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(54) **Wiresaw arranged for conducting an endless diamond wire**

Drahtsäge, die zum Führen eines Endlosdiamantdrahts eingerichtet ist

Scie à fil agencée pour réaliser un fil de diamant sans fin

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Description

Introduction and problem to be solved

[0001] It is easy to diamond wire cut out vertical and inclined shafts in the rock because it is rarely a problem with nonplanar cuts. It is very difficult to make straight generally horizontal cuts in the rock, e.g., to cut out a generally horizontal tunnel. An essential problem is to cut a flat floor.

Background art

[0002] Japanese patent publication JP6146285 shows an apparatus for cutting out vertically between two vertical boreholes. According to the Japanese patent publication JP6146285, when a stratum with coarse particle sizes, such as a grained in the foundation to be excavated, stones collapsed with the drive of a wire saw may block the thin groove excavated, and is solved by using an adjustable gap between two cutting wires. US patent US558483 shows an apparatus for wire cutting vertically down by means of the weight of the apparatus. US patent US2050761 shows pulleys that move on tracks along rods 21 by means of a weight. US2577545 shows pulleys that move along guides. US454712 illustrates struts with pulleys that are driven downwards into guide holes using weights. US1735012 shows a screw mechanism for guiding pulleys, and JP5332034 shows pulleys that are moveable along guide rails. JP 01223294 discloses a wire saw as per the preamble of independent claim 1.

Short summary of the invention

[0003] The invention is a wire saw with an endless diamond wire (w)

- wherein said diamond wire (w) is arranged to run between two generally parallel guide liner pipes (1a, 1b)
- wherein said guide liner pipes (1a, 1b) are arranged to be inserted into each one of generally parallel boreholes in rock, for a section between said guide liner pipes to be sawed out,
- wherein said guide liner pipes can be arranged in pairs of parallel drilled holes to form a cut out hole with polygonal cross-section such as rectangular,
- said guide liner pipes can be (1a, 1b) arranged in generally horizontally drilled holes,
- wherein each guide liner pipe (1a, 1b) comprises oppositely facing slits (5a, 5b) to allow said diamond wire (w) to run to an opposite of said guide liner pipes (1b, 1a);
- wherein each said guide liner pipe (1a, 1b) is provided with a longitudinally extending wagon (2) with a motorized tractor (3) arranged to pull said wagon (2) along a guide rail (4) within said guide liner pipe (2a, 2b);

- wherein each said wagon (2) with said tractor (3) is arranged as leading in the working direction of said wire saw in said guide liner pipes (1a, 1b);
- wherein each wagon (2) is provided with a front wire wheel (6a, 6b) and a rear wire wheel (7a, 7b) arranged to guide the diamond wire (w) internally between themselves in each guide liner pipe (1a, 1b), and wherein said diamond wire (w) runs in its cutting direction across between said guide liner pipes (1a, 1b) from one of said front wire wheels (6a, 6b) to an opposite of said front wire wheels (6b, 6a);
- wherein at least said two front wire wheels (6a, 6b) are driven each by its separate motor (8a, 8b) and arranged to drive the diamond wire (w);
- wherein said guide rail (4) is a pitch rack rail and wherein said tractor (3) is provided with a motorized driving gear wheel (31) towards said guide rail (4) and with one or more back supporting wheels (32) to keep said gear wheel steadily towards said guide rail (4);
- wherein said diamond wire (w) runs in its return direction across between said guide liner pipes (1b, 1a) between the opposite rear wire wheel (7b) back to said rear wire wheel (7a);
- and wherein each wagon (2) comprises a telescopically extendable stem (9), each with a linear actuator (10) arranged to tighten said rear wire wheel (7a, 7b) in a backward direction relative to said front wire wheel (6a, 6b) in order to put said diamond wire (w) under tension.

Figure captions

[0004] The invention is illustrated in the enclosed drawings.

Figure 1 shows a hook-on location at the surface of a rock wall wherein one has begun sawing a section between two parallel running boreholes. The apparatus according to the invention is shown in a position wherein the two wagons which lead a diamond wire has sawn a short distance into the rock mass between the two upper holes, and wherein a portion of the rear wire wheels are still extending out beyond the surface. As shown, the work direction is to the left, along the boreholes.

Figure 2 shows an opposite perspective in a somewhat later phase, wherein the whole apparatus has sawn its way into the rock. Here, the working direction shown towards right, with tractors of the device shown running in front in the boreholes. The diamond wire in this situation is completely contained within the rock and no part of it runs outside in free space, and is thus not harmful to operators.

Figure 3 illustrates an embodiment of an longitudinally extending telescopic main frame (9) with the

tractor (3) and front and rear wire wheels (6, 7), all arranged in a guide liner pipe (1) with a slit for diamond wire (w) along a desired side of the guide liner pipe (1).

Figure 4 illustrates the front portion of the device with the tractor (3) and the front wire wheel (6) which is driven by a motor (8), with the wire running through the aperture or slit (5). The guide liner pipe is stationary while the device is moving in such way that the wire cuts through the rock between the slits (5). One advantage of the slit (5) is that it allows the guide liner pipe to be flexible in order to be inserted into and taken out of the boreholes in the rock.

Figure 5 shows an opposite perspective of the tractor (3). Driving chains (33) between the tractor motor (30) and the propulsion gear wheel (31) is left out for drawing clarity.

Figure 6 shows an embodiment of a rear end portion of the apparatus showing the telescopic main frame (9), as well as centering wheels to keep the device centered in the guide liner pipe (1).

Figure 7 illustrates an embodiment of the device according to the invention wherein the rear wire wheel is also provided with a motor.

Figure 8 shows a section of a guide liner pipe (1) with a slit (5) and front-end view of a portion of the apparatus according to the invention. The diamond wire (w) runs out of (or into) the slit (5).

Description of an embodiment of the invention

[0005] The invention is a wire saw arranged to carry an endless diamond wire (w), which saw e.g. in rock. The diamond wire (w) is arranged to run between two generally parallel guide liner pipes (1a, 1b), wherein each guide liner pipe (1a, 1b) is provided with a longitudinally extending wagon (2) with a motorized tractor (3) arranged to pull said wagon (2) along a guide rail (4) within said guide liner pipe (2a, 2b), please see Fig. 1 and Fig. 2, wherein the working direction is indicated by the term "in".

[0006] Each wagon (2) has the tractor (3) arranged in front in the working direction of the wire saw within the guide liner pipes (1a, 1b), please see Fig. 1 and Fig. 2 wherein the working direction is towards the left, respectively right in the drawings. The working direction is not changed, only the perspective is reversed in the two drawings. In Figure 1 there are formed four parallel boreholes wherein the guide liner pipe is shown in the two upper ones. The most suitable for the purpose is to cut out the bottom face first, between the two bottom holes, then lateral surfaces between right lower and right upper boreholes, lower left and upper left respectively, and finally cut between the two upper boreholes. Then the

square core may be removed by blasting or cutting, and you are left with a tunnel with straight, smooth cut walls, bottom and ceiling. It may alternatively be formed shafts.

[0007] There is a significant advantage to have cut walls, floor and ceiling of a tunnel (or shaft) because these will have an intact rock to a significantly greater degree than a blasted tunnel, wherein the explosion causes significant cracking deeply into the rock wall.

[0008] This may be very important with regard to long term storage of radioactive or toxic materials in the tunnels. By sawing out the tunnels the sawn seam will result in that shocks are avoided during the actual cutting.

