

(19)



(11)

EP 2 864 549 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
08.11.2023 Bulletin 2023/45

(51) International Patent Classification (IPC):
E02D 7/18^(2006.01) B06B 1/16^(2006.01)
E02D 11/00^(2006.01)

(21) Application number: **13757881.1**

(52) Cooperative Patent Classification (CPC):
B06B 1/16; E02D 11/00

(22) Date of filing: **05.03.2013**

(86) International application number:
PCT/FI2013/000010

(87) International publication number:
WO 2013/132138 (12.09.2013 Gazette 2013/37)

(54) **HAMMERING DEVICE MEANT FOR HAMMERING POLES AND OTHER LONGISH OBJECTS INTO THE GROUND**

HAMMERRVORRICHTUNG ZUM HÄMMERN VON PFOSTEN UND ANDEREN LÄNGLICHEN GEGENSTÄNDEN IN DEN BODEN

DISPOSITIF D'ENFONCEMENT CONÇU POUR ENFONCER DES POTEAUX ET D'AUTRES OBJETS LONGS DANS LE SOL

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

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(30) Priority: **07.03.2012 FI 20120071**

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(43) Date of publication of application:
29.04.2015 Bulletin 2015/18

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Description

[0001] Invention relates to a hammering device meant for hammering poles, profiles and other elongated objects into the ground which hammering device comprises a body which can be attached to a working machine, one or more moveable pair of jaws which is attached to the body in order to grip the object to be hammered at least with a side grip wherein the jaws of the pair of jaws can be brought nearer and brought farther away from each other with the help of an activator, such as a hydraulic cylinder and the object to be hammered can be pressed between the mentioned jaws and which device further comprises at least two vibrator devices in order to create impacts to be directed to the object to be hammered and that each jaw of the pair of jaws comprises a vibrator device and that the rotations of the vibrator devices are synchronized with each other.

[0002] Hammering devices according to the preamble above are previously known said devices comprising an attachment body with which it is attached for example to an excavator. A vibrator device and another body have been attached to this body with the help of damping cushions wherein the other body partly surrounds the mentioned vibrator device and receives the impacts of the vibrator device and conveys them to the target. Gripping jaws have been attached to the other body either to be stiff or to be turning with the help of a joint. A Finnish patent specification no. 106219 can be mentioned as an example.

[0003] Additionally hammering devices are known from the publications EP 1983112 and EP 2251489 in which publications both jaws comprise a vibrator device and the rotations of these vibrator devices are synchronized with each other.

[0004] The known solutions have the disadvantage that with the vibrator casing gripping jaws with their arms, cylinders which move the jaws and the driving motor of the vibrator device are affected by the impacts of the vibrator device. It is resulting that as impact receiving masses there are many such masses which in vain attenuate the effectiveness of the impacts. The weight of these unnecessary, moveable masses may be the same as the mass of the pole/pile to be hammered. The coefficient of performance of the impacts will thus be less than 50 % already due to this reason. For example insufficient grip of the gripping jaw at the object to be hammered additionally decreases the coefficient of performance. In the known solutions there is also a disadvantage regarding harmful forces and stresses caused by the location of the vibrator device relating for example jaw structures because in the known solutions the vibrator device is located at the side from the longitudinal axis line of the object to be hammered.

[0005] A new hammering device has been developed in order to remove these disadvantages with which hammering device the above mentioned problems can be solved and conveyance of the vibrating forces which is

efficient in a new way to the object to be hammered can be reached. It is characteristic of the invention what is stated in the independent claim.

[0006] It is characteristic of the second way of performance of the invention that the vibrator devices which are adjusted separately at both jaw arms and function side by side each comprise two axes for eccentric masses in which case when the masses are rotating and when the jaw arms are being compressed against each other, the operation effect of a vibrator device with four axes can be reached together with the help of two vibrator devices which have been installed in this way during which action effect there are hardly any sideways impacts.

[0007] The advantage of the invention is the fact that the impacts of the vibrator device are conveyed from the body of the vibrator device directly to the gripping element which is compressed to the object to be hammered. When there are two vibrator devices being symmetrically located close to the object to be hammered at its both sides, the impacts will mainly stress only the gripping heads which are isolated from the other device body and convey impacts and are located at the ends of the jaws. In one embodiment of the invention the impacts of the vibrator devices stress only the gripping heads of the jaws which convey the impacts and are vibration isolated wherein impact energy does not get wasted much for unnecessary masses. When adjacent vibrator devices are used symmetrically at the same stage, no eccentric masses are needed in spite of two vibrator devices more than in known solutions which comprise one vibrator device. Nearly all unnecessary moveable masses which decrease the impact efficiency of the vibrator devices have been eliminated.

