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(54) **A gymnastic apparatus and also a horizontal bar suitable for such a gymnastic apparatus**

(57) A gymnastic apparatus comprising an elongated horizontal bar supported by posts, whereby said bar is supported near each end by at least two spaced-apart supports, wherein the inner supports positioned closer

to the centre of the bar are provided with bearings, in which said bar is movable in longitudinal direction and capable of deflection in a direction transversely to the longitudinal direction of the bar.

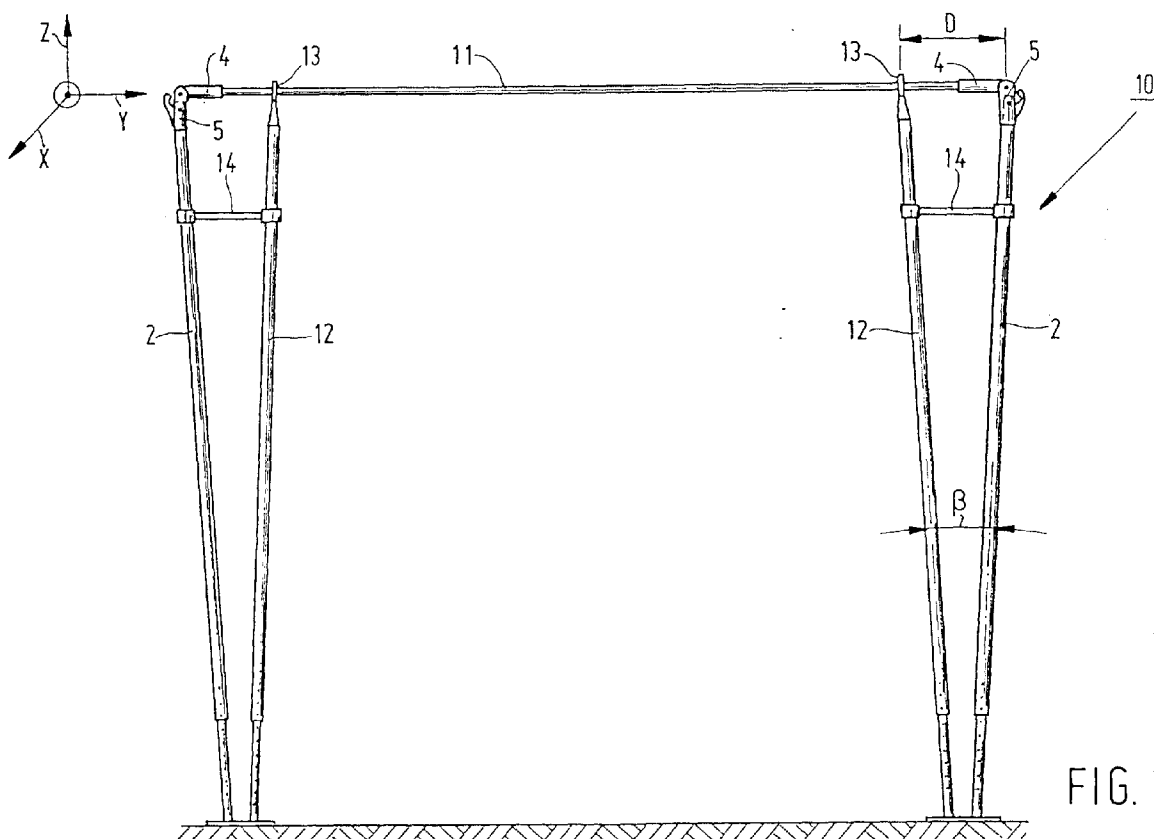


FIG. 2

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Description

The invention relates to a gymnastic apparatus comprising an elongated horizontal bar supported by posts, whereby said bar is supported near each end by at least two spaced-apart supports.

The invention furthermore relates to a horizontal bar suitable for such a gymnastic apparatus.

With a gymnastic apparatus of this type known from Swiss Patent CH-A-621.260 a horizontal bar is supported near each end by two bearing bushings butting against each other, in which the bar is journaled to be rotatable about its central axis. The bar is not capable of movement in axial direction. The two bearing bushes positioned adjacently to each other jointly form a rigid fixation of the bar, as it were, which only allows the bar to rotate about its central axis. Round said bar exercises will be performed by a gymnast, which exercises inter alia include rotation of the body about the bar. The bar is thereby subjected to relatively great mechanical loads. The international gymnastics federation FIG has enforced requirements, inter alia with regard to the degree of deflection in the centre of the bar with a predetermined static test load and a predetermined prescribed diameter of the bar of 28 mm and a length of 2.4 m. When the bar is dynamically loaded during the gymnastic exercises the deflection that occurs in the centre of the bar may amount to 200 mm. The tensile stresses that occur thereby are substantially equal to the breaking stress of the bar material. No materials for bars are known which permit a higher maximum allowable tensile stress whilst retaining the prescribed degree of deflection with a given static test load and which also keep the cost price of the gymnastic apparatus within bounds.

