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(72) Inventors:
• **Bianchini, Darlo**
 Lucca (IT)
• **Bani, Marco**
 Lucca (IT)

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(74) Representative: **Lanzoni, Luciano**
 Bugnion S.p.a.
 Via dei Rustici, 5
 50122 Firenze FI (IT)

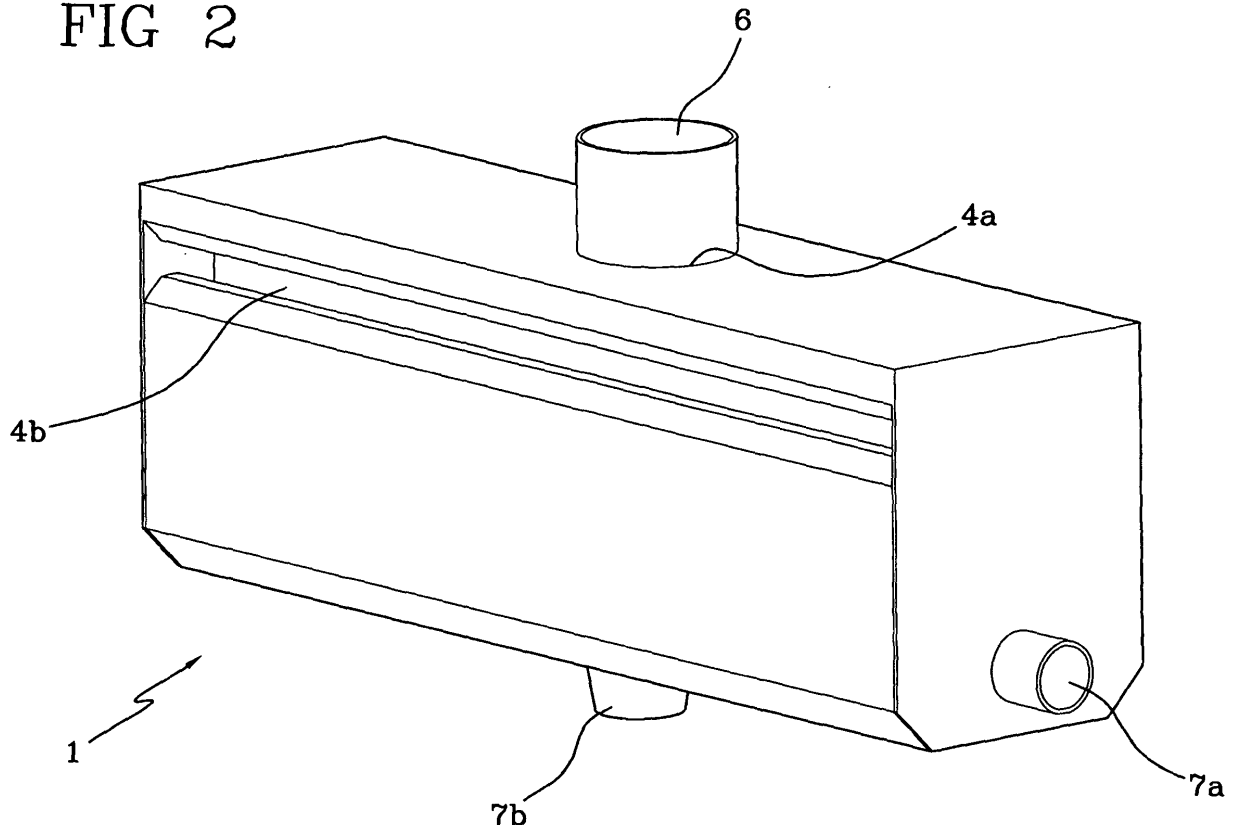
(71) Applicant: **Milltech S.r.l.**
 55100 Mugnano (Lucca) (IT)

(54) Cleaning apparatus, especially for paper production plants

(57) A cleaning apparatus especially for paper production plants, comprising: a storage case (4) having a substantially box-like shape, and means (6) for sucking air around a respective plant (1) for the production of

paper (3). The suction means (6) are associated with the storage case (4) to convey air to a chamber (5) formed in the same case (4). The apparatus also exhibits filter means (7) consisting of water held within the chamber (5) to retain solid impurities entrained by the sucked air.

