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(54) Apparatus for humidifying mats based on loose wood material

(57) Apparatus (1) for humidifying mats based on loose wood material, comprising means (2) for distributing a heat propagation vehicle on at least one face (M1) of a mat (M) in transit along an advancement direction (A), the vehicle being dry or superheated saturated steam and the distribution means (2) comprising at least one lance (3), which is provided with a plurality of ports (4) for the exit of the steam, which are designed to be arranged at the face (M1) and are distributed transversely to the advancement direction (A), and is connected in input to a unit for generating the steam.

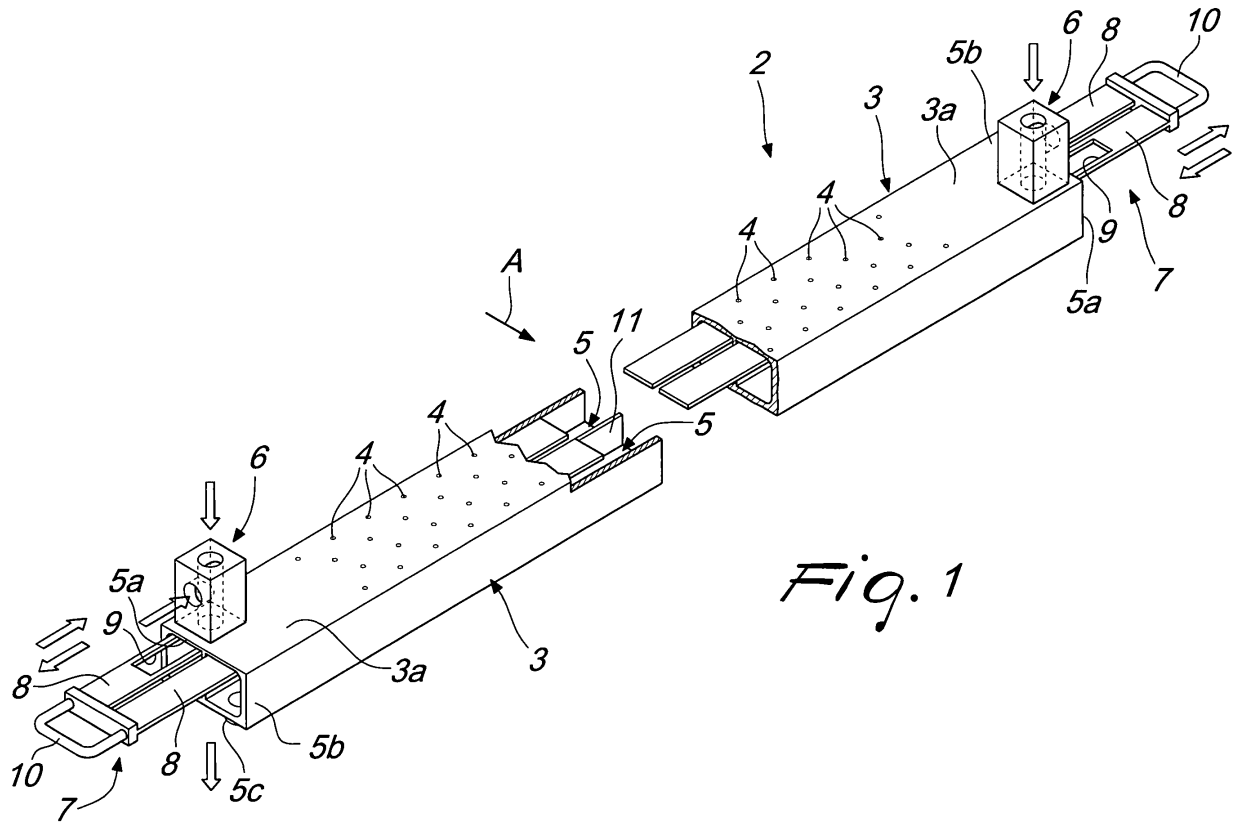


Fig. 1

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Description

[0001] The present invention relates to an apparatus for humidifying mats based on loose wood material.

[0002] The production of panels made of wood chips or fibers provides for a step for forming a semifinished mat of loose particles that are mixed with adhesive substances and a subsequent step of hot pressing of the mat to obtain a panel following the hot polymerization of the adhesive substances.

[0003] It is known to provide a step for the surface humidification of the mat before entering the press in order to increase the rate of penetration of the heat toward the interior of such mat during pressing; the water particles absorbed by the mat act as a vehicle for propagating heat in the subsequent pressing step.

[0004] This step is currently performed by using equipment that is installed in the end portion of the conveyor belt that moves the mats through the forming line. This equipment provides for a bridge-like structure arranged above such belt, transversely to the direction of advancement of such belt, and is provided with a plurality of nozzles for atomizing water, possibly with additives. The particles of atomized water fall by gravity onto the upper face of the mat and act as a vehicle for propagating heat in the subsequent hot pressing step.

[0005] This equipment, therefore, is used predominantly to humidify the upper face of the mat.

[0006] Its use to treat the lower face of the mat in fact does not ensure that the desired degree of humidity will be obtained over the entire extension of the mat and entails a considerable waste of water. The particles atomized upward from below in fact tend to fall back and only partly reach the mat.

[0007] In order to obviate this drawback, it is also known to use this equipment to atomize water directly on the conveyor belt upstream of the forming station, so that the mat rests with its lower face on the wet belt and absorbs humidity from it.

[0008] This operating method, however, entails the risk that parts of the mat might adhere to the belt and remain attached to it during passage on the pressing belt, consequently forming surface defects on the mat and dirtying the forming belt. Moreover, the presence of suction apparatuses along the forming line reduces the humidity of the mat during the crossing of such line and forms deposits in the suction ducts and hoods due to the deposition of humid material.

