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(54) Core drills with wear protection

(57) A core-cutting tool (1), having a support body (3) having connection means (4), for connection to drive means. The tool has an annulus of cutting elements (2) arranged on one of its ends. The tool also has at least one abrasive element (5), arranged normal to the side wall of the tool and which does not extend radially beyond the outer edges of the annulus. When the core-cutting tool jams or snags during its operation, the tool is cut free by the abrasive element(s), thereby reducing the chances of accidents due to tool jamming.

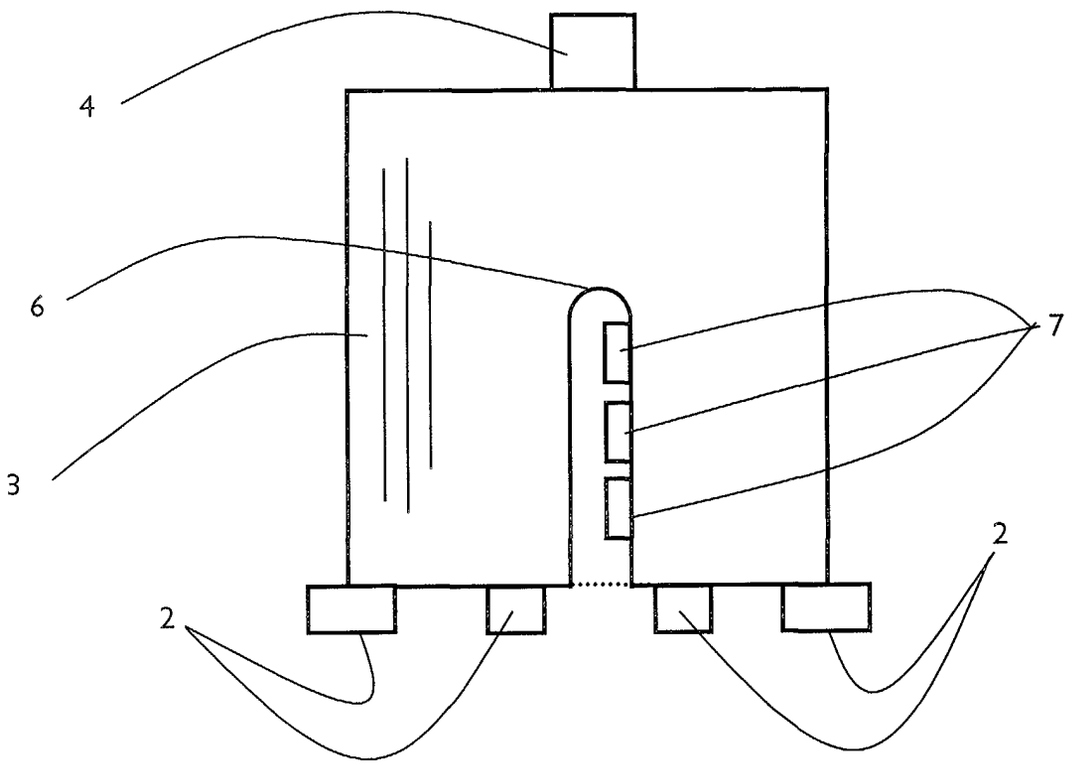

Fig. 5

EP 1 304 199 A1

Description

Field of the Invention

[0001] The present invention relates generally to core drills, and more particularly but not necessarily to core drills of the type having diamond or other abrasive cutting members for use in cutting masonry and stone.

Background of the Invention

[0002] Core drilling of different materials requires different types of cutting tools. However, due to the nature of the cutting process some problems facing these cutting tools are similar.

[0003] A generic core-cutting tool 1 is shown in Figures 1 and 2. In operation the core tool is attached, via connecting means 4, to a machine, which acts as a driving source, typically a drill. As the core-cutting tool is rotated the cutting elements 2, which are mounted on the tubular support body 3, impart a cutting action upon the chosen material e.g. stone, thus creating a hole in the said material; hereinafter referred to as the work piece. As the core-cutting tool is worked, it moves into the hole being cut in the work piece thereby maintaining the cutting force imparted on the work piece.