[0009] Upon removal of the cut out mass by blasting of the prismatic block, vibrations are significantly reduced compared with an ordinary blasted tunnel.

[0010] Upon removal of the mass cut by sawing of the carved prism-shaped mass section by section into the tunnel, the blasting is entirely avoided, and thus all the vibrations caused by blasting are avoided. There are special diamond wire systems for the sawing out of the prism-shaped mass, section by section, i.e. cuts at right angles to the boreholes, and such wire systems are not further discussed in this application.

[0011] The guide liner pipes are used in pairs as shown in Fig. 1 and Fig. 2. The guide liner pipes are continuous throughout the borehole length. They may be composed of 6 meter lengths and joined to form the desired total length, with the slits (5) corresponding at every joint. Each guide liner pipe comprises each its oppositely facing slit (5a, 5b) to allow said diamond wire (w) to run to an opposite of said guide liner pipes (1b, 1a), please see Fig. 1 and Fig. 2, and wherein the diamond wire (w) is also indicated in Fig. 3 running out to one side through the slit (5). Note again that only a small portion of the guide liner pipe (1) is shown. Each wagon is provided with a front wire wheel (6a, 6b) and a rear wire wheel (7a, 7b), please see Fig. 3, arranged to guide said diamond wire (w) internally between themselves in each guide liner pipe (1a, 1b). The diamond wire (w) (6a, 6b) runs from the first forward wire wheel (61, 6b) to an opposite of said front wire wheels (6b, 6a);

[0012] At least said two front wire wheels (6a, 6b) are driven by each its motor (8a, 8b) and arranged to drive said diamond wire (w) please see Fig.3. The diamond wire (w) runs in its return direction across between said guide liner pipes (1b, 1a) between the opposite rear wire wheel (7b) back to the rear wire wheel (7a). The wire saw according to claim 6, wherein at least one of the said rear wire wheels (7) is provided with a rear motor (78) is shown in Fig. 7. This provides a more secure operation with more even pulling of said diamond wire (w).

[0013] Each wagon (2) comprises a telescoping extendable stem (9), each with a linear actuator (10) arranged to tighten the rear wire wheel (7a, 7b) in a rearwards direction relative to said front wire wheel (6a, 6b) in order to tighten the diamond wire (w). This is shown in Fig. 3 and Fig. 7. The linear actuator (10) may be a hydraulic cylinder. In general, all motors in the wire saw

may be of the hydraulic type, and the hydraulic pressure is supplied in hoses through the hook-on end of the guide liner pipes (1) for the wire saw, i.e. the surface of the rock shown in Fig. 1, from where the guide liner pipes (1) are fed in.

[0014] The wire saw according to the invention has the guide rail (4) designed as a pitch rack rail and wherein the tractor (3) is provided with a motor (30) that drives a propulsion gear wheel (31) on the guide rail (4) and with one or more back support wheels (32) for keeping the gear wheel (31) stably against the guide rail (4).

[0015] In an embodiment of the wire saw according to the invention the back support wheels (32) are arranged to run along an opposite face of the guide liner pipe (1) relative to the guide rail (4). For horizontal sawing, for example, the slit (5) may be on a lateral face of the guide liner pipe (1), the guide rail (4) may be along the top of the guide liner pipe (1), and the back support wheels (32) run along the lower portion of the guide liner pipe (1). In this way one may avoid interference between the rails, wire, slit and wheels.

[0016] The wire saw according to the invention may have the back support wheels (32) arranged to run along two opposite faces of the guide liner pipe (1) relative to the guide rail (4) so as for forming corners of a triangle in a cross section of the guide liner pipe. The back support wheels (32) may be arranged to run along one or more auxiliary guide rails (42) arranged in the guide liner pipe (1), please see Fig. 5.

[0017] The wire saw according to the invention is such that the guide liner pipes (1a, 1b) are arranged to be inserted into each one of generally parallel drilled holes in rock, for a section between the guide liner pipes to be sawed out. It is also possible to arrange the guide liner pipe of wire saw in drilled holes in concrete structures, etc. in order to make sections.

[0018] The wire saw according to the invention is arranged so that the guide liner pipes (1a, 1b) can be arranged in generally horizontally drilled holes. A significant advantage of using pair-wise parallel horizontally drilled holes is that one is capable of making a horizontal section (between boreholes at the same elevation) and thus horizontal tunnels with the apparatus. This prevents slack on the wire and thus one may achieve a flat bottom and a flat roof in the tunnel. Thus one may achieve particularly even floor in the tunnel so that it becomes easy to arrange a runway or railway for which there are strict requirements with regard to the evenness of the substrate.

[0019] According to the invention the guide liner pipes can be arranged in pairs of parallel drilled holes to form a cut out hole with polygonal cross-section, e.g. rectangular, triangular, pentagonal, hexagonal.

[0020] The tractors (3) are arranged to be controlled at individual speed rates. It is usually desirable to allow the tractors run parallelly in order to make the diamond wire run the shortest distance between boreholes. The drilled holes may be straight if you want a straight tunnel (or shaft). The drilled holes may have a curvature to drill

a curved tunnel or shaft.

[0021] The wire saw may be remotely controlled wherein the motors are operated via hydraulic hoses so that the operator may stay outside the drill area. It may therefore be so that the wire saw may be operated under water or in places where an operator, due to health and safety considerations, shall not stay e.g. for a toxic or radioactive area.

[0022] For other uses, except for cutting in a rock, the wire saw according to the invention may have guide liner pipes (1a, 1b) arranged to be carried in a structural support frame on either sides of an object subject to a cut, for the sawing of a section between the guide liner pipes. Thus it is possible to put the guide pipes of the wire saw on either sides of a pillar or a pipe, to cut it off in sections e.g. such as on land, above water or under water, e.g. to cut down concrete platforms, pipelines or the similar.

Claims

1. A wire saw with an endless diamond wire (w)

- wherein said diamond wire (w) is arranged to run between two generally parallel guide liner pipes (1a, 1b)
- wherein said guide liner pipes (1a, 1b) are arranged to be inserted into each one of generally parallel boreholes in rock, for a section between said guide liner pipes to be sawed out,
- wherein said guide liner pipes can be arranged in pairs of parallel drilled holes to form a cut out hole with polygonal cross-section such as rectangular,
- said guide liner pipes can be (1a, 1b) arranged in generally horizontally drilled holes,
- wherein each guide liner pipe (1a, 1b) comprises oppositely facing slits (5a, 5b) to allow said diamond wire (w) to run to an opposite of said guide liner pipes (1b, 1a);

characterized in that

- each said guide liner pipe (1a, 1b) is provided with a longitudinally extending wagon (2) with a motorized tractor (3) arranged to pull said wagon (2) along a guide rail (4) within said guide liner pipe (2a, 2b);
- **in that** each said wagon (2) with said tractor (3) is arranged as leading in the worming direction of said wire saw in said guide liner pipes (1a, 1b) ;
- **in that** each wagon (2) is provided with a front wire wheel (6a, 6b) and a rear wire wheel (7a, 7b) arranged to guide the diamond wire (w) internally between themselves in each guide liner pipe (1a, 1b), and wherein said diamond wire (w) runs in its cutting direction across between

said guide liner pipes (1a, 1b) from one of said front wire wheels (6a, 6b) to an opposite of said front wire wheels (6b, 6a);

- **in that** at least said two front wire wheels (6a, 6b) are driven each by its separate motor (8a, 8b) and arranged to drive the diamond wire (w);

- **in that** said guide rail (4) is a pitch rack rail and wherein said tractor (3) is provided with a motorized driving gear wheel (31) towards said guide rail (4) and with one or more back supporting wheels (32) to keep said gear wheel steadily towards said guide rail (4);

- **in that** said diamond wire (w) runs in its return direction across between said guide liner pipes (1b, 1a) between the opposite rear wire wheel (7b) back to said rear wire wheel (7a);

- and **in that** each wagon (2) comprises a telescopically extendable stem (9), each with a linear actuator (10) arranged to tighten said rear wire wheel (7a, 7b) in a backward direction relative to said front wire wheel (6a, 6b) in order to put said diamond wire (w) under tension.

