



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification <sup>5</sup> : E06C 5/42, 9/00, E04G 11/04</p>	<p>A1</p>	<p>(11) International Publication Number: <b>WO 90/14492</b> (43) International Publication Date: 29 November 1990 (29.11.90)</p>
<p>(21) International Application Number: PCT/NO90/00089 (22) International Filing Date: 23 May 1990 (23.05.90) (30) Priority data: 892085 24 May 1989 (24.05.89) NO (71) Applicant (for all designated States except US): RAUFOSS A/S [NO/NO]; P.O. Box 2, N-2831 Raufoss (NO). (72) Inventors; and (75) Inventors/Applicants (for US only): HEGGEN, Hans [NO/NO]; N-2770 Jaren (NO). SKOGLUND, Alf [NO/NO]; N-2750 Gran (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><b>Published</b> <i>With international search report.</i></p>
<p>(54) Title: LADDER RAMP</p>		
<p>(57) Abstract</p> <p>A ladder ramp (5) designed for rapid lowering of a ladder (6) which in a position of readiness is lying upon the ramp, which may in turn be mounted on a rescue vehicle (20) or may be placed in a building structure. A pivot frame (4) is rotatably connected to a base structure (2), and at least one dampening means (3) for the pivotal movement functions between the base structure (2) and the pivot frame (4). There is also included a sliding frame (1) which can slide in parallel with the pivot frame (4) and at least one dampening means for the sliding movement that in turn functions between the sliding frame (1) and the pivot frame (4). A releasable locking device holds the sliding frame (1) in the position of readiness.</p>		

## DESIGNATIONS OF "DE"

Until further notice, any designation of "DE" in any international application whose international filing date is prior to October 3, 1990, shall have effect in the territory of the Federal Republic of Germany with the exception of the territory of the former German Democratic Republic.

### *FOR THE PURPOSES OF INFORMATION ONLY*

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MC	Monaco
AU	Australia	FI	Finland	MG	Madagascar
BB	Barbados	FR	France	ML	Mali
BE	Belgium	GA	Gabon	MR	Mauritania
BF	Burkina Fasso	GB	United Kingdom	MW	Malawi
BG	Bulgaria	GR	Greece	NL	Netherlands
BJ	Benin	HU	Hungary	NO	Norway
BR	Brazil	IT	Italy	RO	Romania
CA	Canada	JP	Japan	SD	Sudan
CF	Central African Republic	KP	Democratic People's Republic of Korea	SE	Sweden
CG	Congo	KR	Republic of Korea	SN	Senegal
CH	Switzerland	LI	Licchtenstein	SU	Soviet Union
CM	Cameroon	LK	Sri Lanka	TD	Chad
DE	Germany, Federal Republic of	LU	Luxembourg	TG	Togo
DK	Denmark			US	United States of America

## LADDER RAMP.

The present invention relates to a ladder ramp designed for rapid lowering of a ladder which in a position of readiness is lying upon the ramp.

Such a ladder ramp is particularly intended for rescue purposes, to be used, for example, in the rescue services such as on a fire engine. However, the ladder ramp could conceivably be used in building structures, also, to be in preparedness if emergency situations should arise. As mentioned, the present ladder ramp has been developed with a view toward rescue operations where the time required to rig the equipment into place can be of critical importance. Thus, there will always be a need for equipment which can bring rescue equipment more rapidly from a position of readiness into operational position. It is preferable that this be done as automatically as possible, i.e., with the fewest possible manual operations.

This is achieved with the present ladder ramp that is capable of rapidly and easily bringing a ladder lying in readiness on the ladder ramp into position for further handling by a crew. An example of such a ladder is shown in NO patent application no. 891964.

This is achieved with a ladder ramp of the kind mentioned above, which is characterized by a pivot frame rotatably connected to a base structure, at least one dampening means for the pivotal movement that functions between the base structure and the pivot frame, a sliding frame capable of sliding in parallel with the pivot frame, at least one dampening means for the sliding movement that functions between the sliding frame and the pivot frame and a releasable locking device which in the starting position holds the sliding frame in its mode of readiness.

The actual sliding frame can well be in the form of a ladder, which has the advantage that, after the lowering of the ladder ramp, the crew is able to climb up onto the rescue vehicle to fetch equipment.

