COMMONWEALTH OF AUSTRALIA

Patents Act 1952

P/00/001
Form 1
Regulation 9

APPLICATION FOR A STANDARD PATENT OR A STANDARD PATENT OF ADDITION

LODGED AT SUB-OFFICE
15 MAR 1988
Melbourne

59456/1

Insert full name(s) of applicant(s)
Insert address(es) of applicant(s)

(71) I/We OY TAMPELLA AB

of Lapintie 1, SF-33100 Tampere, Finland

Insert title of invention
(tick appropriate box)

(54) hereby apply for the grant of a ☑ standard patent ☐ patent of addition for an invention entitled A METHOD OF AND AN ARRANGEMENT FOR CONTROLLING ROCK DRILLING

which is described in the accompanying ☐ provisional ☑ complete specification.

Insert name of actual inventor

(72) The actual inventor (s) of the said invention is/are JUHA PIIPPONEN OSSI TIENARI

Insert address for service of notices in Australia

(74) My/our address for service is SANDERCOCK, SMITH & BEADLE, 207 Riversdale Road, (P.O. Box 410) Hawthorn, Victoria, 3122 Attorney Code SA

13337/88

for Convention cases only

(ONLY TO BE USED IN THE CASE OF A CONVENTION APPLICATION)

Details of basic application (s) —

NUMBER	COUNTRY	DATE OF APPLICATION	ISO Code
871274	Finland	23 March 1987	FI

APPLICATION ACCEPTED AND AMENDMENTS ALLOWED 2-1-90

Insert day, month and year form signed

Dated this 15th day of March, 1988

Signature of applicant or Australian attorney

TO

OY TAMPELLA AB

(Signature)

SANDERCOCK, SMITH & BEADLE

THE COMMISSIONER OF PATENTS

This form must be accompanied by either a provisional specification (Form 9 and true copy) or by a complete specification (Form 10 and true copy).

FORM 7 & 8

AUSTRALIA
PATENTS ACT 1952

PATENT DECLARATION FORM
(CONVENTION OR NON-CONVENTION)

DECLARATION IN SUPPORT OF APPLICATION FOR A PATENT

Insert name of applicant.

In support of the application made by Oy Tampella Ab

Insert title of invention.

for a patent for an invention entitled: "A method of and an arrangement controlling rock drilling"

Insert full name(s) and address(es) of person(s) making declaration. If applicant a company person must be authorised to make declaration.

~~I~~/We Kai Miesmäki and Marja-Liisa Antila
Assistant Vice Pres. Secretary
of Lapintie 1, SF-33100 Tampere, Finland

do solemnly and sincerely declare as follows:

* 1. (a) ~~I am/We are the applicant(s) for the patent.~~

* OR (b) ~~I am~~ XXwe are authorized by the abovementioned applicant to make this declaration on its behalf.

* 2. (a) ~~I am/We are the actual inventor(s) of the invention.~~

* OR (b) Juha Piipponen
Säästäjänkatu 19 E 26, SF-33840 Tampere, Finland
and
Ossi Tienari
SF-39530 Kilvakkala, Finland

Delete alternatives which do not apply

Insert name(s) and address(es) of actual inventor(s).

~~I~~/are the actual inventor(s) of the invention and the facts upon which the applicant(s) is/are entitled to make the application are as follows:—

Applicant is the assignee of inventors.

Insert details of entitlement to apply, e.g. Applicant is assignee of inventor(s)

3. The basic application(s) as defined by Section 141 of the Act was/were made in the following country or countries on the following date(s) by the following applicant(s)

in Finland on March 23, 19 87
by Oy Tampella Ab
in _____ on _____ 19 _____
by _____
in _____ on _____ 19 _____
by _____
in _____ on _____ 19 _____
by _____

Delete 3 and 4 if application non-convention. Otherwise insert details of basic application(s).

4. The basic application(s) referred to in paragraph 3 of this Declaration was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.

Place and date of Signature.