[0004] It is therefore standard practice for the cutting elements to be arranged so as to cut a hole in the work piece that is of sufficient size to receive the tubular support body as the core-cutting tool moves into the hole. The size difference between the radius of the tubular support body, and the radius of the hole cut by the cutting elements is known as the side clearance δ.

[0005] The size of the side clearance has a noticeable effect on the functionality of a core-cutting tool. A large side clearance will allow the tubular support body to enter the hole with a minimised likelihood of jamming. However, the resulting increased width of the cutting elements means that more material has to be removed, which leads to longer cutting times, slower penetration and the need for an increased level of feed pressures all of which in turn lead to increased machine wear and operator fatigue.

[0006] Alternatively, a small side clearance provides a much easier cut due to the smaller amount of material being removed. However, although the cutting is easier, the likelihood of jamming and/or snagging is greatly increased, which causes a severe safety hazard.

[0007] Jamming and stalling can burn out the machines or their clutches and/or severely injure the operator if the clutch of the machine does not work efficiently. Jamming can also be hazardous if the machine is too powerful for the operator to hold when the tool has jammed. Repeated jamming can lead to wear on the tubular support body, and/or deformation of the tubular support body due to overheating. Side wear and abrasion are also caused by repeated jamming.

[0008] It is generally accepted that the side clearance is relatively large to minimise the likelihood of jamming.

[0009] Due to the high stresses involved in the cutting of certain materials, wear on the cutting elements is commonplace. As a result of such wear the size of the side clearance of the core-cutting tool can be reduced, thus leading to the problems discussed above.

Summary of the Invention

[0010] Accordingly, the invention provides a core-cutting tool comprising: a tubular support body having connection means for connection to drive means and, arranged on one end thereof, an annulus of cutting elements; characterised in that the inner and/or outer surface of the tubular support body comprises at least one abrasive element, positioned between the connection means and the annulus of cutting elements, which does not extend radially beyond the cutting extent of the annulus.

[0011] It will be understood from the invention that when jamming occurs, the arrangement of at least one abrasive element on the support body will permit the core-cutting tool to cut itself free and thereby minimise the safety hazards discussed above. The reduction in jamming will also reduce the wear and deformation caused to the core-cutting tool.

[0012] It may be of advantage for the support body to comprise a plurality of abrasive elements on the inner and/or outer surface of the tubular support body.

[0013] Preferably, the abrasive elements will be attached to the support body by welding, soldering, gluing or the like. It will be appreciated from the invention that alternative fixing methods may be used, such as screw attachment.

[0014] In the preferred embodiment, the abrasive elements comprise further cutting elements.

[0015] Preferably, both the cutting elements and the further cutting elements may be those suitable for cutting stone and masonry, such as diamond matrix or silicon carbide. However, it will be appreciated from the invention that when alternative cutting elements are used, such as those used in wood cutting, that the abrasive element(s) may comprise a simple roughened surface like sand paper or a metal file.

Brief Description of the Drawings

[0016] In the drawings which illustrate both the prior art and the preferred embodiments of the invention:

Figure 1 shows a diagrammatic representation of the side view of a generic core-cutting tool from the state of the art;

Figure 2 shows a diagrammatic representation of the bottom plan view of the tool shown in Figure 1:

Figure 3 shows an elevational side view of a first preferred embodiment of the invention;

Figure 4 shows a bottom plan view of the embodi-

ment of Figure 3;
Figure 5 shows an elevational side view of an second preferred embodiment of the invention;
Figure 6 shows a bottom plan view of the embodiment of Figure 5;
Figure 7 shows an elevational side view of an alternative preferred embodiment of the invention;
Figure 8 shows a bottom plan view of the embodiment of Figure 7;
Figure 9 shows an elevational side view of a further alternative preferred embodiment of the invention.

Detailed Description of the Illustrated Embodiments

[0017] Figure 3 shows a core-cutting tool with a first set of cutting elements 2 arranged on one end of the tubular support body 3. It will be appreciated from the invention that the type of cutting element used depends upon the material being tooled. At the opposite end of the tubular support body 3 is arranged connection means 4 to permit the tool to be connected to a drive source, such as a power drill or the like.

