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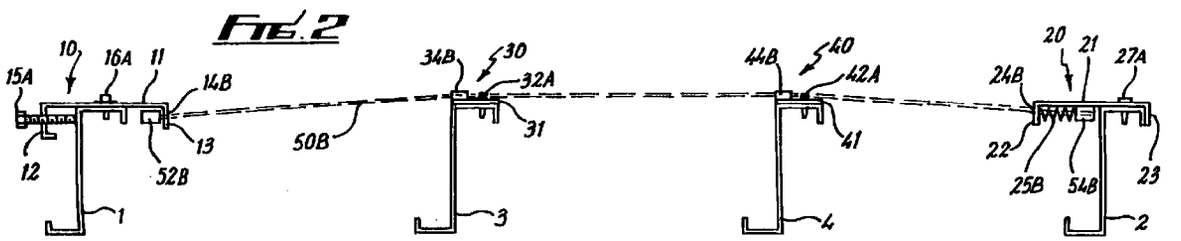
(54) Safety device

(57) A safety device is disclosed for use in assisting in support of roofs of buildings. Use of the device avoids injury if part of a roof collapses, and the device is particularly suitable for use with roofs made from light-transmissive corrugated sheets or similar materials. The device has first (10) and second support members (20) for attachment to a pair of roof purlins (1-4), and one or more metal ropes (50A-50E) extend between the support members. In use, the ropes are typically held in tension between the first and second support members.

Fig.2



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Description

The present invention relates to a safety device and especially but not exclusively to a safety device for assisting in the support of a roof.

Roofs of buildings are often made from corrugated sheet material. It is often desirable to provide such a corrugated sheet material with additional support, over and above that provided by spaced apart substantially rigid beams which are traditionally used for support. This is particularly necessary where the corrugated sheet material is relatively fragile as is the case where, for example, a light-transmissive material is used in order to allow illumination of the interior of the building. The provision of a large number of extra beams to provide the additional support would be expensive and time consuming to construct.

According to the present invention there is provided a safety device for assisting in the supporting of a roof, said safety device comprising:

a first support member having a first engagement means in order to enable a first end portion of an elongate flexible member to be engaged and retained thereby, said first support member being adapted to be attached to a roof purlin;

a second support member spaced apart from said first member, said second support member being adapted to be attached to a roof purlin;

a second engagement means in order to enable a second end of the flexible elongate member to be engaged and retained thereby;

a flexible elongate member adapted to extend between said first and second support members and to provide support to a roof; and

means to adjust the tension in the elongate member between said first and second support members.

Preferably, in use, said flexible elongate member is maintained in tension between said first and second support members.

Preferably, said flexible elongate member is a metal rope.

Preferably, there is provided a plurality of pairs of engagement means, each pair comprising a first engagement means and a second engagement means, and preferably there is provided a plurality of elongate members each extending between a respective pair of engagement means.

Preferably, at least one of said first and second engagement means includes means to take up slack in said elongate member.

Preferably, said means to take up slack comprises means to provide a bias force to a portion of the elongate member at or adjacent said engagement means, said bias force being applied in the direction so as to tend to increase the tension of said elongate member.

Preferably, said means to provide a bias force comprises a resilient member, which may be in the form of a spring, and which preferably comprises a coil spring.

Embodiments of a safety device in accordance with the present invention will now be described by way of example with reference to the accompanying drawings in which:

Fig. 1 is a partial cross sectional plan view of an embodiment of a safety device in accordance with the present invention; and

Fig. 2 is a vertical cross sectional view of the embodiment of Fig. 1, also showing a number of purlins upon which the device is mounted.

Fig 3 is a plan view of a second embodiment of a safety device in accordance with the present invention;

Fig 4 is a vertical cross sectional view of the device of Fig 3, also showing a number of purlins on which the device is mounted;

Fig 5 is a perspective view of the device of Fig 3; and

Fig 6 is a partial cross sectional vertical view of a tensioning tube of the device of Fig 3.

With reference to Figs 1 and 2 of the drawings an embodiment of a safety device comprises a first support member 10 and a second support member 20 with at least one, and in this case five, flexible elongate members extending therebetween. The five elongate members comprise first to fifth wire ropes 50A, 50B, 50C, 50D, 50E.

