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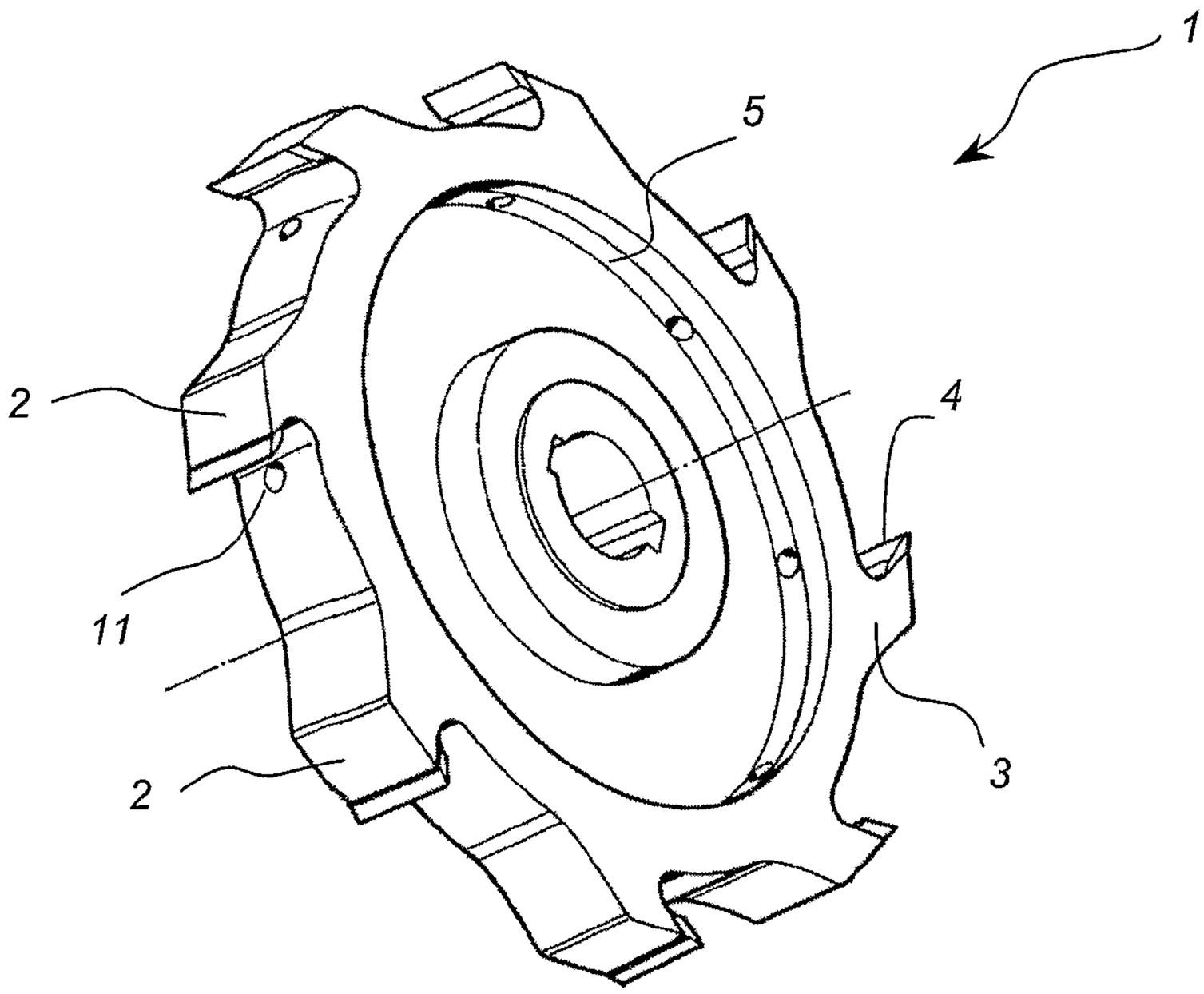

(57) Abrégé/Abstract:
The cutting tool shown generally as (1), has a disc with a peripheral cutting face. In this embodiment the cutting face includes an array of eight circumferentially spaced teeth (2). An open circumferential gutter (5) is located inboard of the teeth and is recessed into a lateral face of the disc. Fluid in the gutter drains into the passageways through the respective inlets under the apparent force due to rotation. A fluid passageway (9) runs between the gutter and the base of the each tooth. The fluid is thereby forced through the passageway and out of outlet (11).

