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(54) **Rotary, mineral cutting head.**

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Description

This invention relates to a rotary, mineral cutting head of a kind used extensively for mineral winning purposes e.g. coal mining, by being drivably mounted on a mineral winning machine, usually known as a shearer, or alternatively of a kind used for the driving of underground roadways or tunnels, by being mounted on what is known as a roadheader machine.

For either purpose of rotary cutting head, the latter is conventionally provided with a plurality of replaceable cutter picks, while furthermore the head is provided with what may be termed a "low pressure" water supply e.g., at 10.3 Bar (150 p.s.i.,) for various functions such as dust suppression, pick cooling, pick face flushing, pre-start warning and, in a mineral winning head, hollow shaft ventilation. In recent times attempts have been made to use water for another purpose being that of water jet cutting, where water at substantially higher pressure e.g., at 345 Bar (5,000 p.s.i.) is required. However, with conventional constructions of pressurised heads, the water flow path from the supply source on the machine in question to the water discharge nozzles on the head is complex and tortuous, incorporating several bends and consequently incorporating inherent pressure losses which can be tolerated in a low pressure system, e.g. GB—A—1309005, but which are particularly disadvantageous in a high pressure system intended for water jet cutting uses, where efficiency and economics demand that the maximum pressure that can be generated by the associated pumping system is transmitted to the discharge nozzles. Furthermore, with low pressure systems, the demands on the rotary water seals is not significant, but on the contrary with a high pressure system, incorporating high pressure rotary seals, these invariably have an unacceptably short service life. Finally and most disadvantageously, in previous water distribution systems the drum itself was subjected to the water pressure, e.g. GB—A—1309005 and consequently to apply high pressure needed to be fabricated to higher standards to accept the stresses imposed by such higher pressures.

According to the present invention there is provided a rotary mineral cutting head of welded construction comprising at least one helical vane and also a face ring which is adapted, in use, to be located adjacent a mineral face, the vane(s) and face ring, being welded around the external periphery of an outer barrel element, and provided with holders for picks whilst the outer barrel element is supported from a central hub, the hub being provided with a water supply bore connectable to a source of high pressure water, a plurality of apertures provided at circumferentially spaced locations around the barrel element, and a plurality of water conveying tubes and extending radially, or generally so, from the central hub to make fluid flow connection thereto at an inner end of each tube with the source of pressurised water, to convey water to a water discharge nozzle to emit a water spray or jet of desired configuration, characterised in that each tube is straight, or generally so, and radiates from the hub, with an inner end of each tube provided with an adaptor for water-tight connection to the hub and for high pressure water inlet to the tube and with an outer end of each tube provided with a water discharge nozzle in the vicinity of a pick, the tubes extending through both the apertures and contiguous radially extending bores in a vane and in the face ring of larger diameter than the outside diameter of the tubes with a radially outer portion of the tube accommodated in the bore, the tubes extending directly to the nozzles such that no welding need be water-tight as the water pressure is confined within the tubes.

Thus, the rotary cutting head in accordance with the present invention provides what in effect is a non-pressurised head, for the water pressure is confined within the tubes and consequently the head may have a greatly simplified construction and/or be fabricated to lower standards. Furthermore, it is possible to incorporate a single bend adjacent the inner end of each tube, with consequent minimal pressure loss between the supply source and the nozzle.

For instance, the face ring may be provided with nine bores, each housing a tube, the latter extending radially inwardly from its nozzle (which may be screwed into the outer tube end) and located at the periphery of the vane(s) and face ring. This inward location may be directly to the hub, or may be to a component carried by the hub and constituting a water distribution block.

The tubes may be rigid, such as a metallic (e.g. steel) tube, or may be flexible yet self-supporting such as a synthetic plastics tube e.g. of nylon (trade mark).

The tubes may terminate at the outer barrel element, or at a peripheral edge of a vane or face ring, or may extend beyond such edge by a first distance to a radially outer edge of a pick box, or by a further distance to a radially outer edge of a pick.

Conveniently, in an embodiment with a bored face ring, the outer end of a rigid tube is resiliently located in its bore by interposing a resilient washer between the outer tube periphery and the inner bore periphery. At the inner end of each tube, whether rigid or flexible, the hub or its distribution block, is conveniently provided with a number of sockets corresponding to the number of tubes, with an inner tube end seated in each socket and provided with a water seal.

