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Courier Press, Leamington Spa, England.

Land mine having timed ignition means

TECHNICAL FIELD

The present invention relates to a mine of the kind which includes a casing, and ignition means, a de-masking charge, a detonator charge and an explosive charge contained in said casing.

The ignition means includes divers means required for the intended function of the mine under predetermined conditions.

The de-masking charge is intended to blow away part of the mine (the upper part) subsequent to the detection of, for example, an enemy vehicle, but prior to causing the mine to explode.

The detonator charge is intended for the preparation of the actual explosion.

The explosive charge creates the explosion for destroying the enemy vehicle.

BACKGROUND ART

Many different embodiments of mines of the kind described in the aforegoing are known to the art. Known to the art are mines having ignition means which include a clock movement for operating a mechanism in accordance with a given program. The mines are provided with safety means to ensure against premature explosion or to prevent the mines from exploding subsequent to a given lapse of time, etc. It has been found, however that the drive means (the clock movement) are able to function in a manner not intended (e.g. as a result of racing), and that, for some reason or another, the safety means have not functioned correctly or have not been handled in the manner intended, and hence the risk of such mines exploding in a non-planned manner is too great to be accepted.

DISCLOSURE OF THE INVENTION

The object of the present invention is to eliminate the aforementioned disadvantages and to increase therewith the safety of mines of the described kind. A mine constructed in accordance with the invention includes an electric motor which is driven by an energy source and which is arranged to rotate at a speed exceeding 5000 r.p.m. and to activate the de-masking charge and the detonator charge at given pre-determined external conditions, via a transmission means and an operating shaft.

These and other characteristic features of a mine constructed in accordance with the invention are disclosed in the accompanying claims.

SHORT DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail with reference to the accompanying drawings, in which Figure 1 illustrates in plan view a mine according to the invention;

Figure 2 is a sectional view of the mine illustrated in Figure 1;

Figure 3 illustrates two safety means and an operating shaft which is capable of being activated by said safety means and which is arranged to enable activation of the de-masking charge and the detonator charge incorporated in the mine; and

Figure 4 illustrates the operating shaft and a marking means which is actuatable by the operating shaft.

PREFERRED EMBODIMENT

Figure 1 illustrates in plan view a mine constructed in accordance with the invention, said mine having a casing 10 which contains an ignition means, a de-masking charge, a detonator charge and an explosive charge. For the purpose of rendering the mine safe and live respectively, there are provided two safety means 11, 12 which, during storage of the mine and the transportation thereof, etc., are locked in a safe position by means of a transport safety means 13, which, in turn, is held in place by a metal wire 14. The safety means 11 is prevented from rotating clockwise by an edge 131 on the transport safety means 13, while an edge 132 prevents clockwise rotation of the safety means 12 in a corresponding manner. The knob or handle of respective safety means points towards markings illustrated by horizontal sectioning in the drawing ("green"), showing that the mine has been made safe. This marking is also shown in a window 15 arranged in the lid of the mine. When the mine is safe, the safety means 11, 12 prevent an operating shaft 30 from rotating (see Figure 3).

Before placing the mine in the ground, the mine must be made live. This is effected by removing the metal wire 14 and the transport safety means 13, whereafter the safety means 11, 12 are depressed and turned clockwise through 90°. The knob or handle of the safety means will then point towards markings having vertical sectioning in the drawing ("red"), showing that the mine is live. The marking visible in the window 15, however, is still sectioned horizontally ("green").

When the safety means 11, 12 occupy their non-safe position, a current path is connected to an electric motor 20 incorporated in the mine (see Figure 2). At the same time a current path is connected to an electronic unit which includes a timing device and after a lapse of about 10 minutes connects a current path to the ignition means. Also, the operating shaft 30 is mechanically freed, see Figure 3, said shaft 30 being driven by the electric motor and thus begins to rotate as soon as the safety means 11, 12 take their non-safe position.

