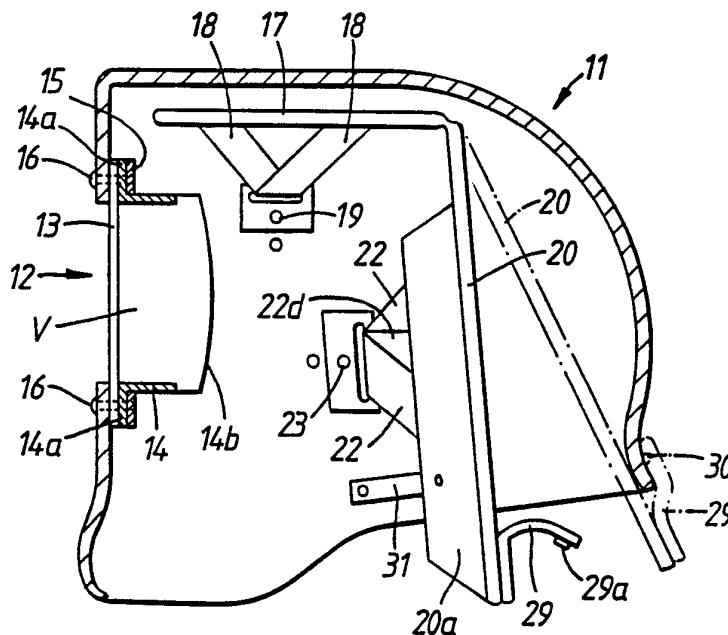




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(54) Title: IMPROVEMENTS IN OR RELATING TO SAFETY HELMETS



(57) Abstract

Safety helmets, totally encasing the wearer's head and incorporate breathing apparatus supplying air to and exhausting air from an isolated volume within the helmet, are well known. The isolated volume is defined by a viewing panel, an annular seal and the face of the wearer. There is a problem in fitting and removing such a helmet which has been solved in prior art constructions by making the helmet from two shell halves, hinged together at the crown of the helmet. The invention proposes a one-piece helmet shell (11), which has a front to rear dimension more than one and a half times that of the wearer's head, and providing a pad (17, 20) so supported that it can be displaced to the rear regions of the helmet, to facilitate fitting and removal of the helmet, and with the helmet fitted pushes the head of the wearer into pressure contact with the annular seal.

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"IMPROVEMENTS IN OR RELATING TO SAFETY HELMETS"

This invention relates to safety helmets and, more specifically, to safety helmets including breathing apparatus incorporated within the helmet.

5 Safety helmets, for use with breathing apparatus incorporated within the helmet, generally totally encase the head of the wearer and include a see-through panel with an annular seal surrounding the said panel and extending into the helmet. The said annular seal, when the helmet is in use,
10 extends into pressure contact with the face of the wearer to form a seal across the forehead, down the sides of the face and across the chin. Thus, the seal forms an isolated volume between the face of the wearer and the see-through panel and means are provided for supplying air to said volume and
15 exhausting spent air therefrom when the helmet is in use.

The helmet also includes flexible and/or resilient means, intended to contact the rear of the head of the wearer,

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to force the wearer's face into pressure contact with the said annular seal, thus to maintain said isolated volume.

Such a helmet is, hereinafter, referred to as "a helmet of the type defined".

5 A problem with helmets of the type defined resides in inserting the wearer's head into the helmet between the face seal and the resilient means and this problem has been solved in prior art helmets by forming the helmet in two parts, a front part and a rear part, connected by a hinge at the crown
10 of the helmet. The see-through panel and the annular seal are supported in the front part and the resilient means are contained in or anchored to the rear part, whereupon by hinging the two parts open the head of the wearer can be inserted into or removed from the helmet and, when in use, the two helmet
15 parts are secured together by fasteners.

A serious disadvantage with the prior art multi-part shell helmets arises in the sealing of the joint between the helmet parts in the closed position and, for example, such multi-part helmets as have been proposed in the past have
20 failed to meet the many test procedures specified for certain applications, for example fire-fighting applications, and therefore such prior art helmets have very limited uses.

The present invention seeks to provide a safety helmet, of the type defined capable of meeting all the requirements for
25 all applications for such helmets.

According to the present invention there is provided a safety helmet of the type defined, characterised in that the helmet comprises a one-piece shell.

