



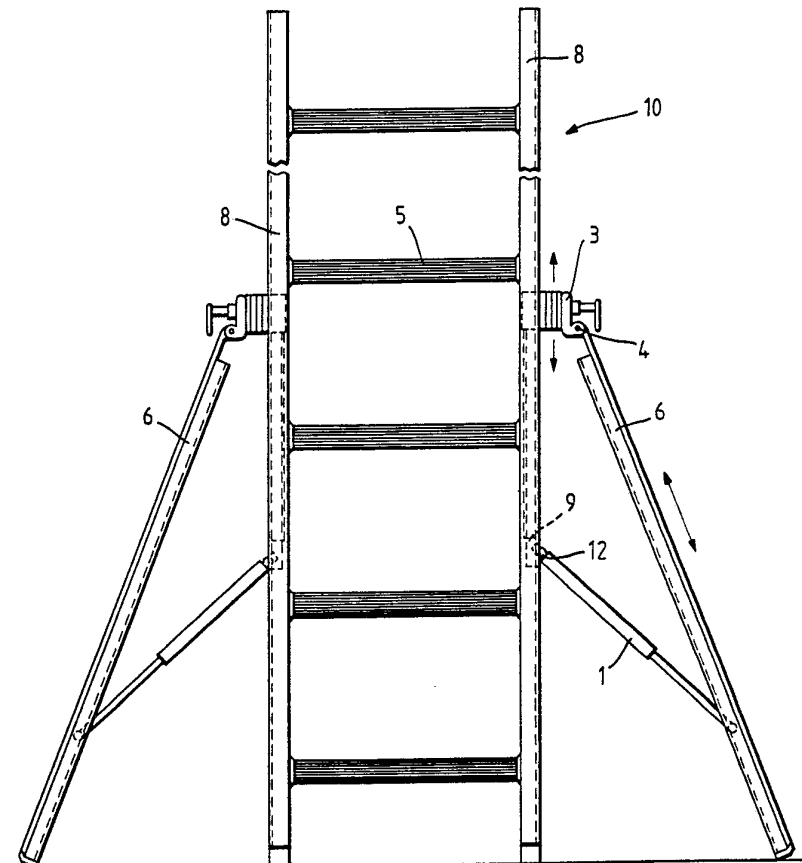
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/NO90/00083 (22) International Filing Date: 16 May 1990 (16.05.90) (30) Priority data: 891965 16 May 1989 (16.05.89) NO (71) Applicant (for all designated States except US): RAUFOSS A/S [NO/NO]; P.O. Box 2, N-2831 Raufoss (NO). (72) Inventor; and (75) Inventor/Applicant (for US only) : HEGGEN, Hans [NO/NO]; N-2770 Jaren (NO). (74) Agent: BYKLUM, Knut, B.; Bryns Patentkontor A/S, P.O. Box 9566, Egertorget, N-0128 Oslo 1 (NO).</p>		<p>(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE*, DE (European patent)*, DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.</p> <p>Published <i>With international search report.</i></p>

(54) Title: LADDER WITH FOUR-POINT FOOTING

(57) Abstract

A ladder having four-point contact with the underlying surface comprises ladder rungs (5), side members or stringers (8) and support legs (6) that are fastened at one end to respective side members (8) for pivoting outwards therefrom. Each support leg (6) independently is rapidly deployable by means of a pressure device (1) acting between the stringer (8) and the support leg (6). The ladder itself may be of any type, but is intended particularly for rescue purposes where time is of critical importance.



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LADDER WITH FOUR-POINT FOOTING.

The present invention relates to a ladder, comprising ladder rungs, side members or stringers and support legs fastened at one end to respective side members for pivoting outwards therefrom.

There are today found many forms of ladders designed for various purposes, such as single ladders intended to rest against a wall, for example; combination ladders that can be used to extend a ladder, as two separate ladders or one free-standing step ladder; sliding ladders, possibly having holes for the mounting of guide wheels at the top for contact against a wall; and extension ladders, optionally having top wheels, but not designed such that the individual ladders may be separated from one another. One type of extension ladder is described in the simultaneously filed Norwegian patent application No. 891964.

Particularly with respect to rescue ladders, there have been continuous developmental efforts made to meet the increasingly strict requirements for safety and functional efficiency. There is thus a need for rescue ladders which can be brought rapidly into their working position, without giving special consideration to the topography of the surface on which the ladder is to be placed.