The motor 20 is arranged to rotate at a relatively high speed, e.g. a speed of about 15000 r.p.m., and drives the operating shaft 30 via a transmission means at a transmission ratio

of 600000:1. After a lapse of about 10 minutes, the shaft 30 will have rotated through about 90°. In this position, two bores extending through the shaft 30 at right angles to the long axis of said shaft will adopt positions such that one bore enables detonation of the de-masking charge while the other bore enables detonation of the detonator charge. These charges, however, can only be detonated when a magnetic sensor incorporated in the mine detects, in a known manner, the presence of an enemy vehicle, such as a tank. As the shaft 30 rotates, it turns a marking shaft which exhibits at one end thereof a marking which can be seen through the window 15. As previously mentioned, this marking has the form of horizontal sectional lines ("green"), when the mine is safe, and vertical section lines ("red"), when the shaft 30 has been rotated through said 90° after a lapse of 10 minutes.

The sectional view shown in Figure 2 illustrates the casing 10, a casing lid 21, a battery 22 for operating the electrical motor 20, the de-masking charge 23, the detonator charge 24, the magnetic sensor 27, the ignition means 25 and the explosive charge 26. The transport safety means 13 and the safety means 11 are shown arranged on the lid 21.

As previously mentioned, Figure 3 illustrates the manner in which the safety means 11, 12 prevent rotation of the operating shaft 30. As will be seen, these safety means in the safe position both engage recesses in the shaft 30. Thus, even if the motor were energized and therewith activated for rotation of the shaft 30, the shaft is unable to rotate before both safety means have been mechanically moved from the safe position.

After a time lapse of about 10 minutes subsequent to rendering the mine live, the mine will thus be ready to be exploded. Meanwhile the timing means in the electronic unit is operative, and if the mine has not been caused to explode within a period of 30 days, a further current circuit is connected to the motor 20, which then begins to rotate the operating shaft through 270°, back to the starting position. The two bores arranged in the shaft 30 will then be rotated out of the positions necessary for effecting a detonation, i.e. the detonator charge and the de-masking charge can not now be detonated. In addition hereto, one of the safety means 11, 12 will be lifted by the shaft 30 in a manner such that said safety means, subsequent to the shaft 30 being rotated through a complete turn, will prevent the shaft 30 from being rotated through a further revolution before the safety means has been reset. The safe, green marking will now be shown in the window 15.

Rotation of the operating shaft 30 after said lapse of 30 days also causes an activating means 40, see Figure 4, to be displaced in a manner such as to activate a marking means (not shown in Figure 4) arranged to mark above the surface of the ground the position of the mine beneath said surface.

Figure 4 illustrates the position of the shaft 30 10 minutes after the mine has been made live and buried in the ground.

A stop screw 41 extends vertically downwardly and projects slightly outside the shaft. When the shaft 30 is rotated through 270° to its starting position after the aforementioned lapse of 30 days, the stop screw 41 during its rotation will engage the edge of the activating means 40, which in the illustrated embodiment comprises a spring-actuated ignition plug. The spring is tensioned during movement of the ignition plug to the right, and, at the same time, a protective cover plate 42 is rotated out of the illustrated position, in which it covers an opening 43 intended for the passage of the ignition plug. Upon continued rotation of the shaft 30, the mechanical contact of the stop screw 41 with the ignition plug 40 ceases, therewith releasing and igniting the marking means on the other side of the opening 43. This means, which comprises a change and a "flag" fixed to a line at the mine casing is therewith shot through the layer of earth above the mine, to disclose the position of the mine. The mine, which is now safe, can be lifted from the ground without risk, thereafter the safety means 11, 12 are rotated to the starting position ("green"). Subsequent to changing the battery 22 and the marking means, the mine is again ready for renewed burial in the earth.

The speed of the motor 20 should not be less than 5000 r.p.m. or greater than 200000 r.p.m.

Figure 2 also illustrates the two bores 301 and 302 of the operating shaft 30, and the electronic unit 28. Adjacent the bore 302 is a detonating cap which is arranged to detonate the de-masking charge which, in turn, intitiates detonation of the detonator charge through a delay capsule in the ignition means 25.