30 Preferably the safety helmet is characterised in that the shell has a front to rear dimension greater than one and one half times the front to rear dimension of the wearer's head, and more preferably more than one and three quarter times the front to rear dimension of the wearers head.

35 Preferably the safety helmet is characterised in that the flexible resilient means include a first pad and flexible resilient straps extending from the pad to anchor locations

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within the helmet, said flexible resilient straps serving to locate the said first pad in a position to engage the rear regions of the wearer's head when the helmet is in use.

5 In a preferred embodiment said flexible resilient straps are arranged to support the first pad in pressure contact with the rear regions of the wearer's head to maintain the wearer's face in pressure contact with the annular face seal.

10 Preferably said flexible resilient straps are arranged to be stretchable towards the rear regions of the shell to allow the head of a wearer to readily enter the helmet between the annular face seal and the first pad.

15 In a preferred embodiment the safety helmet is characterised by a second pad, in the upper regions of the helmet, and said second pad being supported by flexible resilient straps fixed to anchor locations within the helmet and serving as a crown protection for the wearer.

In a preferred embodiment the upper regions of the first pad are hingedly connected to the rear regions of the second pad.

20 Preferably said first pad includes stiffeners and said pad extends outwardly of the opening to the helmet to facilitate stretching of the resilient straps for fitting or removing the helmet to and from the head of the wearer.

25 Preferably the first pad includes detachable anchoring means, for retaining the lower regions of said first pad in close proximity to the rear of the helmet shell whilst the helmet is being fitted or removed from the wearer.

30 In a preferred embodiment the first pad includes non-resilient strap means secured to anchor points in the helmet and adjustable to hold the first pad in pressure contact with the rear regions of the wearer's head.

The invention will now be described further by way of example with reference to the accompanying drawings in which;

35 Fig. 1 shows, in vertical front to rear cross-section, a helmet in accordance with the present invention,

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Fig. 2 shows a plan view of a flexible resilient means suitable for use with the helmet shown in Fig. 1 and

Fig. 3 shows a plan view of a second embodiment flexible resilient means

5 The helmet illustrated in Fig. 1 generally comprises a one-piece shell 11 with a front to rear dimension some one and three quarter times the front to rear dimension of the wearer's head. The shell 11 has a viewing aperture 12 in its forward regions closed by a see-through panel 13, conveniently of a rigid transparent plastics material.

10 An annular flexible resilient seal 14 had one end region 14a splayed outwardly and secured between those regions of the helmet defining the aperture 12 and a rigid closed frame 15. The see-through panel 13, edge region 14a of seal 14 and the closed rigid frame 15 may be secured to the helmet shell 11 by common rivets 16.

15 The edge region 14b of the seal 14, most remote from the helmet shell 11, defines the face seal for the wearer.

20 The helmet will also include means for providing air to, and exhausting spent air from, that volume V defined by the see-through panel 13, the face of a wearer within the edge 14b of seal 14 and bounded by the seal 14 but as such breathing arrangements are well known and established in the art no further description thereof is necessary in this specification.

25 The helmet also includes a flexible resilient means comprising a pad 17, intended to protect the crown of the wearer and suspended in the helmet by resilient straps 18 which extend to fixed anchor points 19 within the helmet. A rear pad 20, hingedly connected to the pad 17 as at 21, extends from its hinged connection 21 to a location below the neck aperture 11a for the helmet and the pad 20 is supported by resilient straps, generally indicated by numeral 22, which extend to fixed anchor points 23 within the helmet.

30 Referring now to Fig. 2 the pads 17 and 20 conveniently

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comprise slabs of a shock absorbing material 17a and 20a respectively, preferably a resilient foam or felt material, within a leather, leather-like or woven fabric covering 24, which may receive both the pads 17a or 20a and the coating 24 may have stitchings separating the pad 17a from the pad 20a and defining the hinge 21 for the assembly.

Each resilient strap 18, there being a resilient strap on each side of the pad 17, has one end 18a stitched to the cover 24 and has its other end 18a passed through a slot 25a in an anchoring bracket 25 and returned and stitched to the covering 24 at a different location such that the parts of the strap 18 to each side of the bracket 25 make an angle of between 30 and 60 degrees with the adjacent edge of the pad 17.

