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(54) **A device for ball games**

(57) A device for ball games providing an adjustable rebound force, comprising a frame structure and a sheet. The sheet is directly attached to the frame structure at least partly along an outer rim of the sheet. The device further comprises a tensioning means for providing the

sheet with a tension. The tensioning means can be an expandable element operated hydraulically or pneumatically. The rebound force can be adjusted in an easy and fast way by changing the pressure in the expandable element.

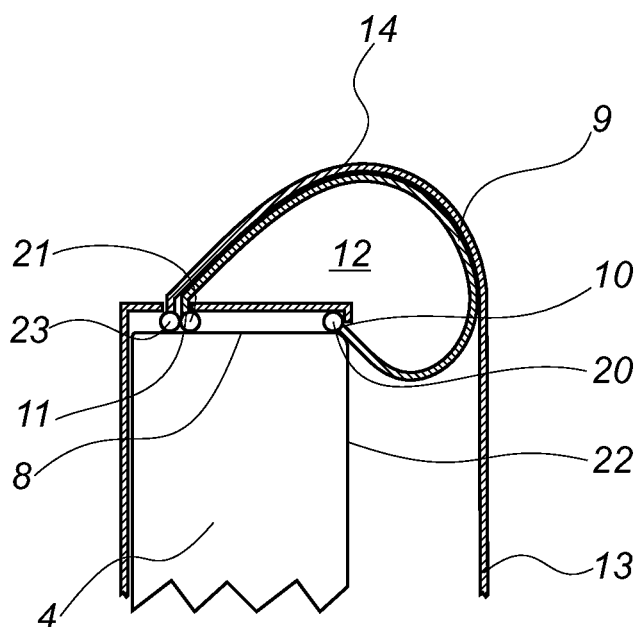


Fig. 2

Description

Technical field

[0001] The present invention relates to a device for ball games providing an adjustable rebound force. The device includes a sheet arranged over a frame structure. The rebound force obtained by the impact of an article, such as a ball, against the sheet is adjustable by means of an easy and fast-adjustable stretching of the sheet.

Technical background

[0002] Training devices with a metal frame over which a net or sheet is stretched with strong elastic bands are in use today for the training or practising of various ball games such as soccer (European football). During practice, the ball is kicked or otherwise shot toward the net or sheet, and the ball is returned by a certain rebound force or so-called "trampoline effect". The trampoline effect or rebound force of this type of training devices is determined by the properties of the net or sheet and the elastic bands and is not adjustable, which limits the potential use of such training devices. The optimal rebound force depends on the skill of the individual soccer player and the technical skill the player is training. Thus, it is crucial for a well-functioning and all-round training device that the rebound force is adjustable.

[0003] US 4,948,147 (Pallanca) discloses a soccer target having target openings and ball return means for returning the ball when you do not hit the target. The ball return means is a net of an only slightly elastic material suspended with elastic peripheral fastening means. The rebound force in such ball return means is not easy and fast-adjustable.

[0004] US 5,857,679 (Ringe et al.) discloses a portable rebound net using a tension adjustable elastic net material lashed to a frame structure. Adjusting the tension of the elastic netting material allows the user to alter the return speed of a ball hit against the rebound net. The frame structure can be supported with variable tilting. The net is tied with an elastic or inelastic adjustable cord spirally wound around the edge of the elastic net and the frame structure. By tightening or loosening the cord, the rebound force is increased or decreased respectively. Thus, the rebound force is adjustable, but the adjustment is complicated and time-consuming.

[0005] It is also known to establish a trampoline effect in a trampoline by means of springs. When the net or sheet is stretched between springs, the efficient area of the net is decreased because the springs occupy a certain area between the net and the frame. If such device is used for ball practice, a ball hitting one of the springs would not rebound in the same way as a ball hitting the net. The rebound from the spring would be shorter and in an unpredictable direction.

[0006] At least theoretically, it is possible to use springs with adjustable force. However, in case of a training de-

vice for soccer having a relatively large net, a large number of springs is needed. The springs would have to be adjusted one by one, which would be very time-consuming. Furthermore, springs are relatively heavy. Thus, in case you want a larger frame, the device will be difficult to handle, especially for children.

