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(54) Improvements in or relating to protective helmets.

(57) A protective helmet (1) incorporates a visor (30) retractable therewithin, a fan (24) for providing filtered air flow through a duct (22) within the shell (2) to the visor (30), and ear defenders (60) mounted substantially within the profile of the shell (2).

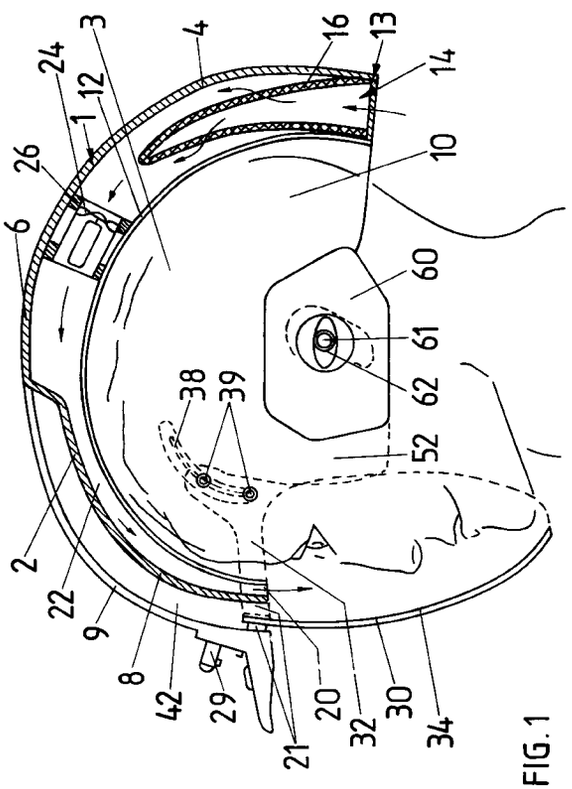

FIG. 1

EP 0 492 984 A1

This invention concerns improvements in or relating to protective helmets for use by operatives in industrial environments.

In particular, although not exclusively, the invention has reference to such helmets for use in the mining or quarrying industries wherein the need for protective headwear is especially acute. Protection is required not only to prevent physical injury but also to avoid and indeed minimise damage to the respiratory organs, to the aural, ocular and olfactory senses.

Protective helmets in the form of powered helmet respirators are already known and generally include a protective shell within which is provided means for introducing a filtered air supply between the wearer's face and a visor which may assume a fixed disposition on the shell or may be pivotally mounted outside the shell to allow movement into and out of an operable, ie protective, position in front of a wearer's face.

It is also known to provide protective helmets with ear defenders mounted externally of the shell and pivotable between operative and inoperative positions. The problem is that because of their location exteriorly of the shell, they can become snagged on equipment which occasions discomfort to the wearer, and damage or dislodgement of the ear defender.

It has been and remains a feature of known powered helmet respirators that they are cumbersome and also heavy and poorly balanced when provided with respirator fans and filter, face visor and ear defenders, with consequential user resistance.

It is therefore an object of the present invention to provide an improved protective helmet.

According to the invention there is provided a protective helmet including a protective shell for accommodating a wearer's head, a visor at the front part of the shell and retractable therewithin, the shell being provided with an ear defender at each side thereof, each ear defender being substantially within the profile of the shell, an air duct defined within the shell and having an inlet towards the rear part of the shell and a number of outlets associated with the front part of the shell and directed on to the internal surface of the visor and at least some of its marginal edges which in use extend adjacent the wearer's face, a filter associated with the duct, and an air mover for introducing air to the duct.

Advantageously the air duct extends from the occipital region to terminate at the front part of the shell in the or each outlet which in use supplies air to the top part of the visor when in its operational extended position in front of a wearer's face, such that the interior of the visor is swept with air. Preferably there is provided a plurality of outlets for the air duct, the outlets being directed such as in use to sweep the interior of the visor with air and to target the marginal edges of the visor lying adjacent the wearer's face thereby to provide a pneumatic seal therearound to minimise the ingress of injurious atmospheric pollutants.