[0018] A second set of cutting elements 5 are arranged radially around the sidewalls of the tubular support body 3. The side cutting elements can be attached in many ways, such as welding, soldering and gluing. Other methods of attachment include electroplating and even screw fixing. It is also appreciated that, alternatively, the sidewalls themselves may be adapted to provide the abrasive element(s) in a manner similar to a metal file, for example having rasps.

[0019] It is understood that the second set of cutting elements could be made from a similar material as the first set of cutting elements, although this does not have to be the case.

[0020] Both sets of cutting elements exert a cutting force, the first set cuts into the work piece and the second set prevents snagging of the tubular support body 3 within the work piece by cutting itself free of any obstacles that could cause snagging.

[0021] The second set of cutting elements 5 comprise a collection of elements with triangular shaped plans, arranged in rows around the circumference of the tubular support body 3. However, it is appreciated that different shaped cutting elements such as those with rectangular plans and circular plans, may be used.

[0022] It is also appreciated that alternative arrangements of the elements may be of benefit. One alternative arrangement would be to arrange adjacent rows of elements so that elements in one row are next to the spaces between the elements in an adjacent row.

[0023] Possible benefits could be gained by using an arrangement comprising a combination of cutting elements of different shapes.

[0024] From Figure 4 it can better be understood how the second set of cutting elements 5, extend radially from the tubular support body 3. It can also be appreciated that the second set of cutting elements 5 do not extend beyond the first set of cutting elements 2. Although the second set of cutting elements 5 only extend outwards in the figure, it is appreciated that they may extend radially inwards instead. It is also appreciated that a combination of cutting elements extending radially, both outwards and inwards, may have further advantages.

[0025] Figure 5 shows a second preferred embodiment of the invention. In this embodiment the tubular support body 3 has a slit 6 in a sidewall thereof. It is understood in the art that such slits are beneficial as they provide, amongst other things, ventilation to the core-cutting tool thus minimising heat build up, which can lead to tool deformation. It will be appreciated that slits of different dimensions will have equal merit.

[0026] In Figure 5 a second set of cutting elements 7 are arranged on the leading edge of the slit 6, so that as the tool rotates the cutting elements 7 exert a cutting force on any obstacles that may cause snagging or jamming. The cutting elements 7 also protect the slit 6 from wear caused by said obstacles and because the slit 6 can be a area of weakness in the tool this protection is beneficial.

[0027] It will be understood that different arrangements of cutting elements can make up the second set of cutting elements 7. Due to the improved protection afforded to the slit 6, it may be possible for a core-cutting tool to have more than one slit, thus providing the associated benefits without greatly impairing the structural integrity of the tool.

[0028] Figure 6 shows the positioning of the second set of cutting elements 7 within the slit 6.

[0029] Figure 7 shows an alternative embodiment of the invention, wherein the layer of abrasive material 8 is attached to the outer wall of the tubular supports structure 3. The abrasive material would preferably be glued to the supports structure, but it is appreciated that alternative fixing methods would be equally viable. It is appreciated that the type of abrasive material used depends on the type of material being worked by the tool.

[0030] Typically a coating of diamond matrix or silicon carbide would be used with masonry or stone. Whereas with timber, a less resilient abrasive material, such as sandpaper, glasspaper or the like, could be used.

[0031] In Figure 8 it can be seen that in this preferred embodiment, a coating of abrasive material 8 is attached to both the inner and outer surfaces of the tubular support structure sidewall. Alternatively, a coating of abrasive material 8 may be present on only one of the surfaces of the support structure sidewall.

[0032] Whereas in the embodiment shown in Figures 7 and 8 the entire surface of the support structure sidewall may be covered in abrasive material, it is appreciated that only selected areas may be covered in an abrasive material. Figure 9 shows an embodiment where abrasive material only covers a section 9 of the sidewall. Any number of different shaped sections 9 could be used as is required.

Claims

1. A core-cutting tool comprising:

a tubular support body having connection means for connection to drive means and, arranged on one end thereof, an annulus of cutting elements;

characterised in that the inner and/or outer surface of the tubular support body comprises at least one abrasive element, positioned between the connection means and the annulus of cutting elements, which does not extend radially beyond the cutting extent of the annulus.

