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(72) Inventors:
• **Lappi, Janne**
41400 Liestuore (FI)
• **Anttilainen, Sami**
40740 Jyväskylä (FI)

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(74) Representative: **TBK**
Bavariaring 4-6
80336 München (DE)

(71) Applicant: **Metso Paper Inc.**
00130 Helsinki (FI)

(54) **Headbox for a fiber web machine**

(57) The invention relates to a headbox for a fiber web machine including a turbulence generator (13) equipped with flow pipes (14) to which at least one man-

ifold (11, 11') is arranged to be connected using intermediate pipes (10). At least part of the intermediate pipes are arranged to extend within the flow pipe of the turbulence generator.

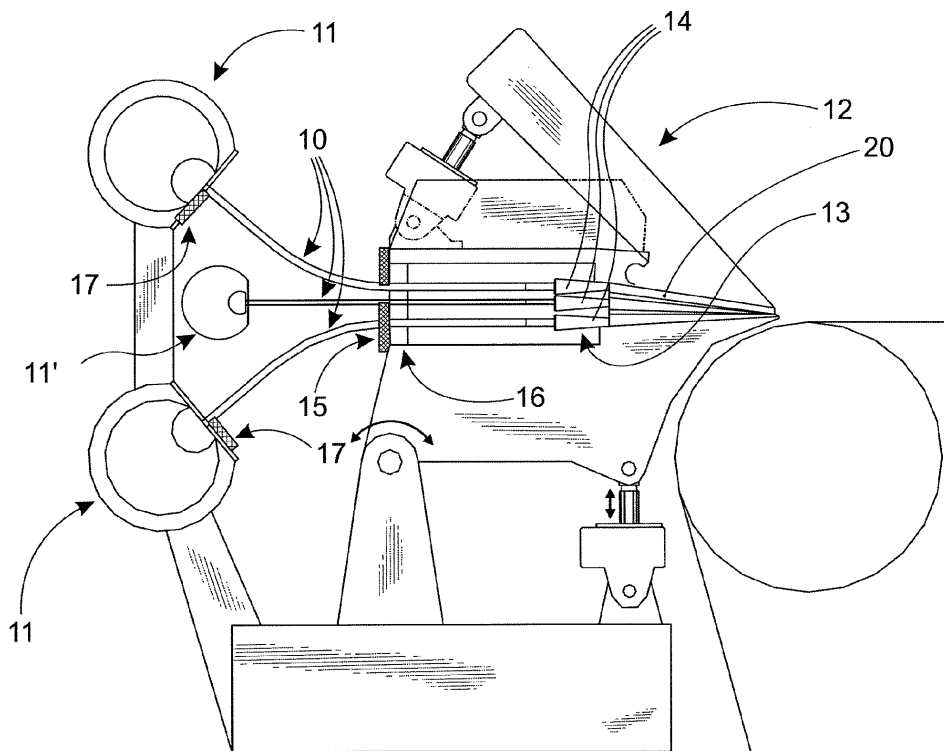


Fig. 1

Description

[0001] The invention relates to a headbox for a fiber web machine, the headbox including a turbulence generator with flow pipes to which a manifold is arranged to be connected using intermediate pipes.

[0002] The headbox of a fiber web machine is supplied with web forming stock from a manifold or a similar delivery pipe. A multi-layer headbox can have several, such as 3 to 5, manifolds. The manifold can be connected to the headbox with a multitude of flexible, elastic intermediate pipes, for example. The web forming stock is supplied to the headbox through these in a desired manner, across its main width.

[0003] A prior art solution is proposed in international patent application publication WO 01/38775 A1. However, a remarkable disadvantage of this solution is that the connection to the structural components of the headbox using rubber hoses is made with separate fitting elements or similar. Using such elements is challenging with the turbulence generator pipes because the turbulence pipes are densely spaced and the space is reduced.