Such a rapidly deployable ladder, which may per se be of any type whatsoever, is intended to be free-standing and to have a stable four-point contact with the underlying surface.

This is achieved according to the invention by a ladder of the kind mentioned above, which is characterized in that each support leg independently is rapidly deployable by means of a pressure device acting between the side member and the support leg. The pressure device may be articulately

disposed between the side member and the support leg at a distance from the support leg's rotational axis.

It is an advantage that the means of attaching each support leg to the side member is axially slidable in relation to the side member. The attachment means may advantageously comprise a rapid-action clamping means that is opened and closed by means of a simple hand grip. The pressure device may with advantage be a gas damper that simultaneously has a dampening effect. Each side member may advantageously comprise means for retaining, but rapidly releasing, the support leg from the side member when the ladder is to be made ready for use. These means may optionally have a spring catch action. The ladder may suitably be manufactured from aluminum.

Other additional objectives, features and advantages will be apparent from the following description of a presently preferred embodiment of the invention, which is provided for descriptive purposes without thereby being limited, and is presented in connection with the enclosed drawings, where:

- Figure 1 shows a ladder in accordance with the invention with support legs arranged in their operative position, seen from the front,
- Figure 2 shows the ladder in accordance with Figure 1 seen from the side,
- Figure 3 shows in greater detail the pressure device seen from above, with a side member and a support leg shown in cross-section,
- Figure 4 shows one type of rapid clamping means in partial cross-section, and
- Figure 5 shows an embodiment of the means for attaching a support leg to the side member.

Reference is made to Figure 1, which shows a ladder 10, which may per se be manufactured from any suitable material, such as aluminum. The ladder 10 comprises ladder rungs 5, side members or stringers 8, and support legs 6 fastened by an attachment means 3 to respective side members 8 for pivoting outwards therefrom. A pressure device 1 is articulately disposed between the side member 8 and the support leg 6. The support leg 6 is fastened to the attachment means 3 via a shaft journal or a joint which forms a pivotal axis 4 for the support leg 6. At a distance from the pivotal axis 4 of the support leg 6, the pressure device 1 is articulately fastened to the support leg 6. The opposite end 12 of the pressure device 1 is articulately fastened to the side member 8 in a holder fitting 9, and in an advantageous embodiment said holder fitting 9 is rigidly connected to the attachment means 3. When the ladder 10 is seen directly from the front, as shown in Figure 1, each support leg is rotated out, backward and to the side, so that the support legs 6 form the rear support for the ladder. Seen from the front, the angle between the side member 8 and the support leg is in the range of 0° to 45° , and is preferably between 15° and 35° .

Seen from the side, as in Figure 2, the angle between the side member 8 and the support leg 6 would be between 25° and 60° and preferably between 35° and 50° .

As is apparent from Figures 1 and 2, the attachment means 3 is axially slidable within the side member 8. The side member can advantageously have a cross-sectional profile in the form of a C. The attachment means 3 may comprise a rapid-action clamping means, for example of the type shown in Figure 4, which locks or releases the attachment means 3 to/from the side member 8. In the "ready for use position" the attachment means 3 is locked securely to the side member 8 by means of the rapid-action clamping means 11. When the ladder 10 is placed on uneven ground or, for example, on stairs, each individual support leg 6 may be adjusted

relative to the side member 8 so that the lengths of the respective support legs 6 may be independent of each other. It will also be possible to equip the lower sections of the side members 8 with respective means (not shown) for adjusting the length of the side members.

Figure 3 shows the pressure device 1 in extended position with respect to a side member 8 and a support leg 6. The pressure device 1 may be of any suitable type that exerts a pressure force between the side member and the support leg to rotate the support leg outwards, and a gas damper which has a built-in dampening effect is particularly well suited. Such a gas damper

has the effect that the outward rotation of the support leg takes place rapidly, yet with a controlled and dampened motion. The rotational axis 4 determines the direction in which the support leg 6 moves. One type of attachment means 3 is shown in Figures 1 and 2, while another version is shown in Figure 5. In Figure 5 the support leg 6 is guided between two support plates 12a, 12b and about a shaft journal 13 which provides good steering and stable support for the outwardly pivotable support leg 6.

Figure 4 shows another sectional view of the alternative attachment means 3 showing the interaction of the rapid clamping means 11 and the C-profile of the side member 8. It should be noted, however, that any suitable type of attachment means 3 could be used, including an attachment means 3 that is not axially slidable along the side member 8.

