(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 081 471**
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **82850244.3**

(22) Date of filing: **29.11.82**

(51) Int. Cl.³: **B 07 B 1/46**
B 07 B 1/48, B 07 B 1/49

(30) Priority: **07.12.81 SE 8107293**
02.03.82 SE 8201272

(43) Date of publication of application:
15.06.83 Bulletin 83/24

(84) Designated Contracting States:
AT BE DE FR GB IT SE

(71) Applicant: **TRELLEBORG AB**
Nygatan 102
S-231 00 Trelleborg(SE)

(72) Inventor: **Dehlen, Bengt Lars Arne**
Näckens väg 2
S-231 00 Trelleborg(SE)

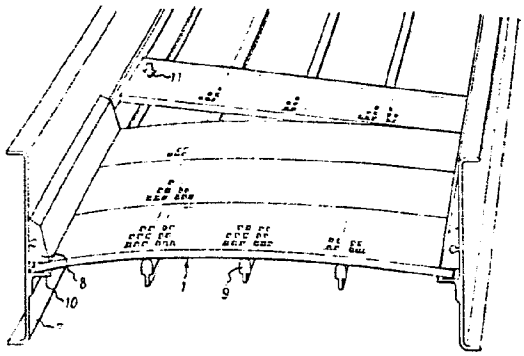
(72) Inventor: **Dyrup, Sven Erik**
Källstorpsvägen 11
S-230 30 Oxie(SE)

(74) Representative: **Wallin, Bo-Göran et al,**
AWAPATENT AB Box 5117
S-200 71 Malmö(SE)

(54) **Screening system.**

(57) A screen deck (1) comprises several elongated screen elements and is retained against the supporting elements (9) of a screen frame (7) by means of stiffening elements (3) included in the screen elements. The stiffening elements may serve independently as the one part of a fastening arrangement (3, 8, 10, 13) by being elastically deformed against the supporting elements (9) with a spring-back force resultant which is at least as large as an oppositely directed inertia resultant acting on the screen elements during screening in a dynamic screening machine. On using stiffening elements (3) of magnetic material, the screen elements (1) are retained against the screening frame (7, 9), or their retention may be increased, by means of permanent magnets (13) magnetically attracting the stiffening elements (3).

Fig 2



EP 0 081 471 A1

SCREENING SYSTEM

The present invention relates to a screen comprising a screen frame with supporting elements for a screen deck inserted in the screen frame, and fastening means for the screen deck.

Many different fastening methods have been used in the mounting of screens for dynamic screening machines. According to, for example, DE-OS 2,849,838 a snap-on system has been used in which the separate screen elements have been snapped onto enlarged supporting elements. Similar modes of fastening are utilized in DE-GM 78 38 335 and DE-OS 2,749,489. In some cases, fastening has been accomplished by projections on the underside of the screen cloths and expansion means adapted to urge said projections into engagement with recesses provided in the supporting elements of the screen frame. Such constructions are shown in, for example, U.S. patent specification 4,141,821 and the corresponding Swedish patent application 7700468-7, and also in U.S. patent specification 3,745,736.

However, the above-mentioned screening machines with small individually fastenable screen elements are not often used since they necessitate reconstruction of existing screening machines. The most commonly used variant of screening machines makes use instead of screen cloths of substantial size, very often 1-2 m^2 per unit.

This type of screen cloths are fastened in the screen frames by providing the screen cloth units with hooks by which the screen cloth units are clamped between opposed edges of the screen frame. An example of such a clamping method is disclosed in DE-OS 2,005,376. This fastening method is utilized for the majority of all screening machines which at present are manufactured all over the world, as a result of which the frame con-

structions of most screening machines are of a similar kind. As will appear from some of the above-mentioned publications, it has been tried to divide the screen deck into smaller units which are readily exchangeable to facilitate rapid exchange of a worn section and also to afford an opportunity for rapidly shifting from one hole size to another within a section of the screen deck.

