4) and that the attachment between the support rib (30) and the bracket (22.4) is arranged to the overlapping area (A).

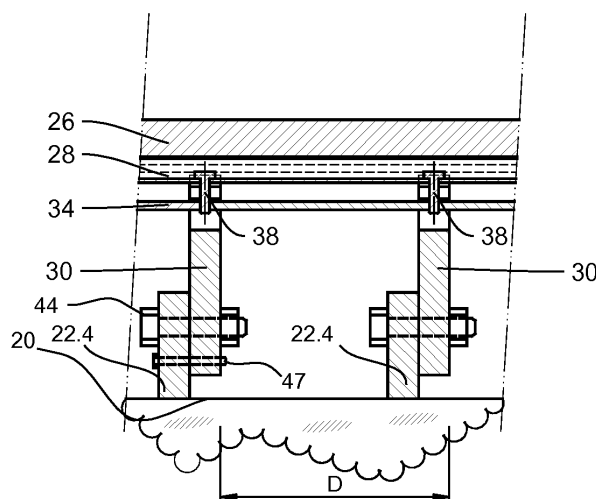


Fig. 3

Description

Technical field

[0001] The invention relates to a dewatering apparatus for a fiber web machine comprising a body being greater in its length than width, and a number of support ribs attached to the body transverse to the longitudinal direction of the body, and at least one foil blade attachment rail that is parallel to the body and adapted to the support ribs for supporting a foil blade in the apparatus according to the preamble of claim 1.

Background art

[0002] Dewatering apparatuses are used particularly in a so called web forming section of a fiber web machine where water is mechanically removed from the fiber suspension spread on the fabric for forming a web. The web forming section is also called a wire section. The web forming section is provided with several dewatering apparatuses in succession, generally located on the side of the fabric opposite to the web. Dewatering apparatuses of the web forming section are based on dewatering blades, which are also called foils. The dewatering foils are supported to a box-like frame construction of the dewatering apparatus, in which case such dewatering apparatuses are called foil boxes. Each foil box has usually several dewatering foils, although it is also possible to adapt individual dewatering foils in the forming section. Dewatering foils are in contact with the fabric and a gap is created between successive dewatering foils. Thus the web is subjected to successive pulses which improve the removal of water from the web. It is also possible to create a vacuum in a foil box for improving dewatering.

[0003] A foil box is attached to a fiber web machine at both of its ends. Known foil boxes are manufactured from several sheet metal components by welding. To achieve sufficient rigidity, various supports and stiffeners are used additionally. Consequently, the foil box becomes heavy and its manufacturing is slow. Furthermore, local stress peaks are created in the foil box during use and setting the dewatering foils in a correct position is difficult at a sufficient accuracy. Foils wear in use and can also break, in which case foils must be replaced at times.

[0004] US 20040238142 A1 discloses a dewatering apparatus in which the frame construction is formed of massive supporting beams with transverse intermediate supports fastened thereto. Each intermediate support has two parts and is provided with profiled gap-like openings for fastening the dewatering foils. In addition, each dewatering foil includes a profiled support blade that creates a form-lock against the gap in the intermediate support.

[0005] The above described dewatering apparatus is firstly extremely heavy and massive because the frame construction is made of beam-like constructions and thick components. In addition, the manufacture of the compo-

nents requires a lot of machining. Frame constructions for different applications must also be designed and manufactured separately. Often it is required that dewatering foils create a surface that is as planar as possible. With the above described solution, planarity is rarely achieved since the dewatering foils deflect along with the deflection of the frame construction. On the other hand, achieving forms that deviate from a planar surface is impossible or at least it requires using custom-built intermediate supports.

[0006] WO2009101243 A1 discloses a dewatering apparatus of a fiber web machine which includes a frame construction greater in its length than width, intermediate supports fastened to the frame construction at an interval of each other and set in the cross direction relative to the longitudinal direction of the frame construction, and at least one foil blade attachment rail that is longitudinal relative to the frame construction supported to openings arranged in the intermediate supports. The opening has a bottom and the foil blade attachment rail is set at a desired distance from the bottom of the opening in each intermediate support, and between the foil blade attachment rail and the intermediate support there is a weld connection. Even if this construction is advantageous in many respects there is still a need to provide a more advantageous dewatering apparatus.

[0007] The object of the invention is to provide a dewatering apparatus for a fiber web machine, by means of which a desired shape is obtained accurately and which is lighter in weight than before, yet sufficiently rigid.

Disclosure of the Invention

[0008] The objects of the invention can be met substantially as is disclosed in the independent claim and in the other claims describing more details of different embodiments of the invention.

[0009] A dewatering apparatus for a fiber web machine comprising a body being greater in its length than width, and a number of brackets attached to the body spaced along the longitudinal direction of the body, and at least one foil blade attachment rail that is parallel to the body and fixed to the body via the brackets for supporting a foil blade in the apparatus. The dewatering apparatus further comprises a number of support ribs parallel to the brackets, which the foil blade attachment rail is attached to, and in which the support ribs are fixed to the brackets such that one or more support ribs are partly overlapping with, and against to one or more brackets and that the attachment between the support rib and the bracket is arranged to the overlapping area and that support ribs are provided with at least one coupling slot into which a retaining part is fitted, in which the retaining part is arranged to extend via the slots of at least two support ribs.

[0010] According to an embodiment of the invention each support rib is provided with at least one coupling slot into which a retaining part, having a hole with an internal screw thread, is releasably fitted, and the foil

blade attachment rail is releasably attached to the support rib by screw coupling with the retaining part.

[0011] According to an embodiment of the invention the slot is an open slot or a recess.

[0012] According to another embodiment of the invention the slot is a closed hole.

[0013] According to an embodiment of the invention the retaining part is form-locked to the support rib at least in the direction of the plane of the support rib.

[0014] According to an embodiment of the invention the support rib is a plate-like structure, and the coupling slot is arranged at the edge of the support rib, the slot having a first width of the slot at the edge rim of the support rib and having a second width of the slot at a distance from the edge rim of the support rib wherein the second width is greater than the first width.

[0015] According to an embodiment of the invention retaining part is a bar arranged to extend via the slots of at least two successive support ribs.