The object of the invention is to provide a gymnastic apparatus which enables a greater freedom in selecting the properties of the material of the bar whilst retaining the prescribed degree of deflection with a predetermined static test load.

This objective is accomplished with the gymnastic apparatus according to the invention, in that the inner supports positioned closer to the centre of the bar are provided with bearings, in which the bar is movable in longitudinal direction and capable of deflection in a direction transversely to the longitudinal direction of the bar, whilst the outer supports are spaced apart from said inner supports.

When the above-described static test load is applied the centre of the bar will deflect in one direction. Parts of the bar located between said supports will be deflected in an opposite direction thereby. Since the bar is journaled in the inner supports, any extension and/or deflection of the bar between the outer supports and the centre of the bar will be absorbed. As a result of the use of such a multiple support of each end of the bar also the tensile forces and mechanical torques that occur in the centre of the bar will be lower than is the case with the known bar. Such a multiple support furthermore

makes it possible to select a material for the bar which in addition to a lower E-modulus also has a lower specific weight. A lower specific weight will result in a more favourable dynamic behaviour of the bar, in particular with regard to the occurrence of natural vibrations.

It is noted that German utility model DE-U-88.15.268 discloses a gymnastic apparatus wherein the horizontal bar is supported near each end by two spaced-apart supports. The inner supports of said apparatus, however, are not provided with bearings in which the bar is capable of deflection in a direction extending transversely to said bar.

One embodiment of the gymnastic apparatus according to the invention is characterized in that the spacing between supports positioned adjacently to each other is determined in dependence on the E-modulus and the predetermined maximum allowable deflection with a predetermined force.

The spacing between the supports can be determined experimentally or physically, depending inter alia on the E-modulus of the material of the bar, whereby the amount of deflection in the centre of the bar equals the prescribed amount of deflection with the given static test load.

Another embodiment of the gymnastic apparatus according to the invention is characterized in that said supports fix the bar against translation in directions transversely to the bar.

In this manner translating movement of the bar is prevented.

The invention will be explained in more detail hereafter with reference to a drawing, in which

Figure 1 shows a gymnastic apparatus according to prior art;

Figure 2 shows a gymnastic apparatus according to the invention.

Figures 3A and 3B diagrammatically show the deflection which occurs with the bars of the gymnastic apparatus shown in Figures 1 and 2 respectively.

Like parts are numbered alike in the Figures.

Figure 1 shows a gymnastic apparatus 1 which is known per se and which comprises a horizontal bar 3 supported by two posts 2. Bar 3 has a length of 2.4 metres. Bar 3 is connected to one end 5 of pole 2 at each end 4. Gymnastic apparatus 1 is stayed by means of guy ropes 6 attached to posts 2. As a result of said staying bar 3 cannot move in X-, Y- or Z-direction. The ends 4 of bar 3 are pivotable about the x-axis with respect to the ends 5 of post 2. Posts 2 are provided with a support 7 on a side remote from the ends 2, with respect to which post 2 is pivotable in three directions. Figure 3A shows a situation wherein a static load F is exerted on the centre of bar 3. As a result of said static load F bar 3 will deflect over a distance δ_1 in its centre. The ends 4 will

thereby pivot with respect to the diagrammatically illustrated ends 5 of posts 2. The deflected bar is indicated at 3'.