The disadvantage of known smaller screen elements is that the frame construction of the screening machines used on the market must be redesigned or completed before the readily exchangeable screen element systems according to, for example, DE-OS 2,754,374 can be utilized.

It is one object of the present invention to provide a far-reaching simplification of prior art screen constructions with smaller screen elements and to allow of a simpler and cheaper mounting on location, without necessitating any essential alteration of the frame construction of the screening machine.

According to the present invention, it is required in a screen comprising a screen frame with supporting elements for a screen deck mounted in the screen frame and fastening means for the screen deck, that the said screen deck comprises several elongated screen elements placed adjacent each other and having stiffening elements which are included in the screen elements and which, upon mounting in the screen frame, are prestressed against the supporting elements by elastic deformation.

The invention thus is based on the idea that the separate screen elements forming said screen deck should be formed as elongated and rigid plank-like elements and, upon mounting, be subjected to an elastic deformation in order to provide the required holding-down force against the supporting elements of the screen frame.

Compared with the conventional systems where the separate screen cloths are provided at their edges with

retention hooks by which the cloths are prestressed, the present invention makes it much easier to apply the requisite holding-down force against the supporting elements of the screen frame. Thus, if the screen frame is designed in such a manner that the supporting elements force the screen elements to curve convexly, the screening elements can be formed with straight stiffening elements. One end of the screen elements is then secured to the frame, and the screen elements are bent over the supporting elements to be secured underneath a hold-down rib at the opposite side of the screen frame. The force required for bending the screen elements will be considerably less than a force directed in the plane of the screen elements and applied in order to stretch the screen elements to such an extent that the same holding-down force is obtained.

The screening system according to the invention can be utilized not only for screening machines in which the screen decks are curved convexly, but also in screening machines with planar decks. In such a case, it is possible, according to a development of the invention, to plastically deform the stiffening elements in a direction opposite to the elastic deformation to which the stiffening elements are subjected during mounting of the screen elements in the screening machine. In the present invention, it is best if the stiffening elements, when the screen elements are mounted in the screen frame, are subjected to an elastic deformation whose spring-back force resultant is at least as large as an inertia resultant acting on the screen elements in the opposite direction, when the screen elements are used in a dynamic screening machine. If it should be difficult to obtain such a strong elastic deformation, it is possible, according to the present invention, to increase the holding-down force by utilizing permanent magnets which preferably are mounted in the supporting elements of the screen frame and which are

caused to act against magnetic inserts in the screening cloth. These magnetic inserts may consist of the said stiffening elements.

The present invention therefore relates also to a screening system comprising a screen frame with supporting elements for a screen deck mounted in the screen frame, and fastening means for the screen elements, said system being characterised in that the screen deck comprises several juxtaposed elongated screen elements in which stiffening elements are inserted at least on the opposite long sides thereof, and that the fastening means comprise permanent magnets and armatures of magnetic material cooperating therewith. As has been mentioned before, these armatures may form the stiffening elements in the screen deck.

The screen elements in the screening system of the present invention preferably are formed for overlap jointing at their side edges extending along one another. As has already been mentioned, the screen elements should be formed as elongated elements similar to planks. In order to promote the elastic deformation which is required for bringing about the necessary holding-down force, it is best if the elements have a length to width ratio of at least 3:1, preferably at least 4:1 or, which is even better, at least 5:1. By this arrangement, the stiffening elements will lie closer to one another, and thus the total holding-down force will be greater, without it being necessary, upon mounting of the individual elements, to exert an inconveniently great force on the free ends of the elements when they are bent down and mounted in the screen frame.

If permanent magnets are utilized for providing or improving the holding-down force, these magnets should be disposed on the supporting elements of the screen frame, preferably by being connected therewith via elastic dampers.

The invention will be described in more detail

in the following, reference being had to the accompanying drawings in which

Fig. 1 is a perspective view of an example of a screen element in accordance with the present invention;

Fig. 2 is a perspective view of parts of the screen frame of a screening machine to illustrate the mounting of the screen elements;

Fig. 3 is a perspective view of another embodiment of a screen element according to the present invention;

Fig. 4 is a longitudinal section of a part of a screening machine with screen elements according to a further embodiment of the invention;

Fig. 5 is a section along line V-V in Fig. 4; and

Fig. 6 is a section along line VI-VI in Fig. 4.