[0016] According to an embodiment of the invention the bar is provided with a number of holes having an internal screw thread, wherein the spacing of the holes equals to the spacing of the support ribs.

[0017] According to an embodiment of the invention the bar is provided with a hole with an internal screw thread at the location between of two support ribs, and that the distance between the successive support ribs is less than 500 mm.

[0018] According to an embodiment of the invention retaining part is a bar which is arranged to extend via slots of all successive support ribs. This way each foil blade attachment rail may be attached by using only one bar, which make the installation straightforward.

[0019] According to an embodiment of the invention a foil blade attachment rail may be attached by using more than one bars which are arranged to extend via slots of at least two but not necessarily all successive support ribs.

[0020] According to an embodiment of the invention the dewatering apparatus comprises a number of foil blade attachment rails arranged parallel to and at a distance from each other, and that each support rib is provided with a number of coupling slots equal to the number of the foil blade attachment rails, and that the retaining part is arranged to extend via each of the successively aligned slots.

[0021] According to an embodiment of the invention the body is made of sheet metal components by welding, and comprises a bottom part and a cover part and the opposite longer edges of the bottom part and the cover part are joined together and the body is provided with a number of transverse brackets to which the support ribs are attached.

[0022] A dewatering apparatus for a one fiber web machine according to an embodiment of the invention is manufactured such that a welding line plan is assigned for one dewatering apparatus, wherein the welding line plan defines the locations of the welded seams in the

apparatus during the process, and subsequently, a first dewatering apparatus is manufactured for the fiber web machine by assembling parts forming a body of the dewatering apparatus and applying the assigned welding line plan to the welding of the parts together, and wherein a second dewatering apparatus is manufactured for the fiber web machine by assembling parts forming a body of the second dewatering apparatus and performing welding according to the assigned welding line plan to join the parts together.

[0023] According to an embodiment of the invention more than one dewatering apparatuses which are adapted for operating at different locations to the same fiber web machine are manufactured such that the welding of each individual apparatus is performed according to the same welding line plan.

[0024] According to an embodiment of the invention the body is formed which is greater in its length than width and providing a support rib with at least one coupling slot into which a retaining part, having a hole with an internal screw thread, is releasably fitted, and attaching a number of support ribs to the body at a distance from each other and transverse to the longitudinal direction of the body, and further attaching at least one foil blade attachment rail to the support rib by screw coupling with the retaining part.

[0025] According to an embodiment of the invention prior to attaching the number of support ribs to the body, the support ribs are aligned such that the coupling slots are oriented according to requirements of the direction of foil blade.

[0026] As the coupling slot are aligned properly also the orientation of the foil blades will be correct.

[0027] The dewatering apparatus according to the invention needs no machining and is straightforward to manufacture and this provides required dimensional accuracy.

[0028] The exemplary embodiments of the invention presented in this patent application are not to be interpreted to pose limitations to the applicability of the appended claims. The verb "to comprise" is used in this patent application as an open limitation that does not exclude the existence of also unrecited features. The features recited in depending claims are mutually freely combinable unless otherwise explicitly stated. The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims.

Brief Description of Drawings

[0029] In the following, the invention will be described with reference to the accompanying exemplary, schematic drawings, in which

Figure 1 illustrates a fiber web machine according to an embodiment of the invention,

Figure 2 illustrates a dewatering apparatus accord-

ing to an embodiment of the invention,
 Figure 3 illustrates sectional view III-III in the figure 2 according to an embodiment of the invention,
 Figure 4 illustrates sectional view III-III in the figure 2 according to another embodiment of the invention,
 Figure 5 illustrates cross sectional views of the dewatering apparatus according to an embodiment of the invention,
 Figure 6 illustrates a dewatering apparatus according to an invention where the foil blades are straightly oriented, and
 Figure 7 illustrates different embodiments of the dewatering apparatus according to the invention.

Detailed Description of Drawings

[0030] As an example of practical application of the dewatering apparatus according to the invention figure 1 depicts schematically a web forming section 10 of a fiber web machine, conventional per se. In the forming section fiber suspension is led to a so called bottom fabric 14 from a headbox 12. The term "fiber web machine" is used to refer particularly to paper, board, tissue and pulp drying machines. Several dewatering apparatuses 20, 20', 20" are arranged one after the other below the bottom fabric. Dewatering apparatuses of the web forming section are based on dewatering blades, which are also called foils. The dewatering foils are supported to a box-like frame construction of the dewatering apparatus, in which case such dewatering apparatuses are called foil boxes.

[0031] In practice, immediately upon arriving at the bottom fabric, the fiber suspension is subjected to pulses which assist in the removal of water from the fiber suspension and thereby the web formation. As is known as such the dewatering apparatuses may be connected to a vacuum system to subject suction to the web.

[0032] In the figure 2, view A there is shown a cross sectional view of a dewatering apparatus 20 according to an embodiment of the invention. View B depicts the encircled part of the view A in a more detailed manner, and the view C depicts the encircled part of the view B in a more detailed manner. In the figure 3 there is shown a sectional view III-III of the view C according to an embodiment of the invention.

[0033] Now referring to the figures 2, 3 and 6 the dewatering apparatus 20 comprises a body 22 and a foil table 24. The body 22 and thus also the dewatering apparatus is greater in its length than width. The body 22 is a beam structure having a longitudinal direction made of suitably cut and formed sheet metal parts by welding. When the dewatering apparatus is installed in a fiber web machine its longitudinal direction coincides generally with the cross direction of the fiber web machine. The foil table 24 is formed of a number of dewatering foils 26 arranged at a distance from each other forming a generally continuous - straight or curved in direction transverse to the longitudinal direction L of the body 22 - plane.

[0034] According to a first aspect of the invention the foil table 24 comprises in addition to the dewatering foils 26 a foil blade attachment rail 28 in connection with each foil 26 provided for attaching each foil 26 to the dewatering apparatus. It is conceivable in the scope of the invention to provide a dewatering apparatus comprising only one foil blade using the concept of the invention. The foil blade attachment rail 28 and the foil 26 are provided with form locking means to make a releasable coupling between the foil blade attachment rail 28 and the foil 26. Advantageously the foil blade attachment rail 28 is a rail having a generally T-shaped form and the foil 26 is provided with mating cavity arranged along one face of the foil 26. This way the foil blade may be slid from the end of the foil blade attachment rail on it. The mating cavity may be also a T-shaped cavity. When the foil table 24 or a foil 26 is installed to the body 22 of the dewatering apparatus 20 the foil blade attachment rail is parallel to the body 22.

