(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 093 898 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
05.04.2006 Bulletin 2006/14

(51) Int Cl.:
B28D 1/22 *(2006.01)* ***E02D 9/00*** *(2006.01)*

(21) Application number: **00830608.6**

(22) Date of filing: **07.09.2000**

(54) **A breaker device for removing the tops of columns.**

Betonpfahltrennvorrichtung

Dispositif de recépage de pieux

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **18.10.1999 IT MO990225**

(43) Date of publication of application:
25.04.2001 Bulletin 2001/17

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(56) References cited:
EP-A- 0 051 837
NL-A- 8 400 404
NL-A- 8 801 167
US-A- 4 480 627

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Description

[0001] Specifically, though not exclusively, the invention is used in breaking up a top of a reinforced-concrete column without damaging the reinforcement elements. In particular, the present invention relates to a device described in the preamble of the first claim.

[0002] A device of this type is taught in Netherlands publication no. 9000008, which addressed the problem of realizing a device able to top columns having different diameters. The solution offered was to provide, for each jackhammer, a stop limiting the run of the activating jack of the tool.

[0003] This solution (Netherlands publication no. 9000008) can be improved upon from the point of view of the ability of the device to adapt itself to columns of different diameters and shapes, while conserving excellent operative results.

[0004] The Netherlands publication no.8 801 167 discloses a breaker device for removing the tops of columns comprising: a support structure composed of a plurality of chain elements reciprocally linked by link couplings to form a closed chain which can surround a column which is to be topped; a plurality of jackhammers supported by the support structure, each of which jackhammers is provided with at least a breaker punch for penetrating the column.

[0005] The main aim of the present invention is to provide a device, constructionally simple and economical, which is extremely flexible, and easily and swiftly adaptable to columns having different sizes and shapes, without losing anything in terms of performance.

[0006] An advantage of the invention is its ability to demolish both round and square columns.

[0007] A further advantage is that it provides a device which operates considerably quickly and accurately.

[0008] A further advantage is that it makes available a device of considerable structural solidity and sturdiness.

[0009] These aims and advantages and others besides are all achieved by the present invention, as it is characterised in the appended claims.

[0010] Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of embodiments of the invention, illustrated by way of example and not to be considered limiting in the accompanying figures of the drawings, in which:

figure 1 shows a schematic plan view from above of a device made according to the present invention;
figure 2 shows an enlarged view of a detail of the device of figure 1;
figure 3 shows a device, made according to the invention, in a configuration which is useful for removing the top from hollow columns as well as for demolishing tubular structures such as tanks and the like;
figure 4 shows a device made according to the invention, in a configuration in which it can remove the top of a square-section column;
figure 5 shows some details of the device of figure 4.

[0011] With reference to figures I and 2 of the drawings, 1 denotes in its entirety a device for removing the top from a column 2, especially a reinforced-concrete column. This operation, common in construction work, consists in breaking up the concrete while uncovering the reinforcement elements and leaving them intact.

[0012] The device 1 comprises a modular support structure 3 composed of a plurality of chain elements 4 reciprocally constrained by links 5 to form a closed chain which can surround the column 2 to be topped.

[0013] The chain elements 4 are identical to each other and each is provided with a plurality of holes 6', 6", 6"" afforded at a distance from the link 5 coupling two chain elements 4. Each hole 6', 6", 6"' is alignable with a corresponding hole 6', 6'', 6''' in an adjacent chain element 4. The holes, thus aligned, receive a pin 7 which blocks the adjacent chain elements 4 in predetermined positions.

[0014] In figure 1 the structure comprises six chain elements 4, each of which represents a module of the structure 3, arranged so as to form a chain in the shape of a regular hexagon in which each side is represented by a chain element 4. In the illustrated embodiment, the chain elements 4 are blocked by insertion of pins 7 into the holes indicated by 6" in figure 2. The chains can be arranged in polygon shapes other than hexagons; it is sufficient to remove or add chain elements 4 and insert the pins 7 in the holes 6' and 6"', specially located in the exactly right positions for obtaining the desired relative inclinations between the chain elements 4. In figure 2 three holes 6', 6" and 6"' are shown, with which three different chains can be obtained, but simply by increasing the number of holes a greater number of chains can be obtained.