Claims

1. A mine comprising a casing, containing an explosive charge (26), a detonator charge (24), a de-masking charge (23), and an ignition means (25) with an electric motor (20) and timing means, characterized in that the electric motor (20) is arranged to rotate at a speed exceeding 5000 r.p.m. and to enable detonation of the de-masking charge and the detonator charge at given, pre-determined external conditions through a transmission and an operating shaft (30), and in that the timing means is arranged to control the electric motor (20) in a manner such

a) that the motor is caused to start and to operate during a given first time period until the shaft (30) has been rotated to an angular position necessary for said detonation of the de-masking charge (23) and the detonator charge (14), whereafter the motor is stopped,

b) that in the event of the mine not being exploded, the motor, after a given second time period, is caused to restart and to operate until the shaft (30) has been rotated to an angular position which lies completely out of the detonating position of the shaft, and

c) thereupon to actuate marking means arranged to mark above the surface of the ground the position of the mine beneath said surface.

2. A mine according to claim 1, characterized in that the motor (20) is arranged to rotate at a speed below 20000 r.p.m. and preferably at a speed of approximately 15000 r.p.m.

3. A mine according to claim 1 or claim 2, characterized in that there are provided two externally, mechanically actuatable safety means (11, 12) which when occupying their safe position prevent the operating shaft (30) from being rotated.

4. A mine according to claim 1, characterized in that arranged in the operating shaft (30) are two bores which extend at right angles to the long axis of the shaft, of which bores one in said given position of the operating shaft (30) enables detonation of the de-masking charge (23), while the other bore enables detonation of the detonator charge (24).

5. A mine according to claim 1 characterized in that the timing means is arranged to control the motor (20) after the two safety means (11, 12) have been moved from their safe position.

6. A mine according to claim 1, characterized in that the activating means comprises a body which is connected to the mine by means of a line and which can be propelled upwardly by means of an explosive charge.

7. A mine according to claim 1, characterized in that the operating shaft (30) is arranged, subsequent to continued rotation of said shaft after being displaced from said first given position, to also activate one of the two safetv means (11, 12) to a safe position, thereby ensuring that the operating shaft (30) can not be caused to commence a further turn before the safety means (11, 12) have again been mechanically activated.

8. A mine according to claim 1, characterized in that the operating shaft (30) is arranged to rotate a marking shaft which has markings at one end thereof, said mine being provided with a window (15) through which one of said markings can be seen, said marking showing whether the mine is safe or live.

Revendications

1. Mine comprenant un boîtier, contenant une charge explosive (26), une charge détonateur (24) une charge de démasquage (23) et un dispositif d'allumage (25) avec un moteur électrique (20) et un dispositif temporisé, mine caractérisée en ce que le moteur électrique (20) est conçu pour tourner à une vitesse supérieure à 5000 tours/minute, et pour permettre la détonation de la charge de démasquage et de la charge détonateur, dans des conditions extérieures données prédéterminées par l'intermédiaire d'une transmission et d'un arbre de commande (30), le dispositif temporisé étant disposé pour contrôler le moteur électrique (20) de telle manière que:

a) le moteur soit amené à démarrer et à agir pendant une première période de temps donnée, jusqu'à ce que l'arbre (30) ait été tourné dans la position angulaire nécessaire pour la détonation de la charge de démasquage (23) et de la charge détonateur (14) après quoi le moteur s'arrête,

b) dans le cas où la mine n'a pas explosé, le moteur, après une seconde période donnée, soit contraint de démarrer à nouveau et de fonctionner jusqu'à ce que l'arbre (30) ait tourné dans une position angulaire que se situe complètement en dehors de la position de détonation de l'arbre, et

c) après quoi, le moteur actionne le dispositif de marquage destiné à marquer sur la surface du sol la position de la mine au-dessous de la surface.