Intermediate the first and second support members 10, 20 there are provided third and fourth intermediate support members 30, 40 in order to provide additional support for the wire ropes 50A, 50B, 50C, 50D, 50E. The first to fourth support members 10, 20, 30, 40 are respectively mounted on first, second, third and fourth purlins 1, 2, 3, 4.

The wire ropes 50A, 50B, 50C, 50D, 50E have respective first ends provided with respective first end ferrules 52A, 52B, 52C, 52D, 52E which are adapted to be engaged by the first support member 10 and respective second ends having respective second end ferrules 54A, 54B, 54C, 54D, 54E which are adapted to be retained by the second support member 20.

The first support member 10 comprises an elongate rectangular top plate 11 held in engagement with an upper surface of the first purlin 1 by two clamping

screws 16A, 16B which are fixed in apertures (not shown) in the first purlin 1. The elongate top plate 11 is orientated with its long axis substantially parallel to the axis of the first purlin 1, upon which it is mounted.

Along a first long edge of the top plate 11 there is provided a downwardly projecting first shoulder portion 13. The first shoulder portion 13 is provided with engagement means in order to allow the first end portions of the wire ropes to be engaged and retained by the first support member 10. The engagement means are in the form of first, second, third, fourth and fifth apertures 14A, 14B, 14C, 14D, 14E through which the wire ropes 50A, 50B, 50C, 50D, 50E pass. The first end ferrules 52A, 52B, 52C, 52D, 52E of the wire ropes abut the first shoulder portion 13 of the first support member 10 and the wire ropes are therefore retained. The top plate 11 of the first support member 10 is provided with two apertures in the form of first and second slots 17A, 17B in which the clamping screws 16A, 16B are retained. The slots are orientated laterally with respect to the top plate 11. This enables the first support member 10 to move relative to the clamping screws 16A, 16B and thus to move laterally with respect to the first purlin.

Along the second long edge of the top plate 11 of the first support member 10 there is provided a second shoulder portion 12 which projects downwardly from the top plate 11. The second should portion 12 is provided with two apertures (not shown) through which first and second adjustment screws 15A, 15B pass. The adjustment screws 15A, 15B are aligned laterally with respect to the top plate 11 and are adapted to abut a vertical surface of the first purlin 1. In use, the adjustment screws 15A, 15B are held in abutment with the first purlin 1 by the tension of the wire ropes 50A, 50B, 50C, 50D, 50E. Adjustment of the adjustment screws therefore causes the first support member to be moved laterally with respect to the first purlin.

The second support member 20 comprises a top plate 21 adapted to be held in engagement with a substantially horizontal surface of a second purlin 2 and is attached thereto by first, second and third screws 27A, 27B, 27C. The top plate 21 is rectangular and elongate, and has an axis substantially parallel to the axis of the second purlin 2.

A first long edge of the top plate 21 of the second support member 20 is provided with a downwardly projecting first shoulder portion 22. The first shoulder portion 22 is provided with first, second, third, fourth and fifth apertures 24A, 24B, 24C, 24D, 24E through which the first to fifth wire ropes 50A, 50B, 50C, 50D, 50E pass in use. The second end ferrules 54A, 54B, 54C, 54D, 54E of the wire ropes 50A, 50B, 50C, 50D, 50E are retained by said first shoulder portion 22. There are, however, provided first, second, third, fourth and fifth coil springs 25A, 25B, 25C, 25D, 25E between the respective second end ferrules 54A, 54B, 54C, 54D, 54E and the first shoulder portion 22 of the second support member 20.

In use, the coil springs 25A, 25B, 25C, 25D, 25E are held in compression and they therefore serve to take up slack in the respective wire ropes 50A, 50B, 50C, 50D, 50E should the ropes stretch or become extended due to, for example, changes in temperature.

The second edge of the top plate 21 of the second support member 20 is provided with a second downwardly projecting shoulder portion 23 which in use abuts a portion of the second purlin 2, helping to provide reinforcement of the connection between the second support member 20 and the second purlin 2, and thus preventing lateral movement of the top plate 22 and mitigating shearing forces to the screws 27A, 27B, 27C.

The third support member 30 is, in use, attached to a third purlin 3. The third support member 30 comprises a top plate 31 which is rectangular and elongate and is adapted to be attached to the third purlin 3 by means of first and second screws 32A, 32B which extend through the top plate and through a part of the third purlin 3.