[0015] The structure 3 is equipped with a plurality of jackhammers 8, each provided with at least one breaker punch 9 for penetrating the column 2. The various punches 9 are arranged around the column circumference, facing the column centre. Each jackhammer 8 is kitted with a plurality of interchangeable breaker punches 9, each of a different length. In figure 2 three punches 9', 9'', 9"' are shown, selectively applicable on the jackhammer 8.

[0016] To optimize the device 1 performance, each interchangeable punch 9', 9", 9"', is suitable for use with a chain having a specific number of sides and with columns 2 having a diameter which is within a certain interval. When changing the number of sides of the chain 4, and in consideration of the diameter of the column to be topped, it is opportune also to change the length of the punch which will go to penetrate the column 2.

[0017] Figure 3 shows a device in which each chain element 4 is predisposed to receive at least one jackhammer 8 with the breaker punch 9' selectively turned

either internally or externally of the support structure 3. In the embodiment illustrated in figure 3, the jackhammers 8 are mounted with the breaker punches 9' facing externally. In this case the device can be used for demolishing a tubular wall 10 (for example, a hollow column or a tank), working from the inside of the tubular structure.

[0018] Figure 4 shows a device, not according to the invention, in which the support structure 3 comprises a plurality of intermediate chain elements 11 which are predisposed to connect up to two adjacent chain elements 4. The device of figure 4 is suited to topping square columns 12. The device can be adapted to square columns having sides of different lengths, with the insertion of special intermediate chain elements 11' and 11'', each having a special arrangement of the holes 50', 50'' and 60', 60'' destined to form the chains in collaboration with the holes of the main chain 5 and, respectively, 6.

[0019] Figure 5 shows two different types of intermediate chain elements 11 and 11''. Each type can be used to form a basically square chain, i.e. one in which the main chain elements 4, bearing the jackhammers 8, are angularly arranged at 90° to one another. By using a specific intermediate element 11' or 11'', it is possible to make a square chain having a specific side length.

[0020] Note that this result can be reached by using the same main chain elements 4 and changing only the intermediate chain elements.

Claims

1. A breaker device for removing the tops of columns, comprising:

   a support structure (3) composed of a plurality of identical chain elements (4) reciprocally linked by link couplings (5) to form a closed chain which can surround a column which is to be topped;
   a plurality of jackhammers (8) supported by the support structure (3), each of which jackhammers (8) is provided with at least a breaker punch (9) for penetrating the column;
   each jackhammer (8) being kitted with a plurality of breaker punches (9', 9'', 9'''), which are interchangeable and which are of different lengths;
   characterised in that each of the plurality of chain elements (4) exhibits a plurality of holes (6', 6'', 6''') which are distanced from the link couplings (5) for linking the chain elements (4), each hole of the plurality of holes (6', 6'', 6''') being alignable with a corresponding hole of the plurality of holes (6', 6'', 6''') of an adjacent chain element (4); the plurality of holes (6', 6'', 6'''), when aligned, being able to receive a pin (7) for blocking adjacent chain elements (4) in predetermined positions.

2. The device of claim 1, **characterised in that** the plurality of breaker punches (9', 9'', 9'''), are of different lengths and are interchangeable according to selective variations in the predetermined positions of the chain elements (4).

3. The device of claim 2, **characterised in that** the support structure (3) comprises a plurality of intermediate chain elements (11', 11''), which are predisposed to connect two adjacent chain elements of the plurality of chain elements (4).

4. The device of any one of the preceding claims, **characterised in that** each chain element (4) of the plurality of chain elements (4) is predisposed so that at least one of the jackhammers (8) can be mounted thereon, with a breaker punch (9') of the at least one of the jackhammers (8) facing inwardly or outwardly of the support structure (3), so that when the breaker punch (9') is facing outwardly of the support structure (3), the device can be used for demolishing a tubular wall (10) by being positioned inside the tubular wall (10).

