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(54) **Press for mechanical dehydration**

(57) A press for mechanical dehydration, of the type that comprises at least one filtration cage (2) provided with at least one inlet (3) for feeding the material to be pressed and with at least one outlet (4) for discharging the pressed material, the cage (2) accommodating at least one rotating screw feeder (5) provided with at least one helix (6) which is wound around a respective shaft (7), comprising at least one interspace (8) formed between the crest (6a) of the helix (6) and the internal wall (2a) of the cage (2), the interspace (8) being thicker along at least one respective portion of the screw feeder (5), so as to facilitate the reverse flow and remixing of the material.

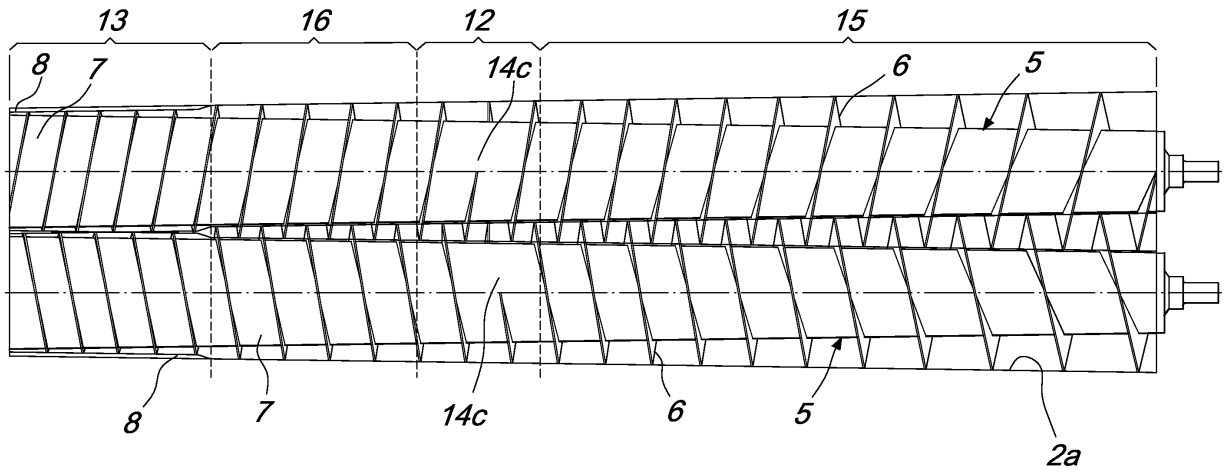

Fig. 2

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Description

[0001] The present invention relates to a press for mechanical dehydration of products containing liquids.

[0002] Presses of this type are used particularly to process pulps of sugar beets and the like or also to extract oils and produce flours for feeds derived from the recovery of foodstuffs such as fish and others.

[0003] These presses are used to extract mechanically the greatest possible amount of water contained in various materials, including beet pulps, intended for drying: pressing allows to pre-dehydrate partially the processed materials, so as to reduce their drying costs, which otherwise would be very high due to the large amount of fuel that would otherwise be necessary.

[0004] Mechanical dehydration by pressing the material that contains liquid is achieved by using known presses of various types, in which the rotation occurs of one or more helical elements (subsequently termed screw feeders for convenience in description) with a conical or cylindrical shaft and conical or cylindrical helices with variable pitch (compression screws) which rotate in converging or diverging opposite directions inside a cage which comprises filtering walls.

[0005] The material to be dehydrated, particularly beet pulp, is introduced at a feed end of the cage and is made to advance by the helical elements toward the opposite discharge end, from which it exits after being pressed; the pressed liquid exits through perforated internal walls of the filtering cage and of the shafts, if they are of the draining type.

[0006] In order to increase the efficiency of the presses, i.e., to dehydrate effectively the pressed material, traditionally an attempt has been made to perfect presses which have a large filtering surface and produce inside them high pressures in order to press the material to be dehydrated, with a prolonged retention time of such material. However, an excessive retention of the material within the press is detrimental to the capacity of the press.

[0007] The onset of presses with a biconical geometry as a replacement of those with a two-cylinder geometry has increased the region of central interference, facilitating the advancement of material and thus reducing the risk of damaging pressure drops within the press.

[0008] In particular, again to achieve high efficiency, it is necessary to facilitate the outflow of the extracted liquid, which however, in the various known types of press, has difficulties in migrating outward, especially from the regions that lie furthest from the filtering perforated walls of the cage.