[0008] In the following the invention is described more detailed by referring to the accompanying drawings in which

Figure 1 shows a hammering device as a simplified version seen from above.

Figure 2 shows a hammering device as a side view in which case the backmost jaw construction can be seen.

Figure 3 shows a vibrator device diagonally seen by showing an external body solution.

Figure 4 shows the eccentric masses of the vibrator device.

Figure 5 shows a vibrator device when it hammers downwards.

[0009] The jaw structure of the hammering device according to the invention, moving of the jaws 2, 7 with the help of a cylinder 9 and a toggle joint structure 12, 13, 17 and the vibrator devices 1, which are located at the jaws 2, 7 are shown in the figure 1. The jaws 2, 7 form a pair of jaws between which gripping devices of the pair of jaws the object 18 to be hammered is taken. The arms 7 of the jaws are adjusted to turn while resting on the

joint pins 11. The jaw arms 7 are turned with a cylinder 9 the piston rod of which cylinder pushes the toggle joint arms 12 from the pivot 17 to be straightened and to be lengthened. A cylinder which is smaller than the used cylinders is nowadays enough to be a cylinder 9 regarding its power because in the toggle joint arrangement the power of the cylinder knowingly becomes multiplied when its power is inverted to be a recession force of the jaw arms 7. A smallish cylinder 9 also opens the jaws quickly with a pulling movement of the cylinder. The vibrator devices 1 are adjusted to be at both jaws 7, 2.

[0010] In the embodiment according to the invention the gripping heads 2 of the jaws are structurally separated from the jaw arms 7. The gripping heads 2 are bearing-mounted to be sliding in a vertical direction at the ends of the jaw arms 7 with the help of slide rails 6. For example a dovetailed form can be a suitable slide rail profile 5. Instead of a slide rail the bearing can be performed also with another linear bearing, for example with a roller bearing set which controls and fits the moveable rail profile, which is attached to the adjacent part, with a bearing.

[0011] The gripping heads 2 slide in the operating mode for the amount of an amplitude created by the vibrator device 1 in relation to the end of the jaw arm 7. This distance is fairly short, at the most 5-10 mm. The gripping head 2 is attached to the end of the jaw arm 7 with the help of damping rubbers 6. The damping rubbers 6 allow the above mentioned moving distance. The vibrator devices 1 are located at the gripping heads 2 and in this example both vibrator devices 1 have two axes. Rotating force is transferred from the upper vibrator axis which can be seen in the figure to the other axis of the vibrator located underneath it with the help of a toothed wheel 3. The vibrator devices 1 are located symmetrically at both sides of the object 18 to be hammered next to it in which case the impacts are being transferred efficiently to the object through gripping devices 4. Only the gripping heads 2 create vibrating movement when the vibrator devices 1 are being activated.

[0012] A body casing 10 which is adjusted around the jaws is shown in the figure 2 from which body casing the device can be attached in a such known way for example to an excavator through a tilting mechanism 15, 16 and a possible rotating device. Structures have been directed from the body casing 10 inwards in order to attach joint pins 11 to a casing 10 and in order to attach a hydraulic motor 8 to the casing 10. Also the other end of the cylinder is attached to the body casing 10. The backmost jaw arms 7 of the pair of jaws, gripping heads 2 and the attachment line L of the object are shown in the figure 2.

[0013] The hydraulic motor 8 rotates through an articulated shaft 11 the upper eccentric axis 19 of both vibrator devices (figures 4 and 5). A diverging rotating movement is arranged for them at their own articulated shafts, but as a mirror image at the same stage, such as is shown more accurately in the figures 4 and 5.

[0014] In the figure 3 a body casing 10 and two support plates 21 which are adjusted inside it are shown in the

figure 3 which body casing and support plates can be used as aids when one attaches for example joint pins 11, the hydraulic motor 8 and a cylinder 9 to the body casing 10.

