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(71) **Applicant** *(for all designated States except US)*: **KESLA OYJ** [FI/FI]; Kuurnankatu 24, FI-80100 Joensuu (FI).

(72) **Inventor; and**
(75) **Inventor/Applicant** *(for US only)*: **KAKSONEN, Petri** [FI/FI]; Sorsantie 6, FI-82500 Kitee (FI).

(74) **Agent**: **PATENTTITOIMISTO PITKÄNEN OY**; PO Box 1188, FI-70211 Kuopio (FI).

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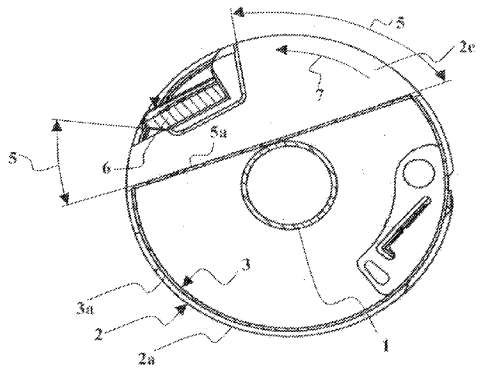
(54) **Title**: ROTOR OF CHIPPING MACHINE

FIG. 2 A - A



(57) **Abstract**: This invention relates to a rotor of a chipping machine, which is used for chipping wood, which chipping-machine rotor includes one or more bodies (1), to which is fastened one or more fastening bodies (2), which includes one or more blades (4). According to the invention, there is an open chip passage (5) between the blade (4) and the body (1).

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ROTOR OF CHIPPING MACHINE

This invention relates to a rotor of a chipping machine according to the preamble of claim 1.

Recently, wood is chipped by chipping machines which include a rotating rotor in which wood-chipping blades are fastened. The rotor includes a body which operates as the rotation axis of the rotor. The body is so-calledly of solid steel, such as described e.g. in patent specification FI95109. The blades are fastened to grooves milled to the rotor with a screw fastening, and the blades are parallel to the rotor axis and their length is also the whole length of the rotor.

A disadvantage of the rotors of drum chipping machines of the above type is that the chips exit pushed by the blades. The exit of chips strongly counteracts the rotation of the rotor and thus increases the requirement of force rotating the rotor, whereby the efficiency of the chipping machine weakens substantially. The chips cause friction in the rotor and its housing, whereby the temperature of the rotor and the housing increases. As the temperature increases, the sharpening interval of the blades increases. Furthermore, the blades soften when heating and cooling, whereby blade costs increase. The wood being chipped rubs against the rotor surface also causing an increase in the rotating power requirement of the rotor and an increase of heat on the surface of the rotor, whereby the chipping machine can catch fire. The feed force of the wood being chipped must also be great, which easily causes the feed rollers to so-calledly dig in the wood being chipped, whereby the wood stops and the chipping machine is blocked.

An object of this invention is that chips removed from wood by the blades of the chipping machine are able to pass well through the rotor, whereby they cause no friction. A further object of the invention is to increase the sharpening interval of the blades. An object is also to position the blades to the rotor such that the rotor will not vibrate when rotating. The cutting angles of the blades must also eliminate the end forces of the rotor.

The above disadvantages can be eliminated and the above objects achieved with a chipping-machine rotor according to the invention which is characterised by what is stated in the characterising section of claim 1. Advantageous embodiments of the invention are the subject of the dependent claims.

The most important advantage of the invention is that chips removed from wood by the blades of the chipping machine are able to pass well to an exit channel through

the rotor along a chip passage below the blades, whereby they cause no friction in the rotor and the rotor housing. Because the chips do not cause friction in the rotor and its housing, the power requirement of the chipping machine is low in relation to the amount of wood fed to the chipping machine. The feed power requirement of the wood being fed is also small in relation to the amount of wood, because the blades so-calledly suck wood into the chipping machine. The heating of the blades and the housing is minor, due to which, the blades remain sharp for a long time, whereby the sharpening interval of the blades is long. The cutting angles of adjacent blades are in opposite directions, whereby the opposite cutting angles of the blades eliminate the end force of the rotor, i.e., so-calledly the cutting angles cancel forces caused by each other. The blades are positioned to different sectors seen from the rotor end, whereby the blades balance the rotor thus preventing the rotor from vibrating during rotation. The elimination of the rotor vibration and end forces substantially increases the durability of rotor bearings.

It is evident that, by means of the invented chipping-machine rotor, great cost savings are acquired in chipping wood.

The invention will now be described in detail with reference to the accompanying figures.

Fig. 1 shows an inclined top view of a chipping-machine rotor according to the invention.

Fig. 2 shows a perpendicular view from the body end of the chipping-machine rotor according to Fig. 1, without blades, cut in the direction A–A.