2. Mine suivant la revendication 1, caractérisée en ce que le moteur (20) est prévu pour tourner à une vitesse inférieure à 20 000 T/m et de préférence à une vitesse d'environ 15 000 t/m.

3. Mine suivant l'une des revendications 1 ou 2, caractérisé en ce que sont prévus deux organes de sécurité (11, 12) actionnables extérieurement et mécaniquement, qui, lorsqu'ils occupent leur position de sécurité, s'opposent à une rotation de l'arbre de commande (30).

4. Mine suivant la revendication 1, caractérisée par deux perçages, prévus dans l'arbre de commande (30) s'étendant perpendiculairement à son axe longitudinal, dont l'un, dans une position donnée de l'arbre de commande (30) permet l'explosion de la charge de démasquage (23) tandis que l'autre permet l'explosion de la charge détonateur (24).

5. Mine suivant la revendication 1, caractérisée en ce que le dispositif temporisé est monté de façon à contrôler le moteur (20) après que les deux dispositifs de sécurité (11, 12) ont été déplacés hors de leur position de séurité.

6. Mine suivant la revendication 1, caractérisé en ce que le moyeu d'actionnement comprend un corps qui est connecté à la mine par un conducteur et qui peut êtgre projeté vers le haut au moyen d'une charge explosive.

7. Mine suivant la revendication 1, caractérisée en ce que l'arbre de commande (30) est disposé pour que, s'il continue à tourner, après s'être déplacé à partir de sa première position donnée, il active l'un des deux dispositifs de sécurité (11, 12) vers une position de sécurité, assurant ainsi que l'arbre de commande (30) ne peut pas être amené à commencer une nouvelle révolution, avant que les dispositifs de

sécurite (11, 12) aient été activés mécaniquement de nouveau.

8. Mine suivant la revendication 1, caractérisée en ce que l'arbre de commande est disposé pour entraîner en rotation un arbre de marquage portant des marques sur une de ses extrémités, la mine étant pourvue d'une fenêtre (15) par où l'un de ces marquages peut être vu et indiquant si la mine est en position de sécurité ou active.

Patentansprüche

1. Mine, enthaltend ein Gehäuse mit einer Sprengladung (26), einer Zündladung (24), einer Aufdeckladung (23) und einer Zündeinrichtung (25) mit einem Elektromotor (20) und einer Zeiteinstelleinrichtung, dadurch gekennzeichnet, daß der Elektromotor (20) mit einer Geschwindigkeit von mehr als 5000 U/Min drehbar und in der Lage ist, die Aufdeckladung und die Zündladung bei bestimmten äußeren Bedingungen über ein Getriebe und eine Betätigungswelle (30) zu zünden, und daß die Zeiteinstelleinrichtung so zur Steuerung des Elektromotors (20) ausgelegt ist, daß

a) der Motor über ein bestimmtes erstes Zeitintervall gestartet und betrieben wird, bis die Welle (30) in eine zur Zündung der Aufdeckladung (23) und der Zündladung (14) erforderlichen Winkellage gedreht ist, worauf der Motor angehalten wird,

b) daß der Motor bei ausbleibender Explosion der Mine nach einem zweiten Zeitintervall erneut gestartet und solange betrieben wird, bis die Welle (30) in eine Winkelstellung gedreht ist, die vollständig außerhalb der Zündsteilung der Welle liegt, und

c) daß anschließend Markiereinrichtungen betätigt werden, die die Lage der unter der Oberfläche des Bodens befindlichen Mine über der Bodenoberfläche anzeigen.

2. Mine nach Anspruch 1, dadurch gekennzeichnet, daß der Motor (20) mit einer Geschwindigkeit von weniger als 20 000 U/min, vorzugsweise mit einer Geschwindigkeit von etwa 15 000 U/min drehbar ist.

3. Mine nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß zwei äußere, mechanisch betätigbare Sicherungen (11,12) vorgesehen sind, die in ihrer Sicherungsstellung eine Drehung der Betätigungswelle (30) verhindern.