[0009] Therefore, this known equipment is not free from drawbacks, which include the fact that it does not allow to obtain correct and efficient humidification of the lower face of the mat. As a consequence of pressing, the resulting panels therefore have different physical and mechanical characteristics on the two opposite faces.

[0010] The aim of the present invention is to eliminate the above-mentioned drawbacks of the background art, by providing an apparatus for humidifying mats based on loose wood material that allows to optimize the step for humidifying the mat without waste, ensuring that the desired degree of humidification is reached with uniform distribution, particularly on the lower face of the mat.

[0011] Within this aim, an object of the present invention is to increase the propagation depth of humidity in the mat, with consequent increase in the efficiency of the hot pressing step.

[0012] Another object of the present invention is to avoid the formation of surface defects on the mat that would entail the production of defective panels.

[0013] Another object of the present invention is to not cause the formation of deposits of material along the forming and pressing lines or in the auxiliary apparatuses thereof.

[0014] Another object of the present invention is to allow its installation along existing or newly built systems, without requiring the execution of particular structural interventions thereon.

[0015] Another object of the present invention is to have a structure that is simple, relatively easy to provide in practice, safe in use, effective in operation, and of relatively low costs.

[0016] This aim and these and other objects, which will become better apparent hereinafter, are achieved by the present apparatus for humidifying mats based on loose wood material, comprising means for distributing a heat propagation vehicle on at least one face of a mat in transit along an advancement direction, **characterized in that** said vehicle is dry or superheated saturated steam and in that said distribution means comprise at least one lance, which is provided with a plurality of ports for the exit of said steam, which are adapted to be arranged at said face and are distributed transversely to said advancement direction, and is connected in input to a unit for generating said steam.

[0017] Further characteristics and advantages of the present invention will become better apparent from the following detailed description of a preferred but not exclusive embodiment of an apparatus for humidifying mats based on loose wood material, illustrated by way of nonlimiting example in the accompanying drawings, wherein:

Figure 1 is a schematic perspective view of the distribution means of an apparatus according to the invention;

Figure 2 is a schematic perspective view of a portion of the apparatus according to the invention;

Figure 3 is a schematic perspective view of the heating means of the apparatus according to the invention;

Figure 4 is a schematic longitudinal sectional view of a lance according to the invention, illustrating the behavior of the stream of steam;

Figure 5 is a schematic longitudinal sectional view of the lance according to the invention, illustrating the behavior of the stream of compressed air;

Figure 6 is a schematic side view of the apparatus according to the invention installed upstream of the

inlet of a press of the continuous type;

Figure 7 is a schematic side view of the apparatus according to the invention installed upstream of the inlet of a press of the discontinuous type.

[0018] With reference to the figures, the reference numeral 1 generally designates an apparatus for humidifying mats M based on loose wood material.

[0019] The term "mats" M is used to reference the semifinished articles obtained by forming loose wood material (chips, fibers, flakes, et cetera) mixed with adhesive substances; the mats M generally have the shape of a parallelepiped and are formed directly on a conveyor belt T, which transfers them along an advancement direction A through the forming station (not shown) toward the inlet to a pressing station P, which can be of the continuous type (Figure 6) or discontinuous type, with a single chamber or with multiple chambers (Figure 7).

[0020] In the description that follows, the term "width" of the mat M is used to reference the dimension that lies transversely to the advancement direction A, considering that the mat M generally advances while oriented longitudinally.

[0021] The apparatus 1 comprises means 2 for distributing a heat propagation vehicle on at least one face of the mat M in transit along the advancement direction A.

[0022] The apparatus 1 can be designed to humidify one or both of the mutually opposite largest faces of the mat M. The figures show the application of the apparatus 1 for humidifying a lower face M1 of the mat M; in this configuration, the apparatus 1 can be associated with a unit, not shown, for atomizing water, optionally with additives, onto the upper face of the known type of mat M.

[0023] The heat propagation vehicle is constituted by dry saturated steam (titer = 1) or by superheated steam, and the distribution means 2 comprise at least one lance 3 provided with a plurality of ports 4 for the outflow of steam, which are designed to be arranged proximate to the lower face M1 and are distributed transversely to the advancement direction so as to strike, with the steam jets that exit from such ports, the entire width of the mat M. The lance 3 is connected in input to a steam generation unit, which is not shown since it is of a known type.

[0024] Conveniently, the lance 3 is connected in output to an assembly, not shown, for collecting the condensation that has formed inside it and/or the debris of wood material that has fallen inside it.

[0025] The lance 3 consists of a channel 5 that is connected to the ports 4 and has a first end 5a and a second end 5b, which are mutually opposite and at which it is connected respectively to the steam generation unit and to the collection assembly. Preferably, the channel 5 is connected directly to the ports 4, so as to obtain a jet of steam in output from each port 4 with a diffuse pattern, so as to not produce grooves on the lower face M1.

[0026] The lance 3 is preferably arranged so that the ports 4 are substantially in contact with the face M1. More particularly, the lance 3 is provided with a flat wall 3a on which the ports 4 are formed, such wall being adapted to be arranged tangent to the face M1 of the mat M in transit.

[0027] In the embodiment shown, the channel 5 has a linear extension and is arranged substantially transversely to the advancement direction A, preferably at right angles thereto. The ports 4 are distributed with constant spacing along at least one row and preferably along multiple rows that are mutually staggered so as to strike, with the jets of steam in output from such ports, the entire width of the mat M.

[0028] The direction of entry of the steam along the channel 5 is substantially transverse to the extension of such channel, so as to give a turbulent motion to the stream of steam, facilitating its passage through the ports 4, which otherwise might only be skimmed by such flow.

[0029] The apparatus 1 further comprises means for introducing compressed air, which are connected in input to the lance 3 to eliminate condensation inside the channel 5 in the absence of the supply of steam and to remove any wood material debris fallen inside such channel through the ports 4, which are associated at the first end 5a.