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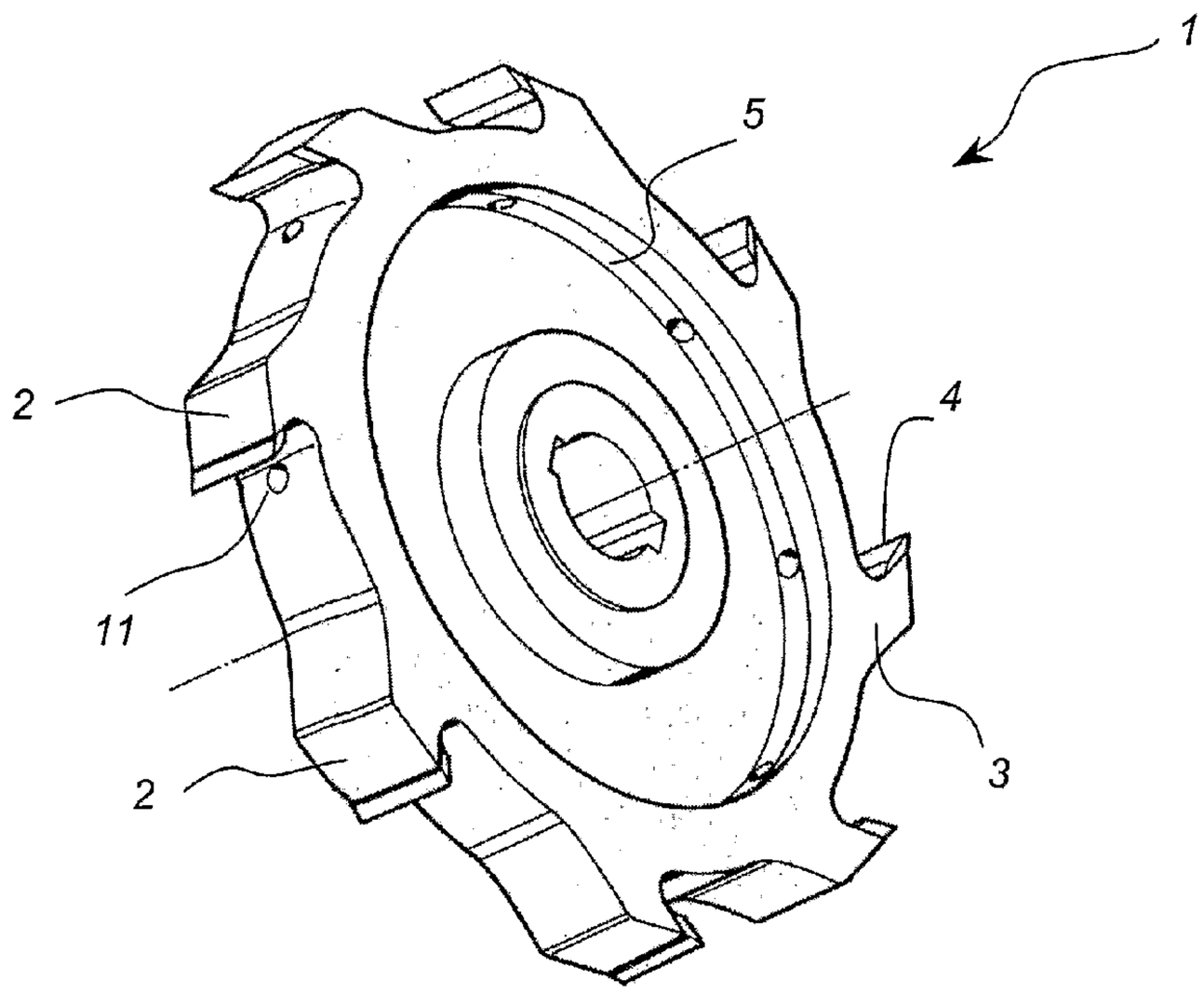
(54) Title: A CUTTING TOOL