In order to counter the effect of water pressure tending to unseat a tube from its socket, a rigid tube may be provided with a collar, while the hub is provided with a securing ring having a plurality of pairs of forked arms. Thus nine pairs of forked arms would be provided for a head incorporating nine tubes. Conveniently, the securing ring is retained on the hub by means of a circlip. With a flexible tube, the inner end thereof is provided with an adaptor, of metal or synthetic plastics,

which is at least partially located in the socket and is retained therein by a releasable latching means, e.g., a "U"-shaped staple, passing into an internal groove in the socket and an external groove in the adaptor.

In accordance with another proposal of the invention, there is provided a rotary, mineral cutting head comprising a plurality of holders for mineral cutter picks, and an internal network of water conveying piping, including at least one water inlet branch connectable to a source of high pressure water, at least one distribution branch in fluid flow communication with the inlet branch, and a plurality of tubes in fluid flow communication with the distribution branch and associated with the individual pick holders.

The cutting head in accordance with this proposal again avoids the imposition on the head of water pressure, as the high pressure water is confined within the network.

The pick holders may be constituted by sockets in the vane(s) or face ring; sockets in the outer barrel part; sockets in boxes welded to the vane(s) or face ring or outer barrel part; or a male projection to receive a female apertured pick.

The rotary cutting head in accordance with the invention is preferably provided with conventional ducting for the lower pressure water supplies e.g. for pick face flushing, where pressure losses and sealing difficulties are not so significant.

The invention will now be described in greater detail, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a sectional side elevation of a portion of a first embodiment of rotary cutting head in accordance with the invention;

Figure 2 corresponds to Figure 1 but shows a second embodiment; and

Figure 3 also corresponds to Figure 1 but shows a proposal for an internal network of piping.

In all Figures, like reference numerals are accorded to like components.

A rotary mineral cutting head 1 is rotatable about an axis 2 and is mounted, in the conventional manner, on a drive arbour of a shearer type mining machine. The head 1 comprises a hub 3 over which is mounted a cylindrical outer barrel element 4 welded to an inner annular collar 5 which seats on an outer flange 6 of the hub 3, to be secured to that flange by a plurality of bolts 7 passing through aligned holes 8. The hub 3 is provided with an axially extending water supply bore 9 connected at one end to a source of high pressure water, e.g. a pump, which may be mounted on the shearer or which may be statically located, e.g. in a roadway, adjacent one end of a mineral face being mined, and provided at its other end with a radial portion and hence having a single bend. The outer barrel part 4 is provided with a plurality of radial apertures 10 at circumferentially spaced locations around its periphery, with a hollow, water-conveying tube 11 of external diameter such that it may be readily housed at least partially within each aperture 10, the tubes 11 extending radially from the hub 3 and being in fluid flow connection with the bore 9. Around the external periphery of the barrel element 4, is welded a face ring 12 which carries mineral cutter picks 13, usually with interposed pick boxes, and which is provided with a number of bores 14 appropriate to the number of tubes 11, which number would usually correspond to the number of picks 13 carried by the face ring 12.

In the embodiment of Figure 1, the tubes 11 are rigid, each being constituted by a steel tube. At its radially inner end, each tube 11 is provided with a fitting 15 comprising a spigot portion 16 adapted to fit into a socket 17 provided directly in the hub 3, and in communication with the radial portion of bore 9. An enlarged collar 18 retains the tube 11 in position, against the displacing effect of the water pressure, by engagement with a pair of forked arms 19 provided on a securing ring 20 surrounding the hub 3. The spigot 16 also carries a pair of water seals 21 which engage the socket 17. At its radially outer end the tube 11 is provided with a screw-in water discharge nozzle 22, while a resilient washer 23 is interposed between that tube end and the bore 14. Also illustrated in Figure 1 is a conventional ducting system 24 for the supply of low pressure water via tubing 25 for purposes such as pre-start warning.

The embodiment of cutting head 1A illustrated in Figure 2 differs from Figures 1 in that the tubes 11A are of flexible, yet self-supporting synthetic plastics, such as nylon, which may, if required, be provided with an outer reinforcing braid. At its inner end, each tube 11A is provided with an adaptor 16A retained, by means of a "U"-shaped staple 26, in a socket 17A provided in a water distribution block mounted on the end of the hub 3, the block being provided with an axial portion of the bore 9 and also with its radial portion, again to define a single bend. Also illustrated in Figure 2 is a portion of a helical vane 27 in which the low pressure ducting 24 is provided.