Fig. 1 shows a screen element consisting of an elastomer, for instance natural or synthetic rubber, such as polyurethane. The screen element has holes 2 made during the manufacture of the element. Reinforcing or stiffening elements 3 are inserted along the longitudinal sides of the screen element. These reinforcing elements are made of rigid material and may consist of metallic square tubes, as illustrated in the drawings. If necessary, the screen elements may also be reinforced with a suitable number of laid-in stiffening elements 4 extending at right angles to the stiffening or reinforcing elements 3. The screen element is then formed for overlap jointing by being provided with a recess 5 at one long side and an overlap flange 6 at the other long side.

Fig. 2 shows an example of a screen frame in a screening machine. The screen frame has side members 7, hold-down ribs 8 and longitudinal supporting elements 9. The side members 7 also are provided with supporting surfaces 10. In the embodiment illustrated, the supporting surfaces 10 and the supporting elements 9 are mounted at different levels, such that the screen elements 1 will curve upwardly over the supporting elements 9.

As will appear from Fig. 2, the screen elements are mounted by clamping their one ends against the supporting surface 10 by means of the hold-down rib 8, whereupon the elements are pressed down over the supporting elements 9 by being subjected to a force in the direction of the arrow 11. Finally, the elements 1 are retained in this elastically deformed position by securing the hold-down rib 8 to the left in Fig. 2.

The present invention thus utilizes the elasticity or spring force provided by the stiffening elements 3 in order to obtain the requisite holding-down action against the supporting elements 9 during the subsequent use of the screening machine. The holding-down action can be very large if an appropriate material is selected for the stiffening elements 3. These elements may consist of, for example, metallic material which is rigid and can be subjected to heavy elastic deformation without surpassing the 0.2% yield strength during mounting. However, the stiffening elements 3 may also be formed of other materials, such as glass fiber rods or other rigid bars placed in the screening cloth elements either at the long side edges only, as is shown in Fig. 1, or at suitable intervals in the lateral direction of the screen elements (= the screening direction of the screening machine).

In the embodiment according to Figs. 1 and 2, the invention has been utilized in connection with a screening machine with a convexly curved screen deck. As has been mentioned above, the invention may also be utilized with screening machines in which the finished screen deck is planar, in which case the stiffening elements may have been subjected to a plastic predeformation (see Fig. 3) such that the screen elements are curved in a direction opposite to the elastic deformation imparted to them during mounting. In Fig. 3, this plastic predeformation is illustrated by the arrows 12 which indicate the amount by which the screen elements deviate from a straight line 13.

If it is desired, according to a further development of invention, to strengthen the holding-down force or to avoid deformation of the screen elements during mounting, it is possible in accordance with Figs. 4-6, to provide a holding-down force by means of permanent magnets 13 which, by means of resilient holders 14 serving as dampers, are mounted on the longitudinal supporting elements 9 of the screen frame. In the embodiment illustrated, the holders 14 are fixedly mounted on the longitudinal supporting elements 9 by means of a holder plate 15 secured by means of bolts 16 (Fig. 5) or by welding (Fig. 6).

The permanent magnets 13 attract the stiffening elements 3 which are inserted in the screen elements and which, in this instance, must consist of magnetic material to be able to function as armatures. As will appear from Fig. 4, the magnets 13 can be placed at suitable intervals across the screening surface, such that the magnets can be used for retaining the stiffening elements 3 of two juxtaposed screen elements. The use of magnetic retention means makes mounting and dismounting much simpler than in known mounting systems. With magnets, the magnetic force can be used as the only retention force, but it is also possible to utilize the above-mentioned deformation of the screen elements to produce a more powerful holding-down action.

The invention has been described above with reference to a screen frame in which the screening cloth elements extend from one side to the other. However, the invention may be used also with screening machines designed in a different manner, in which the screening deck is divided into two or more juxtaposed areas, as shown in Fig. 7.

