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(54) **RECREATIONAL EQUIPMENT FOR SKI JUMPING**

(57) **Problem**

To provide recreational equipment for ski jumping that is provided with a landing portion artificially similar to a curved surface of a snow surface and can ensure safety by sufficiently absorbing impact.

Solution

Provided in-run face 116 and edge 117, an air blower to blow air into the air mat, the landing portion is provided a landing of a part of the surface at least of the air mat and finished as the inclination to decelerate sliding (120, 130, 140, 150 and 160).

The inclination form can be kept even the air pressure applied by provided a plural of partition membrane 133 to connect the inner wall of top surface and the inner wall of bottom surface in the air mat of the landing portion.

The air in the air mat can be efficiently moved and dispersed internally so as ease the impact.

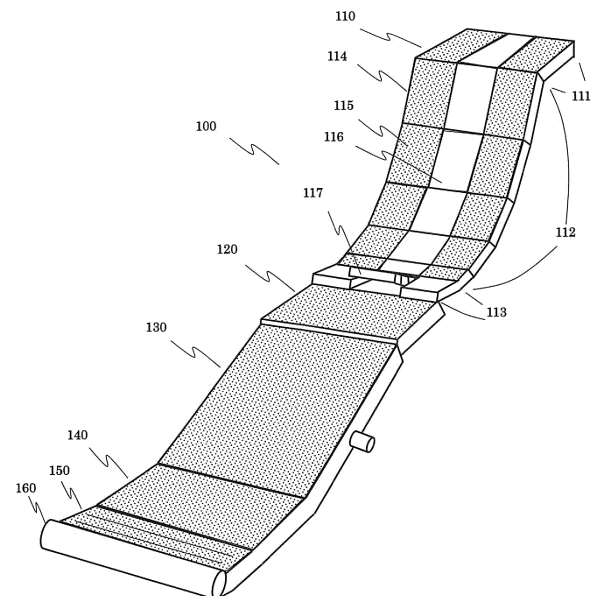


Fig. 1

Description

Technical Field

[0001] This invention relates to recreational equipment for ski jump practicing in the sports facilities. In particular, this relates to recreational equipment that is used for jump practicing for the athletes in the snow sports field such as snowboarding or skiing, and that is used for enjoying experience as a recreation for the general players.

Background Art

[0002] The recreational equipment for ski jumping for snow sports in the prior art has an approach portion and a landing portion. The approach portion utilizes a natural terrain such as slopes of hills and mountains, or utilizes an artificial slope formed by scaffolding by laying run-up mat for skiing on the artificial slope.

[0003] Regarding the landing portion, some prior arts are known, such as a recreational equipment for ski jumping employing a landing slope in order to weaken the landing impact on landing portion the same as well-known ski jump facility for competition (JP 11-29904), and a recreational equipment for ski jumping employing landing special portion filled with shock absorbing material such as sponges or the water surface of ponds and pools in the case that the installing area is limited (JP2001-70497).

[0004] Especially, the latter equipment is suitable where the installing area cannot secure wide enough. As shown in Fig.10, user runs on the run-up air mat on the approach portion and jumps into pools or sponges provided to the landing portion in order to have experience of jumping or do the advanced practice for ski jumping competitions and aerial competitions.

Prior Art 1: JP11-29904

Prior Art 2: JP2001-70497

Summary of the invention

[0005] However, the prior recreational equipment for ski jumping for snow sports described above has problems on both of the approach portion and the landing portion.

[0006] First, the problem about the approach portion is shown below.

[0007] An approach portion is mainly a portion to accelerate the player in order to obtain predominantly take-off speed at jumping, so it requires the approach portion having long distance and a large angle in order to obtain a sufficient jumping speed. Especially, if the in-run slope is not covered by the snow but the artificial turf, there is a problem that the entire length of the recreational equipment tends to be longer because it is required to secure the length enough on the approach portion in order to obtain the acceleration as well as the slope is covered

by snow.

[0008] In addition, the athlete playing in the ski jump facility for competition can feel some complicated senses of acceleration, deceleration and upturn continuously from the run-up in the approach portion and what is called "J-curve portion" to the taking-off portion. Therefore, it is necessary for the player in the recreational equipment for ski jumping to obtain the complicated sense of acceleration, deceleration and upturn continuously the same as the ski jump facility for competition for his practice. Therefore, it is important how the length of the approach portion can be reduced shorter while possessing this sense.

[0009] Moreover, there was a problem that the article turf on the in-run face because ski boards run up on the in-run face at a high speed.

[0010] Next, there is a big problem in the landing portion too.

[0011] The recreational equipment installing the hard type landing slope which is normally employed in the ski jump facility for competition has problem that the entire length and the installing area of the recreational equipment become larger because the slope requires the considerable distance for a safe deceleration after landing in the recreational equipment for ski jumping.

[0012] It can be supposed that the entire length of the recreational equipment and the installing area cannot be a big problem in the large mountainous areas. However, if it is installed in the limited space in the urban area or to the artificial slope on the set-up scaffolding, the entire length and the installing area become larger and the cost will be increased.

[0013] On the other hand, the latter recreational equipment employing the water jumping landing portion can be installed relatively in the small size of the landing portion as compared with the former. Therefore, the entire length and the installing area of the recreational equipment become compact.

[0014] However, the recreational equipment employing the water jumping has a problem to be solved that the safety for users is not always highly secured because physical shock by sudden change of temperature and shock by the water pressure in collision at the moment of landing because the landing portion is filled with water in the sea or pools. In addition, the use period of the recreational equipment is limited to summer season because of using the water surface for landing, users can not play during autumn season to winter even if they want to practice jumping.

[0015] Furthermore, users must play or practice by wearing a protector or an impact resistance suits, such as life jackets and wetsuits. Such protector and suits gives players different feelings from the real feelings which can obtain in the real ski jumping.

[0016] If users are beginners just to play as one day experience for their leisure, it is not matter to wear such instrument or suits. However, for those who would like to keep practicing as athletes or for those who would like

to play ski jump for their hobbies even they are beginners or not, such instrument or suits is not useful for their practice because it is too different from the real state in the competition.

[0017] Furthermore, since the landing motion is end up on the water surface, it is not clear that the landing is finished successfully or unsuccessfully. That is, the players cannot judge whether landing will be finished successfully or unsuccessfully on the real snow slope in the case that users try with official equipment for ski jumping.

[0018] In order to solve this problem, this invention aims to provide the recreational equipment which absorb impact enough and secure the safety, and provide the landing portion artificially formed by the air mat similar to the landing slope formed on the real slope covered with snow surface in the prior art.

Means for solving the problems

[0019] In order to achieve the above purpose, the recreational equipment for ski jumping, wherein an approach portion including an in-run face and an edge wherein a pseudo-curved surface to be able to slide smoothly from running up to taking off is formed; a landing portion including an air mat filled with air inside and a blower to blow air into the air mat, wherein a slope used as a landing and deceleration sliding portion is formed by a part of the air mat; wherein a plurality of partition membranes connecting the inner wall of top surface and the inner wall of bottom surface in the air mat of the landing portion, the slope shape is maintained even the predetermined air pressure is applied to the air mat.

[0020] For example, the direction of the partition membrane is along to the front-back direction of the landing portion. The partition membranes divide the air mat space into plurality of cylindrical spaces in which the front end and back end become open ends inside of the air mat.

[0021] The shape of this partition membrane is not limited. Holes or mesh structure are provided at least in a part of the partition membrane. By those holes or mesh structure, the inner air can diffuse by passing through the partition membrane, so a landing impact can be absorbed by diffusion of the inner air in the air mat and by elasticity of the air mat.

[0022] Next, the means for facilitating the maintenance of the air mat is described. The air mat may be broken by a large load to the sheets and a partition membrane of the air mat applied by the greatly change of the air pressure and vibration in the air mat can occur when the player lands on the air mat successful or not.

[0023] If the part broken part exists on the outer surface of the air mat, the maintenance is relatively easy by repairing from the outside, but it is very hard in the case that the broken part exist inside of the air mat, in particular, the partition membrane is broken. Therefore, cutting portion is provided in the vicinity of the holes or mesh structure of the partition membrane. The cutting portion

has a weaker cutting tolerance than the structural part of the other of the partition membrane.

[0024] If a force exceeding the cutting tolerance in the partition membrane is applied by landing of player, the cutting portion can be cut instead of other portion. By providing the cutting portion, broken and damaged points can be discovered easier by checking cutting portion intentionally instead of checking every portion of large air mat.