The pivot frame can, as mentioned above, be attached directly to the vehicle or support structure, but there may advantageously be included a base frame which in turn is secured to the base structure.

It is advantageous to include a supporting block that is attached to the base structure or the vehicle and forms a resting surface and holder for the sliding frame at the forward edge when the ladder is in its position of readiness. The sliding frame may include support wheels at the forward edge thereof for contact with the supporting block.

Although not a requirement, the sliding frame may advantageously form a gradient with the base structure or the base frame in the readiness position. This facilitates the lowering of the ladder, which will take place almost automatically with the aid of the intrinsic weight of the ladder and the sliding frame, together with the displacement of their center of gravity. To further reduce the friction between the sliding frame and the pivot frame, the pivot frame may with advantage be provided with rollers that engage with the sliding frame or with the side rails thereof.

The various dampening means can constitute gas springs, gas dampers, or conventional shock absorbers.

Other additional objectives, features and advantages will be apparent from the following description of the presently preferred embodiment of the invention, provided for the purpose of description without thereby being limiting, and given in connection with the enclosed drawings, where:

- Figure 1 schematically shows a rescue vehicle onto which is mounted a ladder ramp according to the invention together with a ladder positioned thereon,
- Figure 2a-2c schematically shows three phases of the process of lowering the ladder from its readiness position.
- Figure 3a, 3b schematically shows the ladder ramp in closer detail, and
- Figure 4 shows in section the articulated connection between the base structure and the pivot frame.

Reference is made to Figure 1, which shows a rescue vehicle 20 equipped with a ladder ramp 5 which is placed on the back of the truck and on top of the vehicle body. A ladder 6 lies on the ladder ramp 5 in readiness position up on the truck. The ladder ramp 5 comprises a pivot frame 4 rotatably connected to the truck itself or to a base structure 2. Between a fastening bracket 11 on the base structure 2 and the pivot frame 4 there is pivotably secured at both ends a dampening means 3. A sliding frame 1 lies in the pivot frame 4 and is slidable in relation thereto. As shown in Figure 3b, another dampening means 7 is placed in the pivot frame 4 and is intended to dampen the movement of the sliding frame 1. There is also included a releasable locking device 15 which in starting position holds the sliding frame 1 in its mode of readiness.

Figure 1 also indicates with dotted lines four different phases (A,B,C,D) in the process of lowering a ladder 6 by means of the ladder ramp 5. The lowering process is more clearly illustrated in Figures 2a, 2b and 2c. In the readiness position, the sliding frame preferably forms an angle of inclination  $\alpha$  with the base structure 2. On release of the locking device 15, the sliding frame 1 with the ladder 6 begins to move backwards due to the

force of gravity. To facilitate this movement, the pivot frame 4, as also shown in Figure 3a, is equipped with rollers 9 that run within the side rails of the sliding frame 1. These side rails may in cross-section have a C-profile, like the side members of the ladder. In their backward movement the sliding frame 1 and the ladder 6 reach a point where their center of gravity passes the rotational axis 12 of the pivot frame 4, and the sliding frame 1 will then begin to swing down, bringing with it the ladder 6. As is clearly apparent from Figure 3b, a dampening means 7 between the pivot frame 4 and the sliding frame 1 serves to deaden the motion during the final phase of the return course of the sliding frame. Attached to the sliding frame is a stop means 16 for engagement with the dampening means 7. As an example, the motion can be dampened substantially during the final 30 centimeters of movement. The actual pivotal movement between the base structure 2 or a base frame 2b and the pivot frame is controlled by the dampening means 3. At the desired angle between the base structure 2 and the sliding frame 1 the pivotal movement is stopped, for example at maximum extension of the dampening means 3 or another limiting means (not shown).

The ladder ramp may include a supporting block 10 secured to the base structure 2, which forms at the forward edge a surface on which the sliding frame rests at the same time as the frame and the ladder are held in place vertically, for example, during transport. For ease of movement in inserting or bringing down the ladder 6, the sliding frame 1 is equipped at the forward edge with support wheels 8. If the locking device 15 cannot be reached from the ground, it may be operated by means of, for example, a line pull. The sliding frame 1 may also be equipped at the rear edge with a pulling means, such as a line, to assist in bringing down the ladder ramp if the vehicle is, for example, placed with its front facing down a hill or if the gravitational force is not

sufficient to initiate the sliding movement between the sliding frame 1 and the pivot frame 4.