[0035] The apparatus 20, and particularly the foil table 24 comprises a number of support ribs 30 arranged to support and attach the foil blade attachment rail 28 and also the foil blade 26 to the body 22. The support ribs 30 are arranged generally transverse to the foil blades 25. Advantageously the support ribs 30 are arranged substantially perpendicular to the longitudinal direction of the foil blades. The support rib 30 is of a plate-like structure, advantageously made of cut metal sheet. For the purpose of attaching the foil blade attachment rail 28 to the body 22 the apparatus 20 comprises a number of support ribs 30 arranged parallel and spaced from each other over the length of the foil table 24, which is depicted in figure 3. The suitable distance D between the successive support ribs 30 is for example 100 - 500 mm depending on the design of the specific application.

[0036] The support rib 30 is provided with a number of coupling slots 32 at its one edge which is positioned on top of the body when installed thereto. The number of slots 32 advantageously equals to the number of foils belonging to the foil table 24. In the foil table the coupling slots for one blade in the successive support ribs 30 are arranged in line. Naturally there may be extra slots where no foil is attached, if so desired. Therefore, in case the dewatering apparatus would have only one foil the support rib 30 would have respectively only one coupling slot 32.

[0037] In the figure 2 the coupling slots 32 are arranged at a periphery, to one edge of the support rib 30. There is a retaining part 34 arranged in the coupling slot 32 of the rib 30. The retaining part 34 is provided with a hole or holes 36 provided with an internal screw thread. The retaining part and the slot are formed such that the retaining part 34 may not, in its attachment position, come out of the coupling slot 32. Thus the retaining part 34 is form-locked to the support rib at least in the direction of the plane of the support rib.

[0038] The coupling slot 32 is formed such that it has a first width W1 of the slot at the edge of the support rib and a second width W2 of the slot at a distance from the

edge of the support rib 30 wherein the second width W2 is greater than the first width W1. In the embodiment of figure 2 the slot is an open slot, that is, not a closed hole. As can be seen in the figure 3 there is a screw bar, bolt 38 or a like arranged substantially in the middle region of width or thickness of the support rib 30. This provides a function of the coupling between the retaining part 34 and the foil blade attachment rail 28 in which the coupling force is in the region of the support rib 30. This way the attachment of the foil blade attachment rail 28 does not tend to bend the support and the foil blade 26. The actual attachment of the foil blade attachment rail 28 to the support rib 30 is made by screw coupling with the retaining part 34. There is a protrusion of the support rib 30 pressed between the foil blade attachment rail 28 and the retaining part 34 which are fastened and tightened towards each other by a screw which is arranged in a hole of the foil support rib and which is screwed to the inner thread in the retaining part 34.

[0039] As can be seen in the figure 3 the retaining part 34 is here an elongated flat bar. The flat bar 34 is provided with a number of holes 36 provided with an internal screw thread and the foil blade attachment rail 28 is provided with number of openings, through which opening a bolt or alike may be installed to attach it to the screw thread of the flat bar 34. The holes in the flat bar 34 and the openings in the blade attachment rail 28 are equally spaced in the longitudinal direction. The flat bar extends through all of the support ribs 30 in the dewatering apparatus.

[0040] The support rib 30 is provided with an outward extension 40 in the vicinity to the slot. The extension is directed towards to foil blade attachment rail 28. More particularly, the support rib 30 has a plane surface at which the coupling slot 32 is formed and the extension is arranged to the plane at a distance from the edge of the slot opening in the longitudinal direction of the support rib 30. The extension forms a shoulder 40 against which the foil blade attachment rail 28 is positioned and supported when installed. The shoulder may be also called as a claw. The shoulder 40 defines the actual position of the attachment rail 28 in the dewatering apparatus. The distance from the edge of the notch to the slot is such that the foil blade attachment rail 28 rests against the notch 40 when installed to the support rib 30. The shoulder 40 and the slot 32 together form an attachment part for the foil blade attachment rail 28. The flat bar 34 and the foil blade attachment rail 28 are together adjustable in respect to their position such that the foil blade attachment rail 28 may be positioned against the shoulder 40.

[0041] Now turning particularly to the figures 3 and 6 one can see that the body is provided with a number of transverse brackets 22.4. The brackets are extending outwardly from the surface of the body 22. The brackets 22.4 are adapted to and used for attaching the support rib 30 to the body 22. The brackets 22.4 are attached in spaced manner on the body 22. Advantageously the brackets are equally spaced over the length of the body

to the support ribs 30 to the body 22. The bracket 22.4 and the support rib 30 are overlapping with each other such that they are attached with each other by e.g. bolt connection 44 at the shaded area A over which the bracket 22.4 and the support rib 30 are against each other.

[0042] The support ribs 30 in one dewatering apparatus are similar to each other. The operating direction in respect to the machine direction can be changed easily by simply installing the dewatering apparatus to the fiber web machine such that the shoulder 40 is downstream, or behind, the foil blade attachment rail 28 in the running direction of fabric of the paper machine. The direction of the support rib 30 may be selected easily in the manufacturing process and this way either operating direction is possible using the same basic components.

[0043] In the figure 4 there is shown a sectional view III-III of the view C according to another embodiment of the invention. One can see that also on this embodiment the body 22 is provided with a number of transverse brackets 22.4. The brackets are extending outwardly from the surface of the body 22. The brackets 22.4 are adapted to and used for attaching the support rib 30 to the body 22. The brackets 22.4 are spaced on the body equally to the support ribs 30. The bracket 22.4 and the support rib 30 are overlapping each other such that they are attached with each other by e.g. bolt connection 44.

