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(54) A paddle device for mixer and mixer

(57) A paddle device (1) for mixing intended to be fixed to a rotating shaft (10) within a container (20) with a cylindrical wall bottom (21) of said mixer and having a substantially flat shape with two main faces (2, 3) approximately parallel to one of its median geometric plane (M).

The shape of said device (1) is approximately a sector of a circumference with an operating edge (4) of arched shape.

The device (1) is characterized in that at least one of the two main faces (2, 3) has a respective shaped portion having a distance from the median geometric plane (M) that increases from a minimum distance (L1) to a maximum distance (L2) at the operating edge (4).

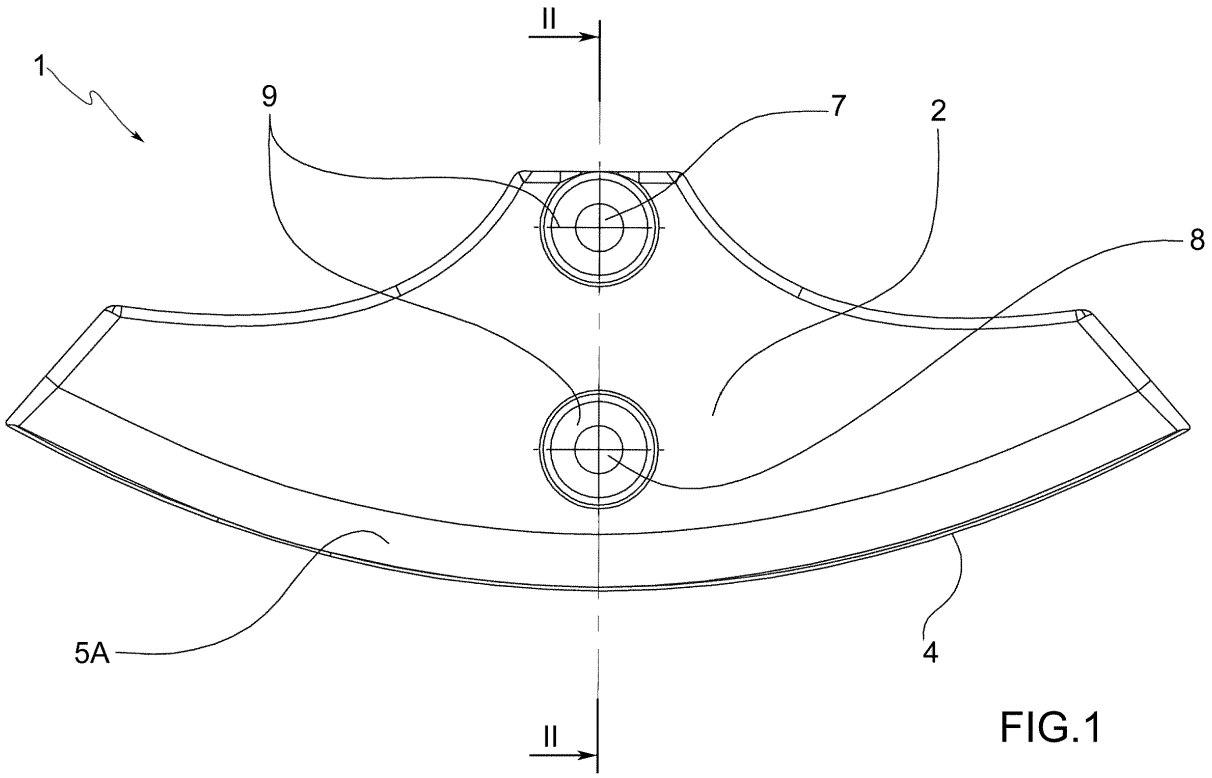

FIG.1

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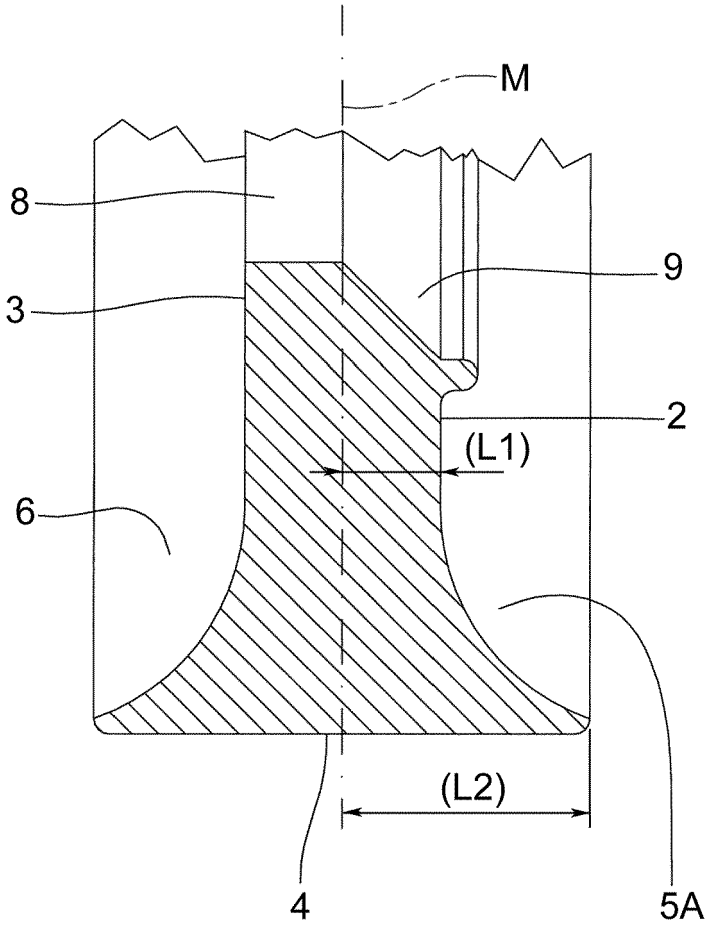

FIG.3A

Description

[0001] The present invention relates to the field of machinery for buildings and for the construction industry and in particular relates to a paddle device for a mixer and to a mixer particularly suitable for the mixing of cements, concretes and conglomerates in general.

[0002] There are known containers with the bottom in the shape of straight sector of cylindrical wall, for example consisting of buckets of the excavator or earthmoving type, internally equipped with a motorized shaft positioned parallel to the bottom generatrices, for example at the geometric axes of the cylindrical wall, and equipped with radial arms and/or blades. The shaft rotation allows the arms or the blades to mix the constituents of the conglomerate poured into the bucket.

[0003] Said known blades are constituted by flat metal plates whose profile is contoured similar to an axe-like shape and are fixed, by screws or welding to the arms projecting radially from the motorized shaft. As shown in Figure 15 of the known prior art, the outer edge of each blade is approximately an arc of circumference to graze the cylindrical face of the bucket bottom.

[0004] As shown in Figure 16 of the known prior art, the known blade as a result of the rotation of the motorized shaft, sets the materials to be mixed in a rotary motion with axial component; the gravel, the stones and in general the more coarse elements and having a specific weight greater than that of mortar tend to settle to the bottom and to accumulate in front of the paddles with a predominantly axial motion.

[0005] A disadvantage of said known mixers is the premature wear of the bucket bottom due to the dragging of stones and gravel upon it that accumulate on the bottom.

[0006] Another disadvantage consists in the fact that the continuous dragging of the gravel, stones and the like against the paddles and against the bucket bottom, causes the frequent insertion of the gravel, stones and similar between the bottom and the paddles causing a further increase of the wear also loaded upon the blade edges, excessive pulse stress to all the moving parts that can damage bearings, transmissions and engine, increased energy consumption and noise.