The pressure device 1 is such that it presses the support leg 6 out to the desired position (fully extended) and in this position is also capable of absorbing tensile forces that could be exerted on the device 1 during use.

When the ladder is in its storage position, the support legs 6 lie along the side members 8 and can be retained in this

position by any suitable means. They must, however, have the capability of rapidly releasing each support leg 6 from its associated side member 8. The retaining means may, for example, have a snapper or a spring catch action (not shown), so that the support legs are merely pushed into a resilient latching means, from which it is correspondingly simple to release the support legs 6.

As still another embodiment, the pressure device may also be disposed where the support leg is fastened to the side member 8 in the form of a helical spring (not shown) and dampening means (not shown), although that would not at the present time be the most preferred embodiment of the invention.

P a t e n t C l a i m s

1.

A ladder, comprising ladder rungs (5), side members or stringers (8) and support legs (6) fastened at one end to respective side members (8) for pivoting outwards therefrom, characterized in that each support leg (6) independently is rapidly deployable by means of a pressure device (1) acting between the side member (8) and the support leg (6).

2.

A ladder in accordance with claim 1, characterized in that the pressure device (1) is articulately disposed between the side member (8) and the support leg (6) at a distance from the rotational axis (4) of said support leg.

3.

A ladder in accordance with claims 1 - 2, characterized in that the pressure device (1) is a gas damper.

4.

A ladder in accordance with claim 1, characterized in that the pressure device (1) is a spring, preferably a helical spring.

5.

A ladder in accordance with claims 1 - 4, characterized in that the means (3) of attaching each support leg (6) to the side member (8) is axially slidable in relation to said side member.

6.

A ladder in accordance with claim 5,

7

c h a r a c t e r i z e d i n that the attachment means (3) comprises a rapidly operable clamping means (11).

7.

A ladder in accordance with claims 1 - 6,
c h a r a c t e r i z e d i n that the attachment means (3) and the holder fitting (9) for the pressure device (1) are rigidly connected to one another.

8.

A ladder in accordance with claims 1 - 7,
c h a r a c t e r i z e d i n that each side member (8) comprises means that retain, but rapidly release, the support leg for use.

9.

A ladder in accordance with claims 1 - 8,
c h a r a c t e r i z e d i n that said means have a snapping or spring catch action.

10.

A ladder in accordance with claims 1 - 9,
c h a r a c t e r i z e d i n that it is manufactured from aluminum.

1/3

Fig. 1.