Declared at Tampere this 14th day of March 19 88

NO ATTESTATION
OR SEAL

Oy Tampella Ab

per: K. Miesmäki M-L Antila

Signature(s) of declarant(s).

To: The Commissioner of Patents, Australia

Kai Miesmäki Marja-Liisa Antila

(12) PATENT ABRIDGMENT (11) Document No. AU-B-13337/88
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 594561

(54) Title
CONTROLLING THE FEEDING BEAM OF A ROCK DRILL

International Patent Classification(s)
(51)[4] E21C 005/00

(21) Application No. : 13337/88 (22) Application Date : 15.03.88

(30) Priority Data

(31) Number	(32) Date	(33) Country
871274	23.03.87	FI FINLAND

(43) Publication Date : 22.09.88

(44) Publication Date of Accepted Application : 08.03.90

(71) Applicant(s)
TAMPELLA OY A.B.

(72) Inventor(s)
JUHA PIIPPONEN; OSSI TIENARI

(74) Attorney or Agent
SMITH SHELSTON BEADLE MELBOURNE

(57) Claim

1. A method of controlling rock drilling, wherein a feeding beam of a rock drill machine is positioned in the direction of a hole to be drilled in such a manner that a drill rod is positioned at the hole to be drilled, whereafter the feeding beam is displaced by displacing means in the longitudinal direction thereof towards the surface of the rock to be drilled until the forward end of the feeding beam makes contact with the rock surface and supports the feeding beam on the rock at least at the beginning of the drilling process, whereby the longitudinal movement of the feeding beam is controlled by means of a control element mounted at the forward end of the feeding beam, which control element stops the operation of the displacing means of the feeding beam when it makes contact with the rock surface, whereafter the drilling of the hole is initiated, c h a r a c t e r i z e d in that the control element is a sleeve-like drilling support mounted around a drill bit at the forward end of the feeding beam and secured axially slidably in the longitudinal direction of the drill rod,

whereby the axial movement of the drilling support with respect to the feeding beam controls the displacing movement of the feeding beam when the support makes contact with the rock.

3. An arrangement for controlling a feeding beam of a rock drill machine when the feeding beam is displaced so that the forward end thereof makes contact with the rock surface to be drilled for supporting the feeding beam during the drilling process, comprising displacing means for displacing the feeding beam in the longitudinal direction thereof and control means for controlling the operation of the displacing means, the control means comprising a control element which is mounted at the forward end of the feeding beam so that when the feeding beam is displaced in the longitudinal direction it is the first to make contact with the rock surface, the control element being connected to stop the operation of the displacing means of the feeding beam when it hits the rock surface, c h a r a c t e r i z e d in that the control element comprises a sleeve-like drilling support mounted slidably in the longitudinal direction of the feeding beam and to be positioned around a drill bit in the retracted position thereof, the drilling support being displaced with respect to the feeding beam backwards in the longitudinal direction thereof when it hits the rock surface; a member which is arranged to push the drilling support to its forward position; and a detector which detects the displacement of the drilling support and is connected to control the displacing means of the feeding beam.

594561

COMMONWEALTH OF AUSTRALIA

Form 10

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

Class Int. Class

Application Number:
Lodged:

Complete Specification—Lodged:
Accepted:
Published:

Priority:

Related Art:

This document contains the amendments made under Section 49 and is correct for printing.

TO BE COMPLETED BY APPLICANT

Name of Applicant: OY TAMPELLA AB

Address of Applicant: Lapintie 1, SF-33100 Tampere, Finland

Actual Inventor: JUHA PIIPPONEN OSSI TIENARI

Address for Service: SANDERCOCK, SMITH & BEADLE
207 Riversdale Road, (P.O. Box 410)
Hawthorn, Victoria, 3122

Complete Specification for the invention entitled:
A METHOD OF AND AN ARRANGEMENT FOR CONTROLLING ROCK DRILLING

The following statement is a full description of this invention, including the best method of performing it known to me:—

