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(54) **Grinder head, particularly for polishing marble, granite and stone materials in general**

Schleifkopf, insbesondere zum Schleifen von Marmor, Granit und Gestein im allgemeinen

Tête de meulage, en particulier pour le polissage du marbre, granit et matériau pierreux en général

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(74) Representative: **Forattini, Amelia et al**
I-20121 Milano (IT)

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(56) References cited:
DE-A- 2 015 385 **DE-A- 3 924 772**

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- **PATENT ABSTRACTS OF JAPAN vol. 6, no. 224 (M-170)(1102) 9 November 1982 & JP-A-57 127 657 (YAMANA SEISAKUSHO K.K.) 7 August 1982**
- **PATENT ABSTRACTS OF JAPAN vol. 7, no. 37 (M-193)(1182) 15 February 1983 & JP-A-57 189 761 (GIFU SEISAKUSHO K.K.) 22 November 1982**

(73) Proprietor: **SIMEC S.P.A.**
I-31030 Castello di Godego (Treviso) (IT)

(72) Inventor: **Ampelio, Stangherlin**
31030 Castello di Godego (Treviso) (IT)

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Description

The present invention relates to a grinder head, particularly for polishing marble, granite and stone materials in general.

It is known that a grinder tool has to be used in the most uniform possible manner for the best polishing and for the longest life of the tool itself.

Grinder machines for polishing marble are therefore provided with a grinder head having a plurality of radial grinder tools. The grinder head rotates about a vertical axis while the grinder tools are oscillating about their horizontal axis. Each grinder tool generally has a curved working surface and therefore the tool working surface is substantially reduced to a constantly changing line.

Grinder heads of this type have a very expensive construction due to the complicated lever mechanisms required for rotating the head and at the same time oscillating the grinder tools on the head.

From Patent Abstracts of Japan & JP-A-57-127 657 a grinder head is known having all the features defined in the preamble of claim 1. In this prior grinder head no connection means is provided between the shafts and the clearances between the cam and followers cause non uniform movement and consumption of the tools.

The aim of the present invention is to provide a rotating grinder head overcoming the above mentioned disadvantages and wherein the grinder tools are oscillating by means of far simpler and reliable mechanisms than those of the prior art.

The above aim, as well as other objects that will be more apparent later, are achieved by a grinder head, particularly for polishing marble, granite and stone materials in general, having all the features defined in the attached claim 1.

Further characteristics and advantages of the invention will be more apparent by the following description of an embodiment of the invention, illustrated, by way of example in the enclosed drawings in which

FIG. 1 is a top section view of a grinder head according to the invention;

FIG. 2 is a detail front view of a gear member according to the invention;

FIG. 3 is a detail top view of the gear member of FIG. 2.

FIG. 4 is a side section view of a grinder head according to a further aspect of the invention;

FIG. 5 is a perspective partially cutout view of the grinder head of FIG. 4;

FIG. 6 is a schematic detail front view of a grinder tool of the grinder head of FIGS. 5, 6;

FIG. 7 is a diagram of the guide profiles of the tools.

FIG. 8 is a schematic isometric view of the grinder tool;

FIG. 9 is a side view of the tool schematically showing the various working positions.

With reference to FIGS. 1-3, the grinder head, according to the invention, generally designated by the reference numeral 1, comprises a plurality of grinder tools 3 arranged radially on a case 5. Each grinder tool 3 has a shaft 7 having a gearwheel 9.

Each gearwheel 9 is connected to two adjacent gearwheels of adjacent shafts so that all the shafts 7 oscillate together. At least one arm 11 is connected to one of shafts 7 and supports at least one wheel 13. Wheel 13 rolls along the undulated profile of a cam 15, which rotates in the same direction of the case 5 although at a different speed.

FIGS. 2 and 3 show one of gearwheels 9 in greater detail.

The different rotation speed of the cam 15, with respect to the case 5, causes the oscillation of the arm 11, rigidly associated with the shaft 7, and thus the partial and alternating rotation of the shaft itself.