[0030] Such input means comprise a compressor assembly of a known type, which accordingly is not shown.

[0031] The stream of compressed air (Figure 5) in input along the channel 5 transfers the condensation and/or debris that might have deposited inside it toward the collection assembly through an opening 5c formed at the second end 5b.

[0032] The lance 3 has a connecting element 6, which is associated with the wall 3a at the first end 5a and is provided with an input portion 6a that is connected to the channel 5 through a hole 5d that is formed in the wall 3a and is arranged transversely to the extension of such channel. The connecting element 6 is further provided with a first steam inlet port 6b in a direction that is substantially transverse to the input portion 6a and with a second port 6c for the inflow of compressed air in a direction that is parallel to such inlet portion. The first port 6b and the second port 6c are associated respectively with the unit for generating steam and with the means for introducing compressed air.

[0033] The stream of steam (Figure 4) thus encounters two consecutive variations of direction before it diffuses along the channel 5 so as to increase its turbulence.

[0034] Conveniently, the lance 3 has flow control means 7 for the selective closure of the ports 4 according to the width of the mat M being processed.

[0035] The flow control means 7 comprise at least one lamina 8, which is associated so that it can slide within the channel 5 at one of its ends 5a or 5b. The lamina 8 is arranged so as to be internally tangent or proximate to the wall 3a. If the lamina 8 is associated with the first end 5a, it is provided with an elongated slot 9 to allow the passage of the stream of steam and compressed air in input to the channel 5 through the inlet portion 6a, regardless of its position along such channel. Preferably,

the flow control means 7 comprise two laminas 8, which are associated slidingly at respective ends 5a and 5b of the channel 5; the lamina located at the first end 5a is provided with the slot 9.

[0036] In the embodiment shown, the sliding actuation of the laminas 8 is of the manual type, and such laminas have respective end portions that protrude from the channel 5 and are associated with means 10 for grip by an operator, such as a handle or the like. It is in any case possible to automate the sliding of the laminas 8 as a function of the width of the mats M being processed, according to technologies that are known to the person skilled in the art.

[0037] Advantageously, the distribution means 2 of the apparatus 1 shown in the figures comprise two lances 3 in countercurrent, i.e., in which the respective channels 5 are parallel to each other and the respective first ends 5a are arranged on opposite sides. In this manner it is possible to level the degree of humidification over the width of the mat M, taking into account the load losses that occur on the length of each channel 5.

[0038] The lances 3 are provided as a single piece constituted by a box-like body inside which there is a diaphragm 11 for separating the channels 5.

[0039] The lances 3 are provided with respective laminas 8 at the mutually opposite ends of the corresponding channels 5; the laminas 8, at each of the first and second ends 5a and 5b, can be actuated so as to slide simultaneously.

[0040] The apparatus 1 further provides means 12 for heating the distribution means 2, which are adapted to keep them at such a temperature as to inhibit the condensation of the steam that flows through the channels 5.

[0041] The heating means 12 provide a plate 13 made of heat-conducting material, which is provided with a seat 14 for accommodating the lances 3, which also are made of heat-conducting material, and at least one duct 15, which is arranged substantially transversely to the advancement direction A, for the passage of a heating fluid that is constituted for example by steam. The plate 13 is provided preferably with at least two ducts 15, which are crossed in countercurrent by the fluid and are arranged on opposite sides of the lances 3 with respect to the advancement direction A. The plate 13 is kept at a temperature on the order of 160°C.

[0042] The plate 13 can be shaped so as to form a wedge-shaped portion 13a at the front part with respect to the advancement direction A, in order to allow the positioning of the apparatus 1 proximate to the inlet to the pressing station P.

[0043] The upper surface, with respect to the figures, of the plate 13 is coplanar with respect to the wall 3a so as to define a surface for the sliding of the mat M in transit.

[0044] The method for humidifying the mats M according to the invention, performed by the apparatus 1, comprises the steps of:

- supplying dry or superheated saturated steam, for example at temperatures on the order of 110°C and at a pressure on the order of at most 1 bar;
- providing at least one mat M in transit along the advancement direction A; and
- distributing the steam on at least one face of the mat M at at least one band that lies transversely to the advancement direction A whose extension is at least equal to the width of such mat.

[0045] The operation of the apparatus according to the present invention is as follows.

[0046] During the operating cycle, the steam production unit supplies the lances 3, from which steam exits through the ports 4 and strikes the lower face M1 in transit along the advancement direction A resting on the apparatus 1.

[0047] The steam humidifies the face M1 and penetrates at least partially into the mat M, increasing its degree of humidity, so as to facilitate the polymerization of the adhesive substances during the subsequent hot pressing step.

[0048] The transfer of heat from the heating means 12 to the distribution means 2 allows to avoid or at least contain the formation of condensation along the channels 5 during operation. It should be noted that if any condensation formed along the channels 5 were carried toward the mat M by the stream of steam, it would cause the formation of stains on the face M1, and therefore of production rejects.

[0049] The adjustment of the position of the flow control means 7 allows to limit the exit of the steam only to the ports 4 at which the mat M is in transit, depending on its width.

[0050] In case of interruption of the delivery of steam, for example in the case of machine downtime, and subsequent resumption of the operation of the apparatus 1, the input means are activated so as to eliminate from the inside of the channels 5 any condensation that has formed as a consequence of the cooling of the steam that has remained inside it and/or any debris of wood material that may have fallen inside such channels.

[0051] In practice it has been found that the described invention achieves the proposed aim and objects, and in particular the fact is stressed that the apparatus according to the invention allows to ensure effective and efficient humidification of one or both faces of a mat, and in particular of the lower face. This entails a reduction in the polymerization times of the adhesive substance and therefore an increase in the productivity of the press, i.e., for an equal retention time in the press, a reduction in the amount of adhesive substance that is used, with a consequent reduction in material costs.