2. The wire saw according to claim 1, wherein said back supporting wheels (32) are arranged to run along an opposite face of said guide liner pipe (1) relative to said guide rail (4).
3. The wire saw according to claim 1, wherein for horizontal cuts, said slit (5) is arranged on said lateral face of said guide liner pipe (1), said guide rail (4) is arranged along said top of said guide liner pipe (1), and said back supporting wheel (32) runs along the lower face portion of the guide liner pipe (11), to avoid interference between said rails, wire, slit and wheels.
4. The wire saw according to claim 1, wherein said back supporting wheel (32) is arranged to run along two opposite faces of said guide liner pipe (1) relative to said guide rail (4) so as to form corners of a triangle in a cross section of said guide liner pipe.
5. The wire saw according to claim 2, 3 or 4, wherein said back supporting wheels (32) run along one or more auxiliary guide rails (42).
6. The wire saw according to one of claims 1 - 5, wherein at least one of said rear wire wheels (7) is provided with a rear motor (78).
7. The wire saw according to one of claim 1, wherein said tractors (3) are arranged to be controlled at individual speed rates.
8. The wire saw according to claim 1, wherein said drilled holes are straight.
9. The wire saw according to claim 1, wherein said

drilled holes have a curvature in order to be able to drill a curved tunnel or shaft.

10. The wire saw according to one of claims 1 - 6, wherein said guide liner pipes (1a, 1b) are arranged to be carried in a structural support frame on either sides of an object to be given a section, for the sawing of a section between said guide liner pipes.

Patentansprüche

1. Seilsäge mit einem Endlosdiamantseil (w),

- wobei das Diamantseil (w) so angeordnet ist, dass es zwischen zwei allgemein parallelen Führungseinsatzrohren (1a, 1b) verläuft,

- wobei die Führungseinsatzrohre (1a, 1b) angeordnet sind, um in jedes einer Anzahl von allgemein parallelen Bohrlöchern in Gestein eingesetzt zu werden, um einen Abschnitt zwischen den Führungseinsatzrohren auszusägen,

- wobei die Führungseinsatzrohre in Paaren von parallelen gebohrten Löchern angeordnet werden können, um ein ausgeschnittenes Loch mit vieleckigem, wie etwa rechteckigem Querschnitt zu bilden,

- wobei die Führungseinsatzrohre (1a, 1b) in allgemein horizontal gebohrten Löcher angeordnet werden können,

- wobei jedes Führungseinsatzrohr (1a, 1b) in entgegengesetzte Richtungen weisende Schlitze (5a, 5b) umfasst, um dem Diamantseil (w) zu gestatten, zu einem entgegengesetzten der Führungseinsatzrohre (1b, 1a) zu verlaufen;

dadurch gekennzeichnet, dass

- jedes Führungseinsatzrohr (1a, 1b) mit einem sich in Längsrichtung erstreckenden Wagen (2) mit einer motorisierten Zugvorrichtung (3), die angeordnet ist, um den Wagen (2) entlang einer Führungsschiene (4) innerhalb des Führungseinsatzrohrs (2a, 2b) zu ziehen, versehen ist;

- dass jeder Wagen (2) mit der Zugvorrichtung (3) so angeordnet ist, dass er in die Arbeitsrichtung der Seilsäge in den Führungseinsatzrohren (1a, 1b) führt,

- dass jeder Wagen (2) mit einem vorderen Seilrad (6a, 6b) und einem hinteren Seilrad (7a, 7b) versehen ist, die so angeordnet sind, dass sie das Diamantseil (w) innen zwischen sich in jedem Führungseinsatzrohr (1a, 1b) führen, und wobei das Diamantseil (w) in seiner Schneidrichtung überkreuz zwischen den Führungseinsatzrohren (1a, 1b) von einem der vorderen Seilräder (6a, 6b) zu einem entgegengesetzten der

- vorderen Seilräder (6b, 6a) verläuft;
 - dass zumindest die beiden vorderen Seilräder (6a, 6b) jeweils von einem getrennten Motor (8a, 8b) angetrieben werden und so angeordnet sind, dass sie das Diamantseil (w) antreiben;
 - dass die Führungsschiene (4) eine Zahnstangenschiene ist, und wobei die Zugvorrichtung (3) mit einem motorisierten Antriebszahnrad (31) zur Führungsschiene (4) hin sowie mit einem oder mehreren Gegenhalterädern (32) versehen ist, um das Zahnrad ständig an der Führungsschiene (4) zu halten;
 - dass das Diamantseil (w) in seiner Rücklauf- richtung überkreuz zwischen den Führungsein- satzrohren (1b, 1a) zwischen dem entgegenge- setzten hinteren Seilrad (7b) zurück zu dem hin- teren Seilrad (7a) verläuft;
 - und dass jeder Wagen (2) einen teleskopartig ausfahrbaren Schaft (9) aufweist, der jeweils einen Linearaktuator (10) aufweist, der angeord- net ist, um das hintere Seilrad (7a, 7b) in eine Rückwärtsrichtung relativ zu dem vorderen Seil- rad (6a, 6b) zu spannen, um das Diamantseil (w) unter Spannung zu setzten.
2. Seilsäge nach Anspruch 1, wobei die Gegenhalte- räder (32) so angeordnet sind, dass sie entlang einer entgegengesetzten Seite des Führungseinsatzrohrs (1) relativ zu der Führungsschiene (4) verlaufen.
3. Seilsäge nach Anspruch 1, wobei für horizontale Schnitte der Schlitz (5) an der seitlichen Fläche des Führungseinsatzrohrs (1) angeordnet ist, die Füh- rungsschiene (4) entlang der Oberseite des Füh- rungseinsatzrohrs (1) angeordnet ist, und das Ge- genhalterad (32) entlang des unteren Seitenab- schnitts des Führungseinsatzrohrs (1) verläuft, um eine Interferenz zwischen den Schienen, dem Seil, dem Schlitz und den Rädern zu verhindern.
4. Seilsäge nach Anspruch 1, wobei das Gegenhal- terad (32) so angeordnet ist, dass es entlang zweier entgegengesetzter Seiten des Führungseinsatz- rohrs (1) relativ zu der Führungsschiene (4) verläuft, um so die Ecken eines Dreiecks in einem Quer- schnitt des Führungseinsatzrohrs zu bilden.
5. Seilsäge nach Anspruch 2, 3 oder 4, wobei die Ge- genhalteräder (32) entlang einer oder mehrerer Zu- satzführungsschienen (42) verlaufen.
6. Seilsäge nach einem der Ansprüche 1 bis 5, wobei zumindest eines der hinteren Seilräder (7) mit einem hinteren Motor (78) versehen ist.
7. Seilsäge nach Anspruch 1, wobei die Zugvorrichtun- gen (3) so angeordnet sind, dass sie mit individuellen Geschwindigkeitsraten angesteuert werden kön-

nen.