[0009] The aim of the present invention is to solve the drawbacks noted above, by providing a press for mechanical dehydration which facilitates the expulsion of the liquid, so as to achieve a significant increase in efficiency, i.e., a higher dehydration of the pressed material.

[0010] Within this aim, an object of the present invention is to provide a press which, by way of its particular constructive characteristics, is capable of giving the greatest assurances of reliability and safety in use.

[0011] Another object of the present invention is to provide a press which is simple, relatively easy to provide in practice, safe in use, effective in operation, and further competitive from an economic standpoint.

[0012] This aim and these and other objects which will become better apparent hereinafter are achieved by a press for mechanical dehydration, of the type that comprises at least one filtration cage provided with at least one inlet for feeding the material to be pressed and with at least one outlet for discharging the pressed material, said cage accommodating at least one rotating screw feeder provided with at least one helix which is wound around a respective shaft, characterized in that it comprises at least one interspace formed between the crest of said helix and the internal wall of said cage, said interspace being thicker along at least one respective portion of said screw feeder, so as to facilitate the reverse flow and remixing of the material.

[0013] Further characteristics and advantages of the invention will become better apparent and evident from the following detailed description of a preferred but not exclusive embodiment of a press according to the invention, illustrated by way of non-limiting example in the accompanying drawings, wherein:

Figure 1 is a schematic side view of a press for mechanical dehydration according to the invention;

Figure 2 is a schematic top of view of an embodiment of the press which comprises two screw feeders;

Figure 3 is a detail front view of a shallower helix portion, which forms a thicker interspace with the respective portion of the internal wall of the cage which it faces;

Figure 4 is a detail front view of a helix portion affected by a cutout which faces a respective portion of the internal wall of the cage;

Figure 5 is a detail front view of a second embodiment of a helix portion, affected by a window which faces a respective portion of the internal wall of the cage;

Figure 6 is a detail front view of a third embodiment of a helix portion, affected by a discontinuity which faces a respective portion of the internal wall of the cage;

Figure 7 is a detail front view of a fourth embodiment of a helix portion, affected by a slot located in an intermediate area of the helix comprised between the crest and the shaft;

Figure 8 is a detail front view of a fifth embodiment of a helix portion, affected by a cutout which faces a respective portion of the internal wall of the cage provided with a protrusion which can be engaged in said cutout.

[0014] With reference to the figures, the reference numeral 1 generally designates a press for mechanical dehydration according to the invention.

[0015] The press 1 is of the type which comprises at least one filtration cage 2 provided with at least one inlet 3 for feeding the material to be pressed and with at least one outlet 4 for discharging the pressed material. The cage 2 accommodates internally at least one rotating screw feeder 5, which is provided with at least one helix 6 wound around a respective shaft 7; advantageously, the press 1 comprises an interspace 8 which is formed between a crest 6a of the helix 6 and an internal wall 2a of the cage 2, and positively the interspace 8 is thicker along at least one respective portion of the screw feeder 5, so as to facilitate the reverse flow and remixing of the material.

[0016] The figures show a horizontal press 1 which comprises two screw feeders 5 with conical shafts 7; however, it is noted that the technical solutions described here can be applied equally to any type of vertical or horizontal press, single- or multiple-shaft presses, with draining shafts provided with perforated plates or with solid shafts. With reference to the figures, the screw feeders 5 are supported so that they can rotate at a respective end on respective supports 9 and are supported, at the opposite end, in a reduction unit 10, through which they are turned by a motor 11 which is mounted thereon. The filtration cage 2 is arranged around the screw feeders 5 and duplicates their profile. The internal wall 2a of the cage 2 is constituted by panels made of perforated metal plate, which allow the exit of the extracted liquid from the pressed material, which is constituted preferably but not exclusively by sugar beet pulp.

[0017] Each screw feeder 5 comprises a respective shaft 7 which has a conical or cylindrical cross-section which tapers toward the outlet 4 of the material and at least one respective helix 6 which is wound onto the shaft 7. Further, the pitch of the helix 6 decreases from the inlet 3 toward the outlet 4, and the height of the helices 6 is such that the crest 6a of the helix 6 of one screw feeder 5 is tangent to the surface of the shaft 7 of the adjacent screw feeder 5.