Figure 2 shows a gymnastic apparatus 10 according to the invention. The gymnastic apparatus comprises two posts 2, between which a bar 11 is provided in a manner shown in Figure 1. Gymnastic apparatus 10 furthermore comprises two posts 12, which are disposed between poles 2 and which are connected to horizontal bar 11 with one end 13. The distance between ends 13 corresponds with the length of 2.4 metres prescribed by the FIG. Each end 13 is provided with a ball bearing, in which bar 3 is movable in Y-direction and also pivotable in X-, Y- and Z-direction. Posts 2, 12 are disposed at an angle β with respect to each other, but they may also extend vertically. The desired spacing between posts 2, 12 is maintained by a distance piece 14. The gymnastic apparatus may also be constructed in such a manner that angle β is adjustable. In that case the end of post 12 will be provided with hinge piece 15, and the end of post 12 will be provided with ball joint 13. Distance piece 14 will be substituted for an adjusting mechanism in that case. When the angle β is changed, also the distance D between the ends 5, 13 of posts 2, 12 will be changed, and thus the angle between the supports of the bar 11 formed by the ends 5, 13. Figure 3 shows a situation wherein the centre of bar 11 is subjected to the same load F as bar 3 in Figure 3A. Bar 11 will deflect in negative Z-direction over a distance δ_2 between the supports formed by the ends 13 of posts 12. Bar 11 will deflect in positive Z-direction between supports 5, 13. The deflected bar 11 is indicated at 11'.

When the distance between supports 5 of bar 3 and the distance between supports 13 of bar 11 equals 2.4 metres, and the bars have an identical diameter, the distance D will have to equal 1.03 metres to obtain the same deflection $\delta_1 = \delta_2$, assuming that the same load F is applied and that the ratio between the E-modulus of bar 3 and the E-modulus of bar 11 is 2.4.

When the ratio between the various E-moduli is different, also the distance D will be different, of course. The distance D can be determined experimentally or be calculated physically.

Bar 11 may for example be made of a composite material comprising a fibre-reinforced plastic. The bar may comprise carbon or aramid. Such materials generally have a lower specific weight than the steel of which the known bar 3 is made. The lower specific weight has a positive effect on the dynamic mechanical behaviour of the bar.

It is also possible to provide three or more supports or points of fixation on either side of the bar.

The supports may also be mounted on an enlarged end of a post, so that only two posts will be required.

The gymnastic apparatus according to the invention may also be used with so-called parallel bars or asymmetric bars, whereby each bar is supported in a similar manner as the above-described horizontal bar near

each end.

Claims

1. A gymnastic apparatus comprising an elongated horizontal bar supported by posts, whereby said bar is supported near each end by at least two spaced-apart supports, characterized in that the inner supports positioned closer to the centre of the bar are provided with bearings, in which said bar is movable in longitudinal direction and capable of deflection in a direction transversely to the longitudinal direction of the bar, whilst the outer supports are spaced apart from said inner supports.
2. A gymnastic apparatus according to claim 1, characterized in that the spacing between supports positioned adjacently to each other is determined in dependence on the E-modulus and the predetermined maximum allowable deflection with a predetermined force.
3. A gymnastic apparatus according to claim 1, characterized in that an outer support is provided with a bearing, in which said bar is movable in longitudinal direction and also pivotable in three directions extending transversely to each other.
4. A gymnastic apparatus according to claim 1, 2 or 3, characterized in that said supports fix the bar in directions extending perpendicularly to said bar.
5. A gymnastic apparatus according to any one of the preceding claims, characterized in that each support is mounted on one end of a post.
6. A gymnastic apparatus according to any one of the preceding claims, characterized in that the spacing between supports positioned adjacently to each other is adjustable.
7. A horizontal bar for a gymnastic apparatus according to any one of the preceding claims, characterized in that said bar is made of a fibre-reinforced plastic.

