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Remarks:
Amended claims in accordance with Rule 86 (2) EPC.

(54) Adjustable tongs for forming pipes

(57) Adjustable tongs (1) for forming pipes (2), including polygonal-shaped clamps (130, 230) with a plurality of housings (150, 250) configured for adjusting to a diameter of the pipe (2) to be formed. The tongs are provided with opening and closing means configured for allowing the introduction of a pipe between the clamps (130, 230) and allowing encircling the pipe in a housing constituted of two housings (150, 250) in respective opposite faces of the clamps (130, 230).

The tongs also include a forming element (310) for forming the pipe according to a frusto-conical shape of the forming element (310). The clamps (130, 230) are pivotable about shafts (3110, 3210) for choosing and bringing face to face, selectively, tow housings (150, 250) with dimensions corresponding to the diameter of the pipe to be formed. The clamps (130, 230) comprise a plurality of plates (160, 260) overlaid and joined to one another to define a polygonal outer profile of the clamps (130, 230) and a plurality of grooves (170, 270) in each housing (150, 250).

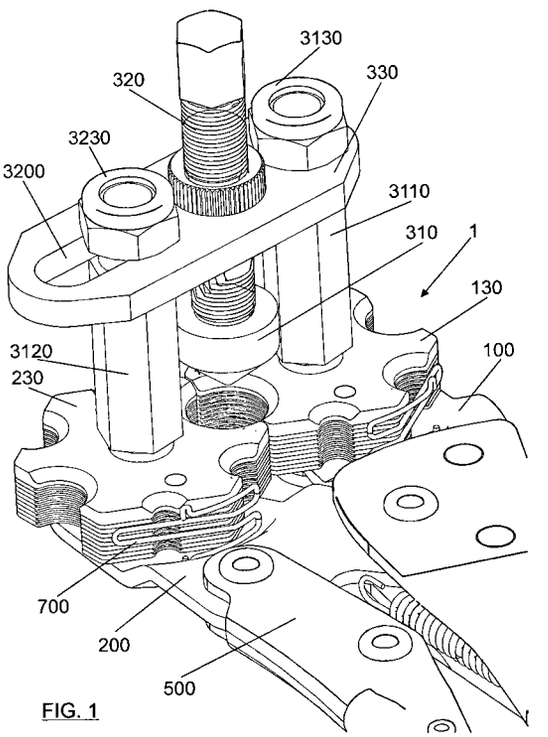

FIG. 1

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Description

Field of the Invention

[0001] The invention is encompassed within the field of tools provided with adjustable tongs for forming pipes.

Background of the Invention

[0002] Models are known in the state of the art which have clamps needing a station fixing system for placing them in the desired position such that they are facing the semi-cylindrical cavities for nipping the pipe to be flared. This system consists of fixing the clamps in the jaws of the tool prepared to that end by means of the insert of a polygonal-section column acting as a rotating shaft for the clamp and fixing a ball in one of its vertices, which ball has a spring inside pushing it outwards, fitting into the holes provided inside the inner interspaces, also polygonal, which the clamp is provided with.

[0003] These clamps are also designed in a single piece, and the cavities for the nipping of the pipes are grooved by means of threading, ribbing, machining, etc.

Description of the Invention

[0004] The problems to be solved by the present invention consist of providing:

- Grooving in the housings of the faces of the clamps for nipping pipes, excluding machining techniques, such as threading and ribbing.
- Means for positioning the clamps on the jaws of the tool which do not require using a shaft with a polygonal section.
- Jaws for housing the shafts which do not require anti-rotation interspaces.
- Decreasing the distance between the shafts about which the clamps and the shaft common to both jaws pivot.
- Means for positioning the clamps on the pivot shafts which do not require the system of a housing for a spring and a ball in the interspaces of the polygonal pivot shaft of the clamps.

[0005] After considering the problems solved by the present invention, said invention will be described below. Thus, the invention proposes a tool, specifically adjustable tongs, for forming pipes, provided with:

polygonal-shaped clamps comprising:

a plurality of faces,
a plurality of housings configured to be adjusted to a diameter of the pipe to be formed,

a housing being arranged on each face of the clamp,

said housings being sized according to a plurality of diameters of the pipes;

opening and closing means configured for moving the clamps in a first plane between a first open position, in which the pipe can be introduced between the clamps, and a closed position, in which the clamps encircle the pipe in a housing constituted of two housings in respective opposite faces of the clamps;
a forming element that can move in a substantially perpendicular direction to the first plane for forming the pipe according to a frusto-conical shape of the forming element;

the clamps being pivotal about shafts for choosing and bringing face to face, selectively, two housings with dimensions corresponding to the diameter of the pipe to be formed.

[0006] According to a first aspect of the invention, the clamps comprise a plurality of plates piled on and joined to one another to define:

a polygonal outer profile of the clamps and
a plurality of grooves in each housing.

Brief Description of the Drawings

[0007] A series of drawings helping to better understand the invention will be very briefly described below, which drawings are expressly related to an embodiment of said invention, presented as a non-limiting example thereof.

Figure 1 shows a perspective view of the tool with the upper portion of the jaws removed.
Figure 2 shows a perspective view of the tool including the upper portion of the jaws.
Figure 3 shows a view of the tool in an open position.
Figure 4 shows a view of the tool in a closed position.
Figure 5 shows a plan view of the tool.
Figure 6 shows a plan view of a clamp.
Figure 7 shows a view of a spring.
Figure 8 shows a perspective view of a clamp in which the plates and grooves making up the clamp can be seen.