CLAIMS

1. A screening system comprising a screen frame (7) with supporting elements (9) for a screen deck (1) inserted in the screen frame, and fastening means (3, 8, 10, 13) for the screen deck, c h a r a c t e r i s e d in that the screen deck (1) comprises several elongated screen elements placed adjacent each other and having stiffening elements (3) which are included in the screen elements (1) and which are prestressed against the supporting elements (9) by elastic deformation upon mounting in the screen frame (7).

2. A screening system according to claim 1, c h a r a c t e r i s e d in that the length to width ratio of the screen elements (1) is at least 3:1, preferably at least 4:1.

3. A screening system according to claim 1 or 2, c h a r a c t e r i s e d in that the stiffening elements (3) in the screen elements (1) are plastically deformed in a direction opposite to the elastic deformation imparted to said stiffening elements upon mounting.

4. A screening system according to claim 1, 2 or 3, c h a r a c t e r i s e d in that the stiffening elements (3) are mounted in the screen frame (7) with an elastic deformation whose spring-back force resultant is at least as large as an inertia resultant acting on the screen deck (1) in the opposite direction when the screen deck is used in a dynamic screening machine.

5. A screening system, possibly according to claim 1, 2, 3 or 4, comprising a screen frame (7) with supporting elements (9) for a screen deck (1) inserted in the screen frame, and fastening means (3, 8, 10, 13) for the screen deck, c h a r a c t e r i s e d in that the screen deck (1) comprises several juxtaposed elongated screen elements in which stiffening elements (3)

are inserted at least on the opposite long sides thereof, and that the fastening means comprise permanent magnets (13) and armatures (3) of magnetic material cooperating therewith.

6. A screening system according to claim 5, c h a r a c t e r i s e d in that the armatures (3) consist of stiffening elements (3) included in the screen elements (1).

7. A screening system according to any of the preceding claims, c h a r a c t e r i s e d in that the screen elements (1) are formed for overlap jointing at their side edges (5, 6) extending along one another.

8. A screening system according to any one of claims 5-7, c h a r a c t e r i s e d in that the permanent magnets (13) are disposed on the supporting elements (9) of the screen frame (7).

9. A screening system according to claim 8, c h a r a c t e r i s e d in that the permanent magnets (13) are anchored to the supporting elements (9) by means of elastic dampers (14).