Figure 4 shows in closer detail the articulated connection between the base frame 2b and the pivot frame 4 and a roller 9 that rolls within the side rail of the sliding frame 1. The articulated connection between the base structure 2 or the base frame 2b and the pivot frame 4 is accomplished in the embodiment shown by means of a shaft journal 12 on both sides.

P a t e n t   C l a i m s

1.

A ladder ramp designed for rapid lowering of a ladder (6) which in a position of readiness is lying upon the ramp (5), characterized by a pivot frame (4) rotatably connected to a base structure (2), at least one dampening means (3) for the pivotal movement that functions between the base structure 2,2b) and the pivot frame (4), a sliding frame (1) capable of sliding in parallel with the pivot frame (4), at least one dampening means (7) for the sliding movement that functions between the sliding frame (1) and the pivot frame (4) and a releasable locking device (15) which in the starting position holds the sliding frame (1) in its mode of readiness.

2.

A ladder ramp in accordance with claim 1, characterized in that the actual sliding frame (1) is in the form of a ladder.

3.

A ladder ramp in accordance with claims 1 - 2, characterized in that the base structure is a base frame (2b).

4.

A ladder ramp in accordance with claims 1 - 3, characterized in that there is included a supporting block (10) attached to the base structure which forms a resting surface and holding means for the sliding frame (1) at its forward edge in the position of readiness.

5.

A ladder ramp in accordance with claims 1 - 4,



characterized in that the sliding frame (1) comprises support wheels (8) for contact with the supporting block (10).

6.

A ladder ramp in accordance with claims 1 - 5, characterized in that the sliding frame (1) forms an angle of inclination  $\alpha$  with the base structure (12) or the base frame (2b) in the position of readiness.

7.

A ladder ramp in accordance with claims 1 - 6, characterized in that there are provided rollers (9) on the pivot frame (4) that engage with the sliding frame (1).

8.

A ladder ramp in accordance with claims 1 - 7, characterized in that the dampening means or is/are a gas spring, a gas damper or conventional shock absorber.