[0052] The apparatus according to the invention therefore allows to process the mats entering the press so as to obtain panels whose density and flexural strength are substantially equivalent on the two mutually opposite faces. The panels thus treated further have both faces "glazed".

[0053] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0054] All the details may further be replaced with other technically equivalent elements.

[0055] In practice, the materials used, as well as the contingent shapes and dimensions, may be any according to requirements without thereby abandoning the scope of the protection of the appended claims.

[0056] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. An apparatus (1) for humidifying mats based on loose wood material, comprising means (2) for distributing a heat propagation vehicle on at least one face (M1) of a mat (M) in transit along an advancement direction (A), **characterized in that** said vehicle is dry or superheated saturated steam and **in that** said distribution means (2) comprise at least one lance (3), which is provided with a plurality of ports (4) for the exit of said steam, which are designed to be arranged at said face (M1) and are distributed transversely to said advancement direction (A), and is connected in input to a unit for generating said steam.

2. The apparatus (1) according to claim 1, **characterized in that** it comprises an assembly for collecting the condensation and/or debris formed within said lance (3), which is connected in output to said lance.

3. The apparatus (1) according to one or more of the preceding claims, **characterized in that** said lance (3) comprises at least one channel (5) that is connected to said ports (4) and has a first end and a second end (5a, 5b) which are mutually opposite and at which said channel is connected respectively to said production unit and to said collection assembly and is adapted to be arranged substantially transversely to said advancement direction (A).

4. The apparatus (1) according to one or more of the preceding claims, **characterized in that** said ports (4) are connected directly to said channel (5).

5. The apparatus (1) according to one or more of the preceding claims, **characterized in that** said lance (3) comprises a substantially flat wall (3a), in which said ports (4) are formed and which is adapted to be arranged tangent to said face (M1), with said ports (4) substantially in contact with said face.

6. The apparatus (1) according to one or more of the preceding claims, **characterized in that** said ports (4) are distributed along at least one row.

7. The apparatus (1) according to one or more of the preceding claims, **characterized in that** said ports (4) are distributed along a plurality of said mutually staggered rows.

8. The apparatus (1) according to one or more of the preceding claims, **characterized in that** the inlet direction of said steam along said channel (5) is substantially transverse to the extension of said channel.

9. The apparatus (1) according to one or more of the preceding claims, **characterized in that** it comprises means for introducing compressed air which are connected in input to said lance (3) to eliminate condensation and/or debris of wood material inside said channel (5) toward said collection assembly.

10. The apparatus (1) according to one or more of the preceding claims, **characterized in that** said lance (3) comprises flow control means (7) for the selective closure of said ports (4).

11. The apparatus (1) according to one or more of the preceding claims, **characterized in that** said flow control means (7) comprise at least one lamina (8), which is associated slidingly with said channel (5) proximate to one of its ends (5a or 5b).

12. The apparatus (1) according to one or more of the preceding claims, **characterized in that** said distribution means (2) comprise at least two of said lances (3) whose respective channels (5) are arranged mutually parallel and so that the respective first ends (5a) lie on opposite sides of the advancement direction (A).

13. The apparatus (1) according to one or more of the preceding claims, **characterized in that** it comprises means (12) for heating said distribution means (2).

14. The apparatus (1) according to one or more of the preceding claims, **characterized in that** said heating means (12) comprise a plate (13) made of heat-conducting material, which is provided with a seat (14) for accommodating said distribution means (2) and with at least one duct (15) for the passage of a heated fluid, the distribution means (2) being made of heat-conducting material.

15. A method for humidifying mats based on loose wood material, **characterized in that** it comprises the

steps of:

- supplying dry or superheated saturated steam;
- supplying at least one mat (M) based on loose wood material in transit along an advancement direction (A); and
- distributing said steam on at least one face (M1) of said mat (M) at at least one band that lies transversely to said advancement direction (A).