An inner protective skin is disposed within the shell in spaced relation thereto, the skin conveniently defining the duct between it and the internal surface of the shell. retractable. The air duct extends over a substantial part of its length between the shell and the inner skin, the inner skin being bifurcated at the front part of the shell to provide both the number of outlets and the space for visor retraction.

The shell may be formed to give at its rear part an outer wall and at its front part an inner wall, the front part being provided with a cover to define a channel within which the visor may retract. The cover in such an embodiment is so formed as to give the helmet a continuous or substantially continuous outer profile. The cover may for convenience be removable and replaceable, suitable fixtures being provided for that purpose.

The filter may conveniently extend across the inlet to the duct, and the air mover may be disposed within the duct in rearwards of the crown of the shell. The air mover is constituted by at least one fan, preferably battery powered.

The visor may be removably mounted in a carrier having a renewable transparent section constituting the visor per se. Alternatively, the carrier may comprise a frame into which a renewable transparent section may be insertable.

The visor carrier may be slidably mounted to the interior of the shell by means of side supports each having slots with which bushes on the carrier engage to afford in use and arcuate sliding motion for the visor into and out of an operative position in front of the wearer's face.

Each ear defender may conveniently be provided substantially within the profile of the helmet thereby to secure that there are no protuberances which in use could constitute a source of danger by snagging.

The front part of the shell may be peaked and be provided with protective side cheeks which in use complement the visor and the ear defenders to provide continuity around the wearer's face. The side cheeks form a proximity seal between the visor frame and the wearer's face, thus providing enhanced protection from side draughts of contaminated air.

The front part of the shell may be provided with a mount for a lamp such as is used in underground mining, the lamp being battery powered. In the one embodiment described above, the cover would be provided with the mount at the front of the helmet. The removable cover provides a degree of versatility whereby different fitments thereto can be provided on a range of covers.

By way of example only, one embodiment of protective helmet according to the invention is described below with reference to the accompanying drawings in which:

Figure 1 is a side view of the helmet partly in sec-

tion and in position on a wearer's head; and

Figure 2 is an interior view of the helmet.

Referring to the drawings, there is shown at 1 a protective helmet in the form of a powered helmet respirator in position on a wearer's head 3, the respirator comprising a protective shell 2 having a rear part 4, a crown 6, a front part 8 and sides 10. A head harness (not shown) is provided within the shell 2 for comfortably seating the respirator on the wearer's head 3.

An inner skin 12 extends from the rear part 4 to the front part 8 and defines in the occipital region an air inlet 14 across which there is provided a filter 16 of suitable fibrous material. The filter 16 is clipped into a holder 13 and can thus be easily dismountable and replaceable. A further inner skin which comprises parts of the shell 4, 6, 8 extends through 4, 6 and downwards through 8 terminating in a plurality of outlets 20 in the form of slots. An air duct 22 is thus defined within the shell 2 between its inner surface and the skins 12 and 4, 6 and 8.

A front cover 9 is fixed to the shell 2 to provide a smooth profile to the helmet exterior and with the front part of the protective shell 8, provides a space 42 into which the visor 30 may retract.

An air mover in the form of two battery-powered fans 24 is located within the duct 22 on sound-absorbing mounts 26 rearwards of the crown 6 of the shell 2. The power for the fans 24 is conveniently provided by a body mounted battery pack (not shown) which is of such capacity as additionally to power a lamp (not shown) releasably fixable to the front part 9 on a bracket 29 provided for that purpose (Figure 1).

A visor 30 comprising a carrier 32 which is releasably fixed to a transparent window 34 is slidably and pivotally mounted on supports 38 fixed to the sides of the helmet shell 2, with bushes 39 attached to the visor carrier 32. The supports 38 have curved slots within which the bushes are adapted to slide.