[0007] Accordingly, there is still a demand for a handier device equally usable for serious training for the skilled ball player and for children's enjoyable ball games and provided with a sheet or net for which the rebound force by a ball impact is adjustable in an easy and fast way.

Description of the invention

[0008] To meet the above demand, the present invention provides a device for ball games providing an adjustable rebound force, comprising a frame structure and a sheet wherein the sheet is directly attached to the frame structure at least partly along an outer rim of the sheet, the device further comprising a tensioning means for providing the sheet with a tension.

[0009] The tensioning means may comprise an expanding means made of a supple or flexible material such as one or more inflatable tubes or a similar inflatable system. In a preferred embodiment, the expanding means is one or more inflatable tubes. Such tube may be of a flexible material, but may also be of a non-flexible, but supple material, that is a material which is capable of being bent or folded without creases, cracks, or breaks. Further to inflatable systems which are inflated by means of a pneumatic pressure, similar hydraulic systems using a hydraulic fluid and hydraulic pressure are also contemplated.

[0010] In one embodiment of the device, the tensioning means comprises an expanding means arranged at least partly around an outer circumference of the frame structure, and wherein the rim area of the sheet is folded over the expanding means.

[0011] In another embodiment of the device, the frame structure comprises a number of bars connected in joints and wherein the tensioning means comprises an expanding means, including a number of connected expandable elements, wherein each joint is provided with one or more of the expandable elements, and wherein the expandable element may be brought in contact with an end of a first bar and an end of a second bar to force the ends of the first and second bars apart from each other.

[0012] In a further embodiment, the frame structure includes an inner frame and an outer frame having an expandable element such as one or more flexible or supple tubes placed between the inner and outer frames. These tubes may be expandable by means of a hydraulic or pneumatic pressure.

[0013] The purpose of the tensioning means is to stretch out the sheet by the provided tension. By stretching the sheet, it is possible to increase the rebound force of the sheet by ball impact. Similarly, the rebound force can be decreased when the sheet is slackened.

[0014] In the strongly stretched condition, the dampening action on the ball is minimized, and the rebound force is approaching the one obtained by ball impact against a solid wall. This is often desired by the skilled soccer player. When, on the other hand the sheet is less stretched, the dampening action is higher, and the rebound force is decreased.

[0015] In a preferred embodiment, the expanding means is a hydraulically expandable or inflatable tube. By use of such expandable tube, an expansion and hence the stretching of the sheet can be distributed equally based on the pressure in the tube, and the rebound force will be substantially the same at any point of the sheet.

[0016] The tube may be made of a flexible or supple material surrounding the outer circumference of the frame structure. The outer rim of the sheet may be folded over the tube squeezing the tube against the outer circumference of the frame structure.

[0017] In a further embodiment, only a part of the tube is made of a flexible or supple material whereas the remaining part is part of the frame structure. Thus, the tube may be formed of a band of a flexible or supple material with two opposite edges attached to the frame structure, whereby a cross section of the tube comprises a first peripheral portion of the flexible or supple material and a second peripheral portion included in the frame structure. Also, in this embodiment the outer rim of the sheet may be folded over the tube squeezing the tube against the outer circumference of the frame structure.

[0018] In a preferred embodiment, the rebound force of the sheet can be adjusted by controlling the pressure in the tube. The advantages of such pressure control are that a change in the pressure will be distributed very fast in the entire tube, and the desired level of rebound force is easy to obtain by means of an inflation means or hydraulic pressure means, such as a conventional pump or compressor. Furthermore, the rebound force can easily be decreased by opening an outlet valve connected with the tube.

[0019] Thus, in a preferred embodiment the inventive device further comprises a pump and an outlet valve connected with the inside of the tube.

[0020] Moreover, the device may include a means for controlling the pressure in the tube by regulating the pump and the outlet valve. Such control may be designed to keep the rebound force on a number of pre-determined levels suitable for the skilled player, the medium trained player or the beginner, respectively.

[0021] In a preferred embodiment, the sheet may be in the form of a net. A net with openings for the air will give lesser dampening and faster rebound as compared with a closed sheet because the air resistance is smaller with an open net.