Fig. 3 shows a perpendicular view from the body end of another structural solution according to the invention, in which the shape of the bottom of a chip passage of the chipping-machine rotor according to Fig. 1 is curved, without blades, cut in the direction A–A.

Fig. 4 shows a perpendicular front view of the chipping-machine rotor according to Figs. 1–3.

Fig. 5 shows the chipping-machine rotor according to Figs. 1–4, without blades, cut at the centre.

Fig. 6 shows a perpendicular end view of the chipping-machine rotor according to Figs. 1–5.

Fig. 7 shows an inclined top view of a fastening body of the chipping-machine rotor according to Figs. 1, 2, 4 and 5, the rotation direction being counter-clockwise.

Fig. 8 shows a perpendicular side view of the fastening body of Fig. 7, the rotation direction being clockwise.

Fig. 9 shows a perpendicular front view of the fastening body of Figs. 7 and 8 i.e. from the wood feeding direction.

Fig. 10 shows a perpendicular side view of the fastening body of Figs. 7–9, the rotation direction being counter-clockwise.

The parts in the figures are designated as follows: A body 1. A fastening body 2, which includes an outer edge 2a, a side surface 2b, a chip groove 2c and a cleat 2d. The side surface 2b includes an outer side surface 2ba. A stopper 3, which includes an outer surface 3a. A blade 4, which includes a body 4a, a cutting surface 4b and a fastening element 4c. The cutting surface 4b includes a cutting angle 4ba. A chip passage 5, which includes a bottom 5a. A fastening part 6, in which the blade 4 is screwed fast. A rotation direction is shown with an arrow 7.

The figures show a rotor of a chipping machine which is employed in chipping wood. The figures do not show the known structure of the chipping machine. The chipping-machine rotor is rotatably bearing-mounted to rotate in its housing. The rotor is rotated by an internal-combustion engine or an electric motor. To the housing is fed in a known way, e.g. with feed rollers, wood being chipped which is chipped when contacting the rotor rotating in the housing. Wood chips exit the housing due to the force provided by the rotation motion of the rotor.

The chipping-machine rotor shown in the figures includes one or more bodies 1, to which is fastened one or more fastening bodies 2, which includes one or more blades 4. The body 1 is fastened to the rotation axis e.g. with known friction bushes or wedges.

According to the invention, the figures show that between the blade 4 and the body 1 there is the open chip passage 5 which extends within the fastening bodies 2 for the depth of the chip groove 2c in the fastening bodies 2. Fig. 2 shows that, seen from the end of the body 1, the cross-sectional area of the chip passage 5 is 20–40 per cent of the diameter area of the chipping-machine rotor. The width of the chip passage 5 is the width of the cutting surface 4b of the blade 4 or 0–20 percent wider than the cutting surface 4b of the blade 4. The chip passage 5 starts at the front of

the blade 4 and extends below the blade 4 behind it. According to the best structural solution shown in Fig. 3, the bottom 5a of the chip passage 5 is curved, whereby it operates as an effective wind wing as the chipping-machine rotor rotates, the chips effectively exit the housing of the chipping-machine rotor, due to which, the exiting wood chips fly for a long distance and, thus, no separate chip conveyor is required. The strong air blow of the bottom 5a also cools down the chipping-machine rotor, improving the lifetime of the blades 4. In Fig. 3, the bottom 5a of the chip passage 5 is in the rotation direction 7 forward curved. The bottom 5a of the chip passage 5 can also be straight as shown in Figs. 2, 7, 8 and 10.

Figs. 6, 7 and 9 show that on the side surface 2b of one or more fastening bodies 2 there is one or more chip grooves 2c. The chip groove 2c is at the point of the chip passage 5, whereby the chip groove 2c widens the chip passage 5. The chip groove 2c is milled or otherwise machined to the fastening body 2, whereby the fastening body 2 is thinner at the point of the chip groove 2c. To the fastening bodies 2 at the ends of the chipping-machine rotor, the chip grooves 2c are only milled on the inner side surface 2b of the chipping-machine rotor, whereby the outer side surfaces of the fastening bodies 2 at the ends are straight. In the figures, there are on the outer side surfaces 2ba of the fastening bodies 2 at the ends of the chipping-machine rotor the protruding cleats 2d which prevent the wood chips from packing at the ends of the chipping-machine rotor. The fastening body 2 seen from the end of the body 1 is a planar part circular of its outer edge.

The figures show that between the fastening bodies 2 there is the stopper 3 the outer surface of which is 3–2 mm within the outer edge 2a of the fastening body 2. Fig. 2 particularly shows that the stopper 3 is a ring circular of its outer edge which includes an opening at the point of the chip passage 5. The diameter of the outer edge 2a of the fastening body 2 being larger than the stopper 3 decreases friction between the wood and the chipping-machine rotor, the end of the wood being chipped collides the outer edge 2a. The cross-sectional area of the outer edge 2a is small, whereby the friction is also small decreasing the heating of the chipping-machine rotor.