4. Mine nach Anspruch 1, dadurch gekennzeichnet, daß in der Betätigungswelle (30) zwei Bohrungen vorgesehen sind, die sich in rechten Winkeln zu der Längsachse der Welle erstrecken, wobei eine dieser Bohrungen in der bestimmten Stellung der Betätigungswelle (30) die Zündung der Aufdeckladung (23) ermöglicht, während die andere Bohrung die Zündung der Zündladung (24) ermöglicht.

5. Mine nach Anspruch 1, dadurch gekennzeichnet, daß die Zeiteinstelleinrichtung so angeordnet ist, daß sie den Motor (20) nach der Entfernung der beiden Sicherungen (11,12) aus ihren Sicherungsstellungen steuert.

6. Mine nach Anspruch 1, dadurch gekennzeichnet, daß die Markiereinrichtung einen mittels einer Leine mit der Mine verbundenen Körper darstellt, der mit Hilfe einer Sprengladung nach oben getrieben werden kann.

7. Mine nach Anspruch 1, dadurch gekennzeichnet, daß die Betätigungswelle (30) so angeordnet ist, daß sie, nachdem sie sich aus der ersten Stellung weiter gedreht hat, auch eine der beiden Sicherungen (11, 12) in eine Sicherungsstellung aktiviert, wodurch gewährleistet ist, daß die Betätigungswelle (30) keine weitere Drehung ausführen kann, bevor die Sicherungen (11,12) wider mechanisch aktiviert sind.

8. Mine nach Anspruch 1, dadurch gekennzeichnet, daß die Betätigungswelle (30) eine Markierungswelle dreht, die an einem Ende Markierungen trägt, wobei die Mine mit einem Fenster (15) versehen ist, durch welches eine der Markierungen sichtbar ist, wobei diese Markierung anzeigt, ob die Mine gesichert oder entsichert ist.