Provided on the upper surface of the top plate 31 are first, second, third, fourth and fifth wire rope retaining guides 34A, 34B, 34C, 34D, 34E adapted to guide the respective wire ropes 50A, 50B, 50C, 50D, 50E.

The fourth support member 40 is substantially identical to the third support member 30 having a top plate 41, first to fifth wire rope retaining guides 44A, 44B, 44C, 44D, 44E and being attached to a fourth purlin 4 by means of first and second screws 42A, 42B.

The wire rope retaining guides 34A, 34B, 34C, 34D, 34E, 44A, 44B, 44C, 44D, 44E may be extremely simple in construction and may each comprise a pair of projections extending from the top plate 31, 41 such that there is a space between the said two projections through which the respective wire rope may pass.

In use, the first, second, third and fourth support members are attached to the first, second, third and fourth purlins 1, 2, 3, 4 as described above and as shown in Fig. 2. The wire ropes may be tensioned by adjustment of the first and second adjustment screws 15A, 15B. The wire ropes 50A, 50B, 50C, 50D, 50E therefore provide a simple economic means of support for, for example, a sheet roof.

The form of the engagement means by which the wire ropes are engaged by the first and second support members may be considerably varied and individual tensioning means may be provided for adjusting the tension of individual wire ropes. It will be appreciated that the coil springs 25A, 25B, 25C, 25D, 25E are provided in order to take up slack which may occur in the wire ropes 50A, 50B, 50C, 50D, 50E and help in maintaining the wire ropes at or close to the desired tension. It will therefore be appreciated that it is desirable to use coil springs which provide the required bias force to the second end ferrules of the wire ropes (and thus the required rope tension) whether or not slack has been taken up.

Alternatively, other means of taking up slack, preferably whilst providing a substantially constant bias force, may be provided. Clearly, any number of interme-

diate support members may be used. Similarly, the means for adjusting the distance between the first and second support members is open to a large number of variations.

In the illustrated embodiment the wire ropes consist of 6mm diameter wire ropes and spacing between the respective wire ropes is approximately 167mm. Clearly, however, other dimensions, spacings and materials may be used.

With reference now to Figs 3-6 of the accompanying drawings a second embodiment of a safety device in accordance with the present invention has a first support member 110 and a second support member 120. Intermediate the first and second support members 110, 120 are third and fourth intermediate support members 130, 140. (Fourth support member not shown in Fig 5). The first to fourth support members are mounted on first to fourth purlins 101, 102, 103, 104.

The first support member 110 consists of a rectangular top plate 111 held in engagement with the upper surface of the first purlin 101 by pairs of self tapping screws 201. The top plate 111 is orientated with its long axis substantially parallel to the axis of the purlin 101 on which is it mounted.

A first shoulder portion 200 extends downwardly from the edge of the top plate nearest the second support member 120. The first shoulder portion 200 is constructed from 2mm thick pressed galvanised steel.

The second support member 120 has a top plate 121 in engagement with a substantially horizontal surface of the second purlin, 102 by self tapping screws 202. the top plate 121 is rectangular and elongate, and its long axis is substantially parallel to the axis of the second purlin 102.

The long edge of the top plate 121 adjacent the first member 110 has a downwardly projecting shoulder portion 122 constructed of 2mm thick pressed steel.

The shoulder portion 200 of the first member 110 is provided with a pair of circular apertures 204 which are vertically aligned, one on the top plate 111 and one on the horizontal plate of the shoulder 200 parallel to the top plate 111.

Through the apertures 204 fits a hollow tensioning tube 206 held in place by a pair of 50mm long steel pins 208. The tube 206 is a 19mm diameter steel tube. A portion 210 of the tube projects above the surface of the top plate 111 and the projecting portion 210 is externally threaded to receive a locking nut 212. On one side, the tensioning tube 206 has a hole 214 cut into its surface.

The tensioning tube 206 is held in position by the locking nut 212 and a pair of nylon washers 216 are provided around the tube 206 to sit between the steel pins 208 and the interior surface of the top plate 111.

The shoulder portion 122 of the second member 120 is provided with pairs of circular apertures 218 which are vertically aligned and through each of which passes a 6mm diameter bolt 220 to hold in place a nylon pulley 222 rotatable about the longitudinal axis of the bolt 220. A nut 224 holds the bolt and pulley in place. The first support member 110 is provided with similar pairs of pulleys 222 as can be seen in Fig 3.