The grinding member is caused to oscillate because it is rigidly associated with the shaft, which is in turn connected to the wheel 13 which follows the shape of the cam.

The grinder tools oscillate with an undulatory motion, each one in the direction opposite to the adjacent grinder tools.

The oscillation of the grinder tools makes the grinding member to work with a cutting line which changes continuously, thus making it wear uniformly so as to obtain better polishing and excellent efficiency of said tool.

FIGS. 4-7 show a grinder head 101 according to a further aspect of the invention, wherein a plate 120 is rigidly associated with the mandrel of the grinder machine.

A bearing 102 is arranged between the central shaft 104, which rotates, and the upper part 106 of the case, which is fixed to the machine.

The secondary shafts 103 are fixed on the upper part 106 of the case and constitute the shafts of gearwheels 105; the gearwheels 105 are actuated by the gearwheel 107 which is rigidly associated with the mandrel.

Therefore, the gearwheel 107, by means of the gearwheels 105, transmits motion to the gearwheel 108 as well.

There is a slight difference in the number of teeth between the gearwheels 107 and 108 which makes the gearwheel 108 to have a slightly different speed with respect to the main shaft; therefore the cam 111 with the profile 111a, which is connected to the gearwheel 108, rotates at a different speed with respect to the movable lower part 112 of the case.

The movable case 112 is connected to the lower slotted part of the main shaft by means of two concentric metallic rings 113 and 114 which are joined by a layer of rubber 115 and define an elastic rubber coupling.

Alternatively, the planetary gearwheels 105 are divided into two parts having a different number of teeth.

Figure 5 is a cutout view of the grinder head showing the lower case 112 which supports the grinding wheels 119. The undulatory motion of the slotted shafts 118 is transmitted to the grinder tools, and the slotted shafts are provided with two arms 117 which have, at their ends, wheels 116 which follow the profile 111a of the cam 111.

Figure 6 is a detail view of a grinder tool 119 which oscillates about the axis of the slotted shaft 118. The slotted shaft 118 has two arms 117 at whose ends two wheels 116 are arranged and follow the profile 111a of the cam 111.

As seen above, the slotted shafts are parallel to the working plane and are provided with two arms, at each end of which there is a wheel which is adapted to follow the profile of the internal cam.

Rotary motion is transmitted to all the elements of the machine by the central shaft which is connected to the motor of the polishing machine and by adapted gearwheels.

The shaft transmits its motion directly to the lower case which supports the grinding wheels and, by means of gearwheels, to the internal cam as well.

The gearwheels rotate the cam with a speed which is different from the rotation speed of the shaft, because there is a small difference in the number of their teeth. The oscillation is produced by the profile of the cam, which forces a continuous lowering of an arm, causing the rise of the opposite arm.

This leads to a partial and alternating rotation of the slotted shaft, which transmits the oscillating motion to the grinding wheels.

In its lower part, the central shaft meshes with a ring which is joined to a second outermost ring by means of the rubber coupling.

The rubber coupling, in addition to transmitting motion, has three other functions: damping start up; compensating slight differences in the level of the working surface; absorbing vibrations during operation.

This coupling avoids the presence of any metallic connection between the motor shaft and the movable part.

A ring is screwed on the lower end of the motor shaft, which is threaded, and supports all the movable parts of the head.

FIGS 7-9 show a detail of the grinder tool of the grinder head according to the invention.

Two or more guides with converging sides, suitable for supporting the tools, are defined on the tool holder, which is fixed to the arms of the rotating head.

Said converging guides are arranged on different planes and are defined by sectional portions of the same cone; therefore they are arranged above one another and are shifted with respect to one another so that if their

converging sides are ideally extended the meeting points do not coincide on a horizontal plane but are slightly offset. The abrasive-carrying tool which is inserted on these guides is also obtained from the same cone, and therefore can be inserted in any guide, arranging itself at different distances from the rotation axis.

The tool is provided with an elongated central body with overlying protrusions which allows its insertion up to the innermost guide.