[0015] The figures 4 and 5 show how two vibrator devices with two axes can be used as vibrator devices 1 the rotating directions of the axes 19 of which vibrator devices are reversed both in relation to the axes 19 of the adjacent vibrator device and in the separate vibrator device. The eccentric masses 20 of the adjacent vibrator devices are located symmetrically in relation to the vertical centre line. When the vibrators are being activated and the jaws are being compressed against each other, the adjacent vibrator devices are almost like the same device regarding their body. One might imagine that they together form a vibrator device with four axes. During the impact situation sideway impacts do not occur in this kind of solution. Only two rotating eccentric masses 20 are needed at the ends of both jaw arms 7 in order to create impacts. Sideway forces are being compensated when the jaw arms 7 are being compressed against each other.

[0016] The above described joining of a vibrator device which is equipped with two eccentric masses 20 can be realized also in such a case wherein the gripping jaws are totally stiff arms without a separate possibility of movement organized for the gripping heads 2. Vibrator devices with two axes are then installed to the jaw arms 7 most advantageously to be located immediately at both sides of the gripping point, such as is shown in the figure 1. In relation to the figure 1 the bearings (5, 6) are missing in this solution and at the same time possibility of separate movement for the gripping heads.

35 Claims

1. Hammering device meant for hammering poles, profiles and other elongated objects into the ground which hammering device comprises a body (10) which can be attached to a working machine, one or more moveable pair of jaws which is attached to the body (10) in order to grip the object to be hammered at least with a side grip wherein the jaws (7, 2) of the pair of jaws can be brought closer or brought farther away from each other with the help of a regulating unit, such as a hydraulic cylinder (9) and the object to be hammered can be pressed between the mentioned jaws (7, 2) and which device further comprises at least two vibrator devices (1) in order to create impacts which can be directed to the object to be hammered and that both jaws (7, 2) of the pair of jaws comprise their own vibrator device (1) the rotations of which vibrator device are synchronized with each other, **characterized in that** both jaws comprise a jaw arm (7) and attached at its end a gripping head (2) which is attached at the end of the jaw arm (7) with the help of a slide rail (5) or with the help of a bearing with a linear direction, wherein the vibrator

devices (1) are located at the mentioned gripping heads (2).

2. Hammering device according to the claim 1, **characterized in that** the slide rail (5) or the bearing has the same direction as the impacts of the vibrator device (1).
3. Hammering device according to the claim 1, **characterized in that** there are damping rubbers (6) in combination with the slide rails (5) or the bearing which damping rubbers attach the gripping heads (2) to the jaw arms (7) and allow a mutual, limited vibration movement for them.
4. Hammering device according to the claim 1, **characterized in that** rotations are arranged from a driving motor (8) to the vibrator devices (1) of the pair of jaws with the help of articulated shafts (11) and the rotations are synchronized to the same stage as a mirror image.
5. Hammering device according to the claim 1, **characterized in that** the moving of the jaws (7, 2) of the pair of jaws is adjusted to occur with the help of toggle joint arms (12) the common toggle joint (17) of the arms of which toggle joint arms is adjusted to be movable with the help of a hydraulic cylinder (9).
6. Hammering device according to the claim 1, **characterized in** by the vibratory devices (1) functioning side by side and being adjusted separately at the gripping heads (2) of both jaw arms (7), wherein these vibratory devices (1) each are comprising two axes (19) with eccentric masses (20) wherein -when the masses are rotating and when the gripping heads (2) of the jaws are being pressed against each other- the operative effect of a vibratory device with four axes with eccentric masses can be achieved by means of the two vibratory devices being installed in this manner, so that -during operation- hardly any sideway impacts are effected. the

Patentansprüche

1. Hammervorrichtung zum Hämmern von Pfosten, Profilen und anderen länglichen Gegenständen in den Boden, wobei die Hammervorrichtung einen Körper (10), der an einer Arbeitsmaschine befestigt werden kann, ein oder mehrere bewegbare Paare von Klauen, die am Körper (10) befestigt sind, um den zu hämmernden Gegenstand mindestens mit einem Seitengriff zu greifen, umfasst, wobei die Klauen (7, 2) des Paares von Klauen mittels einer Regeleinheit, wie etwa einem Hydraulikzylinder (9), einander angenähert oder weiter voneinander getrennt werden können und der zu hämmernde Ge-

genstand zwischen den genannten Klauen (7, 2) gepresst werden kann und wobei die Vorrichtung ferner mindestens zwei Vibratorvorrichtungen (1) umfasst, um Stöße zu erzeugen, die auf beide zu hämmernde Gegenstände gerichtet werden können, und dass beide Klauen (7, 2) des Paares von Klauen ihre eigene Vibratorvorrichtung (1) umfassen, wobei die Drehungen der Vibratorvorrichtung miteinander synchronisiert sind, **dadurch gekennzeichnet, dass** beide Klauen einen Klauenarm (7) und an dessen Ende befestigt einen Greifkopf (2), der an dem Ende des Klauenarms (7) mittels einer Gleitschiene (5) oder mittels eines Lagers mit einer Linearrichtung befestigt ist, umfassen, wobei sich die Vibratorvorrichtungen (1) an den genannten Greifköpfen (2) befinden.

2. Hammervorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Gleitschiene (5) oder das Lager dieselbe Richtung aufweist wie die Stöße der Vibratorvorrichtung (1) .
3. Hammervorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** in Kombination mit den Gleitschienen (5) oder dem Lager Dämpfungsgummis (6) vorgesehen sind, wobei die Dämpfungsgummis die Greifköpfe (2) an den Klauenarmen (7) befestigen und eine wechselseitige begrenzte Vibrationsbewegung für dieselben erlauben.
4. Hammervorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** Drehungen mithilfe von Gelenkwellen (11) von einem Antriebsmotor (8) zu den Vibratorvorrichtungen (1) des Paares von Klauen angeordnet sind und die Drehungen auf dieselbe Stufe wie ein Spiegelbild synchronisiert sind.
5. Hammervorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Bewegung der Klauen (7, 2) des Paares von Klauen derart eingestellt ist, dass sie mittels Kniegelenkarmen (12) erfolgt, wobei das gemeinsame Kniegelenk (17) der Arme der Kniegelenkarme eingestellt ist, um mittels eines Hydraulikzylinders (9) bewegbar zu sein.

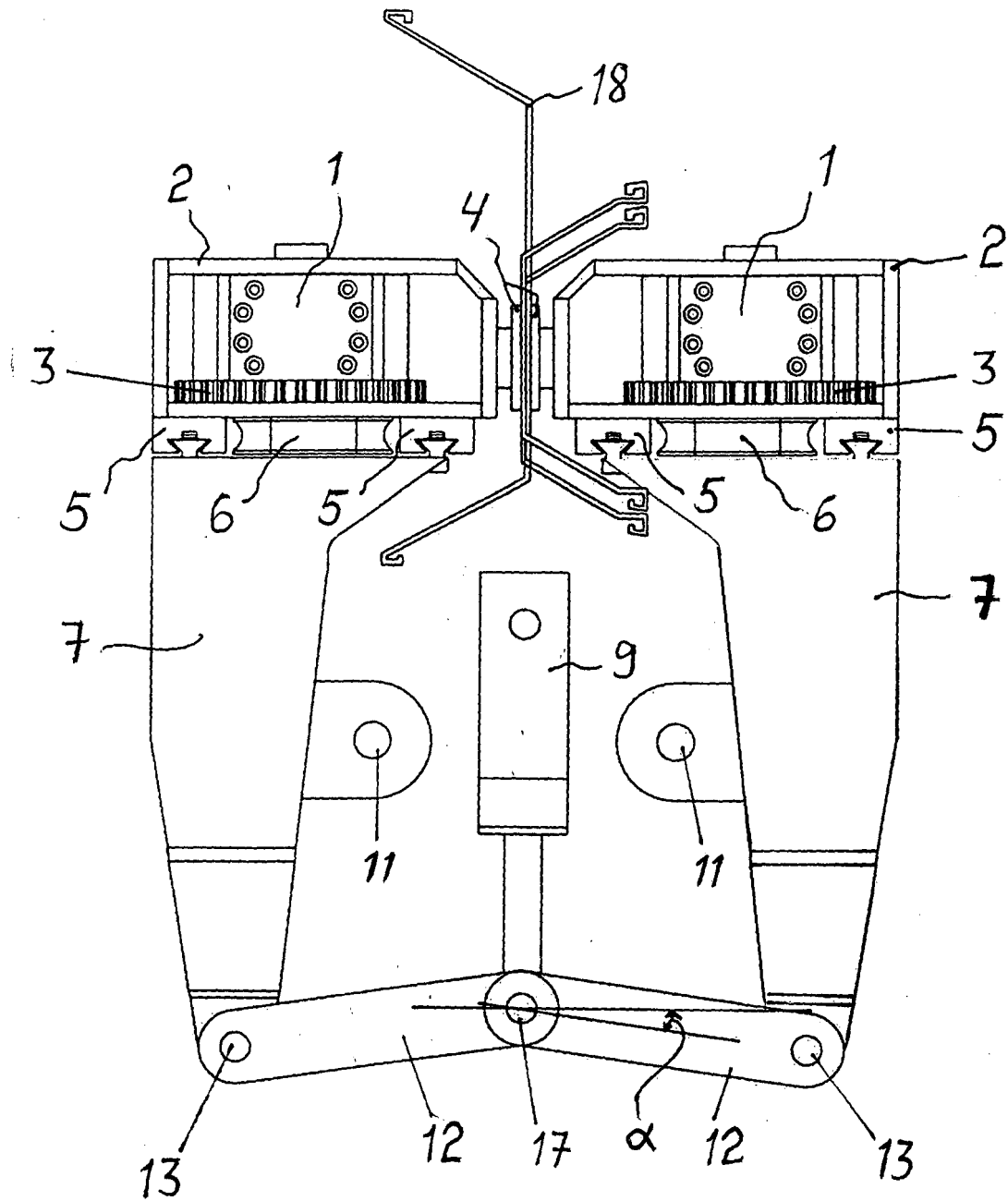
6. Hammervorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Vibratorvorrichtungen (1) Seite an Seite funktionieren und an den Greifköpfen (2) beider Klauenarme (7) separat eingestellt werden, wobei diese Vibratorvorrichtungen (1) jeweils zwei Achsen (19) mit exzentrischen Massen (20) umfassen, wobei, wenn sich die Massen drehen und wenn die Greifköpfe (2) der Klauen gegeneinander gepresst sind, der Wirkeffekt einer Vibratorvorrichtung mit vier Achsen mit exzentrischen Massen mittels der zwei Vibratorvorrichtungen erreicht werden kann, die in dieser Weise installiert sind, derart, dass während des Betriebs kaum Seitenstöße bewirkt