Revendications

1. Dispositif de recépage de pieux, comprenant:

   une structure de support (3) composée d'une pluralité d'éléments de chaîne identiques (4) réciproquement accouplés par des accouplements à charnière (5) pour former une chaîne fermée pouvant entourer un pieu devant être recépé;
   une pluralité de marteau-piqueurs (8) supporté par la structure de support (3), chacun desdits marteau-piqueurs (8) étant pourvu d'au moins une pointe de concassage (9) pour pénétrer dans le pieu;
   chaque marteau-piqueur (8) étant équipé d'une pluralité de pointes de concassage (9', 9'', 9'''), qui sont interchangeables et qui présentent de différentes longueurs;
   caractérisé en ce que chaque élément de la pluralité d'éléments de chaîne (4) présente une pluralité d'orifices (6', 6'', 6''') à distance des accouplements à charnière (5) pour accoupler les éléments de chaîne (4), chaque orifice de la pluralité d'orifices (6', 6'', 6''') pouvant être aligné avec un orifice correspondant de la pluralité d'orifices (6', 6'', 6''') d'un élément de chaîne (4) adjacent; la pluralité d'orifices (6', 6'', 6''') étant alignée, pouvant recevoir un axe (7) pour le blocage des éléments de chaîne adjacents (4) dans des positions prédéterminées.

2. Dispositif selon la revendication 1, **caractérisé en**

ce que la pluralité de pointes de concassage (9', 9", 9"') sont de différentes longueurs et sont interchangeables selon les variations sélectives des positions prédéterminées des éléments de chaîne (4).

3. Dispositif selon la revendication 2, **caractérisé en ce que** la structure de support (3) comprend une pluralité d'éléments de chaîne intermédiaires (11', 11"), prédisposés pour relier deux éléments de chaîne adjacents de la pluralité d'éléments de chaîne (4).

4. Dispositif selon n'importe laquelle des revendications précédentes, **caractérisé en ce que** chaque élément de chaîne (4) de la pluralité d'éléments de chaîne (4) est prédisposé de manière à ce qu'au moins un des marteau-piqueurs (8) puisse être monté sur ce dernier, avec une pointe de concassage (9') dudit au moins un marteau-piqueur (8) orientée vers l'intérieur ou vers l'extérieur de la structure de support (3), le dispositif pouvant être utilisé pour démolir une paroi tubulaire (10) en étant disposé à l'intérieur de la paroi tubulaire (10).

Patentansprüche

1. Brechvorrichtung zum Abtrennen der Spitzen von Pfählen, enthaltend:

   - eine Trägerstruktur (3), zusammengesetzt aus einer Anzahl von gleichen Kettenelementen (4), die durch Gelenkkupplungen (5) miteinander verbunden sind, um eine geschlossene Kette zu bilden, welche um einen abzutrennenden Pfahl gelegt werden kann;
   - eine Anzahl von Bohrhammern (8), gehalten von der Trägerstruktur (3), jeder der Bohrhammer (8) versehen mit wenigstens einem Brechdom (9) zum Durchdringen des Pfahls;

   wobei jeder Bohrhammer (8) mit einer Anzahl von Brechdomen (9', 9", 9"') ausgestattet ist, welche austauschbar und von unterschiedlichen Längen sind; **dadurch gekennzeichnet, dass** jedes aus der Anzahl von Kettenelementen (4) eine Anzahl von Bohrungen (6', 6", 6"') aufweist, welche einen Abstand von den Gelenkkupplungen (5) zum Verbinden der Kettenelemente (4) haben, wobei jede Bohrung der Anzahl von Bohrungen (6', 6", 6"') zu einer entsprechenden Bohrung der Anzahl von Bohrungen (6', 6", 6"') eines angrenzenden Kettenelementes (4) ausgerichtet werden kann; und wobei die Bohrungen in der Lage sind, einmal zueinander ausgerichtet, einen Zapfen (7) zum Blockieren der angrenzenden Kettenelemente (4) in vorgegebenen Positionen aufzunehmen.

2. Vorrichtung nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die Anzahl von Brechdomen (9', 9", 9"') von unterschiedlichen Längen und austauschbar sind, je nach den gewählten Änderungen in den vorgegebenen Positionen der Kettenelemente (4).

3. Vorrichtung nach Patentanspruch 1, **dadurch gekennzeichnet, dass** die Trägerstruktur (3) eine Anzahl von Kettenzwischenelementen (11', 11") enthält, welche dazu vorgesehen sind, zwei aneinandergrenzende Kettenelemente der Anzahl von Kettenelementen (4) miteinander zu verbinden.