[0004] A known headbox construction includes a number of successive subassemblies. Starting from the inlet side, these typically include a manifold, manifold tubes, an equalizing chamber, a turbulence generator, a slice channel, and a slice opening, from which the web forming stock is discharged to the forming section. Since each subassembly is massive and requires high precision manufacturing, the manufacturing of a headbox is capital-intensive. In addition, each subassembly increases the headbox length in the machine direction, which affects the total machine investment cost.

[0005] The object of this invention is to provide a headbox for a fiber web machine enabling the connection of the manifold to the headbox internal structures located in a confined space. The characteristic features of the headbox according to the invention are set forth in claim 1.

[0006] In the invention, at least part of the intermediate pipes connecting the manifold and the flow pipes of the turbulence generator are arranged to extend within the turbulence generator flow pipe and these intermediate pipes are fastened to the inner surface of the flow pipe. The invention removes the need of various fitting elements and makes it possible to create the connection in spite of the confined headbox internal space. Also, with the invention, it is not necessary to compromise over the spacing of the turbulence generator flow pipes.

[0007] By taking the intermediate pipes as far as this within the headbox, the need of constructing subassemblies is avoided and thereby the price of the headbox is reduced. Using an intermediate pipe, thermal expansion of the headbox can be better controlled. The intermediate pipe, instead of fixed headbox constructions, can take up any potential thermal expansion. The intermediate pipe is also easy to replace, if necessary.

[0008] According to another embodiment, a step is ar-

ranged to form at the boundary between the intermediate pipe and the turbulence generator flow pipe. Thus the flow pipe can be made of a straight pipe. Other additional advantages achieved with the invention become evident from the specification while the characteristic features are set forth in the appended claims.

[0009] The invention, which is not limited to the embodiment set forth below, is described in more detail by making reference to the enclosed drawings, in which:

Figure 1 is a sectional side view of a first example of a headbox provided with intermediate pipes;
 Figure 2 is a sectional side view of a second example of a headbox provided with intermediate pipes;
 Figure 3 is a sectional side view of a third example of a headbox provided with intermediate pipes; and
 Figure 4 shows an example of connecting the intermediate pipes and the turbulence generator flow pipe to each other.

[0010] Figures 1 to 3 are sectional side views of an embodiment of a headbox 12 for a fiber web machine. The headbox 12 includes, in a manner known as such, a turbulence generator 13 equipped with flow pipes 14. At least one manifold 11, 11', for example, separate from the headbox 12, is arranged to be connected to the flow pipes 14 with intermediate pipes 10. The manifold 11, 11' is typically a tubular manifold 11 for a stock suspension, for example, but it can also be a manifold 11' for dilution water, for example, or another type of stock suspension delivery system, such as a so-called octopus manifold (not shown).

[0011] In Figure 1, two stock suspension manifolds 11 and one dilution water manifold 11' are connected to the headbox 12 with intermediate pipes 10 to provide a water layer. In Figure 2, the intermediate pipes 10 are used to connect two manifolds 11 to the headbox 12. The manifold 19 for the dilution water used for the fiber web basis weight profile is located near the second manifold 11, from which dilution water is supplied via a dilution water element to an intermediate pipe 10 shared with the manifold 11. In Figure 3, the intermediate pipes 10 are used to connect two manifolds 11 to the headbox 12. As can be clearly seen from Figures 1 to 3, an intermediate pipe 10 according to the invention is particularly suitable for applications using multi-layer headboxes 12; however, it can also be applied in single-layer headboxes.