The length of the tool is chosen so as to ensure perfect coupling in any position.

The abrasive-carrying tool can thus be arranged in various positions and thus at various distances from the rotation axis of the head, defining, on the working surface, different annuli which are larger or smaller than the crown defined by the normal coupling. It is thus possible to perform, with the same tool, machining with different diameters depending on the guide in which said tool has been inserted.

The working diameter is chosen according to the type, hardness and size of the material to be machined.

With this type of coupling it is easy to vary the diameter of the working crown simply by moving the tool from one guide to the other.

The tool coupling for oscillating and non-oscillating rotating heads for machining ceramic, glassy and stone-like materials is provided with a plurality of guides in which the tool is inserted; said guides are mutually superimposed and shifted forward or backward with respect to one another so that the tool is inserted in a different position with respect to the center of rotation of the head.

Figure 7 shows the three cones 201, 202 and 203 which are mutually offset and at different levels; the three guides 204, 205 and 206 are obtained from their profiles and are arranged at different levels on the same tool holder 207.

Figure 8 is a view of the grinder tool 208, which is composed of an abrasive part 209 and of an upper abrasive-carrying part 210 which is suitable for being inserted on the holder 207 which is fixed to the arm 212 of the rotating head (indicated in broken lines). The upper part 210 is provided with a central body and with two protrusions 211 which are suitable for being inserted in the guides 204, 205 and 206.

Figure 9 shows the various positions in which the tool 208 can work by inserting it in the various guides 204, 205 and 206; in the first position, the tool 208 is arranged on the innermost guide 204 and defines the smallest crown 213; in the second position, the tool 208 is inserted on the intermediate guide 205 and the crown 214 defined by the tool is the intermediate one; in the third position, the tool 208 is arranged on the lowermost guide 206 and defines the largest crown 215.

The materials employed, as well as the dimensions, may be any according to the specific needs and the state of the art.

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 scope of each element identified by way of example by such reference signs.

Claims

1. Grinder head, particularly for polishing marble, granite and stone material in general, comprising a rotatable case (5) for being coupled to a vertical spindle of a grinding machine and carrying a plurality of radial grinder tools (3) each mounted on a shaft (7), at least one of said shafts being rigidly connected with at least an arm (11), said arm carrying a cam follower (13) cooperating with a cam member (15) for oscillating said shaft, characterized in that it comprises connection means adapted to connect each shaft with at least one adjacent shaft, said connection means comprising a gear member (9) having a central hub fitted to each shaft proximate to the inner end thereof and a pair of lateral projections extending from the diametrically opposed sides of said hub, each projection having at the outer end thereof a set of teeth so adapted to continuously mesh with a corresponding set of teeth belonging to an adjacent gear member, the connection being such that the cutting lines of the grinder tools change continuously thereby causing a uniform tool wear.
2. Grinder head according to claim 1, characterized in that the teeth of said toothed projections are conical.
3. Grinder head according to claim 1, characterized in that each shaft (118) has two symmetric arms (117) both provided with a follower (116) cooperating with said cam member (111).
4. Grinder head according to claim 1, characterized in that said case (5) is connected to said vertical spindle by means of an elastic coupling formed by two concentric metallic rings (113, 114) joined by a rubber layer (115).

Patentansprüche

1. Schleifkopf, insbesondere zum Schleifen von Marmor, Granit und Gestein im allgemeinen, mit einem drehbaren Gehäuse (5) zur Ankopplung an eine vertikale Spindel einer Schleifmaschine, das eine Vielzahl von radialen Schleifwerkzeugen (3) trägt, die jeweils auf einer Welle (7) befestigt sind, wobei wenigstens eine dieser Wellen starr mit wenigstens einem Arm (11) verbunden ist, der Arm einen Mitnehmer (13) trägt, der mit einer Steuerkurve (15) zusammenwirkt, um die Welle hin und her zu bewegen, dadurch gekennzeichnet, daß er Verbindungsmittel enthält, die geeignet sind, jede Welle mit wenigstens einer benachbarten Welle zu verbinden,