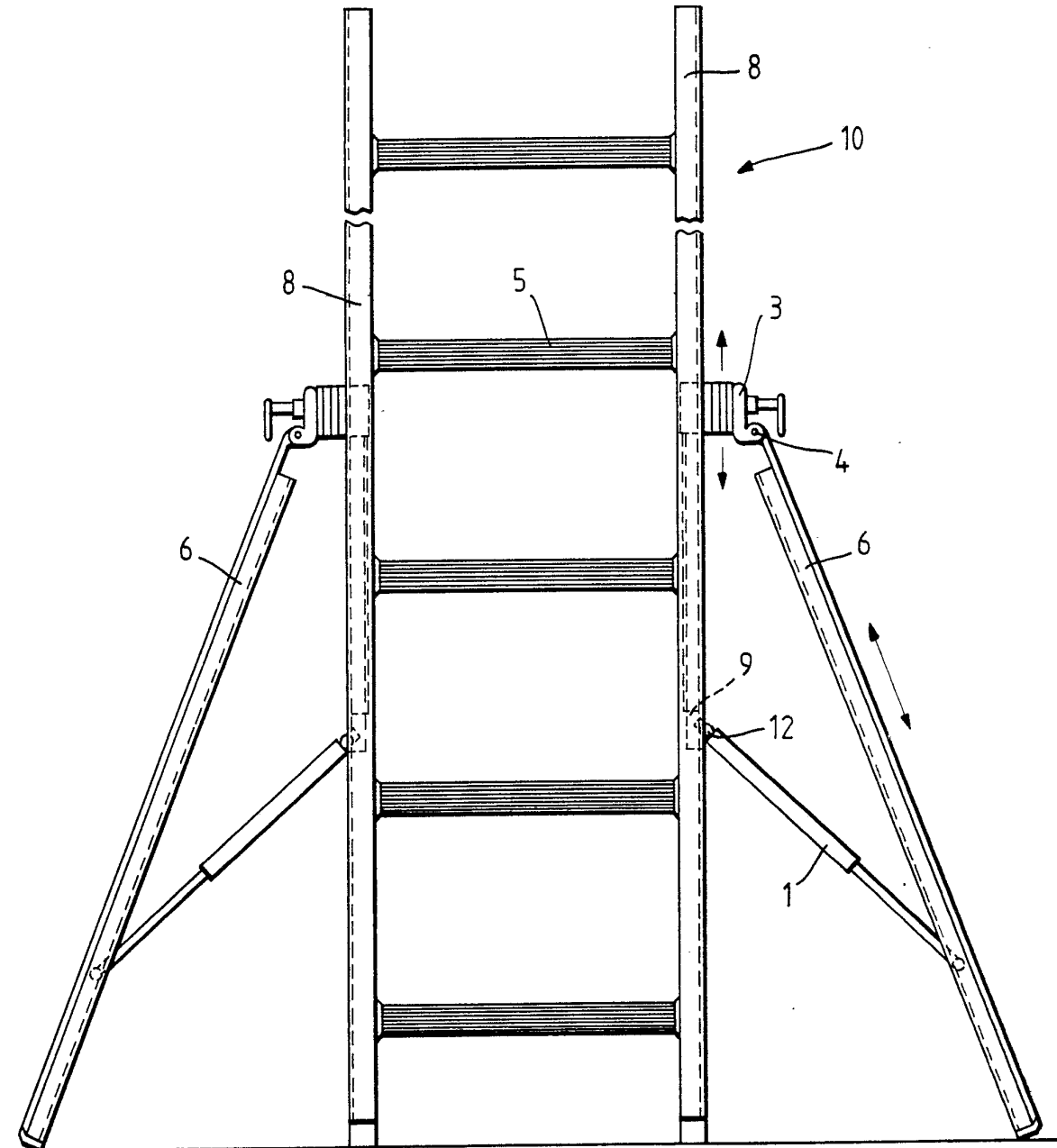


Fig. 2.