The visor 30 is retractable within a space 42 defined between part 8 of the shell 2 and the inside wall of the outer cover 9. The visor 30 has a stop for abutting a cut-off switch (not shown) such that when the visor is fully extended in front of the wearer's face, the power to the fan 24 is initiated. Additionally, in this position, the visor is sealed against the inner face of the outer cover 9 by a sealing strip 21. The visor may alternatively seal against the outer face of the shell 8 along its lower edge. A limited pivoting motion about the lower bush 39 may be provided to enable the lower part of the visor to move closer to the wearer's face, and is achieved by a small recess in the slot in the support 38 into which the upper bush may move.

In its operative position as shown in figure 1, the visor 30 in conjunction with cheek plates 52 and ear defenders 60, to be described later, on the sides 10 of the shell 2 gives panoramic protection for the front and sides of the wearer's face.

The visor 30 may be provided with a range of proximity seals (not shown) to reduce the distance between the visor margins and the wearer's face for the purpose of further minimising the ingress of contaminated air into the wearer's breathing zone.

With reference to Figure 1, there is shown on one side of the powered helmet respirator 1 an ear defender 60 which is secured to the shell 2. A corresponding ear defender (not shown) is provided on the other side of the shell. The ear defender 60 conforms to the general profile of the helmet 1, and is secured to the shell 10 so that the inner face of the ear defender sits relatively close to the wearer's ears. When in its correct position, the ear defender 60 is close to but not in contact with the wearer's head. In this position, noise attenuation is not achieved. In order for the ear defenders to become operable, an inner portion (not shown) of the ear defender 60 is caused to move inwards to contact the wearer's ear, or the region therearound, by a mechanism (not shown) akin to a piston moving within a cylinder. The mechanism is resiliently loaded when in its operative position to provide correct pressure against the wearer's head.

In order to permit use of a telephone when the helmet is being worn, pressure on lugs 61 in the ear defender 60 opens channels 62 to allow the transmitted speech to become audible to the wearer.

In use, the helmet 1 fits snugly and comfortably on the wearer's head 3 initially with the visor 30 in its retracted position within the space 42, the fans 24 being stationary. Downward movement of the visor 30 brings it into its operative position as shown in Figure 1. At the same time release of the cut-off switch (not shown) allows power to be restored to the fans 24 which accordingly induce an air flow through the inlet 14 and the filter 16 into the duct 22 and thence to the outlets 20 whence it travels downwards between the visor 34 and the face of the wearer to ventilate same with filtered air and to provide cooling. By virtue of the slot form of the outlets 20 and the close fitting of the visor 30 with the cheek plates 52 and ear defenders 60, a screen of air passes in a concentrated flow over the nose and mouth of the wearer, the air flow passing out between the lower margins of the visor 30 and the wearer's chin, and lower parts of the cheeks.

The ear defenders 60 are within the general profile of the shell 2 of the helmet 1, and present no projection likely to be a hazard. Operation of a fully integrated and custom designed helmet according to the present invention in which the ear defenders are within the profile of the shell enables noise attenuation to be achieved effectively.

The present invention thus provides a comprehensive and versatile powered helmet respirator possessing an optimum of protective features whilst being less cumbersome and less weighty than its antecedents. Equally, replacement of the filter and of the visor window are facilitated thus reducing cost and time spent in repair.

Claims

1. A protective helmet including a protective shell for accommodating a wearer's head, a visor at the front part of the shell characterised in that the visor (30) is retractable within the shell (2), the shell (2) being provided with an ear defender (60) at each side thereof, each ear defender (60) being substantially within the profile of the shell (2), and characterised by an air duct (22) defined within the shell (2) and having an inlet (14) towards the rear part of the shell (2) and a number of outlets (20) associated with the front part of the shell (2) and directed on to the internal surface of the the visor (30) and at least some of its marginal edges which in use extend adjacent the wearer's face, a filter (16) associated with the duct (22), and an air mover (24) for introducing air to the duct.

2. A helmet according to Claim 1 characterised in that the air duct (22) extends from the occipital region to terminate at the front part of the shell (2) in the or each outlet (20) which in use supplies air to the top part of the visor (30) when in its operational extended position in front of a wearer's face, such that the interior of the visor (30) is swept with air.