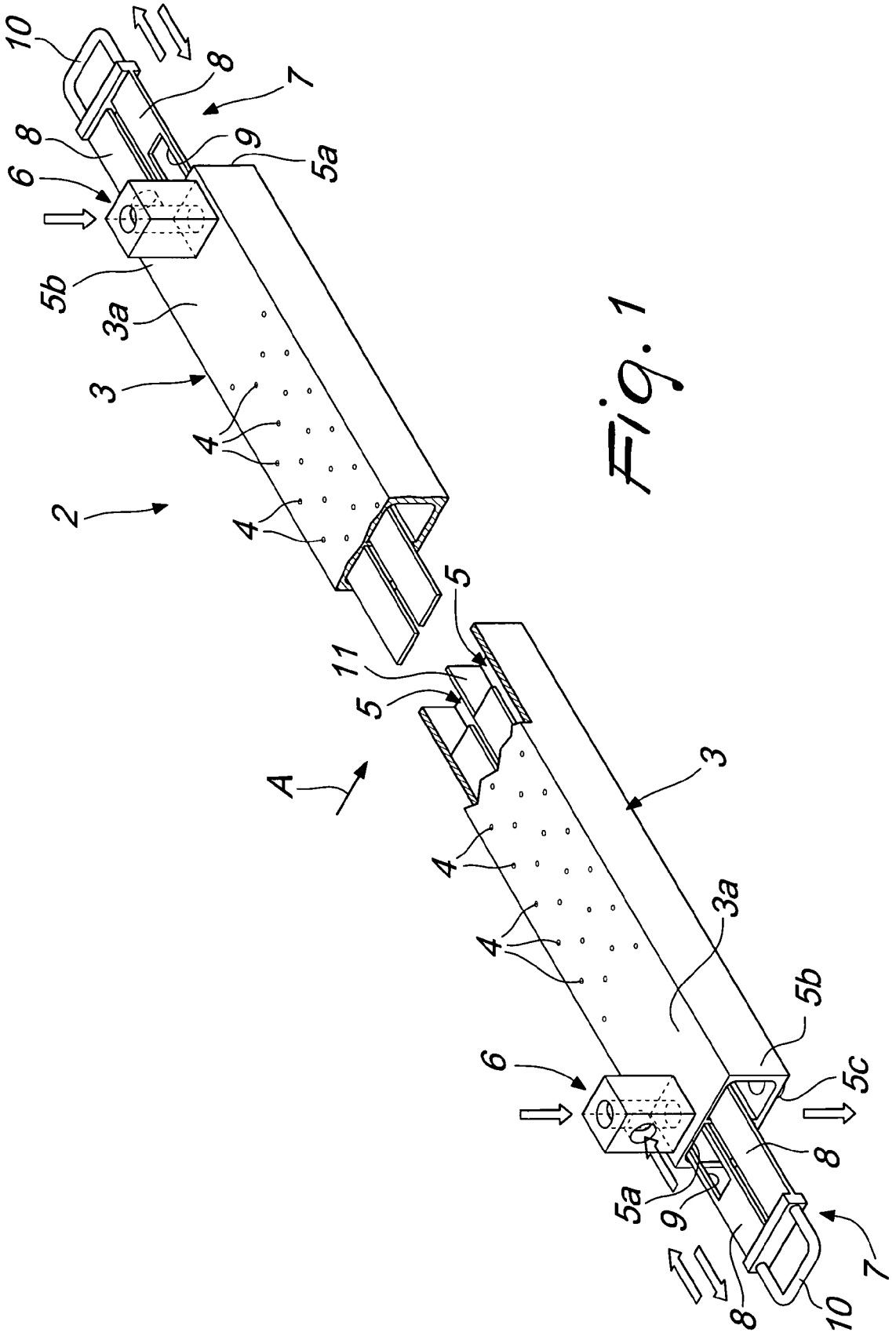


Fig. 1

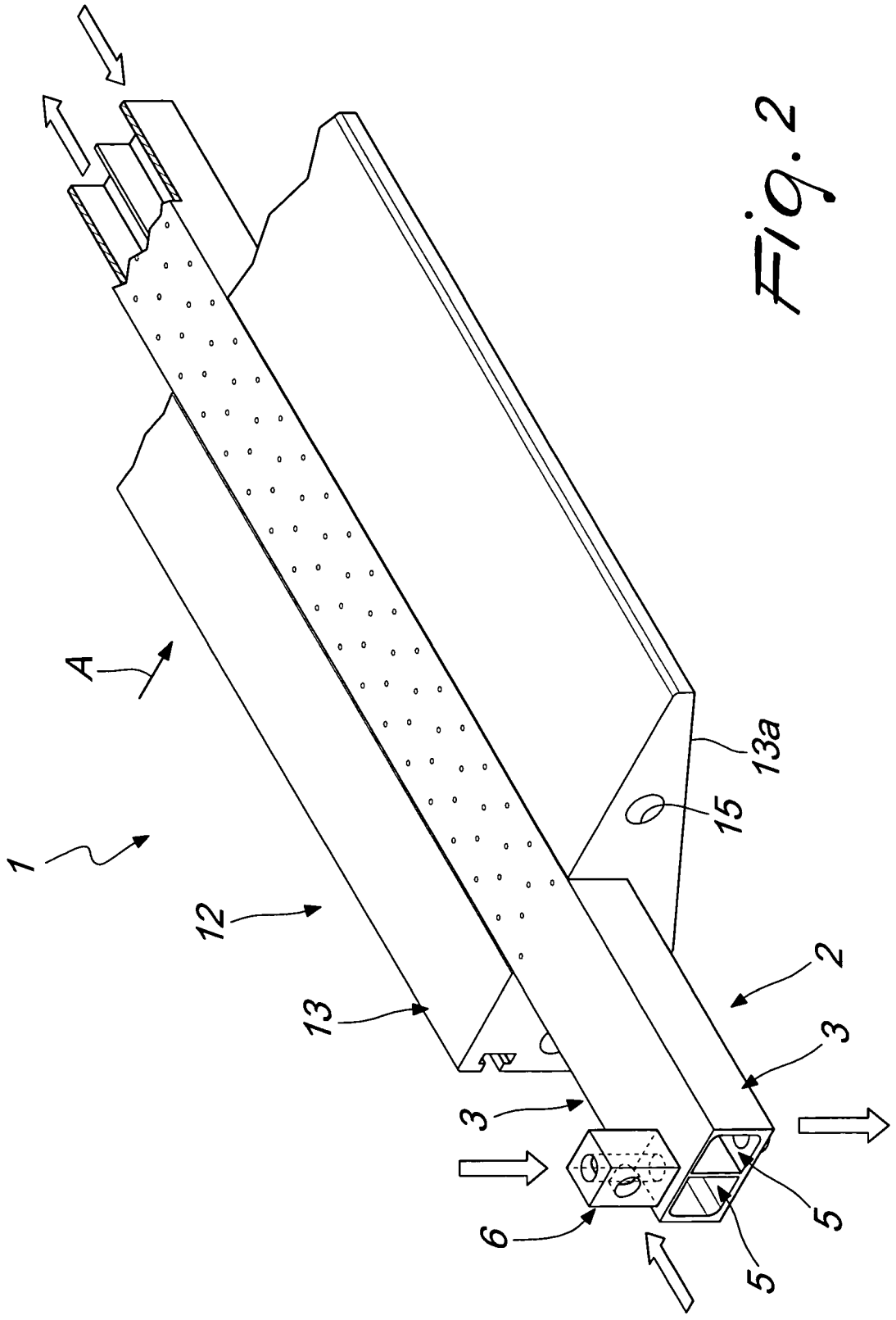


Fig. 2

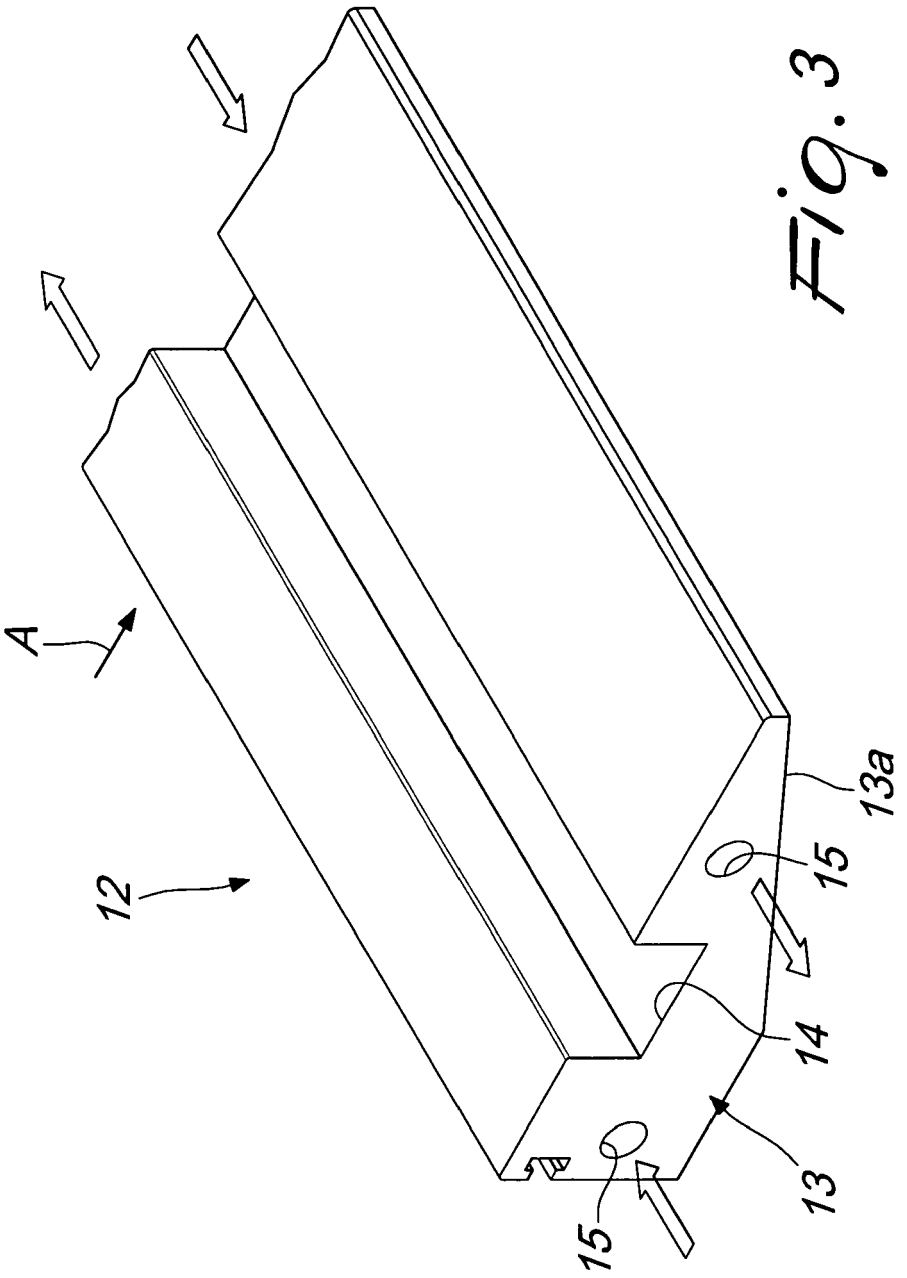


Fig. 3