In contrast to the embodiment of Figure 1, the tubes 11A do not terminate adjacent the radially outer circumference of the face ring 12, but are provided with a connection fitting 28 by which an extension portion 11B of each tube 11A may penetrate a suitable bore of a mineral cutter pick 13A.

The rotary mineral cutter head 1B illustrated in Figure 3, is provided with an internal network 29 of water conveying piping, comprising an inlet branch 30 extending radially from the hub 3, at least one axially extending distribution branch 31 in fluid flow communication with the inlet branch 30, and a plurality of tubes 11B, and in both the face ring and vane 27, in fluid flow communication with the distribution branch 31 and associated with individual picks 13A.

Claims

1. A rotary mineral cutting head (1, 1A, 1B) of welded construction comprising at least one helical vane (27) and also a face ring (12) which is

adapted, in use, to be located adjacent a mineral face, the vane(s) (27) and face ring (12), being welded around the external periphery of an outer barrel element (4), and provided with holders for picks (13, 13A) whilst the outer barrel element (4) is supported from a central hub (3), the hub (3) being provided with a water supply bore (9) connectable to a source of high pressure water, a plurality of apertures (10) provided at circumferentially spaced locations around the barrel element (4), and a plurality of water conveying tubes (11, 11A, 11B) extending radially, or generally so, from the central hub (3) to make fluid flow connection thereto at an inner end of each tube (11, 11A, 11B) with the source of pressurised water, to convey water to a water discharge nozzle (22) to emit a water spray or jet of desired configuration, the rotary mineral cutting head being characterised in that each tube (11, 11A, 11B) is straight, or generally so, and radiates from the hub (3), with an inner end of each tube (11, 11A, 11B) provided with an adaptor (16, 16A) for water-tight connection to the hub (3) and for high pressure water inlet to the tube (11, 11A, 11B), and with an outer end of each tube (11, 11A, 11B) provided with a water discharge nozzle (22) in the vicinity of a pick (13, 13A), the tubes (11, 11A, 11B) extending through both the apertures (10) and contiguous radially extending bores (14) in a vane (27) and in the face ring (12) of larger diameter than the outside diameter of the tubes (11, 11A, 11B), with a radially outer portion of the tube (11, 11A, 11B) accommodated in the bore (14), the tubes (11, 11A, 11B) extending directly to the nozzles (22) such that no welding need be water-tight as the water pressure is confined within the tubes (11, 11A, 11B).

2. A head as claimed in Claim 1, wherein the tubes (11, 11A, 11B) are rigid.

3. A head as claimed in Claim 1, wherein the tubes (11, 11A, 11B) are flexible yet self-supporting.

4. A head as claimed in any one of Claims 1 to 3, wherein the outer tube ends and water discharge nozzles (22) terminate at the peripheral edge of a vane (27) or face ring (12).

5. A head as claimed in any one of Claims 1 to 3, wherein the tubes (11, 11A, 11B) are provided with extension portions (11C) extending beyond the peripheral edge of a vane (27) or face ring (12).

6. A head as claimed in any one of Claims 1 to 5, wherein at the inner end of each tube (11, 11A, 11B), the hub (3) or distribution block thereof is provided with a number of sockets (17, 17A) corresponding to the number of tubes (11, 11A, 11B), with an inner end of each tube (11, 11A, 11B) seated in each socket (17, 17A) and provided with a water seal (21).

7. A head as claimed in any one of Claims 1 to 6, wherein each tube (11) is provided with a collar (18), while the hub (3) is provided with a securing ring (20) having a plurality of pairs of forked arms (19).

8. A head as claimed in Claim 6, wherein each adaptor (16A) is of metal or synthetic plastics, is at least partially located in a socket (17A) and is retained therein by a releasable latching means (26), passing into an internal groove in the socket (17A) and an external groove in the adaptor (16A).

9. A head as claimed in any one of Claims 1 to 9, comprising a plurality of holders for mineral cutter picks, and an internal network (29) of water conveying piping, including at least one distribution branch (31) in fluid flow communication with the tubes (11A) by means of a connector (30), and a plurality of connectors (30A) for pressurised water distribution.