2/4

Fig. 2a

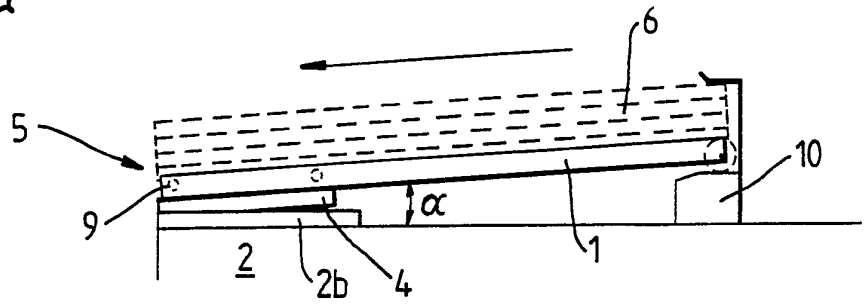


Fig. 2b

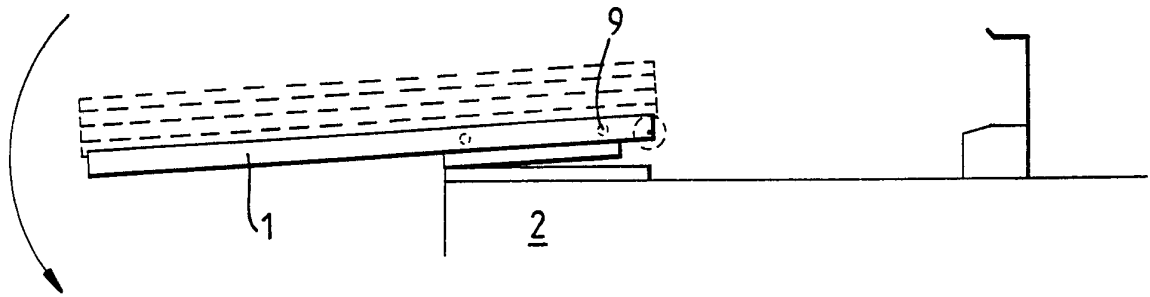
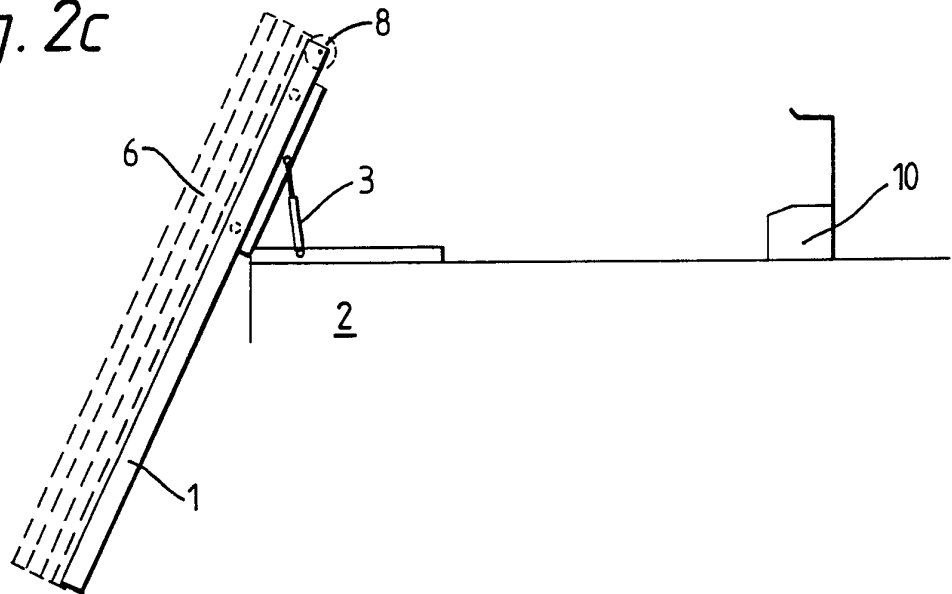