2. A tool according to Claim 1, wherein the support body comprises a plurality of abrasive elements on the inner and/or outer surface of the tubular support body.

3. A tool according to Claims 1 or 2, wherein the abrasive elements comprise further cutting elements.

4. A tool according to Claim 3, wherein the cutting elements and the further cutting elements are of the type suitable for cutting stone and masonry.

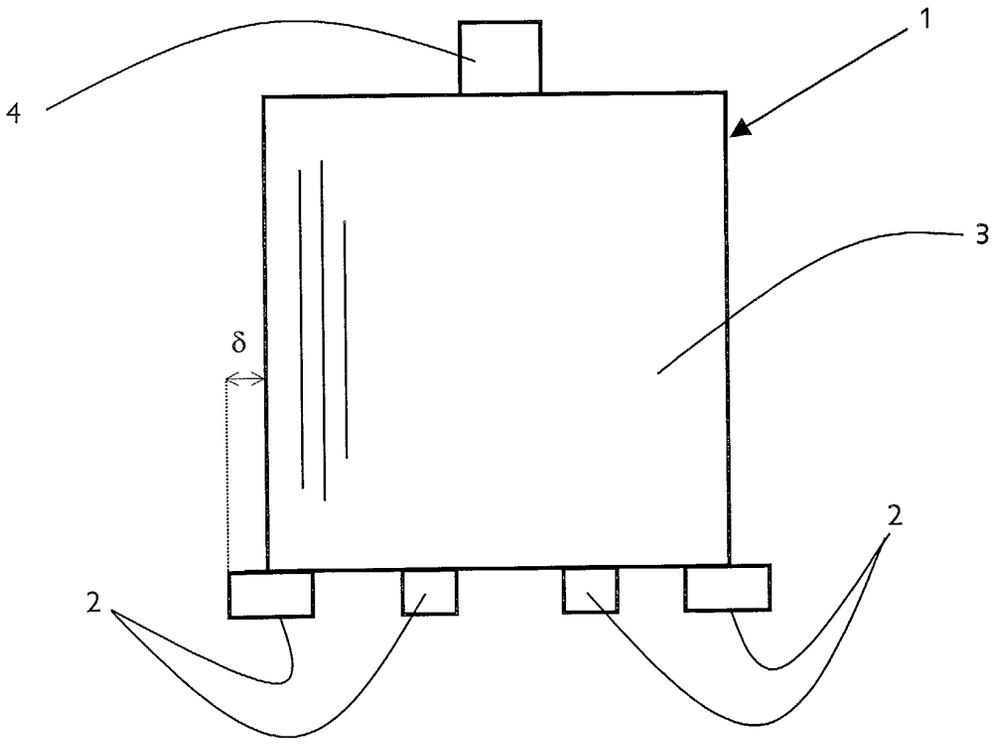

Fig. 1