(57) Abstract: The cutting tool shown generally as (1), has a disc with a peripheral cutting face. In this embodiment the cutting face includes an array of eight circumferentially spaced teeth (2). An open circumferential gutter (5) is located inboard of the teeth and is recessed into a lateral face of the disc. Fluid in the gutter drains into the passageways through the respective inlets under the apparent force due to rotation. A fluid passageway (9) runs between the gutter and the base of the each tooth. The fluid is thereby forced through the passageway and out of outlet (11).

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

A CUTTING TOOL

Field of the Invention

The present invention relates generally to cutting tools, and more particularly to rotating, fluid lubricated cutting tools.

Background of the Invention

The invention has been developed primarily for use in cutting fibre reinforced concrete (FRC) sheet and pipe with a rotating disc cutter, and will be described predominantly with reference to this application. It will be appreciated, however, that the invention is not limited to this particular field of use, being also applicable to other cutting applications and materials.

As with many building materials, FRC sheeting and piping is cut using a high speed rotating blade cutter. Spinning at high rpm, the disc has a number of peripheral teeth which steadily remove slices of material as the spinning disc is advanced along a cutting path.

One problem with this method is the high levels of friction and stress at the interface between the teeth and material being cut. The high friction causes very high temperatures and wear rates on the teeth. Consequently, the teeth need to be sharpened regularly; a process that adds cost, increases downtime and ultimately reduces tool life. One method of reducing wear of the tool is to make or coat the teeth with tungsten carbide, ceramic or polycrystalline diamond. While these methods do reduce the wear rate on the tool, the special materials are expensive at the outset and more difficult to overhaul.

Another problem associated with cutting with a high speed tool and in particular cutting FRC, is dust. Fine particles are generated during cutting and readily become airborne. As such they are easily breathed in by workers and may represent a health risk.

Another problem with cutting FRC is that the cellulose fibre in the brittle matrix can be difficult to cut. This is due to the fibre "fluffing up" and creating swarf.

One method used to overcome these problems is to apply a fluid to the material being cut. This reduces temperature, and friction and thus tooth wear, as well as keeping dust generation low. Such fluid application is commonly used when cutting metals concrete and stone however is not readily applied to FRC. This is because FRC will readily absorb any fluid and distort.

It is an object of the present invention to overcome or ameliorate one or more of these disadvantages of prior art, or at least to provide a useful alternative.

Disclosure of the Invention

In a first aspect, the invention provides a cutting tool including:

a disc having a peripheral cutting or grinding face;

a circumferential gutter formed in a lateral face of the disc inboard of the cutting face; and

a fluid passageway having an inlet in fluid communication with the gutter and an outlet at or adjacent the cutting face;

wherein said gutter and passageway are disposed such that during operation, fluid directed onto the lateral face is caused by rotation of the disc to migrate outwardly into the gutter, and then through the passageway to the outlet for lubrication at the cutting face.

Preferably, the tool includes a plurality of cutting teeth in a circumferentially spaced array on the periphery of the disc. Preferably, each tooth extends generally radially to a distal cutting edge. Preferably, each tooth includes an undercut section disposed inwardly of and immediately behind the corresponding edge.

Preferably, the disc includes a plurality of said passageways, the outlets of which direct the fluid to the undercut sections of respective teeth.

Brief Description of the Drawings

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Fig. 1 is a perspective view of a cutting tool in accordance with the invention;

Fig. 2 is front view of the apparatus shown in Fig. 1; and

Fig. 3 is a sectional side view of the apparatus shown in Fig. 2 taken along the section line III-III.

Preferred Embodiment of the Invention

Referring to the drawings, the cutting tool shown generally as 1, has a disc with a peripheral cutting face. In this embodiment the cutting face includes an array of eight circumferentially spaced teeth 2 for slicing through Fibre Reinforced Concrete (FRC). Each tooth has a wide base 3 at the periphery of the disc and terminates at cutting edge 4.