[0044] Here the foil blade attachment rail 28 is supported on two adjacent support ribs 30. As can be seen in the figure 3 there is a bolt 38 arranged substantially in the middle between two support ribs 30. This provides a function of the coupling between the retaining part 34 and the foil blade attachment rail 28 in which the coupling force is distributed between two support ribs 30 and the attachment of the foil blade attachment rail 28 does not tend to bend the support and the foil blade 26 excessively. The actual attachment of the foil blade attachment rail 28 to the support rib 30 is made by screw coupling with the retaining part 34. Even if not shown, particularly in this embodiment the coupling slots 32 may be closed holes, because the symmetrical distribution of the attachment force is obtained by the position of the bolt 38 between the support ribs 30.

[0045] Figure 5 depicts cross sectional views of the dewatering apparatus 20 according to an embodiment of the invention showing the structure in a more detailed manner. Views A to E shows a particular part of the apparatus 20 in solid line while the other parts are shown as dotted lines. The foil blade 26, the foil blade attachment rail 28, the retaining part 34 and the bolt 38 are not shown here for clarity reasons. Advantageously the body 22 is made of sheet metal components by welding. The body 22 comprises a bottom part 22.1 which is greater in its length than width. The bottom part 22.1 is formed of a rectangular metal sheet which is bend into a form of a trough, i.e. it has a concave or curved shape with an open upper side when the body is in the position shown in the figure 5. In the manufacturing process two opposite long edges of a rectangular sheet are bent towards each

other such that a trough is formed. This stage is shown in the view D. The bend may consist of several separate bends as in the figure or the bend may be one continuous curve with a predetermined one or more radiuses (not shown). The body 22 further comprises a cover part 22.2 as is shown in the view C. The cover part 22.2 has a length equal to the length of the bottom part 22.1. The cover part is also made of a rectangular piece of metal sheet into curved shape. In the body 22 the opposite longer edges 45 of the bottom part and the cover part are joined together by welding, continuous or intermittent welding in the longitudinal direction of the body. The body 22 comprises end parts 22.3 attached to the ends of the bottom part 22.1 and the cover part 22.2. This is shown in the view E. Additionally the body 22 is provided with a number of transverse brackets 22.4. The brackets are transverse in respect to the longitudinal direction of the body 22 being perpendicular to plain of the cross sectional view in the figure. The brackets are here attached to the cover part 22.2, but it is conceivable that the bracket would extend from the edge of the bottom part over the cover part and further to the edge of the bottom part. This is shown in the view B. In the view 5 A there is shown the attachment of the support rib 30 to the transverse bracket 22.4 by bolt connection.

[0046] According to an aspect of the invention in a process of manufacturing dewatering apparatuses to one fiber web machine a so called welding line plan is assigned for one dewatering apparatus. The welding line plan defines the locations of the welded seams in the apparatus during the process. After that, a first dewatering apparatus 20 is manufactured for the fiber web machine by assembling the bottom part 22.1, the cover part 22.2, the end parts 22.3 and the transverse brackets 22.4 to form the first dewatering apparatus and applying the assigned welding line plan to the welding of the parts together. Next a second dewatering apparatus 20' is manufactured for the fiber web machine by assembling the bottom part 22.1, the cover part 22.2, the end parts 22.3 and the transverse brackets 22.4 to form the second dewatering apparatus and performing welding according to the assigned welding line plan to join the parts together. Thus, according to the invention more than one dewatering apparatuses 20, 20' 20" which are installed at different locations to the same fiber web machine 10 are manufactured such that the welding of each individual apparatus is performed according to the same welding line plan.

[0047] According to another aspect of the invention, the dewatering apparatus is manufactured such that a body 22 is formed which is greater in its length than width. The body is formed by preparing a rectangular piece of a sheet metal and shaping the sheet into a form of trough forming the bottom part 22.1. Next the trough is closed by the cover part 22.2 such they together generally enclose a space. The body is additionally provided with number of transverse brackets 22.4 arranged in spaced manner from the one end of the body to the other end thereof. Next, one (or two, as shown in the figure 4) sup-

port rib 30 is positioned next to or against each transverse bracket 22.4 in overlapping manner as shown in the figures, but such that the rib 30 is not yet bolted or generally fastened to the bracket 22.4. The overlapping area A is used for providing attachment between the support rib 30 and the bracket 22.4. Now the support ribs 30 are at correct positions in longitudinal direction. Each one of the support ribs 30 are still movable in the plane of the brackets 22.4 which is depicted by arrows 25 in the figure 6. This allows accurate positioning of the each support rib 30 prior to its attachment to the bracket 22.4. Now, the support ribs 30 are against the brackets 22.4 but still movable at least in the direction of their plane, that is transverse to the longitudinal direction of the body 22, and the final orientation of the foil blades is set or adjusted in respect to the body 22. In other words, the distance of the foil blades from the body is adjusted according to desired requirements such that prior to attaching the support ribs 30 to the body, the support ribs are positioned such that the coupling slots and the foil blades are oriented according to requirements of the direction of foil blade. When support ribs 22.4 are at desired position the support ribs 30 are fixed to the transverse brackets 22.4 at the overlapping area A. The attachment is preferably provided with bolt connection such the bracket 22.4 and the support rib 30 are pressed against each other by the bolt connection.

[0048] As is shown in the figure 3 it is possible to use a lock pin 47 or alike together with the bolt connection 44 for ensuring the right position of the support ribs 30 in respect to the bracket 22.4. In addition or alternatively to the use of the lock pin 47 the support ribs 30 and the brackets may be e.g. spot welded with each other for obtaining the same effect.

[0049] After the support ribs 30 are positioned and fixed to the brackets 22.4 the foil blade attachment rails 27 and the respective retaining part 34, or bars are installed in connection with the coupling slots 32 and joined together by installing the screws. At this stage a foil table 24 is formed.

[0050] Since the parallel foil blades 26 are coupled to the support rib 30 it is possible to minimize - or control if so desired - the curvature of the foil table. For example it is very straight forward to provide a cambered foil table by adjusting the fixing position of each support rib 30 to the transvers brackets 22.4 individually, as required. This may be simplified by using an appropriately designed assembly jig for the purpose. Figure 6 depicts a dewatering apparatus according to an invention where the foil blades are straightly oriented.