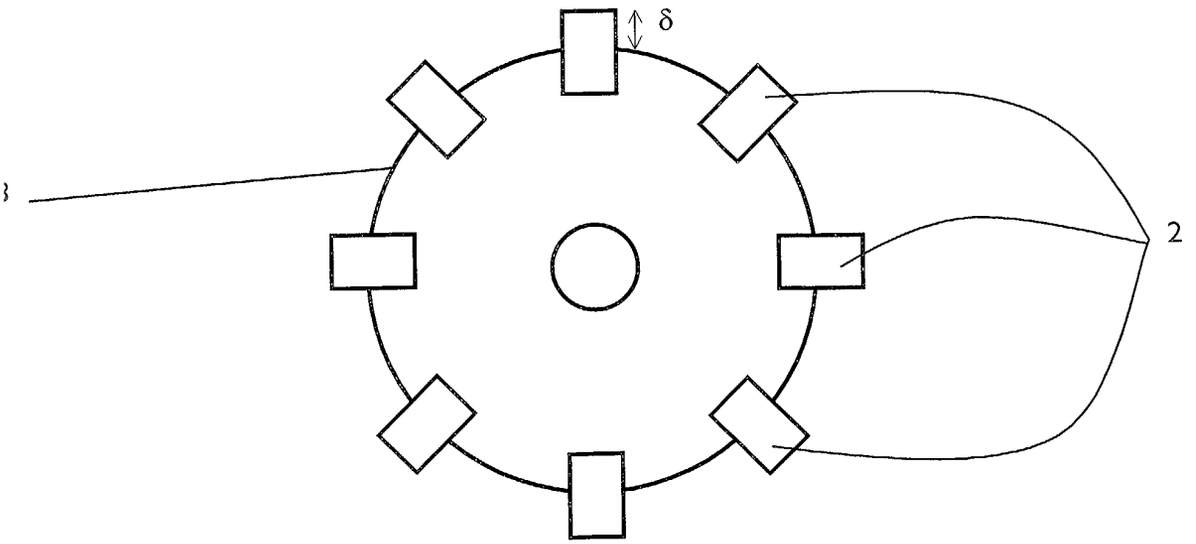

Fig. 2

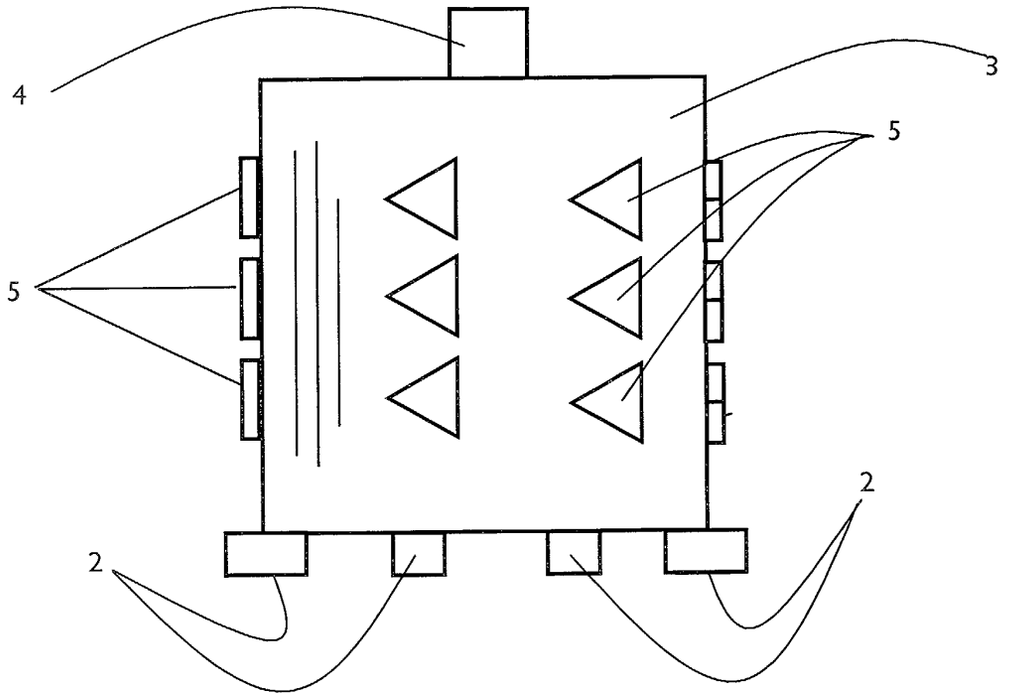

Fig. 3

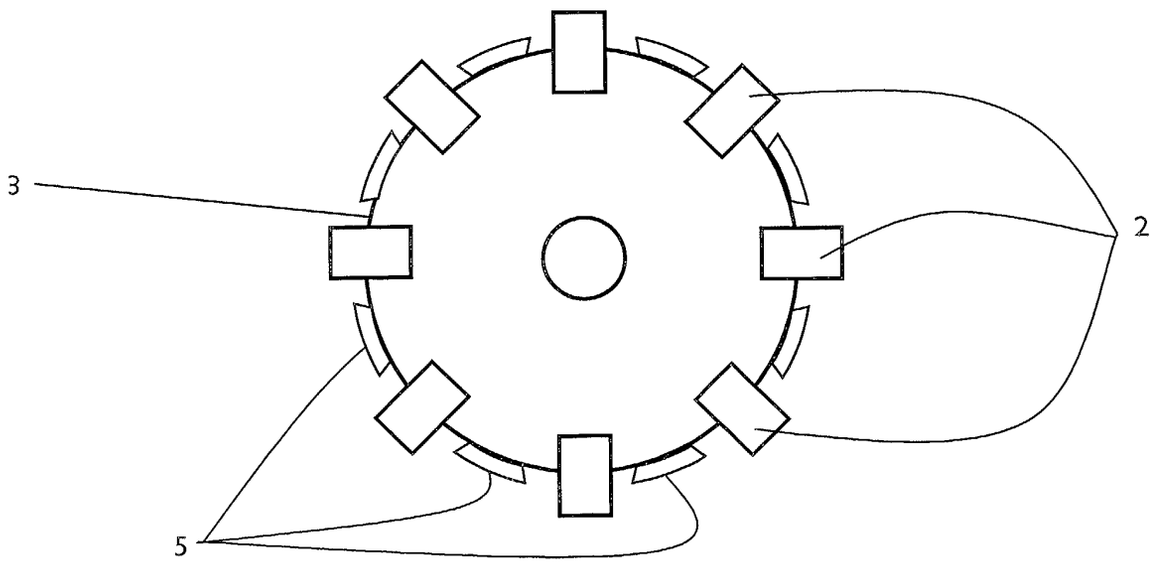

Fig. 4

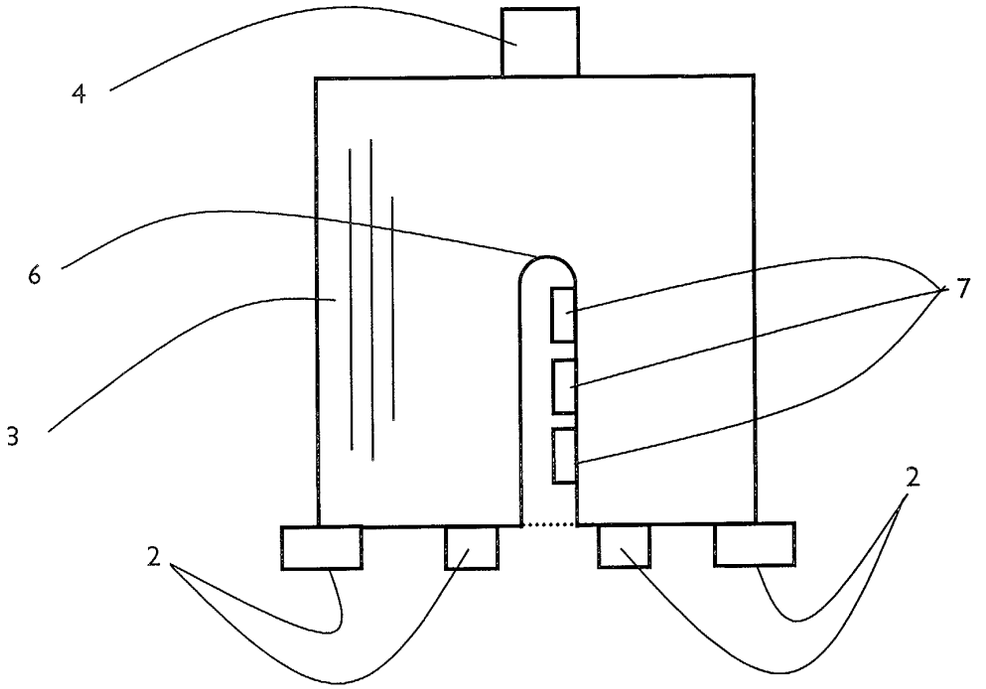

Fig. 5

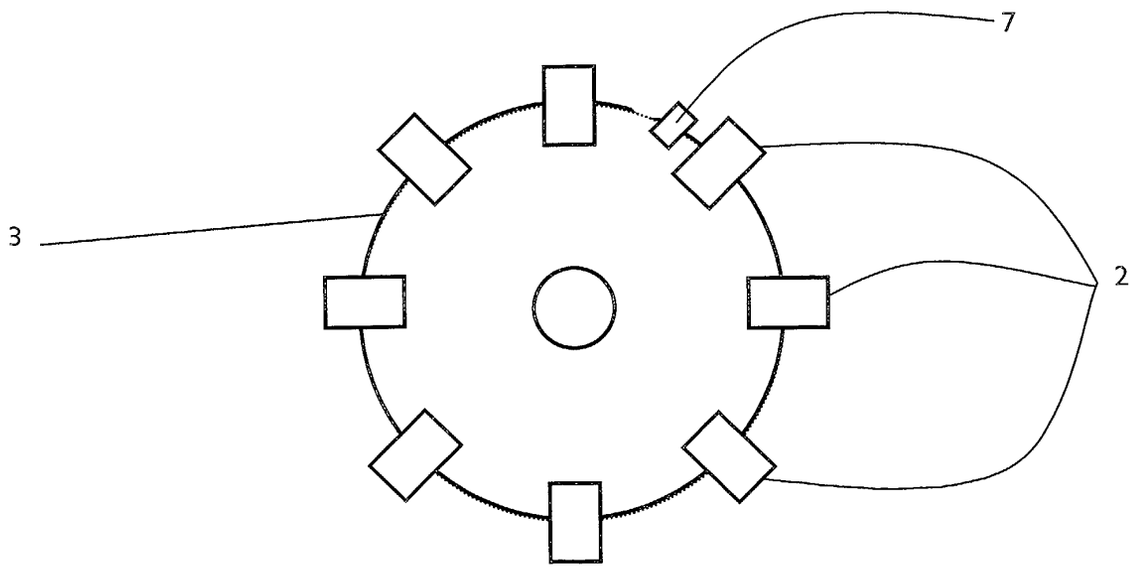