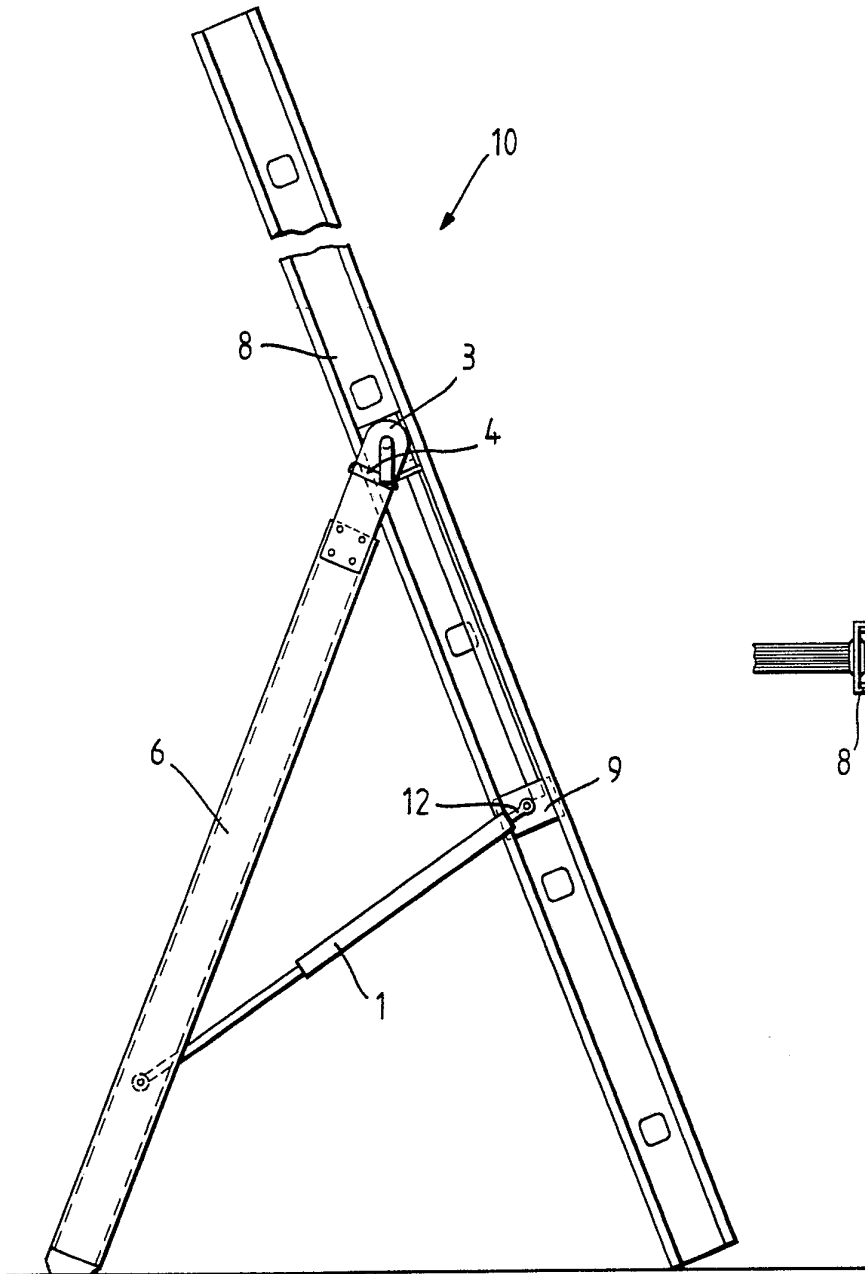
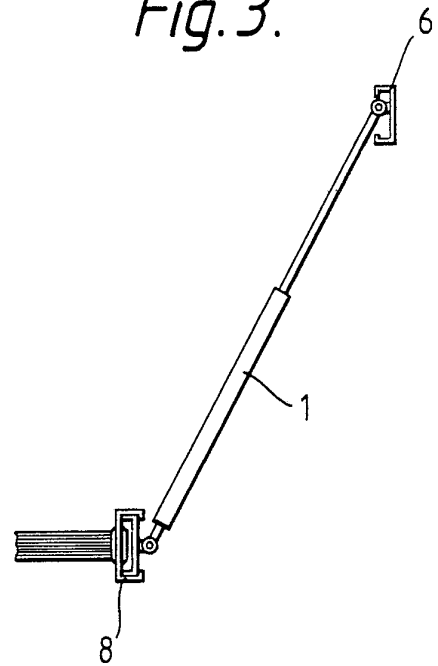