This invention relates to a method of controlling rock drilling, wherein a feeding beam of a rock drill machine is positioned in the direction of a hole to be drilled in such a manner that a drill rod is positioned at the hole to be drilled, whereafter the feeding beam is displaced by displacing means in the longitudinal direction thereof towards the surface of the rock to be drilled until the forward end of the feeding beam makes contact with the rock surface and supports the feeding beam on the rock at least at the beginning of the drilling process, whereby the longitudinal movement of the feeding beam is controlled by means of a control element mounted at the forward end of the feeding beam, which control element stops the operation of the displacing means of the feeding beam when it makes contact with the rock surface, whereafter the drilling of the hole is initiated.

The invention is also concerned with an arrangement for controlling a feeding beam of a rock drill machine when the feeding beam is displaced so that the forward end thereof makes contact with the rock surface to be drilled for supporting the feeding beam during the drilling process, comprising displacing means for displacing the feeding beam in the longitudinal direction thereof and control means for controlling the operation of the displacing means, the control means comprising a control element which is mounted at the forward end of the feeding beam so that when the feeding beam is displaced in the longitudinal direction it is the first to make contact with the rock surface, the control element being connected to stop the operation of the displacing means of the

feeding beam when it hits the rock surface.

When drilling a hole in a rock, it is of great importance, especially when starting the drilling, to be able to support the forward end of the feeding beam of the drill machine on the rock so as to prevent the displacement of the annular bit along the surface of the rock during the rotation thereof so that the drilling could be started at the desired place. In addition, the movement of the annular bit causes sideward forces in the drill rod which may distort or break the drill rod, which causes breaks in the drilling process and unnecessary costs.

In order to avoid this it has been customary both in manual and automated drilling to first displace the feeding beam to the right drilling position and thereafter push it in the longitudinal direction towards the rock so that a usually tooth-shaped drilling support mounted at the forward end of the feeding beam hits the rock, thus preventing the transverse movements of the forward end of the feeding beam and, consequently, of the annular bit. This procedure has been carried out manually by the driller even though the drilling process would be fully automated otherwise.

Automatic displacement of the feeding beam to a predetermined distance from the rock surface is known per se e.g. from British Patent Application 2 103 968, in which the distance of the feeding beam is adjusted by means of the feeding mechanism of the drill rod and control means attached thereto. In the solution of the patent application, the feeding beam is first positioned in the drilling direction and displaced to some distance from the rock, whereafter the rock drill machine with a drill rod attached thereto is begun to be displaced forwards from its retracted position on the

feeding beam until the annular bit hits the rock surface. During the displacement of he drill machine, the distance of displacement thereof is measured, and after the annular bit hits the rock the feeding beam is displaced a distance shorter than the distance of displacement of the rock drill machine so that a predetermined distance remains between the feeding beam and the rock.

The above solution is applicable to automatic drilling, whereby the control means effect the approaching, measuring and displacing steps automatically without the help of the driller. Besides being slow, a drawback of the solution is that the feeding beam is not supported on the rock and, as a consequence, disturbances and damages hamper the drilling process.

The object of the solution according to the invention is to provide a method and an arrangement which enable an automatic displacement of the feeding beam to the right drilling position so that the forward end thereof is supported on the rock, thus making it easier to start the drilling process. The method according to the invention is characterized in that the control element is a sleeve-like drilling support mounted around a drill bit at the forward end of the feeding beam and secured axially slidably in the longitudinal direction of the drill rod, whereby the axial movement of the drilling support with respect to the feeding beam controls the displacing movement of the feeding beam when the support makes contact with the rock.

The arrangement according to the invention is characterized in that the control element comprises a sleeve-like drilling support mounted slidably in the longitudinal direction of the feeding beam and to be

positioned around a drill bit in the retracted position thereof, the drilling support being displaced with respect to the feeding beam backwards in the longitudinal direction thereof when it hits the rock surface; a member which is arranged to push the drilling support to its forward position; and a detector which detects the displacement of the drilling support and is connected to control the displacing means of the feeding beam.