Fig.1

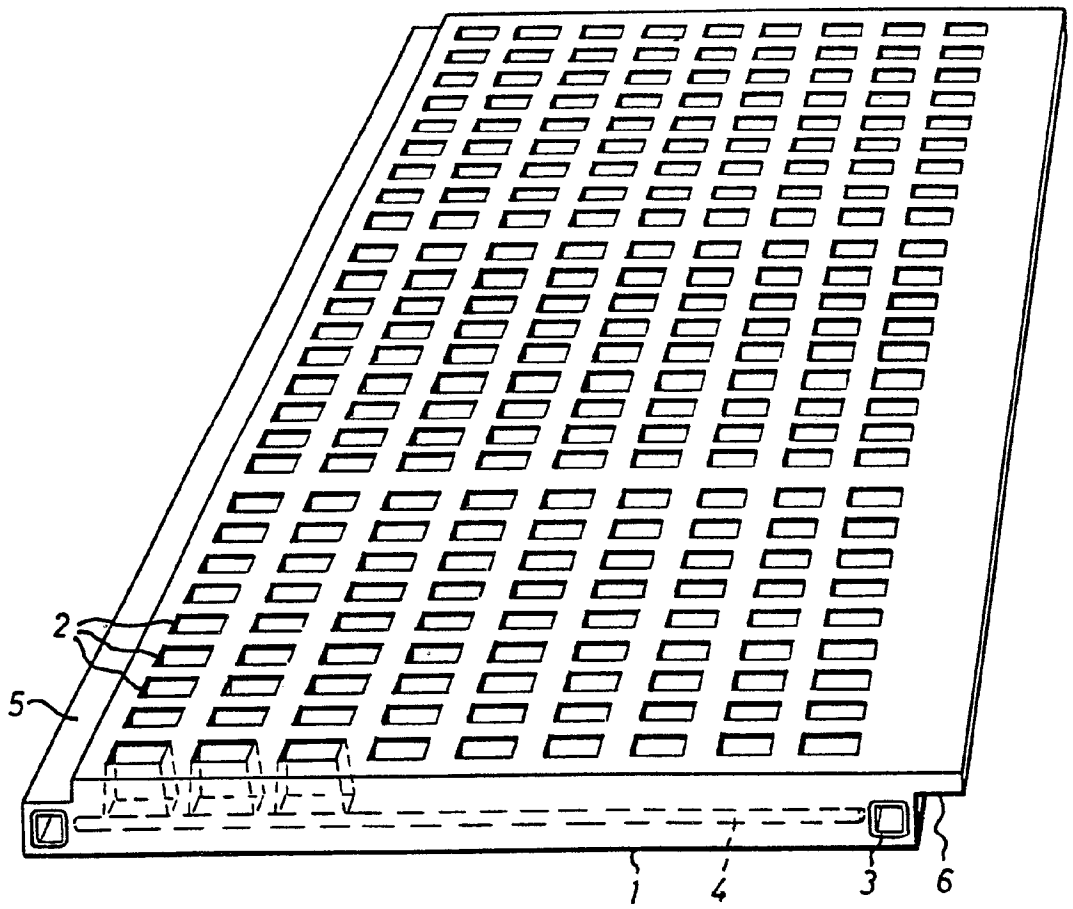


Fig.2