[0022] Especially for the skilled player, the sheet or net is preferably made of an only slightly elastic material whereas the necessary elasticity is obtained by the tensioning means providing an adjustable tension of the sheet or net. By such arrangement, the slightly elastic or

low-flexible sheet material ensures a high rebound force when the sheet is stretched and also a more uniform rebound force. With the terms "slightly elastic" or "low-flexible" as used in the present specification and in the claims is understood that the flexibility of the sheet or net should be selected as low as possible when the sheet or net still has to resist a hard ball impact in the tensioned state.

[0023] According to a further aspect of the invention, the device may further be provided with an adjustable supporting structure for standing the frame structure on the ground, wherein the supporting structure comprises means for adjusting an angle between a normal to the ground and a normal to the sheet. In this way, it is possible to adjust the tilting position of the frame structure, whereby the rebound direction can be changed making the play more challenging for the player.

[0024] The training program for a player can be made more effective and interesting when the tension provided by the tensioning means, such as by the pressure in the tube, can be variable. Furthermore, it is contemplated to control the rebound force by a pre-set or randomized tension program making the ball rebound less predictable to the player. Such tension program could control a tension change, such as a pressure change in the tube or in a number of the connected expandable elements. This will make the play more challenging and entertaining due to a surprising ball rebound.

[0025] In the present specification and in the claims, the terms "rebound force" and "trampoline effect" refer to how a ball will act when you kick or throw it into the sheet or net. A high rebound force returns the ball maintaining almost all the force with which the ball was kicked.

[0026] A rebound time, that is the time from the first touch of the ball with the sheet until it is rebounded to the same position on its way back, depends on the tension on the sheet or net as well the elasticity of the entire arrangement. The rebound time depends on different parameters including the embodiment of the tensioning means and the tension to which it is adjusted. Thus in case of a high elasticity in the sheet and the tensioning means, there will be some delay before the ball is returned. In a preferred embodiment, especially for the skilled player, the delay should be as short as possible.

This may be obtained when the tensioning means provides a high tension to stretch the sheet. To ensure this, a minimal elasticity is desired in the sheet or net. Thus, a low-flexible or slightly elastic sheet or net is preferred.

[0027] On the other hand, to the lesser skilled player and children, a longer rebound time is in some cases desirable. Such longer rebound time may be obtained by selection of a more elastic sheet or net material.

[0028] The sheet or net may be prepared of any suitable material. Preferred materials include polymers such as polyamides, for example Nylon®, and polyesters.

[0029] In the present specification and in the claims, the term "sheet" has the general broad meaning of a bendable and non-rigid material which is thin in compar-

ison to its length and breadth including a membrane, a cloth, a woven or non-woven fabric, a web and a net, provided the mesh size of the net is smaller than the ball.

[0030] According to an embodiment, a flexible or supple tube inflated with air is placed between a frame structure and a sheet material, which is stretched over the frame structure. By raising and lowering the air pressure in the tube, the tension of the sheet material can be adjusted whereby the rebound force or elastic behaviour of the sheet material can be adjusted.

[0031] Preferably, the tube may rest in a groove or open channel in the outer circumference of the frame structure in order to stabilize the tube. The tube may also be attached to the frame.

[0032] In another embodiment, a frame structure part at the outer circumference or a part thereof may be a second portion of the tube, whereby the first portion is made of a band of a flexible or supple material attached at its longitudinal edges to the frame structure.

[0033] In a further embodiment, the tube is placed in a casing made in the outer rim of the sheet. Thus, the outer rim of the sheet may be a material of tarpaulin or canvas cloth which is folded over to made a casing or channel for the tube and attached to the remaining part of the sheet and to the frame structure.

[0034] Suitable supple materials forming the tube are PVC and the more flexible materials such as natural or synthetic rubber.

[0035] The inventive device has primarily been developed for use as a novel soccer training device with the frame structure made of metal whereas the sheet material stretched over the frame structure is a net. The hydraulic pressure or air pressure distributed equally in the tube provides the net with a trampoline like effect by which a soccer ball kicked into the net is rebounded (i.e. springs back) in the same way as if it was kicked against a wall. If the pressure is increased or decreased this trampoline-like effect or rebound force will be increased or decreased, respectively, and in this way it is possible to adapt the rebound of the ball to the actual exercise to be trained.