[0025] Next, the means for deceleration and stop motion of sliding by the air mat are described. It is preferable that a structure to support the deceleration and stopping on the air mat for downsizing the length of the installation area of the recreational equipment for ski jumping. The grooves and bumps are formed on the surface of the air mat along with the partition membranes which connect the inner wall of upper surface and the inner wall of lower surface of the air mat. The direction of the partition membranes are arrayed in the right-left direction in the front part of the landing portion in the air mat. The grooves and bumps give resistance to the sliding ski boards for deceleration. It is preferable that the front edge of the air mat is bent and wrapped upwards to provide the stopper.

[0026] Next, the means for drainage of the air mat is described.

[0027] The recreational equipment for ski jumping is assumed to be installed outdoors. Therefore, the water is attached to the surface of the air mat because it is disposed to rain, dew or forest. The upper part of the air mat has a slope so water falls downward along the slope. However the front part of the air mat is substantially horizontal portion because this portion is provided as the deceleration zone and the stop zone. Therefore, the water tends to accumulate in the vicinity of the tip of the air mat. Especially, the portion where the plane membranes connected become groove and bumps, water tend to accumulate into this groove. Therefore, it is preferable to form the tilt in the right direction or the left direction in the grooves formed on the surface of the air mat in the front portion of the air mat. Water dropped on the surface in the vicinity of the front portion of the air mat is drained off to the left or right direction of the air mat along the tilt by this slope.

[0028] Next, the upper portion of the air mat is described below. In the normal prior equipment for ski jump has a table portion which is horizontal, a nord portion which locates the starting point of the slope in the vicinity of the upper end of the air mat. However, in this invention, it is preferable that the upper end is formed as slope from beginning. Originally, a table unit is located on the space where the players who jump at the predetermined speed successfully do not fallen in, so the table portion is provided as horizontal structure simply and is followed by the nord portion having slope for landing. However, in the case of what is called "mis-jump", for example the player tumbles down in the approach portion and the player drops downward beyond the take off point, the player can be involved in the accidents by falling directly

on the table portion. The normal table portion is substantially horizontal, so players may be injured because the drop height from the top edge of the take off point to the table portion is several meters. In order to reduce the drop height from the take off point to the air mat, the slope is provided up to the vicinity of the upper end of the air mat.

[0029] Next, the contrivance on the approach portion is below.

[0030] The in-run face of pseudo-curved surface of the approach portion is divided into a center zone for in-run face portion and a side zone on the side of the center zone, the coefficient of friction on the surface of the center zone for in-run face is smaller than that of the side zone. When sliding on the center zone for in-run face becomes easy, but in the case of coursing out to the side zone, the sliding is decelerated by the friction effectively.

[0031] Thus, it enables to lead the player to the central zone for sliding. The sliding speed accelerates when sliding on the center zone of the normal in-run face and decelerates in case of coursing out to the side zone.

[0032] The surface of the in-run face of the approach portion is covered with artificial turf, which is a plastic material. Skiing occurs frictional heat by passing through at high speed, and the frictional heat can occurs problems to melt the artificial turf by repeated use. Therefore sprinklers are installed, which spew water toward the surface of the artificial turf from below in the area where the ski boards slide. Spewed water from sprinklers can cool ski boards and the artificial turf directly and remove the friction heat.

[0033] Next, the contrivance on the pseudo-curved surface of the approach portion is described as follows.

[0034] It is preferred that the approach portion is formed in a smooth curved surface. However, it is difficult to form the entire surface of the approach portion with a smooth curved surface with a long distance. Therefore, in this recreational equipment for ski jumping of this invention, the approach portion is formed by the pseudo-curved by connecting the flat plate member and changing the angle at the joints between the plate members. Then, the vertical width of the plate member is changed according to the approach portion for descending area for sliding and the ascending area for jump. Regarding the descending area for sliding, the plate members which vertical width is more than 5m are jointed by the relative angle 5 degrees, regarding the ascending area for jump, the plate members which vertical width is less than 1m are jointed by the relative angle 1 degree to 3 degrees for adjusting these joint angle in order to make the pseudo-curved structure by the connection of the plate members becomes similar to the ski jump curved structure.

[0035] By the above configuration, most lengths of the ski are about 1m50cm ~ 2m, since length of the plate in the descending portion having down slope in the approach portion is more than 5m, the entire of the ski boards are on the plate member or the ski boards are across only one joint point, but the ski will not be across on 2 joint points at the same time. In addition, the angle

is within 5 degrees per 5m, that is, the change rate is less than 1 degree per 1m. According to the many years of research and study by the inventor, if the change rate is more than 1 degree per 1m, the player feels the angle change distinguishably. In addition, the angle change is too much, the player feels the bumping distinguishably, but the angle change is less than 3 degrees per 1m, the player does not feel bumping fluctuation.

[0036] Thus, the players can feel the sense of a straight acceleration in the descending area for sliding in the approach portion and players can feel the angle change along with upward curved line in the ascending area for moving upward for taking off in the approach portion corresponding to the number of the joint points which the ski boards across at the same time and the angle change rate of the sliding track. Therefore the player feeling can be adjusted by adjusting the number of the joint points and the angle change rate of the sliding track.

[0037] Next, it is important to accelerate the run-up speed of the users to a predetermined speed at the approach portion. If the installation length of the approach portion is prolonged, the run-up distance becomes long and the acceleration is obtained easily. It means that if the acceleration can be enhanced enough, the installation length of the approach portion can be downsized. Therefore, the inventor focuses on the angle of the surface of the plate member immediately before the turning point to go up for jump in the pseudo-curved surface of the approach portion. In a typical pseudo-curved surface of the approach portion, the slope angle of the surface just before the turning point to go up for jump is zero, in other words, the nearly horizontal portion is provided, and the ascending portion is started after such no acceleration zone. Many years of the earnest research and study by the inventor, it is found that the slope angle of the surface just before the turning point to go up for jump is set as 5 degrees up to 10 degrees in downward, the player feels as if the acceleration zone is over and turning to horizontal zone. Actually, such portion is still as the acceleration zone and the player accelerates slightly because the down slope is 5 degrees to 10 degrees. However, the player feels as if the acceleration zone is over. The initial speed at jumping motion at the takeoff point can be enhanced by such contrivance because the acceleration zone becomes longer and the no-use deceleration can be omitted. It means that the length of the approach portion can be shorten for gaining the same initial speed at jumping motion at the takeoff point.

Effects of the invention

[0038] According to this recreational equipment for ski jumping, the required curving surface of the air mat can be formed and kept even air pressure is applied to the air mat, by providing a plurality of partition membranes connecting the inner wall of top surface and the inner wall of bottom surface in the air mat in the landing portion, and the inner air can be diffused through the partition

membrane by providing holes or mesh structure in the partition membrane, the elasticity on the whole air mat and shock absorbing effect can be obtained in result.

[0039] By providing holes or mesh structure in the partition membrane, the maintenance performance of the air mat will be improved; the performance for controlling speed deceleration and stop can be improved. Furthermore, the inclination of the drain arrayed at the connecting portion of the partition membranes makes better the drainage.

[0040] In addition, by installing a sprinkler for spewing water toward the surface of the artificial turf from below on the approach portion, a direct cooling down the ski sliding surface and the artificial turf with water can be achieved by removing the frictional heat. In addition, it is possible to shorten the length of approach portion while make feel the natural deceleration and acceleration to users by devising the curving of the surface of the slope in the approach portion.

Description of the preferred embodiments

[0041] Some embodiments of this recreational equipment for ski jumping are shown as follows. This invention is not limited to these examples.

Embodiment 1

[0042] The example of the configuration of the recreational equipment for ski jumping relates to this invention is explained with refereeing the figures as follows.

[0043] Fig. 1 shows the appearance of the recreational equipment for ski jumping relating to Embodiment 1.

[0044] Fig. 1 shows in a perspective view.

[0045] As shown in Fig. 1, the recreational equipment for ski jumping 100 of this invention roughly combines two parts, one is an approach portion to run-up, accelerate, and takeoff, and another is a landing portion to land, decelerate, and stop.

[0046] The approach portion is shown as the approach portion 110 in Fig. 1, and the landing portion is shown as the combination of the table portion 120, the landing slope portion 130, the landing lower part 140, the reduction portion 150 and the stopper 160. Other facilities such as the steps, the lights and the air blower are not shown in figures.

[0047] Firstly, the approach portion 110 is explained as follows.

[0048] The approach portion 110 provides an in-run face and an edge (for takeoff), and provides a pseudo-curved surface to enable smoothly to perform continuous motion from running-up to takeoff.

[0049] Fig.2 shows the focus view of the approach portion 110. Fig.2 (a) is a side view and Fig.2 (b) is a plan view.

[0050] Showing in Fig. 1 and Fig. 2, the approach portion 110 includes roughly 3 portions of the starting stage portion 111, the approach slope portion 112 and takeoff

portion 113.

[0051] The starting stage portion 111 is nearly horizontal plane and the portion for the player to stand up for starting.