Other embodiments of the invention are described in claims 2 to 10.

In the following the invention will be described in more detail by means of the attached drawing, whereby

Figure 1 shows a rock drilling equipment with its boom and feeding beam,

Figure 2 is a detailed view of one embodiment of the invention,

Figure 3 is a front view of the embodiment shown in Figure 2,

Figure 4 is a side view of another embodiment of the invention,

Figure 5 is a front view of the embodiment shown in Figure 4, and

Figures 6 and 7 show the embodiment of Figures 4 and 5 in one operational situation.

Figure 1 shows a rock drilling equipment indicated generally with the reference numeral 1. The rock drilling equipment comprises a boom 2 to which a feeding beam 3 is attached. The feeding beam 3 is displaceable with respect to the end of the boom 2 in the longitudinal direction thereof with displacing means 4 along slide pieces positioned in a cradle 5. The operating device of the displacing means 4 is generally a hydraulic cylinder or the like.

A control element 6 according to the invention is fastened to the forward end of the feeding beam, and a drill rod 7 attached to the rock drilling machine is arranged to be passed through said control element.

The operation and structure of the operating means of the rock drilling equipment, the boom, and the displacing means of the feeding beam are generally known in the art, so they are not described more closely here.

Figure 2 shows the control element according to the invention. In the figure, the drill rod 7 with an annular bit 8 attached thereto goes through a centralizer 9 known per se. The control element 6 is mounted in front of the centralizer 9 at the forward end of the feeding beam 3. The control element comprises a sleeve-like support 10 positioned around the annular bit 8 and acting as a detecting element, and a body 11 which is fastened to the end of the feeding beam 3. A spring 12 is mounted within the body 11 behind the support 10 between it and the body 11, which spring pushes the support 10 forwards, i.e. in a direction away from the feeding beam. For controlling the operation the support 10 comprises e.g. an annular groove 13 an edge 14 of which is positioned at a detector 15 in the forward position of the support 10. The support 10 is mounted within the body 11 axially slidably but unrotatably e.g. by means of grooves (not shown) provided therein and bolts 16 extending into the grooves through the body.

The detector 15, which operates e.g. by means of electricity or light, is connected to control the displacing means 4 of the feeding beam 3 in such a manner that the displacement of the support 10 from its forward position causes the detector 15 to gener-

ate a control impulse which stops the operation of the displacing means 4.

The equipment operates in such a manner that when the drilling process, for instance, is started by means of an automatic control means, the feeding beam 3 is displaced to the drilling position so that the drill rod 7 is positioned at the hole to be drilled in the direction thereof but at some distance from the surface of the rock. Thereafter the control device starts the displacing means 4 by means of which the feeding beam 3 is displaced along the slide faces in the cradle 5 towards the rock until the support 10 hits the surface of the rock. Since the support 10 is axially displaceable with respect to the body 11, it yields slightly inwards, thus compressing the spring 12, whereby the edge 14 of the groove 13 of the sleeve is displaced away from the detector 15. This causes the detector 15 to generate a control impulse which stops the operation of the displacing means, thus leaving the feeding beam leaning on the surface of the rock by means of the support 10.

The control impulse which stops the operation of the displacing means 4 can simultaneously be used for starting automatically the drilling process, whereby the rock drilling machine and the drill rod 7 begin to move along the feeding beam towards the rock in a manner known per se and the whole drilling process continues conventionally until the next hole is to be drilled.

By using the support 10 according to Figures 2 and 3 as a detecting element the movement of which effects the control operation for stopping the feeding movement, a simple and advantageous solution is achieved in which the feeding beam is supported at the beginning of the drilling process, which makes the in-

itiation of the drilling process easier. As shown in the figures, tooth-like prongs 17 preferably positioned symmetrically around the axis of the support 10 can be formed at the end of the support 10, whereby the prongs act as a reliable drilling support as they are able to enter even minor clefts in the rock.