Small pieces of wood being chipped stop at the outer surface of the stopper 3, whereby the quality of wood chips is uniform, because no so-called biting can occur.

The cutting angles 4ba of adjacent blades 4 are in different directions, whereby no end stress is applied to the chipping-machine rotor, because the opposite cutting

angles 4ba cancel the end-directional force of each other. Advantageously, there is an even number of blades 4. As shown in Fig. 5, the blades 4 seen from the end of the chipping-machine rotor are on different sectors, whereby the blades 4 cannot cause vibration in the chipping-machine rotor when rotating.

The invented chipping-machine rotor can be manufactured with methods and machines known in the manufacture of chipping machines, of materials known to be used in chipping machines.

It is evident to those skilled in the art that the invention is not limited solely to the alternatives described above, but many modifications are possible within the scope of the inventive idea defined by the enclosed claims.

CLAIMS

1. A rotor of a chipping machine, which is used for chipping wood, which chipping-machine rotor includes one or more bodies (1), to which is fastened one or more fastening bodies (2), which includes one or more blades (4), *characterised* in that between the blade (4) and the body (1) there is an open chip passage (5).

2. A rotor of a chipping machine according to claim 1, *characterised* in that the cross-sectional area of the chip passage (5) is 20–40 per cent of the diameter area of the chipping-machine rotor.

3. A rotor of a chipping machine according to claim 1, *characterised* in that the width of the chip passage (5) is the width of the cutting surface (4b) of the blade (4) or 0–20 percent wider than the cutting surface (4b) of the blade (4).

4. A rotor of a chipping machine according to claim 1, *characterised* in that the chip passage (5) starts at the front of the blade (4) and extends below the blade (4) behind it.

5. A rotor of a chipping machine according to claim 1, *characterised* in that a bottom (5a) of the chip passage (5) is straight or curved.

6. A rotor of a chipping machine according to claim 1, *characterised* in that on a side surface (2b) of one or more fastening bodies (2) there is one or more chip grooves (2c).

7. A rotor of a chipping machine according to claim 6, *characterised* in that the chip groove (2c) is at the point of the chip passage (5), whereby the chip groove (2c) widens the chip passage (5).

8. A rotor of a chipping machine according to any one of claims 1–7, *characterised* in that the fastening body (2) is a planar part circular of its outer edge.

9. A rotor of a chipping machine according to claim 1, *characterised* in that between the fastening bodies (2) there is a stopper (3) the outer surface of which is 3–25 mm within the outer edge (2a) of the fastening body (2).

10. A rotor of a chipping machine according to any one of claims 1–9, *characterised* in that the stopper (3) is a ring circular of its outer edge which includes an opening at the point of the chip passage (5).

11. A rotor of a chipping machine according to claim 1, *characterised* in that the cutting angles (4ba) of adjacent blades are in different directions, whereby no end stress is applied to the chipping-machine rotor.

12. A rotor of a chipping machine according to claim 1, *characterised* in that the blades (4) seen from the end of the chipping-machine rotor are on different sectors, whereby the blades (4) do not cause vibration in the chipping-machine rotor when rotating.