[0012] Figure 4 shows an example of connecting the intermediate pipe 10 and the flow pipe 14 of the turbulence generator 13 to each other. As was shown in Figures 1 to 3, the length and diameter of the intermediate pipe 10 are dimensioned in such a way that the intermediate pipe 10 can be fastened to the flow pipe 14 of the turbulence generator 13 within the headbox 12. The intermediate pipe 10 outer surface is fastened to the inner surface of the flow pipe 14. Thus, at least part of the

intermediate pipes 10 are arranged to extend within the flow pipe 14 of the turbulence generator 13. The flow pipe 14 can have, in a manner known as such, at least two successive cross-section profiles allowing the connection of the intermediate pipe 10 to the pipe section on the inlet side. By connecting the intermediate pipe 10 directly to the flow pipe 14, the headbox 12 no longer needs an equalizing chamber or manifold tubes.

[0013] The intermediate pipe 10 can be arranged within the flow pipe 14 for a distance D. Then a step 21 (Figure 4) is formed at the boundary between the intermediate pipe 10 and the flow pipe 14; this step can serve to generate turbulence. The flow pipe 14 can even be made of a straight pipe, which makes it inexpensive to manufacture. For example, if the intermediate pipe 10 is made of plastic, it can be made smooth on the outer surface to be easy to push within the flow pipe 14. Arranging the intermediate pipe 10 within the flow pipe 14 is advantageous because the flow pipes 14 of the turbulence generator 13 are relatively densely spaced. In addition, the construction of the flow pipe 14 becomes advantageous when it can be made of a straight pipe whose end located on the side of the slice channel 20 is simply made to a rectangular or another similar form.

[0014] Fitting the intermediate pipe 10 within the flow pipe 14 is arranged to allow for it a slight movement relative to the flow pipe 14. Thus the intermediate pipe 10 can take up length changes due to temperature variations. The intermediate pipe 10 is also equipped with a sealing arrangement 18 for sealing the joint between the intermediate pipe 10 and the flow pipe 14. An example of the sealing arrangement may be an O-ring 18, for which at least one groove is arranged at the end of the intermediate pipe 10, on its outer surface, for a sealing ring 18.

[0015] As shown in Figures 1 to 3, a connection arrangement 15 is adapted in the intermediate pipe 10 for connecting it to the constructions 16 on the inlet side of the headbox 12. According to an embodiment, the connection arrangement 15 can be formed, for example, by locking rings formed on the outer surface of the intermediate pipe 10 from which it can be connected to the force plate 16 of the headbox 12.

[0016] Correspondingly, the intermediate pipe 10 is also provided with a connection arrangement 17 for connecting it to the manifold 11. This can also be implemented in the same way as the connection to the constructions of the headbox 12, using a small reduction sleeve, for example. Between the headbox 12 and the manifold 11, the intermediate pipe 10 can also vary its length during thermal expansion. Across this distance, the intermediate pipe 10 can have a curved shape, the curvature serving to take up thermal expansion.

[0017] The intermediate pipe 10 can be pre-bent in the longitudinal direction, which facilitates the control of thermal expansion between the manifold 11 and the headbox 12. This assists in its installation between the headbox 12 and the manifold 11, particularly if they are located at

different levels in the vertical direction. The material of the intermediate pipe 10 can be plastic, for example, such as polyamide, PE or POM, generally industrial plastic, and an example of its manufacturing method can be extrusion.

[0018] The intermediate pipe 10 can have a constant inner diameter and outer design. For example, by casting from plastic, the intermediate pipe 10 can be an integral component. Since an intermediate pipe 10 made of plastic can resist slight bending, the pipe 10 is also suitable for headboxes 12 in which the tilt angle is adjustable. A flexible intermediate pipe 10 also enables free tilting of the headbox 12 while the manifolds 11 are kept in place.

[0019] At least one local change in the cross-section can be arranged in the intermediate pipe 10. This creates a flow change in a desired place in the intermediate pipe 10, which is advantageous for the turbulence phenomenon.

[0020] In the context of the invention, a fiber web machine refers to paper, board and tissue machines as well as pulp drying machines.

[0021] It is understood that the above description and the figures related thereto are only intended for illustrating the present invention. The invention is thus not limited only to the embodiments described above or those set forth in the claims, but many different variations and modifications of the invention, which are possible within the inventional idea specified in the appended claims, will be apparent for one skilled in the art.