The support 10 may be fastened unrotatably but it can also be mounted rotatably if this is considered necessary. The recess or groove 13 may be provided on the side of the detector 15 only, if the detector 10 is mounted unrotatably, but it can also be a groove extending around the entire sleeve.

The support 10 can be round, angular or elliptical in cross-section or of any other desired shape. If it comprises prongs 17, these are preferably three or more in number.

The detector 15 may be electric or electromagnetic or it may be operated by light, whereby that point of the support 10 which generates the control impulse can be shaped or constructed in a manner required by the use of the detector. The detector may also consist of a switch or the like detector positioned behind the detecting element, so that the detecting element effects the control operation when it presses or approaches the detector.

Instead of the sleeve-like support, the detecting element may consist of a separate body which may be e.g. tooth-like or of some other shape and which is mounted at the forward end of the feeding beam aside from the axial point of the drill rod so that it extends in front of the annular bit 8 when this is in its retracted position, thus, it is the first to make contact with the rock surface when the feeding beam is displaced towards the rock. As described above, it is possible to detect when such a detecting element hits

the rock and, correspondingly, control the operation of the equipment. Figures 4 and 5 show a structure formed by three separate detecting means, the detecting element being positioned symmetrically around the annular bit 8. Each detecting means comprises a detecting element 10' and a body 11'. The point of the detecting element 10' may be tooth-like or it may be provided with tooth-like prongs or the like.

The detecting means are connected to control the displacing means of the feeding beam 3 in such a manner that a single detecting element 10' making contact with the rock is enough to stop the displacing movement of the feeding beam. The control means can further be connected to control the drilling process so that if one or more the detecting elements 10' does not make contact with the rock when the displacing movement of the feeding beam is completed, the control means displaces the feeding beam and turns it in the direction of those detecting elements 10' which have not made contact with the rock. The drill rod thereby turns closer to the normal axis of the rock surface, which makes the initiation of the drilling easier. In automatic drilling, the turning and displacing of the feeding beam can be taken into account particularly easily because the feeding beam can be displaced aside from the original drilling axis and this displacement can be taken into account so that the end point of the finished drill hole will be positioned essentially at the same place as originally planned. This operation is illustrated in Figures 6 and 7; in Figure 6, one detecting element 10' only has hit the rock surface. As the detecting element 10' makes contact with the rock, the movement of the feeding beam towards the rock has stopped, but the position of the feeding beam with respect to the surface is too oblique for the

drilling to be started reliably. On the basis of the position of the detecting element which has remained out of contact, the control means turns the feeding beam and displaces it further in the sideward direction with respect to the rock wall so that at both detecting elements make contact with the rock surface and the drilling process can be started.

The detecting element 10 can further be used for controlling the operation of the drilling equipment in cases where a piece of rock breaks off from under the detector acting as a drilling support on starting the drilling process, whereby the detecting element 10, 10' is able to advance to its forward position. There is thereby a risk of the drill rod being damaged for lack of sufficient support with a resultant break in the drilling process.

In such a case the operation can be controlled e.g. by measuring the length of the feeding movement of the drill machine, i.e. the advance of the drill rod, and if the advance is smaller than a predetermined distance, the drilling process is interrupted and the drill rod is retracted, whereafter the feeding beam is again displaced forwards until the detecting element again hits the rock and the operation can be continued similarly as originally planned.

If, however, the drilling has advanced over a predetermined distance, the drilling can be continued merely by displacing the feeding beam forwards until the detecting element 10 hits the rock surface at the point where the piece of rock broke off.

Both operations can be made to take place automatically, whereby the displacement of the detecting element forwards starts the operation depending on the distance the drill rod has advanced. In the case of too short a boring, the feeding beam is displaced

forwards e.g. in response to an impulse generated by the detection of the retracted position of the drill machine, and in the case of a boring exceeding a predetermined length the forward displacement of the feeding beam is initiated by a control impulse generated by the detecting element while it is displaced.