5 [0052] The approach slope portion 112 is the portion for run-up and acceleration, and provides a pseudo-curved surface which enables smooth descending.

10 [0053] The approach slope portion 112 in this example comprises the in-run face 116 and the side portion 115, each coefficient of friction of surface is different respectively.

15 [0054] The in-run face 116 is the surface on which the player slides, when performing usual approach, the player uses this in-run face 116 for running-up and acceleration to slide. Therefore, it has a relatively low coefficient of friction surface for suitable acceleration even if the approach portion is relatively short.

20 [0055] The side portion 115 is a portion to stop the players in order to protect them, in the case that players are going to course out by failing in sliding straightly. Therefore, the side portion 115 has a relatively large coefficient of friction in order to control easily for decelerating and stop safely at the side portion 115. It is not shown in Fig.1, the outside area of the side portion 115 is not the dangerous area such as cliffs but the safe slope as green field or soil. It is preferable that the height gap between the side portion 115 and the outer area is small. It is further preferable that an object such as a side stopper to stop forcibly is placed.

25 [0056] For example, the surface of run-up surface 116 of approach portion 110 should be a slippery artificial turf, and the material such as non-slip rubber sheet which friction coefficient is large is installed on the surface of side portion 115.

30 [0057] Next, the contrivance for installing the sprinklers below the in-run face 116 of the artificial turf is described. In the case the surface of in-run face 116 of the approach portion is covered with artificial turf, the artificial turf is made from plastic material. The ski boards generates the friction heat by passing in a high speed on in-run face 116, the problem is occurred that the artificial turf melts gradually by adding the friction heat repeatedly. Therefore, as shown in Fig. 2 (b), the sprinkler 118 is installed below the in-run face 116 of the artificial turf for spewing the water from bottom to the surface of the artificial turf. Figure 2 (b) shows an example of array of the sprinkler 118 placed six sprinklers 118.

35 [0058] Fig. 3 (a) shows the rough appearance of the water spewing from sprinkler 118. As shown in Fig.3, spewing water from sprinkler 118 enables to cool down the surface of the ski sliding portion of the artificial turf and to remove the friction heat effectively.

40 [0059] On the other hand, Fig. 3 (b) shows the example of what is called "spray cooling system" in which the external sprinklers is installed on the outside of the edge of the approach portion 110 instead of installing the sprinkler 118 under the in-run face. This is an example that the cooling water is sprayed from the side in order to slide

on the artificial slope easier. However, as shown in Fig. 3(b), the area where the cooling water is sprayed by such external sprinkler is extended in a fan shape, so it is impossible to concentrate the cooling water efficiently on the in-run face 116. In addition, it is impossible to sprinkle directly to the bottom surface of ski boards because water is spewed from the side direction. Certainly, water can be sprinkled at least to the surface of a part of area on the in-run face 116 and a constant cooling effect to the artificial turf is obtained. However, the artificial turf of in-run face 116 where the cooling water is not sprayed can be melted. On the other hand, the configuration shown in Fig.3 (a) in which the sprinkler 118 is embedded beneath the in-run face can spew water directly to the bottom surface of ski boards by the sprinkler 118, so the cooling effect can be obtained directly to the bottom surface of ski boards, in addition, cooling water flow can concentrate on in-run face 116 so that the cooling effect for the entire of the artificial turf becomes high.

[0060] Next, the formation of the pseudo-curved surface of the approach portion 110 is described below.

[0061] The pseudo-curved surface of the approach portion 110 is formed by connecting a plurality of plate members 114. It is preferable to form the pseudo-curved surface of the approach portion 110 similar to the curved surface of the takeoff portion for competition equipment.

[0062] The plate member 114 should be a durable structure. The employed material is not limited particularly, however, it should have a structural strength to sustain enough against pressure changes caused by the sliding of the users. The single plate member can be employed if it has enough structural strength. The combination of metal frame and board can be employed too. The sheets and the artificial turf are laid on the surface of plate member 114.

[0063] The length of the plate member 114 is assumed to be more than 5m for the in-run face 116 as an example. Because the length of ski boards are usually about 1m50cm to 2m, if the length is 5m, the ski boards can contact more than 2 points at the same time along the plate member 114. If the number of the joint points between the plate member 114 that the ski boards stride over is zero or one, the vector change in the vertical direction of ski boards doesn't occur, so the energy concentrates on the downward acceleration. On the other hand, if the number of the joint points between the plate member 114 that the ski boards stride over is more than two, the rate of vector change in the vertical direction is increased, so the downward acceleration rate is decreased. As Shown in Fig.2, in this configuration, 5 plates members 114 are connected from stage portion 111 in the starting portion as 114-1, 114-2, 114-3, 114-4, 114-5 in order, wherein each length of 114-1, 114-2, 114-3 and 114-4 as L1, L2, L3 and L4 is 6 m for example, and 114-5 as L5 is 12m for example.

[0064] Next, it is preferable that the relative joint angle between the plate member is less than 5 degrees. If jointing the plate member whose length is 5m or more at

relative angle within 5 degrees, the change in vertical direction is less than 1 degree per 1m. For many years of research conducted by inventors, it is found that the players feel the sense of sliding acceleration larger than the sense of angle change if the change in vertical direction is less than 1 degree per 1m. Therefore, the players feel running up on the gentle curved surface, and they don't feel the vector change and irregularities at the joints. As shown in Fig.2, the joint angle of the plate member 114 is $\theta 1, \theta 2, \theta 3, \theta 4$, and $\theta 5$ each, for instance, the absolute angle is 27 degrees, 22 degrees, 17 degrees, 12 degrees and 7 degrees for each and The relative angle of the joints between plate member 114 is $\theta 1-\theta 2, \theta 2-\theta 3, \theta 3-\theta 4$, and $\theta 4-\theta 5$, so it is 5 degrees each in this example.

[0065] The angle of plate member 114 is changeable by changing the height. The angle of plate member 114 is changeable to adjust each height, H1, H2, H3, H4 and H5 by jacking up.

[0066] Next, the edge 117 for takeoff is described below.

[0067] Takeoff portion 113 has edge 117 for takeoff in its center zone. That is, from in-run face 116 to edge 117 for takeoff smoothly connected. The side portion 115 for course out is extended to the both sides of edge 117, they are almost horizontal.

[0068] For example, the length of the plate member 114 of the edge 117 for takeoff is more than 75cm up to 1m. Because the ski boards stride over more than 2 joints between plate member 114 at the same time because the length of the ski boards is about from 1m50cm to 2m in usual. If the number of the joints connecting between plate member 114 that the ski boards stride over is more than 2 pieces, the player can focus on takeoff upward because the ratio of the vector change in upward direction increases.

[0069] FIG. 5 shows the pseudo-curved surface of edge for takeoff. As shown in Fig.5, 6 plates are connected in turns, 114-6, 114-7, 114-8, 114-9, 114-10 and 114-11 toward the top end of edge 117 for takeoff, the length of L6, L7, L8, L9, L10 and L11 is 90 cm each, for instance.

[0070] Next, the angle of connection of the plate members on taking-off portion 113 is described. It is preferable that the relative joint angle between plate member 114 is less than 3 degrees. If Jointing the plate member 114 which length is more than 75cm up to 1m in the relative angle within 3 degrees, the angle change may become more than 1 degree up to 3 degrees. For example, the angle change is 2 degrees, that means the player will feel height change in 2 degrees in this 1 m sliding. The result obtained by many years of research by inventors, the players will feel the angle change relatively if the angle change is more than 1 degree at 1m sliding. Therefore, if the angle change is more than 1 degree up to 3 degrees per 1 m, the players feel the sense of taking off upward in a gently curved way, and don't feel a large uneven joint beneath the ski boards. In the example of Fig.5, the plate member 114 shown as $\theta 6, \theta 7, \theta 8, \theta 9, \theta 10$, and $\theta 11$ is 2

degrees, 4 degrees, 6 degrees, 9 degrees, 12 degrees and 15 degrees in absolute angle. The relative angle of the joints between plate member 114 is 07-06, 08-07, 09-08, 10-09 and 11-10, so these relative angles at joint point are from 2 degrees to 3 degrees each in this example.

[0071] Thus, the number of joints that the ski boards go across in the takeoff portion 113 and the largeness of the angle change in this portion are adjusted appropriately, the players can feel a linear acceleration feeling in the descending sliding area at the approach portion, and they can feel rounded angle change directed upward at the approach portion where the slope is formed by the uptrend angle.

[0072] The same as approach portion, the angle of the plate member 114 of the takeoff portion 113 is changeable by changing its height. The angle of the plate member 114 is changeable to adjust each height H6, H7, H8, H9, H10 and H11 by jacking up.

[0073] Next, the joint part of run-up 116 and 117 of the approach portion 110 is described below.