Description of a Preferred Embodiment of the Invention

[0008] According to a first embodiment of the invention, the tool, specifically adjustable tongs or flaring tool (1) for forming pipes (2), comprises:

opening and closing means configured for moving the clamps in a first plane between a first open po-

sition (350), in which a pipe can be introduced between the clamps (130, 230), and a closed position (340) in which the clamps (130, 230) encircle the pipe in a housing constituted of two housings in respective opposite faces of the clamps (130, 230):
first securing means or first jaw (100) having

a first substantially flat portion (110) for coupling with a first handle (400) fixed to the first portion (110) of the first securing means or first jaw (100)
a second portion constituted of two substantially parallel surfaces (120) spaced a sufficient distance in order to house

a first polygonal pivoting clamp (130) having a plurality of faces (140)
second securing means or a second jaw (200) having

a first substantially flat portion (210) for coupling with the first handle (400) and for coupling a with second handle (500) and
a second portion constituted of two substantially parallel surfaces (220) spaced a sufficient distance in order to house

a second polygonal pivoting clamp (230) having a plurality of faces (240)
connection means (600) between the first handle (400) and the second handle (500) to allow positioning the tool in the closed position (340) and in the open position (350)
joining means constituted of a bridge piece (300) between the securing means or jaws (100, 200) comprising

a forming element consisting of a punch (310) for forming the pipe by means of flaring according to a frusto-conical shape of the forming element or punch (310)
positioning means constituted of a support (330) placed in a parallel direction to the securing means or jaws (100, 200), provided with first locating means constituted of a borehole (3100) for housing a first shaft (3110) in a substantially perpendicular direction to the securing means or jaws (100, 200)

second locating means constituted of a slit (3200) for housing a second shaft (3210) in a substantially perpendicular direction to the securing means or jaws (100, 200), said second shaft (3210) being able to move linearly along said second locating means, i.e., along the groove (3200), said locating means (3100, 3200) being configured so that the shafts (3110, 3210) allow the tool (1) to be opened and closed between a first open position (350), in which a pipe can be introduced between the clamps (130, 230), and a closed position (340), in which the clamps encircle the pipe in a housing constituted of two housings (150, 250) in respective opposite faces of the clamps (130, 230);

first fixing means (3130) for fixing the first shaft (3110) with the first securing means or first jaw (100) and the joining means, i.e., the bridge piece (300)
second fixing means (3230) for fixing the second shaft (3210) with the second securing means or second jaw (200) and the joining means or bridge piece (300)

the first clamp (130) pivoting about the first shaft (3110)
the second clamp (230) pivoting about the second shaft (3210)
said clamps (130, 230)

comprising a plurality of semi-cylindrical housings (150, 250),

a housing (150, 250) being arranged on each face (140, 240) of the clamp (130, 230),
said housings (150, 250) being sized according to a plurality of diameters of pipes a pair of housings (150, 250) defining a mold for controlling and containing the forming or flaring of the pipe

encircling a pipe with two facing semi-cylindrical housings (150, 250) corresponding to an outer diameter of the pipe.

[0009] In this first embodiment of the invention, the clamps (130, 230) comprise a plurality of plates (160, 260) piled on and joined to one another to define:

a polygonal outer profile of the clamps (130, 230);
a plurality of grooves (170, 270) in each semi-cylindrical housing (150, 250)
to firmly secure a pipe (2) between said housings (150, 250) and to prevent the slipping of the pipe (2) with regard to the clamps (130, 230).

[0010] According to a first embodiment of the invention, the clamps (130, 230) and the shafts (3110, 3210) are cylindrically articulated to prevent the need of using reference facets.
[0011] Additionally, the tongs (1) comprise locking means (700) constituted of an outer spring for each clamp (130, 230), said spring resting on the faces (140,

240) of the clamp (130, 230) to lock the clamps (130, 230) in a working position chosen according to the diameter of the pipe (2) to be formed.

[0012] According to another preferred embodiment of the invention, the tongs (1) also comprise actuation means through a screw (320) for pushing the forming element (310) against the pipe (2) according to a controlled force and a controlled direction.

[0013] As a further additional feature, the tongs (1) of the present invention allow for the clamps (130, 230) to be interchangeable.

[0014] On the other hand, the tongs (1) comprise securing means (100, 200) provided with a portion (110, 120) for housing the clamps (130, 230), said portion (110, 210) being configured with an enveloping shape surrounding the polygonal profile of the clamps (130, 230) to minimize a distance between the shafts (3110, 3120) and a shaft of the locking and unlocking mechanism common to both securing means (100, 200). The securing means (100, 200) of the tongs (1) also comprise cylindrical boreholes for housing the shafts (3110, 3210).

[0015] The different embodiments of the invention solve the problems considered above as summarized below:

- The clamps are constituted of piled or overlaid plates, being joined to one another preferably by means of welding, although it is also possible to use any other joining means.
- The spring housed in the jaws for dividing the stations by means of acting on the outer portion of the clamps prevents the positioning means of the clamps in the jaws of the tool from requiring the use of a polygonal-section shaft.
- Since the jaws are carried out with circular holes through which the shafts pass, which do not require anti-rotation interspaces, the manufacturing process is less expensive.
- The enveloping shape of the jaws allows reducing the distance between the shafts about which the clamps and the shaft common to both jaws pivot, which provides great rigidity to the jaws and an aesthetic appearance.
- Since the use of a system of a housing for a spring and a ball in the interspaces of the polygonal pivot shaft of the clamps is avoided, it is not necessary for the clamps to have a hole with sockets for dividing the stations, which makes the manufacture of the parts less expensive.