The method and the arrangement according to the invention can also be used in a rock drilling equipment which does not comprise any separate displacing means for the longitudinal displacement of the feeding beam. Thereby the longitudinal movement of the feeding beam is effected e.g. by turning the boom with respect to the carrier of the device and by simultaneously extending it and by further turning the feeding beam with respect to the end of the boom. In a computer-controlled equipment in particular, this is easy to realize and the boom thereby acts as a displacing means for the longitudinal movement of the feeding beam.

It is further possible to use both the displacing means and the boom as a displacing means effecting the longitudinal movement of the feeding beam.

In addition to automatic drilling, the invention is applicable to manual drilling, whereby the feeding beam can be placed against the rock surface considerably more rapidly than previously. After the driller has started the longitudinal displacing movement of the feeding beam, the movement continues until the detector generates a control impulse which stops the movement and e.g. lights a signal light and/or starts the drilling.

The claims form part of the disclosure of this specification.

The claims defining the invention are as follows:

1. A method of controlling rock drilling, wherein a feeding beam of a rock drill machine is positioned in the direction of a hole to be drilled in such a manner that a drill rod is positioned at the hole to be drilled, whereafter the feeding beam is displaced by displacing means in the longitudinal direction thereof towards the surface of the rock to be drilled until the forward end of the feeding beam makes contact with the rock surface and supports the feeding beam on the rock at least at the beginning of the drilling process, whereby the longitudinal movement of the feeding beam is controlled by means of a control element mounted at the forward end of the feeding beam, which control element stops the operation of the displacing means of the feeding beam when it makes contact with the rock surface, whereafter the drilling of the hole is initiated, c h a r a c t e r i z e d in that the control element is a sleeve-like drilling support mounted around a drill bit at the forward end of the feeding beam and secured axially slidably in the longitudinal direction of the drill rod, whereby the axial movement of the drilling support with respect to the feeding beam controls the displacing movement of the feeding beam when the support makes contact with the rock.

2. A method according to claim 1, c h a r a c t e r i z e d in that the drilling of the hole is further controlled by means of the control element in such a manner that when stopping the operation of the displacing means of the feeding beam the control element starts the drilling of the hole.

3. An arrangement for controlling a feeding

beam of a rock drill machine when the feeding beam is displaced so that the forward end thereof makes contact with the rock surface to be drilled for supporting the feeding beam during the drilling process, comprising displacing means for displacing the feeding beam in the longitudinal direction thereof and control means for controlling the operation of the displacing means, the control means comprising a control element which is mounted at the forward end of the feeding beam so that when the feeding beam is displaced in the longitudinal direction it is the first to make contact with the rock surface, the control element being connected to stop the operation of the displacing means of the feeding beam when it hits the rock surface, c h a r a c t e r i z e d in that the control element comprises a sleeve-like drilling support mounted slidably in the longitudinal direction of the feeding beam and to be positioned around a drill bit in the retracted position thereof, the drilling support being displaced with respect to the feeding beam backwards in the longitudinal direction thereof when it hits the rock surface; a member which is arranged to push the drilling support to its forward position; and a detector which detects the displacement of the drilling support and is connected to control the displacing means of the feeding beam.

4. An arrangement according to claim 3, c h a r a c t e r i z e d in that the drilling support comprises a groove or recess and that the detector is arranged to detect the displacement of an edge of the groove or recess.

5. An arrangement according to claim 3 or 4, c h a r a c t e r i z e d in that the member ar-

ranged to push the drilling support is a spring.

6. An arrangement according to claim 3, c h a r a c t e r i z e d in that the forward edge of the sleeve-like drilling support comprises at least three tooth-like prongs which are essentially symmetrically positioned with respect to the longitudinal axis of the drilling support.