Patentansprüche

1. Rotierender Schrämkopf für Mineralien (1, 1A, 1B) in geschweißter Konstruktion, bestehend aus wenigstens einer schraubenlinienförmig verlaufenden Leitschaufel sowie einem Ortsring, welcher im Einsatz am Ortsstoß zur Anlage bringbar ist, wobei die Leitschaufel(n) und der Ortsring auf den Umfang eines äußeren Walzenelementes aufgeschweißt sind und mit Haltern für Schrämmeißel versehen sind, während das äußere Walzenelement auf einer Zentralnabe abgestützt ist, welche mit einer an eine Druckwasserquelle anschließbaren Wasserspeisebohrung versehen ist, wobei eine Anzahl von Öffnungen rund um das Walzenelement an umfangsmäßig im Abstand voneinander liegenden Stellen sowie eine Anzahl von Wasserleitungsrohren vorgesehen sind, welche von der Zentralnabe aus radial oder im allgemeinen radial verlaufen und mit ihrem jeweiligen inneren Ende eine Verbindung mit der Druckwasserquelle herstellen, um einer Wasserabgabedüse Wasser zuzuleiten und einen Wassernebel oder -strahl gewünschter Gestaltung abzugeben, dadurch gekennzeichnet, daß jedes Rohr (11, 11A, 11B) gerade oder im allgemeinen gerade verläuft und von der Nabe (3) radial ausgeht, wobei ein innenliegendes Ende eines jeden Rohres zwecks wasserdichter Verbindung mit der Nabe (3) und für den Hochdruckwassereinlaß zur Rohr mit einem Adapter (16, 16A) und ein außenliegendes Ende eines jeden Rohres mit einer Wasserabgabedüse (22) in unmittelbarer Nähe eines Meißels (13, 13A) versehen ist, wobei die Rohre sowohl durch die Öffnungen (10) wie die anstoßenden radial verlaufenden Bohrungen (14) in einer Leitschaufel (27) und im Ortsring (12) mit größerem Durchmesser als der Außendurchmesser der Rohre hindurchlaufen und ein radial außen liegendes Teil des Rohres in die Bohrung (14) eingepaßt und alle Rohre direkt zu den Düsen laufen, so daß keine Verschweißung wasserdicht sein muß, da der Wasserdruck in den Rohren eingesperrt ist.

2. Schrämkopf nach Anspruch 1, dadurch gekennzeichnet, daß die Rohre (11, 11A, 11B) starr sind.

3. Schrämkopf nach Anspruch 1, dadurch gekennzeichnet, daß die Rohre (11, 11A, 11B) flexibel aber selbsttragend sind.

4. Schrämkopf nach irgendeinem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die

äußeren Rohrenden und die Wasserabgabedüsen (22) an der Umfangskante einer Leitschaufel (27) oder des Ortsringes (12) enden.

5. Schrämkopf nach irgendeinem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die Rohre (11, 11A, 11B) mit Verlängerungen (11C) versehen sind, welche über die Umfangskante einer Leitschaufel (27) oder des Ortsringes (12) hinausragen.

6. Schrämkopf nach irgendeinem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß am Innenende eines jeden Rohres (11, 11A, 11B) die Nabe (3) oder ihr Verteilerblock mit einer der Anzahl der Rohre entsprechenden Anzahl von Muffen (17, 17A) versehen ist und ein Innenende eines jeden Rohres in jeder Muffe sitzt und mit einem Wasserverschluß (21) versehen ist.

7. Schrämkopf nach irgendeinem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß jedes Rohr (11) mit einem Bund (18) versehen ist, während die Nabe (3) einen Sicherungsring (20) mit einer Anzahl von gegabelten Armpaaren aufweist.

8. Schrämkopf nach Anspruche 6, dadurch gekennzeichnet, daß jeder Adapter (16A) aus Metall oder Kunststoff besteht, zumindest teilweise in einer Muffe (17A) angeordnet ist und darin durch eine lösbare Verriegelung (26) festgehalten wird, welche in eine Innennut der Muffe und eine Außennut des Adapters eingreift.