A 5mm diameter wire rope 226 has a ferrule stopper 228 pressed onto one end. The ferrule 228 abuts against the lower end of the tube 206 and from there the rope 226 passes up through the interior of the tube and out through the hole 214 in the surface of the tube. The rope 226 then passes through an aperture 230 in the shoulder portion 200 of the first member and then extends to the second member 120 via the third and fourth members 130, 140 which are provided with pairs of guides 232 along their lengths. On reaching the second member 120 the rope 226 passes through an aperture 234 in the shoulder 122 of the second member and around the first pair of pulleys 222 and from there, back across to the first support member 110, and around a first pair of pulleys thereof. As can be seen from Fig 3, this alternation between the support members 110 and 120, via the intermediate support members 130 and 140, continues until the rope is finally joined onto the second support member by a weld 234.

In use, the support members 110, 120, 130, 140 are attached to the roof purlins 101, 102, 103, 104 as described above and as shown in Fig 4. In this example the purlins are distanced approximately 1800mm from one another. The rope 226 may be tensioned by tightening the locking nut 212 thereby causing the tensioning tube 210 to turn and the rope 226 to wrap around the tube 212.

Various modifications and variations are envisaged which will fall within the scope of the invention. For example, the device may be adapted to be fitted to the underside of the purlins of a roof.

Claims

1. A safety device for assisting in the supporting of a roof said safety device comprising:

   a first support member having a first engagement means in order to enable a first end portion of an elongate flexible member to be engaged and retained thereby, said first support member being adapted to be attached to a roof purlin;

   a second support member spaced apart from said first member, said second support member being adapted to be attached to a roof purlin;

   a second engagement means in order to enable a second end of the flexible elongate member to be engaged and retained thereby;

   a flexible elongate member adapted to extend between said first and second support mem-

bers and to provide support to a roof; and

means to adjust the tension in the elongate member between said first and second support means.

2. A safety device as claimed in Claim 1 wherein in use said flexible elongate member is maintained in tension between said first and second support members.

3. A safety device as claimed in Claim 1 or 2 wherein said flexible elongate member is a metal rope.

4. A safety device as claimed in any preceding claim wherein there is provided a plurality of pairs of engagement means, each pair comprising a first engagement means and a second engagement means.

5. A safety device as claimed in Claim 4 wherein there is provided a plurality of elongate members each extending between a respective pair of engagement means.

6. A safety device as claimed in any preceding claim wherein at least one of said first and second engagement means includes means to take up slack in said elongate member.

7. A safety device as claimed in Claim 6 wherein said means to take up slack comprises means to provide a bias force to a portion of the elongate member at or adjacent said engagement means, said bias force being applied in a direction so as to end to increase the tension of said elongate member.

8. A safety device as claimed in Claim 7 wherein said means to provide a bias force is in the form of a resilient member.