The pad 20 also has the resilient straps 22 on each side thereof and the straps 22 each comprise two resilient straps 26 and 27, the strap 26 has one end region 26a stitched to the covering 24 and has its other end 26b passed through a slot 28a in an anchoring bracket 28 and returned to the cover 24 where said end 26b is stitched to the covering 24. In a relaxed condition the resilient strap 26 to each side of the bracket 28 makes an angle of between 30 and 60 degrees with the adjacent edge of the pad 20.

The resilient strap 27 has one end region 27a passed through the slot 28a in the bracket 28 and the two end regions 27a, 27b are brought together and stitched to the cover 24 such that the said strap 22d has its axis substantially at right angles to the adjacent edge of the pad 20.

The anchoring brackets 25 and 28 have apertures 25b and 28b respectively by which the said brackets may be secured to the fixed anchoring points 19 and 23 respectively.

Each said anchoring point 19 and 23 comprises a nut embedded in the helmet material and the brackets 25 and 28 are secured to their respective anchoring points 19 and 23 by screws which pass through the apertures 25b and 28b to the respective nut defining the anchoring points 19 and 23 respectively.

Whilst the resilience of the straps 19 and 22 will allow the helmet to accommodate varying head sizes the helmet may include two anchoring points 19 and/or 23, at each anchoring location, to allow the brackets 25 and 28 to be anchored to different anchoring points and thereby to allow for a wide range of different head sizes with maximum comfort to the wearer.

The pad 20 may include stiffeners (not shown) extending in the length direction of the pads 17 and 20 to facilitate deflection of the pad 20 towards the rear of the helmet when the helmet is being fitted or removed. As will be clearly seen from Fig. 1 the pad 20 extends outwardly of the helmet to facilitate displacement towards the rear of the helmet.

The pad also includes a strap 29, stitched at one end region to the pad 20 at a location remote from the pad 17, having a press fastening socket 29a at its free end engageable with a press fastener 30 at the rear of the helmet. Thus, when the pad 20 has been displaced to its rearmost position within the helmet the fastener socket 29a can be engaged with the fastener 30 to maintain the pad 20 rearwardly, leaving the wearer with both hands free to fit and manipulate the helmet and arrange the face seal comfortably before releasing the strap 29 to allow the pad 20 to move forwardly into resilient contact with the rear of the wearer's head.

The pad 20 also includes padded side panels 20a and 20b, one to each side of the panel 20, to allow a degree of wrap-around of the head of the wearer.

The helmet also includes straps 31, one to each side of the helmet, and each strap 31 has one end pivotably anchored to the helmet adjacent the opening thereto. Each strap 31 includes two or three press stud sockets, spaced apart but adjacent its free end, and said press stud sockets on each strap 31 are selectively connected to a press stud fastener 32, individual to each strap 31, on the pad 20.

To fit the helmet the pad 20 is pushed rearwardly until the fastener socket 29a can be secured on fastener 30. Then,

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with the pad 20 held rearwardly and with both hands free to manipulate the helmet the wearer can readily insert his/her head into the helmet, and roughly adjust the helmet until the face seal 14, is in comfortable location on the face. The strap 29 is then released to allow the resilient straps 26 and 27 to contract to bring the pad 20 into contact with the rear of the head of the wearer and again, by using both hands on the helmet shell and pushing the head rearwardly against the pad 20, the wearer can make any final adjustments to the fitting of the face seal 14.

The straps 26 and 27 thereafter resiliently hold the pad 20 in the pressure contact with the wearer's head and this pressure is balanced by the pressure contact of the seal 14 with the wearer's face so that the seal between the seal 14 and the wearer's face cannot be accidentally broken.

The wearer can then secure a selected fastener socket on each strap 31 to its cooperating fastener 32, thus additionally retaining the lower regions of the pad 20 forwardly to prevent accidental displacement of the helmet.

In the second embodiment flexible resilient means illustrated in Fig. 3 a pad 40, hingedly connected to a pad 41 are intended to protect the head of the wearer within the helmet shell. The pads 40 and 41 comprise slabs of shock absorbing material within a leather, leather-like or woven fabric covering 42 and the lines of stitching 43 between the pads 40 and 41 allow for the hinge movement of said pads 40, 41.