9. Schrämkopf nach irgendeinem der Ansprüche 1 bis 8, gekennzeichnet durch eine Vielzahl von Haltern für Schrämmeißel und ein internes Netz von wasserführenden Rohrleitungen mit wenigstens einem Verteilerzweig (31) in Strömungsverbindung mit den Rohren (11A) über einen Verbinder (30) und eine Anzahl von Verbindern (30A) zur Druckwasserverteilung.

Revendications

1. Tête de havage rotative (1, 1A, 1B) de construction soudée, comprenant au moins un pale d'hélice (27) ainsi qu'une bague de taille (12) qui est prévue pour être positionnée, en utilisation, au voisinage d'un front de taille d'une mine, la ou les pales (:27) et la bague de taille (12) étant soudées autour de la périphérie extérieure d'un tambour extérieur (4) et étant munis d'éléments porteurs de pics (13, 13A), tandis que le tambour extérieur (4) est supporté par un moyeu central (3), le moyeu (3) étant muni d'un alésage d'alimentation en eau (9) qui peut être relié à une source d'alimentation en eau sous haute pression, une pluralité d'ouvertures (10) étant prévues en des endroits circonférentiellement espacés autour du tambour (4), et une pluralité de tubes transporteurs d'eau (11, 11A, 11B) s'étendant radialement, ou sensiblement radialement, à partir du moyeu central (3), afin de réaliser le raccordement, à l'extrémité intérieure de chaque tube (11, 11A, 11B), avec la source d'eau sous pression, et de transporter l'eau à une buse d'évacuation (22) afin d'émettre un jet ou une pulvérisation d'eau de la configuration souhaitée, la tête de havage rotative étant caractérisée en ce que chaque tube (11, 11A, 11B) est droit ou du moins globalement droit, et rayonne à partir du moyeu (3), l'extrémité intérieure de chaque tube (11, 11A, 11B) étant munie d'un adaptateur (16, 16A) en vue d'un raccordement étanche au moyen (3) et d'une admission d'eau sous haute pression dans le tube (11, 11A, 11B), l'extrémité extérieure de chaque tube (11, 11A, 11B) étant munie d'une buse d'évacuation d'eau (22) au voisinage d'un pic (13, 13A), les tubes (11, 11A, 11B) s'étendant à travers les ouvertures (10) et à travers des alésages contigus s'étendant radialement (14) qui sont pratiqués dans une pale (27) et dans la bague de taille (12) et qui présentent un diamètre supérieur au diamètre extérieur des tubes (11, 11A, 11B), et une partie radialement extérieure du tube (11, 11A, 11B) étant reçue dans l'alésage (14), les tubes (11, 11A, 11B) s'étendant directement jusqu'aux buses (22), de sorte qu'aucune soudure ne doit être étanche, étant donnée que l'eau sous pression est confinée à l'intérieur des tubes (11, 11A, 11B).

2. Tête selon la revendication 1, dans laquelle les tubes (11, 11A, 11B) sont rigides.

3. Tête selon la revendication 1, dans laquelle les tubes (11, 11A, 11B) sont flexibles mais cependant autoporteurs.

4. Tête selon l'une quelconque des revendications 1 à 3, dans laquelle les extrémités extérieures des tubes et les buses d'évacuation d'eau (22) se terminent au niveau du bord périphérique d'une pale (27) ou selon le cas de la bague de taille (12).

5. Tête selon l'une quelconque des revendications 1 à 3, dans laquelle les tubes (11, 11A, 11B) sont munies de prolongements (11C) s'étendant au-delà du bord périphérique d'une pale (27) ou selon le cas de la bague de taille (12).

6. Tête selon l'une quelconque des revendications 1 à 5, dans laquelle, à l'extrémité intérieure de chaque tube (11, 11A, 11B), le moyeu (3) ou le bloc de distribution de ce dernier est muni d'un certain nombre de douilles de raccordement (17, 17A) correspondant au nombre de tubes (11, 11A, 11B), l'extrémité intérieure de chaque tube (11, 11A, 11B) étant logée dans chaque douille (17, 17A) et munie d'un joint étanche à l'eau (21).