FIG 2



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Description

[0001] The present invention relates to a cleaning apparatus, especially for paper production plants.

[0002] In particular, the present invention is apt for use in the cleaning of air surrounding the plants for the production of tissue paper, that is, paper for disposable products of typically domestic use.

[0003] As well known, the plants for the production of tissue paper are provided with a so-called "yankee or smooth" cylinder over which the paper ply in the course of formation is wound. The paper formed onto the smooth cylinder is subsequently fed to a reel for the collection of the finished product.

[0004] Generally, the smooth cylinder is partially wrapped up by the paper ply along a path where the same ply is subjected to the formation operations. The formed paper ply is then detached from the outer surface of the yankee cylinder by suitable rakers (so-called detaching, crinkling and cleaning devices) interposed between the said ply and the cylinder.

[0005] In particular, the rakers exhibit respective ends predisposed for detaching the paper ply from the cylinder, thereby allowing the same ply to be removed from the surface of the smooth cylinder.

[0006] Cleaning means are also known, located below the cylinder region, whose main function is that of intercepting and kneading paper portions dropped as a consequence of ply's breakings.

[0007] Moreover, the operation of detaching paper from the cylinder, and in particular the scraping action operated by the blades on the outer surface of the cylinder, is cause for a drop of powder made up of a great number of cellulose particles. Such particles are disposed of to prevent them from spreading, thus maintaining all the time a clean environment in compliance with the enforced safety regulations for production plants.

[0008] In order to eliminate such particles use is made of cleaning devices located below the smooth cylinder.

[0009] The cleaning devices consist of a water dispenser located below separation wedges and predisposed for delivering a jet of water transversally to the drop direction of cellulose particles. In this way, the particles are moistened and, therefore, made heavier, to prevent them from spreading about in the environment.

[0010] The water being sprayed, holding the cellulose particles therein, is stored in a suitable vessel located below the dispenser.

[0011] The cleaning devices briefly described above have, however, some major drawbacks.

[0012] Firstly, it must be pointed out that the cleaning devices are unable to efficiently eliminate all the particles suspended in the air. In fact, the lighter cellulose particles are scattered in the ambient before being hit by the jet of water. Consequently, the surrounding air is not fully clean.

[0013] It is also to be stressed that the handling of the cylinder, and the movement of the mechanical members

of the plant as well, cause displacements of the air which make even more difficult to carry the cellulose particles towards the jets of water.

[0014] In this context, the technical task of the present invention is to propose a cleaning apparatus for paper production plants which does not exhibit the above mentioned drawbacks.

[0015] In particular, the object of the present invention is to provide a cleaning apparatus able to efficiently eliminate the cellulose particles entrained by the air. A further object of the present invention is a cleaning apparatus for paper production plants able to carry air to be cleaned along a predetermined path.

[0016] The indicated technical task and the specified objects are substantially obtained by means of a cleaning apparatus, especially for paper production plants, comprising the technical characteristics set forth in one or more appended claims.

[0017] Further characteristics and advantages of the present invention will appear more clearly by the exemplary and not limiting description of a preferred, but non-exclusive, embodiment of a cleaning apparatus, especially for paper production plants, as illustrated in the accompanying drawings, wherein:

- Fig. 1 shows schematically a region of the paper production plant wherein the cleaning apparatus according to the present invention is applied;
- Fig. 2 is a perspective view of the cleaning apparatus shown in Fig. 1; and
- Fig. 3 shows a side elevation view and a section view of the apparatus of Fig. 2.

[0018] With reference to the attached figures, numeral 1 indicates on the whole a cleaning apparatus, especially for plants 2 for the production of paper 3, according to the present invention.

[0019] In particular, the apparatus 1 is advantageously used in plants for the production of tissue paper, that is, paper for any kind of disposable items.

[0020] Generally, the plants 2, partly illustrated in Fig. 1, are made up of a smooth cylinder 2a for driving a sheet of paper 3 in the course of formation. The plant 2 is also provided with a series of rakers 2b of known type - which will not, therefore, be illustrated in greater detail - predisposed for detaching the sheet of paper 3 formed by the outer surface of cylinder 2a.

[0021] The cleaning apparatus 1 is housed below the indicated rakers 2b so as to result as much as possible close to the region of detachment of the paper 3 from cylinder 2a.