Fig. 1

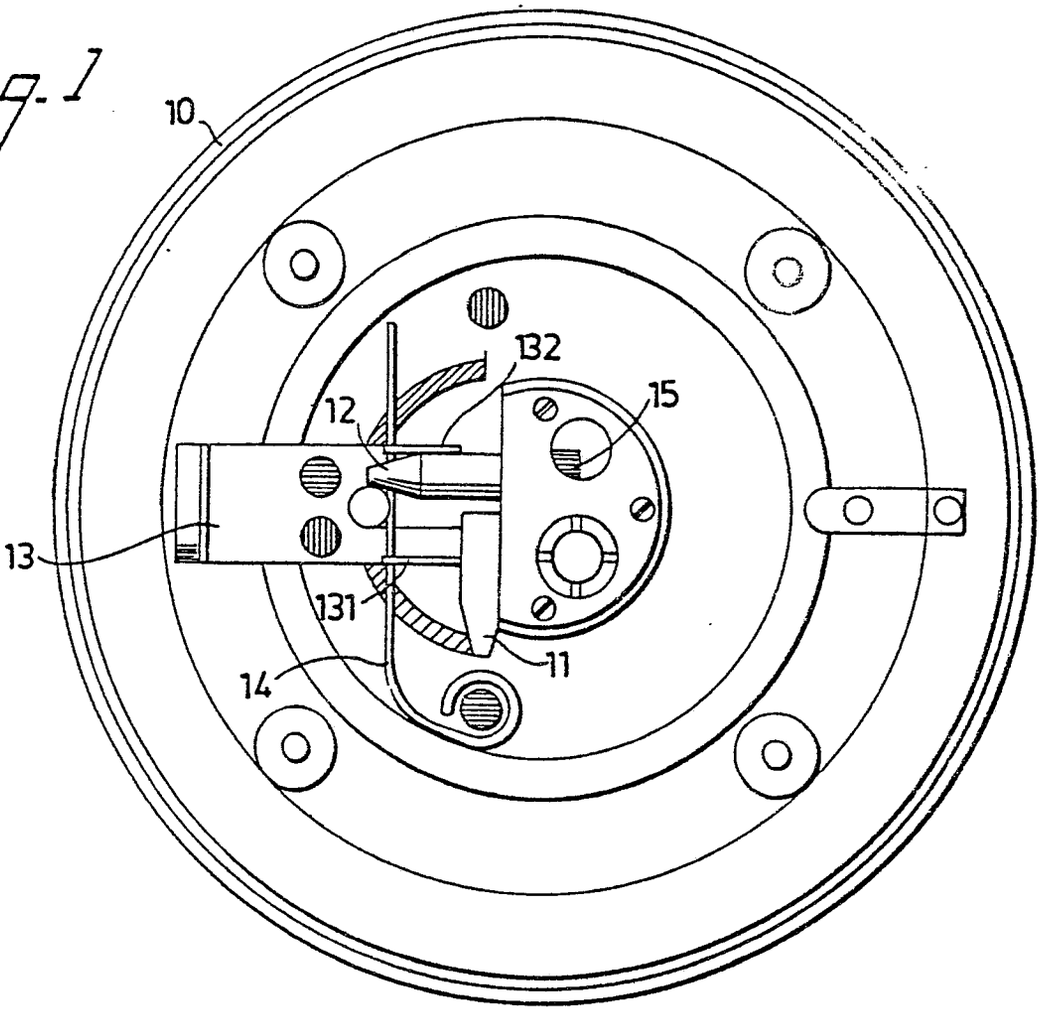

10
132
15
12
13
131
11
14

Fig. 2

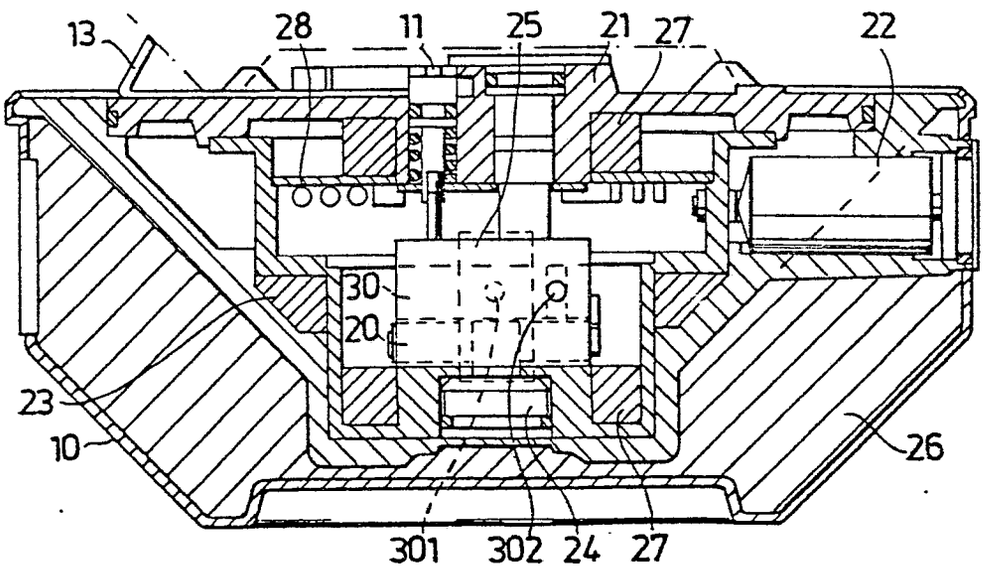
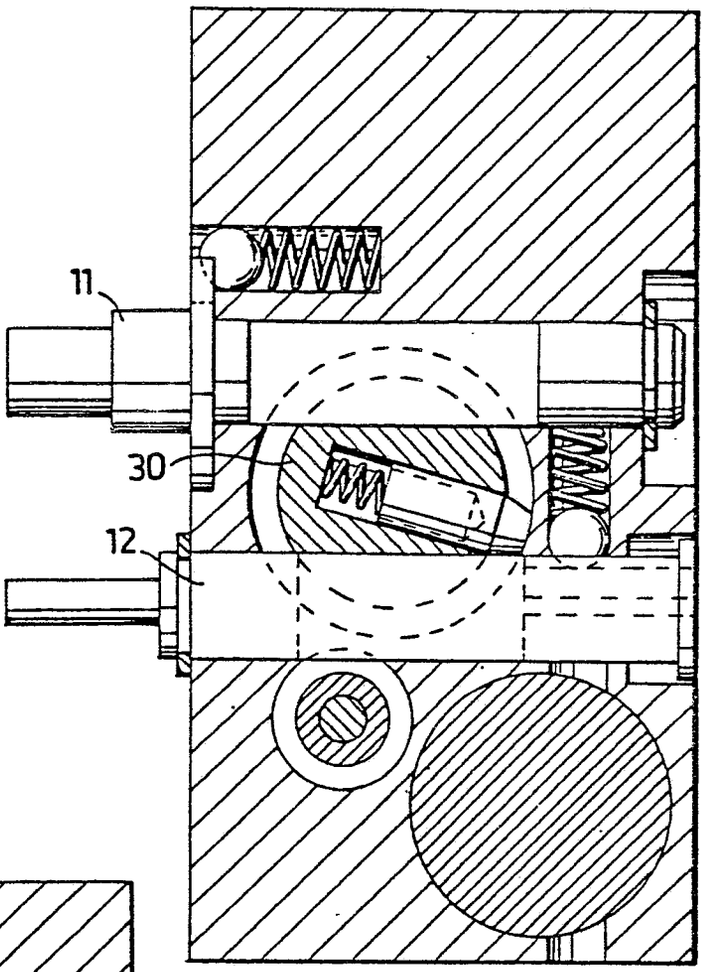

