(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 163 432**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **85303117.7**

(22) Date of filing: **02.05.85**

(51) Int. Cl.⁴: **E 21 C 35/22**
E 21 D 9/10

(30) Priority: **04.05.84 GB 8411526**

(43) Date of publication of application:
04.12.85 Bulletin 85/49

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

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(54) Rotary, mineral cutting head.

(57) A fabricated rotary, mineral cutting head (1, 1A, 1B) comprises an outer, barrel element (4) 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 spokes (11, 11A, 11B) each penetrating an aperture (10) and extending radially, or generally so, from the central hub (3) to make fluid flow connection thereto at an inner spoke end with the source of pressurised water, and provided at an outer spoke end with a water discharge nozzle (22) to emit a water spray or jet of desired configuration.

The invention also includes a rotary, mineral cutting head comprising a plurality of holders for mineral cutter picks, and an internal network (29) of water conveying piping, including at least one water inlet branch (30) connectable to a source of high pressure water, at least one distribution branch (31) in fluid flow communication with the inlet branch (30), and a plurality of spokes (11B) in fluid flow communication with the distribution branch (31) and associated with the individual pick holders.

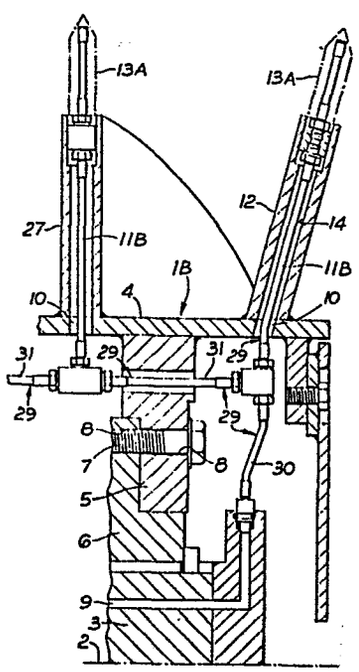

Fig. 3

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ROTARY, MINERAL CUTTING HEAD

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 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 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 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 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 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 fabricated rotary cutting head comprising an outer barrel element 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 spoke each penetrating an aperture and extending radially, or generally so, from the central hub to make fluid flow connection thereto at an inner spoke end with the source of pressurised water and provided at an outer spoke end with a water discharge nozzle to emit a water spray or jet of desired configuration.

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 spokes 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 spoke, with consequent minimal pressure loss between the

supply source and the nozzle.

In an embodiment of head intended for mineral winning operations, the outer barrel element would be cylindrical, while in an embodiment for roadway driving the outer barrel element would be frusto-conical.

Furthermore a cutting head, particularly for mineral winning operations would normally be provided with at least one helical vane and also with a face ring adapted, in use, to be located remote from the associated mining machine and adjacent the mineral face, the vane(s) and face ring, being welded around the external periphery of the outer barrel element. In accordance with another feature of the invention, the vane(s) and face ring are each provided with a plurality of radially extending bores, each contiguous with an aperture of the outer barrel part, so that a radially outer portion of a spoke may be accommodated in a bore. For instance, the face ring may be provided with nine bores, each housing a spoke, the latter extending radially inwardly from its nozzle (which may be screwed into the outer spoke 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 spokes 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 spokes 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 spoke is resiliently located in its bore by interposing a resilient washer between the outer spoke periphery and the inner bore periphery. At the inner end of each spoke, whether rigid or flexible, the hub or its distribution block, is conveniently provided with a number of sockets corresponding to the number of spokes, with an inner spoke end seated in each socket and provided with a

water seal.

In order to counter the effect of water pressure tending to unseat a spoke from its socket, a rigid spoke 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 spokes. Conveniently, the securing ring is retained on the hub by means of a circlip. With a flexible spoke, 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 of independent significance, 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 spokes 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 spoke 11 of external diameter such that it may be readily housed at least partially within each aperture 10, the spokes 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 spokes 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 spokes 11 are rigid, each being constituted by a steel tube. At its radially inner end, each spoke 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 spoke 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 spoke 11 is provided with a screw-in water discharge nozzle 22, while a resilient washer 23 is interposed between that spoke 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 spokes 11A are of flexible, yet self-supporting synthetic plastics tube, such as nylon, which may, if required, be provided with an outer reinforcing braid. At its inner end, each spoke 11A is provided with an adaptor 16A retained, by means of a "U"-shaped staple 26, in a socket 17A provided in a water distriution 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 spokes 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 spoke 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 in spoke-like manner 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 spokes 11B, and in both the face ring 12 and vane 27, in fluid flow communication with the distribution branch 31 and associated with individual picks 13A.