[0022] In particular, the apparatus 1 comprises a storage case 4, having a substantially box-like shape and defining a chamber 5 therein.

[0023] The storage case, best illustrated in Figs. 2 and 3, has preferably a substantially parallelepiped shape with rectangular plan. However, the case 4 may exhibit any shape suitable for any installation sites and accord-

ing to various construction requirements.

[0024] The case 4 has suction means 6 predisposed for sucking air surrounding the relevant plant 2 for the production of paper 3. The suction means 6, schematically illustrated in Fig. 2, can be made up of a common aspirator of known type and, therefore, not to be described and illustrated in greater detail. Advantageously, the suction means 6 are associated with the case 4 in correspondence of an outlet 4a formed in a top region of the same case 4.

[0025] The case 4 is also provided with an inlet 4b consisting of a slit formed in a side wall and extending along the whole longitudinal development of the same case 4.

[0026] In this way, the suction means 6 make it possible to convey air, through the inlet 4b, to the inside of the chamber 5, and to flow it outwardly therefrom through the outlet 4a.

[0027] The apparatus 1 also exhibits filter means 7 housed in the chamber 5 and intended to retain solid impurities entrained by the sucked air, such as cellulose particles generated by the sheet of paper 3 during the detachment of the latter from the cylinder 2.

[0028] In greater detail, the filter means 7 consist of a liquid, preferably water, contained in a lower region of the chamber, opposite to the outlet 4a.

[0029] Preferably, as illustrated in Fig. 2, the water is distributed into the chamber 5 via a suitable introduction conduit 7a connected with a hydraulic circuit of the plant 2. Moreover, after a series of air filterings, the water is disposed through a discharge conduit 7b formed below the case 4.

[0030] The apparatus 1 also exhibits a deflector 8 disposed in the chamber 5 and, in particular, interposed between the inlet 4b and the outlet 4a. In this way, the deflector 8 diverts the flow of air sucked through the inlet 4b to convey the same air along a predetermined path P defined in the chamber 5, as illustrated in Fig. 3.

[0031] In particular, the deflector 8 is made up of a wall 9 disposed in cantilever fashion inside the chamber 5, and having an opposing surface 10 facing the inlet 4b.

[0032] The wall 9 exhibits a first end 9a associated on top with an internal surface 5a defining the chamber 5, and a second end 9b opposite the first 9a and facing the filter means 7.

[0033] It is to be noted that the second end 9b of wall 9 has a projection 11 facing an internal side surface 5a of chamber 5. In this way, there is defined a region 12 for the acceleration of the sucked air between the projection 11 and the internal surface 5a.

[0034] Also to be pointed out is the fact that the acceleration region 12 is disposed in correspondence of the first length P' and exhibits a passage section S which is smaller than the passage section S' in correspondence of the inlet 4b.

[0035] The above mentioned path P for the sucked air consists of a first length P' extending from the inlet 4b to the water surface 7, and of a second length P'' extending from the water surface 7 to the outlet 4a. Moreover, the

path P exhibits an intermediate length M for connection to the first and second lengths P', P''.

[0036] In other words, and as clearly illustrated in Fig. 3, the intermediate length M is between the second end 9b of wall 9 and the surface of water 7.

[0037] The suction means 6, therefore, provide for directing the air to the inside of chamber 5 along the path P.

[0038] In particular, during the separation of paper 3 from the outer surface of cylinder 2a, a number of impurities are produced consisting of cellulose particles.

[0039] In this situation, the apparatus 1 disposed below the cylinder 2a sucks the air and the particles dropping from the separation region.

[0040] Following the path of the air, it can be noted that the latter is directed from the surface 10 of wall 9 to the filter means 7 which consist of water. In particular, the air runs the first length P' as far as to reach the acceleration region 12 which, as mentioned above, has a passage section S which is smaller than the passage section S' as measured in the remaining first length P'.

[0041] Inside the region 12, the air is accelerated, owing to the narrowing exhibited by the same region 12, and pushed at high speed towards the intermediate region M. The air, by passing through the intermediate region M, is made to press onto the water thereby creating a depression in the water surface. Such depression provides a larger exchange surface wherein the cellulose particles, suspended in the air, are deposited and retained in the water.