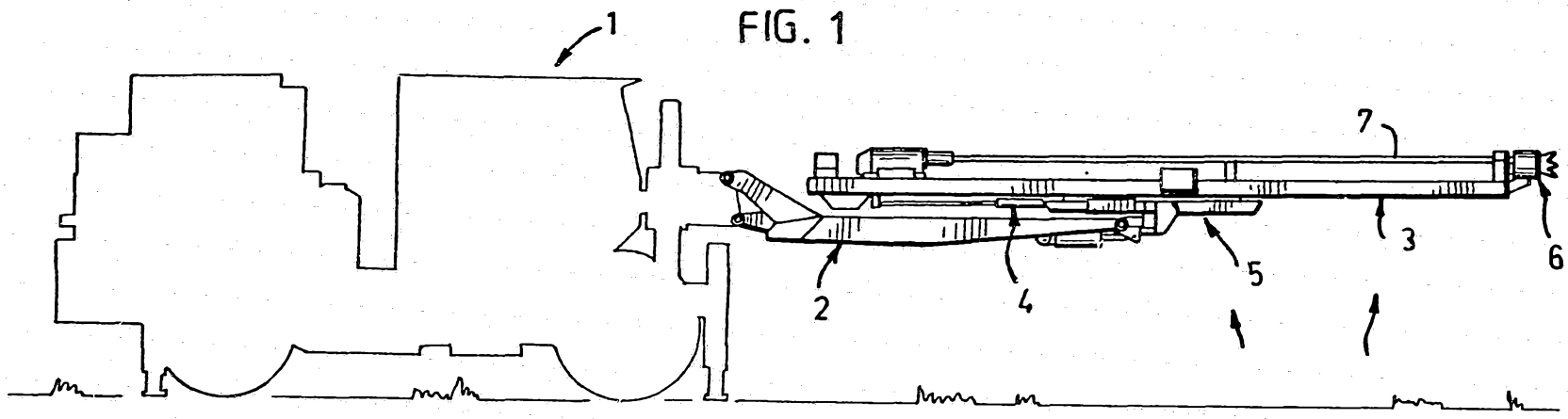
7. A method of controlling rock drilling substantially as hereinbefore described with reference to any one of the particular embodiments in Figures 2-7 of the accompanying drawings.

8. An arrangement for controlling a feeding beam of a rock drilling machine substantially as hereinbefore described with reference to any one of the particular embodiments in Figures 2-7 of the accompanying drawings.

~~9. The articles, things, parts, elements, steps,~~ features, methods, processes, compounds ~~and compositions~~ referred to or indicated in ~~the~~ specification and/or claims of the ~~application~~ individually or collectively, and any and ~~all combinations of any two or more of such.~~

DATED THIS 15th March, 1988
SANDERCOCK, SMITH & BEADLE
Fellows Institute of Patent
Attorneys of Australia.
Patent Attorneys for the Applicant
OY TAMPALLA AB