"CLAIMS"

1. A fabricated rotary, mineral cutting head (1, 1A, 1B) comprising an outer, barrel element (4) 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 spokes (11, 11A, 11B) each penetrating an aperture (10) and extending radially, or generally so, from the central hub (3) to make fluid flow connection thereto at an inner spoke end with the source of pressurised water, and provided at an outer spoke end with a water discharge nozzle (22) to emit a water spray or jet of desired configuration.

2. A head as claimed in Claim 1, provided with at least one helical vane (27) and also with a face ring (12) adapted, in use, to be located adjacent the mineral face, the vane(s) (27) and face ring (12), being welded around the external periphery of the outer barrel element (4), with a plurality of radially extending bores (14) provided in the

vane(s) (27) and face ring (12) each bore (14) being contiguous with an aperture (10) of the outer barrel part (4), so that a radially outer portion of a spoke (11, 11A, 11B) is accommodated in a bore (14).

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

4. A head as claimed in Claim 1 or Claim 2, wherein the spokes (11, 11A, 11B) are flexible yet self-supporting.

5. A head as claimed in any one of Claims 1 to 4, wherein the spokes (11, 11A, 11B), terminate at the peripheral edge of a vane (27) or face ring (12).

6. A head as claimed in any one of Claims 1 to 4, wherein the spokes (11, 11A, 11B) extend beyond the peripheral edge of a vane (27) or face ring (12).

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

17A) and provided with a water seal (21).

8. A head as claimed in Claim 3, and any Claim appendant thereto, wherein each spoke (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).

9. A head as claimed in Claim 4 and any Claim appendant thereto, wherein the inner end of each spoke (11A, 11B) is provided with an adaptor (16A) of metal or synthetic plastics, which is at least partially located in the 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).

10. A rotary, mineral cutting head comprising a plurality of holders for mineral cutter picks, and an internal network (29) of water conveying piping, including at least one water inlet branch (30) connectable to a source of high pressure water, at least one distribution branch (31) in fluid flow communication with the inlet branch (30), and a plurality of spokes (11B) in fluid flow communication with the distribution branch

(31) and associated with the individual pick holders.