[0042] Afterwards, the air without particles (filtered air) flows along the second length P'' outwardly of outlet 4a to be carried back into the environment that surrounds the plant 2.

[0043] The invention overcomes the problems of the known technique and obtains the proposed objects.

[0044] First of all, it is to be pointed out that the apparatus 1 allows the air to be efficiently filtered.

[0045] In fact, the air to be filtered is pushed inwardly of the case 4 by the intake action of the suction means 6 and, as a consequence of this, all the cellulose particles (even those most light and volatile) are aspirated and retained by the apparatus 1.

[0046] Moreover, the formation of the depression on the water surface makes it possible to increase the exchange surface in which the particles are deposited onto the water itself.

[0047] A further advantage is given by the fact that the water is kept inside the case 4 all the time. Consequently, the surrounding environment remains always dry and clean.

[0048] Referring now to Fig. 1, the case according to the invention is provided with a sensor 12 that measures the pressure exerted by the water inside the chamber 5. The measure made by the sensor 12 is read by an electronic device 13 located in a position of easy access for an operator and connected to the sensor 12 via a waterproof cable 14.

[0049] With the reading of the sensor 12 it is possible,

advantageously, to determine the height of water surface as a function of the air's passage section which is to be set to achieve the desired flow rate.

[0050] It is worth noticing that, as already indicated, when the case is in operation, the water surface takes up a non linear profile or "depression". Such profile is in turn a function of the speed of air that hits the surface, so that the electronics actually carries out a theoretical modelling of the water surface profile, into which the water's speed and height are correlated. Advantageously, this procedure makes it possible to optimize the filtering and to provide and regulate the efficiency of the case.

[0051] The shape of the case could also be of different configurations, either with simple (Fig. 4a) or double bottom (Fig. 4b), the latter being provided when wanting to increase the length L of the case, the depth H being equal.

[0052] The invention thus conceived is evidently apt for industrial application; it can also be subjected to numerous modifications and variants falling within the scope of the inventive concept; moreover, all the components can be replaced by technically equivalent elements.

Claims

1. A cleaning apparatus, especially for paper production plants, **characterized in that** it comprises:

a storage case (4) having a substantially box-like shape;

means (6) for sucking air around a respective plant (1) for the production of paper (3), said suction means (6) being associated with the storage case (4) to convey air to a chamber (5) formed in the same case (4) and able to house a bed of filtering liquid to retain solid impurities entrained by the sucked air, **characterized in that** the said storage case (4) comprises a deflector (8) for conveying the sucked air along a predetermined path (P) formed in the chamber (5); said deflector (8) being interposed between an inlet (4b) for the introduction of the sucked air and an outlet (4a) for the exit of said air.

2. Apparatus according to the preceding claim, **characterized in that** the said deflector (8) comprises a wall (9) having an opposing surface (10) facing the inlet (4b) for diverting the flow of sucked air; said wall (9) exhibiting a first end (9a) associated on top with an internal surface (5a) of chamber (5), and a second end (9b) opposite the first (9a) and facing the said filter means 7.

3. Apparatus according to any of the preceding claims, **characterized in that** the said chamber (5) houses a bed of liquid consisting of water held below the deflector (8).

4. Apparatus according to any of the preceding claims, **characterized in that** the said path (P) includes: a first length (P') extending from the inlet (4b) to the water surface; a second length (P'') extending from the water surface to the outlet (4a); and an intermediate region (M) for connection to said first and second lengths (P', P'') between the second end (9b) of wall (9) and the water surface.

5. Apparatus according to any of the preceding claims, **characterized in that** the said second end (9b) of wall (9) has a projection (11) facing an internal side surface (5a) of chamber (5) thereby defining a region (12) for the acceleration of air along the first length (P') having a passage section (S) smaller than the passage section (S') in correspondence of the inlet (4b).

6. Apparatus according to any of the preceding claims, **characterized in that** the said suction means (6) are disposed in correspondence of the outlet (4a) for delivering filtered air outwardly of the case (4).

7. Apparatus according to any of the preceding claims, **characterized in that** the said storage case (4) is disposed below a smooth cylinder (2a) making part of the respective production plant (2), a length of tissue paper (3) in the course of formation being wound over said cylinder (2a).