[0074] Fig. 4 (a) shows the rough appearance of the pseudo-curved surface of the portion of the approach portion 110 which is just before the turning portion for upward, in which the inclination angle 05 of the plate member 114-5 is set as from 5 degrees to 10 degrees and connected directly to the pseudo-curved surface of edge 117 for takeoff. In this example, the inclination angle 05 is 7 degrees. On the other hand, the inclination angle 06 of the first plate member 114-6 of the pseudo-curved surface of edge 117 for takeoff is 2 degrees. Therefore, the relative angle of the joint point becomes 9 degrees.

[0075] By intensive research by inventor, the players are intended to feel smooth motion shift from the descending vector change to the ascending vector change of running up toward taking off portion without a sense of stumbling if the relative angle at the joints is less than 10 degrees. If the pseudo-curved surface is shown in Fig. 4 (a), the acceleration can be obtained by the inclination of 05 of plate member 114-5 up to just before the motion shift for the taking off portion, the players can shift their motion for ascending movement to the plate member 114-6 without deceleration.

[0076] On the other hand, Fig.4 (b) is a typical type in the prior art, it provides the horizontal zone plate member 114-5-2 as the joint portion between the plate member 114-5-1 of the last part of the pseudo-curved surface of the in-run face 116 of approach portion 110 and the plate member 114-6 of the edge 117 for takeoff. By this type in the prior, the players can recognize the boundary easier because there is horizontal motion between the descent movement of in-run face 116 to the ascent movement of edge 117 for takeoff. However, the friction generates on the horizontal zone, so it works as a speed reduction zone in fact. How shorten the length of the installation area for the approach portion 110 is one problem to be solved for this invention, the takeoff speed at the edge 117 for takeoff becomes low if such reduction

zone exists. On the other hand, the configuration without the horizontal zone as shown in Fig.4 (a), it is possible to fasten effectively the takeoff speed at edge 117 for takeoff up to the predetermined speed because the acceleration zone is continued until just before the edge 117 to shift the ascend movement.

[0077] Next, the landing portion is described below.

[0078] Fig. 6 shows the landing portion of this recreational equipment for ski jumping 100 shown in Fig. 1. This landing portion comprises a table portion 120, a landing slope portion 130, a lower landing 140, a deceleration portion 150 and a stopper 160. Fig. 6 shows a figure by removing the cover sheet 121, 131, 141 and 151 covering the surface.

[0079] First, the table portion 120 is explained below. As shown in Fig.6, the upper end of the landing portion is gently sloped, but does not have the horizontal table portion as the prior art. The table portion of the prior art is provided simply as horizontal table, which is overpass physical space in the case that ski jumping is taken off by the predetermined initial rate. The slope of the landing portion is provided after such nord portion. Therefore, in the case of failure jumping, for example, the players tumble in approach portion 110 and fall forward, they can be involved in accidents to fall directly on such table portion. In order to avoid such accident, the nose of the table portion 120 is lift up to the vicinity of the height of the end of the approach portion 110 to reduce the gap and distribute the falling impact as showing in Fig. 1.

[0080] Next, the landing slope portion 130 is described below. The landing slope is the portion for performing landing and subsequent decelerating, and reduce the landing impact by along the jump flight motion of the players taking off the edge 117 for takeoff, and provides the slope adjusted in the angle to catch the player safely. Also, the landing slope portion 130 has adjusted angle corresponding to the flight angle of the players in order to slide forward smoothly and decelerate safely.

[0081] The landing slope portion 130 is made of the air mat, further, it comprises a cover sheet 131 to protect the surface of them, a blower (not shown) to maintain the internal air pressure of the air mat and a ventilation to adjust air pressure in the air mat 132.

[0082] The material of the air mat has the elasticity to accept and absorb the landing impact by the players, and has the tensile strength and the rupture strength to withstand the change of air pressure caused by landing impact of players. It is also preferable to combine several materials as the multi-layered sheet for those air mat and cover sheets. The material is not particularly limited as long as there are such tensile strength and breaking strength. For example, a canvas material of high-strength polyester fiber can be employed as the material for the air mat and the cover sheet.

[0083] Fig.7 shows a part of the inner structure of the landing slope portion 130.

[0084] Fig.8 shows air flow in the landing slope portion 130 to absorb the impact by landing in a plane view.

[0085] As Shown in Fig.7 and 8, there are plural partition membrane 133 are provided inside of the landing slope portion 130. The partition membrane 133 is installed along to the direction of landing, that is, the players' motion direction. It supports the inside of the air mat, furthermore partition membrane 133t becomes a kind of the wall pillar to suppress the projected deformation of the surface of the air mat.

[0086] The space divided by the partition membrane 133 becomes a kind of cylindrical tube 137, and has a connecting structure which a plurality of cylindrical tubes 137 are connected in the air mat. The end part of each cylindrical tube 137 is not closed end, the internal air of the cylindrical tube 137 can flow in and out among the plurality of cylindrical bodies 137.

[0087] Moreover, in this example of the configuration as shown in Fig.7, the partition membrane 133 has a mesh structure 134, in addition, holes 135 are opened, the air can flow among the partition membrane 133 in the transverse direction. Because as shown in Fig.8, even if adult players having heavy weight lands vigorously and the landing impact is huge, a large volume of air in the air mat is spread efficiently and widely with the adequate air resistance. Such air resistance and the elasticity gives the whole air mat shock absorbing effect. By the intensive research by inventors, as shown in Fig.7, it is found that a mass air in the air mat can be extended effectively and largely with reasonable air resistance by providing the mesh structure 134 and the hole 135 to the partition membrane 133 in order to assist the flow of the air, in addition by providing the open end among the cylindrical tube 137 partitioned by partition membrane 133.

[0088] Fig.8 shows the appearance that the impact given by the landing of players with the entire the air mat and the large quantities of the internal air diffusing.

[0089] After Landing in the vicinity of the center in the example of Fig.8, the landing impact is applied at the landing point. Six cylindrical bodies 137 are formed inside of the air mat by the partition membrane 133, each end part is connected in order to secure the air flow freely among them. When landing impact is applied to the air mat, the air in the vicinity of the center of the air mat is spread at a time to the longitudinal direction of cylindrical tube 137, and ejected from the front end and the rear end. The ejected air increases the air pressure of the ends of the air mat, and the front end and the rear end of the air mat are expanded by its elasticity. There is no way for the air to go outwardly at the front end and rear end of the air mat but the way for the direction to the ventilation 132 (which is the right side direction in the figure). The ventilation 132 is installed in the top right end of the cylindrical tube 137. If the air pressure of the air mat increases, the air in the air mat can be released to outside via the ventilation 132. Therefore, the air erupted from other cylindrical bodies 137 flows in the cylindrical tube 137 and the introduced air can be released to outside through the ventilation 132. Thus, recreational equipment for ski jumping 100 has the structure that can

adjust the change of air pressure in the air mat.

[0090] Because the partition membrane 133 has a structure which passes the air through it, if a landing impact is applied to the air mat as shown in Fig. 7, the inside air in the vicinity of the center portion of the air mat flows over to the vicinity of the cylindrical tube 137 by passing through the partition membrane 133 cross and oblique direction.

[0091] The mechanism for releasing the over flow air through the ventilation 132 can work as mentioned above.

[0092] Thus, the capability of absorbing the landing impact is improved by not only the movement of air toward the front and rear direction along with the partition membrane 133 but also the movement of air passing through partition membrane 113 to the crossing direction and oblique directions.

[0093] After landing absorbing the large impact, the player will start decelerating safely while sliding on the landing slope portion, the pressure applied to the air mat is decreased comparing to the landing moment. The landing slope portion 133 has an air blower (not shown in the figure) to flow air into the air mat, so the air pressure of the air mat can recover to the normal state. Therefore, the deformed air mat can return to the original shape.

[0094] Next, the improvement of the maintenance for the landing slope portion 133 associated with impact of landing is described below.

[0095] The landing slope portion 130 can be broken by the landing impact. If the surface cover sheet 131 is broken, the maintenance is relatively easier because it can be accessed from outside for repairing. However, if the inside element of the air mat is broken, in particular, the interior partition membrane 133 is broken, the maintenance becomes so hard. Because the length of the air mat is large, it is hard to find out the damage portion in the partition membrane 133.

[0096] Fig.9 shows the configuration including the cutting portion 136 in a part of mesh structure 134 of partition membrane 133, which cutting portion 136 has weaker cutting tolerance than other mesh structure 134. If the force exceeding the proof stress of the mesh structure 134 of partition membrane 133 is applied by landing impact, the cutting portion 136 will be cut first. As shown in Fig. 9 (a), by installing the cutting portion 136, the damaged points will be found effectively and the maintenance becomes easier by checking these cutting portions 136 instead of searching whole air mat. Of course, other points except for the cutting portion 136 can be broken. However, it is possible to check the cutting portion 136 in a usual daily check and maintenance intensively and check the entire body in a regular full maintenance.