Fig. 1

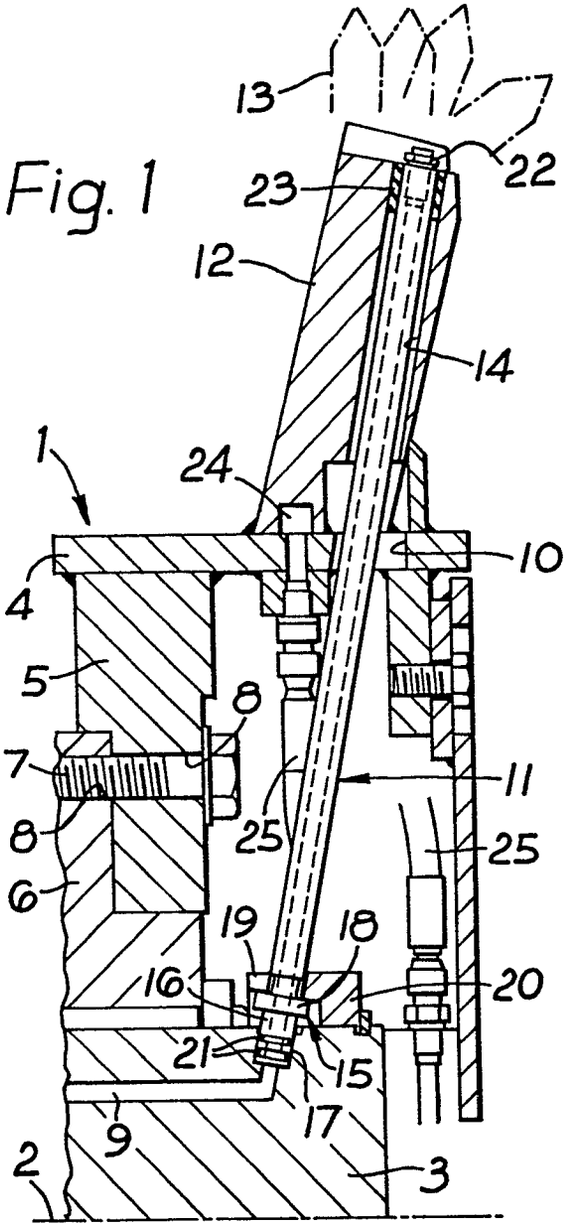
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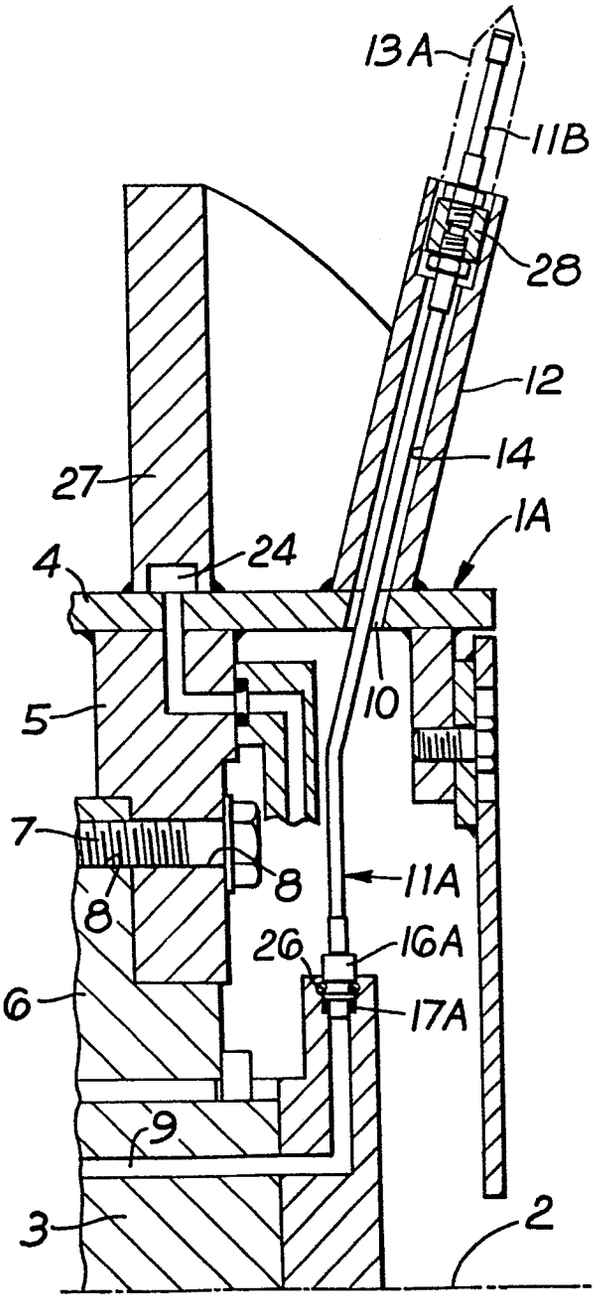
Fig. 2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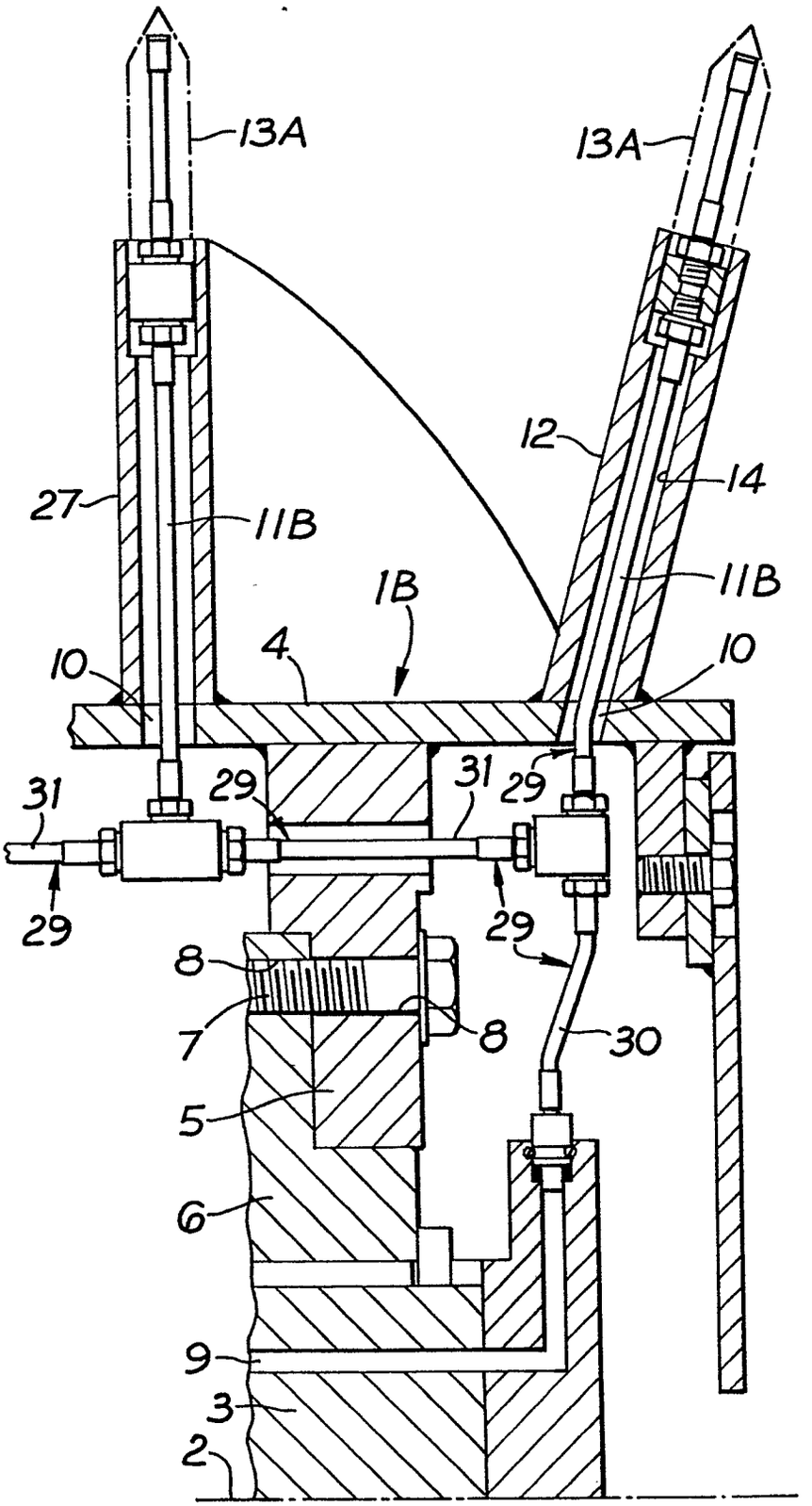

Fig. 3

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EUROPEAN SEARCH REPORT

0163432
Application number

EP 85 30 3117

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	GB-A-2 089 868 (PAURAT) * Abstract; figures 4-6 *	1,4-7, 10	E 21 C 35/22 E 21 D 9/10
A	FR-A-2 242 558 (SOCIETE STEPHANOISE) * Page 3, lines 8-32; figures *	1,3,5, 10	
A	DE-A-2 134 893 (COAL INDUSTRY) * Figure 2 * & GB - A - 1 309 005 (Cat. D)	1,2,4, 5,7,10	
A	US-A-4 219 239 (KRAMPE)		
A	GB-A-2 015 625 (EICKHOFF)		TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			E 21 C E 21 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	13-08-1985	RAMPELMANN J.

CATEGORY OF CITED DOCUMENTS

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