9. A safety device as hereinbefore described with reference to the accompanying drawings.

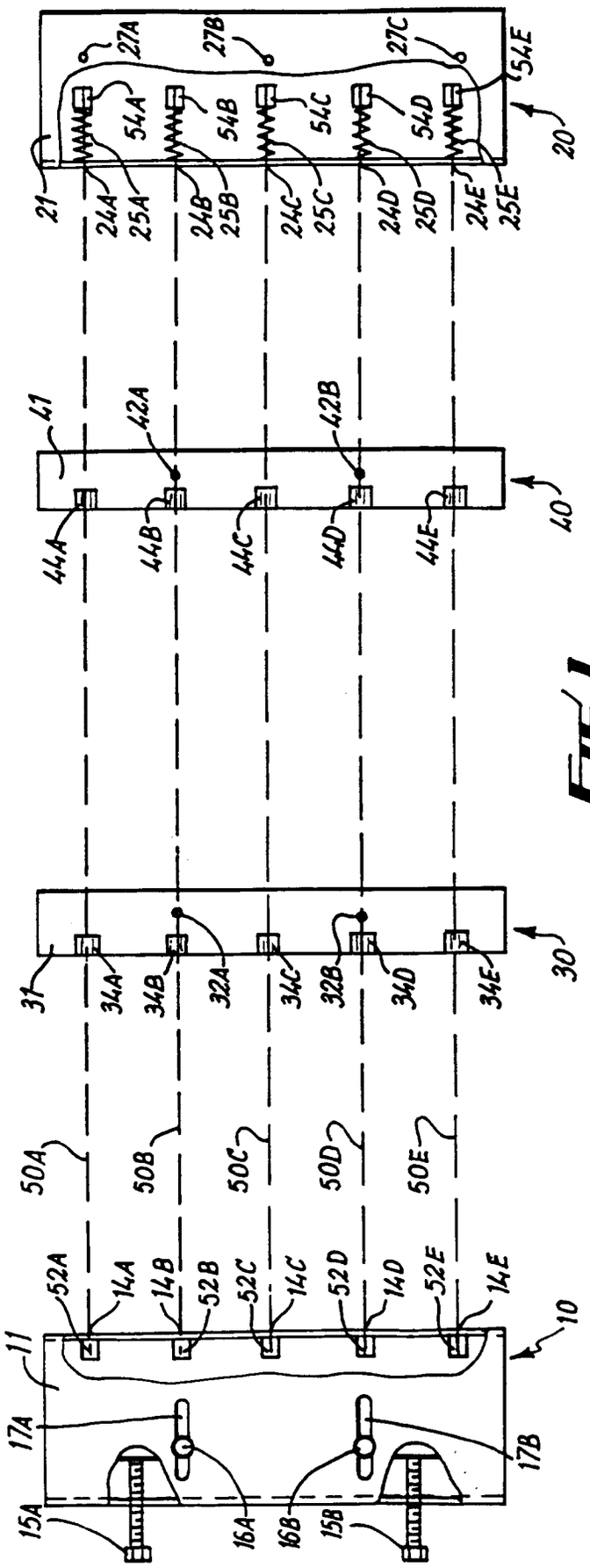
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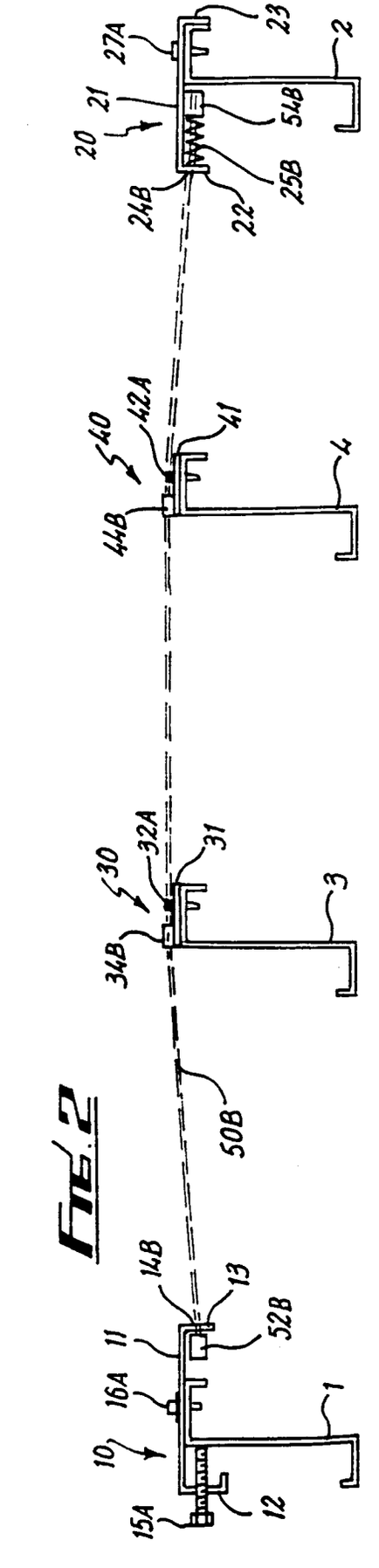
FIG.1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34B
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42A
44B
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52B
54B