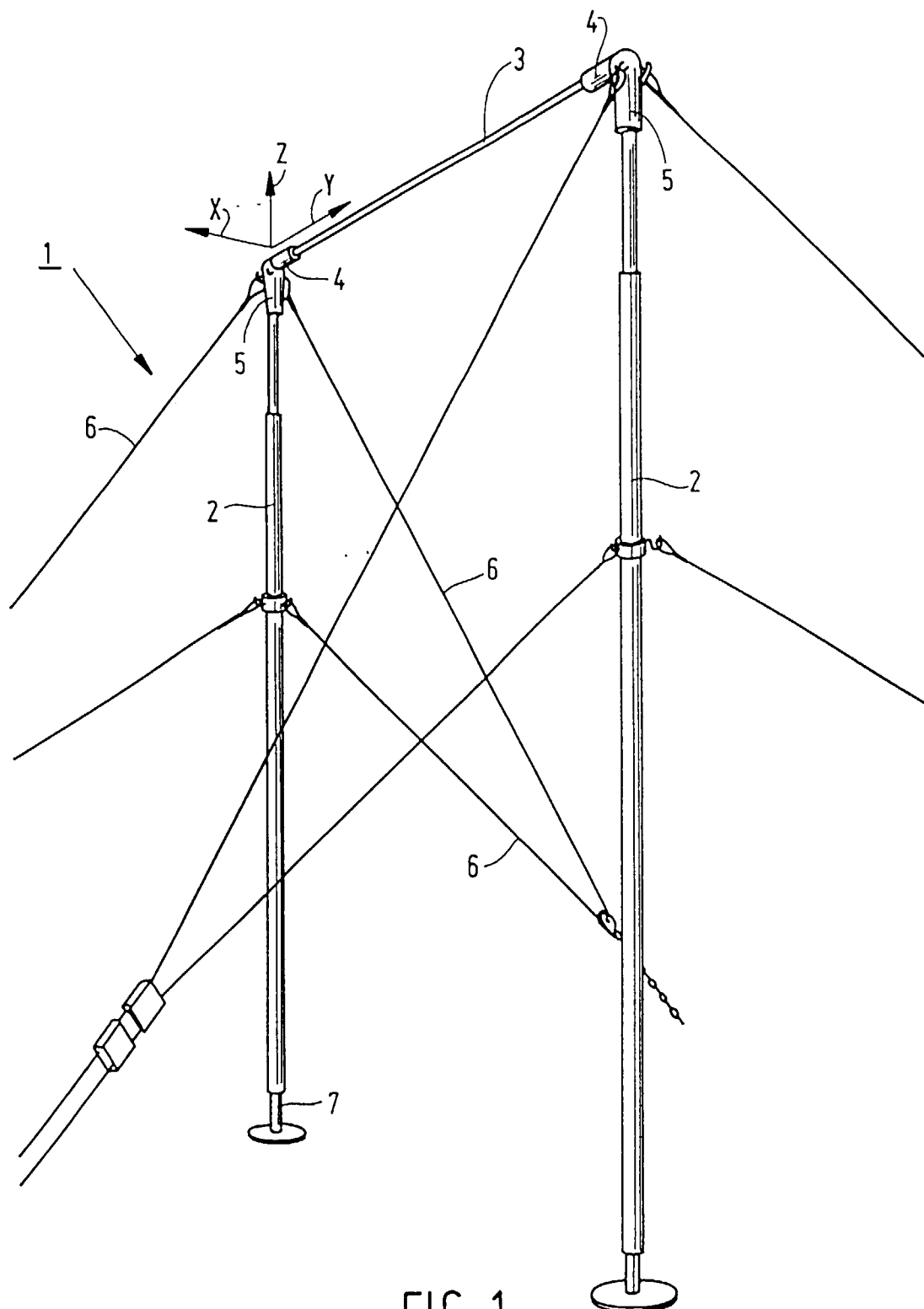
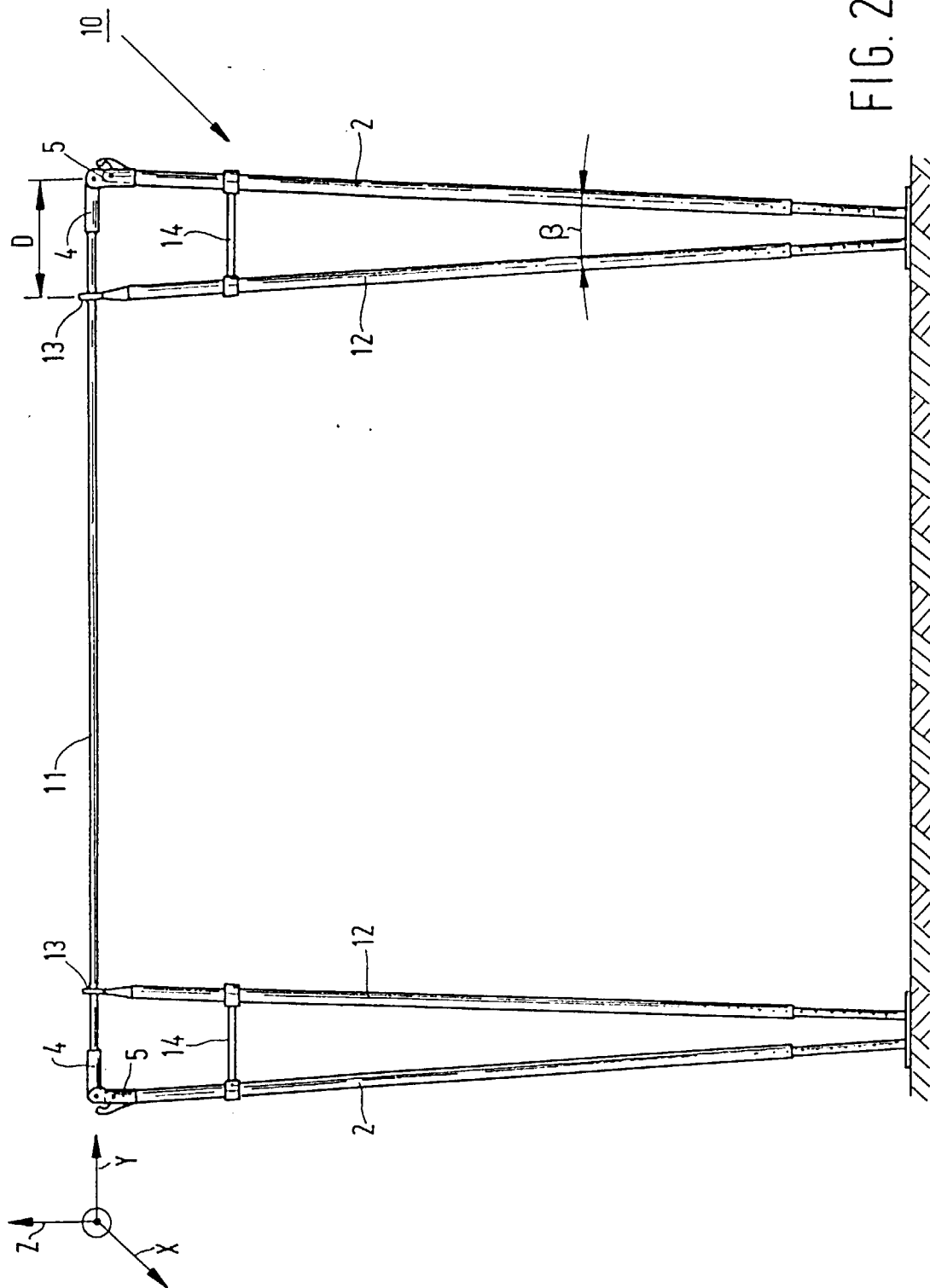