Fig. 2c



3/4

Fig. 3a

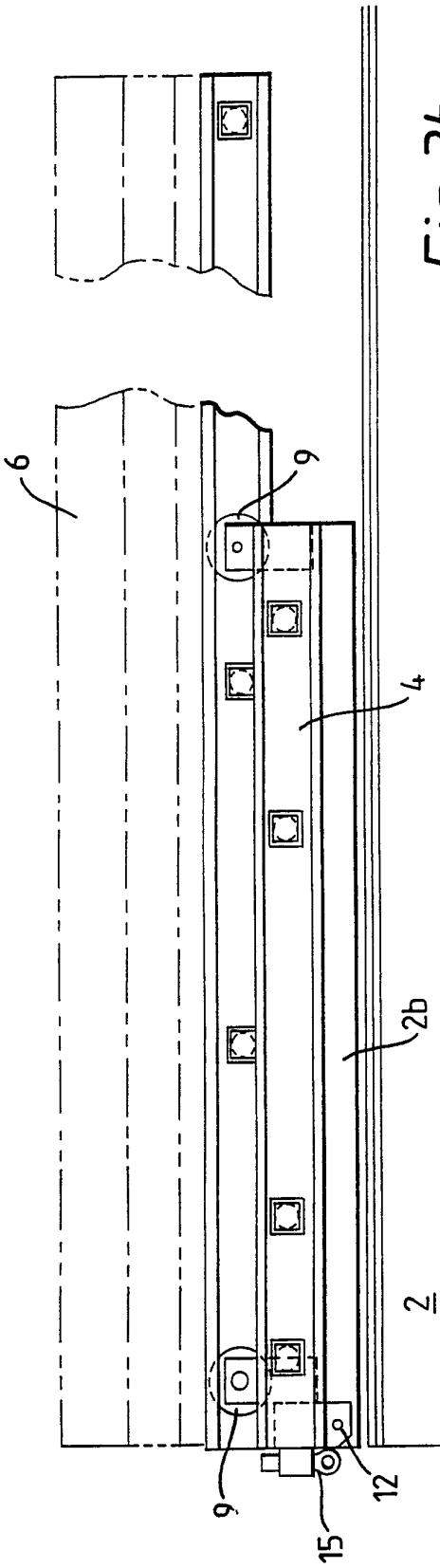
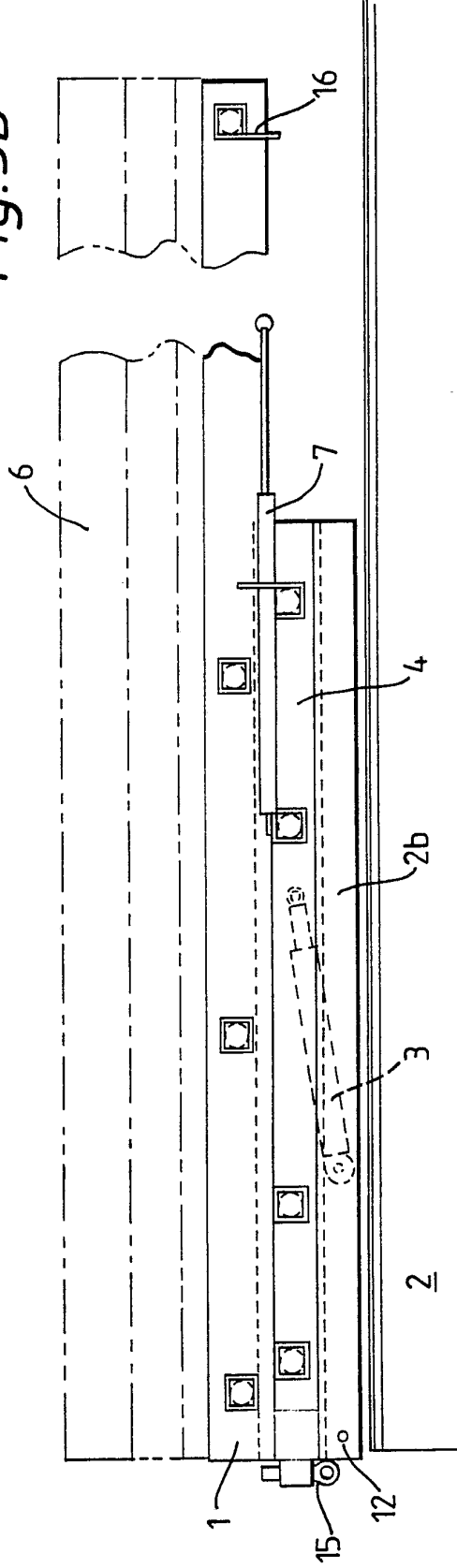
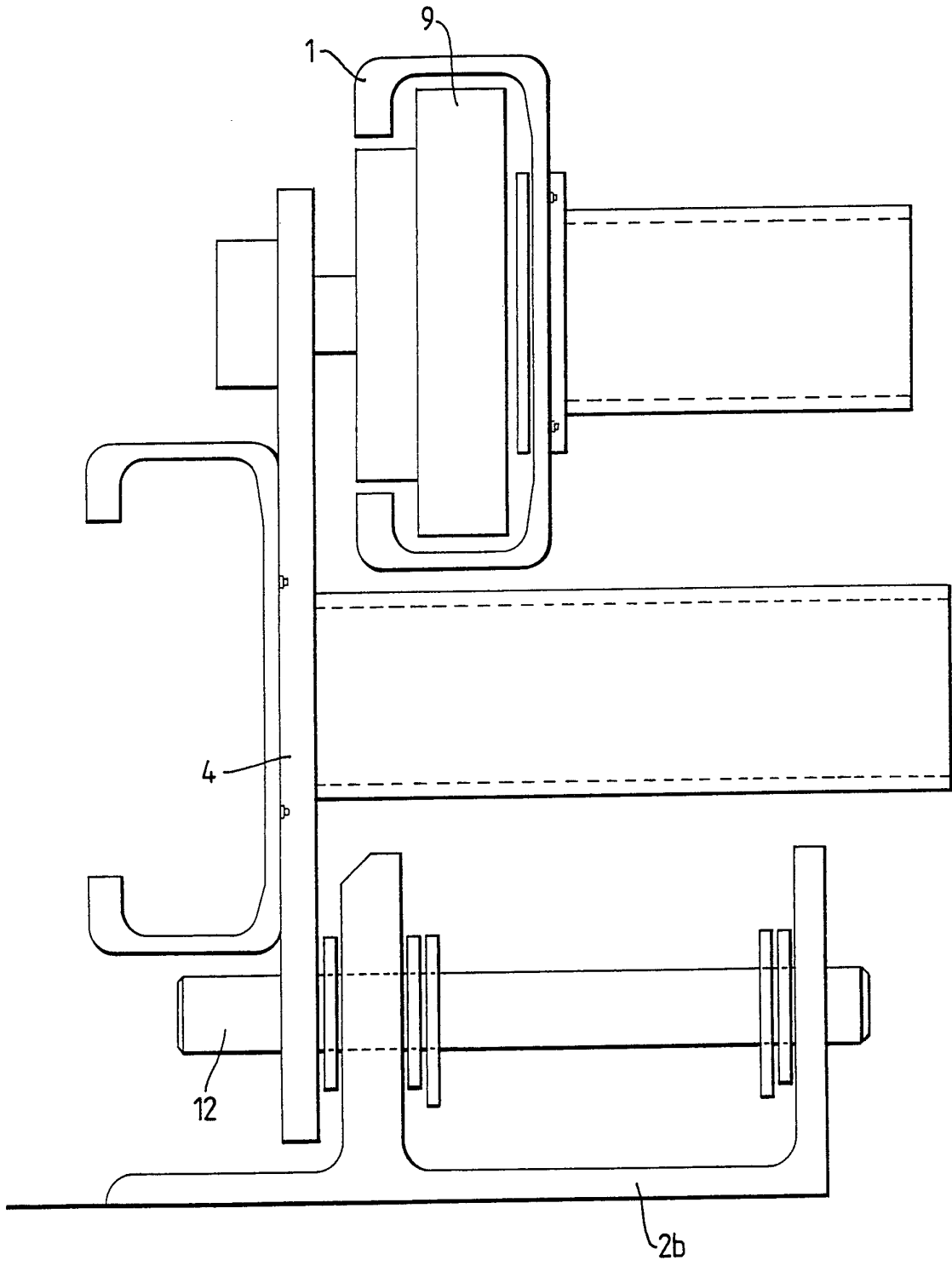