The term "cutting" is used herein to describe a number of operations to which the tool of the invention may be configured to perform. For instance the disc may be use to slice, route, plane, grind, buff or polish. Accordingly, the cutting face may include any number of teeth shaped to a specific task or grinding or polishing

surfaces, without departing from the scope of the invention. The invention might also be applied to a tool for performing any of the above operations to any number of base materials, for instance, metal, stone, ceramics, concrete, composites or timber.

An open circumferential gutter 5 is located inboard of the teeth and is recessed into a lateral face of the disc. Referring to Figure 3, in cross section, the gutter is defined by bottom 6, back wall 7 and a lip 8, formed integrally with the disc.

A fluid passageway 9 runs between the gutter and the base of the each tooth. Each passageway has an inlet 10 in the gutter bottom and an outlet 11 at or adjacent the base 3 in an undercut section of the respective tooth. In this embodiment each passageway 9 is disposed to run substantially radially from its inlet in the gutter 5 to the outlet 11 at the base of the respective tooth 2. In alternative embodiments the outlet may be located at any position in the periphery of the tool, to optimise efficiency and/or performance in terms of cooling, lubrication and/or finishing as appropriate. In addition, the tool may be configured so that more than 1 passageway is provided per tooth to provide a more even distribution of fluid.

In operation, the tool is attached by means of a central drive aperture 12 to a drive shaft. Commonly, the drive shaft is powered by an electric motor for supplying rotational drive. Once the disc has reached operational speed, cutting may be initiated. At this time a cutting fluid is introduced to the gutter. The fluid may be applied directly into the gutter by one or more fluid supply lines (not shown) or it may be directed onto the lateral face of the disc inboard of the gutter. Either way, since the disc is spinning, it acts as a centrifuge causing the fluid to be distributed substantially evenly around the gutter. In the case where the fluid is directed onto the lateral face, cohesion between the lateral face and the fluid causes the fluid to adhere to the disc before moving into the gutter by the apparent outward force of rotation. The fluid in

the gutter is contained by the back wall, gutter lip and outward force due to the rotation. In this way, the disc may be used at virtually any orientation.

Fluid in the gutter drains into the passageways through the respective inlets under the apparent force due to rotation. The fluid is thereby forced through the passageway and out of the outlet. In the present embodiment, the passageway and outlet are configured to act as a nozzle directing fluid onto the cutting edge. The undercut section of each tooth also acts to direct the fluid onto the cutting edge. In this way cutting fluid is directed to the medium being cut right at the point of separation as material is removed.

As such the cutting fluid is directed to where it is needed most, thereby limiting the contact between the cutting fluid and base product. In addition, because the fluid is applied to the product on the removal side most of the product material which does contact with cutting fluid is being removed from the base product. This is particularly advantageous in the case of FRC, which readily absorbs fluid and may cause damage.

It will be appreciated that the invention provides a cutting tool. The invention enables the materials of cartridges to be recycled quickly, in a cost effective manner. Moreover, particulate concentration in the surrounding air is vastly reduced, eliminating the potential hazards of dust inhalation by workers and the risk of explosion. In all these respects, the invention represents practical and commercially significant improvement over the prior art.

Although the invention has been described with reference to specific examples it will be appreciated by those skilled in the art that the invention may be embodied in many other forms.

CLAIMS

1. A cutting tool including:

a disc having a peripheral cutting or grinding face;

a circumferential gutter formed in a lateral face of the disc inboard of the cutting face; and

a fluid passageway having an inlet in fluid communication with the gutter and an outlet at or adjacent the cutting face;

wherein said gutter and passageway are disposed such that during operation, fluid directed onto the lateral face is caused by rotation of the disc to migrate outwardly into the gutter, and then through the passageway to the outlet for lubrication at the cutting face.

2. A cutting tool according to claim 1 wherein said cutting face includes at least one cutting tooth disposed on the cutting face.

3. A cutting tool according to claim 2 wherein said tooth extends generally radially to a distal cutting edge.

4. A cutting tool according to claim 3 wherein said gutter and passageway are disposed such that during operation, fluid in the gutter is caused by rotation of the disc to move into the passageway and onto the tooth adjacent the cutting edge.