[0036] Such adjustable rebound force is of high value because the training device can be used for many different types of exercise ranging from exercises, where you want the ball to essentially lie still after impacting the net, to exercises, where you want the ball to be returned at high speed.

[0037] As explained above, the use of elastic bands to fasten the sheet has the disadvantage that the rebound force cannot be adjusted in practice. Also the use of springs is problematic. Springs must have a certain length whereby there will be a sheet-free area between the sheet edge and the frame. Thus, you need a larger frame for the same size of the sheet. Furthermore, if the ball hits one or more of the springs the rebound force will be smaller and the direction of the ball unpredictable. These disadvantages by use of elastic bands or springs are overcome by the inventive rebounding device which

is easy and fast to adjust by adjusting the tension, such as the pressure in the hydraulically or pneumatically operated expanding means, and by which the entire frame area has an evenly distributed rebound effect. Thus, even when the ball hits the expandable element, such as the inflatable tube, the rebound force will be closely similar to the rebound force in the central sheet area. In other words, also when the frame is hit by the ball the rebound from the frame will be of high quality.

[0038] The use of air pressure in the expandable element makes the adjustment very fast and a further advantage is that the air pressure will be distributed uniformly in the tubes along the frame ensuring the same pressure throughout the tubes along the entire frame without further adjustment. A similar effect is obtainable in case of a hydraulically expandable element.

[0039] The inventive rebounding device can be prepared with a relative low total weight making it easy to handle, transport, mount and take down. Thus it is applicable for a large target group including children and professional soccer players. To establish or change the air pressure does not require major strength and can easily be performed by children.

[0040] A relative low total weight of the device may be obtained by using a low-weight material for the frame structure. Examples of low weight materials are lightweight metals such as aluminium.

[0041] The pressure can be adjusted in a very short time using a hand pump or a mechanical pump. It is further contemplated to provide the device with an automatic pump controlled by a pre-selected or randomized program. By such means, using a per se conventional control unit the input signal from the unit could inform the inflation means, such as a pump and/or a valve, to increase or decrease the hydraulic or air pressure providing a surprising rebound of the ball. This could be very useful and entertaining in a number of training exercises and games

[0042] In use, the frame structure has to be supported in an upright position but not necessarily in an exact vertical position. Thus, in a preferred embodiment, the frame structure can be tilted between different angles to the ground including a vertical position and positions with the top tilted more or less backward away from the player. It may also be contemplated to tilt into a position with the top tilted forward toward the player. However, this would require a rather heavy supporting structure unless the supporting structure is placed in front of the device on the same side as the player.

[0043] Accordingly, the device may further include a supporting means such as one or more bars connected with the frame structure. In case the supporting means should be able to tilt the frame, a simple system could be a telescope cylinder system or another extensible bar system.

[0044] The person skilled in the art will appreciate that any relevant conventional technique could be used for the support of the frame structure with a desired tilting position.

[0045] The inventive device is suitable for training of various ball games including soccer, handball, basketball, volleyball, tennis, baseball, grass polo, field hockey, ice hockey and the like.

Description of the drawing

[0046] The invention is explained in detail below with reference to the drawing, in which

Fig. 1 shows an embodiment of a device for ball games,

Fig. 2 shows a cross section of an embodiment of the invention,

Fig. 3 shows a sheet according to an embodiment of the invention,

Fig. 4 shows a cross section like in Fig. 2, according to another embodiment of the invention, and

Fig. 5 shows a sheet according to another embodiment of the invention.

[0047] Illustrated in Fig. 1 is a device for ball games, according to the invention. The device comprises a rectangular frame structure 1 with an adjustable supporting structure 2 attached to a backside of the frame structure by pivoting means 3, such as hinges or similar pivotable joints. The rectangular frame structure 1 has four side bars 4, 5, 6 and 7. Stretched over a front side of the frame structure is provided a sheet 13, which may be tensioned by inflation of an expandable tube 12. The tube may be inflated by means of a pump providing an increased air pressure in the tube. The pressure can be decreased through a valve.