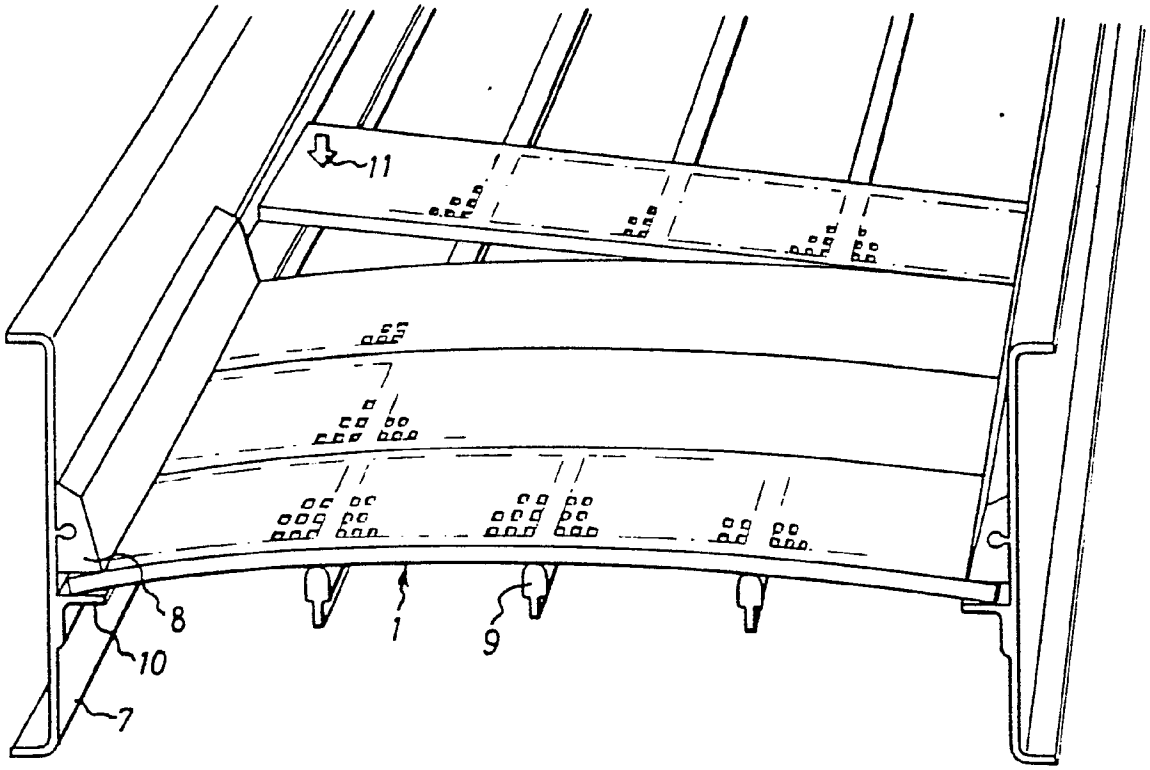
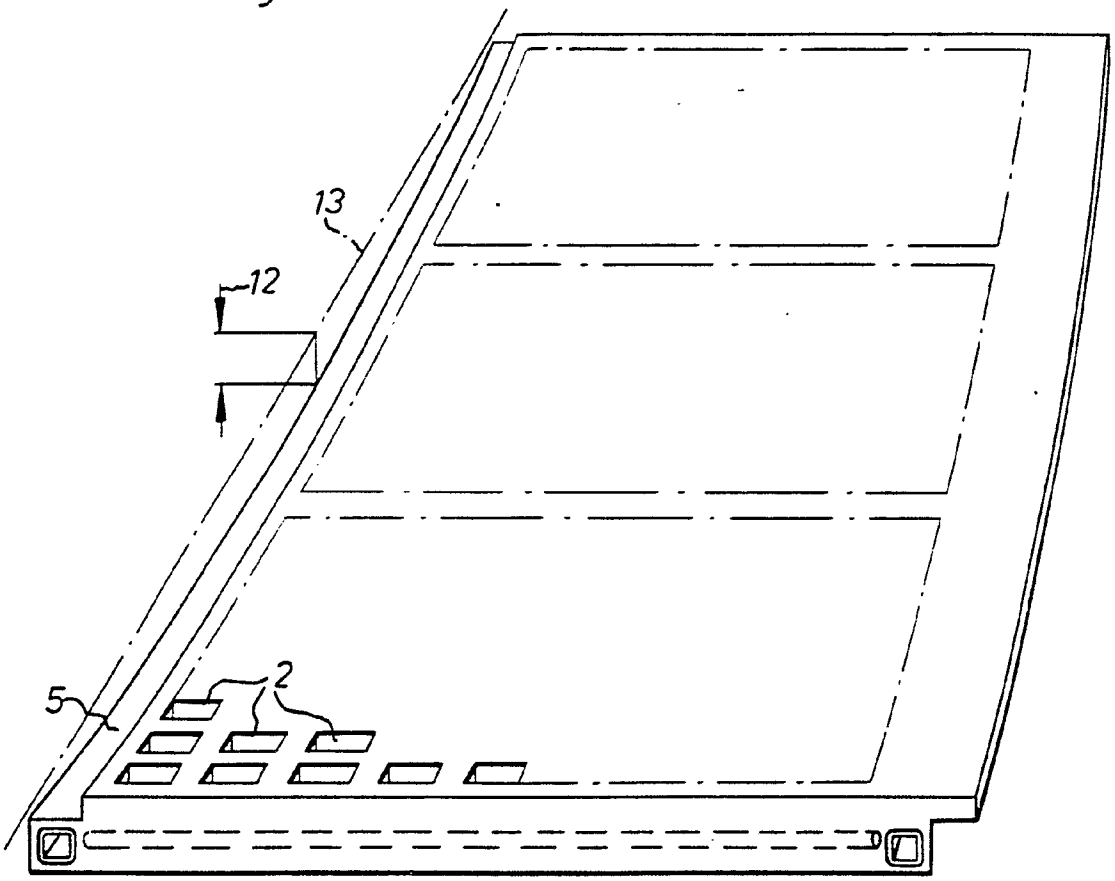