[0051] Even if the dewatering apparatuses may have some differences in the basic components at different positions of the fiber web machine the basic components i.e. the bottom part 22.1, the cover part 22.2, the end parts 22.3 and the transverse brackets 22.4 are of identical cross sectional shape as is shown in the figure 5 and are assembled by welding according to the assigned welding line plan. In the figure 7 there are shown various

modifications of the dewatering apparatus 20 according to the invention. In the view A there is shown a dewatering apparatus 10, which is operated only based on natural pressure impulses caused by the foils blades. In other words the bottom part 22.1 and the cover part 22.2 are intact forming a closed surface. In the view B there is shown a so called vacuum-box where the cover part 22.2 is of same cross sectional profile as in the view A but which has a number of openings 42 therein. There is also an auxiliary trough 45 arranged inside the body 22 i.e. the bottom part 22.1 and the cover part 22.2 defining a vacuum space with the foil table 24. The auxiliary trough 45 is connected to a vacuum system via a vacuum system opening 48 at the end part 22.3 of the apparatus 20. There is also a water removal channel 46 or channels arranged in flow communication with the vacuum space. In the view C there is shown a modification where the vacuum system opening 48 and the water removal channel 40 combined to be a single connection at the end of the body 22. In all of the modifications the basic components i.e. the bottom part 22.1, the cover part 22.2, the end parts 22.3 and the transverse brackets 22.4 are of identical cross sectional shape and are manufactured such that the welding of each individual apparatus is performed comprising the same welding line plan.

[0052] As an example of the assigned welding plan it may comprise providing welding seams to connect all parts 22.1, 22.2, 22.3, 22.4 along lines coinciding with their contact surfaces meeting with each other.

[0053] The dewatering apparatus 20 is attached to the fiber web machine 10 by mean of suitable brackets (not shown) attachable to the end parts 22.3 of the apparatus 20.

[0054] The parts are advantageous cut from a metal sheet with laser cutting, by means of which the components with high dimensional and shape accuracy are achieved. Correspondingly, with laser welding, a narrow and deep weld is achieved, whereby it is also possible to connect components with different thicknesses. Due to low thermal conduction, harmful deformations can be avoided. A laser-welded seam is ready without after-machining and the welds are reliable in spite of a high welding speed.

[0055] While the invention has been described herein by way of examples in connection with what are, at present, considered to be the most preferred embodiments, it is to be understood that the invention is not limited to the disclosed embodiments, but is intended to cover various combinations or modifications of its features, and several other applications included within the scope of the invention, as defined in the appended claims. Instead of metal sheet the apparatus may be manufactured for example of composite, such as carbon fibre composite sheets. The details mentioned in connection with any embodiment above may be used in connection with another embodiment when such combination is technically feasible.

Claims

1. A dewatering apparatus for a fiber web machine comprising a body (22) being greater in its length than width, and a number of brackets (22.4) attached to the body (22) spaced along the longitudinal direction (L) of the body, and at least one foil blade attachment rail (28) that is parallel to the body (22) and fixed to the body (22) via the brackets (22.4) for supporting a foil blade (26) in the apparatus, **characterized in that** the dewatering apparatus further comprises a number of support ribs (30) parallel to the brackets (22.4), to which support ribs (30) the foil blade attachment rail (28) is attached to, and in which the support ribs (30) are fixed to the brackets (22.4) such that one or more support ribs (30) are partly overlapping with, and against to one or more brackets (22.4) and that the attachment between the support rib (30) and the bracket (22.4) is arranged to the overlapping area (A) and that support ribs (30) are provided with at least one coupling slot (32) into which a retaining part (34) is fitted, in which the retaining part (34) is arranged to extend via the slots (32) of at least two support ribs (30).
2. A dewatering apparatus for a fiber web machine according to claim 1, **characterized in that** each support rib (30) is provided with at least one coupling slot (32) into which the retaining part (34), having a hole with an internal screw thread, is releasably fitted, and that the foil blade attachment rail (28) is releasably attached to the support rib (30) by screw coupling with the retaining part (34).
3. A dewatering apparatus for a fiber web machine according to claim 2, **characterized in that** the retaining part (34) is form-locked to the support rib at least in the direction of the plane of the support rib (30).
4. A dewatering apparatus for a fiber web machine according to claim 2 or 3, **characterized in that** the support rib (30) is a plate-like structure, and the coupling slot (32) is arranged at the edge of the support rib, the slot (32) having a first width (W1) of the slot at the edge rim of the support rib (30) and having a second width (W2) of the slot at a distance from the edge rim of the support rib (30) wherein the second width (W1) is greater than the first width (W2).
5. A dewatering apparatus for a fiber web machine according to claim 1, **characterized in that** retaining part (34) is a bar arranged to extend via the slots (18) of at least two successive support ribs (30).
6. A dewatering apparatus for a fiber web machine according to claim 4, **characterized in that** the bar (34) is provided with a number of holes having an internal screw thread, wherein the spacing of the holes

equals to the spacing of the support ribs (30).

7. A dewatering apparatus for a fiber web machine according to claim 4, **characterized in that** the bar (34) is provided with a hole with an internal screw thread at the location between of two support ribs (30), and that the distance between the successive support rib is less than 500 mm. 5
8. A dewatering apparatus for a fiber web machine according to claim 4, **characterized in that** retaining part (34) is a bar which is arranged to extend via slots (32) of all successive support ribs (30). 10
9. A dewatering apparatus for a fiber web machine according to claim 1, **characterized in that** the dewatering apparatus comprises a number of foil blade attachment rails (28) arranged parallel to and at a distance from each other, and that each support rib (30) is provided with a number of coupling slots (32) equal to the number of the foil blade attachment rails (28), and that the retaining part (34) is arranged to extend via each of the successively aligned slots (32). 15
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10. A dewatering apparatus for a fiber web machine according to claim 1, **characterized in that** body (22) is made of sheet metal components by welding, and comprises a bottom part (22.1) and a cover part (22.2) and that the opposite longer edges (45) of the bottom part (22.1) are joined together and the cover part (22.2). 30