wobei diese Verbindungsmittel ein Getriebeglied (9) enthalten, das eine zentrale, auf jede Welle nahe ihrem inneren Ende aufgesetzte Nabe und ein Paar von seitlichen Vorsprüngen besitzt, die sich von diametral gegenüberliegenden Seiten der Nabe aus, erstrecken, wobei jeder Vorsprung an seinem äußeren Ende einen Satz von Zähnen besitzt, der so angepaßt ist, daß er kontinuierlich in einen entsprechenden Satz von Zähnen eingreift, der zu einem benachbarten Getriebeglied gehört, wobei die Verbindung dergestalt ist, daß die Schneidlinien der Schleifwerkzeuge sich kontinuierlich verändern und dadurch einen gleichmäßigen Werkzeugverschleiß bedingen.

2. Schleifkopf gemäß Anspruch 1, dadurch gekennzeichnet, daß die Zähne der mit Zähnen versehenen Vorsprünge konisch sind.
3. Schleifkopf gemäß Anspruch 1, dadurch gekennzeichnet, daß jede Welle (118) zwei symmetrische Arme (117) besitzt, wobei beide mit einem Mitnehmer (116) versehen sind, der mit der Steuerkurve (111) zusammenwirkt.
4. Schleifkopf gemäß Anspruch 1, dadurch gekennzeichnet, daß das Gehäuse (5) mit der vertikalen Spindel durch eine elastische Kupplung verbunden ist, die durch zwei konzentrische, durch eine Gummischicht (115) verbundene Metallringe (113, 114) gebildet ist.

Revendications

1. Tête de meulage, en particulier pour polir du marbre, du granite et d'une façon générale de la pierre, comprenant un boîtier rotatif (5) destiné à être accouplé à une broche verticale d'une machine à meuler et portant une pluralité d'outils radicaux de meulage (3) montés chacun sur un arbre (7), au moins desdits arbres étant rigidement reliés au moins à un bras (11), ledit bras portant un élément suiveur de came (13) qui coopère avec une came (15) pour faire osciller ledit arbre, caractérisée en ce qu'elle comprend des moyens de liaison prévus pour relier chaque arbre à au moins un arbre adjacent, lesdits moyens de liaison comprenant un élément de pignon (9) ayant un moyeu central monté sur chaque arbre à proximité de l'extrémité intérieure de ce dernier et une paire de parties latérales en saillie partant de positions diamétralement opposées dudit moyeu, chaque partie en saillie ayant à son extrémité extérieure un jeu de dents adaptées de manière à s'engrener en permanence avec un jeu correspond de dents appartenant à un élément de pignon adjacent, la liaison étant telle que les profils tranchants des outils de meulage varient en continu de manière à obtenir une usure uniforme des outils.

2. Tête de meulage selon la revendication 1, caractérisée en ce que les dents desdites parties dentées en saillie sont coniques.
3. Tête de meulage selon la revendication 1, caractérisée en ce que chaque arbre (118) comprend deux bras symétriques (117) tous deux dotés d'un suiveur (116) coopérant avec ledit élément de came (111). 5
4. Tête de meulage selon la revendication 1, caractérisée en ce que ledit boîtier (5) est relié à ladite broche verticale au moyen d'un accouplement élastique constitué par deux bagues métalliques concentriques (113, 114) reliées par une couche de caoutchouc (115). 10 15