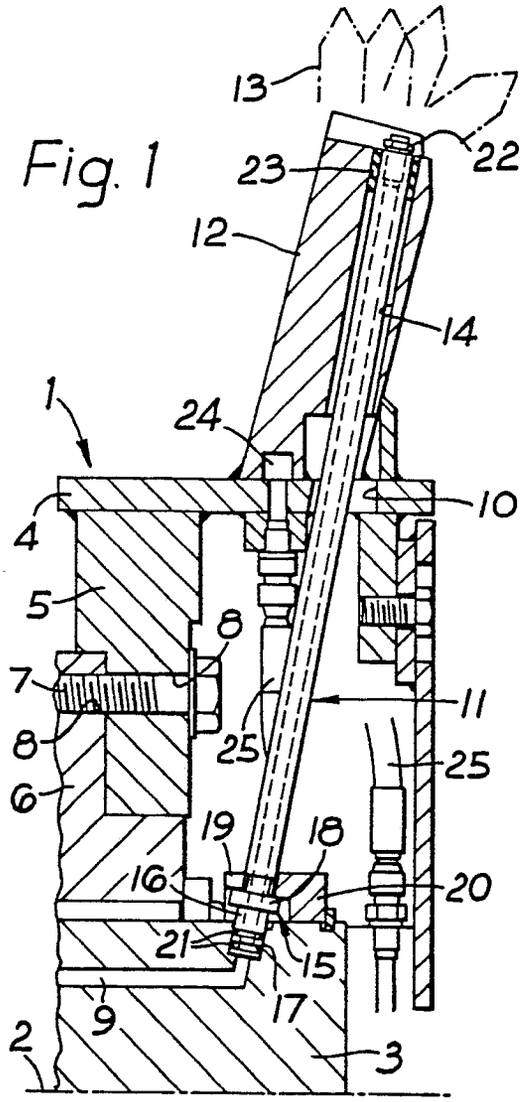
7. Tête selon l'une quelconque des revendications 1 à 6, dans laquelle chaque tube (11) est muni d'un collier (18), tandis que le moyeu (3) est muni d'une bague de fixation (20) présentant une pluralité de paires de bras de fourches (19).

8. Tête selon la revendication 6, dans laquelle chaque adaptateur (16A) est réalisé en métal ou en matière plastique synthétique, est logé au moins partiellement dans une douille (17A), et y est retenu par un moyen de verrouillage libérable (26) qui passe dans une rainure interne pratiquée dans la douille (17A) et dans une rainure externe pratiquée dans l'adaptateur (16A).

9. Tête selon l'une quelconque des revendications 1 à 8, comprenant une pluralité d'éléments porteurs de pics de havage et un réseau interne (29) de tuyauterie transporteuse d'eau, ledit

réseau comprenant au moins une branche de distribution (31) qui est en communication de flux avec les tubes (11A) par l'intermédiaire d'un connecteur (30), et une pluralité de connecteurs (30A) pour la distribution d'eau sous pression.

Fig. 1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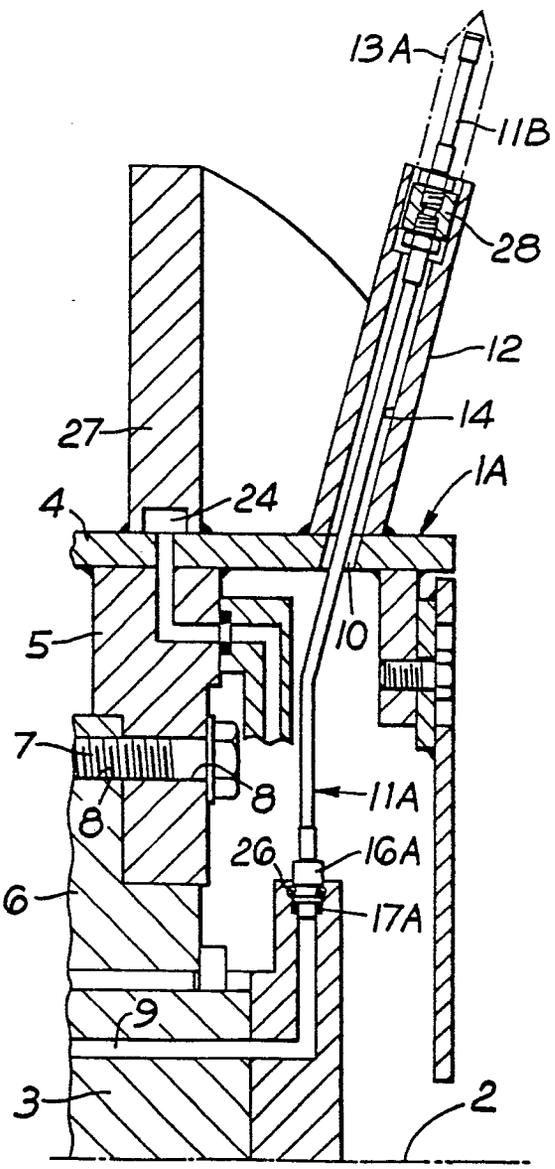
13A
11B
28
12
27
14
1A
4
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5
10
7
8
11A
8
26
16A
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17A
9
3
2