8. Seilsäge nach Anspruch 1, wobei die gebohrten Lö- cher gerade sind.
9. Seilsäge nach Anspruch 1, wobei die gebohrten Lö- cher eine Krümmung ausweisen, um einen ge- krümmten Stollen oder Schacht bohren zu können.
10. Seilsäge nach einem der Ansprüche 1 bis 6, wobei die Führungseinsatzrohre (1a, 1b) so angeordnet sind, dass sie an beiden Seiten eines Objekts, das einen Schnitt erhalten soll, zum Sägen eines Schnitts zwischen den Führungseinsatzrohren in ei- ner Trägerrahmenstruktur getragen werden könn- ten.

Revendications

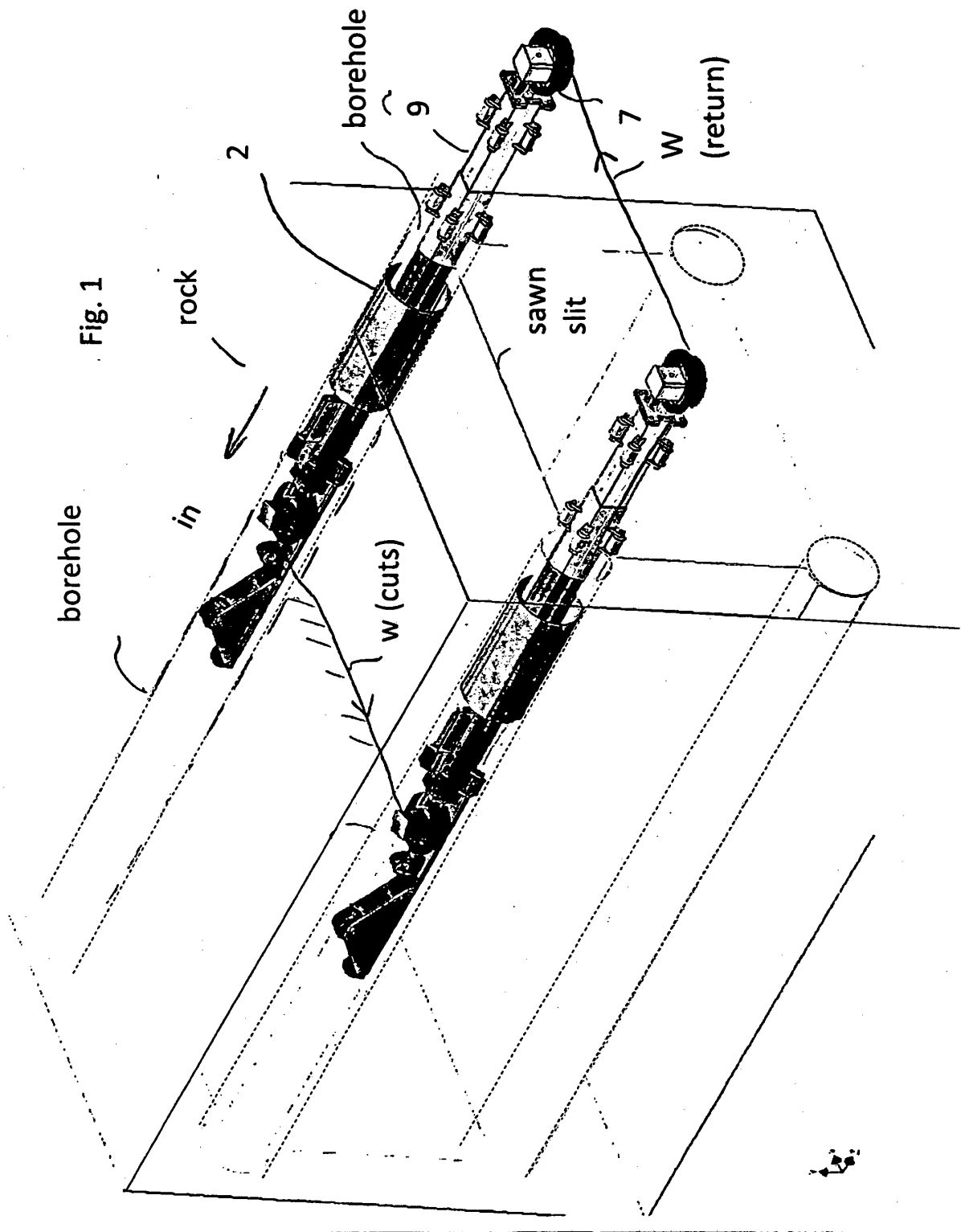
1. Scie à fil avec un fil diamant sans fin (W)

- dans laquelle ledit fil diamant (w) est agencé pour passer entre deux tuyaux de guidage à gar- niture globalement parallèles (1a, 1b)
 - dans laquelle lesdits tuyaux de guidage à gar- niture (1a, 1b) sont agencés pour être insérés dans chacun des trous de forage globalement parallèles dans une roche, pour une section en- tre lesdits tuyaux de guidage à garniture devant être sciée,
 - dans laquelle lesdits tuyaux de guidage à gar- niture peuvent être agencés en paires de trous forés parallèles pour former un trou découpé avec une section transversale polygonale par exemple rectangulaire,
 - lesdits tuyaux de guidage à garniture (1a, 1b) peuvent être agencés dans des trous forés de manière globalement horizontale,
 - dans laquelle chaque tuyau de guidage à gar- niture (1a, 1b) comprend des fentes opposées (5a, 5b) pour permettre audit fil diamant (w) de passer à un tuyau de guidage à garniture oppo- sé desdits tuyaux de guidage à garniture (1a, 1b) ;

caractérisée en ce que

- chacun desdits tuyaux de guidage à garniture (1a, 1b) est pourvu d'un chariot s'étendant lon- gitudinalement (2) avec un tracteur motorisé (3) agencé pour tirer ledit chariot (2) le long d'un rail de guidage (4) à l'intérieur dudit tuyau de gui- dage à garniture (2a, 2b) ; i
 - **en ce que** chacun desdits chariots (2) avec ledit tracteur (3) est agencé en avant dans la direction de travail de ladite scie à fil dans lesdits tuyaux de guidage à garniture (1a, 1b);