Fig. 3b



4/4  
Fig. 4.



# INTERNATIONAL SEARCH REPORT

International Application No PCT/NO 90/00089

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: E 06 C 5/42, 9/00, E 04 G 11/04		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
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 <sup>8</sup>		
SE,DK,FI,NO classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	GB, A, 330784 (BESSLER DISAPPEARING STAIRWAY CO.) 11 March 1929, see page 2, line 55 - line 66; page 3, line 8 - line 14	1-2
Y	--	1-7
Y	US, A, 3621935 (J.J. BODE) 23 November 1971, see column 5, line 1 - line 15; figures 1,9and14	1-5
Y	--	1-2,4,7
Y	US, A, 2586531 (D.L.GORDON) 19 February 1952, see column 3, line 41 - column 4, line 11; figure 11a	1-2,4,7
Y	--	1-4,6
Y	DE, C, 909146 (A. ZIMMERMANN ET AL) 11 March 1954, see page 2, line 33 - line 37; figure 1	1-4,6
	--	
<p>* Special categories of cited documents: <sup>10</sup></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>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
23rd August 1990	1990 -08- 29	
International Searching Authority	Signature of Authorized Officer	
SWEDISH PATENT OFFICE	Mariana Eddin <i>Mariana Eddin</i>	

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
Y	US, A, 2164327 (P.E. HAWKINS) 4 July 1939, see column 6, line 46 - line 58; figure 17 --	1-2
A	US, A, 1952761 (N.P. LARSEN) 27 March 1934, see the whole document --	
A	Derwent's abstract, No. 88- 62 730/09, SU 1 325 164, publ. week 8809 (FIRE FIGHT EQUIP) -- -----	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.PCT/NO 90/00089**

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 Swedish Patent Office EDP file on **90-08-02**. The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 330784	29-03-11	NONE	
US-A- 3621935	71-11-23	NONE	
US-A- 2586531	52-02-19	NONE	
DE-C- 909146	54-03-11	NONE	
US-A- 2164327	39-07-04	US-A- 2222616	00-00-00
US-A- 1952761	34-03-27	NONE	