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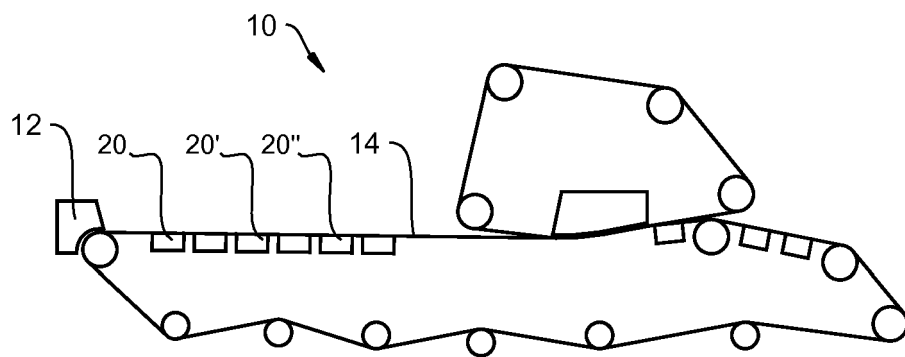
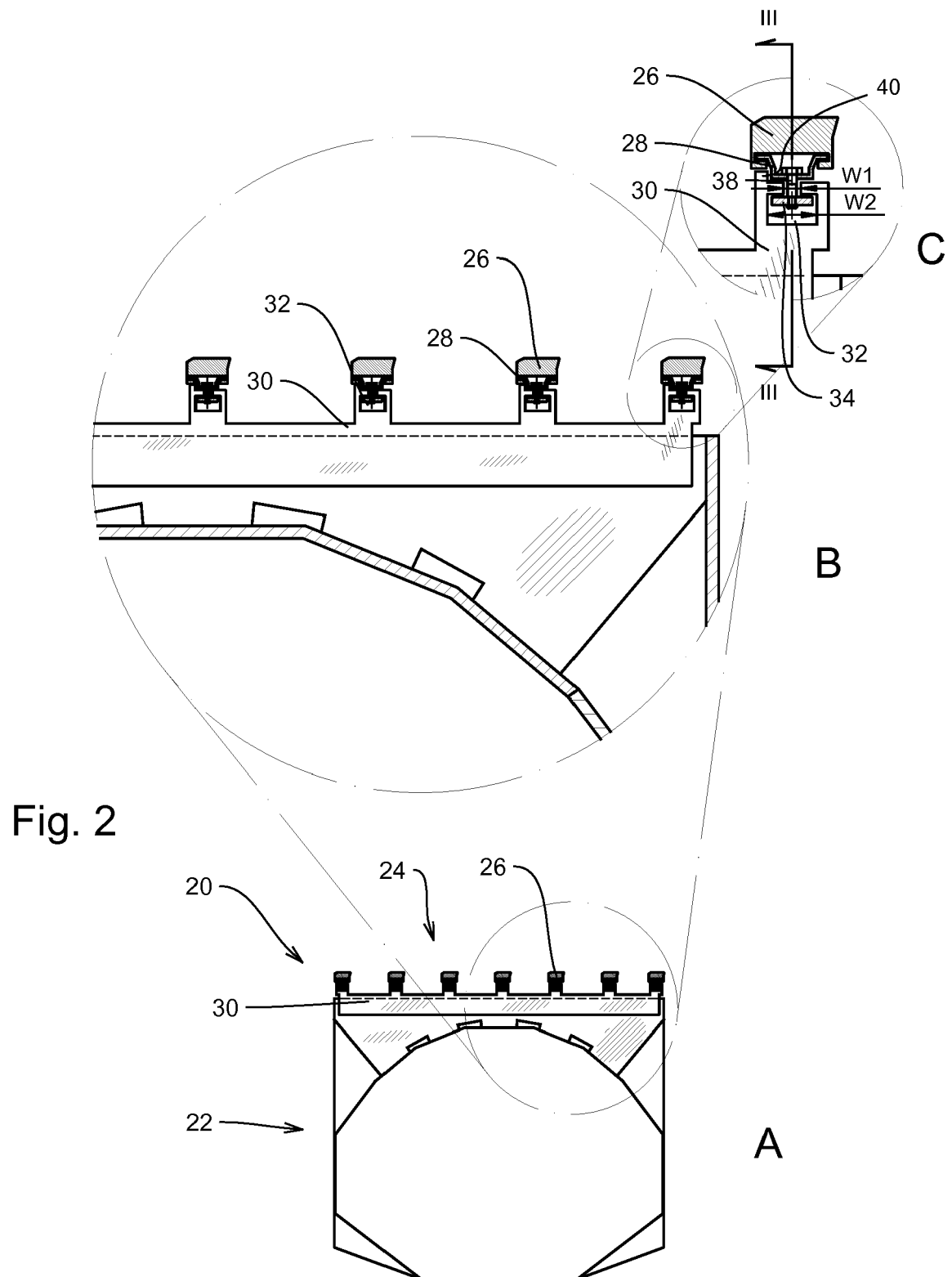