- **en ce que** chaque chariot (2) est pourvu d'une roue à rayons métalliques avant (6a, 6b) et d'une roue à rayons métalliques arrière (7a, 7b) agencées pour guider le fil diamant (w) de l'intérieur entre elles-mêmes dans chaque tuyau de guidage à garniture (1a, 1b), et dans laquelle ledit fil diamant (w) passe dans sa direction de découpage entre lesdits tuyaux de guidage à garniture (1a, 1b) de l'une desdites roues à rayons métalliques avant (6a, 6b) à une roue à rayons métalliques opposée desdites roues à rayons métalliques avant (6b, 5a) ;
- **en ce qu'**au moins lesdites deux roues à rayons métalliques avant (6a, 6b) sont entraînées chacune par son propre moteur (8a, 8b) et agencées pour entraîner le fil diamant (W) ;
- **en ce que** ledit rail de guidage (4) est une crémaillère et dans laquelle ledit tracteur (3) est pourvu d'une roue dentée d'entraînement motorisée (31) vers ledit rail de guidage (4) et avec une ou plusieurs roue(s) de support arrière (32) pour maintenir ladite roue dentée fixement vers ledit rail de guidage (4) ;
- **en ce que** ledit fil diamant (w) retourne dans sa direction de retour entre lesdits tuyaux de guidage à garniture (1b, 1a) entre la roue à rayons métalliques arrière opposée (7b) de retour vers ladite roue à rayons métalliques arrière (7a) ;
- et **en ce que** chaque chariot (2) comprend une tige pouvant s'étendre de manière télescopique (9), chacune avec un actionneur linéaire (10) agencé pour serrer ladite roue à rayons métalliques arrière (7a, 7b) dans une direction arrière par rapport à ladite roue à rayons métalliques avant (6a, 6b) afin de mettre ledit fil diamant (W) sous tension.
2. Scie à fil selon la revendication 1, dans laquelle lesdites roues de support arrière (32) sont agencées pour passer le long d'une face opposée dudit tuyau de guidage à garniture (1) par rapport audit rail de guidage (4).
3. Scie à fil selon la revendication 1, dans laquelle pour des coupes horizontales, ladite fente (5) est agencée sur ladite face latérale dudit tuyau de guidage à garniture (1), ledit rail de guidage (4) est agencé le long de ladite partie supérieure dudit tuyau de guidage à garniture (1), et ladite roue de support arrière (32) passe le long de la partie de face inférieure du tuyau à garniture de guidage (1), pour éviter toute interférence entre lesdits rails, fil, fente et roues.
4. Scie à fil selon la revendication 1, dans laquelle ladite roue de support arrière (32) est agencée pour passer le long de deux faces opposées dudit tuyau de guidage à garniture (1) par rapport audit rail de guidage (4) de manière à former les sommets d'un triangle
- dans une section transversale dudit tuyau à garniture de guidage.
5. Scie à fil selon la revendication 2, 3 ou 4, dans laquelle lesdites roues de support arrière (32) passent le long d'un ou de plusieurs rail(s) de guidage auxiliaire(s) (42).
6. Scie à fil selon l'une des revendications 1 à 5, dans laquelle au moins l'une desdites roues à rayons métalliques arrière (7) est pourvue d'un moteur arrière (78).
7. Scie à fil selon la revendication 1, dans laquelle lesdits tracteurs (3) sont agencés pour être commandés à des vitesses individuelles.
8. Scie à fil selon la revendication 1, dans laquelle lesdits trous forés sont droits.
9. Scie à fil selon la revendication 1, dans laquelle lesdits trous forés ont une courbure afin d'être capables de forer un tunnel ou un arbre courbé.
10. Scie à fil selon l'une des revendications 1 à 6, dans laquelle lesdits tuyaux de guidage à garniture (1a, 1b) sont agencés pour être portés dans un cadre de support structurel sur les deux côtés d'un objet pour leur donner une section, pour le sciage d'une section entre lesdits tuyaux à garniture de guidage.



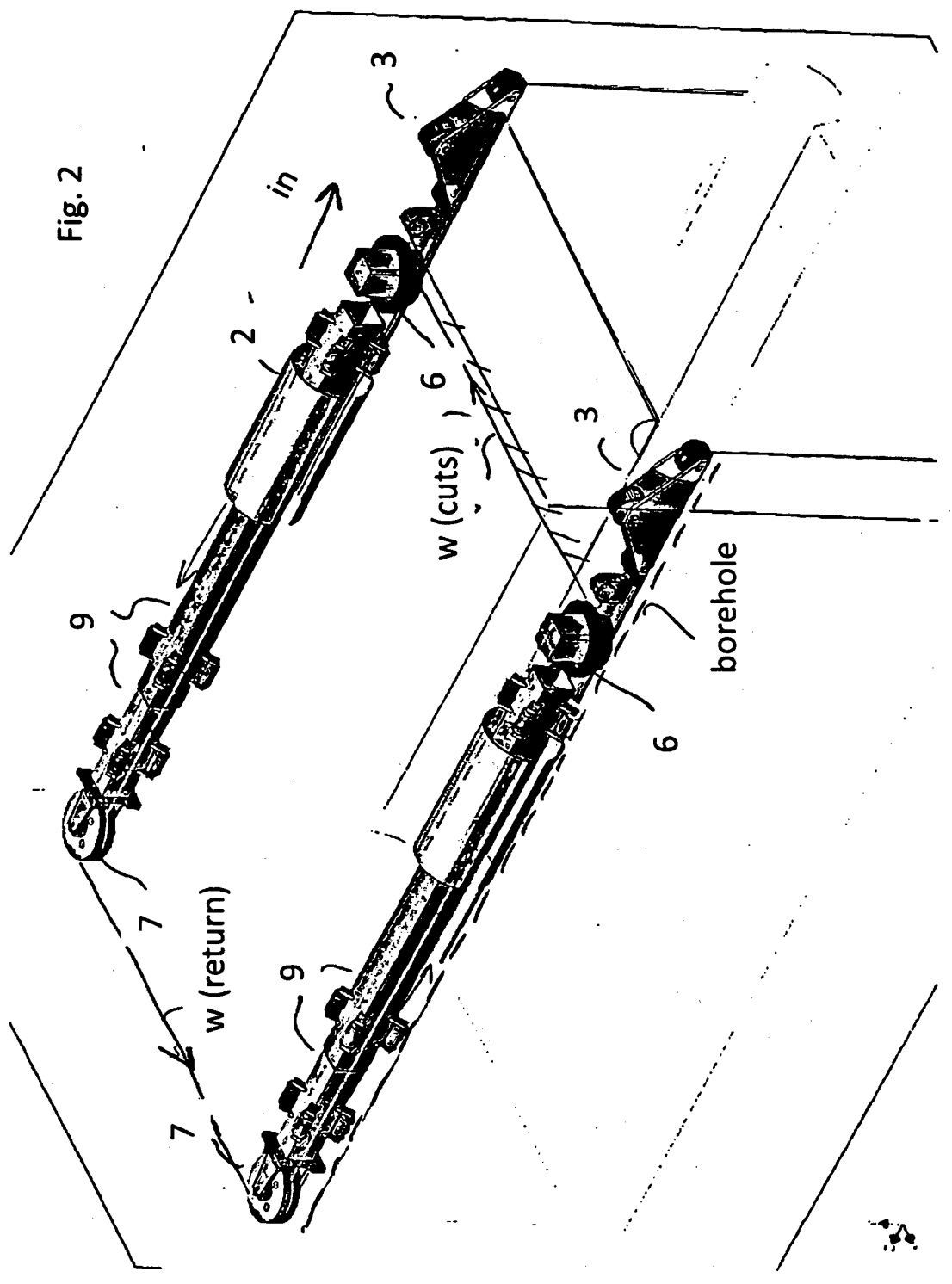
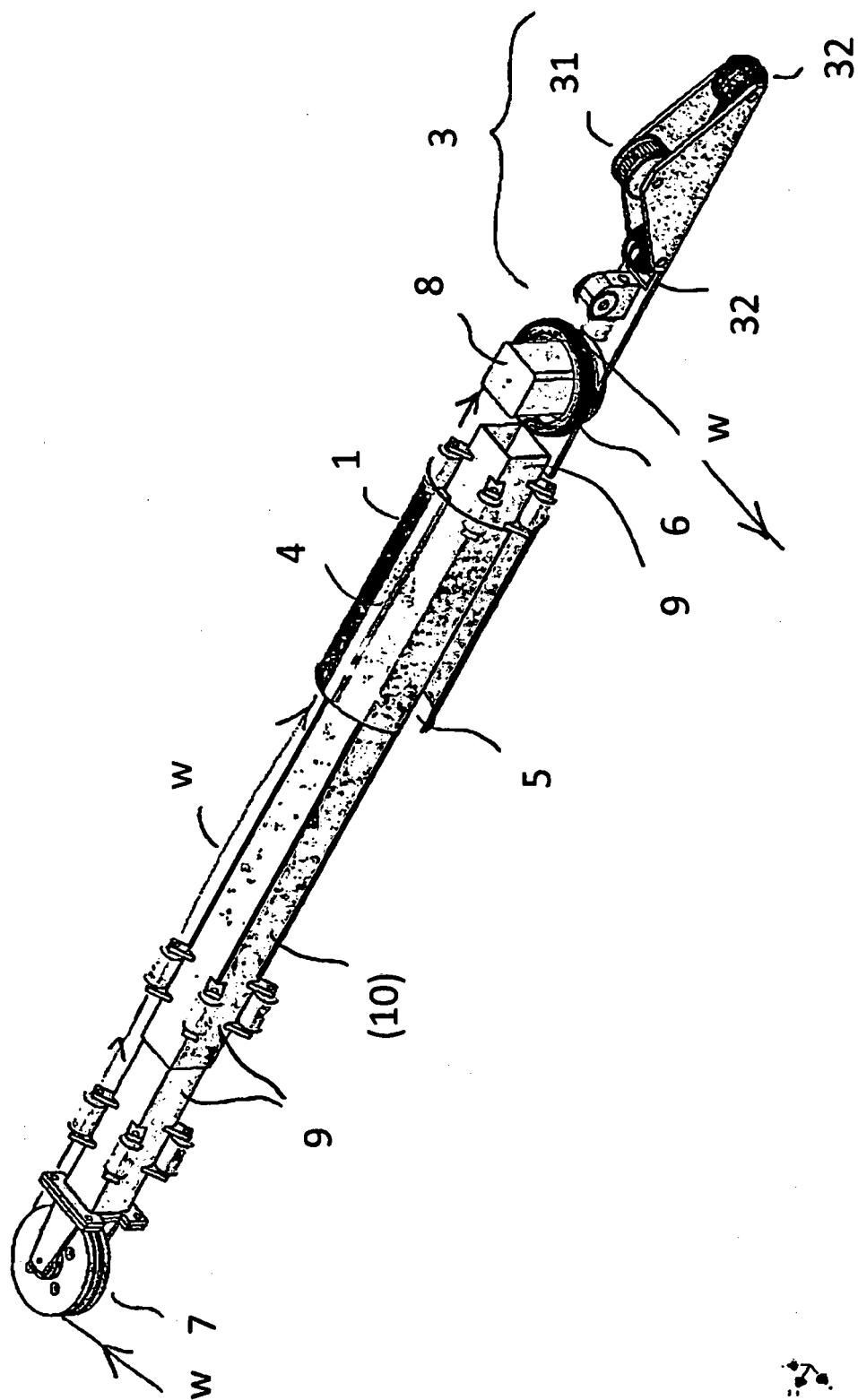