The pad 40 is supported in the helmet by resilient straps 44, there being a resilient strap 44 on each side of the centre line of the pad 40, and each strap 44 has one end stitched to the pad 40 and the other end passed through a slot 45a in an anchoring bracket 45 and returned and stitched to a different location of the pad 40 so that the sections of the strap 44 to each side of the anchor bracket 45 make an angle between 40 degrees and 60 degrees.

In like manner the pad 42 is supported in the helmet by

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resilient straps 46, one strap 46 on each side of the centre line of the pad 42, and each said resilient strap 46 has one end sewn to the pad 42 and its other end passed through a slot 47a in an anchoring bracket 47 and returned and stitched to a different location on the pad 42, such that the sections of strap 46 to each side of the anchor bracket 47 lie at an angle to one another.

A further resilient strap 48 has both its ends passed through the slots 47a in the two anchoring brackets 47 and returned and stitched to the central regions of the pad 42.

In the Fig. 3 embodiment a non-resilient strap 49 has its ends passed through the ends 45a in the two anchoring brackets 45 and turned back and stitched onto the strap 49, to limit the outward displacement of the anchoring brackets 45.

The pad 41 also includes a non-resilient strap 50 which has its ends passed through the slots 51a of the two anchoring brackets 51 and then passed to two quick release/tensioning devices 52 and 53 supported on that uninterrupted length of strap 50 between the anchoring brackets 51.

The pad 40 also includes a short strap 54 which has one end stitched to the pad 40 and its other end passed through a slot 55a in an anchoring bracket 55 and returned and stitched to the pad 40.

The pad 40 presents two side flaps 56 and 57, of flexible resilient material, one to each side of pad 40, and said flaps 56 and 57 serve to support ear phones (not shown) for a communication system for the helmet.

The pad 41 also presents two side flaps 58, 59 one on each side of pad 41, and which wrap around the rear side regions of the wearer's head when the helmet is fitted.

A strap 60 has one end region sewn to the pad 42 and presents a press-stud fastener socket 60a near its other end.

The second flexible resilient means shown in Fig. 3 is fitted generally into a helmet shell substantially as shown in Fig.1 but in this example the anchoring bracket 54 is secured to an anchoring point in the forward regions of the helmet,

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thus to fix the front to rear location of the pad 40 and, via the hinged connection 43, the upper regions of the pad 42.

5 The anchoring brackets 45, 47 and 51 are secured to anchoring points within the helmet but, by adjusting the lengths of the straps 44, 49, 46, 48 and 50, said brackets 45 and 46, and in some cases brackets 47, can share common anchoring points to each side of the helmet shell. With the flexible resilient means fitted and anchored as described above the helmet is ready for use.

10 The helmet shell is fitted in similar manner to that described for the embodiments illustrated in Figs. 1 and 2, with the quick release devices 52 and 53 released and the strap 50 free to extend, the lower regions of the pad 42 are pushed rearwardly of the helmet shell and secured by attaching the fastener socket 60a to the fastener 30 on the helmet shell.

15 With the lower regions of the pad 42 rearwardly within the helmet the wearer can insert his/her head into the helmet and adjust the face seal 14 to a comfortable position. The fastener socket 60a is then detached from the helmet and the resilient straps 46 resiliently apply the pad 42 to the rear of the wearer's head, to resiliently maintain the seal with the annular-face seal 14. At this stage some minor adjustments may be necessary to the fit of the helmet.

20 Once the helmet is comfortably fitted, the free ends of the straps 50 are gripped by the wearer and pulled to tension the strap 50, thus to secure the lower regions of the pad 42 in a non-resilient manner against the wearer's head and effectively guard against accidentally displacement of the helmet.

25 In normal use the strap 49 will be slack, allowing the pad 40 to be resiliently displaced via the straps 44, for the comfort of the wearer but the length of such strap between the anchoring brackets 45 prevents the pad 40 from engaging the roof of the helmet shell, thus to guard against the wearer's head contacting the helmet shell, to the detriment of the wearer, in the event that a falling object should strike the

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helmet shell.

5 In practise it has been found that a helmet shell,
comprising a one piece moulding as defined herein, offers the
greatest security to a wearer. Being without splits or hinges
the shell is resistant to all falling liquids and the flexible
resilient means supporting the wearer's head within the helmet
ensures that the wearer is protected against objects impacting
the helmet and the helmet cannot be accidentally displaced on the
wearer's head such as would break the seal in the breathing
10 volume between the wearer's face and the see-through panel.