Fig. 1



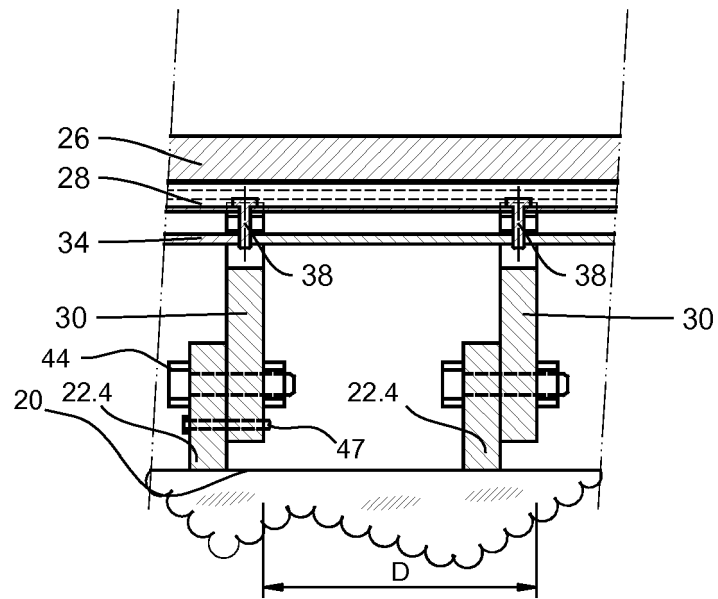


Fig. 3

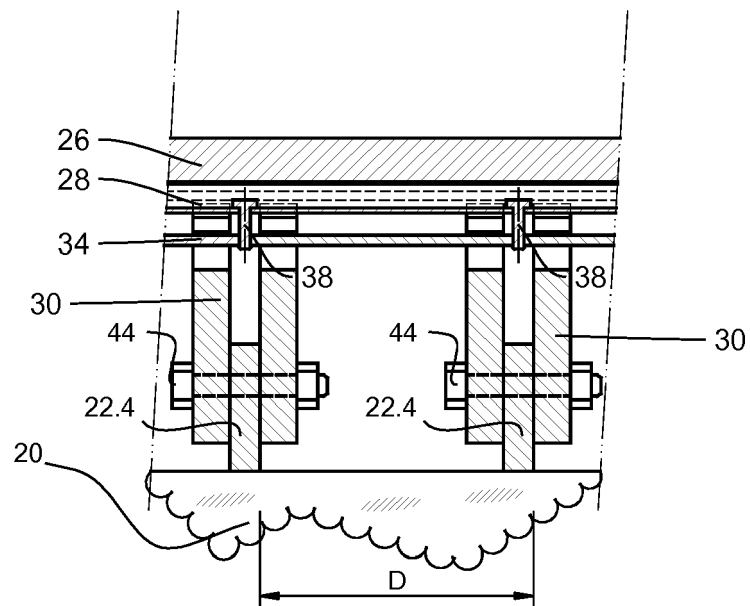
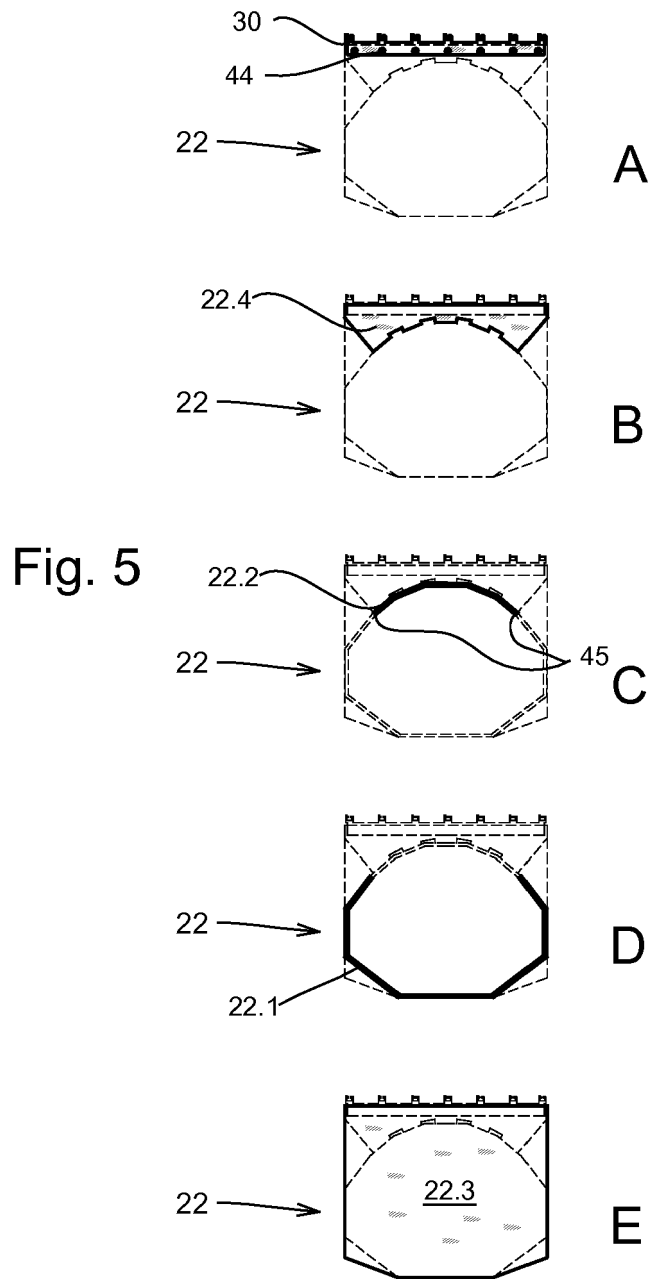
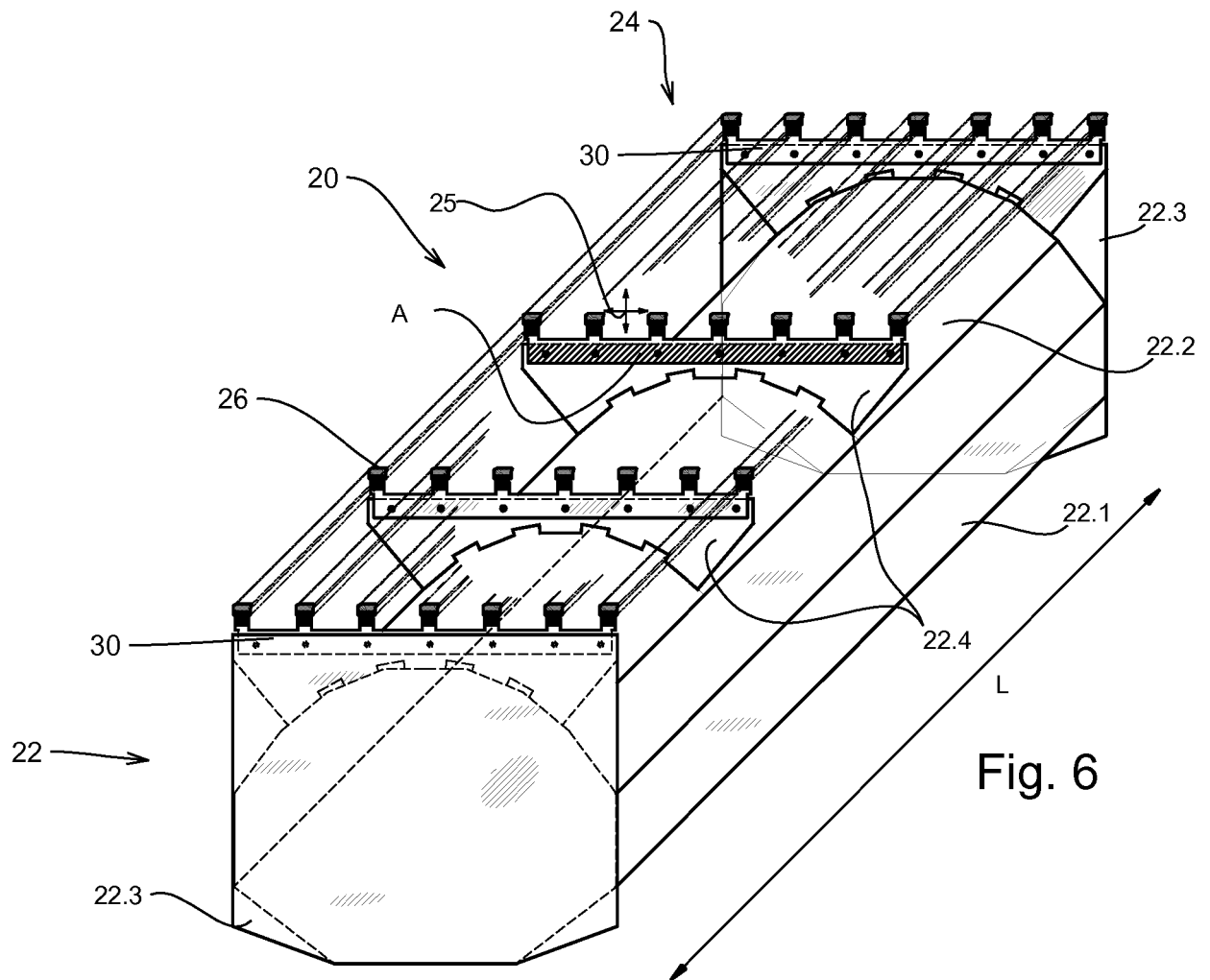