Fig. 3
(one motor)



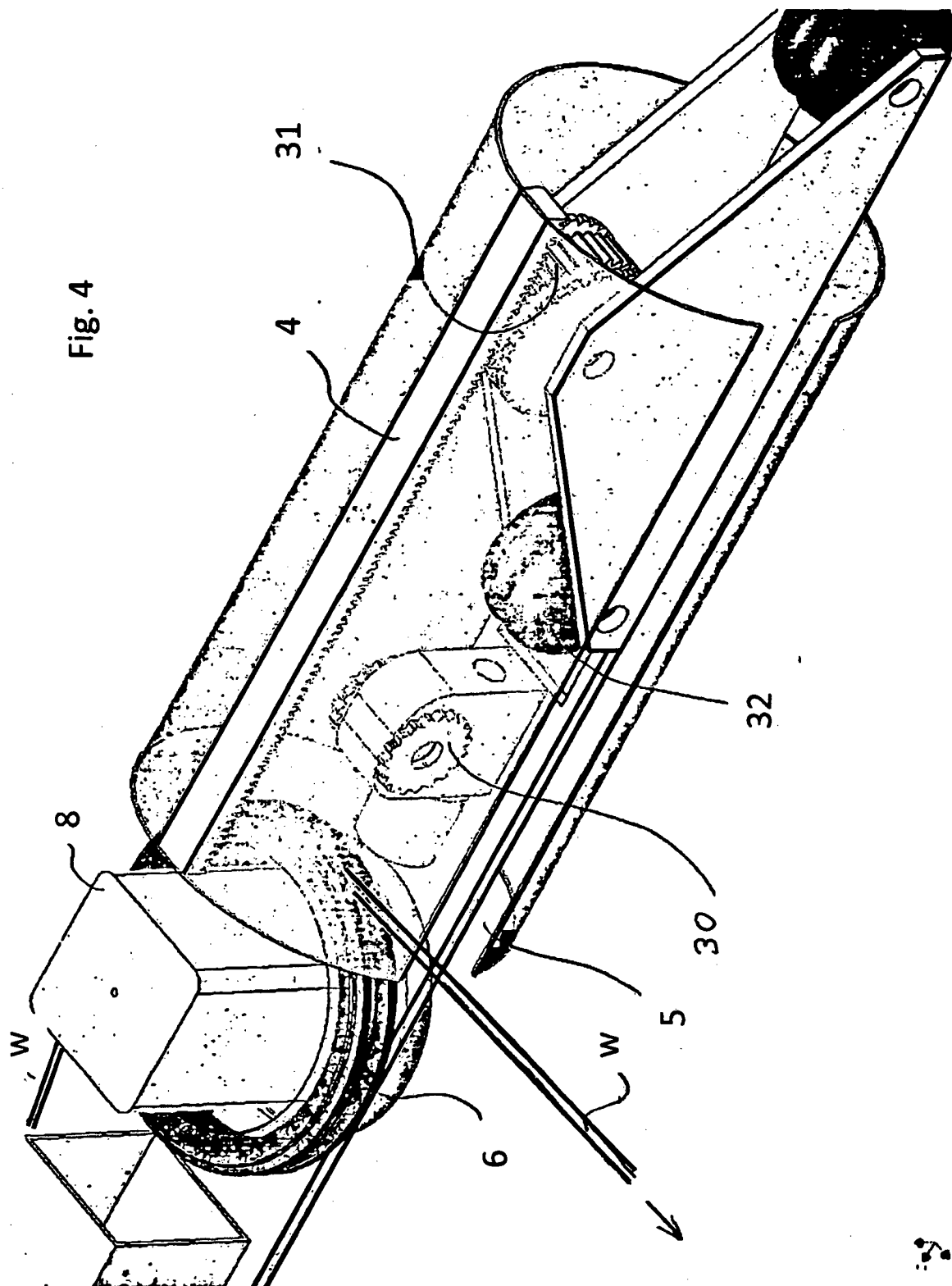


Fig. 5

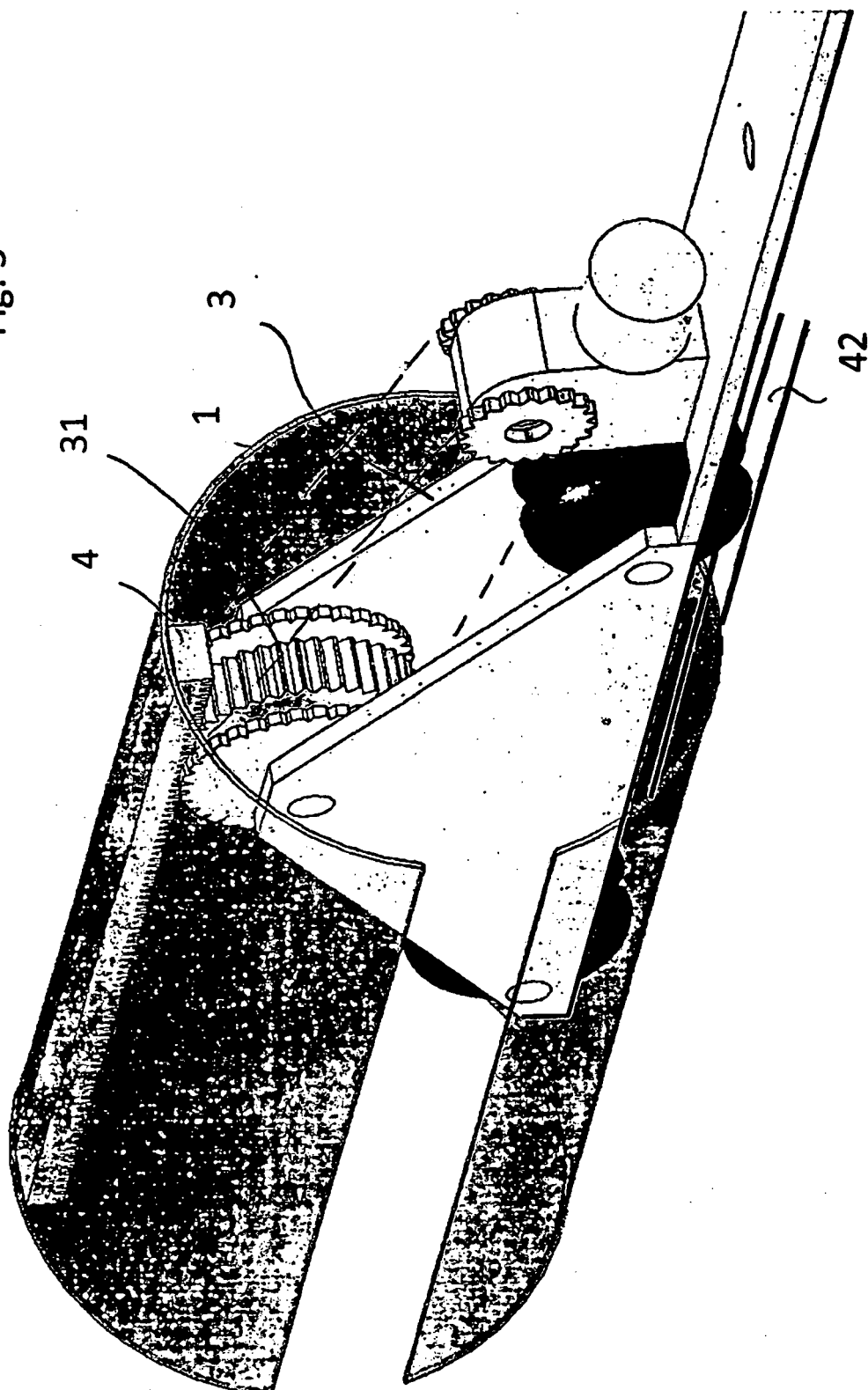


Fig. 6