3. A helmet according to Claim 1 or 2 characterised in that there is provided a plurality of outlets (20) for the air duct (22), the outlets (20) being directed such as in use to sweep the interior of the visor (30) with air and to target the marginal edges of the visor (30) lying adjacent the wearer's face thereby to provide a pneumatic seal therearound to minimise the ingress of injurious atmospheric pollutants.

4. A helmet according to Claims 1, 2 or 3 characterised in that the shell (2) provides at its rear part the outer profile of the helmet (1) and is stepped at its front part, a removable cover (9) being provided in spaced relation to the front part to define a space into which the visor (30) is retractable and being continuous with the profile of the helmet.

5. A helmet according to any one of the preceding claims characterised in that the filter (16) extends across the inlet (14) to the duct (22).

6. A helmet according to any one of the preceding claims characterised in that the air mover (24) is disposed within the duct (22) to the rear of the crown of the shell and downstream of the filter (16).

7. A helmet according to any one of the preceding claims characterised in that the air mover is constituted by at least one fan (24).

8. A helmet according to any one of the preceding claims characterised in that the visor (30) includes a carrier (32) to which a transparent section (34) is detachably fixed.

9. A helmet according to any one of the preceding claims characterised in that the visor (30) is slidably mounted to the interior of the shell (2) by means of at least one support arm (38).

10. A helmet according to any one of the preceding claims characterised in that each ear defender (60) is attached to the shell (2), parts of the defenders (60) being movable between non-operating and operating positions.

11. A helmet according to Claim 10 characterised in that the ear defender (60) in its operating position contacts the otic region thereby to achieve noise attenuation.

12. A helmet according to claim 11 characterised in that an inner part of the ear defender (60) is caused to contact the otic region mechanically.

13. A helmet according to Claim 11 or 12 characterised in that the ear defenders (60) are adapted in their operating position in contact with the otic region to prevent or allow the passage of sound therethrough.

14. A helmet according to Claim 13 characterised in that pressure applied to the ear defenders (60) opens sound transmission passageways therewithin thereby allowing the passage of sound.

15. A helmet according to any one of the preceding claims characterised in that the front part of the shell (2) is provided with protective side cheeks which in use complement the visor and the ear defenders (60) to provide continuity around the wearer's face.

16. A helmet according to any one of the preceding claims characterised in that the front part of the helmet (1) is provided with a mount (29) for a lamp.