8. Apparatus according to any of the preceding claims, **characterized in that** it comprises a sensor (12), located below the chamber (5), which measures the pressure exerted by the bed of water inside the chamber (5).

9. Apparatus according to claim 8, **characterized in that** it comprises an electronic control unit (13) located in a position of easy access for an operator to read the measure made by the sensor (12).

10. Apparatus according to claim 9, **characterized in that** the said electronic control unit (13) determines, from the measure made by said sensor (12), the height of the water surface as a function of the air's passage section to be achieved in order to reach a desired flow rate.

11. Apparatus according to claim 10, **characterized in that** the said electronic control unit (13) carries out a theoretical modelling of the water surface's profile into which the water's speed and height are correlated.

12. Apparatus according to any of the preceding claims, **characterized in that** the case exhibits a inclined bottom.

13. Apparatus according to any of the preceding claims,
characterized in that the case exhibits a V-shaped
double inclined bottom.

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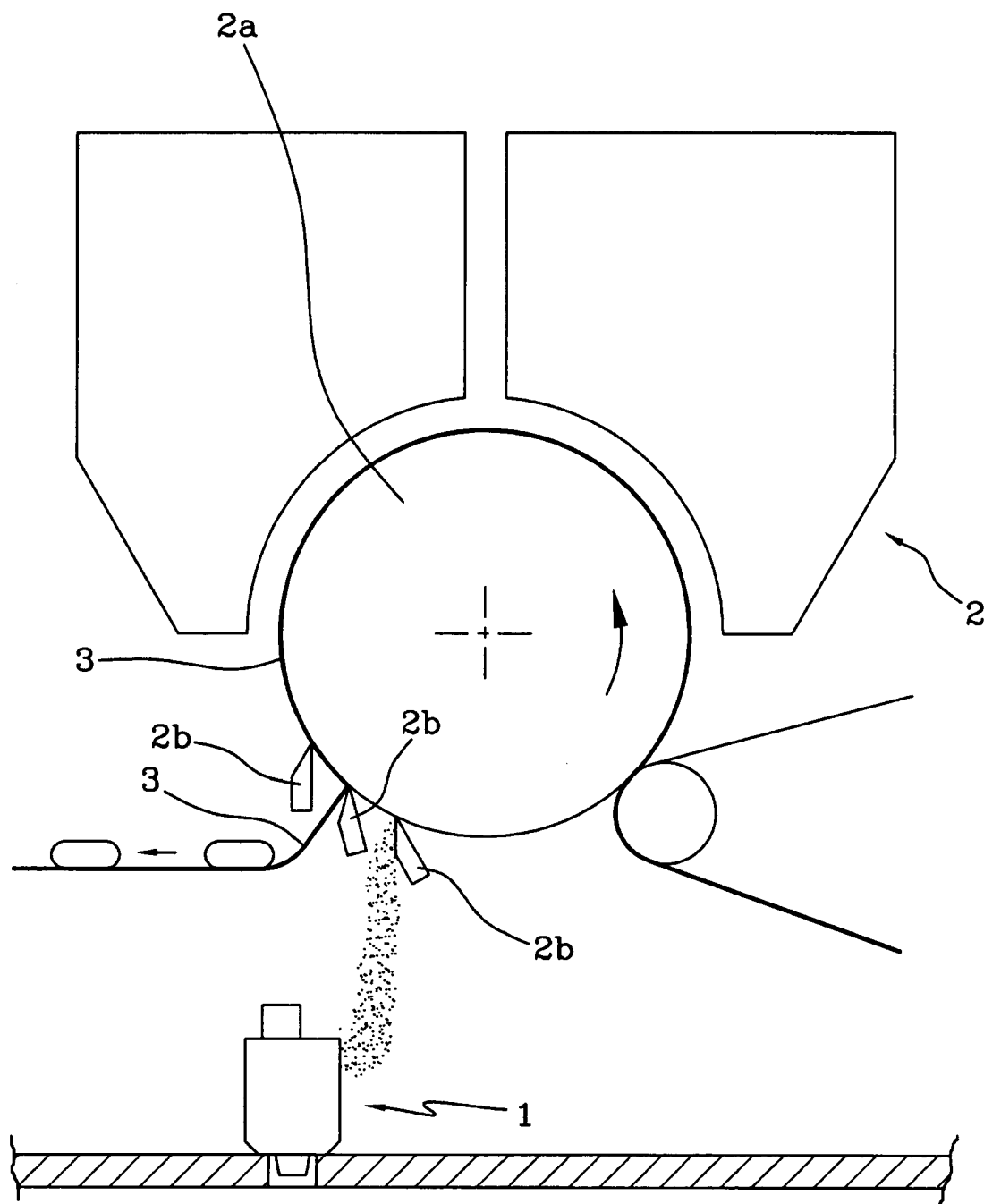
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FIG 1