[0097] On the other hand, as shown in FIG. 9 (b), in the case that the mesh structure 134 and hole 135 are provided to partition membrane 133 but the cutting portion 136 is not provided, the landing impact is added to the entire of mesh structure 134, so it is hard to predict in advance which points will be troubled. Therefore, after

all, every partition membrane 133 in the whole air mat should be checked in a daily check.

[0098] Next, the landing portion is described below.

[0099] The players passing through the landing slope portion 130 can decelerate to a certain degree by the ski edge control and the friction between ski boards and cover sheet 131 of landing slope 130. As showing in Fig.1 and Fig.6, the recreational equipment for ski jumping 100 comprises the landing lower portion 140, the deceleration portion 150 and the stopper 160.

[0100] The landing lower portion 140 is almost horizontally, no longer acceleration occurs. It is easier for the player to decelerate by controlling the ski edge and the friction between ski boards and cover sheet 141. If the players control is enough, they can stop safely within this landing lower portion 140.

[0101] The deceleration portion 150 is provided in front of the landing bottom portion 140 to ensure decelerating, this may have a gradual upward slope, otherwise be nearly horizontal. In order to enhance the deceleration effect, the forming direction of the partition membrane 133 in the air mat may change to the crossing direction as shown in Fig. 6 in order to enhance the deceleration. The partition membrane 133 is installed as connecting the inner wall of top surface and the inner wall of bottom surface of the air mat, so uneven bump and groove are formed on the surface of the air mat. If the forming direction of partition membrane 133 in the air mat is crossing direction, the cylindrical tube 137 is arrayed in horizontal direction so some bumps appear on the surface of the deceleration portion 150. The bumps and grooves may be formed on the cover sheet 151. In this configuration, the bumps and grooves are arrayed on the sliding direction and those give a large resistance against ski boards. Thus, deceleration effect is obtained by passing the bumps and the grooves in the ski sliding.

[0102] The stopper 160 is provided further ahead of deceleration portion 150, and this is a stopper to stop the forward movement of the players who slide until there. For example, it is formed by folding the end of the air mat upward.

[0103] Safe deceleration and stop control is ensured by the landing bottom portion 140, the deceleration portion 150 and the stopper 160.

[0104] Next, the contrivance on the drainage of landing portion is described below.

[0105] The recreational equipment of ski jumping 100 is assumed to set outside, water can adhere on the surface of the air mat by rainfall, condensation or frost. The landing slope portion 130 can drain the water by utilizing its slope, but the landing bottom portion 140 and the deceleration portion 150 cannot drain and the water stay as a pool because these are nearly horizontal plane. Especially, the surface portion where the partition membrane 133 is installed beneath has groove, so water stay in this groove. Therefore, it is preferable that the tilt to right or left is formed along with the groove as a drain in declaration portion 150. By this tilt, water on the surface

of declaration portion 150 is drained to the right side or the left side along the tilt as the drainage.

[0106] The above is described to illustrate the preferred embodiments in the configuration example of the recreational equipment for ski jumping, it should be comprehended that it is possible to make various modifications without departing from the scope of the present invention.

10 Industrial applicability

[0107] The recreational equipment for ski jumping of the present invention can be widely applied to artificial ski jump recreational equipment set indoors or outdoors.

15 Brief description of the drawings

[0108]

Fig.1 shows the recreational equipment for ski jumping relating to Embodiment 1

Fig.2 shows the focus view of the approach portion 110

Fig. 3 shows the rough appearance of the water spewing from sprinkler 118

Fig. 4 shows difference of the connection of the approach portion 110 and the edge 117 for takeoff in this invention and the connection in the prior art

Fig. 5 shows the pseudo-curved surface of edge 117 for takeoff.

Fig. 6 shows the landing portion of the recreational equipment for ski jumping 100.

Fig. 7 shows the inner structure of the landing slope portion 130.

Fig. 8 shows the air flow chart to absorb the landing impact inside of the landing slope portion 130.

Fig. 9 shows the example of the configuration of the cutting portion 136 that the cutting tolerance is weaker than other mesh structure 134 in the mesh structure 134 of the partition membrane 133.

Fig.10 shows the example of the prior configuration disclosed in JP2001-70497

Description of the reference numerals

[0109]

100	Recreational equipment for ski jumping
110	Approach portion
111	Stage portion for starting
112	Approach slope portion
113	Takeoff portion
114	Plate member
115	Side portion
116	in-run face
117	Edge for takeoff
120	Table portion
121	Cover sheet

130 Landing slope portion
 131 Cover sheet
 132 Ventilation
 133 Partition membrane
 134 Mesh structure
 135 Hole
 136 Cutting portion
 137 Cylindrical tube
 140 Landing lower portion
 141 Cover sheet
 150 Deceleration portion
 151 Cover sheet
 160 Stopper

Claims

1. A recreational equipment for ski jumping comprising;

an approach portion including an in-run face and an edge wherein a pseudo-curved surface to be able to slide smoothly from running up to taking off is formed;

a landing portion including an air mat filled with air inside and a blower to blow air into the air mat, wherein a slope used as a landing and deceleration sliding portion is formed by a part of the air mat;

wherein a plurality of partition membranes connecting the inner wall of top surface and the inner wall of bottom surface in the air mat of the landing portion are provided, thus maintaining the slope shape even if a predetermined air pressure is applied to the air mat.

2. The recreational equipment for ski jumping according to Claim 1, wherein the partition membranes are provided inside of the air mat along to the front-back direction of the landing portion; the partition membranes divide the air mat space into plurality of cylindrical spaces in which the front end and back end become open ends inside of the air mat.

3. The recreational equipment for ski jumping according to Claim 1 or 2, wherein holes or mesh structure are provided at least in a part of the partition membrane, the inner air can diffuse by passing through the partition membrane, a landing impact can be absorbed by diffusion of the inner air in the air mat and by elasticity of the air mat.

4. The recreational equipment for ski jumping according to any one from Claim 1 to Claim 3, wherein a cutting portion having weaker cutting tolerance than other portion of the partition membrane nearby the hole or the mesh structure, in case that the power beyond cutting tolerance is applied to the partition membrane by landing, the cutting portion is cut in-

stead of other portion.

5. The recreational equipment for ski jumping according to any one from Claim 1 to Claim 4, wherein the partition membrane is arrayed along the right-left direction of the landing portion in the vicinity of the front end of the air mat.

6. The recreational equipment for ski jumping according to any one from Claim 1 to Claim 5, wherein the right or left tilt is provided along to at least of a part of the groove on the surface of the air mat formed by connecting the partition membrane to the inner surface in the vicinity of the front end of the air mat; and water fallen onto the surface in the vicinity of the tip of the air mat is drained to left side direction or right side direction of the air mat along the tilt of the groove.

7. The recreational equipment for ski jumping according to any one from Claim 1 to Claim 6, wherein neither a table portion nor a nord is formed but a slope is formed instead in the vicinity of the upper end of the air mat.

8. The recreational equipment for ski jumping according to one from Claim 1 to Claim 7, wherein the pseudo-curved surface of the approach portion is divided into a center zone for in-run face portion and a side zone on the side of the center zone, the coefficient of friction on the surface of the center zone for in-run face is smaller than that of the side zone, when sliding on the center zone for in-run face becomes easy, but in the case of coursing out to the side zone, the sliding is decelerated by the friction.

9. The recreational equipment for ski jumping according to one from Claim 1 to Claim 8, wherein the surface of the in-run face of the approach portion is covered with an artificial turf; and sprinklers spewing water toward the surface of the artificial turf are installed beneath the area where the ski boards slide and cooling down the sliding ski boards directly.

10. The recreational equipment for ski jumping according to any one from Claim 1 to Claim 9, wherein the plate member which length is more than 5m forming the descend portion of the pseudo-curved surface of the approach portion are connected within the 5 degrees in relative angle, and the plate member which length is less than 1m forming the ascend portion of the pseudo-curved surface of the approach portion are connected within the 3 degrees in relative angle in order to adjust the plate member of the pseudo-curved surface similar to the curved surface of the ski jump equipment

11. The recreational equipment for ski jumping accord-

ing to any one from Claim 1 to Claim 10, wherein the slope angle at the portion immediately before the turning point to go up for jump in the pseudo-curved surface of the approach portion is adjusted to 5 degrees to 10 degrees.