4. Vorrichtung nach einem beliebigen der vorstehenden Patentansprüche, **dadurch gekennzeichnet, dass** jedes Kettenelement (4) der Anzahl von Kettenelementen (4) so vorgesehen ist, dass wenigstens einer der Bohrhammer (8) an diesem montiert werden kann, wobei der Brechdom (9) des wenigstens einen Bohrhammers (8) nach innerhalb oder nach ausserhalb der Trägerstruktur (3) gerichtet ist, so dass, wenn der Brechdom (9') nach ausserhalb der Trägerstruktur (3) gerichtet ist, die Vorrichtung zum Demolieren einer rohrförmigen Wand (10) benutzt werden kann; und zwar durch Anordnen im Inneren rohrförmigen Wand (10).

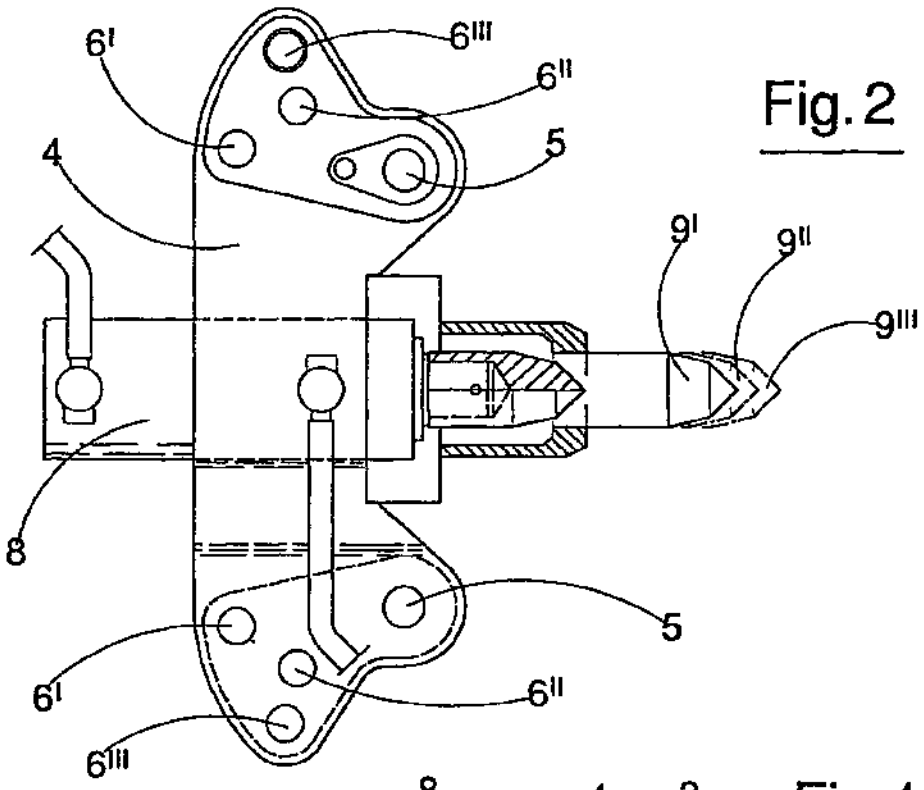

6I
6III
6II
5
4
9I
9II
9III
8
5
6I
6II
6III

Fig. 2

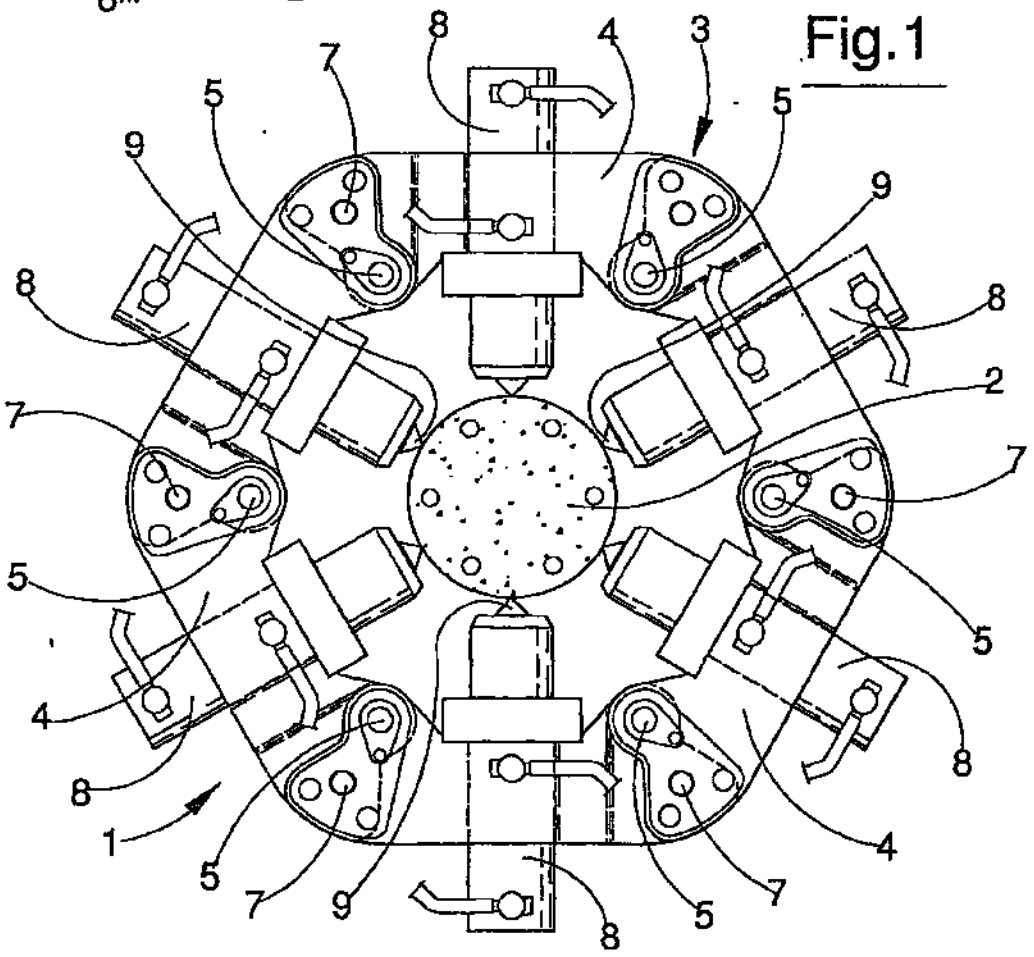
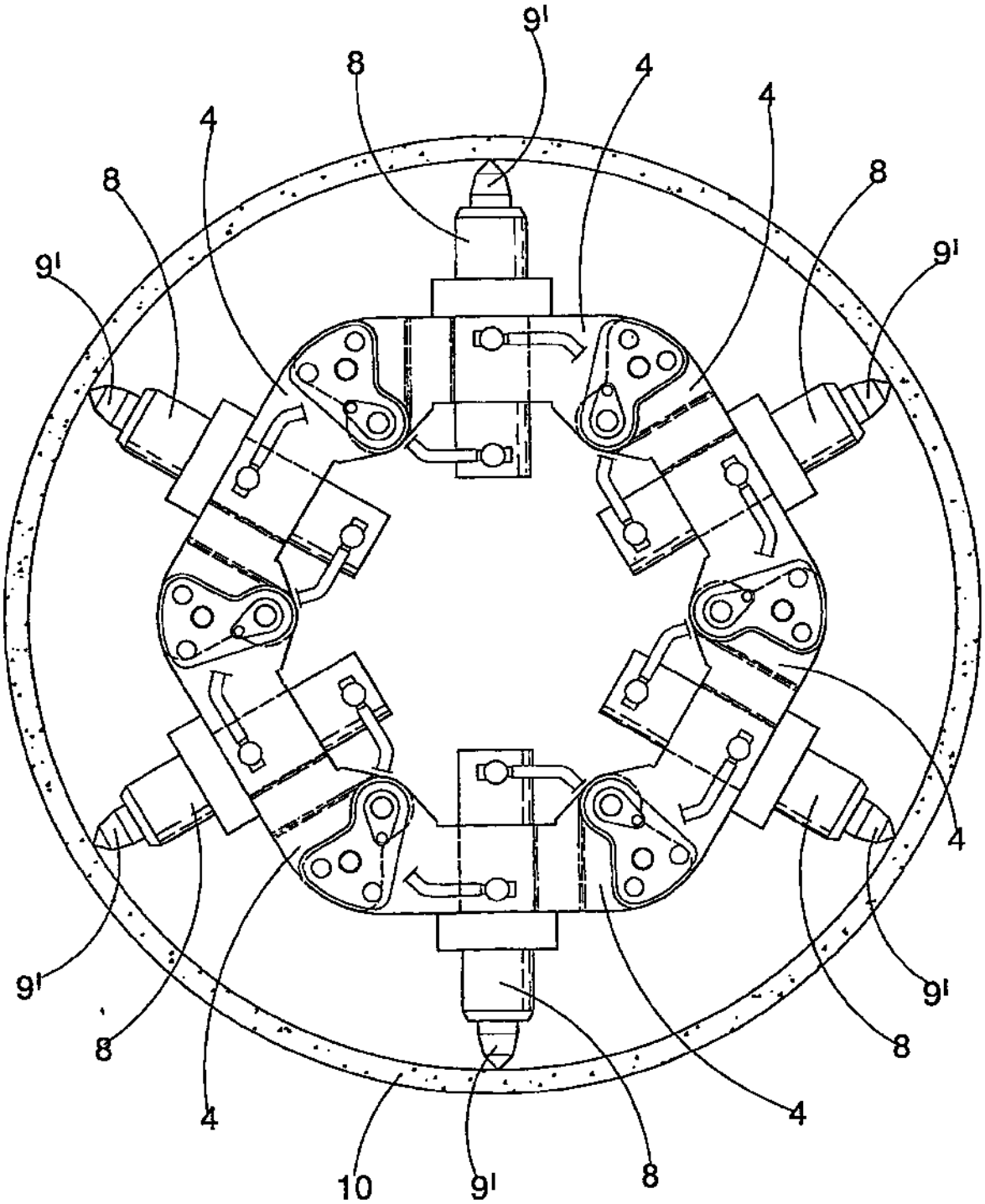