FIG.2

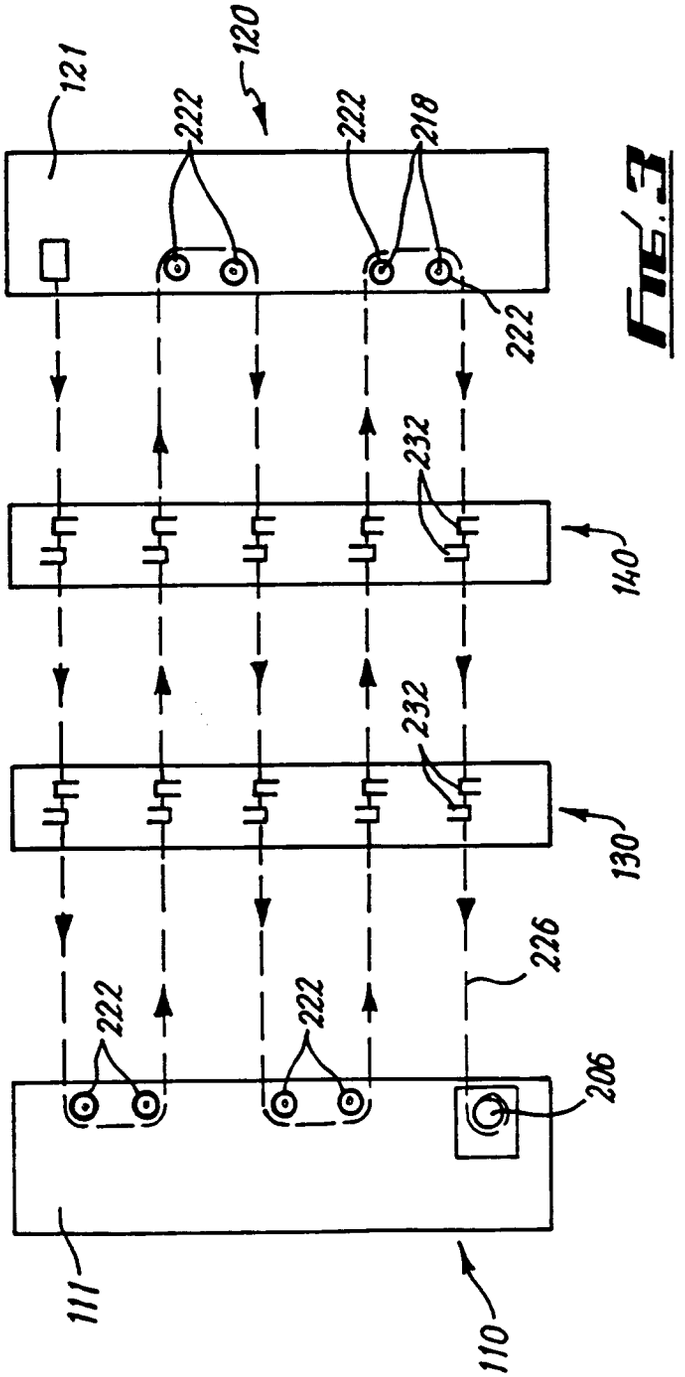
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Fig. 3

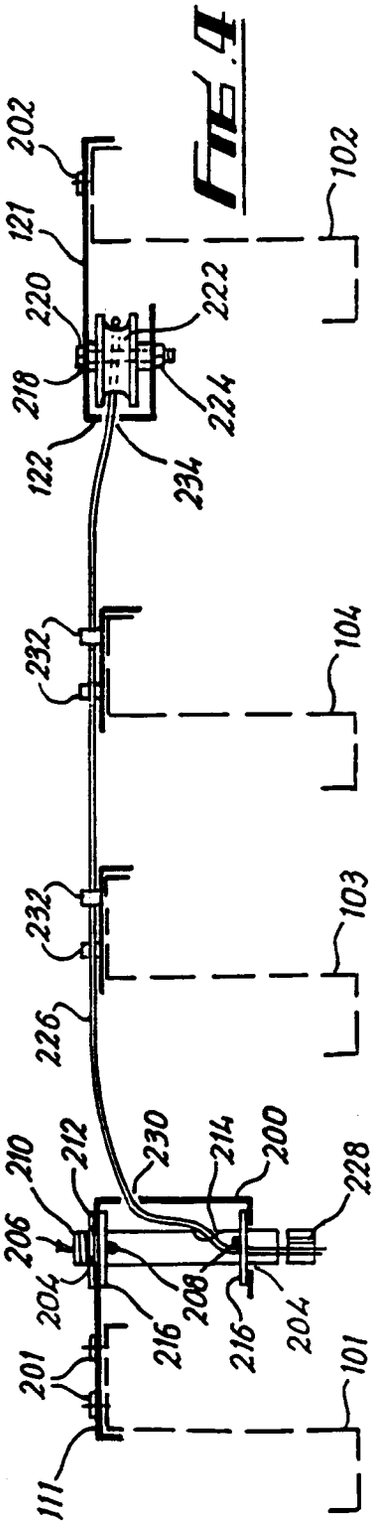
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Fig. 4