Claims

1. Adjustable tongs (1) for forming pipes (2), comprising:

   polygonal-shaped clamps (130, 230) comprising:

   a plurality of faces (140, 240),
   a plurality of housings (150, 250) configured to be adjusted to a diameter of the pipe (2) to be formed,

   a housing (150, 250) being arranged on each face (140, 240) of the clamp (130, 230),
   said housings (150, 250) being sized according to a plurality of diameters of pipes (2);

   opening and closing means configured for moving the clamps (130, 230) in a first plane between a first open position, in which the pipe can be introduced between the clamps (130, 230), and a closed position, in which the clamps (130, 230) encircle the pipe in a housing constituted of two housings (150, 250) in respective opposite faces of the clamps (130, 230);
   a forming element (310) movable in a substantially perpendicular direction to the first plane for forming the pipe according to a frusto-conical shape of the forming element (310);
   the clamps (130, 230) being pivotal about shafts (3110, 3210) for selecting and bringing face to face, selectively, two housings (150, 250) with dimensions corresponding to the diameter of the pipe to be formed;
   said tool (1) being **characterized in that** the clamps (130, 230) comprise a plurality of plates (160, 260) overlaid on and joined to one another to define:

   a polygonal outer profile of the clamps (130, 230) and
   a plurality of grooves (170, 270) in each housing (150, 250).

2. The tongs (1) of claim 1, **characterized in that** the clamps (130, 230) and the shafts (3110, 3120) are cylindrically articulated to prevent reference facets.

3. The tongs (1) of any of claims 1 - 2, **characterized in that** they comprise locking means (700) constituted of an outer spring for each clamp (130, 230), said spring resting on the faces (140, 240) of the clamp (130, 230) to lock the clamps (130, 230) in a working position selected according to the diameter of the pipe (2) to be formed.

4. The tongs (1) of any of claims 1 - 3, **characterized in that** they comprise actuation means (320) for pushing the forming element (310) against the pipe (2) according to a controlled force and a controlled direction.

5. The tongs (1) of any of claims 1 - 4, **characterized in that** the clamps (130, 230) are interchangeable.

6. The tongs (1) of any of claims 1 to 5, **characterized in that** they comprise securing means (100, 200) provided with a portion (110, 210) for housing the clamps (130, 230), said portion (110, 210) being configured with an enveloping shape surrounding the polygonal profile of the clamps (130, 230) to minimize a distance between the shafts (3110, 3210) and a shaft of the locking and unlocking mechanism common to both securing means (100, 200).

7. The tongs (1) of claim 6, **characterized in that** the securing means (100, 200) comprise cylindrical boreholes for housing the shafts (3110, 3210).

Amended claims in accordance with Rule 86(2) EPC.

1. Adjustable tongs (1) for forming pipes (2), comprising:

polygonal-shaped clamps (130, 230) comprising:

a plurality of faces (140, 240),
a plurality of housings (150, 250) configured to be adjusted to a diameter of the pipe (2) to be formed,
a housing (150, 250) being arranged on each face (140, 240) of the clamp (130, 230),
said housings (150, 250) being sized, according to a plurality of diameters of pipes (2);

opening and closing means configured for moving the clamps (130, 230) in a first plane between a first open position, in which the pipe can be introduced between the clamps (130, 230), and a closed position, in which the clamps (130, 230) encircle the pipe in a housing constituted of two housings (150, 250) in respective opposite faces of the clamps (130, 230);
a forming element (310) movable in a substantially perpendicular direction to the first plane for forming the pipe according to a'frusto-conical shape of the forming element (310);
the clamps (130, 230) being pivotal about shafts (3110, 3210) for selecting and bringing face to face, selectively, two housings (150, 250) with dimensions corresponding to the diameter of the pipe to be formed;

said tool (1) being **characterized in that** the clamps (130, 230) comprise a plurality of plates (160, 260) overlaid on and joined to one another excluding securing means to define:

a polygonal outer profile of the clamps (130, 230) and
a plurality of grooves (170, 270) in each housing (150, 250).

2. The tongs (1) of claim 1, **characterized in that** the clamps (130, 230) and the shafts (3110, 3120) are cylindrically articulated to prevent reference facets.

3. The tongs (1) of any of claims 1 - 2, **characterized in that** they comprise locking means (700) constituted of an outer spring for each clamp (130, 230), said spring resting on the faces (140, 240) of the clamp (130, 230) to lock the clamps (130, 230) in a working position selected according to the diameter of the pipe (2) to be formed.

4. The tongs (1) of any of claims 1 - 3, **characterized in that** they comprise actuation means (320) for pushing the forming element (310) against the pipe (2) according to a controlled force and a controlled direction.

5. The tongs (1) of any of claims 1 - 4, **characterized in that** the clamps (130, 230) are interchangeable.

6. The tongs (1) of any of claims 1 to 5, **characterized in that** they comprise securing means (100, 200) provided with a portion (110, 210) for housing the clamps (130, 230), said portion (110, 210) being configured with an enveloping shape surrounding the polygonal profile of the clamps (130, 230) to minimize a distance between the shafts (3110, 3210) and a shaft of the locking and unlocking mechanism common to both securing means (100, 200).

7. The tongs (1) of claim 6, **characterized in that** the securing means (100, 200) comprise cylindrical boreholes for housing the shafts (3110, 3210).