werden.

genouillère est ajustée pour être mobile à l'aide d'un cylindre hydraulique (9).

Revendications

1. Dispositif de martelage conçu pour enfoncer des poteaux, des profilés et d'autres objets allongés dans le sol, lequel dispositif de martelage comprend un corps (10) qui peut être fixé à une machine de travail, une ou plusieurs paires de mâchoires mobiles qui sont fixées sur le corps (10) afin de saisir l'objet à enfoncer au moins avec une pince latérale, dans lequel les mâchoires (7, 2) de la paire de mâchoires peuvent être rapprochées ou éloignées l'une de l'autre à l'aide d'une unité de régulation, tel qu'un cylindre hydraulique (9) et l'objet à enfoncer peut être comprimé entre les mâchoires (7, 2) mentionnées et lequel dispositif comprend en outre au moins deux dispositifs de vibration (1) afin de créer des impacts qui peuvent être dirigés vers l'objet à enfoncer et en ce que les deux mâchoires (7, 2) de la paire de mâchoires comprennent leur propre dispositif de vibration (1), dont les rotations de ce dispositif de vibration sont synchronisées entre elles, **caractérisé en ce que** les deux mâchoires comprennent un bras de mâchoire (7) et, fixée au niveau de son extrémité, une tête de préhension (2) qui est fixée à l'extrémité du bras de mâchoire (7) à l'aide d'un rail de coulissement (5) ou à l'aide d'un palier avec une direction linéaire, dans lequel les dispositifs de vibration (1) sont positionnés au niveau des têtes de préhension (2) mentionnées.
2. Dispositif de martelage selon la revendication 1, **caractérisé en ce que** le rail de coulissement (5) ou le palier a la même direction que les impacts du dispositif de vibration (1).
3. Dispositif de martelage selon la revendication 1, **caractérisé en ce qu'il y a** des caoutchoucs d'amortissement (6) en combinaison avec les rails de coulissement (5) ou le palier, lesquels caoutchoucs d'amortissement fixent les têtes de préhension (2) sur les bras de mâchoire (7) et permettent un mouvement de vibration limité mutuel pour elles.
4. Dispositif de martelage selon la revendication 1, **caractérisé en ce que** des rotations sont agencées d'un moteur d'entraînement (8) aux dispositifs de vibration (1) de la paire de mâchoires à l'aide d'arbres articulés (11) et les rotations sont synchronisées sur le même étage comme une image en miroir.
5. Dispositif de martelage selon la revendication 1, **caractérisé en ce que** le déplacement des mâchoires (7, 2) de la paire de mâchoires est ajusté pour avoir lieu à l'aide des bras de genouillère (12), dont la genouillère (17) commune des bras de ces bras de
6. Dispositif de martelage selon la revendication 1, **caractérisé par** les dispositifs de vibration (1) qui fonctionnent côte à côte et sont ajustés séparément au niveau des têtes de préhension (2) des deux bras de mâchoire (7), dans lequel ces dispositifs de vibration (1) comprennent chacun deux axes (19) avec des masses excentriques (20), dans lequel - lorsque les masses tournent et lorsque les têtes de préhension (2) des mâchoires sont comprimées l'une contre l'autre - l'effet opérationnel d'un dispositif de vibration avec quatre axes avec des masses excentriques peut être obtenu au moyen de deux dispositifs de vibration installés de cette manière, de sorte que - pendant le fonctionnement - presque aucun impact latéral n'est effectué.