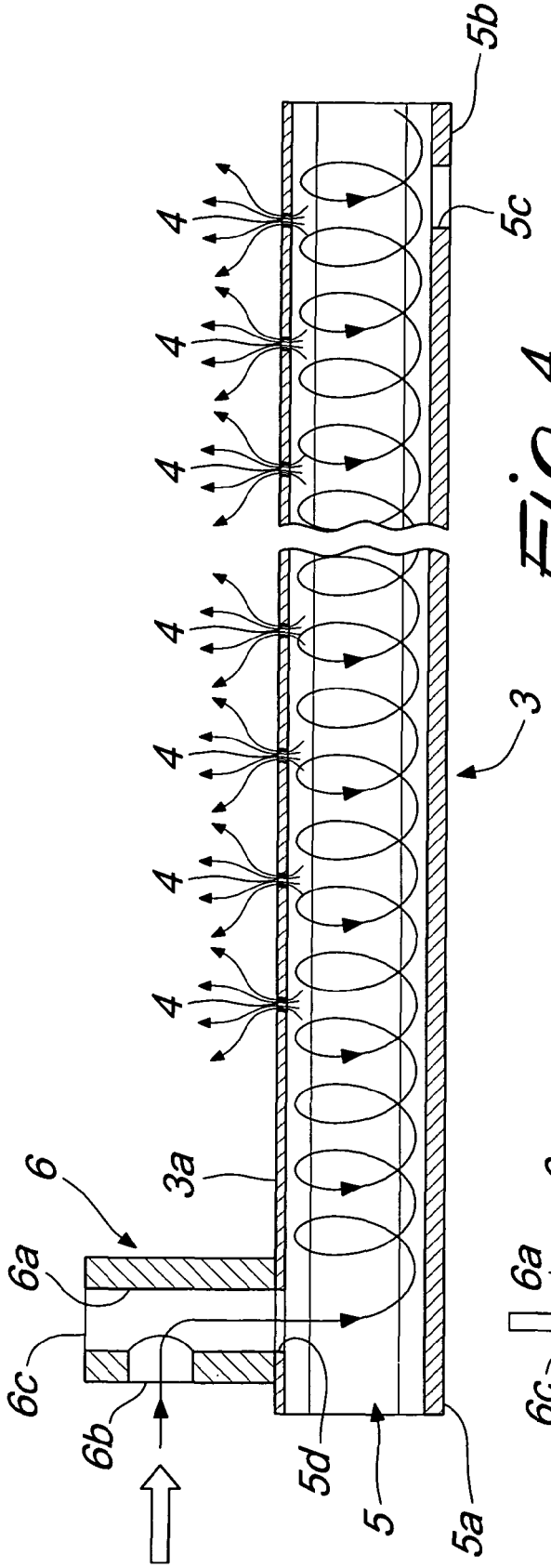


Fig. 4

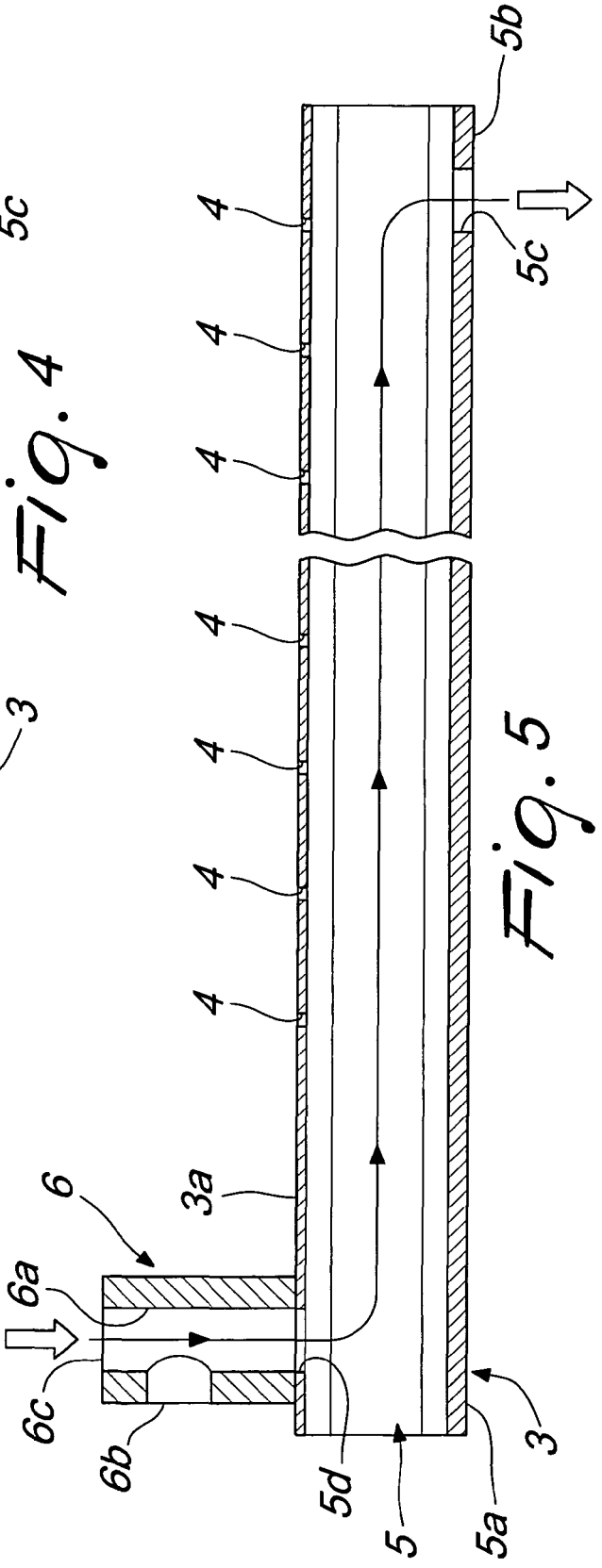


Fig. 5

Fig. 6

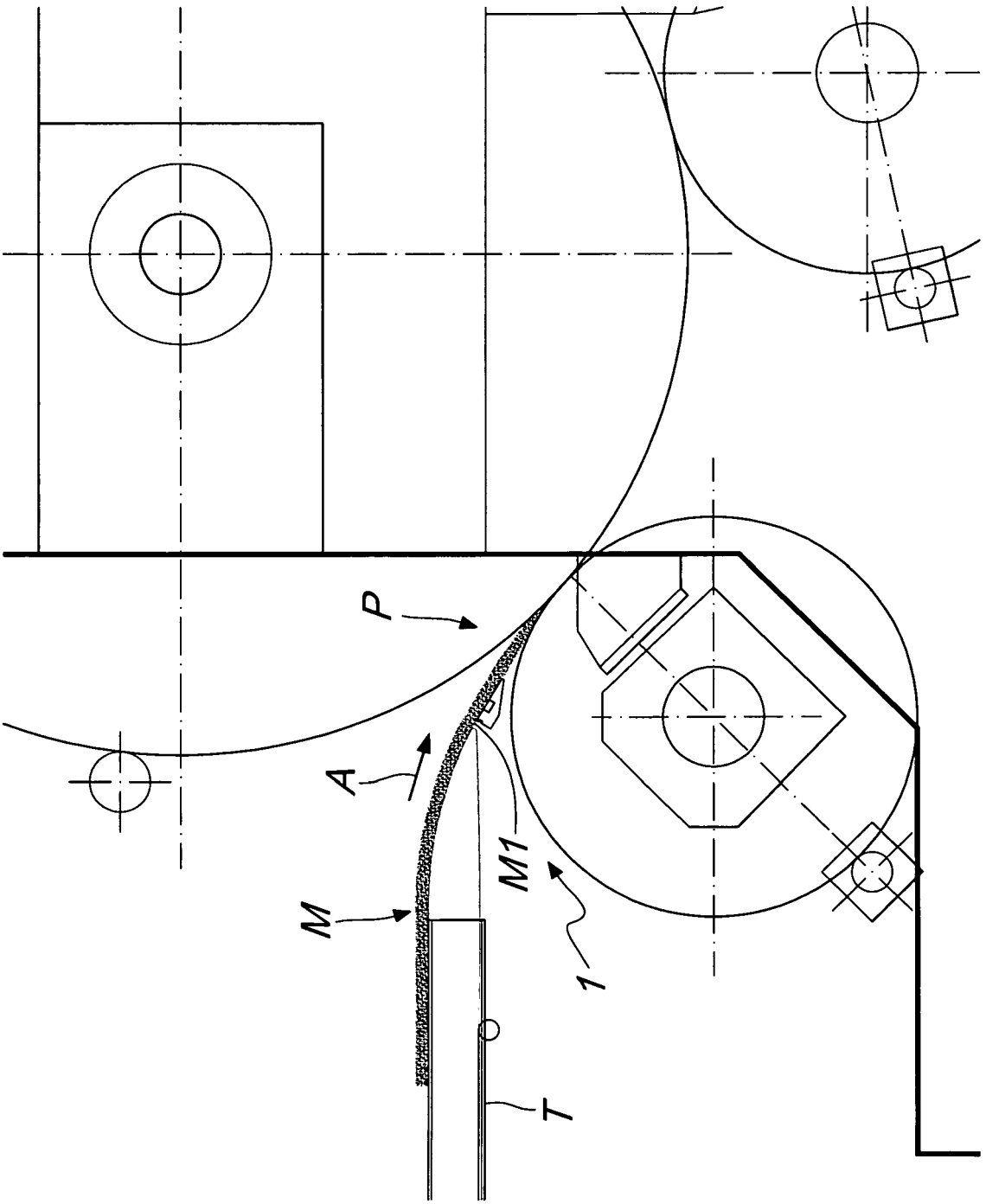