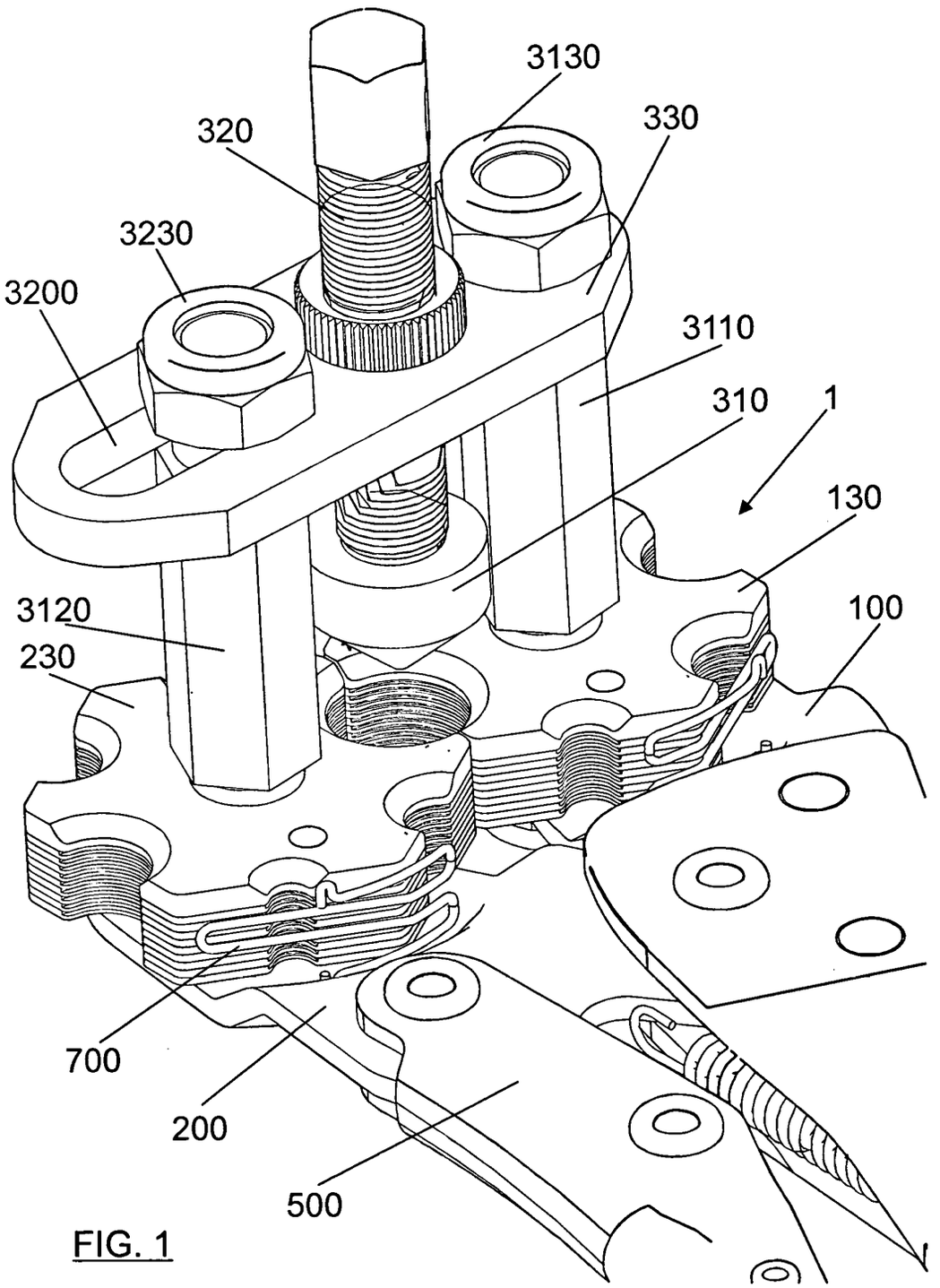

FIG. 1

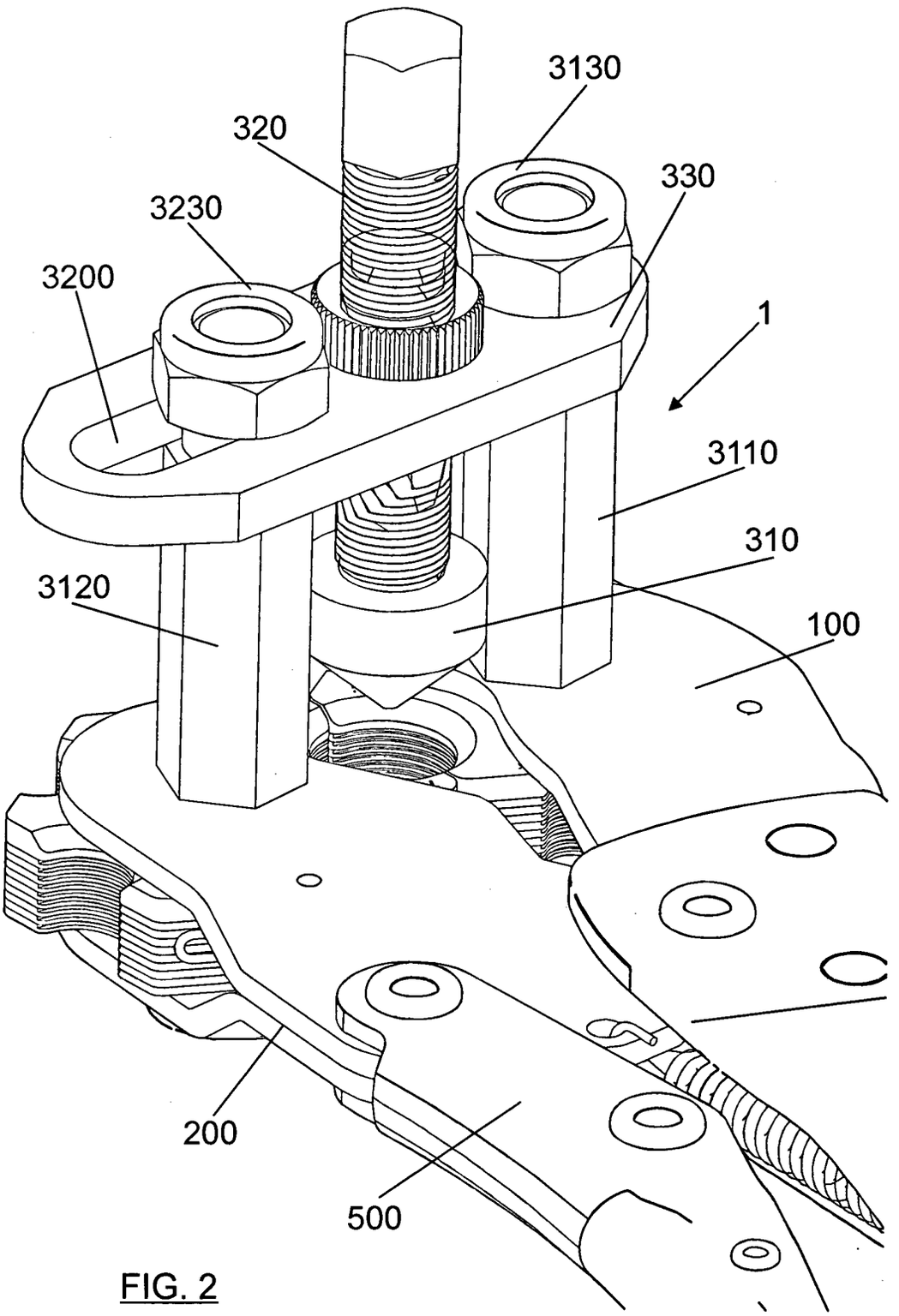

FIG. 2

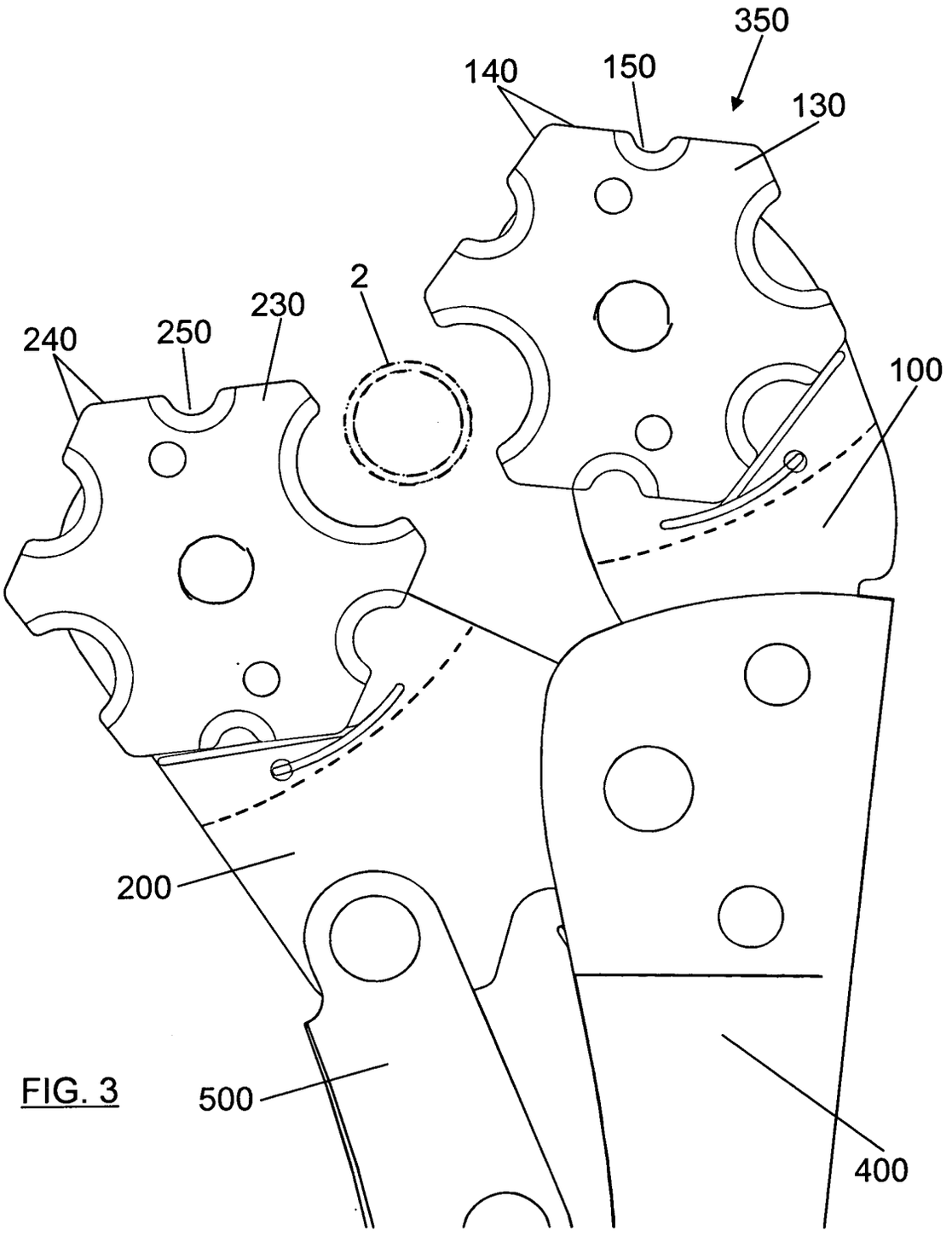

FIG. 3

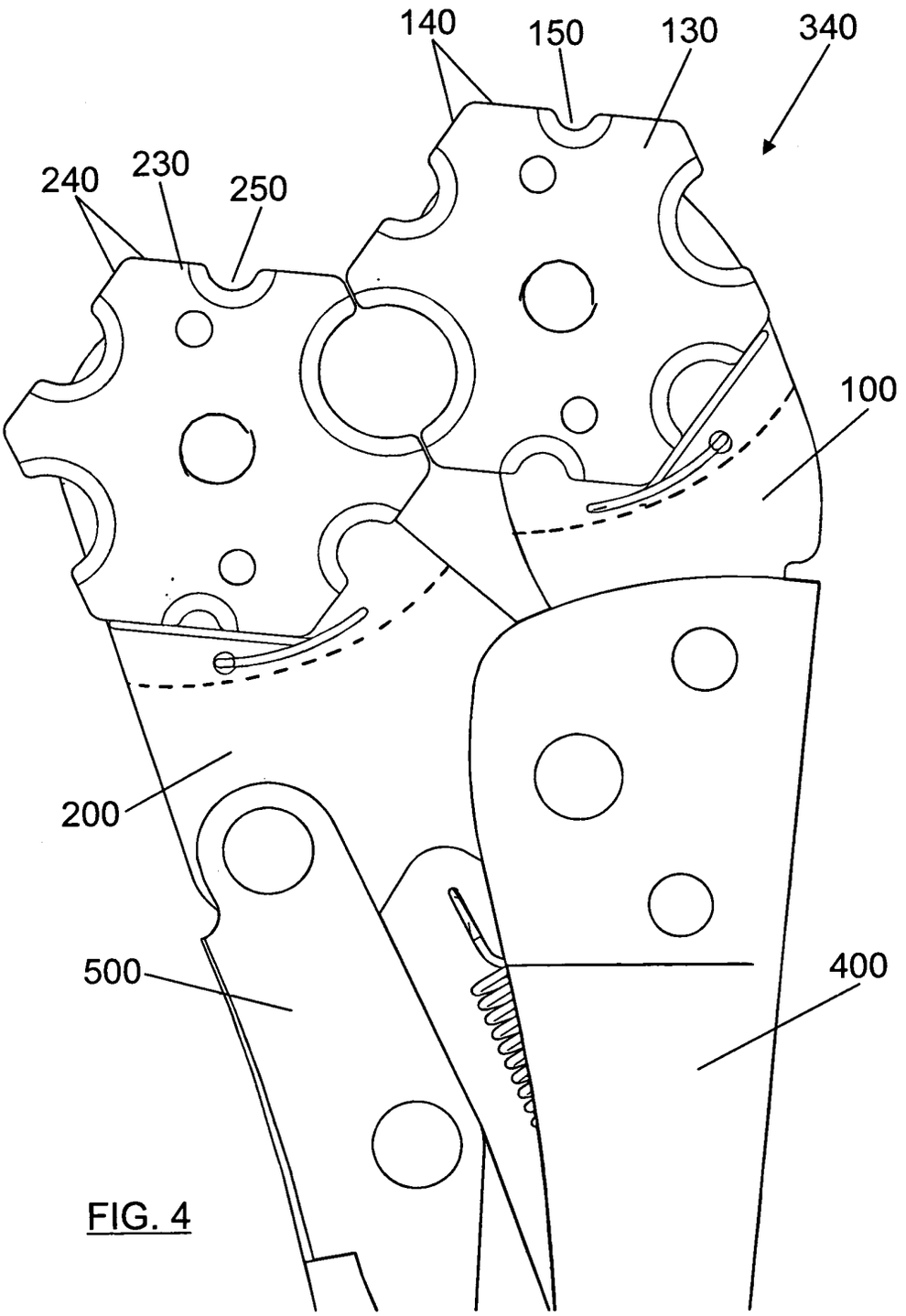

FIG. 4

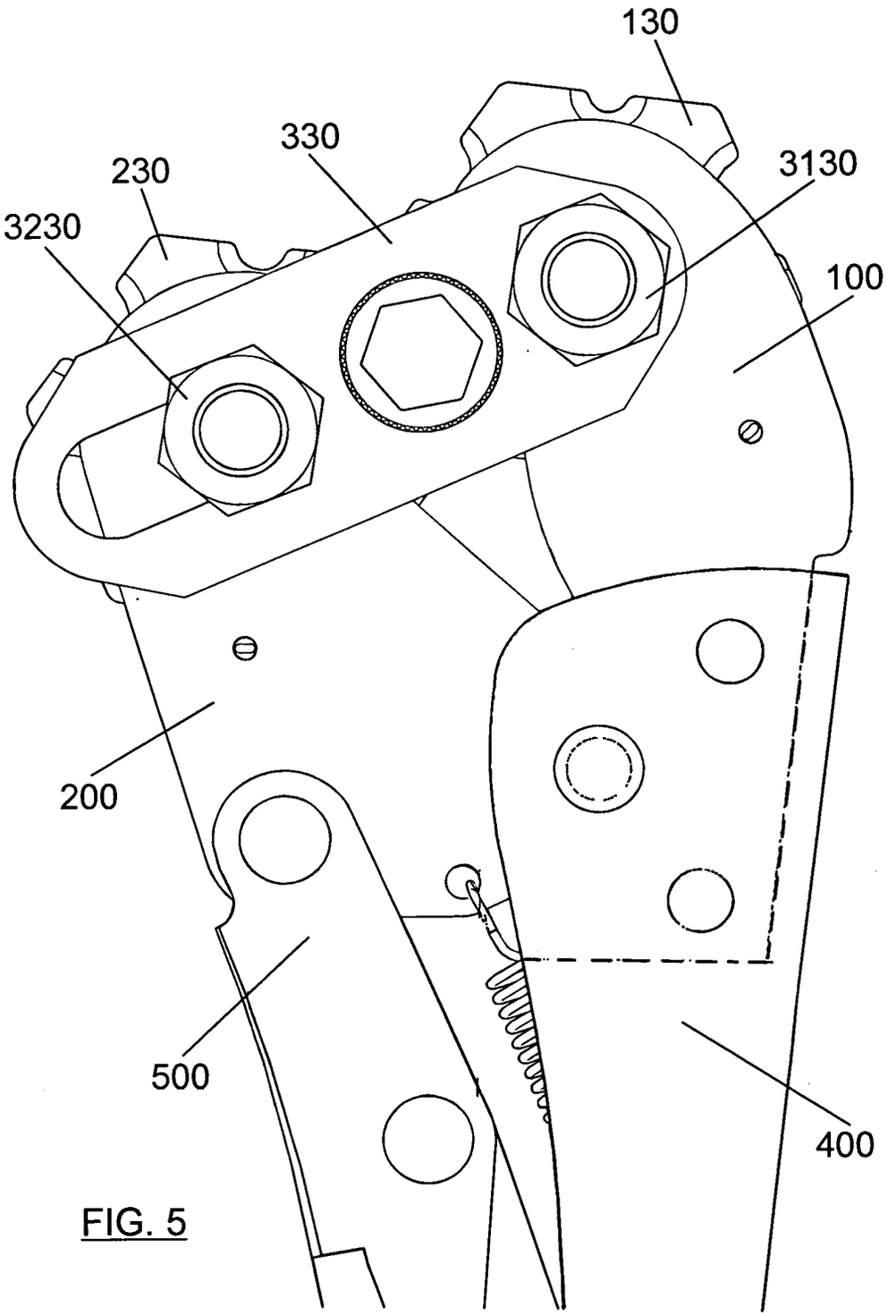

FIG. 5