Fig. 2

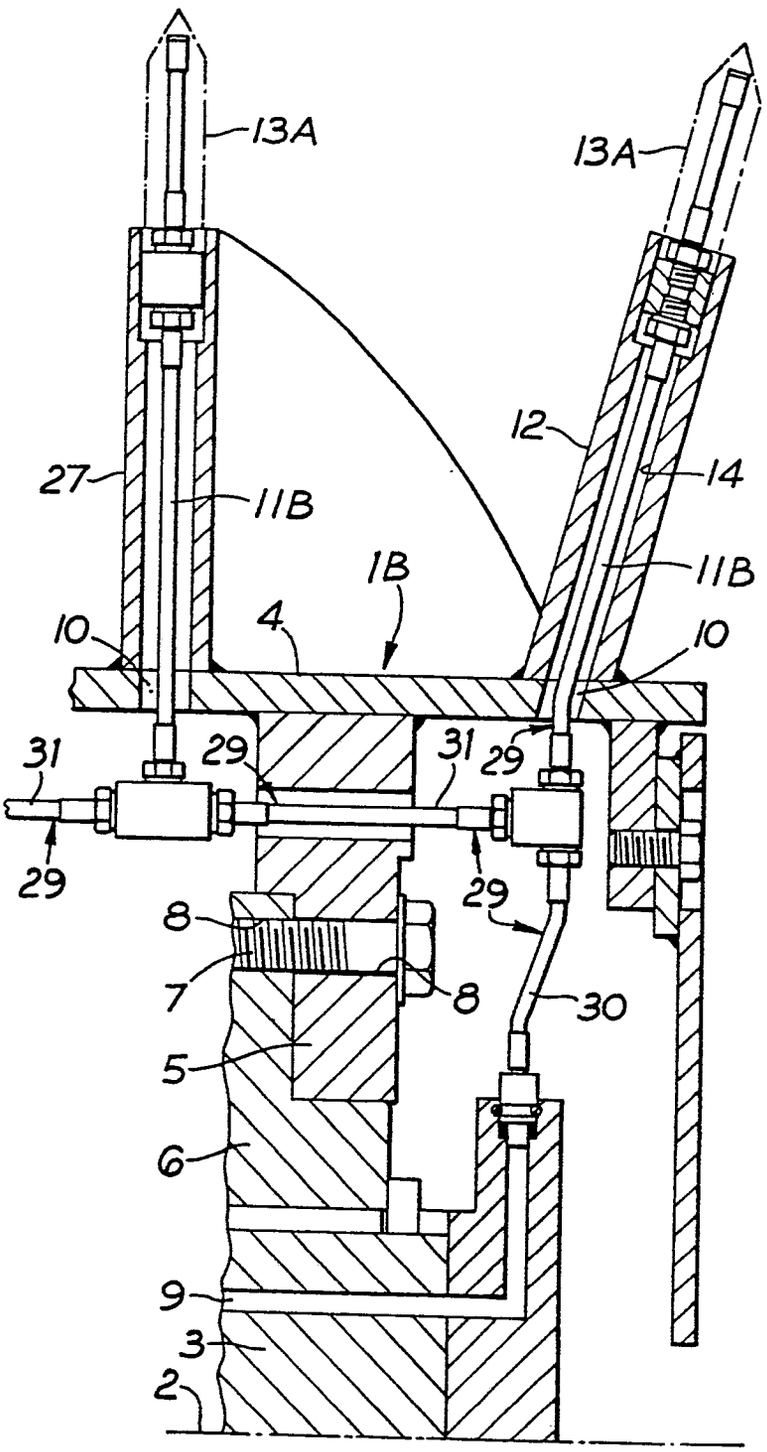

Fig. 3