[0048] Fig. 2 shows a cross section of the top bar 4 of the frame structure. The outside of the bar 4 may be flat, as shown here or have a slightly U-formed profile. A band 9 of supple material is in a longitudinal side 10 attached to the bar 4 along a line 20 and in an opposite longitudinal side 11 attached to the bar 4 along a line 21. The line 20 is closer to the front side 22 of the bar than the line 21. The surface of the bar 4 between the line 20 and the line 21, and the band 9 together form a tube. In the same way, tubes along all or some of the other bars 5, 6, 7 may be provided. Multiple tubes may be communicatively connected, e.g. by one or more air hoses. In this way, the air pressure in the tubes will be substantially identical. Evidently to the person skilled in the art, a single tube may alternatively be provided along the circumference of the frame structure along the outside of the bars 5, 6 and 7. The rim area 14 of the sheet 13 is folded over the tube 12 and attached to the bar 4 along a line 23 close to and behind the line 21.

[0049] In the same way other rim areas 15, 16 and 17 are folded over the tube and attached to the bars 5, 6

and 7, respectively, behind the tube. The sheet is seen to be provided with an expanded region along the edges of the sheet. One way to provide the expanded regions is by attaching, e.g. a piece of rope the edge of the sheet. In this way, a convenient method of attaching the sheet to the frame may be provided. The same method may be used to attach the two longitudinal sides 10, 11 of the supple band 9 to the frame bar 4. However, when attaching the band 9 to form the tube 12, care must be taken that the attachment is air tight. This requirement does not apply when attaching the sheet 13. When the tube 12 is inflated, e.g. by means of the pump, the pressure in the tubes 12 surrounding the frame structure is almost immediately distributed throughout the entire tube 12 stretching the sheet with a uniform tension. Further, when the tube is vented by opening the valve 19 the tension of the sheet against the tube squeezes out the air. During this squeezing out period the pressure in the tube is almost the same throughout the tube and the uniform distribution of the declining tension throughout the sheet is maintained.

[0050] Fig. 3a shows a sheet with rim areas 14, 15, 16 and 17 on four sides. The rim areas 14, 15, 16 and 17 on four sides are to be folded over the expandable tube 12 and attached to the bars 4, 5, 6 and 7, respectively, behind the tube along the lines 23, 24, 25 and 26, respectively. In a preferred embodiment the sheet is a net of a non-elastic or slightly elastic material such as Nylon® or polyester. Fig. 3b shows an enlargement of the circled corner of the sheet 13 shown in Fig. 3a.

[0051] Figs 4 and 5 show an alternative embodiment according to the invention with the sheet or net 13 provided with rim areas 14, 15, 16 and 17 made of a tarpaulin or canvas cloth attached, for example by sewing or stitching, to the sheet along lines 27, 28, 29 and 30 together with the outer edges 31, 32, 33 and 34, respectively of the rim areas whereby an outer part of the rim areas 14a, 15a, 16a and 17a, respectively, are folded over an inner half of the rim areas 14b, 15b, 16b and 17b, respectively, forming a casing or channel for a tube 34. Along a line 35 between the outer rim area 14a and the inner rim area 14b the rim is attached to the bar 4 behind the tube 36.

[0052] The invention has been described with reference to preferred embodiments. Many modifications are conceivable without thereby deviating from the scope of the invention. Modifications and variations obvious to those skilled in the art are considered to fall within the scope of the present invention. For example, the frame structure of the device may take any shape, such as round, triangular, etc. Also, the sheet may be provided with cut-out regions to allow for target practise. Finally, the person skilled in the art will realise that the frame structure, sheet and tensioning means may be interconnected in a variety of ways.