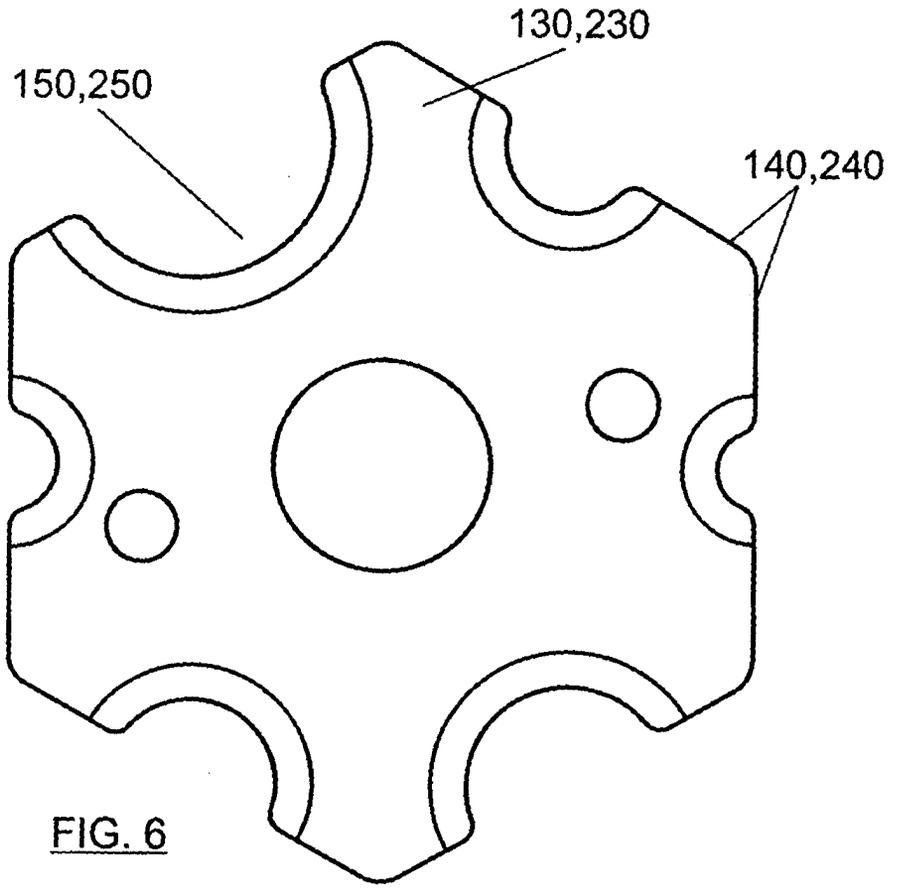

FIG. 6

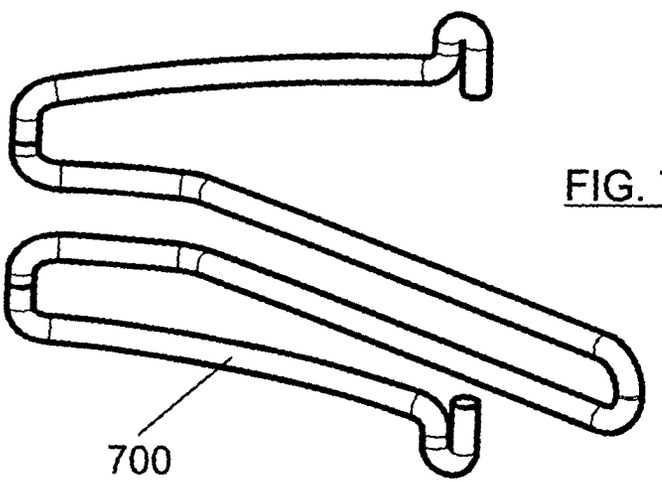

FIG. 7

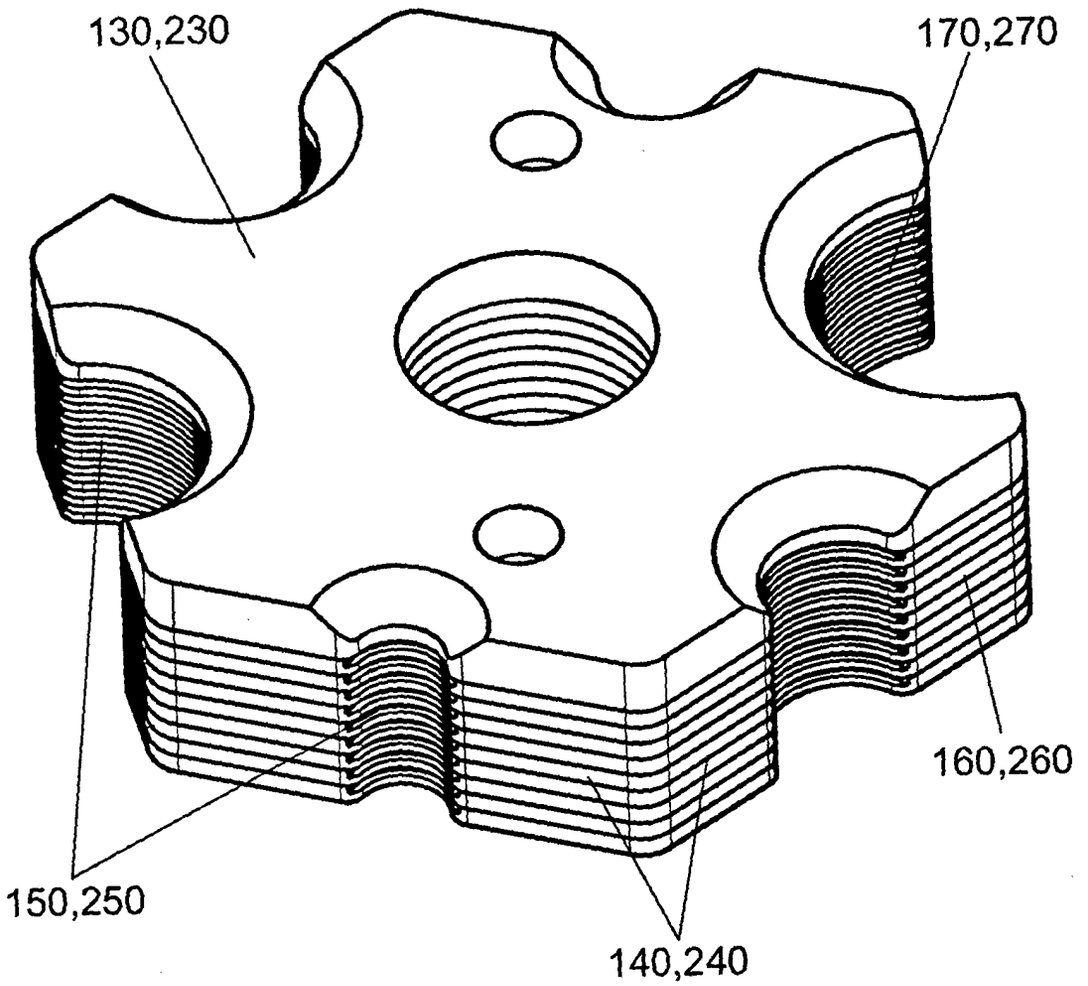

FIG. 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 38 0059

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	US 2 711 576 A (WILSON FRANK R) 28 June 1955 (1955-06-28) * the whole document *	1	B21D41/02
Y	US 2 563 088 A (WILKS JR KARL W ET AL) 7 August 1951 (1951-08-07) * column 4, line 67 - line 73; figure 4 *	1	
A	JP 11 290975 A (MITSUBISHI MATERIALS CORP) 26 October 1999 (1999-10-26) * figures *	1,2,4,6,7	
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 01, 31 January 2000 (2000-01-31) & JP 11 290975 A (MITSUBISHI MATERIALS CORP), 26 October 1999 (1999-10-26) * abstract *	1,2,4,6,7	
A	DE 25 06 053 A (IMP EASTMAN CORP) 26 August 1976 (1976-08-26)		

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B21D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 July 2004	Ris, M

CATEGORY OF CITED DOCUMENTS

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21-07-2004

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