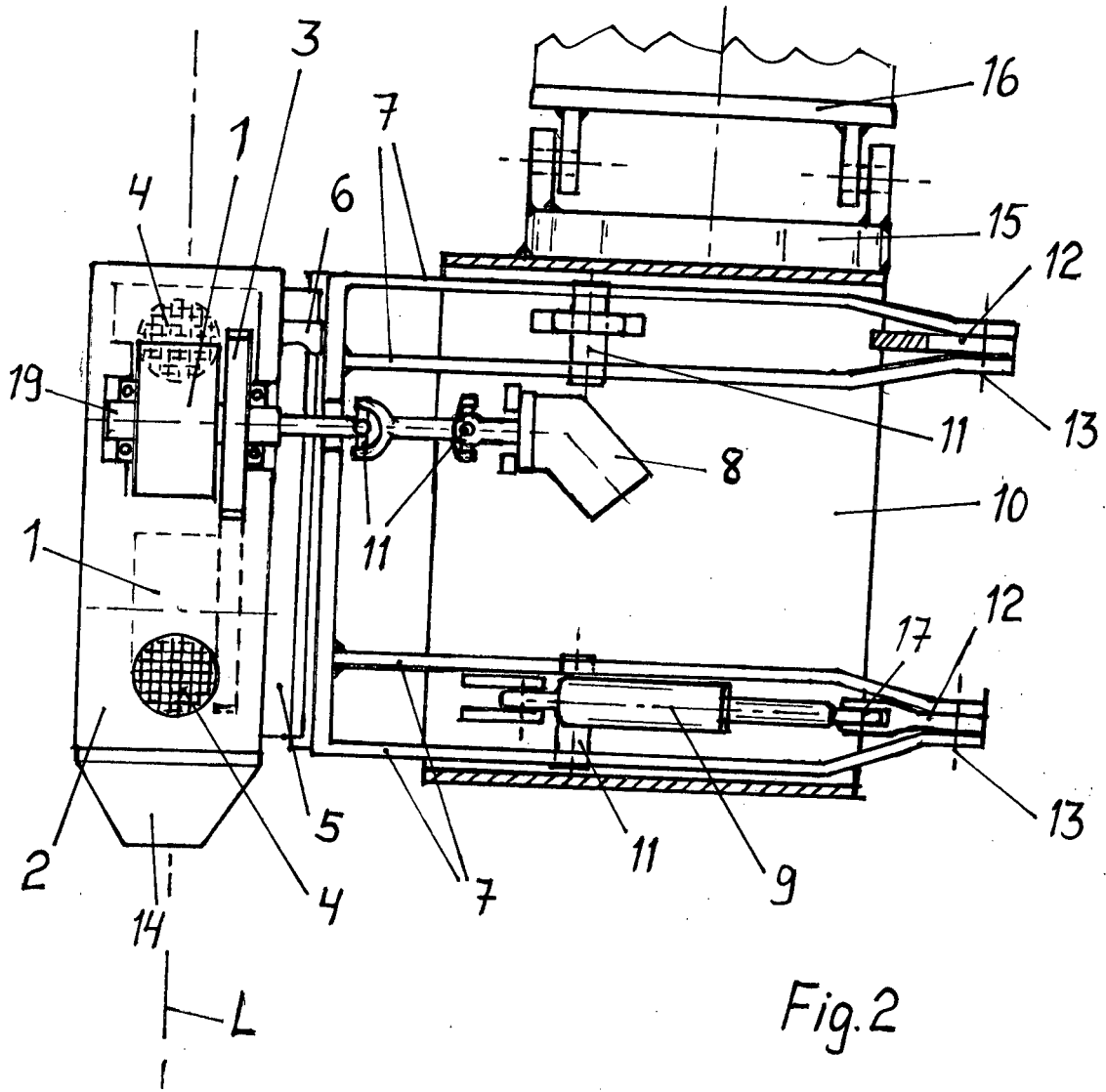


Fig. 2

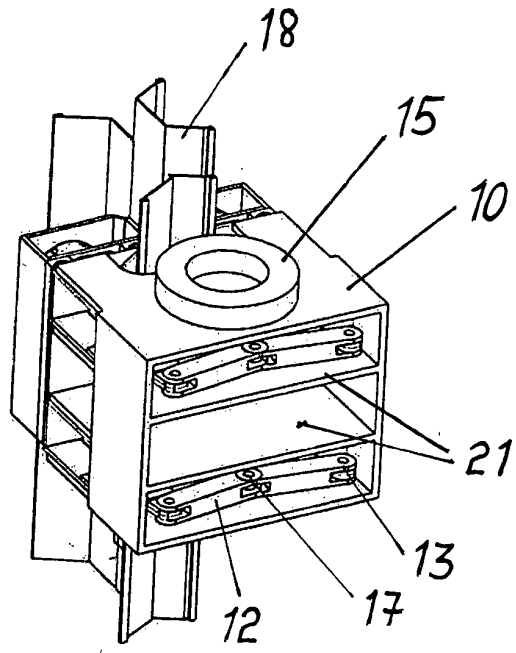
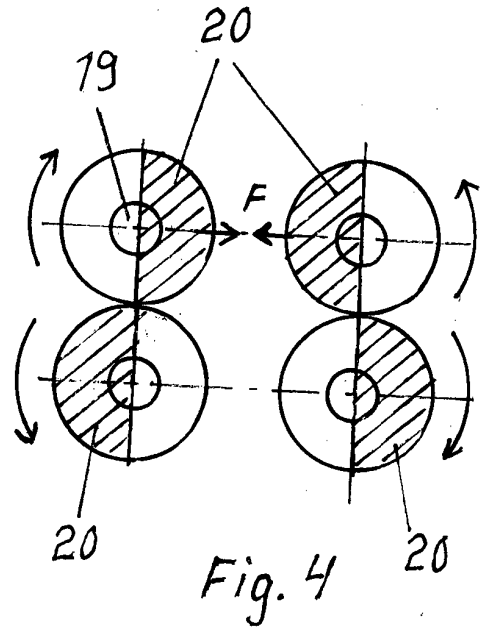