13
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25
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30
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26
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302
24
27

Fig. 3



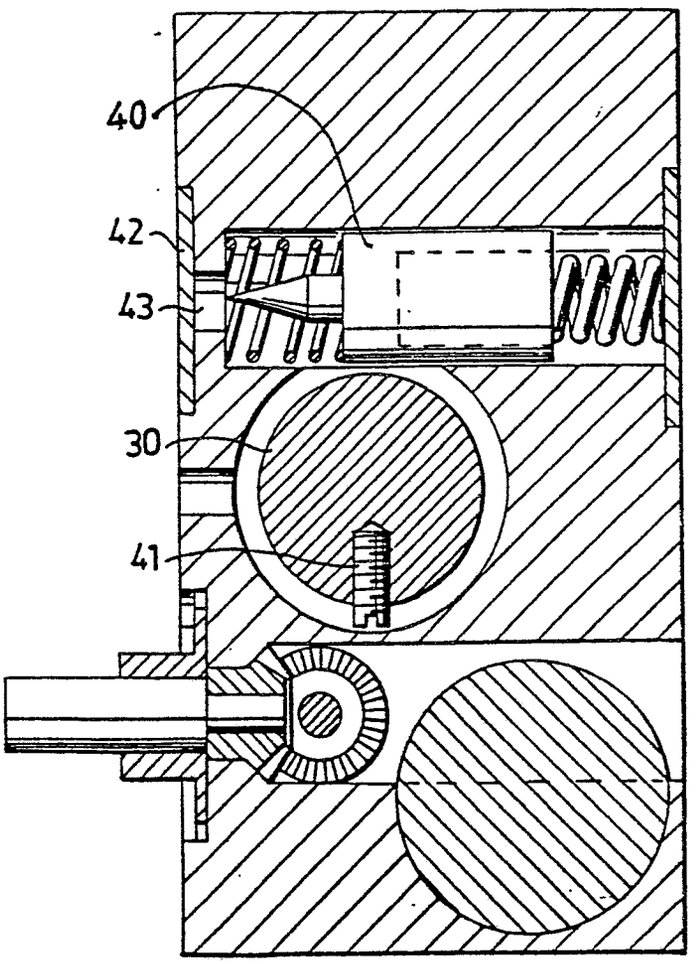


Fig. 4