Claims

1. A device for ball games providing an adjustable rebound force, comprising a frame structure and a sheet wherein the sheet is directly attached to the frame structure at least partly along an outer rim of the sheet, the device further comprising a tensioning means for providing the sheet with a tension. 5
2. A device according to claim 1, wherein the tensioning means comprises an expanding means arranged at least partly around an outer circumference of the frame structure, and wherein the rim area of the sheet is folded over the expanding means. 10 15
3. A device according to claim 1, wherein the frame structure comprises a number of bars connected in joints and wherein the tensioning means comprises an expanding means including a number of connected expandable elements, wherein each joint is provided with one or more of the expandable elements, and wherein the expandable element may be brought in contact with an end of a first bar and an end of a second bar to force the ends of the first and second bars apart from each other. 20 25
4. A device according to any one of the preceding claims wherein tensioning means is a hydraulically or pneumatically operated means. 30
5. A device according to claim 4, wherein the tensioning means is one or more inflatable expandable tubes.
6. A device according to any one of the preceding claims, wherein the sheet is stretched or slackened, respectively, by activating or deactivating the tensioning means. 35
7. A device according to claim 4, wherein the rebound force of the sheet can be adjusted by controlling the pressure in the hydraulically or pneumatically operated means. 40
8. A device according to claim 7, further comprising an inflation means and an outlet valve connected with the hydraulic or pneumatic operated means. 45
9. A device according to claim 8, further including a means for controlling the pressure in the hydraulically or pneumatically operated means by regulating the inflation means and the outlet valve. 50
11. A device according to any one of the preceding claims, wherein the sheet is a net. 55
12. A device according to any one of the preceding claims, wherein the sheet is of a low-flexible material.

13. A device according to any one of the preceding claims further provided with an adjustable supporting structure for standing the frame structure on the ground, wherein the supporting structure comprises means for adjusting an angle between a normal to the ground and a normal to the sheet.