[0007] An object of the present invention is to propose a paddle device for mixer and a mixer capable of reducing the wear of the container bottom of the mixer itself.

[0008] Another object is to propose a paddle device for mixer adapted to reduce the wear of the outer edge of the device itself.

[0009] Further object is to propose a mixer with less stress operation and more fluid, quieter and with lower energy consumption.

[0010] Another object is to propose a mixer adapted to perform a perfect and homogeneous mixing of components also of different specific weights in a reduced time.

[0011] The characteristics of the invention are highlighted in the following with particular reference to the accompanying drawings wherein:

- Figure 1 shows a front view of a first embodiment of a paddle device for mixer object of the present invention;
- Figure 2 shows a view of the device in section according to the plane II - II of Figure 1 associated to a bottom portion of a container and to a set of elements of larger size of the materials that make a conglomerate;
- Figure 3A shows an enlarged view of a detail of the device in question as it has been shown in said first embodiment shown in Figures 1, 2;
- Figure 3B shows an enlarged view of a detail of the device in question as it has been shown in a second embodiment;
- Figure 3C shows an enlarged view of a detail of the device in question as it has been shown in a third embodiment;
- Figures 4 to 6 show side views, from respective points of observation, of the device of Figure 1;
- Figures 7 and 8 show respective axonometric views of the device of Figure 1;
- Figure 9 shows a further embodiment of a paddle device for mixer object of the present invention;
- Figure 10 shows a shaft of a mixer object of the present invention provided with a plurality of devices of Figure 1 fixed thereon by means of respective arms;
- Figure 11 shows the shaft of Figure 10 housed in a container of the mixer and sectioned by a median longitudinal plane;
- Figure 12 shows a cross-sectional view of the elements of the mixer of Figure 11;
- Figure 13 shows an enlarged view of a detail of Figure 12;
- Figure 14 shows an enlarged detail of Figure 11;
- Figures 15 and 16 show views, corresponding to those of the first two figures, of a device of the known prior art.

[0012] With reference to Figures 1 to 14, number 1 indicates the paddle device for mixer object of the present invention.

[0013] The device and the mixer are meant to mix together different solid and possibly liquid components where the solid components may have very different granulometry and/or sizes being, for example, cement, sand and gravel and/or pebbles.

[0014] As shown in particular in figure 11, the paddle device 1 for mixer is intended to be fixed to a rotating shaft 10 within a container 20 with cylindrical wall bottom 21 and flat sidewalls for example tangent to the outer edges of the bottom of said mixer.

[0015] The device 1 is preferably constituted by a plate-shaped metal body with an approximately flat shape, with two main faces 2, 3 approximately parallel to a geometric

median plane M thereof (Figure 2).

[0016] Said body shape in top view is, indicatively and in a first approximation, shaped as a sector of a circumference with an arched shaped operating edge 4 and with a central portion which extends towards the center of curvature of said median arched edge.

[0017] In the first embodiment of the present invention shown in Figures 2, 3A, the two principal surfaces 2, 3 present in the vicinity of the operating edge 4, respective portions with curved surface 5, 6 which connect said faces 2, 3 with said operating edge 10.

[0018] The portions having curved surfaces 5, 6 diverge and therefore the distance between said geometric median plane M and the points of the portions with curved surface 5, 6 increases in the direction of the operating edge 4.

[0019] In other words, as shown in particular in Figure 3A, the substantial half of the transverse thickness of the device 1 increases from a minimum distance (L1) between any of the two faces 2, 3 and the geometric median plane M, at a maximum distance (L2) at the operating edge 4.

[0020] The portions with curved surfaces 5, 6 are concave and preferably are approximately in the shape of longitudinal portions of the inner wall of a tubular toroidal surface.

[0021] As a result of said shape of the portions with curved surfaces 5, 6 connecting the main faces 2, 3 and the operating edge 4, the cross section of the device 1 in the proximity of the operating edge 4 assumes the shape of a bell edge or a flared trumpet mouth.

[0022] Alternatively the invention envisages that only one of the main faces 2, the front one in relation to the motion with respect to the materials to be mixed, is peripherally provided with a respective portion with curved surface 5 while the other main face 3, the rear one, is flat and extends directly up to the operating edge 4 without an interposed portion with a curved surface.

[0023] The invention, as an alternative, also envisages that one or both curved surfaces 5, 6 are convex, for example in the form of a longitudinal portion of a torus or a toroid, or to straight generatrices, for example in a frusto-conical wall sector.

[0024] A further alternative of the present invention shown in Figure 3B in place of the curved surfaces 5A envisages the use of two flat inclined surfaces 5B.

[0025] Alternatively, it is also possible to envisage the use of a surface 5C obtained from the set of a plurality of inclined surfaces arranged in series to each other (Figure 3C).

[0026] In the first embodiment the ends of the device 1, in correspondence to the terminal portions of the operating edge 4, are almost flat with beveled edges and oriented approximately perpendicular to the median geometric plane M.

[0027] The device 1 further comprises first attachment means 7, 8 for fixing to a respective arm 11 of the rotating shaft 10. Said first attachment means 7, 8 consist, for example, in a pair of through holes formed in the central portion which extends towards the center of median curvature of said arched edge and intended to accommodate fastening screws whose heads may be housed in respective flared seats 9 formed at the ends of the through holes 7, 8 in correspondence to the front main face 2 with respect to the motion of the device.

[0028] The operating edge 4 approximately consists in a surface with generatrices almost perpendicular to said median geometric plane M with profile of the projection on said latter plane M having the shape of a sector of geometric intersection between a geometric plane and the inner face of the bottom 21 of the container 20 where said geometric plane is inclined with respect to the geometric axis of said bottom 21.

[0029] The operating edge 4 has a transverse dimension comprised between 1.5 and 6 times the average distance between the two main faces 2,3, preferably equal to about 2.5 times said distance.

[0030] In the embodiment shown in Figures 2 and 3A the medium radius of curvature of each of the cross sections of the curved surfaces 5, 6 is comprised between 0.5 and 2 times the minimum distance (L1) between the faces 2, 3, preferably about equal to said distance. Preferably, but not necessarily, the geometric tangent at the terminal end of the cross section of each curved surface 5, 6 forms with the corresponding section of the operating edge 4 an angle between 20° and 70° preferably about 30°.

[0031] In the alternative embodiment shown in Figure 9, the operating edge 4A is in the form of curvilinear brake lining mountable/dismountable from the rest of the device 1. In known manner the assembly/disassembly of this operating edge 4A is by way of the use of a plurality of countersunk head screws 18 which, in use, are inserted into corresponding through holes 19A made on the operating edge 4A itself. Each screw 18 is then screwed into a threaded hole 19B made on the back of the device 1 facing the operating edge 4A (Figure 9). In this way the dismountable operating edge 4A can be advantageously made in a material that exhibits anti-wear properties better than the rest of the device 1. Furthermore, by adopting this solution, a considerable saving is achieved by changing as needed only the worn operating edge 4A with a new one.

[0032] The conglomerates mixer object of the present invention is provided with a plurality of devices 1 and comprises a rotating shaft 10 inside the container 20 with cylindrical wall bottom 21.

[0033] The container 20 consists, for example, in a bucket for earth moving equipped with other elements connected to the shaft 10 and the devices 1 and maintained, in the condition of operation as mixer, with the opening upwards and with the bottom 21 downwards.

[0034] The rotating shaft 10 is aligned to the geometric axis of the bottom cylindrical wall 21 and is driven in rotation by an engine to which is connected by way of a mechanical transmission with gear reducer.