[0022] The invention relates to a headbox for a fiber web machine including a turbulence generator (13) equipped with flow pipes (14) to which at least one manifold (11, 11') is arranged to be connected using intermediate pipes (10). At least part of the intermediate pipes are arranged to extend within the flow pipe of the turbulence generator.

Claims

1. A headbox for a fiber web machine including a turbulence generator (13) equipped with flow pipes (14) to which at least one manifold (11, 11') is arranged to be connected using intermediate pipes (10), **characterized in that** at least part of the intermediate pipes (10) are arranged to extend within the flow pipe (14) of the turbulence generator (13) and these intermediate pipes (10) are fastened to the inner surface of the flow pipe (14).
2. A headbox according to claim 1, **characterized in that** the intermediate pipe (10) is an integral component.
3. A headbox according to claim 1 or 2, **characterized in that** a connection arrangement (15) is arranged in the intermediate pipe (10) for connecting it to the constructions (16) on the inlet side of the headbox

(12).

4. A headbox according to any of claims 1 to 3, **characterized in that** a connection arrangement (17) is arranged in the intermediate pipe (10) for connecting it to the manifold (11). 5

5. A headbox according to any of claims 1 to 4, **characterized in that** the fitting of the intermediate pipe (10) to the flow pipe (14) is arranged to allow for it a slight movement relative to the flow pipe (14). 10

6. A headbox according to any of claims 1 to 5, **characterized in that** the intermediate pipe (10) is equipped with a sealing arrangement (18) for sealing the joint between the intermediate pipe (10) and the flow pipe (14). 15

7. A headbox according to any of claims 1 to 6, **characterized in that** at least one local change in the cross-section is arranged in the intermediate pipe (10). 20

8. A headbox according to any of claims 1 to 7, **characterized in that** the material of the intermediate pipe (10) is plastic. 25

9. A headbox according to any of claims 1 to 8, **characterized in that** the intermediate pipe (10) is present in its longitudinal direction. 30

10. A headbox according to any of claims 1 to 9, **characterized in that** a step (21) is arranged to form at the boundary between the intermediate pipe (10) and the flow pipe (14) and the flow pipe (14) is made of a straight pipe. 35