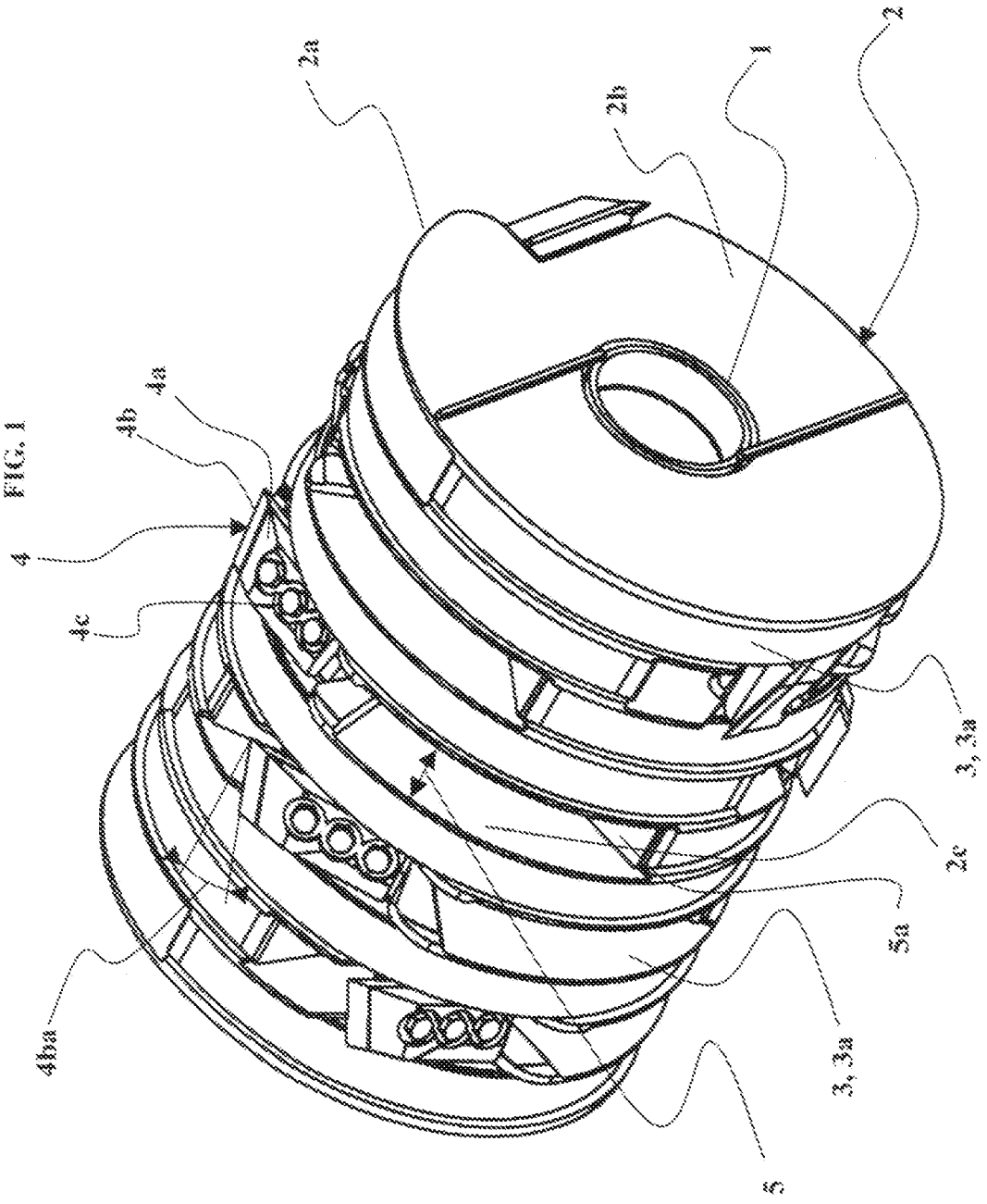


FIG. 1

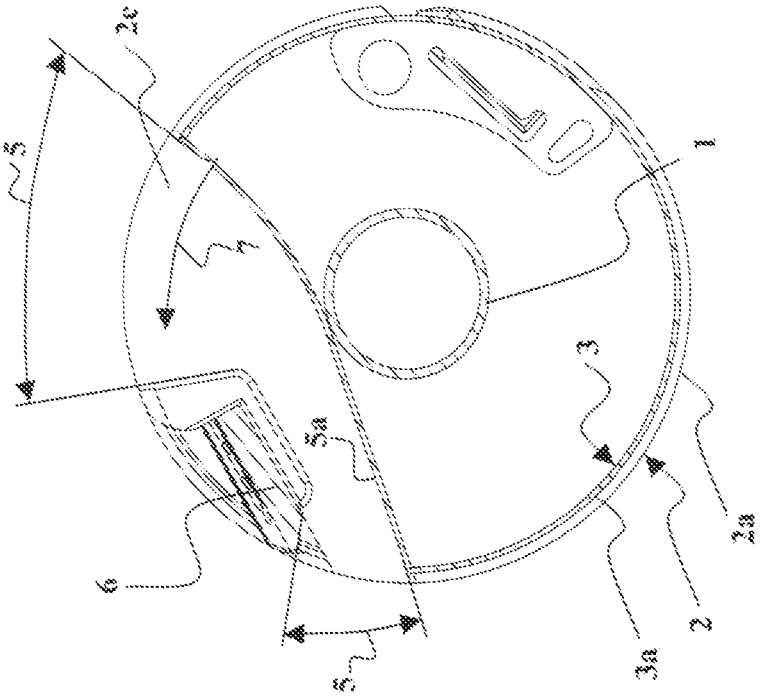


FIG. 3 A - A

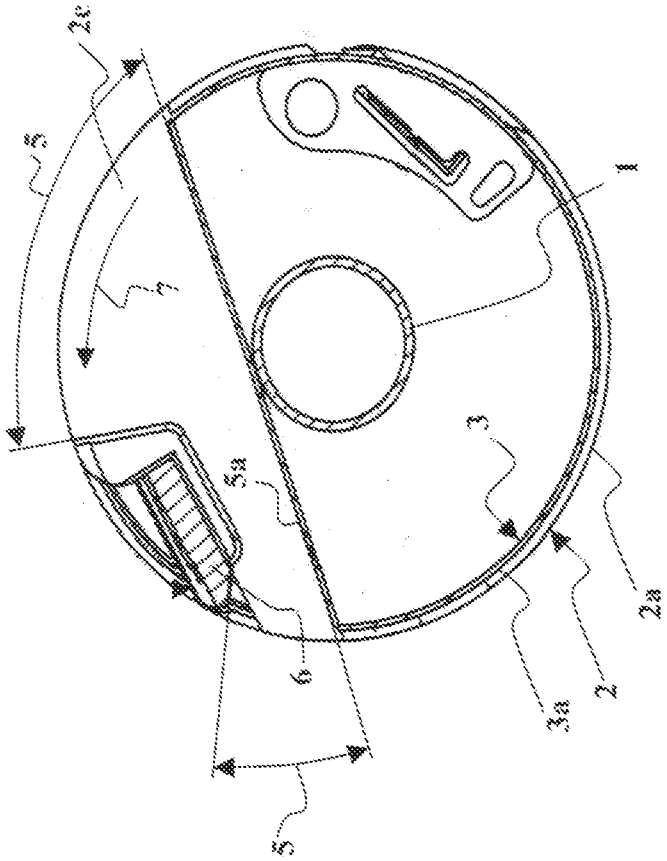


FIG. 2 A - A

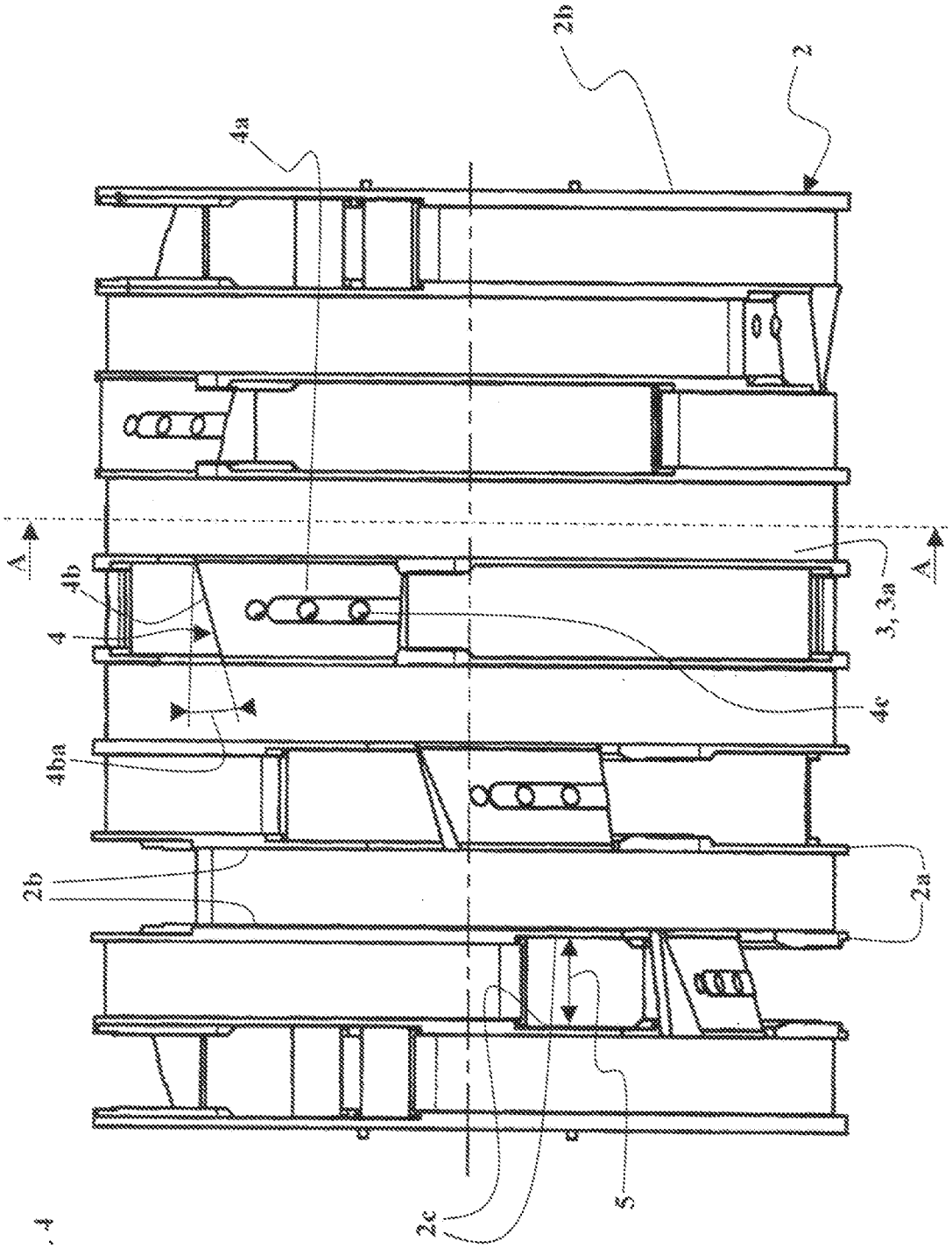


FIG. 4

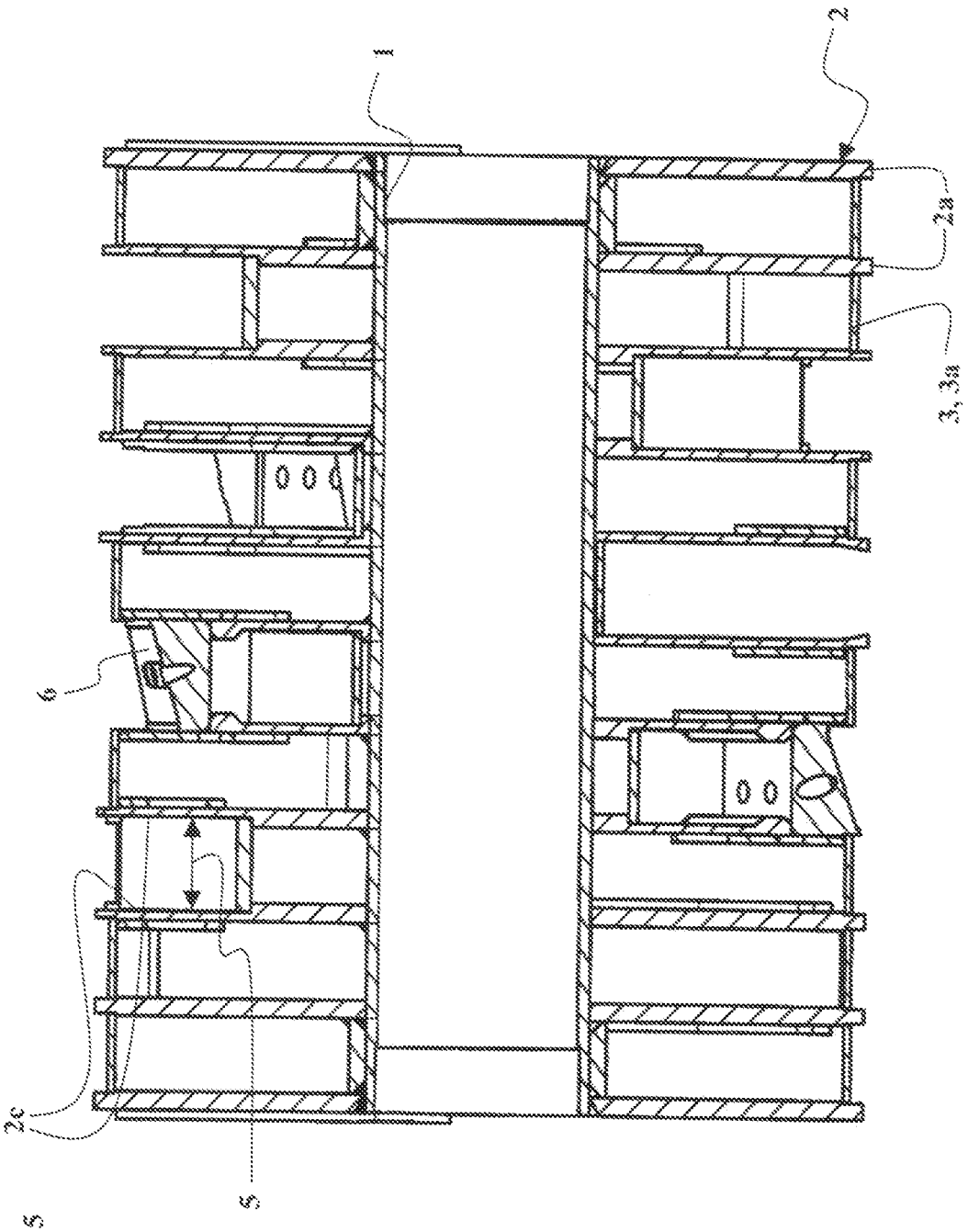


FIG. 5

FIG. 7

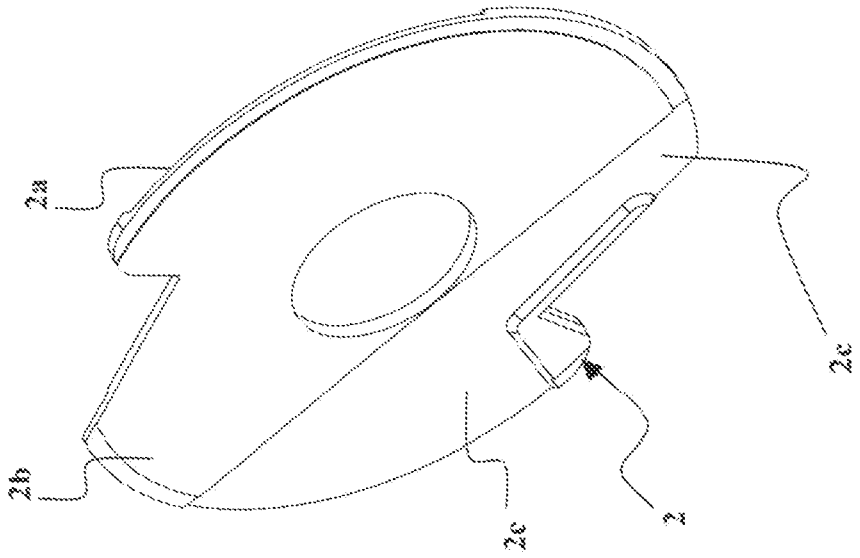


FIG. 6