[0035] Said rotating shaft 10 carries a plurality of arms 11 radially projecting each intended to support a respective device 1. Said arms 11 comprise respective second attachment means 12, 13, consisting of nuts for screws or bolts 20 engaged in the first attachment means 7, 8 and intended to fix the inclined devices 1 at an angle comprised between 25° and 65° with respect to the axis of the shaft 10 and with the respective operating edges 4 grazing the bottom 21. In particular each arm 11 orients the respective device 1 so that the latter lies on a geometrical plane parallel to that of intersection with the inner face of the bottom 21.

[0036] The mutual longitudinal distance between the arms 11 is determined so that the bottom areas 21 affected by the passage of the devices 1 are adjacent or slightly overlapping, thereby excluding the possibility that a bottom portion is not affected by the mixing action of the devices.

[0037] With reference to Figures 1, 2, 3A, 4-9, 10-14, the operation of the device 1 envisages that the elements to be mixed with higher granulometry or size G, for example, gravel, rocks, stones or other solid elements stationed or that have reached the bottom by gravity, are found by the curved surface 5 which connects the main front face 2 to the operating edge 4 which grazes the bottom 21 at a distance less than the sizes of the elements to be mixed with higher granulometry or sizes. Said curved surface 5 in cooperation with the orientation and with the inclination of the front main face causes the translation of the elements to be mixed with higher granulometry or size, such as gravel, rocks, stones or other G, towards the rotation shaft 10 moving them away from the gap between the bottom 21 and the operating edge 4.

[0038] The bucket so equipped becomes the mixer of the invention which assumes the function of a high efficiency concrete mixer.

[0039] As shown again in Figure 9, in certain application has proved particularly advantageous the presence of two lateral recesses 22 which allow the passage of a certain amount of material to be mixed in a direction axially parallel to the shaft 10.

[0040] An advantage of the present invention is to provide a paddle device for mixer and a mixer capable of reducing the wear of the container bottom of the mixer itself.

[0041] Another advantage is constituted by the fact of providing a paddle device for mixer adapted to reduce the wear of the outer edge of the device itself.

[0042] Further advantage is to provide a mixer operating with less stress and more fluid, quieter and with lower energy consumption.

[0043] Another advantage is to provide a mixer adapted to perform a perfect and homogeneous mixing also of components of different specific weights in less time.

Claims

1. A paddle device (1) for mixer intended to be fixed to a rotating shaft (10) within a container (20) with a cylindrical wall bottom (21) of said mixer and having a substantially flat shape with two main faces (2, 3) approximately parallel to its geometric median plane (M), said shape is approximately profiled as a circumference sector with an operating edge (4) of arched shape; said device (1) being **characterized in that** at least one of the two main faces (2, 3) has a respective shaped portion having a distance from said median geometric plane (M) that increases from a minimum distance (L1), to a maximum distance (L2) in correspondence of said operating edge (4).

2. The device (1), as claimed in Claim 1, **characterized in that** said respective shaped portion has a curved surface (5A).

3. The device (1), as claimed in Claim 1, **characterized in that** said respective shaped portion has a flat inclined curved surface (5B).

4. The device (1), as claimed in Claim 1, **characterized in that** said respective shaped portion has a surface (5C) obtained from the set of a plurality of inclined surfaces arranged in series to each other.

5. The device (1), as claimed in any one of the preceding Claims, **characterized in that** both main faces (2, 3) have said respective shaped portions.

6. The device (1), as claimed in Claim 2, **characterized in that** said shaped portion (5A) is approximately shaped as the inner wall portion of a hollow toroidal surface (15).

7. The device (1), as claimed in Claim 6, **characterized in that** the cross section of the device (1) at the operating edge (4) is shaped as a bell edge or a flared trumpet mouth (20).

8. The device (1), as claimed in any preceding Claims, **characterized in that** it comprises first attachment means (7, 8) for fixing to a respective arm (11) of the rotating shaft (10).

9. The device (1), as claimed in any preceding Claims, **characterized in that** the operating edge (4) consists approximately in a surface with generatrices nearly perpendicular to said median geometric plane (M) with the projection profile on said latter plane in the shape of sector of geometric intersection between a geometric plane and the inner face of the bottom (21) of the container (20) where said geometrical plane is inclined with respect to the geometric axis of said bottom (21).

10. The device (1), as claimed in Claim 9, **characterized in that** the operating edge (4) has a transverse dimension comprised between 1.5 and 6 times the average distance between the two main faces (2, 3), preferably equal to about 2.5 times said distance.

11. The device (1), as claimed in any preceding Claims, **characterized in that** the medium radius of curvature of the cross section of the at least one curved surface (5, 6) is comprised between 0.5 and 2 times the average distance between the two main faces (2, 3), preferably approximately equal to said distance; preferably said cross section subtends an angle comprised between 40° and 90°; preferably the geometric tangent at the terminal end of the cross section of the at least one curve surface (5, 6) forms with the corresponding section of the operating edge an angle between 20° and 70° preferably about 30°.

12. The device (1), as claimed in any preceding Claims, **characterized in that** the operating edge is in the form of a curvilinear element mountable/demountable from the rest of the device (1) itself.

13. A mixer for mixing conglomerates provided with a plurality of devices (1) according to any of the preceding Claims and comprising a rotating shaft (10) internal to a container (20) with a cylindrical wall bottom (21); said rotating shaft (10) being aligned to the geometric axis of the bottom cylindrical wall (21), and being drivable in rotation by an engine and has a plurality of projecting arms (11) each intended to support a respective device (1); said mixer (50) being **characterized in that** the arms (11) comprise respective second attachment means (12, 13) for the first attachment means (7, 8) and intended to fix the devices (1) inclined at an angle between 25° and 65° with respect to the axis of the shaft (10) and with the respective operating edges (4) that graze the bottom (21).

14. The mixer, as claimed in Claim 13, **characterized in that** the distance between the arms (11) is such that the areas of the bottom (21) affected by the passage of the devices (1) are adjacent or slightly overlapping.