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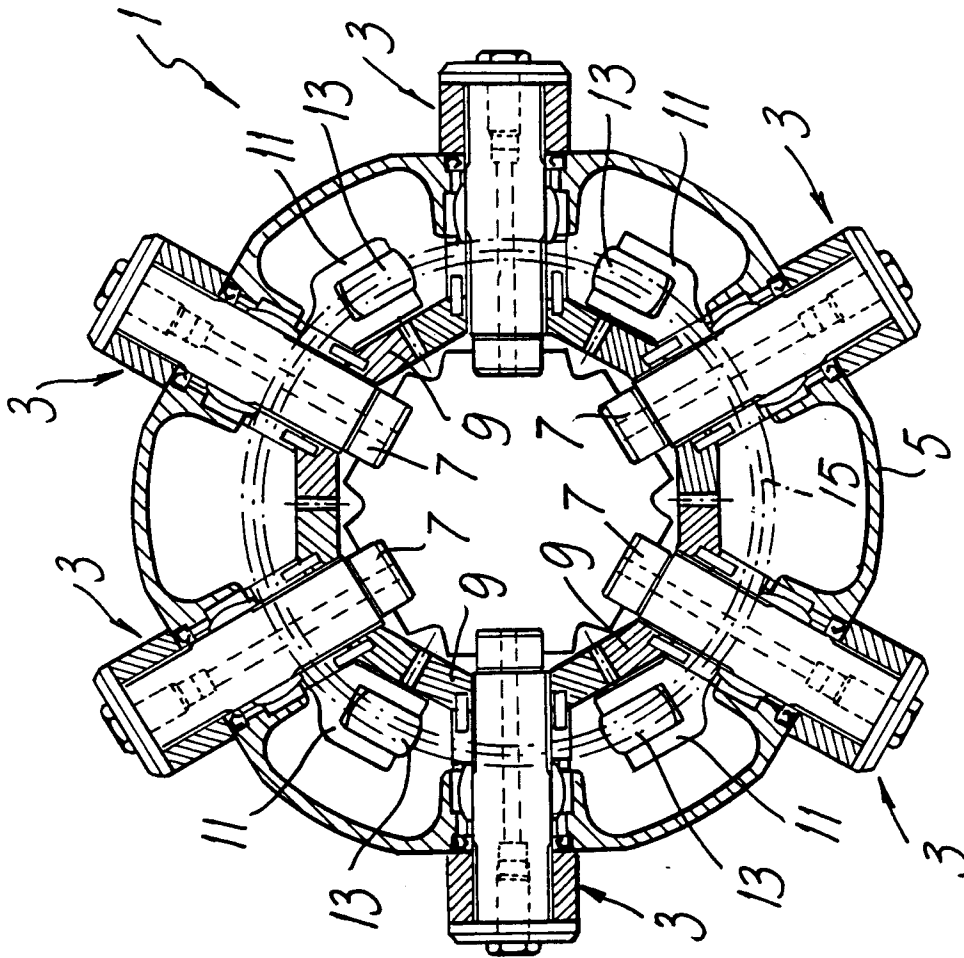