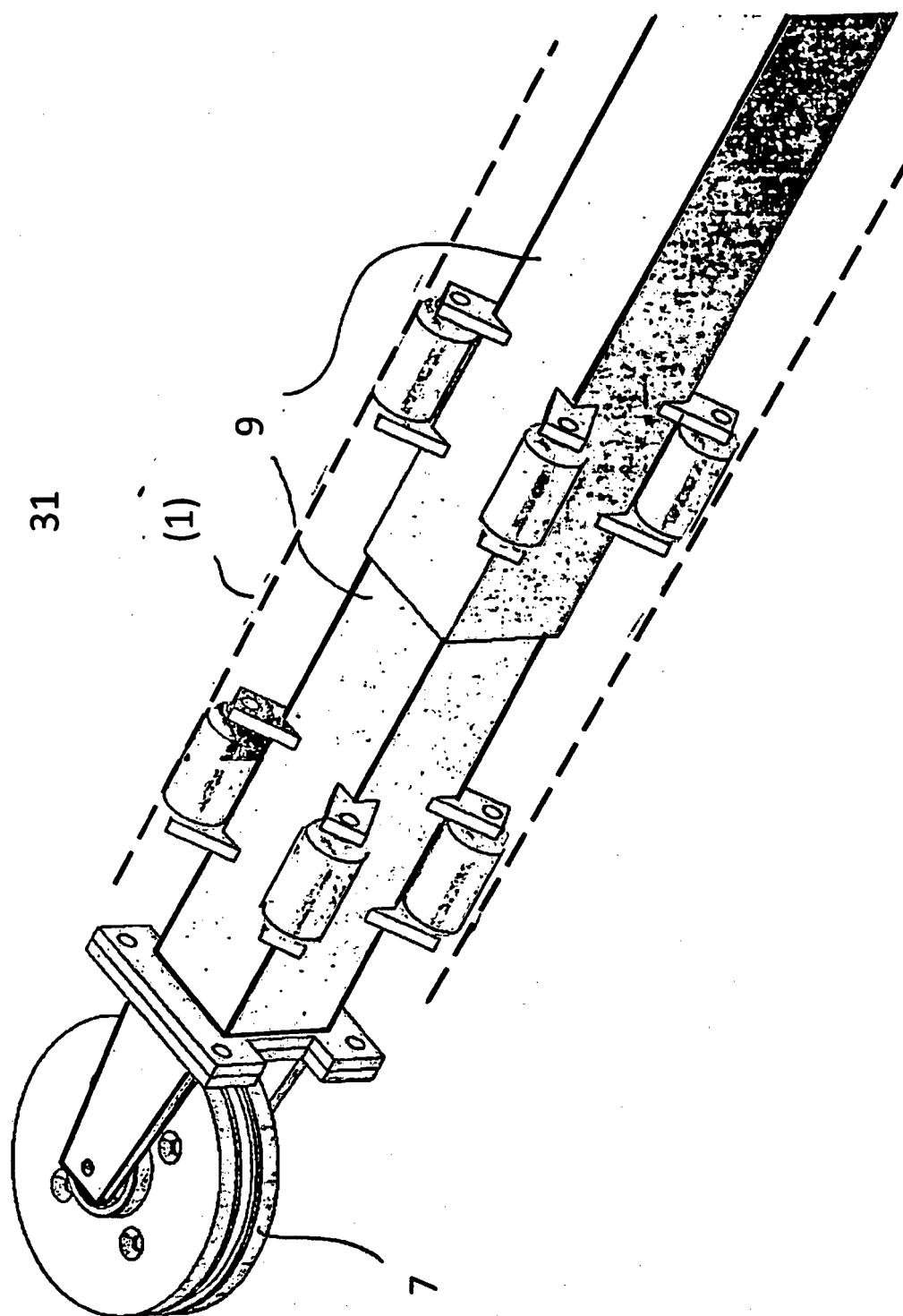
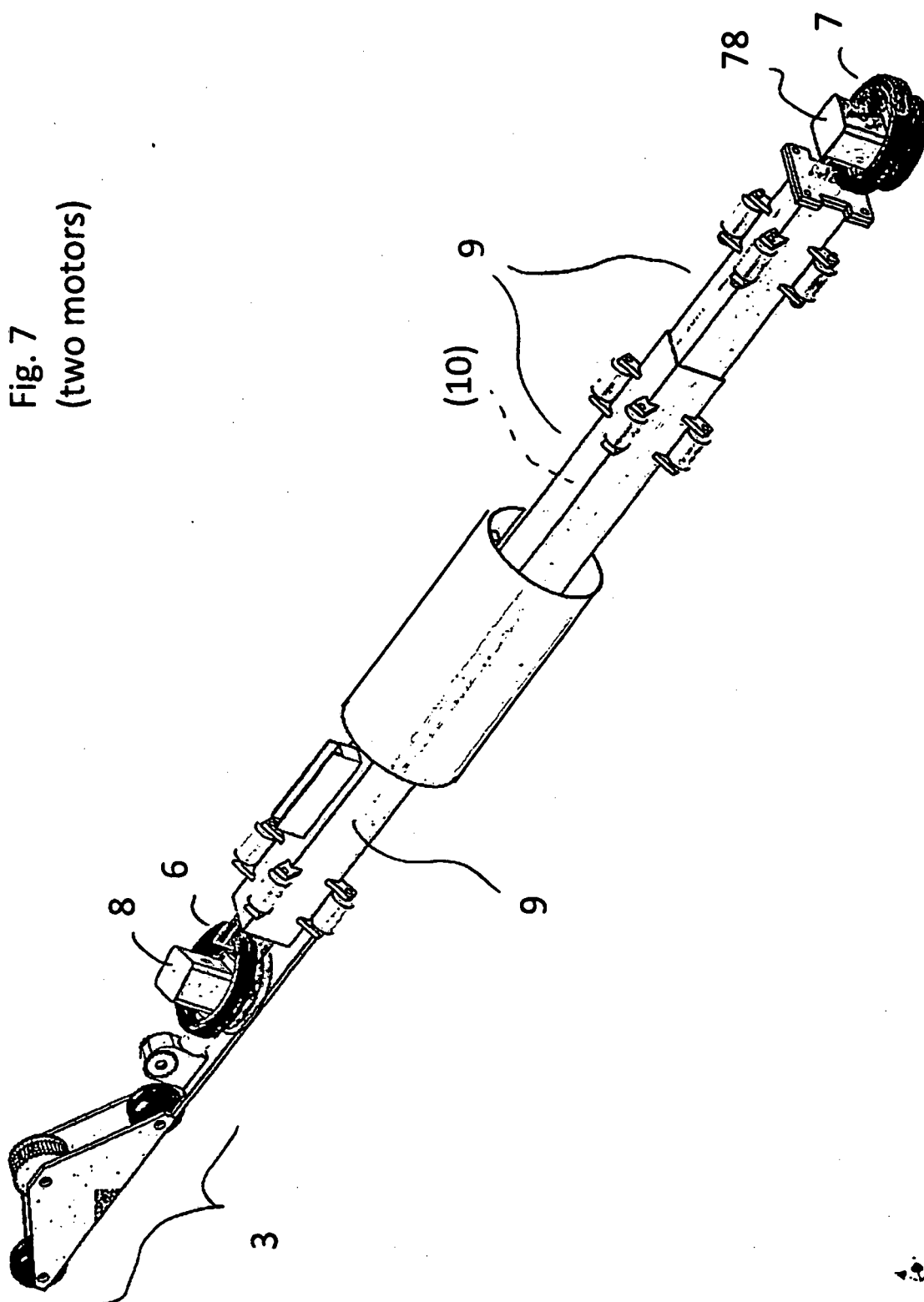
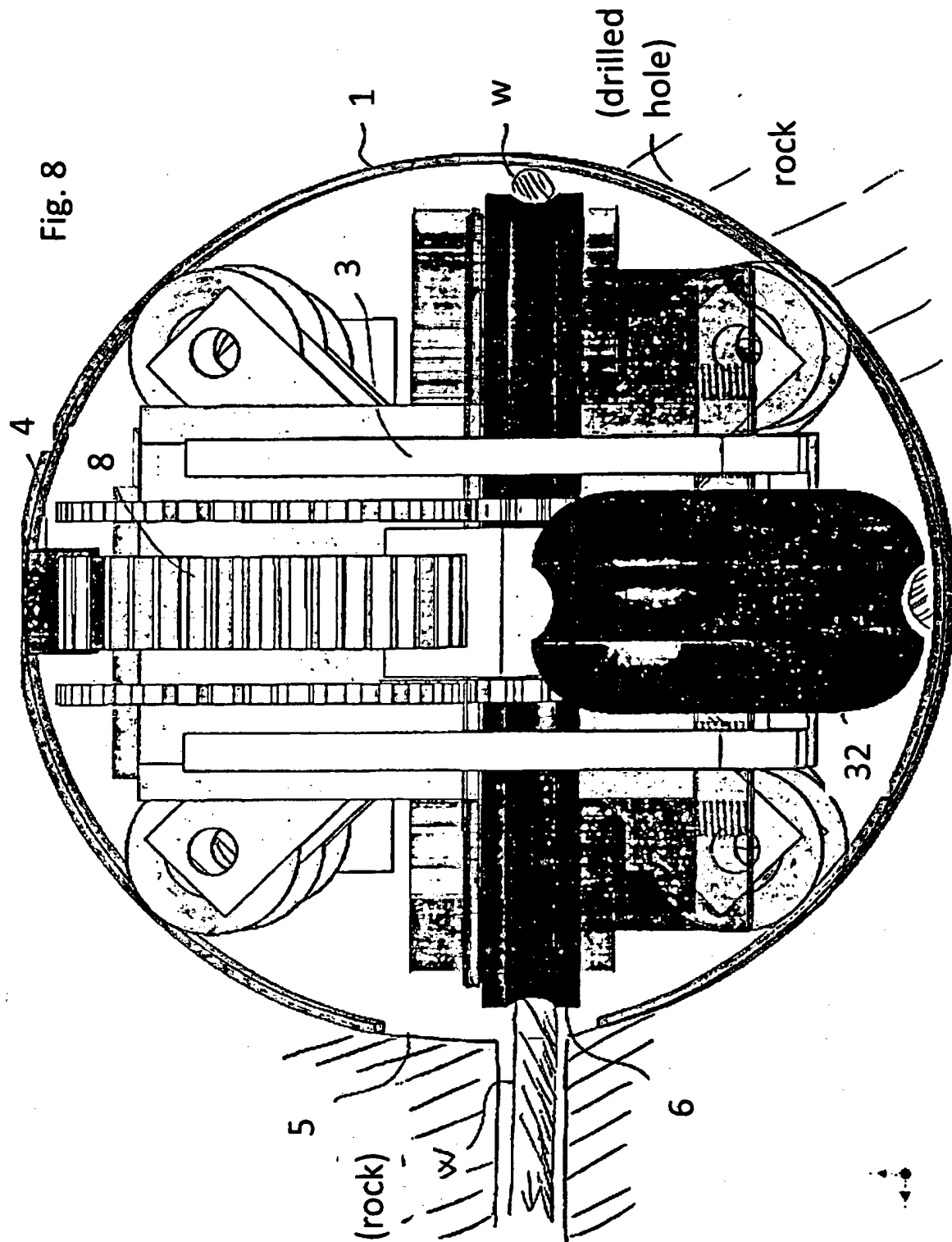


Fig. 7
(two motors)





REFERENCES CITED IN THE DESCRIPTION

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