8
4
3
7
5
5
9
9
8
8
2
7
7
5
5
4
8
8
1
5
7
9
8
5
7
4

Fig. 1

Fig.3



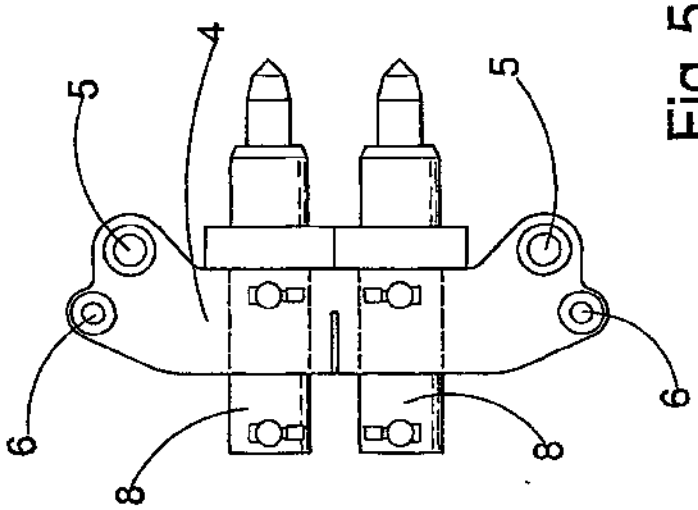

4
5
5
6
6
8
8

Fig.5

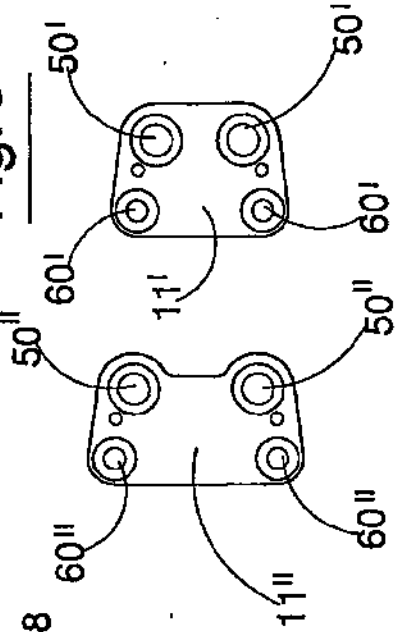