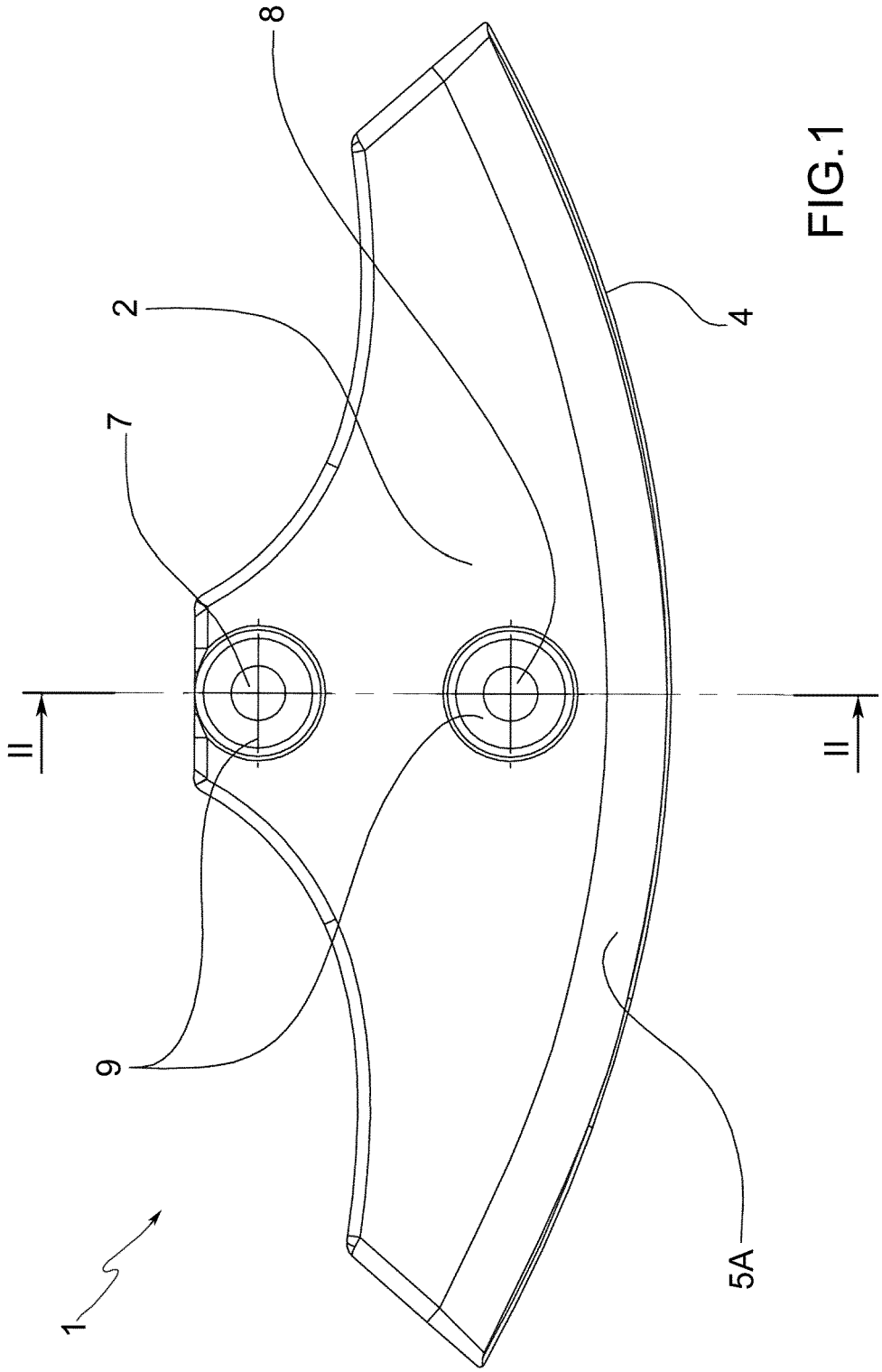

FIG.1

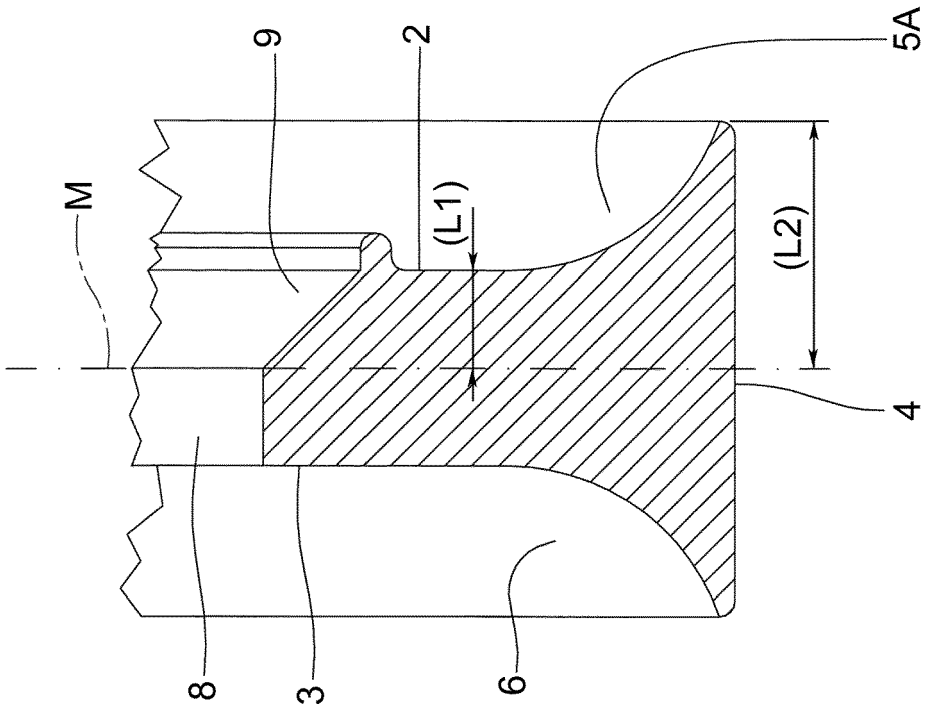

FIG.3A

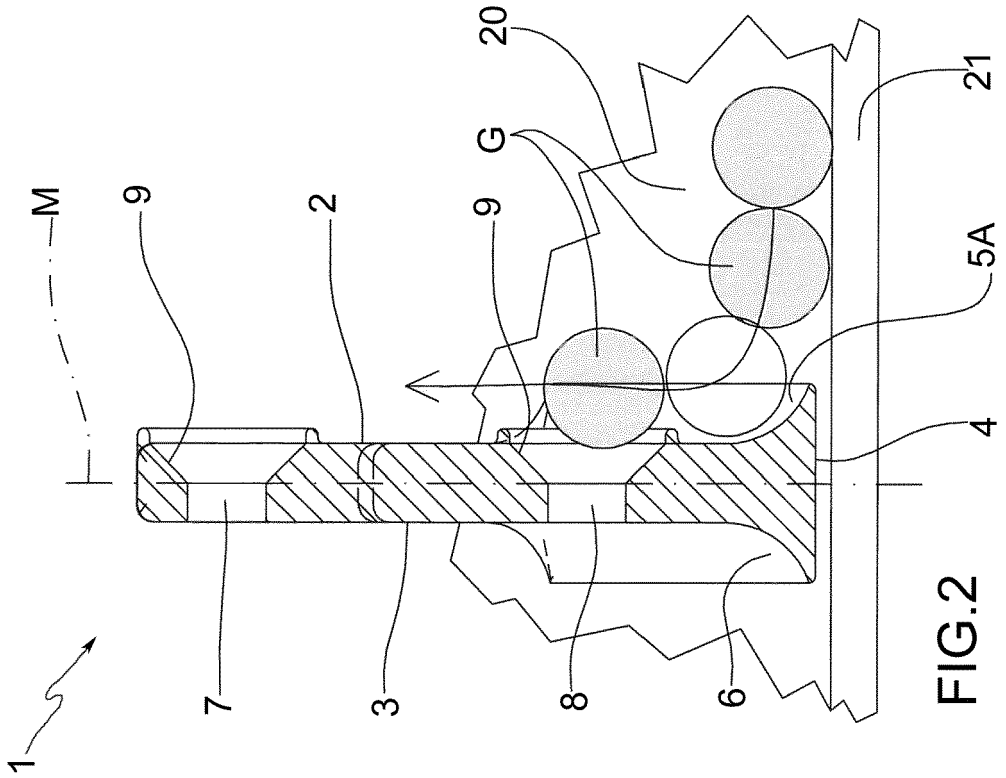

FIG.2

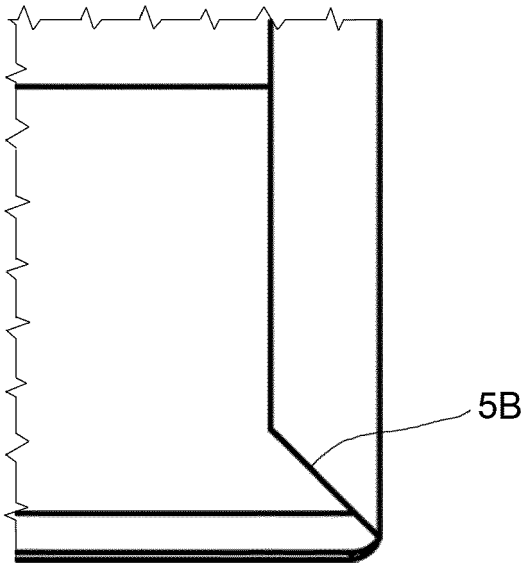

FIG.3B

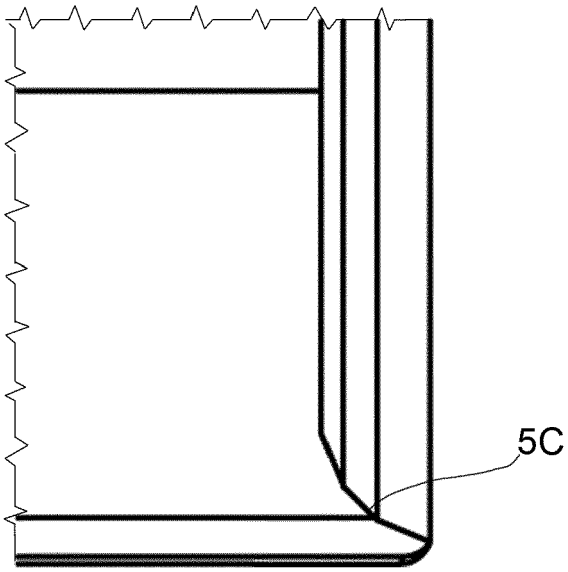

FIG.3C

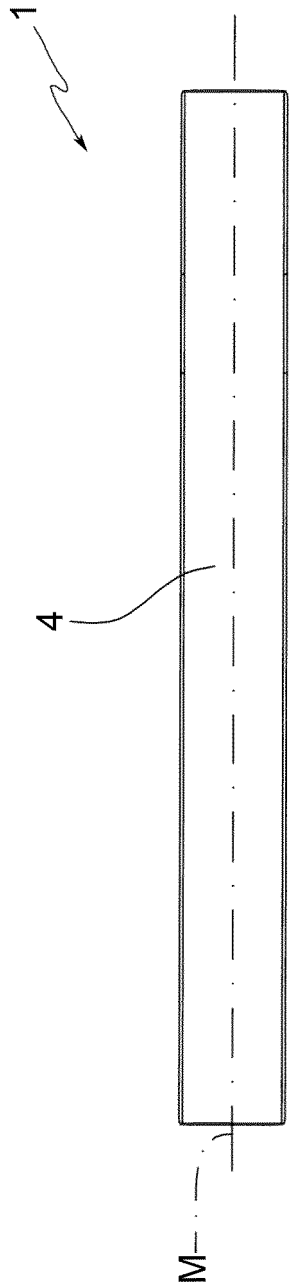

FIG.4

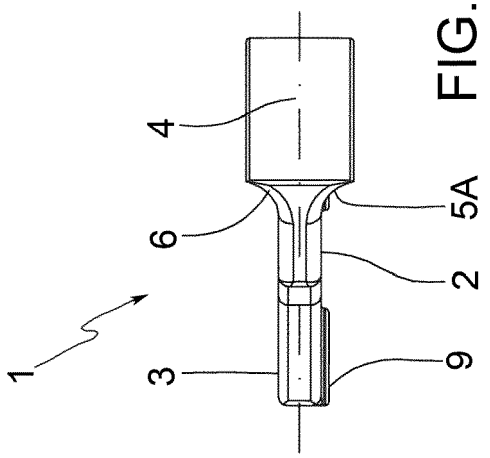

FIG.6

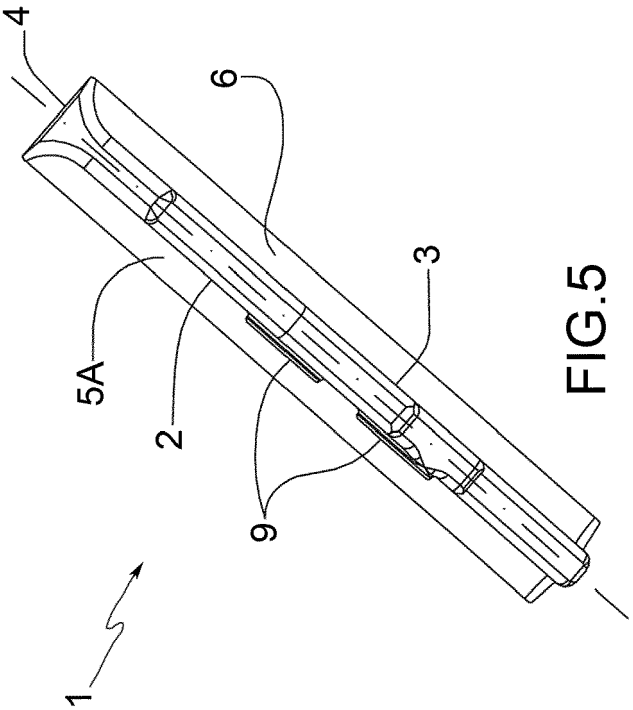

FIG.5