[0018] The material to be pressed, introduced from the inlet 3, is drawn axially by the screw feeders 5 and in proceeding toward the outlet 4 the pressure of the material inside the press 1 increases, so as to perform its pressing.

[0019] To facilitate the exit of the water from the least favored regions, i.e., the regions that lie away from the perforated plates, the pressed material is remixed, advantageously by way of the thicker interspace 8 which allows the reverse flow of the material inside the press.

[0020] Effectively, the thicker interspace 8 is formed at a first intermediate portion 12 of the screw feeder 5 or at an end portion 13 of the screw feeder 5, and in particular it is formed between the crest 6a of the helix 6, which is suitably shallower at said portions, and the internal wall 2a. Nonetheless, in further embodiments the helix 6 can be shallower at other portions of the screw feeder 5.

[0021] Further, the helix 6 can comprise at least one opening 14a, 14b, 14c, 14d at at least one of its portions, so as to allow the reverse flow and remixing of the material to be pressed and facilitate the expulsion of the liquid extracted from said material.

[0022] As shown in Figure 4, the opening on a helix portion 6 is constituted by a contoured cutout 14a, which is open at the crest 6a of the helix 6.

[0023] In a second embodiment, shown in Figure 5, the opening is constituted by a window 14b, which is provided at the base of the helix 6 and opens onto the shaft 7 of the screw feeder 5.

[0024] In a third embodiment, shown in Figure 6, the opening is constituted by a discontinuity 14c of a portion of the helix 6, which is adapted to facilitate the remixing of the material.

[0025] In a fourth embodiment, shown in Figure 7, the opening is constituted by a slot 14d, which is located in an intermediate area of the helix 6 comprised between the crest 6a and the shaft 7.

[0026] Conveniently, the press comprises a plurality of the openings 14a, 14b, 14c, 14d, which are preferably distributed at the first intermediate portion 12 of the screw feeder 5, which is formed substantially in a central region thereof (at intermediate pressing), or at the end portion 13 of the screw feeder 5 (when pressing is nearly completed).

[0027] Both the thicker interspace 8 and the openings 14a, 14b, 14c, 14d allow the reverse flow of the material, which tends to retract partially, allowing its consequent remixing, thus allowing to cause the release of a greater amount of liquids from said material. Preferably, the openings 14a, 14b, 14c, 14d affect only portions of the helix 6 whose extent is at the most approximately one third of a turn.

[0028] The thicker interspace 8, which can affect the end portion 13 and/or the first intermediate portion 12 (or also other portions of the screw feeder 5), is formed by a shallower portion of the helix 6 for a larger total extension, provided on one or more pitches (which can be consecutive or not) of the helix 6. For this solution, the increase in the thickness of the interspace 8 from the standard value to the maximum value can be gradual or sudden.

[0029] In practical operation, in the first half 15 of the shaft 7, on the side where the wet material is fed, a first partial pressing of the material is performed.

[0030] In the first intermediate portion 12 of the screw feeder 5, which is adjacent to the first half 15 thereof and preferably but not exclusively has a length equal to approximately one tenth of the entire length of the shaft 7, a first remixing of the material occurs which is obtained by way of the shallower helix which forms the thicker interspace 8 or by way of the openings 14a, 14b, 14c, 14d: this facilitates the evacuation of water, especially from the more humid pulp parts, repositioning the less dehydrated material from the regions that lie furthest from the perforated metal plates 2a to the regions in contact with the perforated metal plates 2a of the cage 2, and vice versa.

[0031] After the remixing of the material, in a second intermediate portion 16 (which follows the first portion 12 and has a length comprised preferably between three tenths and one fifth of the total length of the shaft 7), a second pressing of the material is performed until it is almost adjacent to the discharge outlet 4.

[0032] Finally, in the end portion 13 (whose length is preferably comprised between one fifth and one tenth of the length of the shaft 7), where the height of the helix 6 is lowest, a further remixing of the material is performed, and a simultaneous increase in pressure can be associated therewith in order to evacuate as much as possible the water that has remained inside it. In the intermediate portion 13, in order to increase the pressing of the material, it is possible to associate with said remixing a higher compression ratio (the pitch of the helix 6 is reduced gradually with respect to the standard pitch) in order to create a choke before the outlet, with a consequent increase of the pressure in the end portion 13 of the screw feeder 5. Any increase in the compression ratio (reduction of the pitch of the helix 6) in the end portion 13 is gradual.