Fig. 1

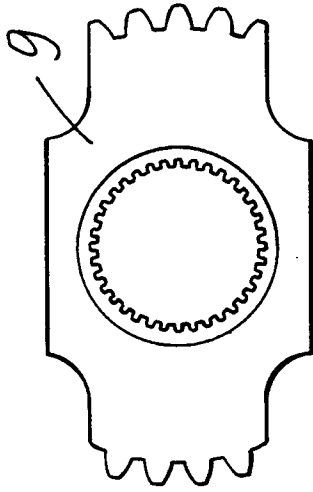


Fig. 2

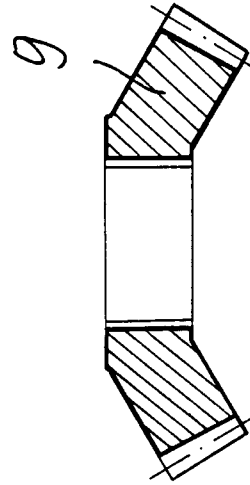


Fig. 3

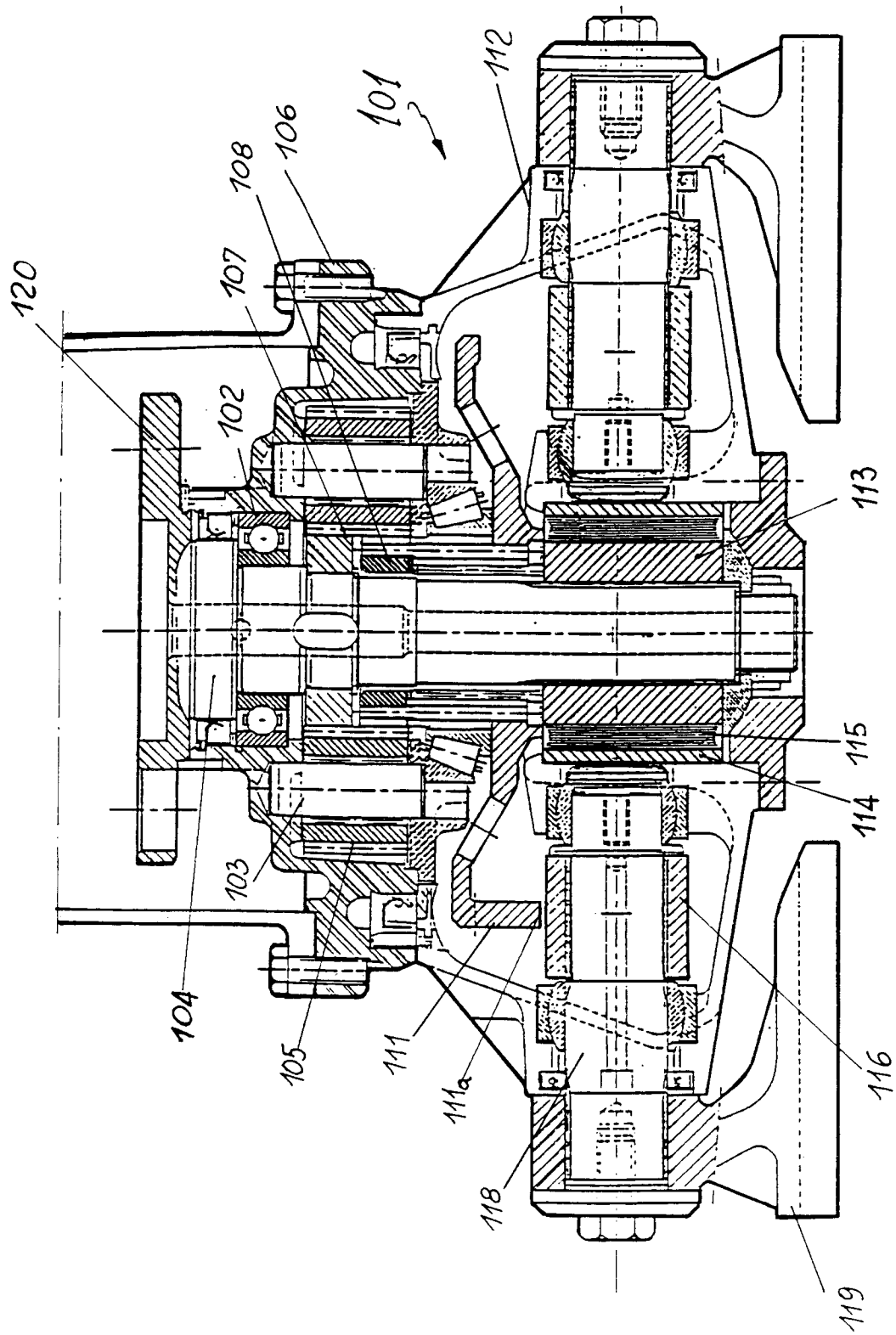
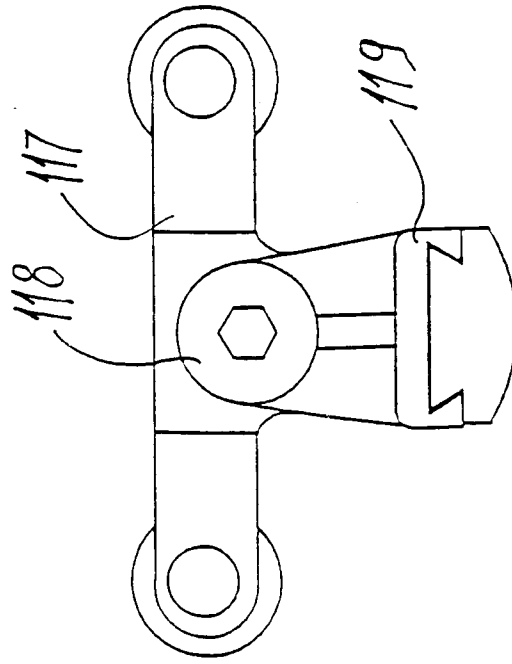
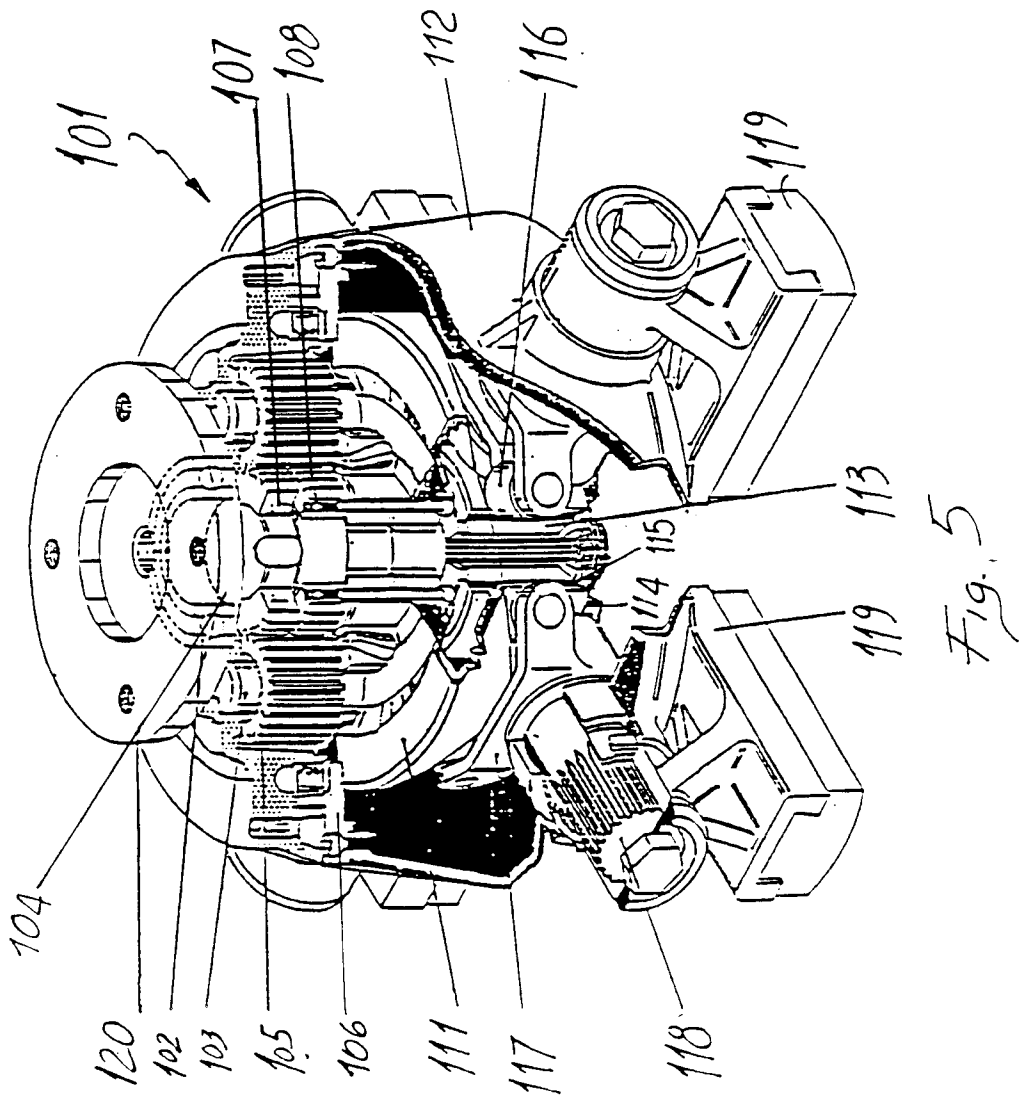