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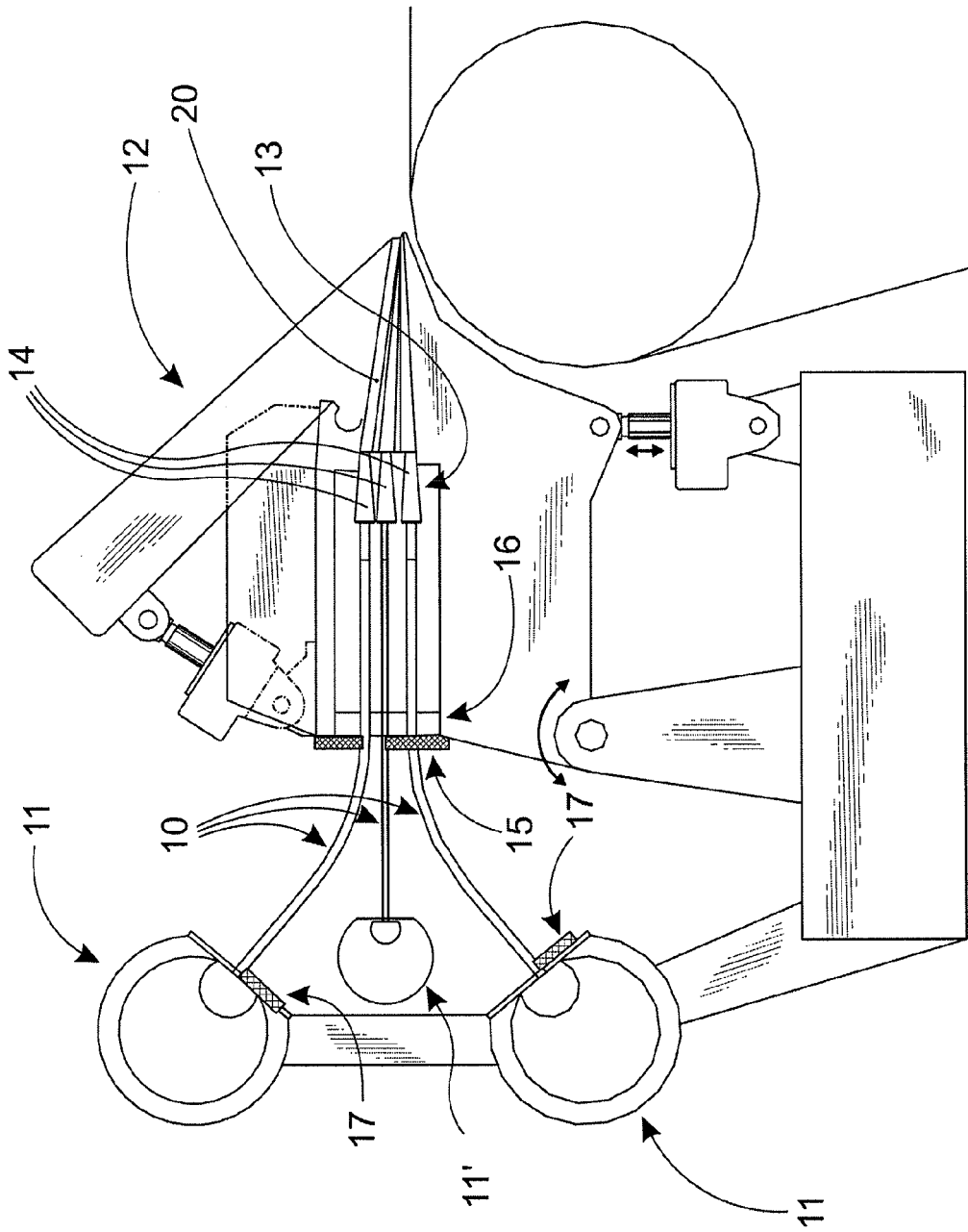