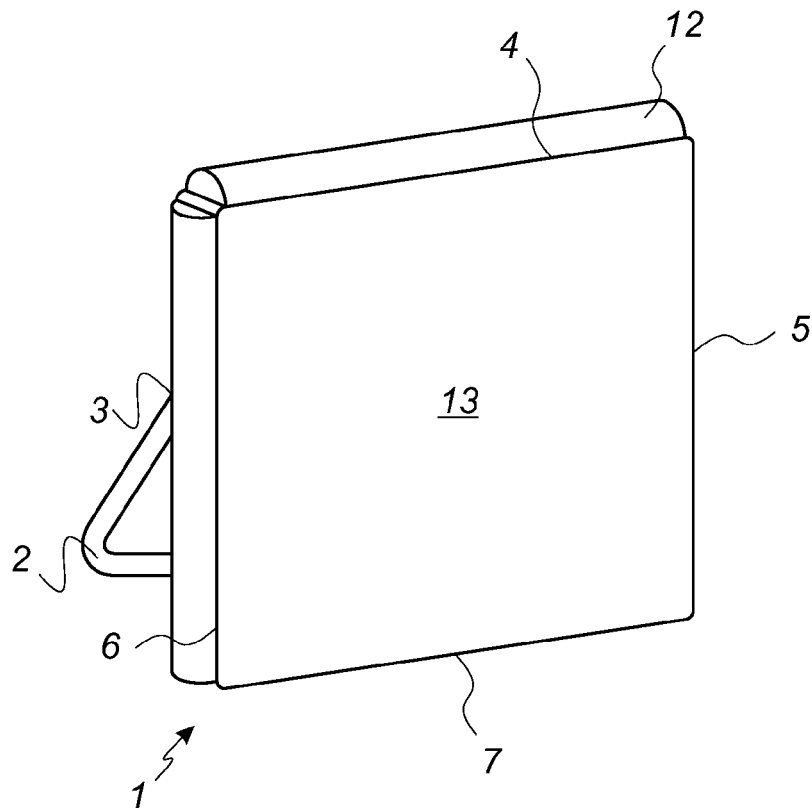


Fig. 1

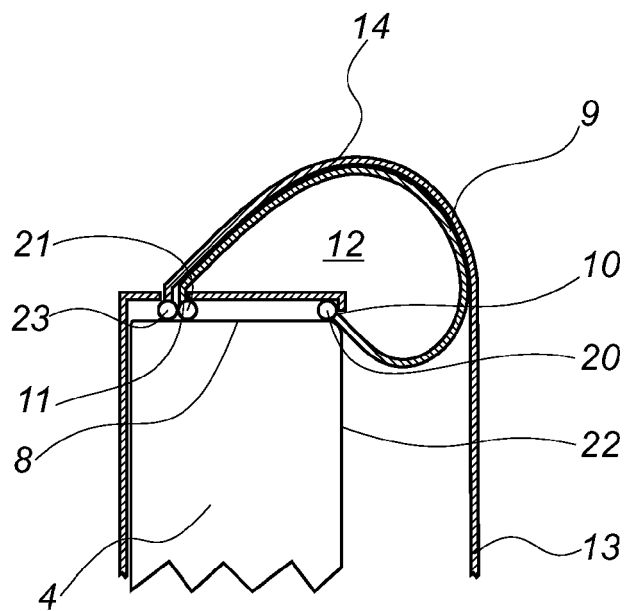
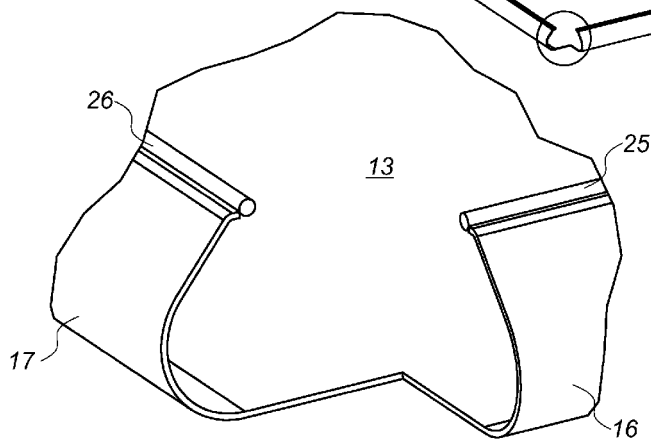
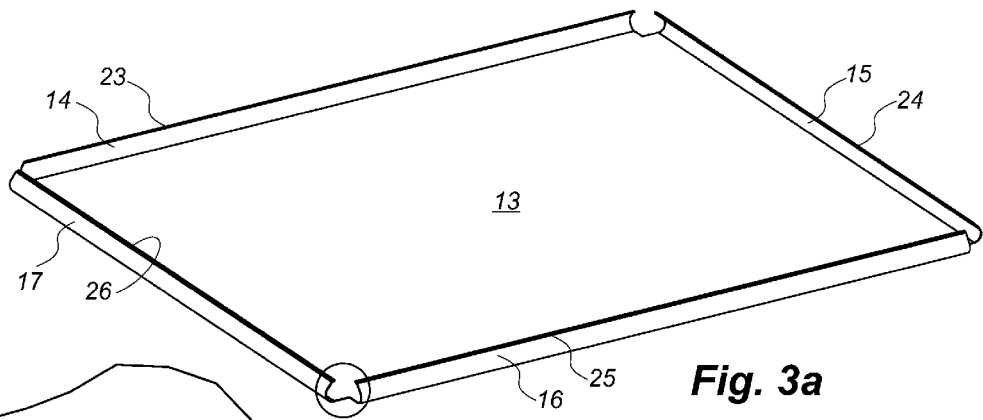