CLAIMS

- (1) A safety helmet of the type defined, characterised in that the helmet comprises a one-piece shell.
- 5 (2) A safety helmet according to claim 1, characterised in that the said shell has a front to rear dimension greater than one and one half times the front to rear dimension of the wearer's head.
- 10 (3) A safety helmet according to claims 1 or 2, characterised in that the shell has a front to rear dimension of more than one and three quarter times the front to rear dimension of the wearer's head.
- 15 (4) A safety helmet according to claims 1, 2 or 3, characterised in that the flexible resilient means include a first pad and flexible resilient straps extending from the pad to anchor locations within the helmet, said flexible resilient straps serving to locate the said first pad in a position to engage the rear regions of the wearer's head when the helmet is in use..
- 20 (5) A safety helmet according to claim 4 characterised in that said flexible resilient straps are arranged to support the first pad in pressure contact with the rear regions of the wearer's head to maintain the wearer's face in pressure contact with the annular face seal.
- 25 (6) A safety helmet according to claim 4 or 5, characterised in that said flexible resilient straps are arranged to be stretchable towards the rear regions of the shell to allow the head of a wearer to readily enter the helmet between the annular face seal and the said first pad.

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- 5 (7) A safety helmet according to claims 4, 5 or 6, characterised by a second pad, in the upper regions of the helmet, and said second pad being supported by flexible resilient straps fixed to anchor locations within the helmet and serving as a crown protection for the wearer.
- (8) A safety helmet according to claim 7 characterised in that the upper regions of the first pad are hingedly connected to the rear regions of the second pad.
- 10 (9) A safety helmet according to claims 6, 7 or 8 characterised in that said first pad includes stiffeners and said pad extends outwardly of the opening to the helmet to facilitate stretching of the resilient straps for fitting or removing the helmet to and from the head of the wearer.
- 15 (10) A safety helmet according to claims 5, 6, 7, 8 or 9 characterised in that the first pad includes detachable anchoring means, for retaining the lower regions of said first pad in close proximity to the rear of the helmet shell whilst the helmet is being fitted or removed from the wearer.
- 20 (11) A safety helmet according to claims 4, 5, 6, 7, 8, 9 or 10 characterised in that the first pad includes non-resilient strap means secured to anchor points in the helmet and adjustable to hold the first pad in pressure contact with the rear regions of the wearer's head.

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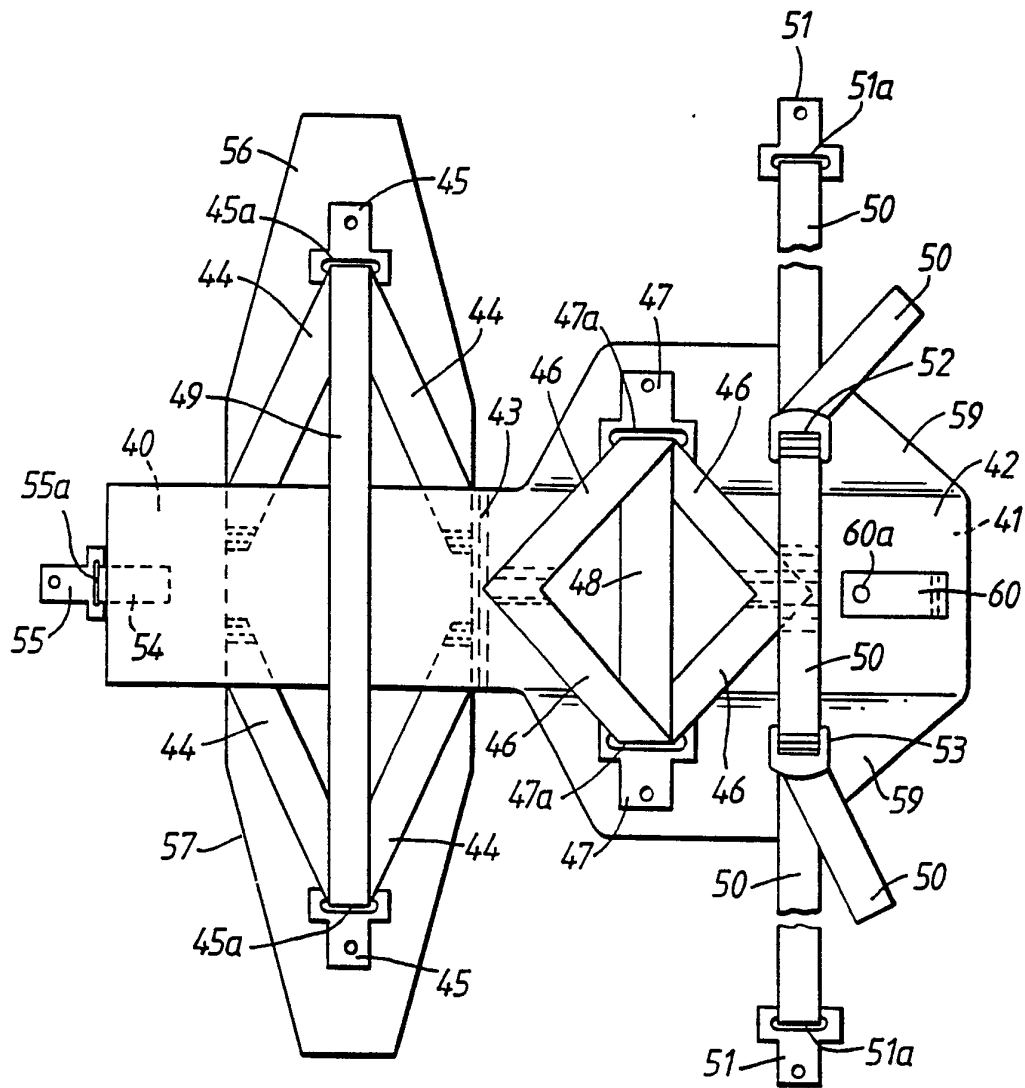