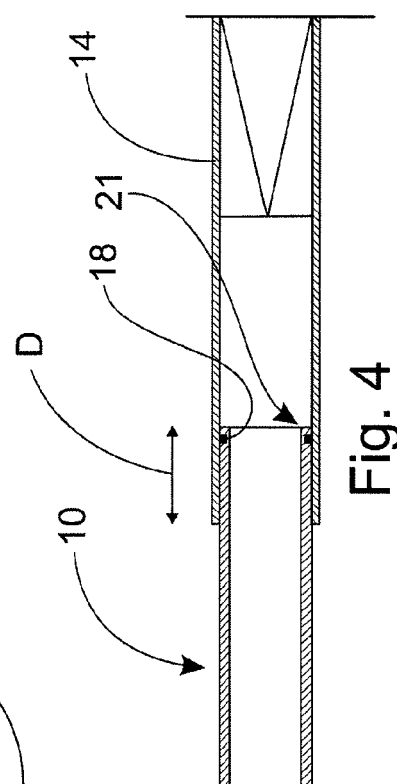
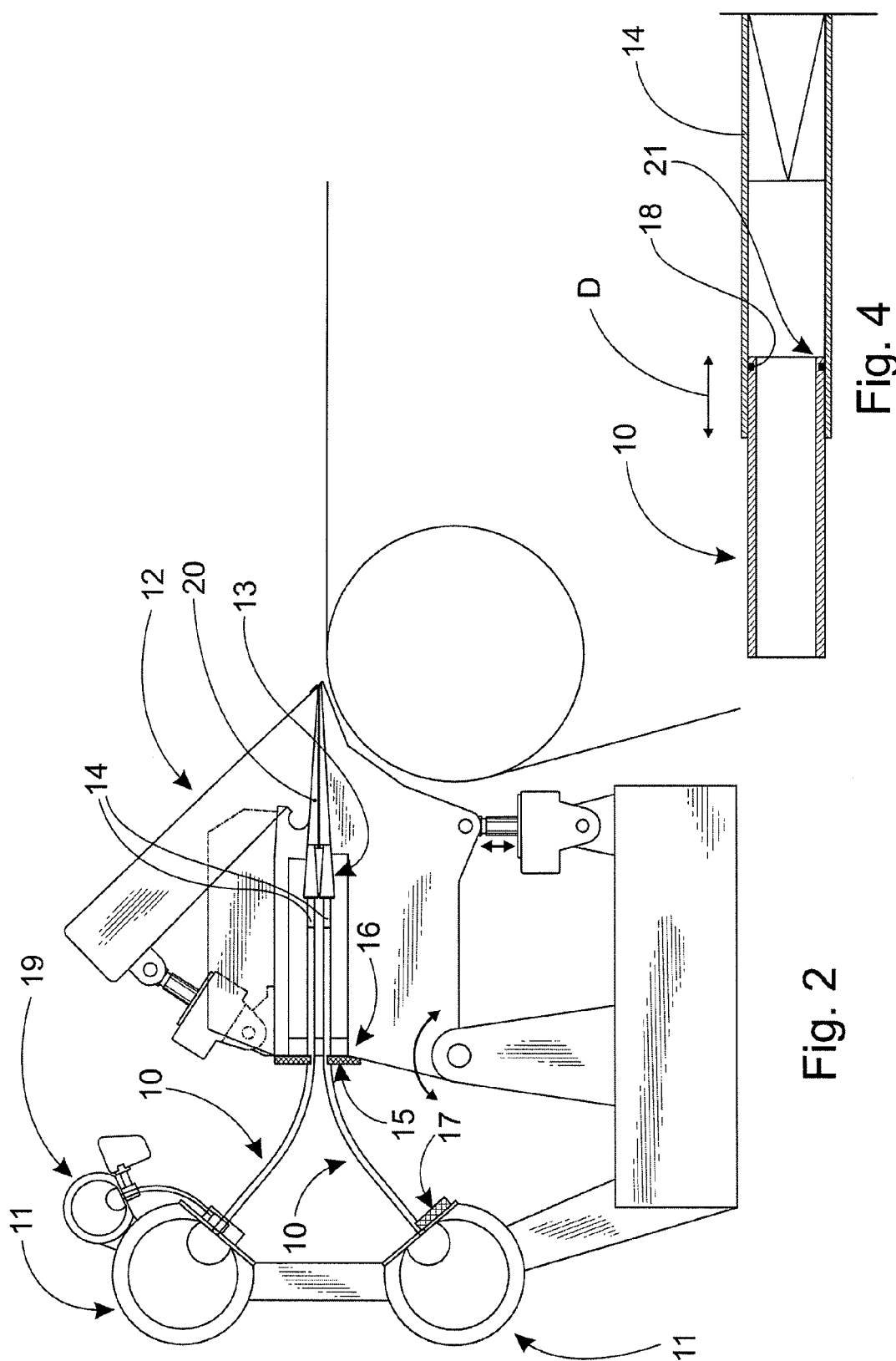