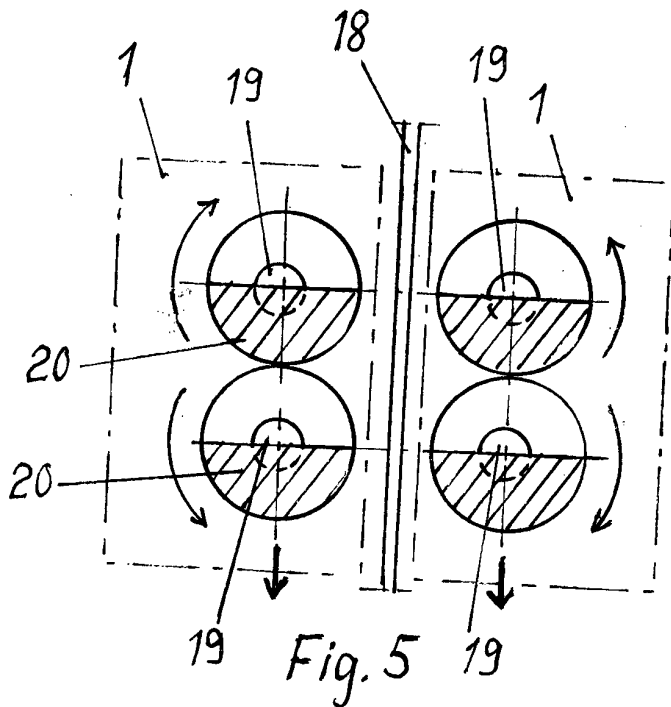


Fig. 3



REFERENCES CITED IN THE DESCRIPTION

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