Fig. 3.



3/3

Fig. 4.

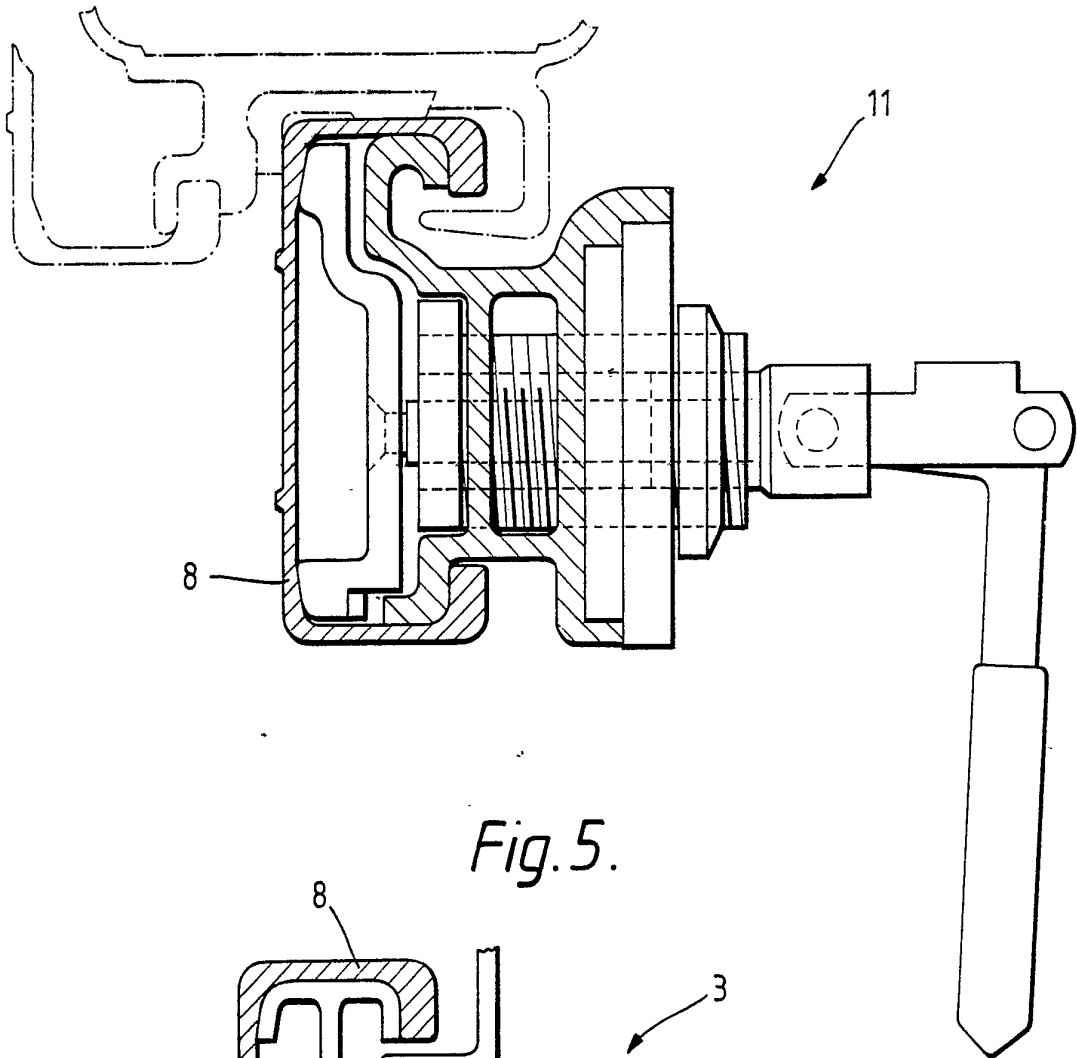
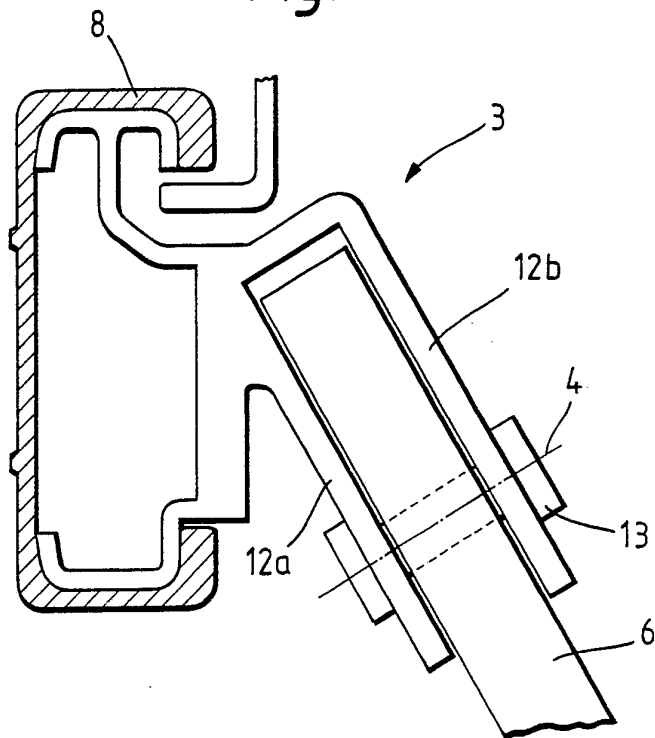


Fig. 5.



INTERNATIONAL SEARCH REPORT

International Application No PCT/NO 90/00083

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁵				
According to International Patent Classification (IPC) or to both National Classification and IPC				
IPC5: E 06 C 7/44				
II. FIELDS SEARCHED				
Minimum Documentation Searched ⁷				
Classification System	Classification Symbols			
IPC5	E 06 C; E 04 G			
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched ⁸				
SE,DK,FI,NO classes as above				
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹				
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³		
X	DE, C, 279264 (ALBERT KOCH) 30 October 1913, see figure land3; claims 2-3	1-2,4		
Y	--	5-6,8- 10		
Y	US, A, 4147231 (CHANTLER ET AL) 3 April 1979, see the whole document	5-6,8- 10		
A	US, A, 759176 (A. HARTZLER) 3 May 1904, see figure land2			

<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> <p>* Special categories of cited documents:¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> <p>"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 invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&" document member of the same patent family</p> </td> </tr> </table>			<p>* Special categories of cited documents:¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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 invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&" document member of the same patent family</p>
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IV. CERTIFICATION				
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report			
14th August 1990	1990 -08- 1 6			
International Searching Authority	Signature of Authorized Officer			
SWEDISH PATENT OFFICE	Mariana Eddin <i>Mariana Eddin</i>			

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/NO 90/00083

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE-C- 279264	13-10-30	NONE	
US-A- 4147231	79-04-03	CA-A- 1064872	79-10-23
US-A- 759176	04-05-03	NONE	