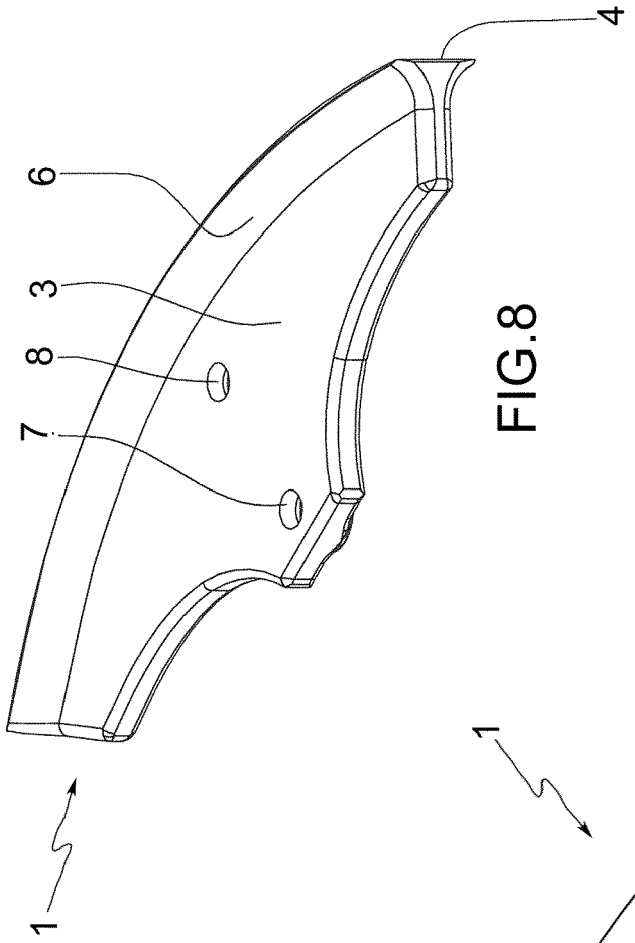

FIG.8

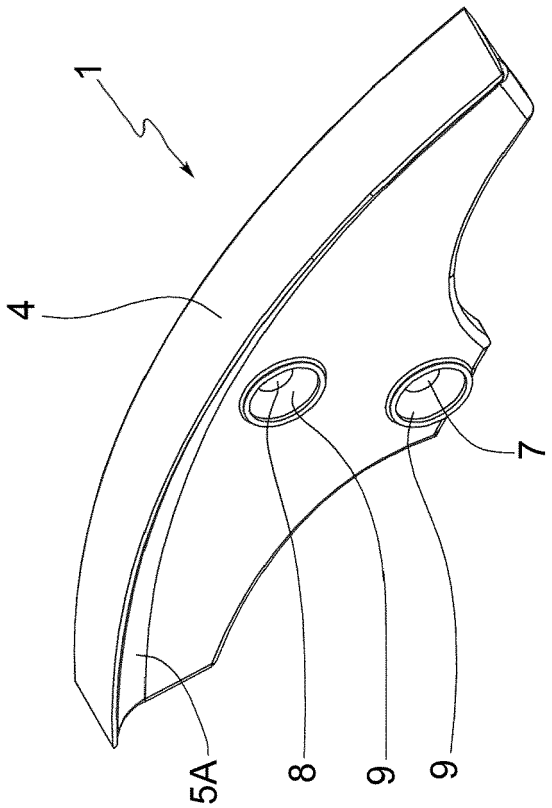

FIG.7

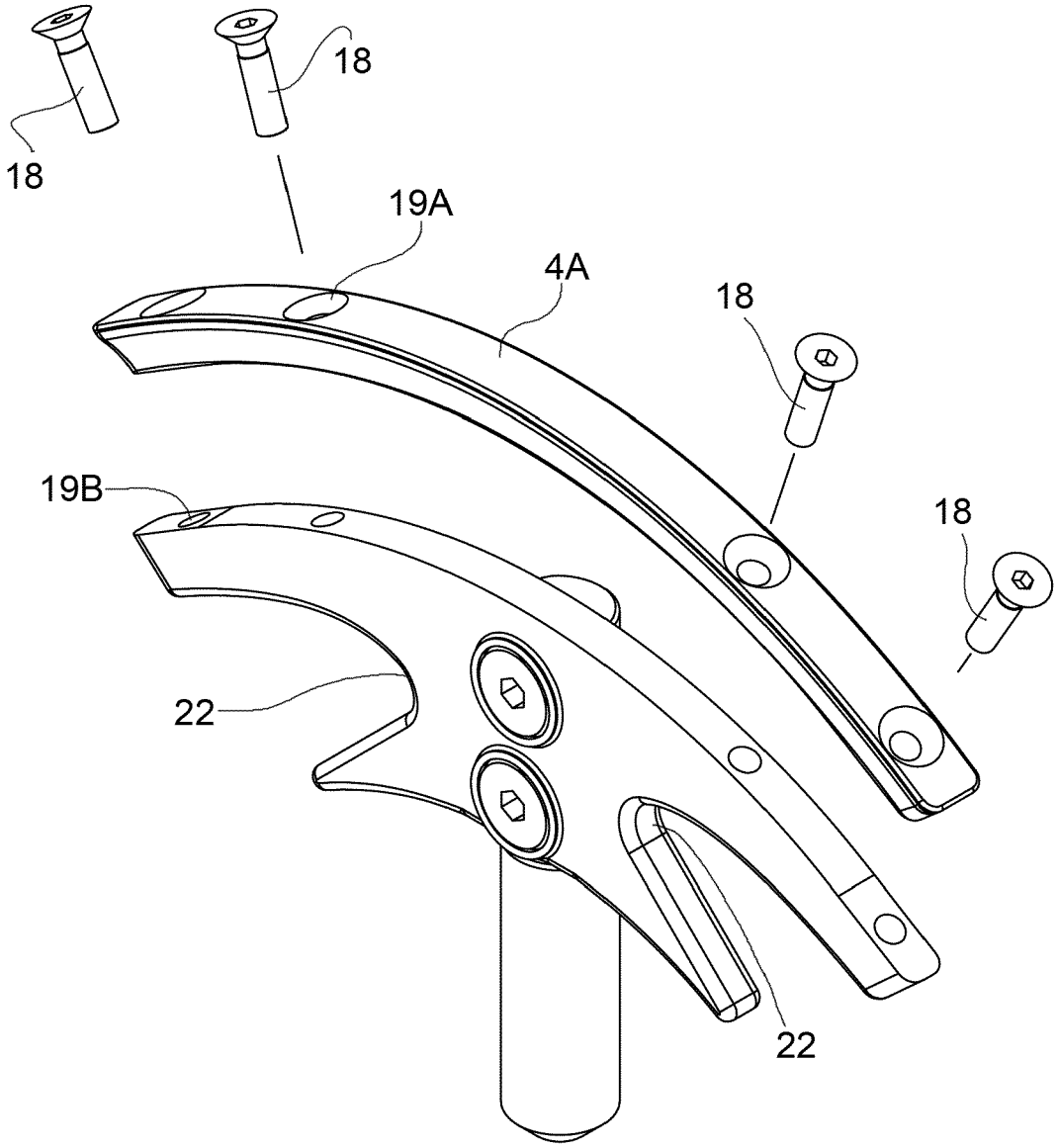

FIG.9

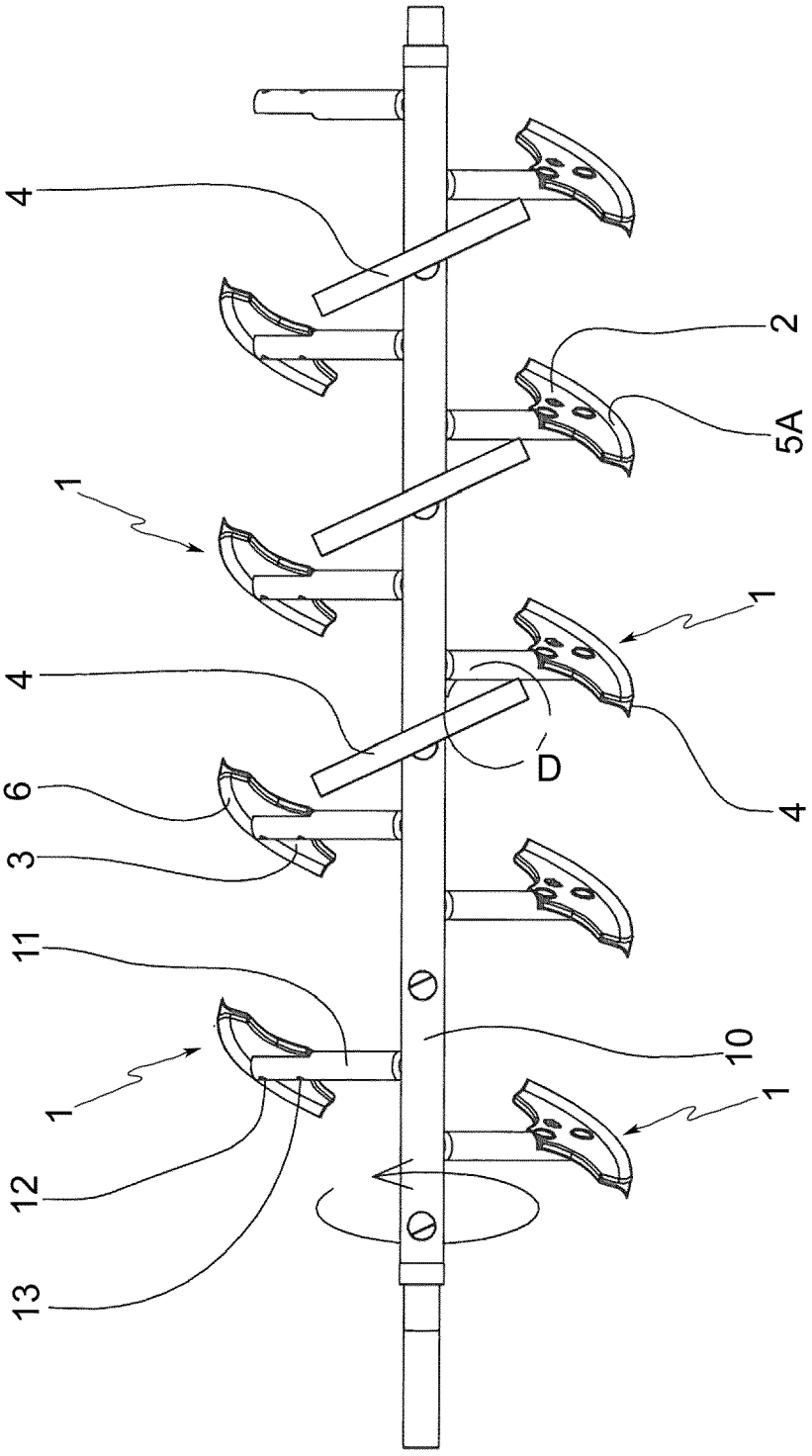

FIG.10

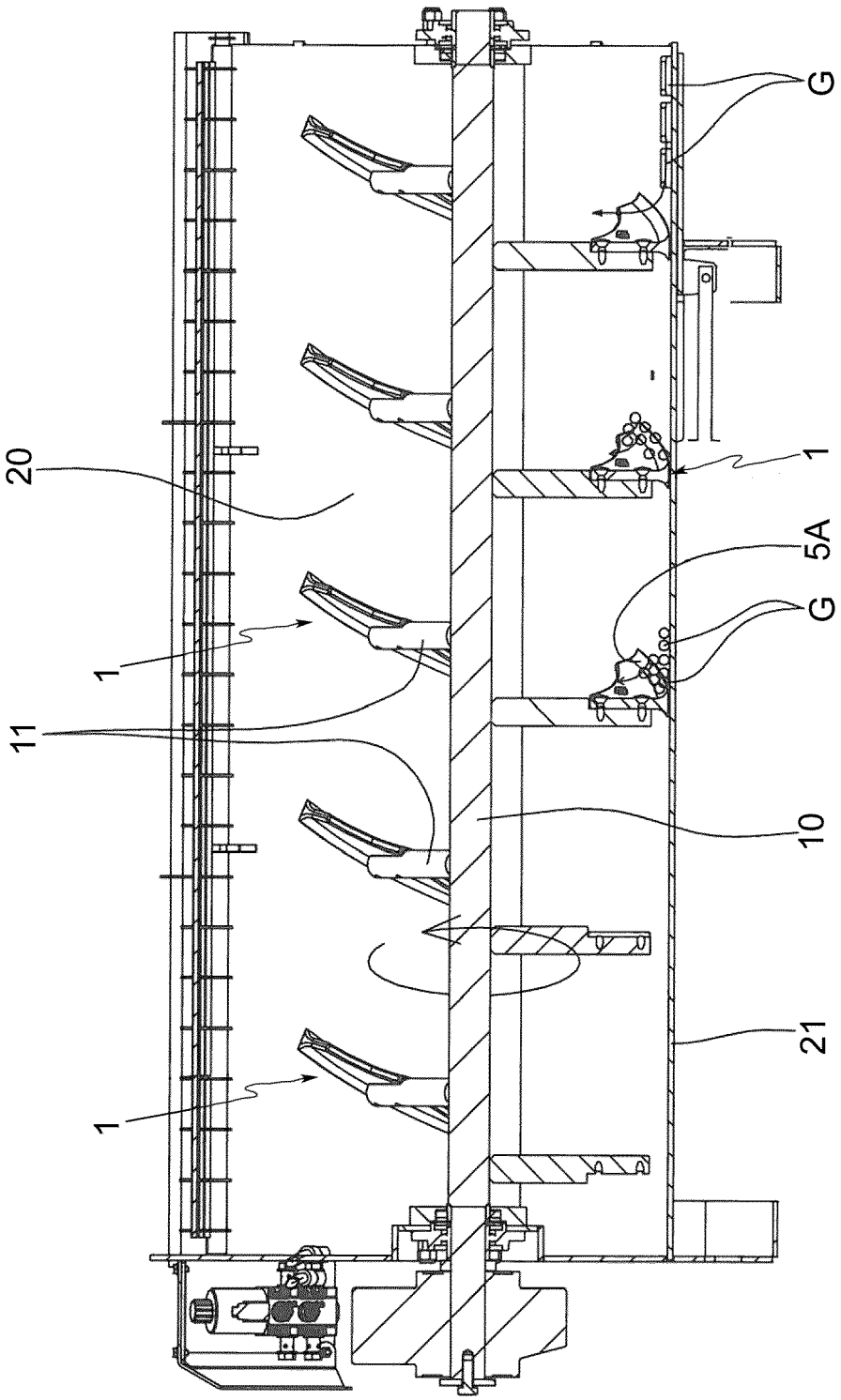

FIG.11

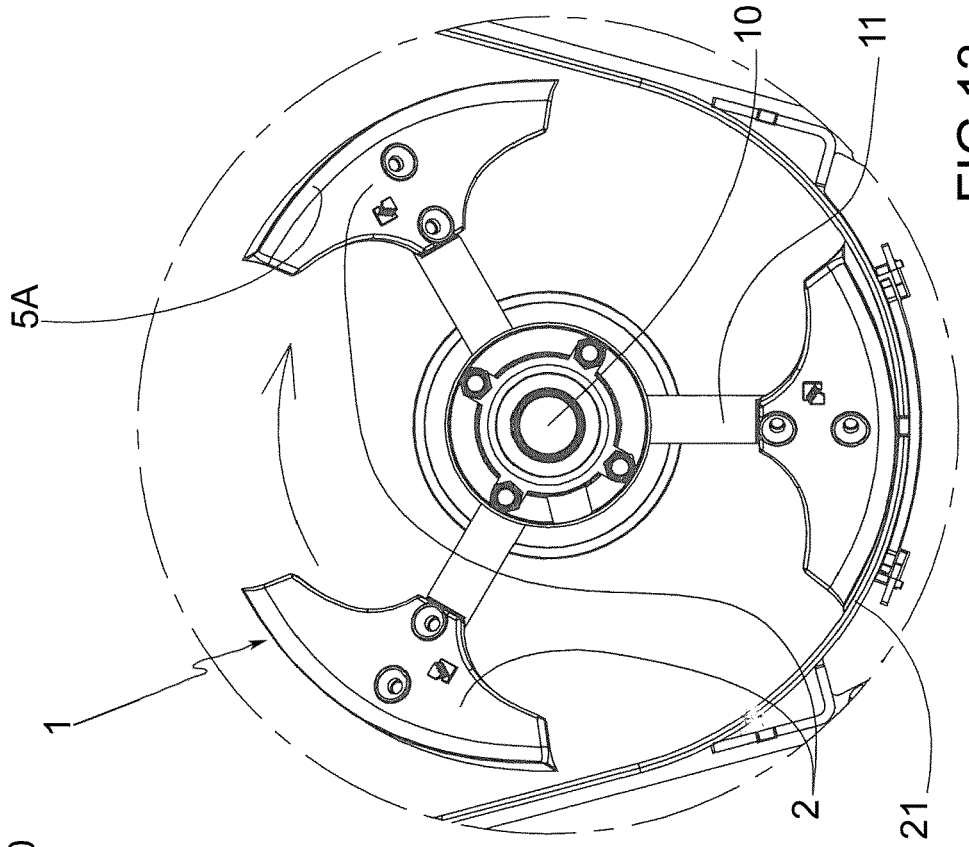

FIG.13

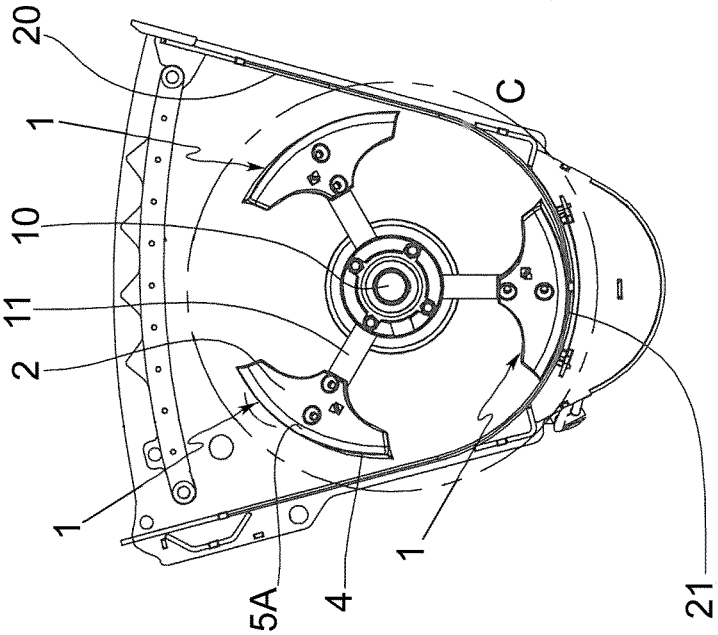

FIG.12

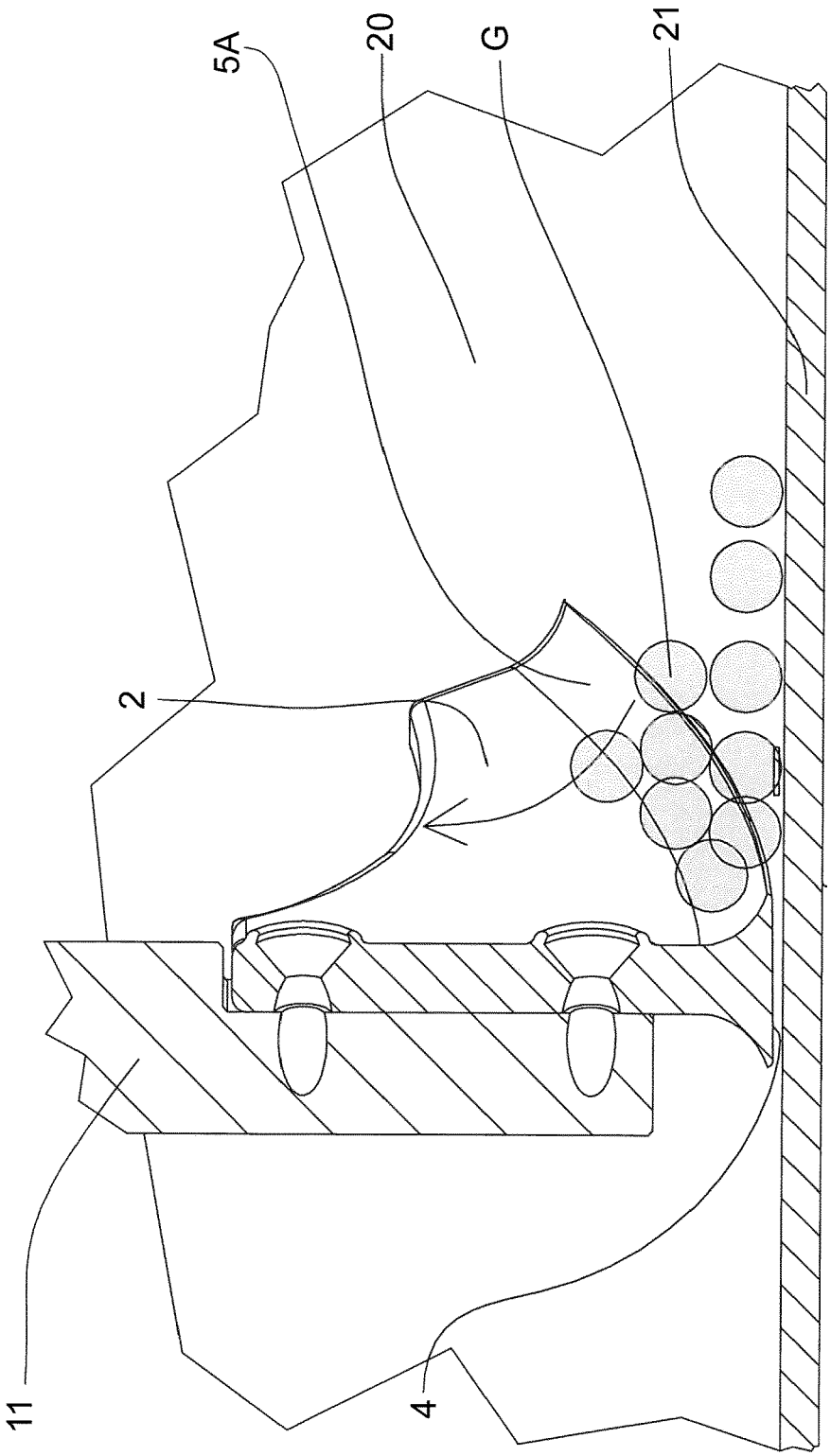

FIG.14

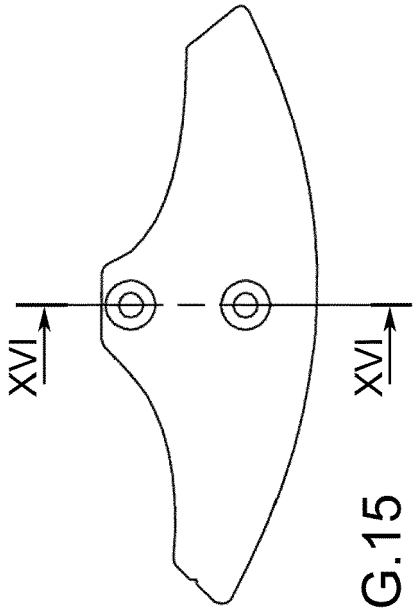