Fig.3



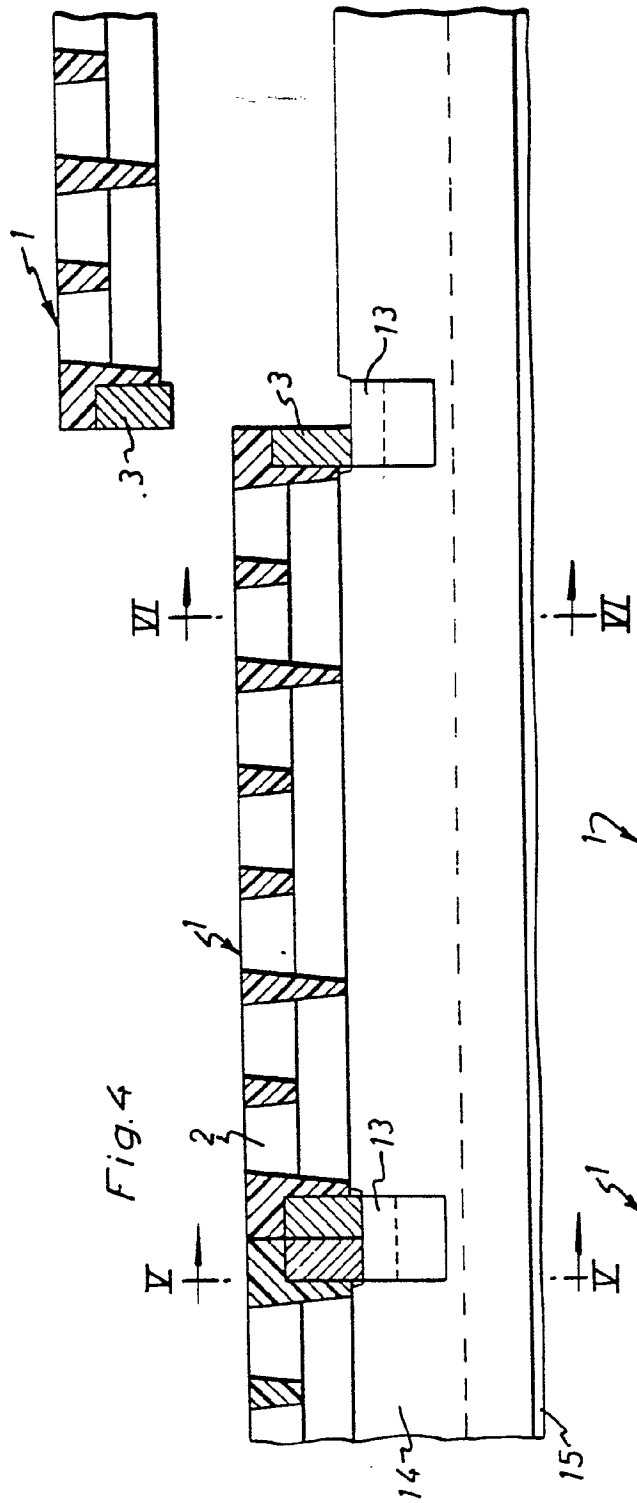


Fig.4

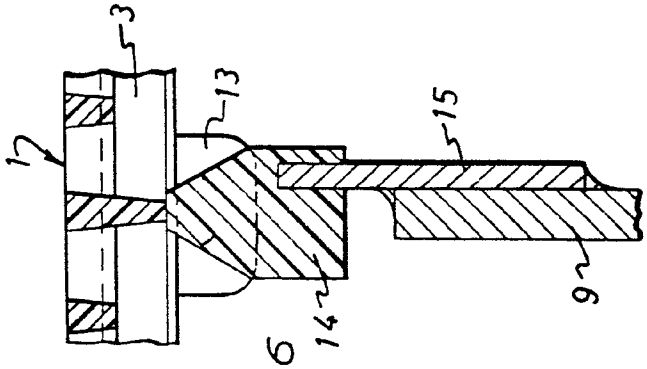


Fig.6

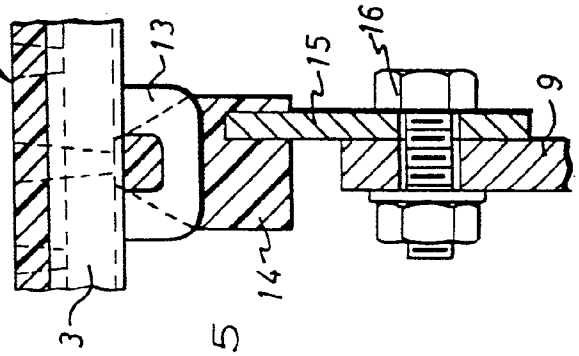


Fig.5

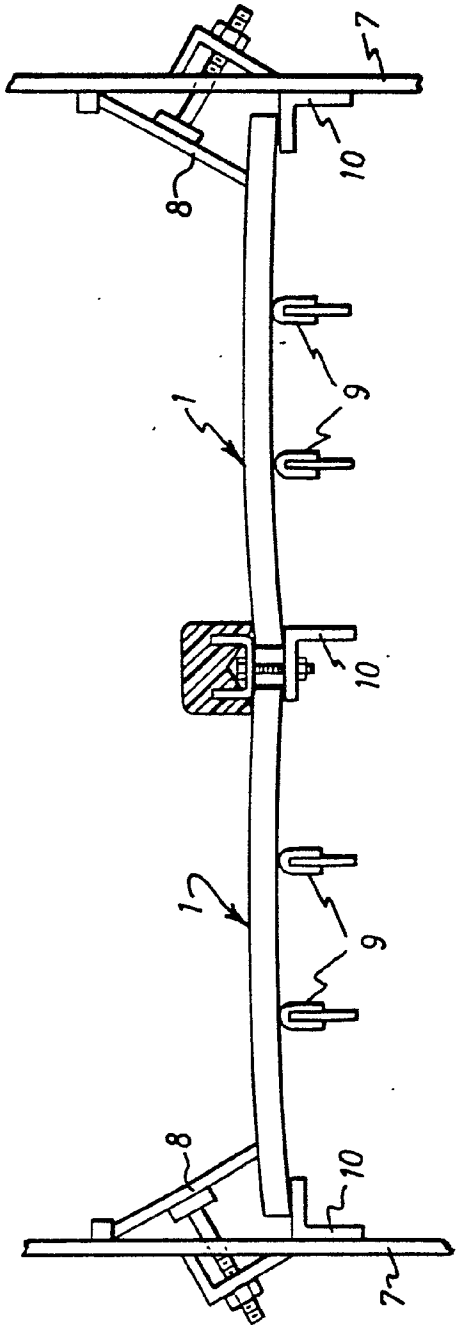


Fig. 7

0081471

European Patent Office

EUROPEAN SEARCH REPORT

Application number

EP 82 85 0244

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 ³)
Y	DE-A-2 461 237 (H.LEHMANN) *Page 6, last paragraph to page 7, line 19; page 8, line 3 to page 19, last line; figure*	1	B 07 B 1/46 B 07 B 1/48 B 07 B 1/49
Y	FR-A-2 047 758 (BRIDGESTONE) *Page 5, line 21 - page 6, line 33; page 9, line 8 - page 10, line 8; figures 6a-7d,8-9b*	1,7	
A	US-A-2 910 180 (J.PARKS) *Column 1, line 44 - column 2, line 15; column 3, line 32 - column 4, last line; figures 1-8*	1	
A	US-A-4 120 784 (G.HASSALL) *Column 2, line 24 - column 4, line 4; figures 1-6*	1,7	TECHNICAL FIELDS SEARCHED (Int. Cl ³)
A	CH-A- 495 791 (STEINHAUS) *Column 2, line 12 - column 4, line 28; figures 1-10*	5	B 07 B
A	DE-A-2 754 374 (GUMMI-KÜPER)		
A	DE-A-2 932 696 (HEINZ D.GÄRTNER)		
A,D	US-A-4 141 821 (STEINHAUS)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17-03-1983	LAVAL J.C.A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO Form 1503 03 82