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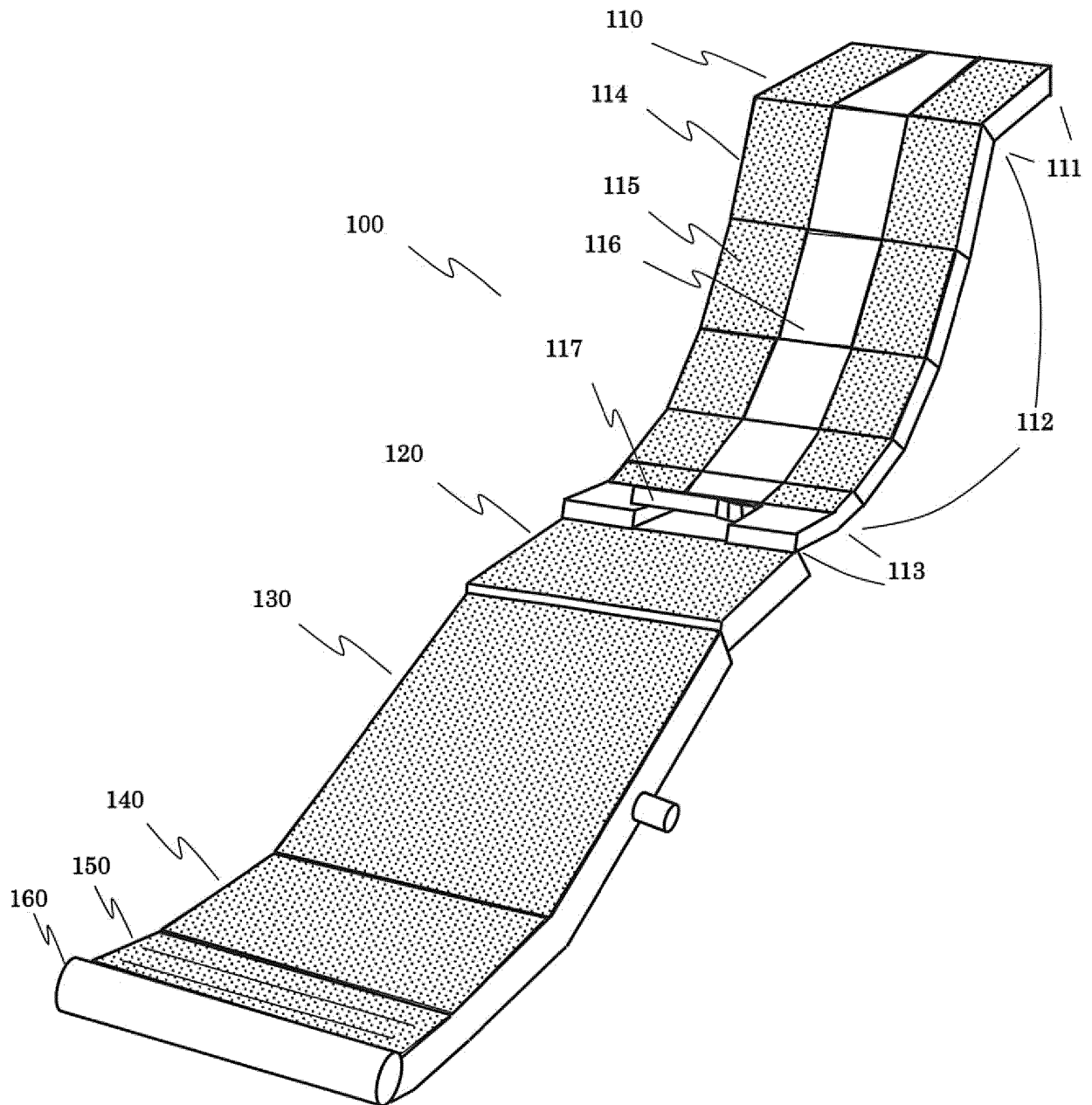
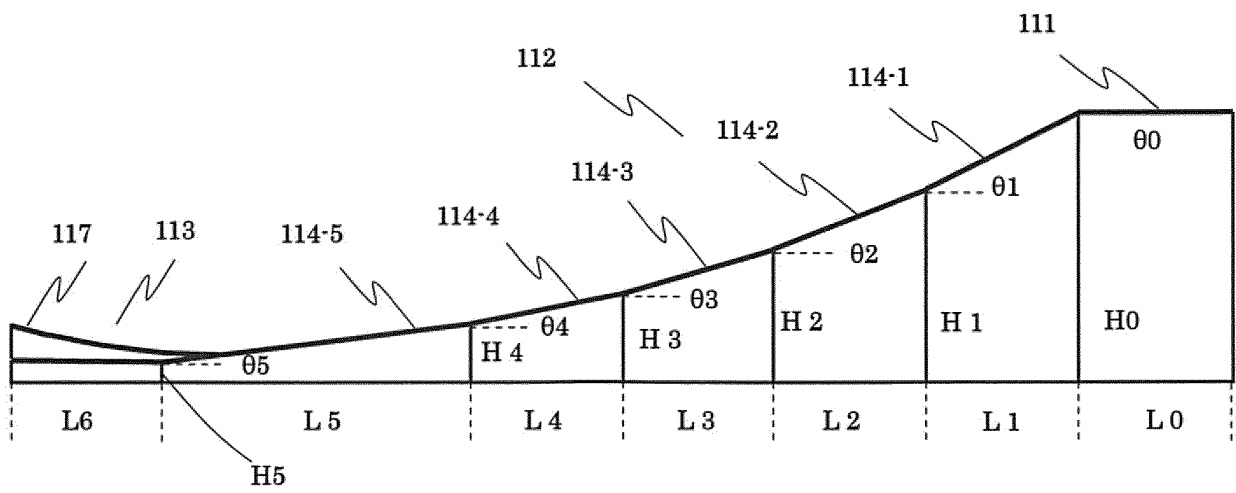


Fig. 1

(a)



(b)

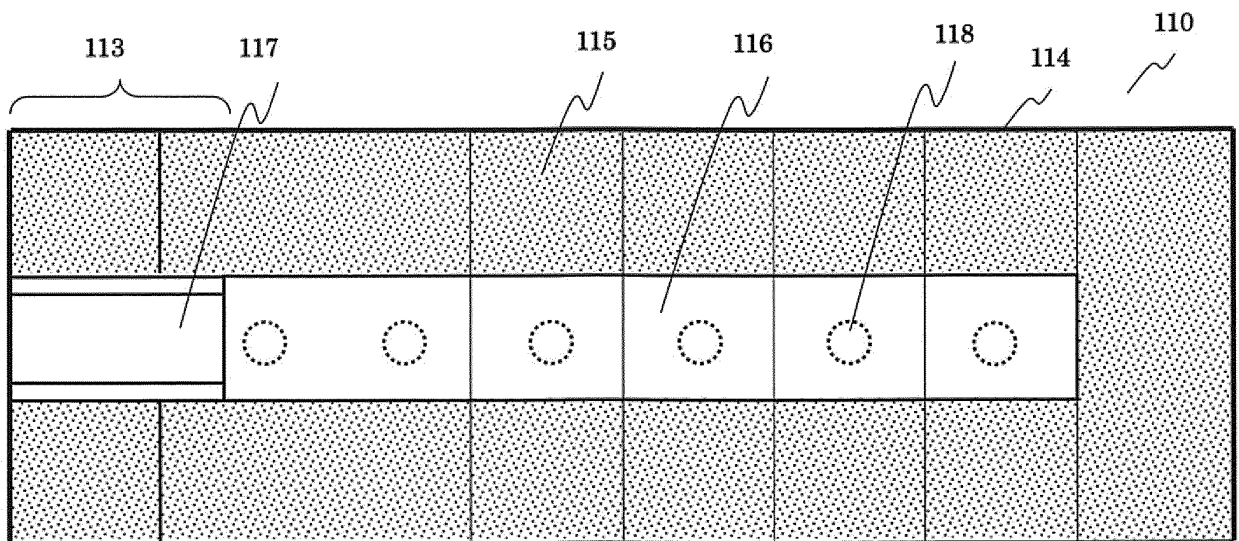
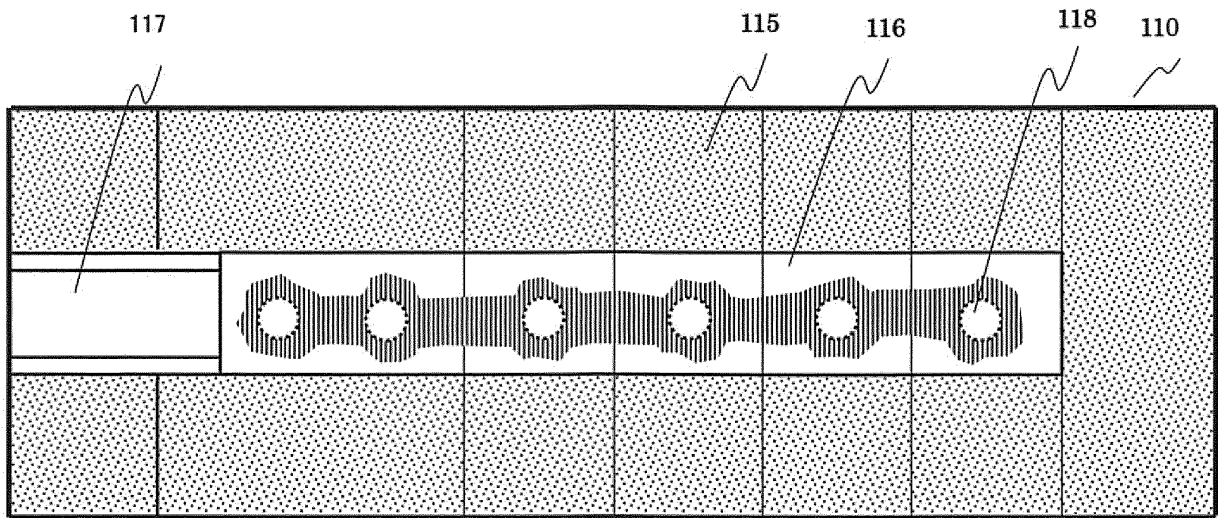