FIG. 1



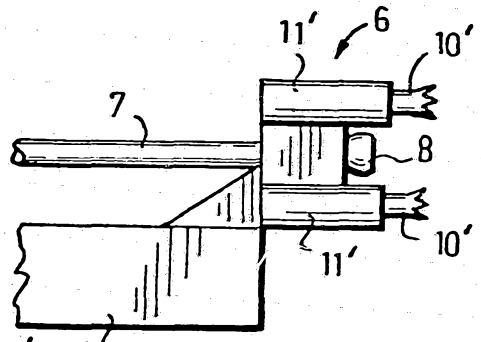


FIG. 4

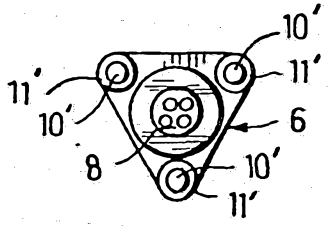


FIG. 5

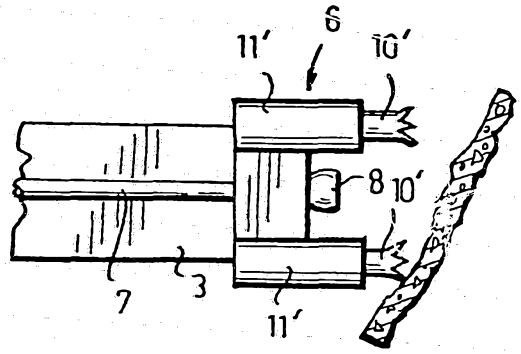


FIG. 6

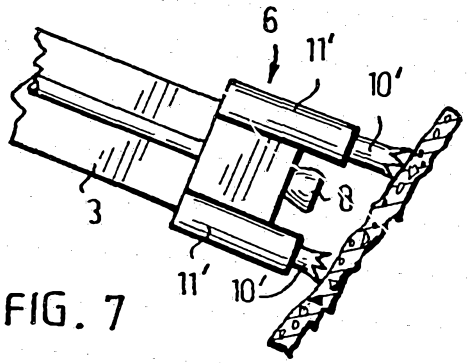


FIG. 7

13 337/88

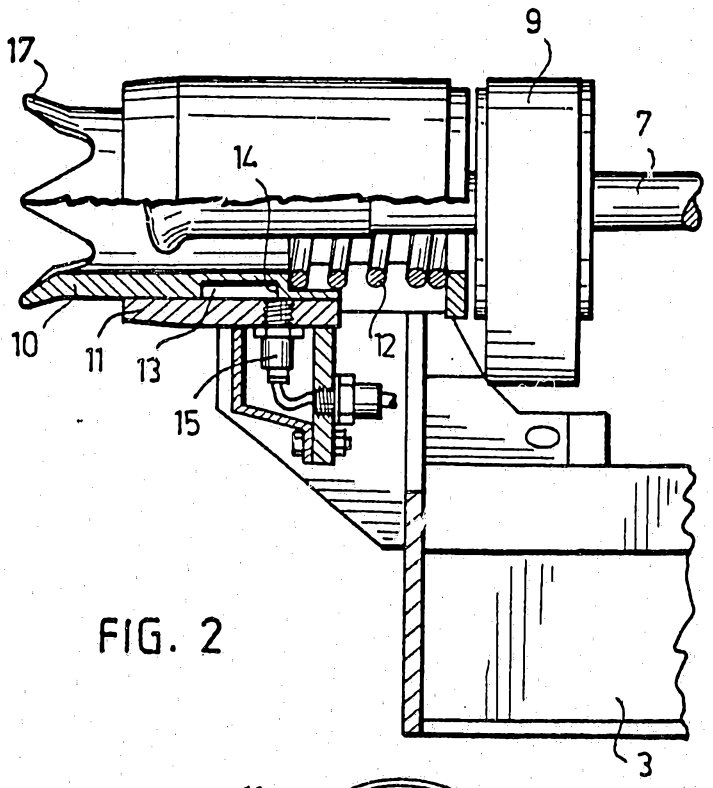


FIG. 2

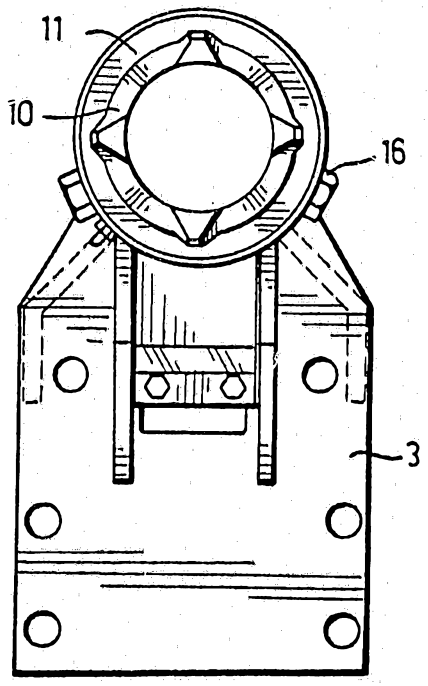


FIG. 3