[0033] Finally, the material, dehydrated to an optimum level, exits from the discharge outlet 4; the extracted liquid, such as the water extracted from the beet pulp, exits from the cage 2 through the lower port 4a or from the shafts, if they are of the draining type.

[0034] As shown, the thicker interspace 8 and the openings 14a, 14b, 14c, 14d allow the reverse flow and remixing of the material during pressing, thus facilitating the exit of the liquid from the most disadvantaged regions (far from the perforated metal plates 2a of the cage 2).

[0035] Therefore, the remixing of the material, provided as described with the press 1, is added to the long retention times of the product in the press, the extensive filtration surfaces, the considerable internal pressures provided and the particular advancement of the material, which can be obtained already with known types of press.

[0036] This leads to a significant increase in efficiency, i.e., to an optimum dehydration of the pressed material, which is significantly greater than achievable with known types of press.

[0037] In practice it has been found that the invention fully achieves the intended aim and objects.

[0038] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims; thus, in yet another possible embodiment, shown in Figure 8, the press 1 can comprise a distribution of protrusions 17 which are associated with the internal wall 2a of the cage at the respective openings of the helix which open onto the crest thereof (and therefore at the cutouts 14a and at the discontinuities 14c): the protrusions 17 are adapted to engage in the respective openings 14a, 14c during the rotation of the screw feeders 5 and are advantageously flattened and arranged edgeways with respect to the advancement direction of the material, so as to facilitate its remixing and prevent its rotation about the shaft 7. The protrusions 17, by preventing the rotation of the material about the shaft 7, facilitate the advancement of the material, increasing the capacity of the press 1.

[0039] All the details may further be replaced with other technically equivalent ones.

[0040] In the exemplary embodiments shown, individual characteristics, given in relation to specific examples, may actually be interchanged with other different characteristics that exist in other exemplary embodiments.

[0041] Moreover, it is noted that anything found to be already known during the patenting process is understood not to be claimed and to be the subject of a disclaimer.

[0042] In practice, the materials used, as well as the shapes and dimensions, may be any according to requirements and to the state of the art without thereby abandoning the scope of the protection of the appended claims.

[0043] The disclosures in Italian Patent Application No. BO2007A000344 from which this application claims priority are incorporated herein by reference.

[0044] 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. A press for mechanical dehydration, of the type that comprises at least one filtration cage (2) provided with at least one inlet (3) for feeding the material to be pressed and with at least one outlet (4) for discharging the pressed material, said cage (2) accommodating at least one rotating screw feeder (5) provided with at least one helix (6) which is wound around a respective shaft (7), **characterized in that** it comprises at least one interspace (8) formed between the crest (6a) of said helix (6) and the internal wall (2a) of said cage (2), said interspace (8) being thicker along at least one respective portion of said screw feeder (5), so as to facilitate the reverse flow and remixing of the material.

2. The press according to claim 1, **characterized in that** said thicker interspace (8) is formed at an end portion (13) of said screw feeder (5), said helix (6) being shallower at said end portion (13).

3. The press according to one or more of the preceding claims, **characterized in that** said thicker interspace (8) is formed at a first intermediate portion (12) of said screw feeder (5), said helix (6) being shallower at said first intermediate portion (12).

4. The press according to one or more of the preceding claims, **characterized in that** said at least one helix (6) comprises at least one opening (14a, 14b, 14c, 14d) at at least one of its portions, so as to allow the reverse flow and remixing of the material to be pressed and facilitate the expulsion of the liquid extracted from said material.

5. The press according to claim 4, **characterized in that** said at least one opening is constituted by at least one contoured cutout (14a) which is open at the crest (6a) of said helix (6) and is adapted to facilitate the remixing of the material.

6. The press according to claim 4, **characterized in that** said at least one opening is constituted by at least one window (14b), which is provided at the base of said helix (6), is open onto the shaft (7) of said screw feeder (5) and is adapted to facilitate the remixing of the material.

7. The press according to claim 4, **characterized in that** said at least one opening is constituted by at least one slot (14d) located in an intermediate area of said helix (6) which is comprised between said crest (6a) and said shaft (7) and is adapted to facilitate the remixing of the material.

8. The press according to claim 4, **characterized in that** said at least one opening is constituted by at least one discontinuity (14c) of a portion of said helix (6) which is adapted to facilitate the remixing of the material.

9. The press according to one or more of the preceding claims, **characterized in that** it comprises a plurality of said openings (14a, 14b, 14c, 14d).