Fig. 2

(a) In case of the embedded sprinkler which spews water from the bottom



(b) In case of the external sprinklers which sprays water from outside

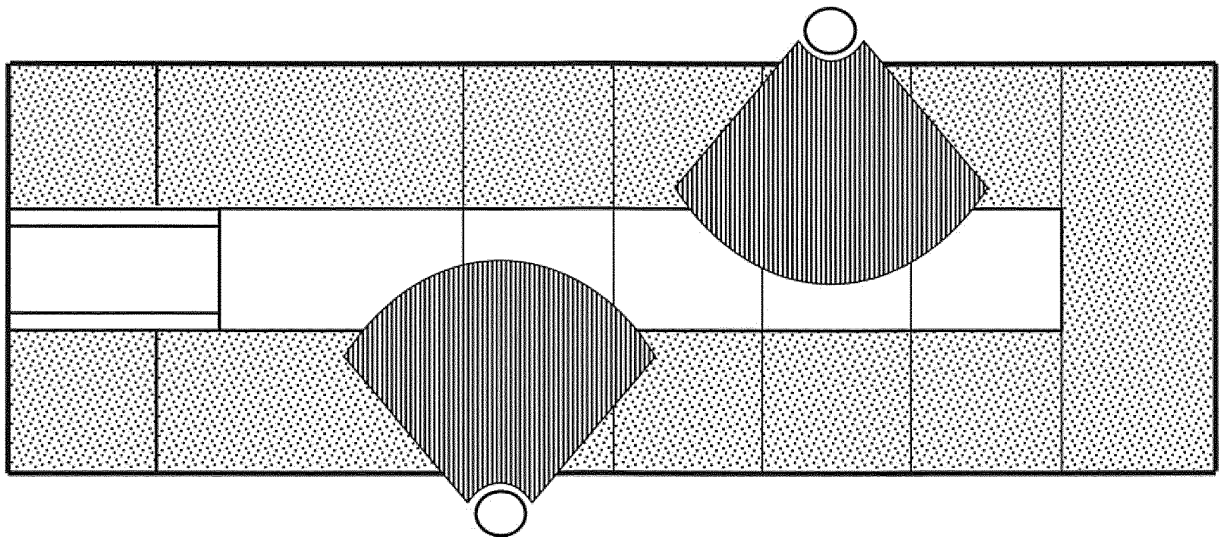
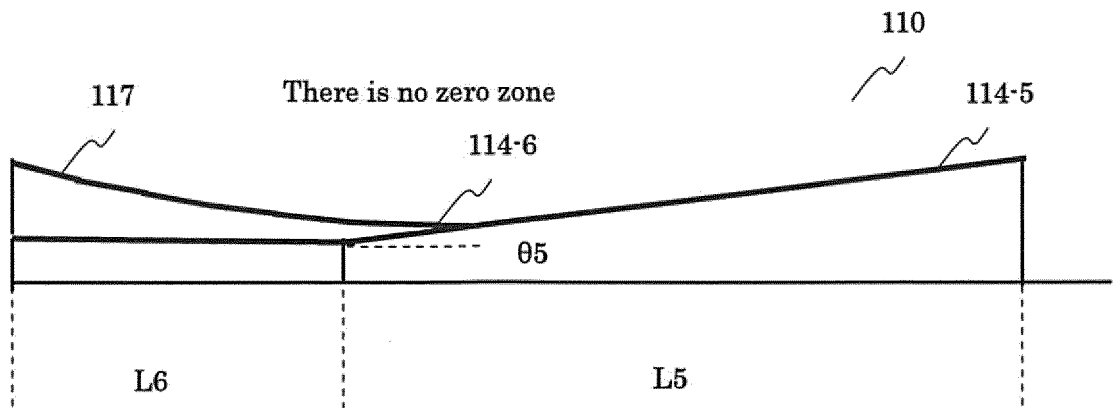


Fig. 3

- (a) The pseudo-curved surface of the portion of the approach portion which is just before the turning portion for upward



- (b) The pseudo-curved surface of the portion of the approach portion which is just before the turning portion for upward in the prior art