Fig. 4



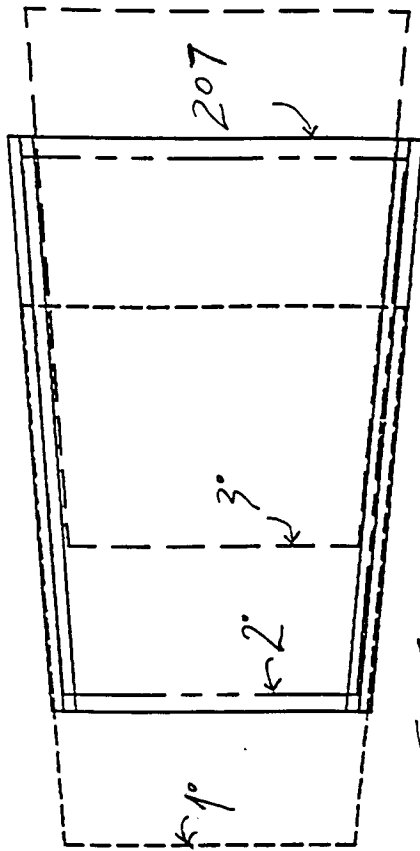


Fig. 7

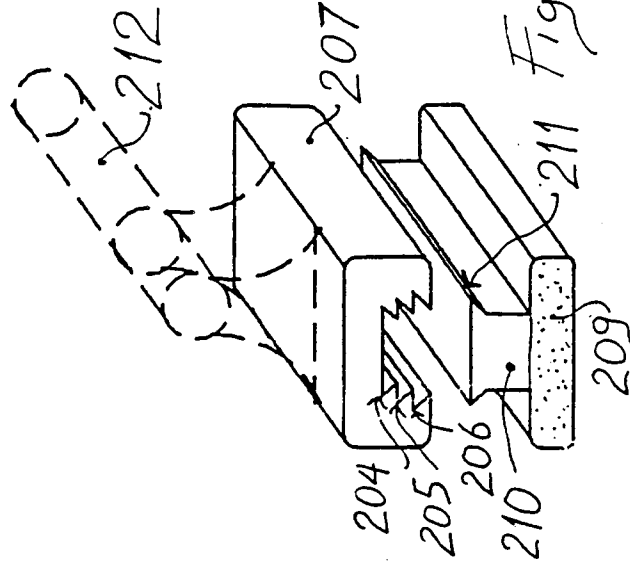


Fig. 8

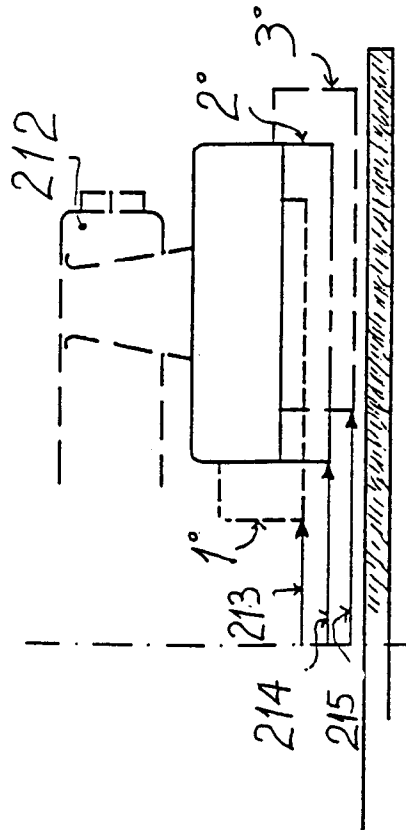


Fig. 9