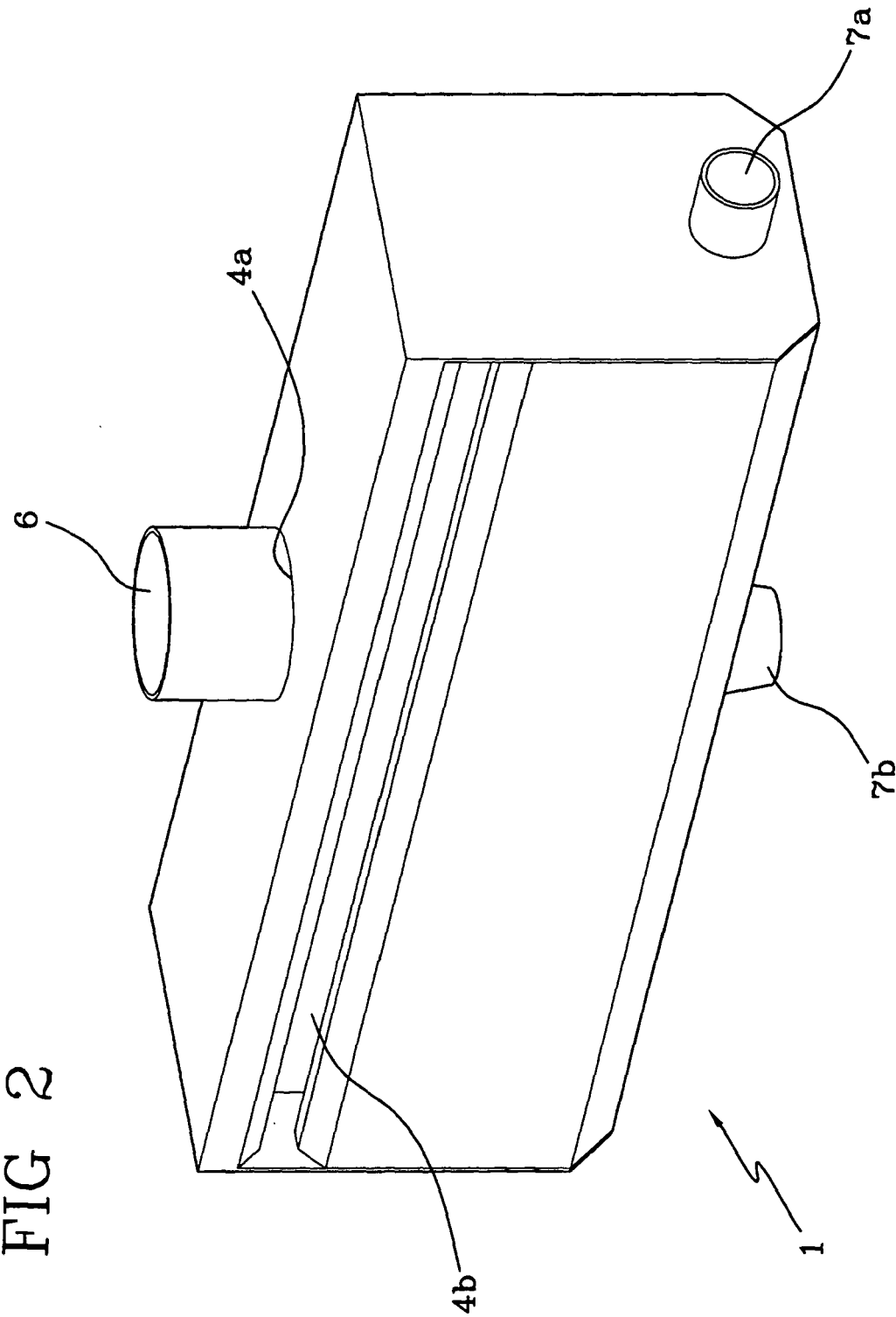
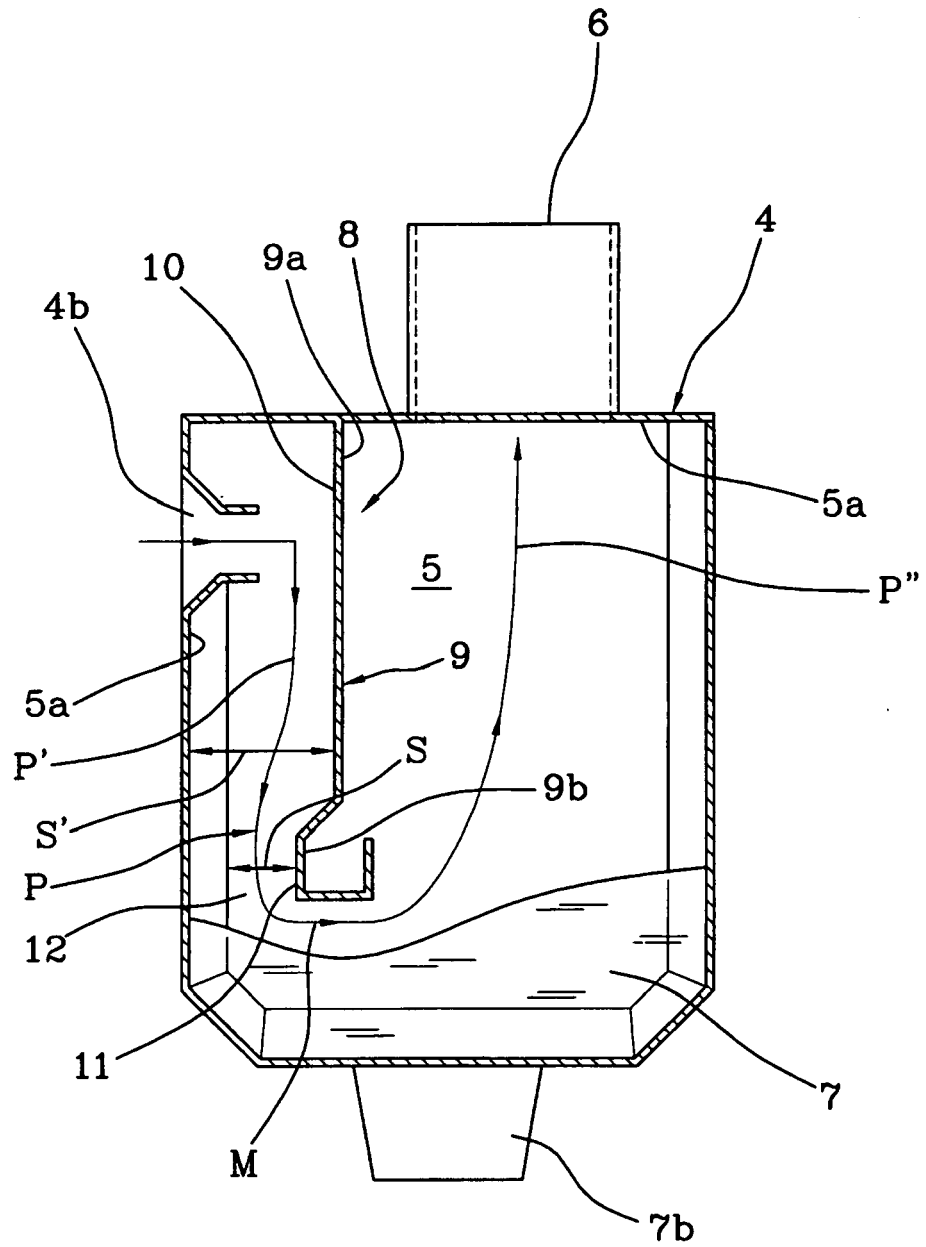


FIG 3





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Place of search The Hague		Date of completion of the search 26 October 2006	Examiner De Rijck, Freddy
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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