17. A helmet according to any one of the preceding claims characterised in that the air mover (24) is battery-powered.

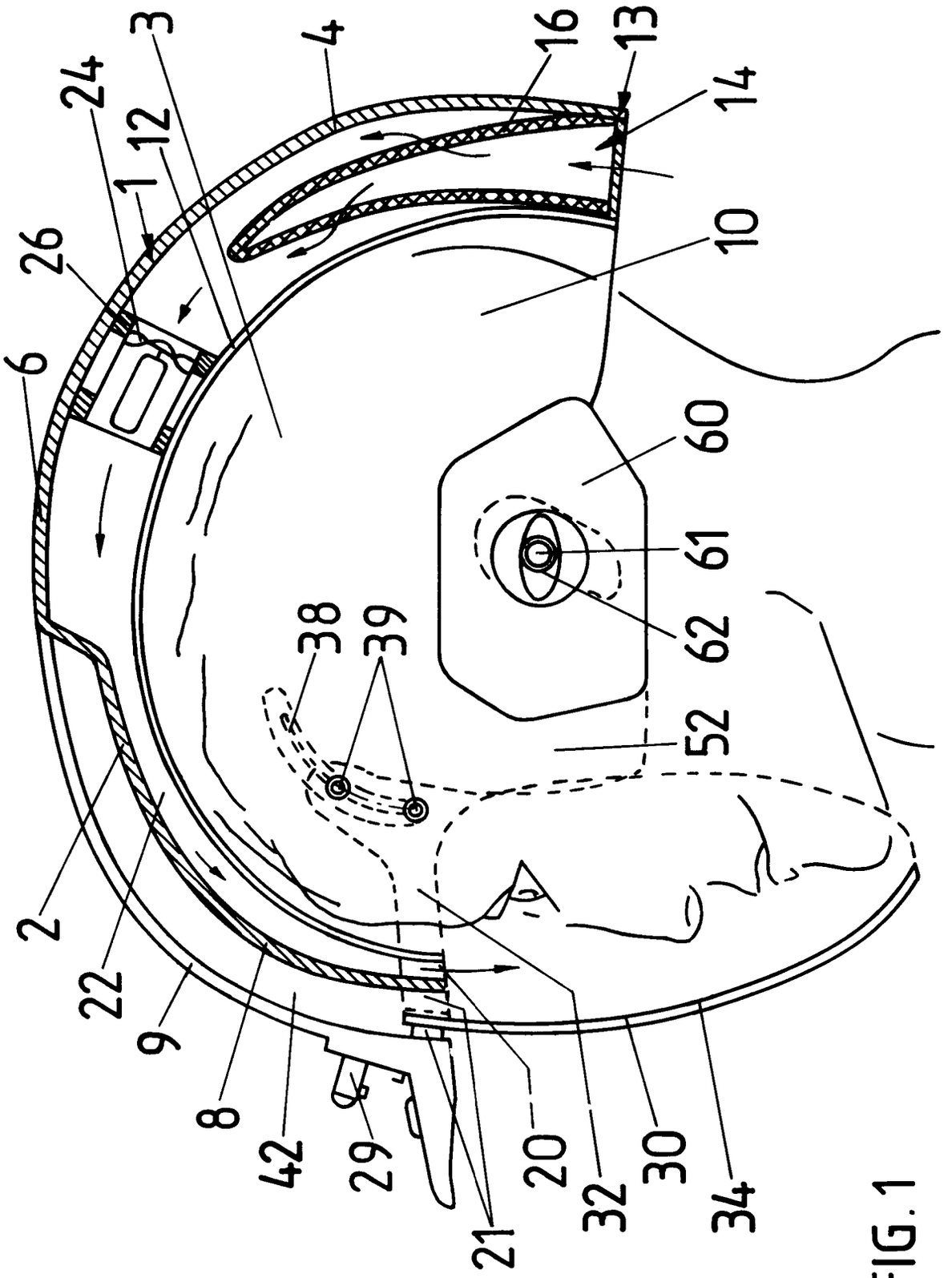

FIG.1

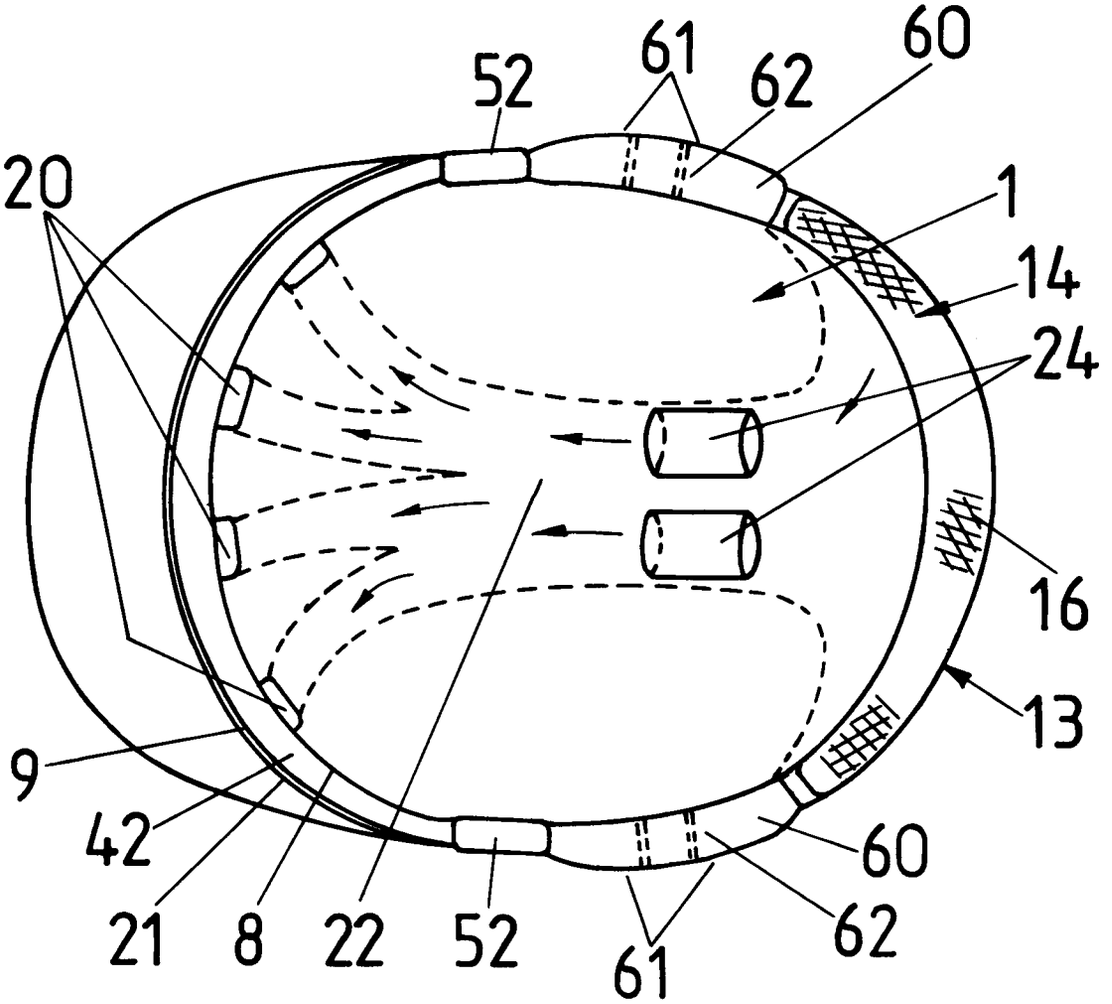

FIG. 2

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EUROPEAN SEARCH REPORT

Application Number

EP 91 31 1796

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.5)
Y	GB-A-2 014 036 (CANADIAN PATENTS AND DEVELOPMENT LIMITED) * page 1, line 85 - line 130 * * page 2, line 22 - line 40 * * figures 1,6-8 * ---	1-17	A42B3/28 A42B3/22 A42B3/16 A62B18/04
Y	FR-A-2 629 986 (ELECTRICITE DE FRANCE) * page 3, line 20 - line 24 * * page 4, line 21 - line 34 * * page 5, line 1 - page 7, line 11 * * page 7, line 22 - line 36 * * page 8, line 4 - line 15 * * figures 1-5,7,8 * ---	1-5,7-9, 15-17	
Y	GB-A-2 063 074 (MARTINDALE PROTECTION LIMITED) * page 1, line 96 - line 125 * * figure 1 * ---	6	
Y	US-A-3 178 723 (J. A. AILEO) * claims; figures * ---	10-13	
Y	US-A-3 906 547 (J. A. AILEO) * column 2, line 58 - column 3, line 2 * * figures 1,2 * ---	14	TECHNICAL FIELDS SEARCHED (Int. Cl.5) A42B A62B A61F
A	WO-A-8 102 514 (MINNESOTA MINING AND MANUFACTURING COMPANY) * the whole document * ---	1-17	
A	US-A-3 223 086 (R. F. DENTON) * the whole document * ---	1-17	
A	DE-A-3 220 691 (HABRA ELEKTRONIK GESELLSCHAFT MBH) * the whole document * ---	1-17	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	26 MARCH 1992	BOURSEAU A.M.

EPO FORM 1503 03.82 (P0401)

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

Application Number

EP 91 31 1796

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.5)
A	US-A-3 310 811 (V. D. IACONO, JR) * column 2, line 29 - column 3, line 35 * * figures 1,2,4,8-11 * -----	1,4,8,9	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)

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