Fig. 4





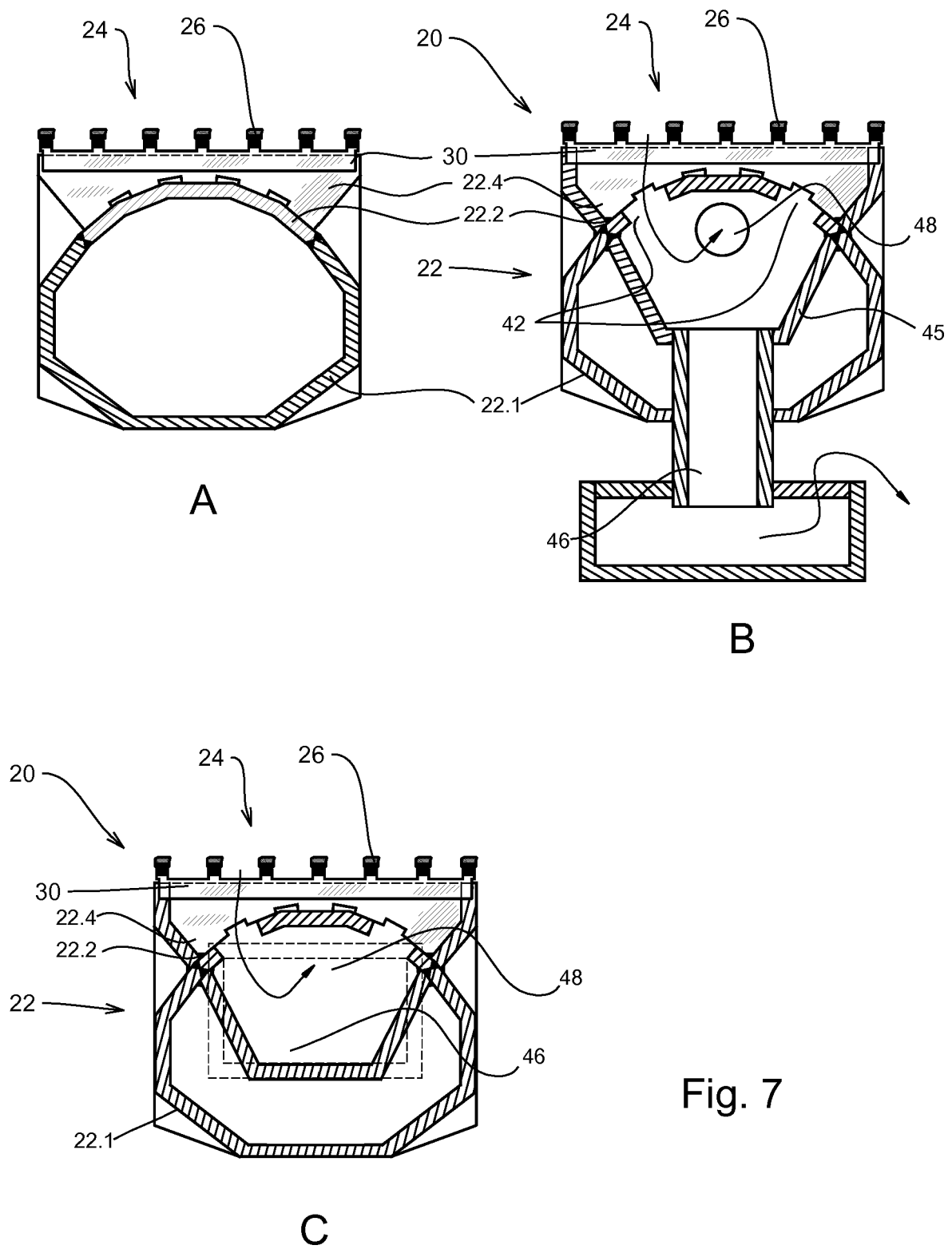


Fig. 7



EUROPEAN SEARCH REPORT

Application Number
EP 17 15 2574

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 23 June 2017	Examiner Pregetter, Mario
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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