Fig. 6

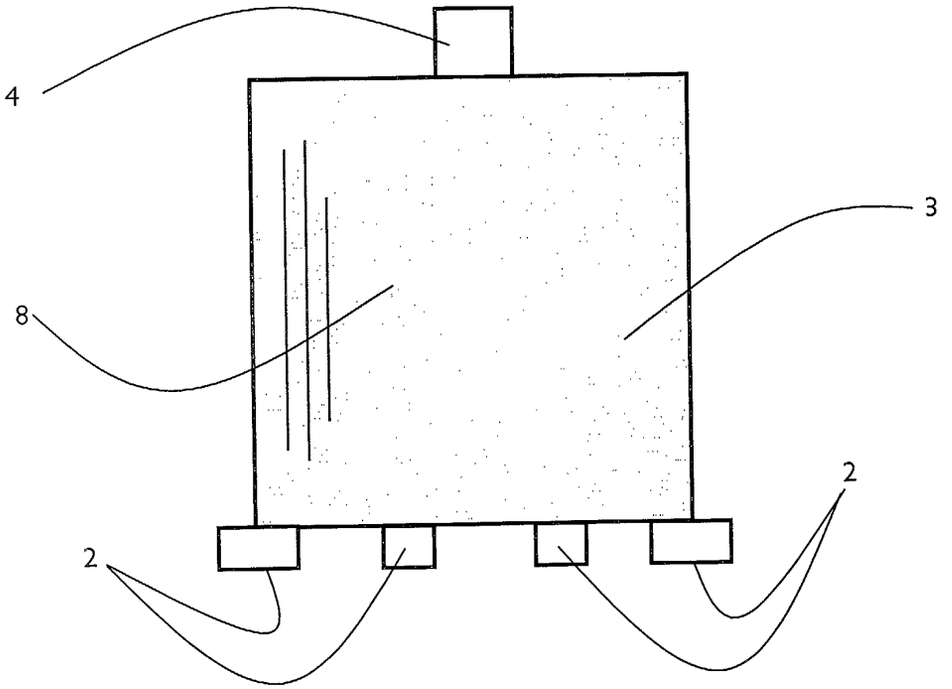

Fig. 7

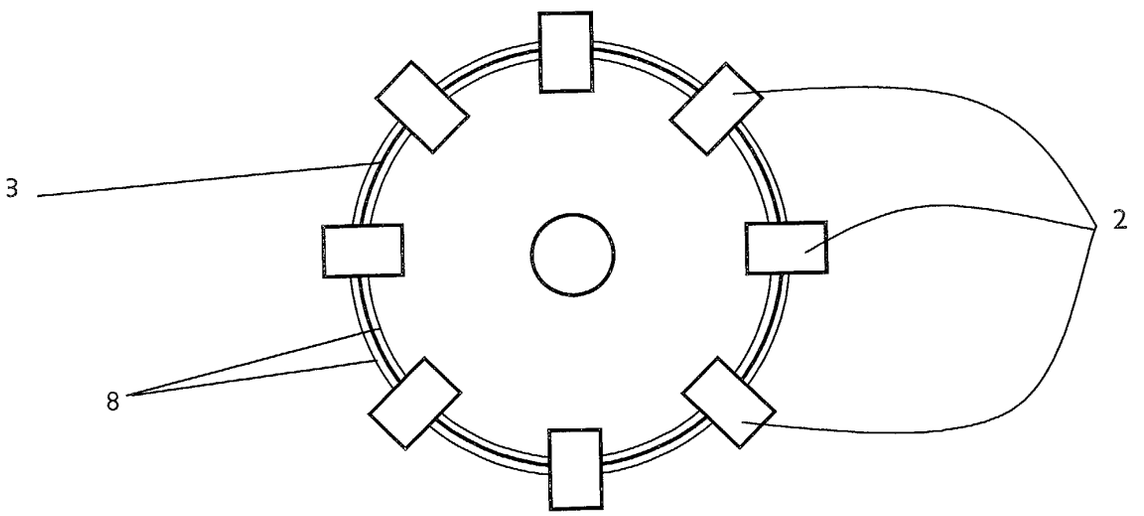

Fig. 8

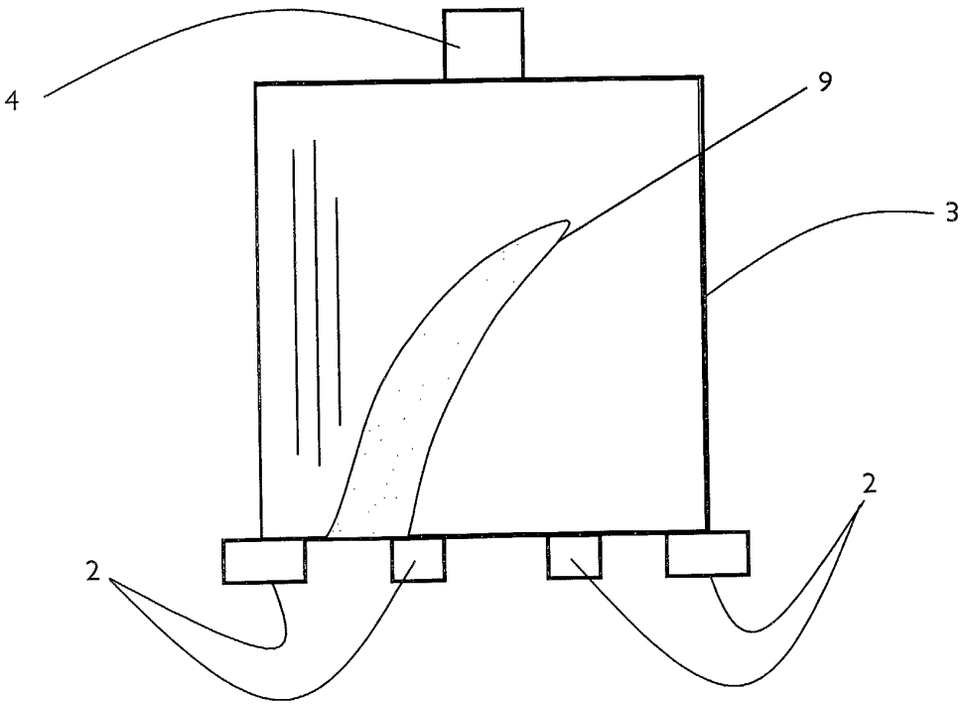

Fig. 9

European Patent Office

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Application Number
EP 01 30 8858

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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	11 March 2002	Rijks, M

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