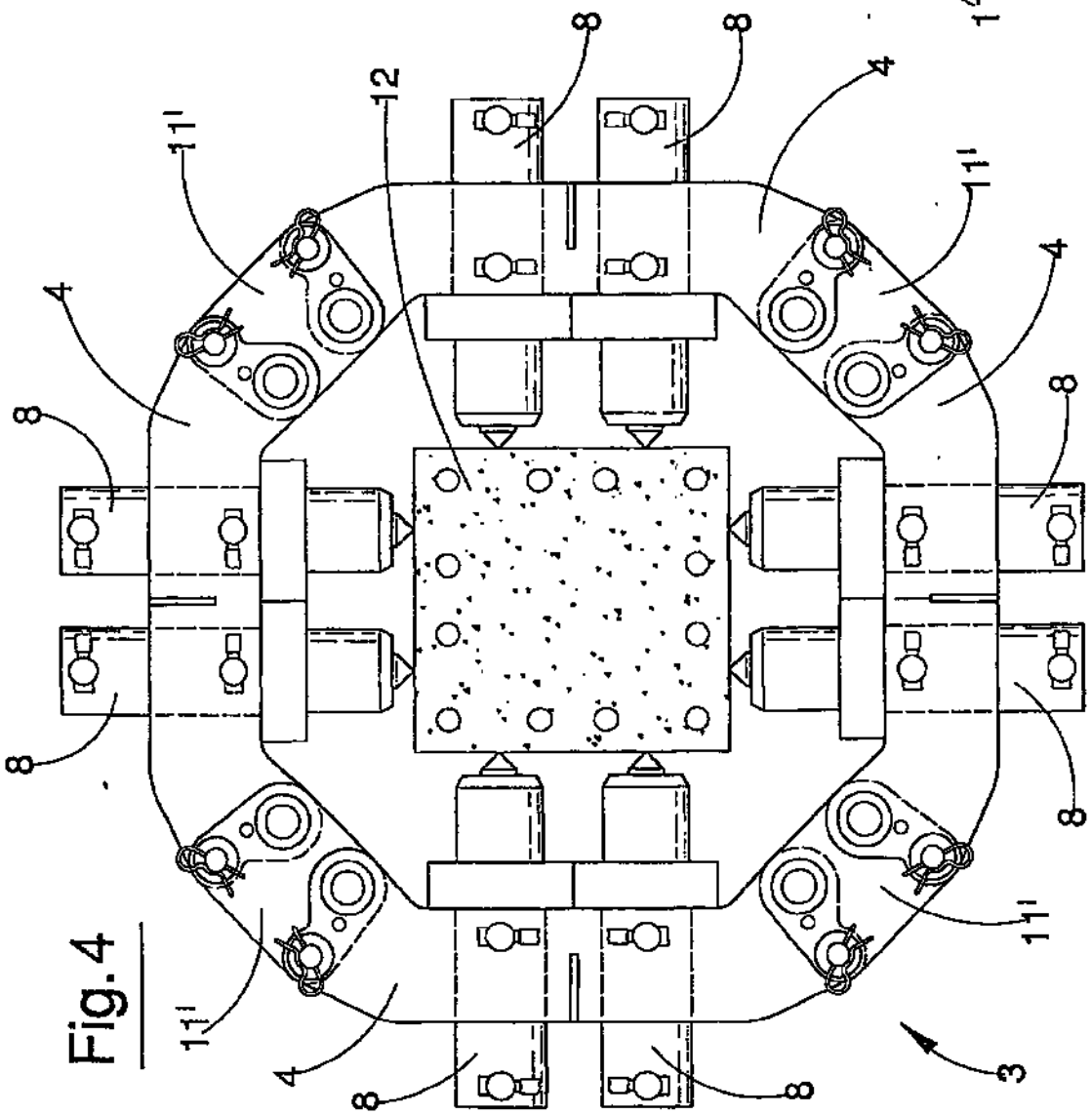

50'
50'
60'
60'
11'
50''
50''
60''
60''
11''

Fig.4


8
8
12
4
11'
11'
4
4
8
8
8
8
11'
11'
4
8
8
3