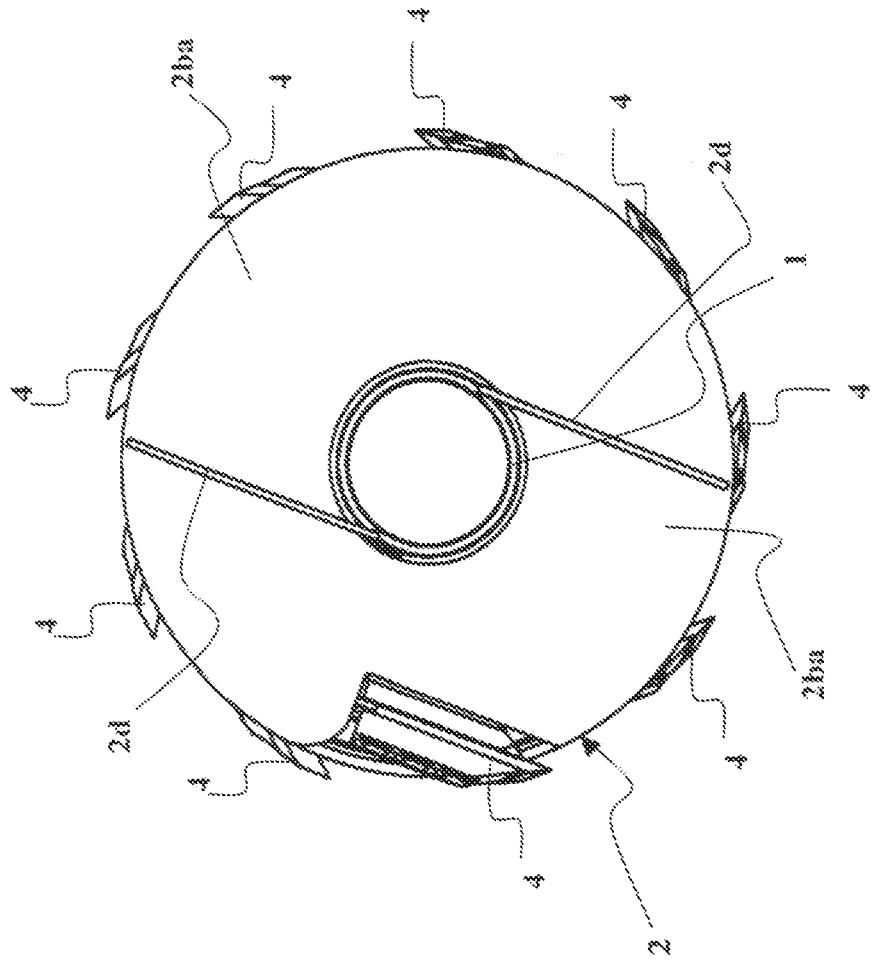


FIG. 10

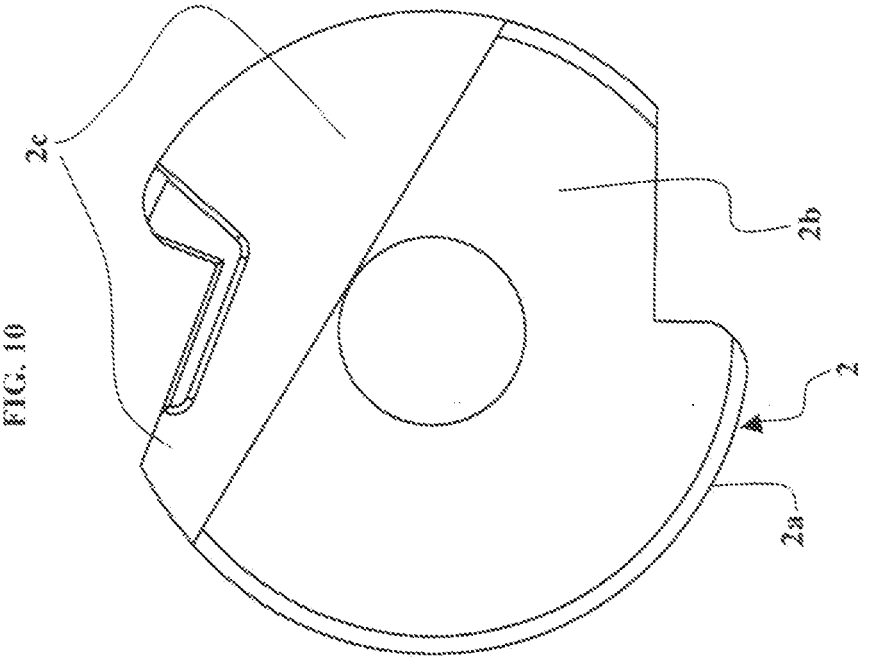


FIG. 9

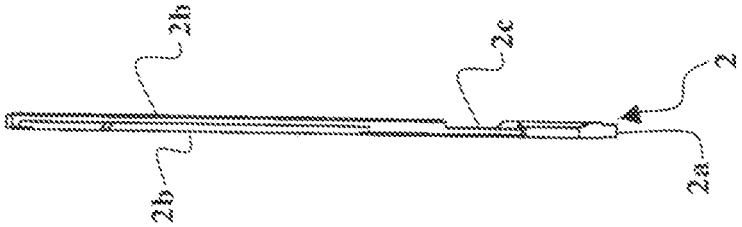
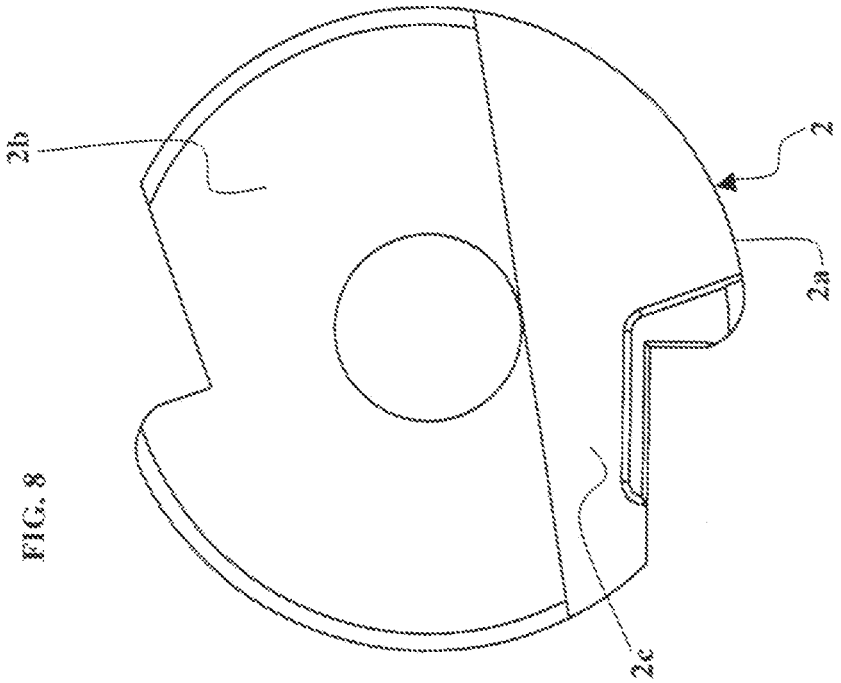


FIG. 8



INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2011/050147

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC B27L, B02C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

FI, SE, NO, DK

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9413442 A1 (TELCOR PTY LTD et al.) 23 June 1994 (23.06.1994) page 3, lines 17-32, page 8, line 9 – page 12, line 30, FIG. 2, 4	1-5, 8-12
A	US 2004069879 A1 (BINDER BRUNO et al.) 15 April 2004 (15.04.2004)	1
A	FI 109981 B (ANDRITZ PATENTVERWALTUNG) 15 November 2002 (15.11.2002)	1

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/FI
National Board of Patents and Registration of Finland
P.O. Box 1160, FI-00101 HELSINKI, Finland
Facsimile No. +358 9 6939 5328

Authorized officer
Ia Backman
Telephone No. +358 9 6939 500

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
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Patent document cited in search report	Publication date	Patent family members(s)	Publication date
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		CA 2260721 A1	03/09/1999

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