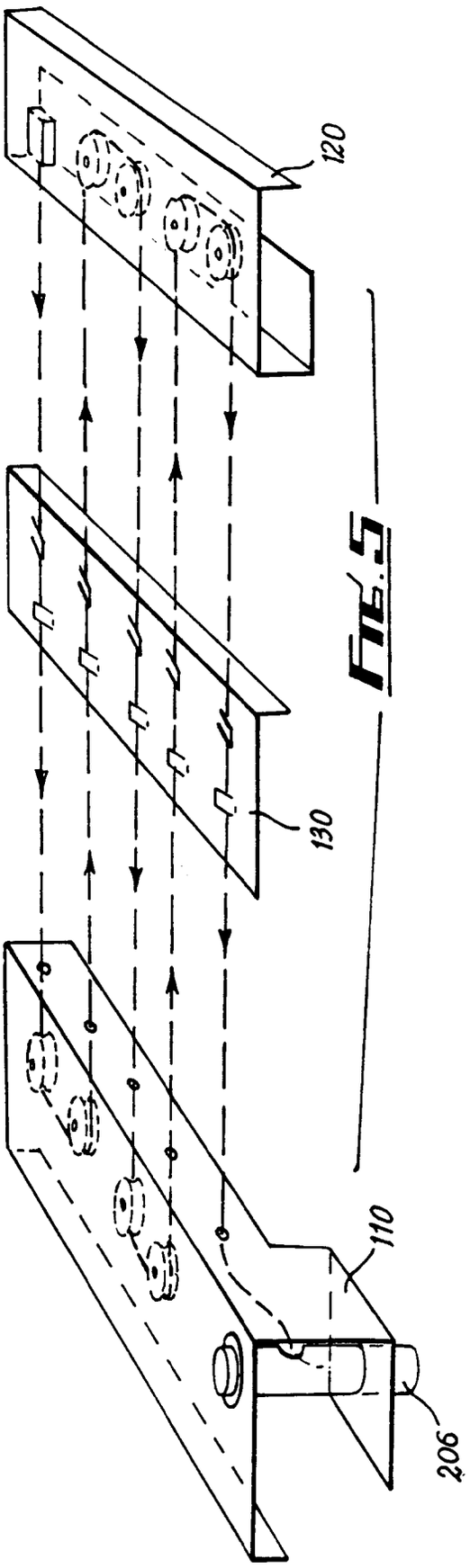

Fig.5

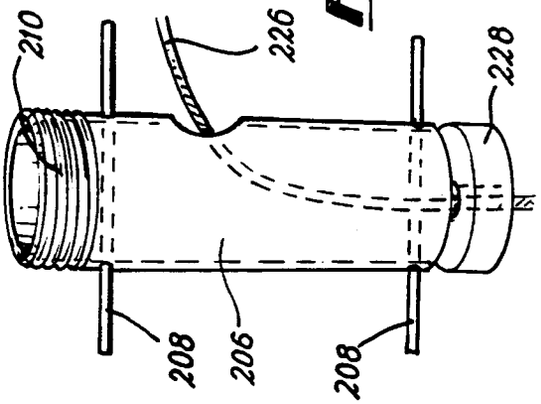

Fig.6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 30 3449

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.6)
X A	US 2 900 929 A (ADELT) * the whole document *	1,2,4,5,9 3,6	E04B7/00 E04D12/00
A	DE 17 09 172 A (LIMBACHER) * page 2, line 7 - line 10; figures *	1	
A	GB 518 051 A (HURDEN) * page 1, line 15 - line 68; figures *	1	
A	US 5 251 415 A (VAN AUKEN ET AL.) * abstract; figures *	1	
A	US 4 557 092 A (BRUESKE) * abstract; figures *	1	
A	CA 2 094 622 A (VAN AUKEN ET AL.) * page 2, last paragraph - page 3, paragraph 1; figures *	1	
A	US 2 999 340 A (MACULAN) * the whole document *	1,3	TECHNICAL FIELDS SEARCHED (Int.Cl.6) E04B E04D
A	DE 903 093 C (GESSNER) * page 2, line 71 - line 102; figures *	6-8	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23 October 1997	Righetti, R

CATEGORY OF CITED DOCUMENTS

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