FIG. 1



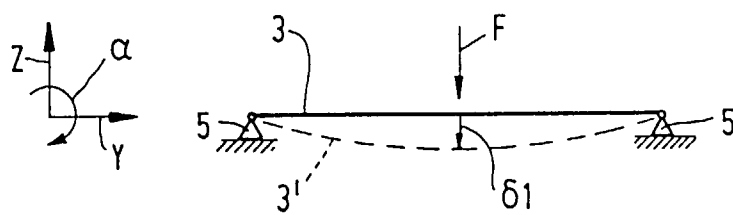


FIG. 3A

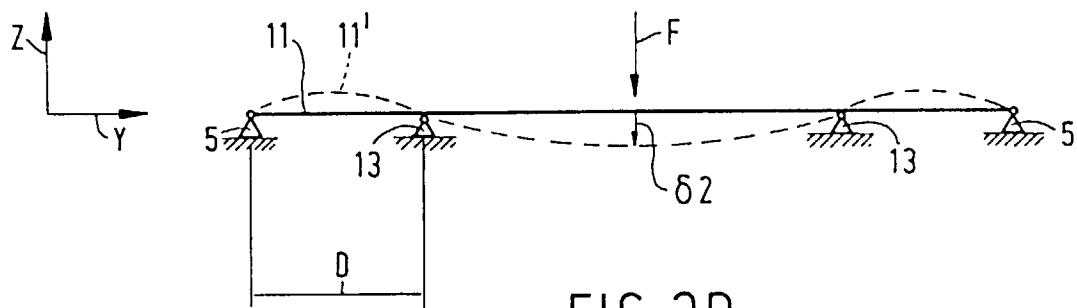


FIG. 3B



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 0416

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)
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D,A	CH 621 260 A (HÄNER) 30 January 1981 * the whole document *	1,4,5	
A	FR 2 611 507 A (MICELI ET AL.) 9 September 1988 * figure *	1	
A	DATABASE WPI Section Ch, Week 8910 Derwent Publications Ltd., London, GB; Class A32, AN 89-074652 XP002030759 & JP 01 029 276 A (ARISAWA SEISAKUSHO KK) , 31 January 1989 * abstract *	7	
A	US 4 227 688 A (SENOH ET AL.) 14 October 1980		
A	US 3 384 368 A (FENNER ET AL.) 21 May 1968		TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			A63B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 12 May 1997	Examiner Williams, M
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