10. The press according to one or more of the preceding claims, **characterized in that** said openings (14a, 14b, 14c, 14d) are distributed at said first intermediate portion (12) of said screw feeder (5).

11. The press according to one or more of the preceding claims, **characterized in that** said openings (14a, 14b, 14c, 14d) are distributed at said end portion (13) of said screw feeder (5).

12. The press according to one or more of the preceding claims, **characterized in that** it comprises at least one protrusion which is associated with the internal wall (2a) of said cage (2) at at least one respective opening (14a, 14c) of said helix (6) which is open on the crest (6a) thereof, said protrusion being suitable to facilitate the remixing of the material and prevent its rotation about said shaft (7).

13. The press according to one or more of the preceding claims, **characterized in that** it comprises a distribution of protrusions which are associated with the internal wall (2a) of said cage at respective openings (14a, 14c) of said helix (6) which are open on the crest (6a) thereof, said protrusions being substantially flat and being arranged edgeways with respect to the direction of advancement of the material, so as to facilitate its remixing and prevent its rotation about said shaft (7).

14. The press according to one or more of the preceding claims, **characterized in that** the pitch of said helix (6) is progressively smaller at said end portion (13).

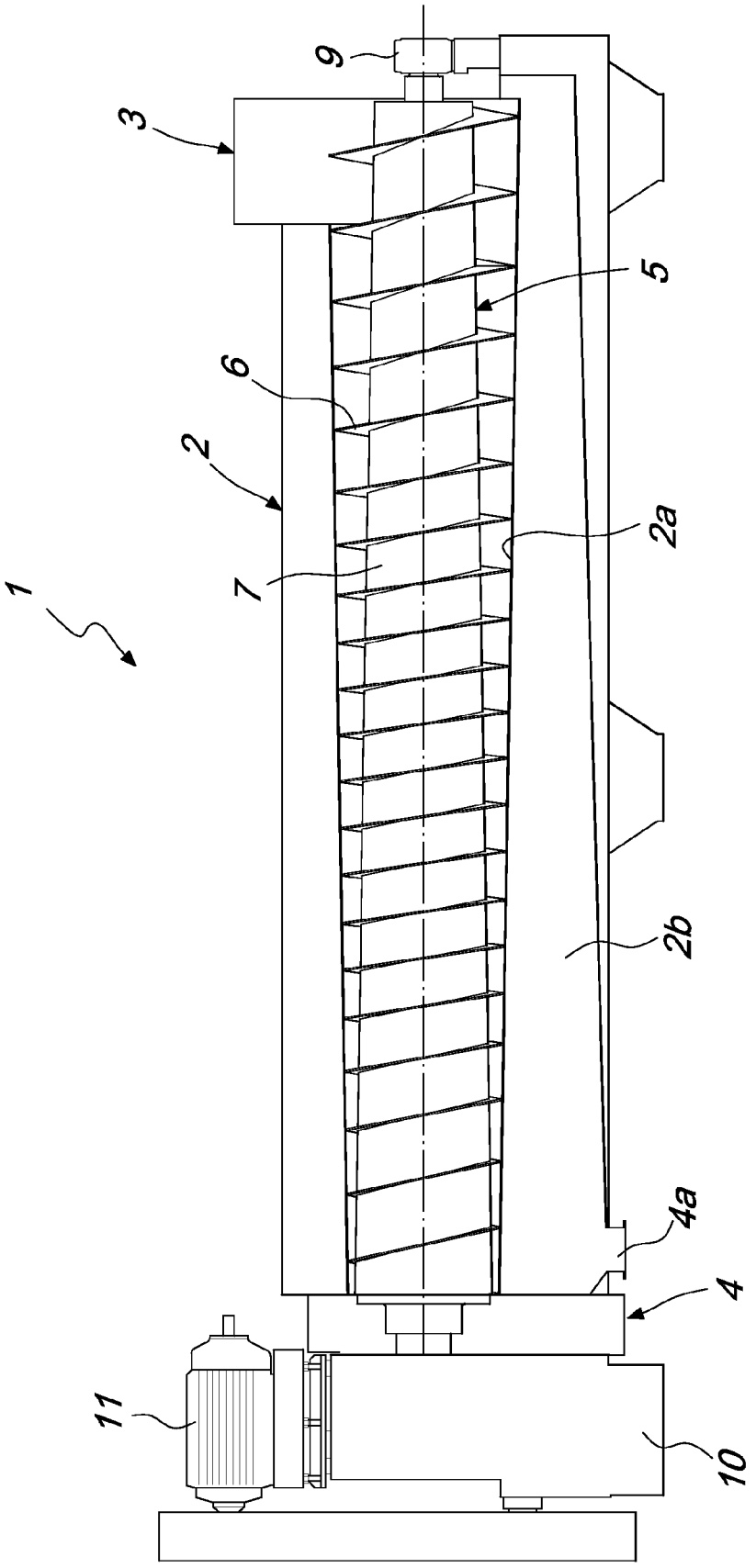

Fig. 1

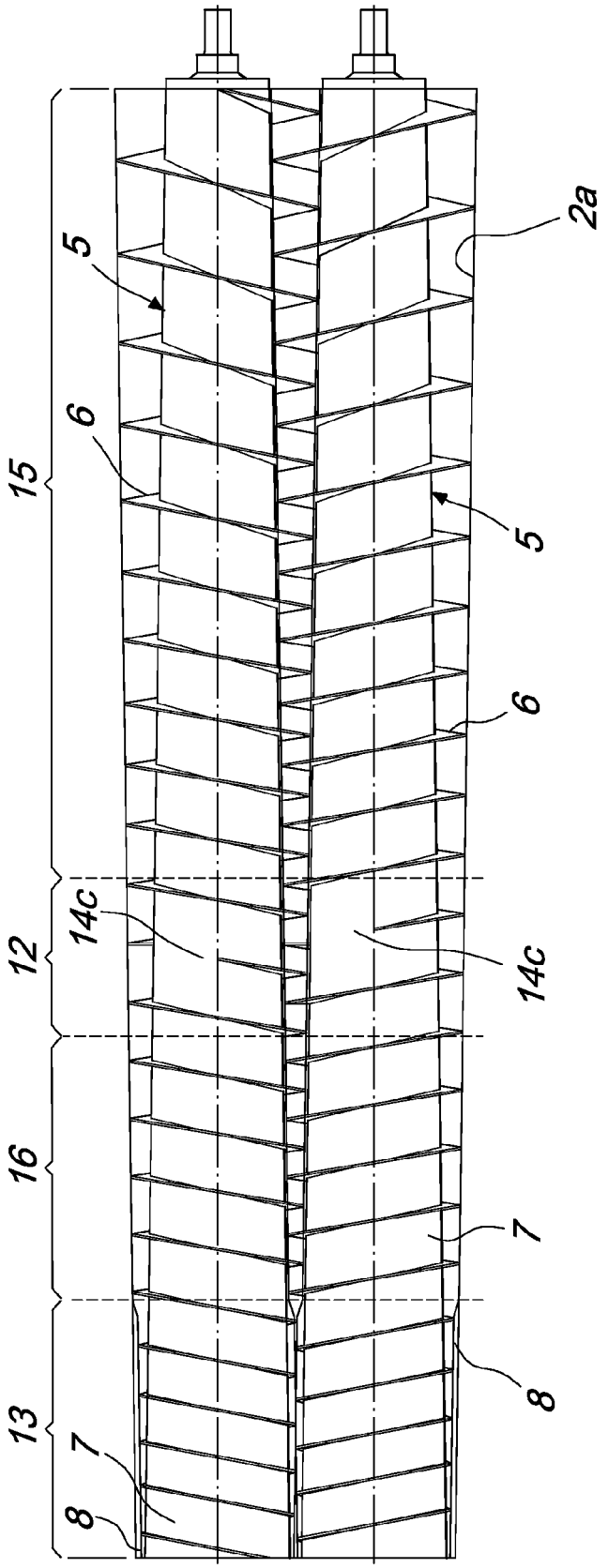

Fig. 2

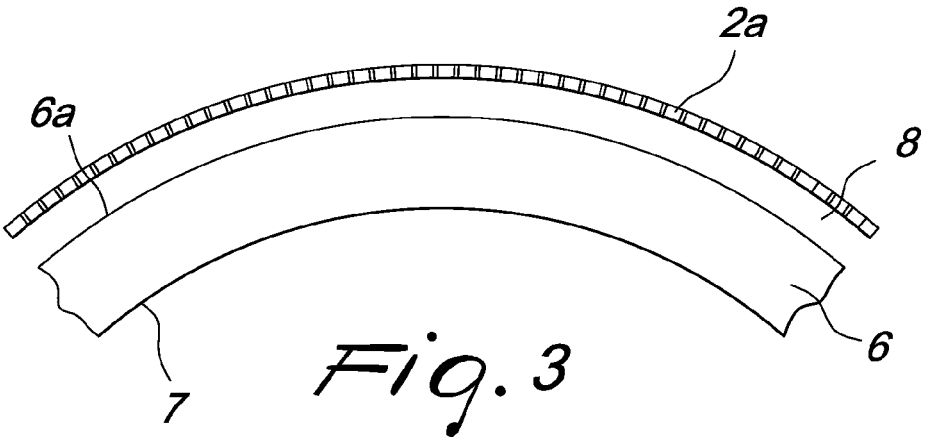

Fig. 3

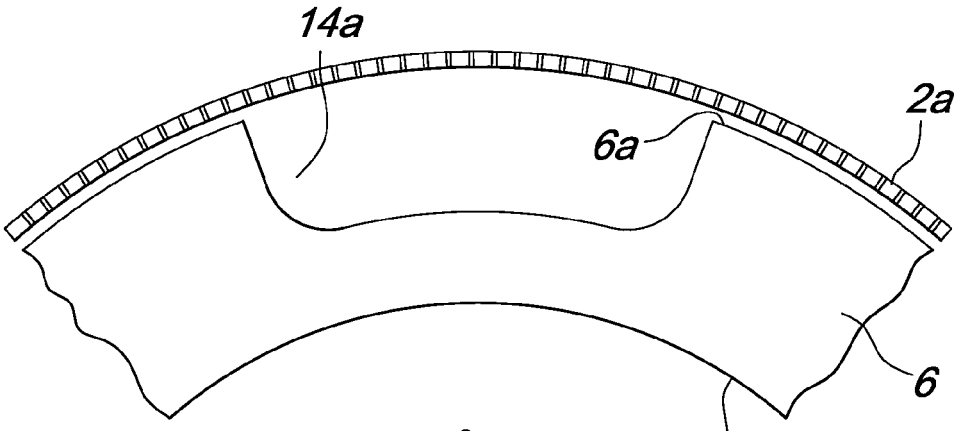

Fig. 4

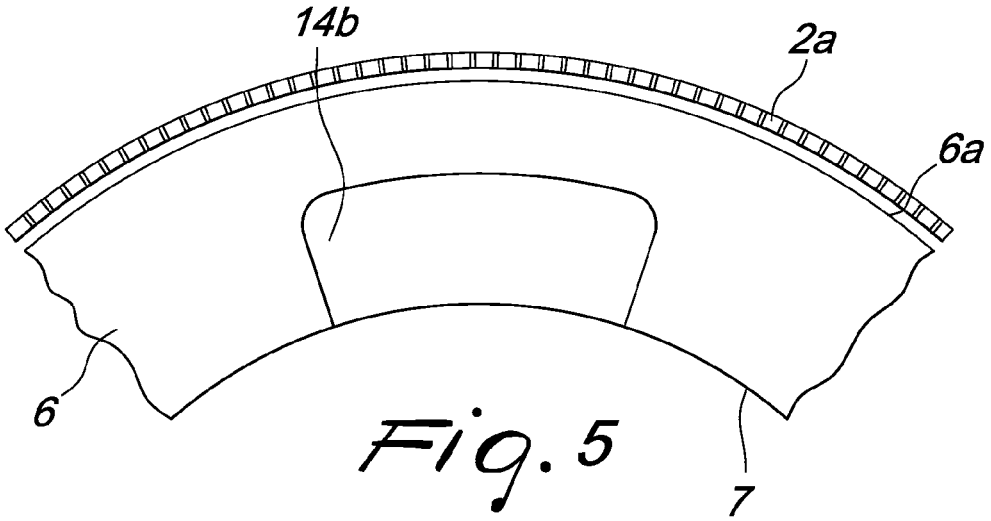

Fig. 5

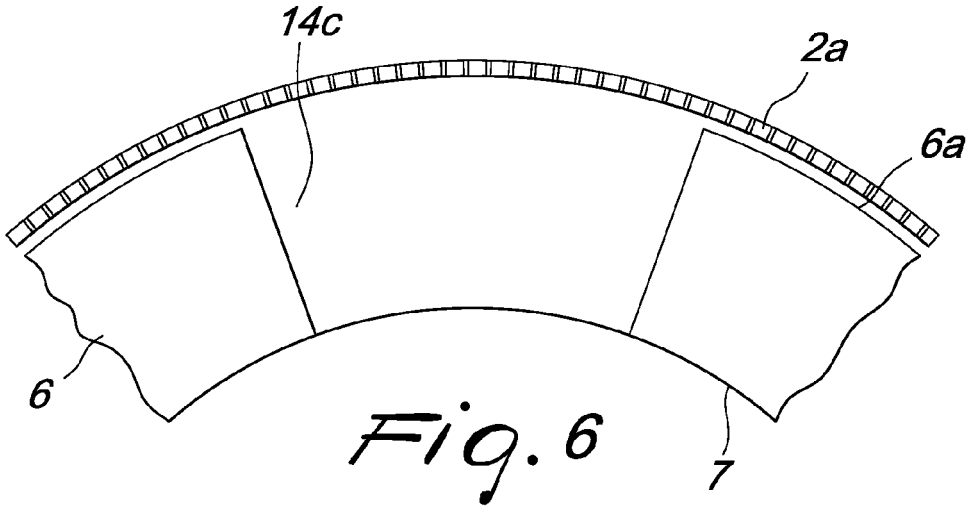

Fig. 6

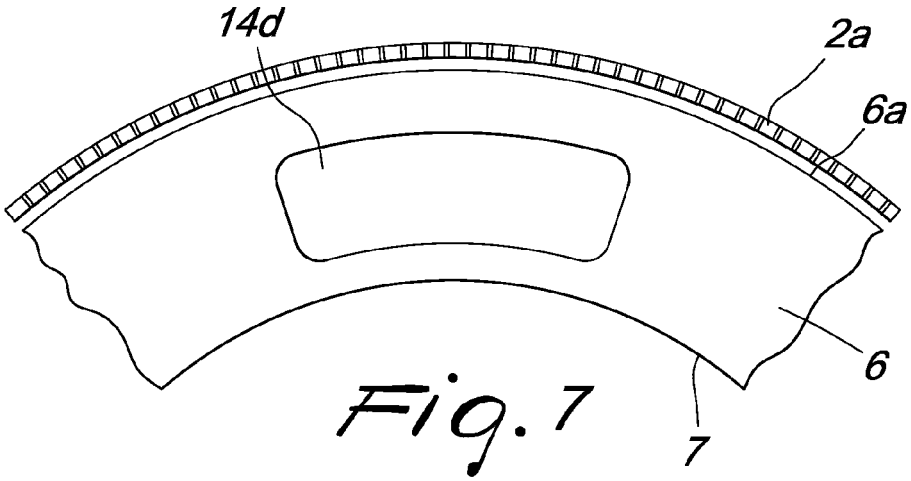

Fig. 7

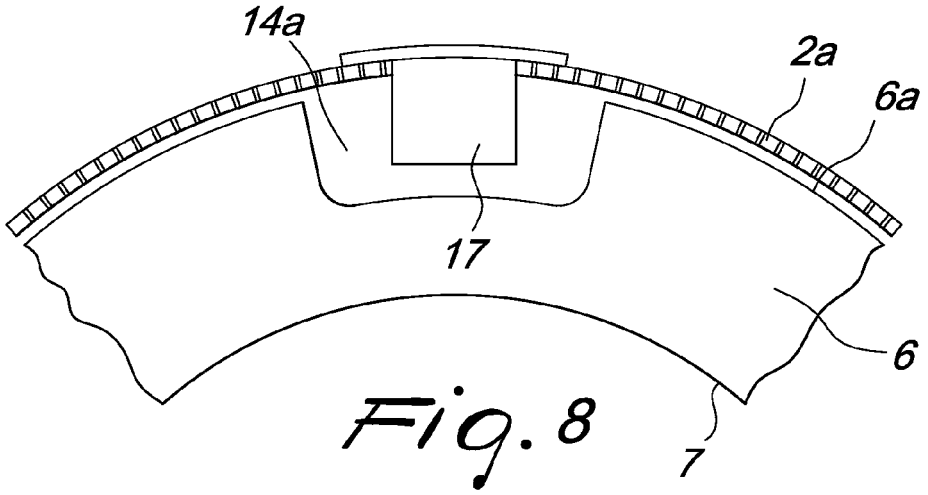

Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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