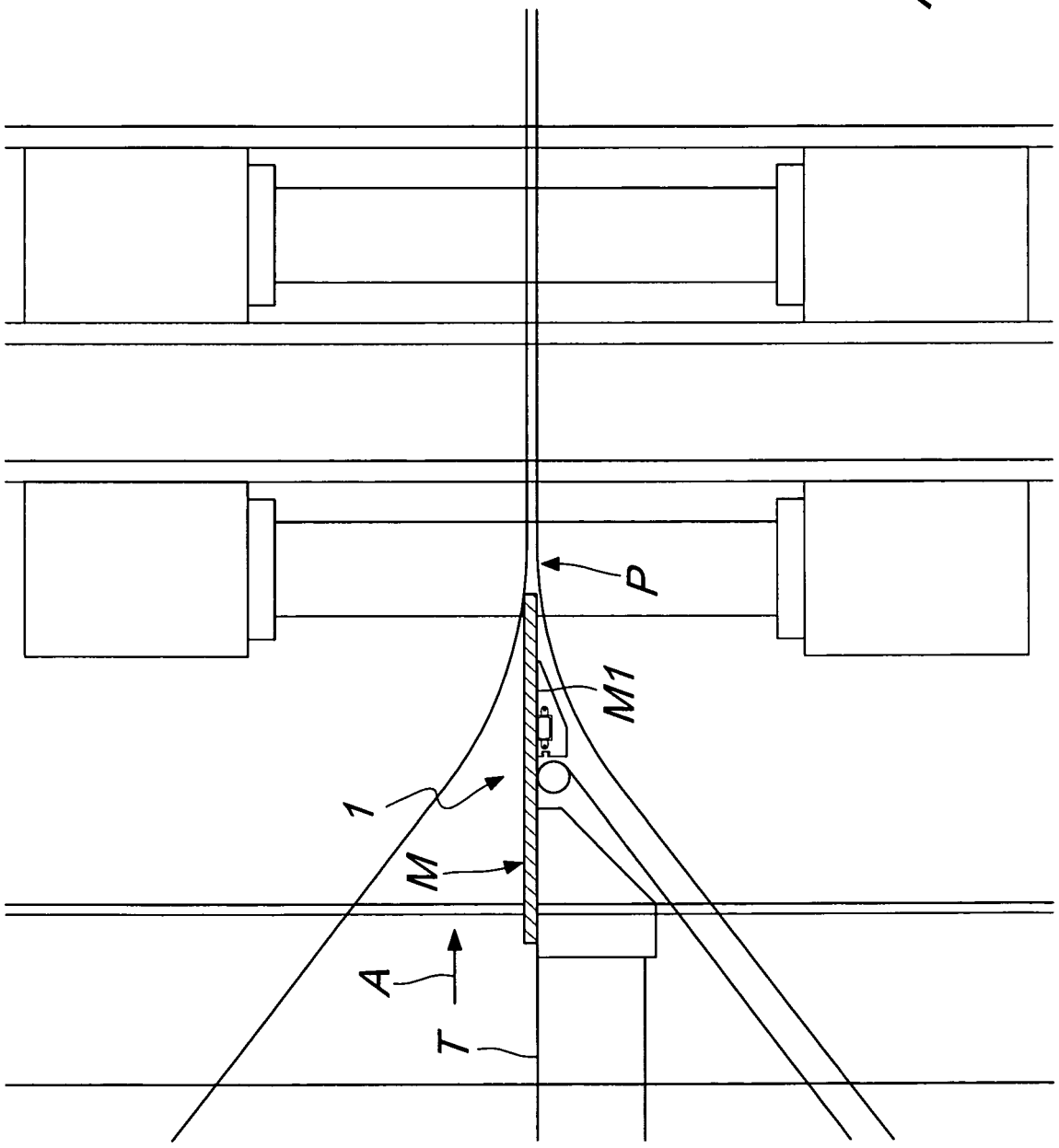


Fig. 7



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EUROPEAN SEARCH REPORT

Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 June 2009	Söderberg, Jan-Eric

CATEGORY OF CITED DOCUMENTS

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