5. A cutting tool according to claim 3 wherein said gutter and passageway are disposed such that during operation, fluid in the gutter is caused by rotation of the disc to move into the passageway and onto the tooth at the cutting edge.

6. A cutting tool according to any one of claims 2 to 5 wherein the tool includes a plurality of cutting teeth in a circumferentially spaced array on the cutting face.

7. A cutting tool according to claim 6 wherein each tooth includes an undercut section disposed inwardly of and immediately behind the corresponding edge.

8. A cutting tool according to claim 7 wherein the disc includes a plurality of said passageways, the outlets of which direct the fluid to the undercut sections of respective teeth.

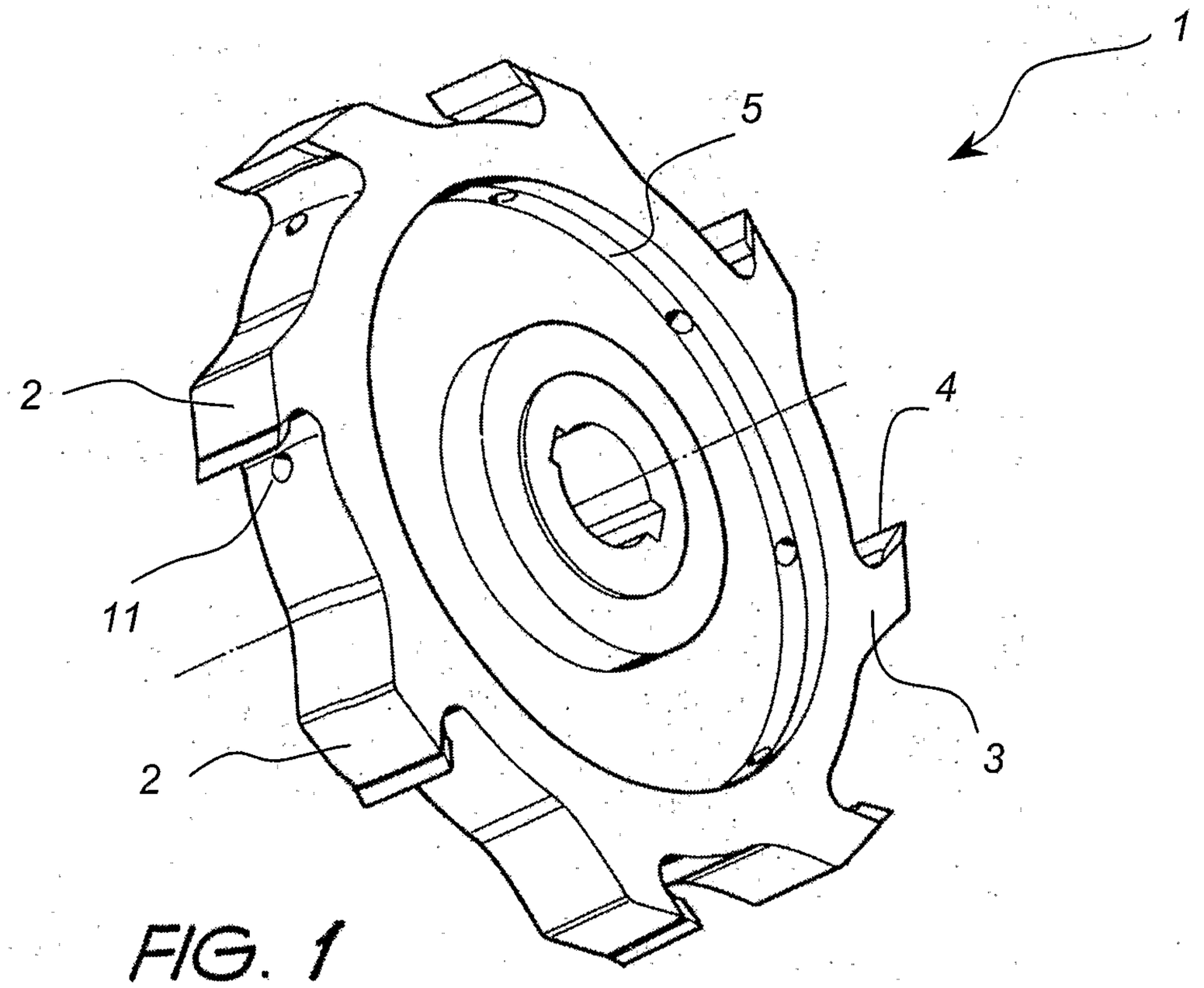


FIG. 1

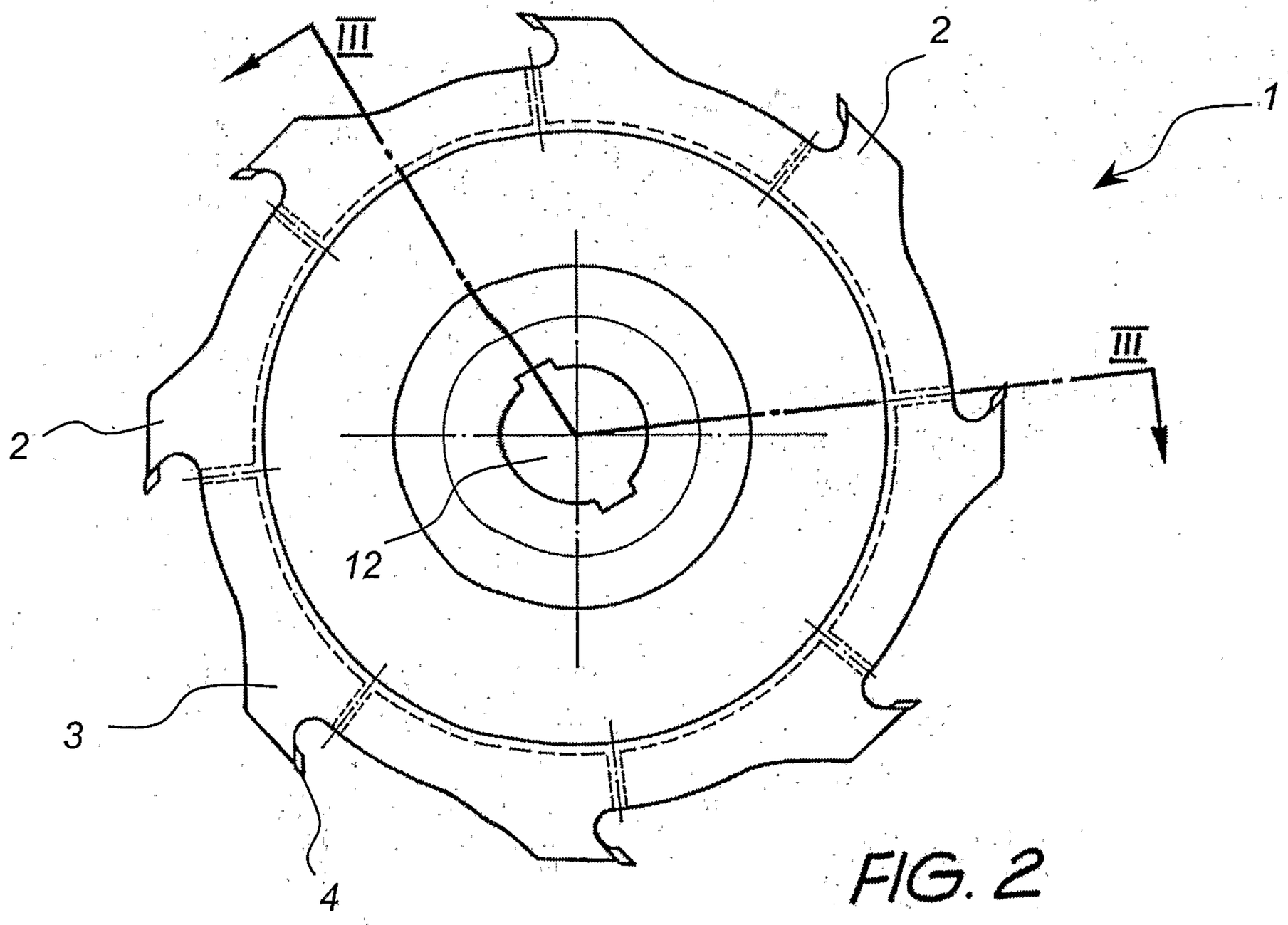


FIG. 2

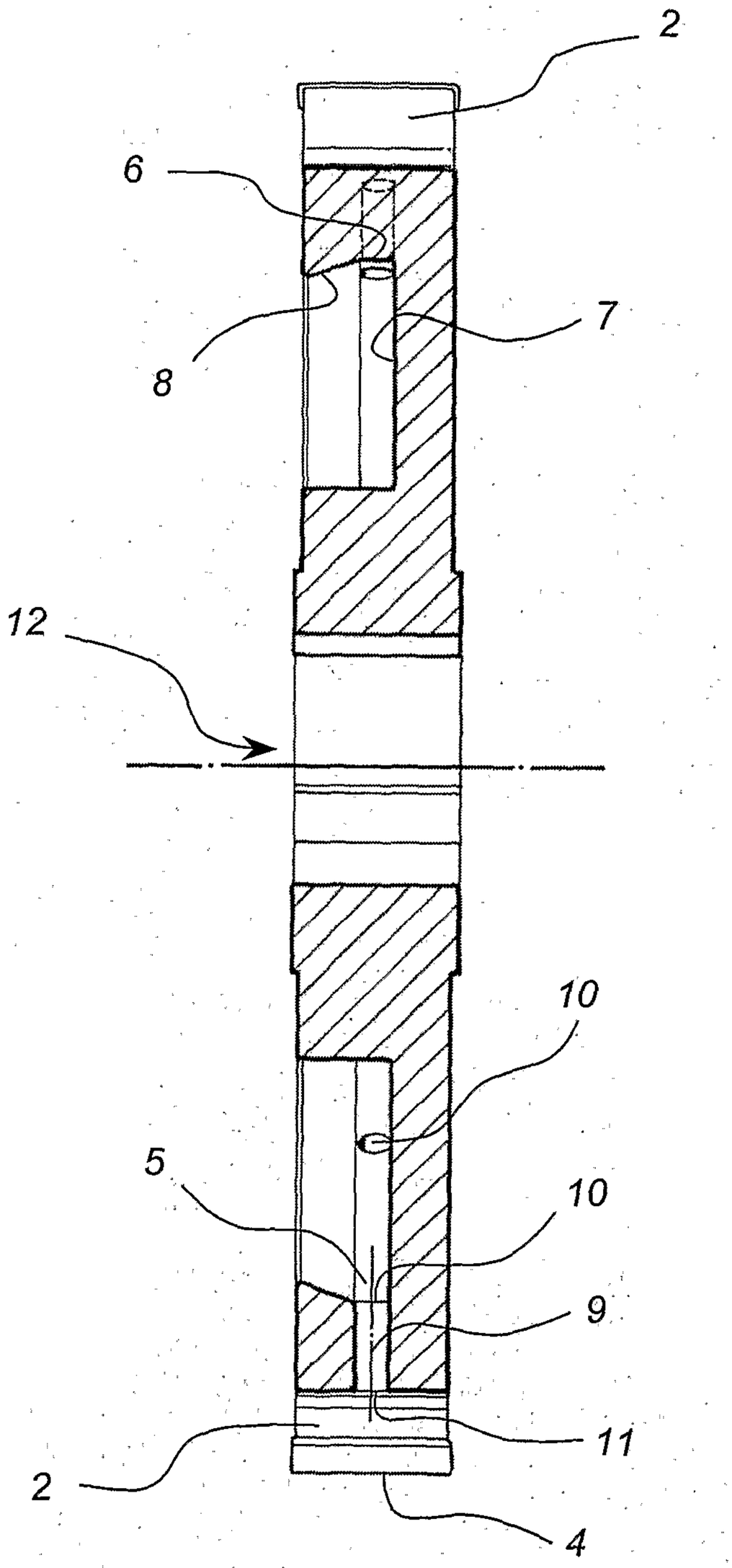
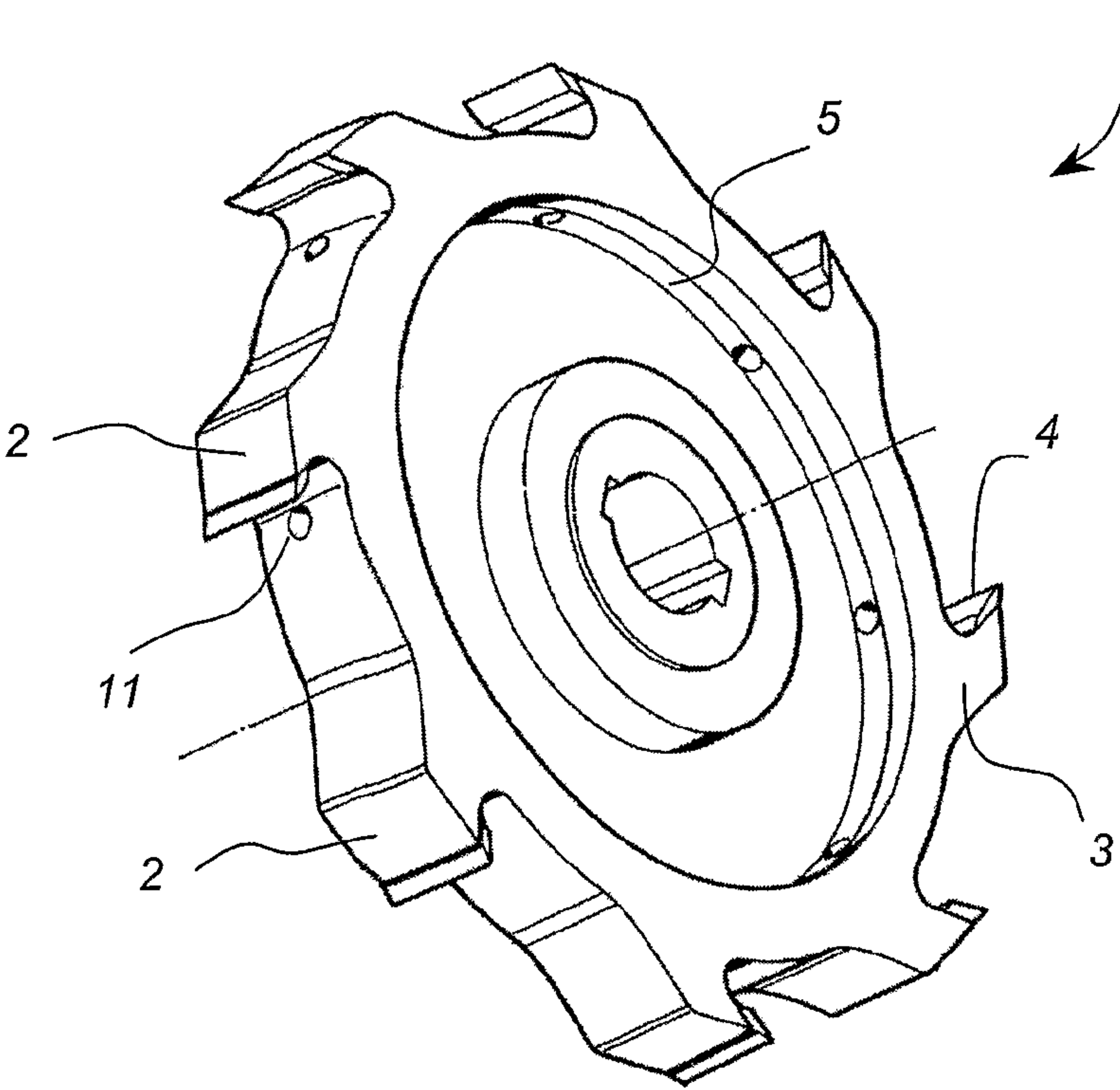


FIG. 3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