Fig.3.

SUBSTITUTE SHEET

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 90/00819

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl. 5 A42B3/04 ; A42B3/10 ; A62B18/04

II. FIELDS SEARCHED

Minimum Documentation Searched⁷

Classification System

Classification Symbols

Int.Cl. 5

A42B ; A62B ; A61F

Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched⁸III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹

Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	DE,U,6937652 (H. FISCHER) 15 January 1970 see page 2, last paragraph; claims 1, 3; figure 1	1-3
A	---	4-11
Y	DE,A,3108148 (SATA-FARBSPRITZTECHNIK GMBH) 30 September 1982 see page 4; claims 1, 3; figures 1, 2	1-3
X	FR,A,1512479 (SOCIETE INDUSTRIELLE DES ETABLISSEMENTS PIEL (S.I.D.E.P.)) 09 February 1968 see page 2, right-hand column, paragraphs 8 - 13 see page 4, left-hand column, paragraphs 5 - 7 see figures 1-4	1-3
A	---	4-11
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¹⁰ Special categories of cited documents: ¹⁰¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance¹⁰ "E" earlier document but published on or after the international filing date¹⁰ "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)¹⁰ "O" document referring to an oral disclosure, use, exhibition or other means¹⁰ "P" document published prior to the international filing date but later than the priority date claimed¹⁰ "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention¹⁰ "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step¹⁰ "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.¹⁰ "&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search

20 SEPTEMBER 1990

Date of Mailing of this International Search Report

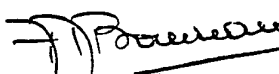
26. 10. 90

International Searching Authority

EUROPEAN PATENT OFFICE

Signature of Authorized Officer

BOURSEAU A.M.



III. DOCUMENTS CONSIDERED TO BE RELEVANT

(CONTINUED FROM THE SECOND SHEET)

Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
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A	---	7-11
Y	DE,A,1435758 (THE B. F. GOODRICH COMPANY) 24 October 1968 see page 4, line 13 - page 15, line 18 see figures 1-4	1-6
A	---	7-11
A	US,A,3789427 (J. A. AILEO) 05 February 1974 see column 5, line 44 - column 6, line 59 see column 7, line 37 - column 10, line 11 see column 12, line 60 - column 13, line 33 see figures 1-9	4-11
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**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.**

PCT/CB 90/00819
SA 37388

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on
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20/09/90

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DE-A-3108148	30-09-82	None	
FR-A-1512479		None	
US-A-4549541	29-10-85	None	
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