Fig. 2



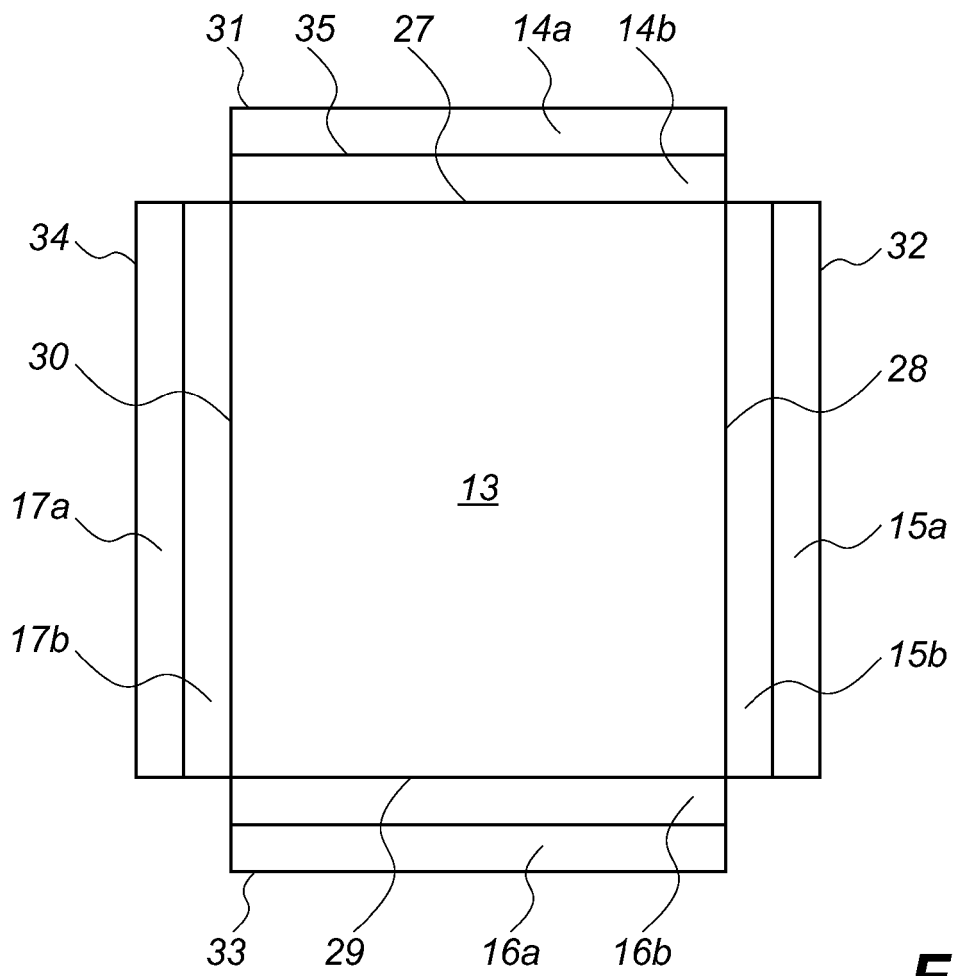


Fig. 4

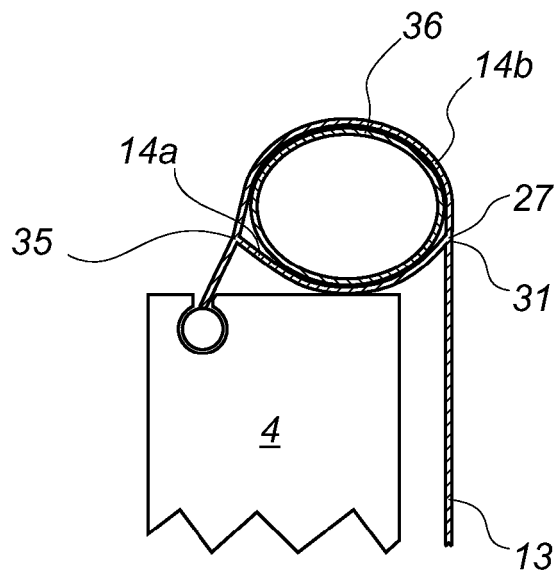


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 09 15 2826

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 836 530 A (STANLEY JR BEDFORD F [US]) 6 June 1989 (1989-06-06) * figures 5,6 * * column 1, lines 15-19 * * column 2, lines 16-22 * * column 4, lines 7-50 * * claim 5 *	1,2,4-12	INV. A63B69/00
Y	-----	3,13	
Y	WO 99/19031 A (VIRTUAL SPORTS INC [US]; BLAIR RODNEY LEE [US]; CHAUVET PHILIP GEORGE) 22 April 1999 (1999-04-22) * page 4, lines 17-30 * * page 6, lines 3-10 *	3	
Y	----- EP 0 064 359 A (RICHARDSON KENNETH) 10 November 1982 (1982-11-10) * figures 11-13 * * figures 9,10 * * page 8, lines 16,17 * * page 12, lines 3-10 * * page 14, lines 1,2 * -----	13	
			TECHNICAL FIELDS SEARCHED (IPC)
			A63B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 11 June 2009	Examiner Tejada Biarge, Diego
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 09 15 2826

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11-06-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4836530	A	06-06-1989	NONE
WO 9919031	A	22-04-1999	AU 9690098 A 03-05-1999 CN 1275089 A 29-11-2000
EP 0064359	A	10-11-1982	AU 8300582 A 04-11-1982 CA 1140960 A1 08-02-1983 JP 57192575 A 26-11-1982

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 4948147 A, Pallanca [0003]
- US 5857679 A, Ringe [0004]