Fig. 1



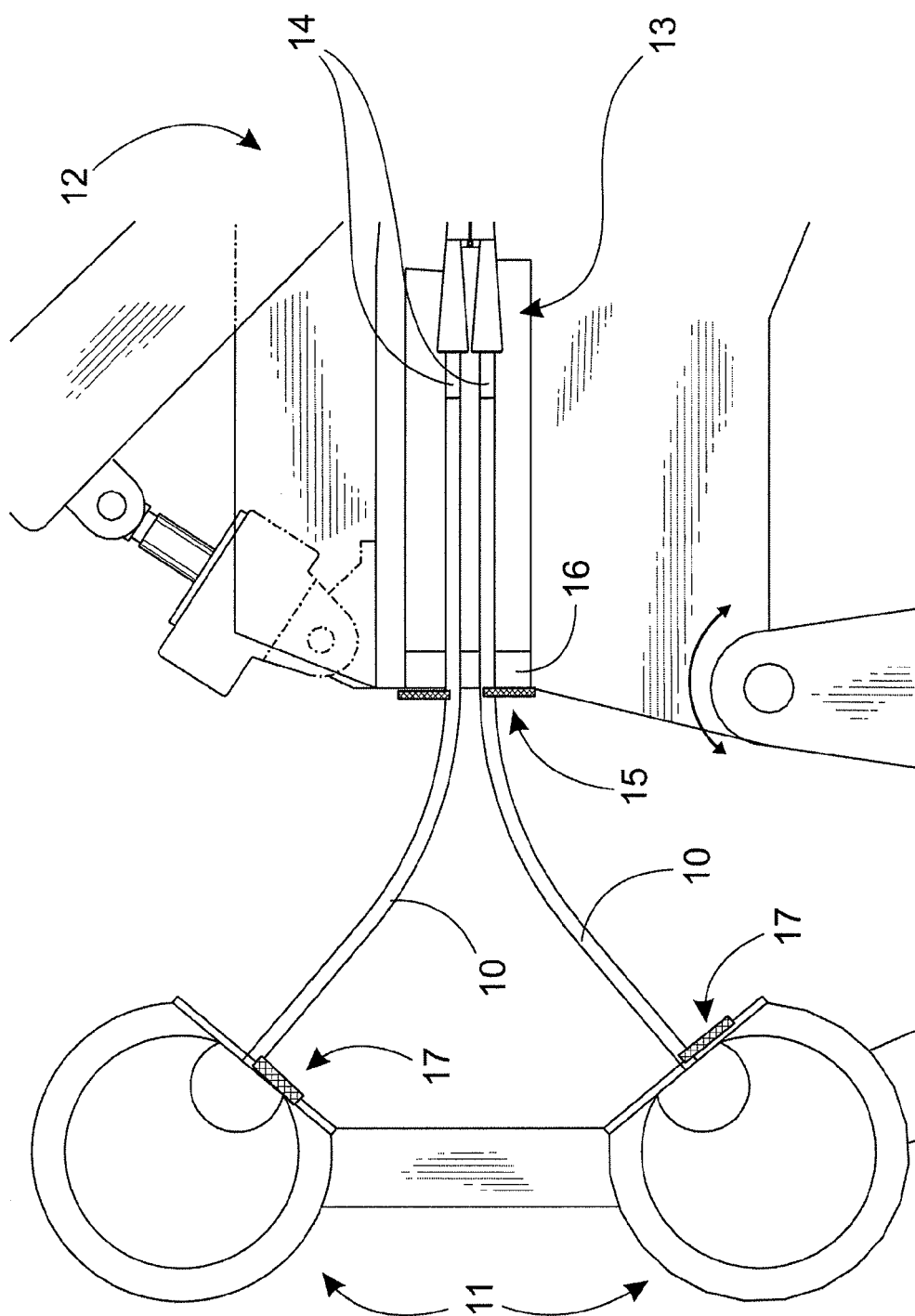


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 12 18 5036

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	WO 2008/105714 A1 (METSO PAPER KARLSTAD AB [SE]; HARALDSSON ULF [SE]) 4 September 2008 (2008-09-04) * page 8 - page 17; figures 1-3,5-7,11 *	1,2,8,10	
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			TECHNICAL FIELDS SEARCHED (IPC)
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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 12 October 2012	Examiner Beckman, Anja
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 12 18 5036

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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