FIG.15

PRIOR ART

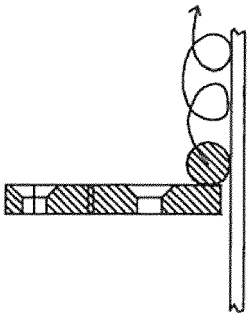

FIG.16

PRIOR ART

Europäisches Patentamt
European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 12 17 8559

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	GB 2 073 036 A (BHS BAYERISCHE BERG) 14 October 1981 (1981-10-14) * abstract; figures 1-4 * -----	1-14	INV. B01F7/00 B28C5/14 B01F7/04
A	WO 2008/003513 A2 (CFS BAKEL BV [NL]; SIMONSEN KNUD [DK]) 10 January 2008 (2008-01-10) * abstract; figures 1,2,7,8 * -----	1-14	
A	EP 0 677 323 A1 (SOFRADEN IND SARL [FR]) 18 October 1995 (1995-10-18) * abstract; figures 1,6,7,9 * -----	1-14	
A	CN 101 670 620 A (SANY HEAVY IND CO LTD) 17 March 2010 (2010-03-17) * figures 1-3 * -----	1-14	
A	GB 994 993 A (OWEN EVANS) 10 June 1965 (1965-06-10) * claim 1; figures 1-2 * -----	1-14	
			TECHNICAL FIELDS SEARCHED (IPC) B01F B28C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 October 2012	Muller, Gérard

CATEGORY OF CITED DOCUMENTS

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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 17 8559

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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11-10-2012

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