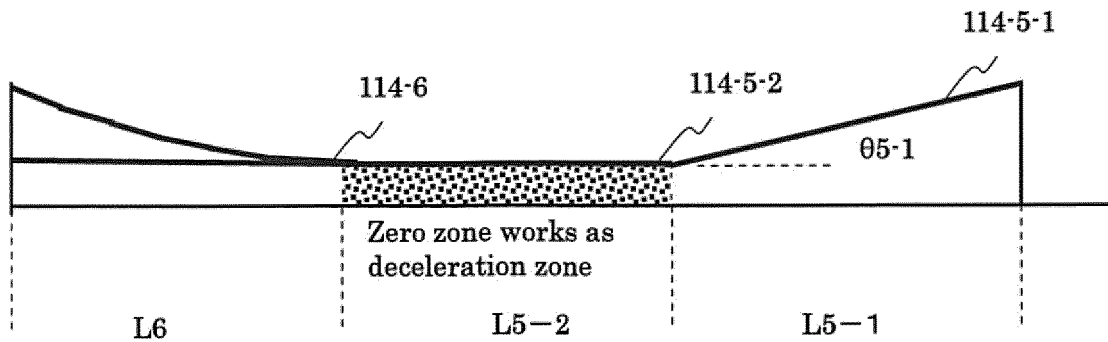


Fig. 4

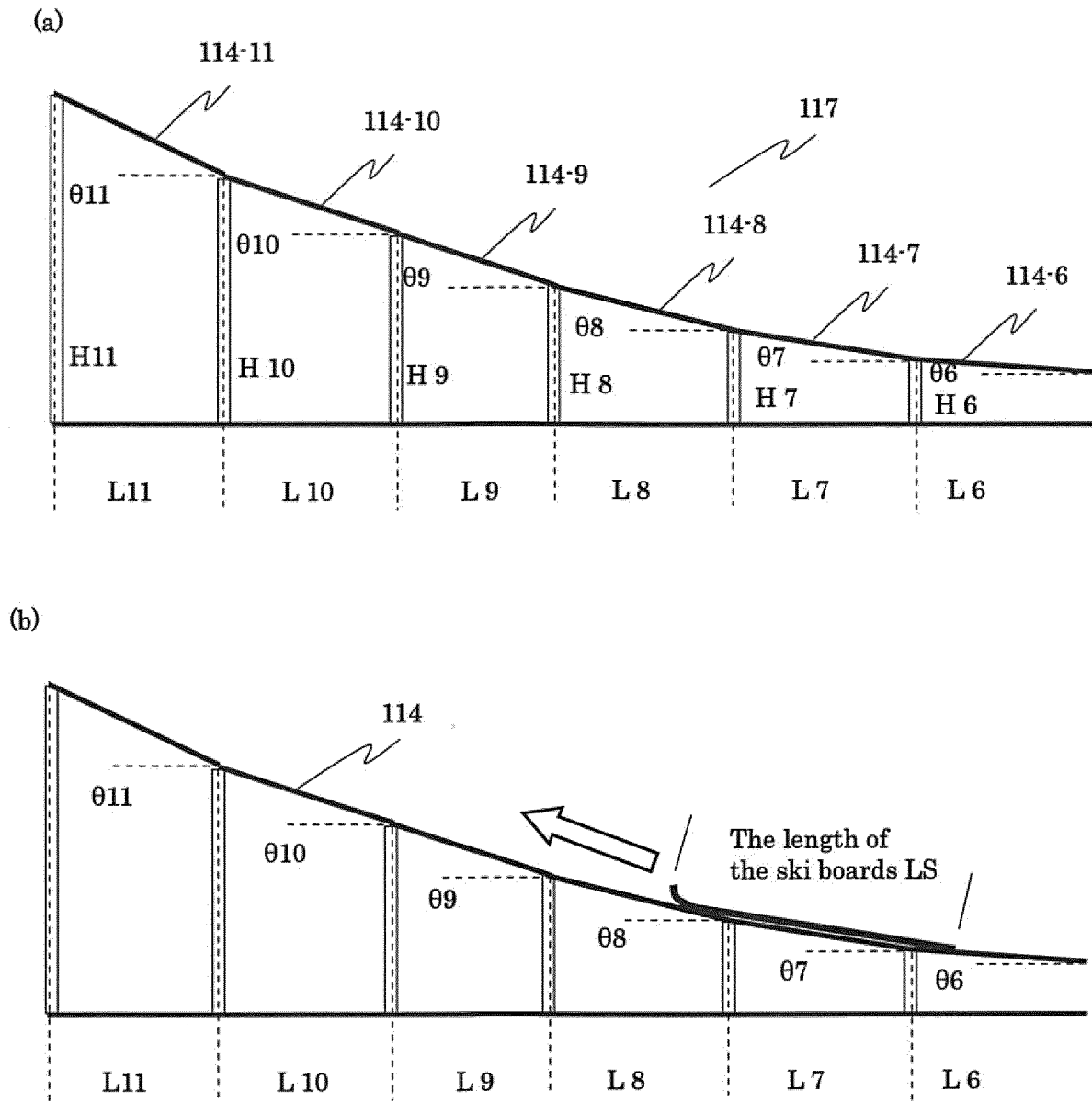


Fig. 5

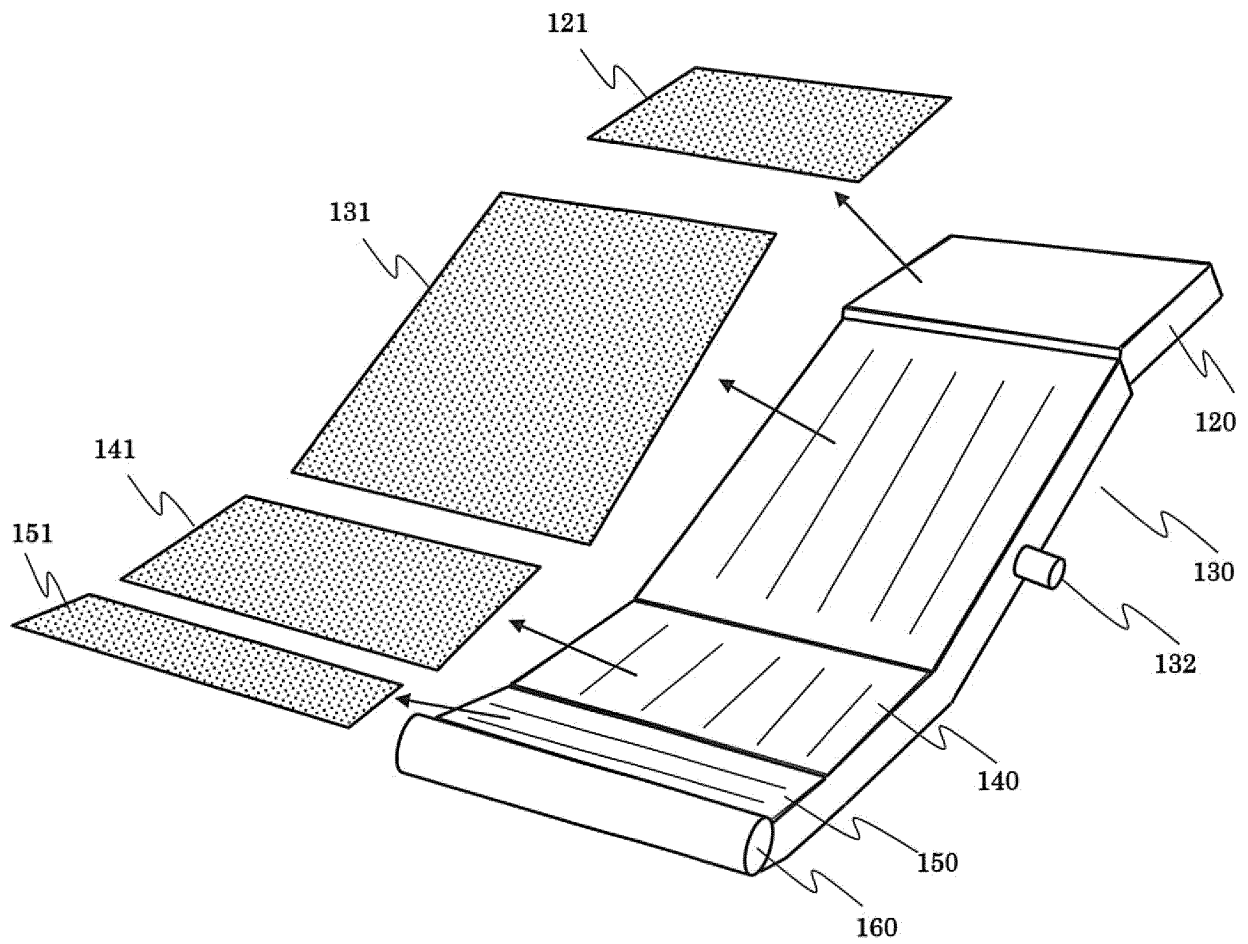


Fig. 6

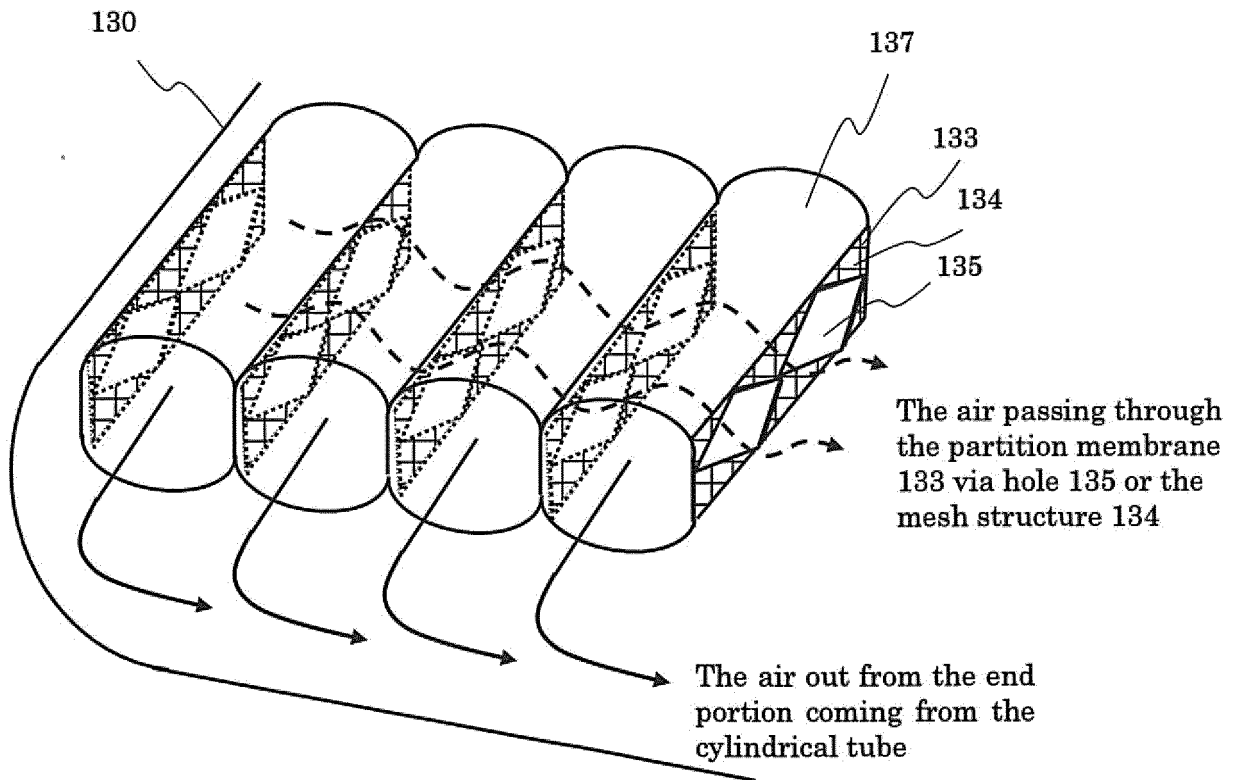


Fig. 7

The air flow in the air mat caused by the landing impact and absorption of the air and air dumper structure

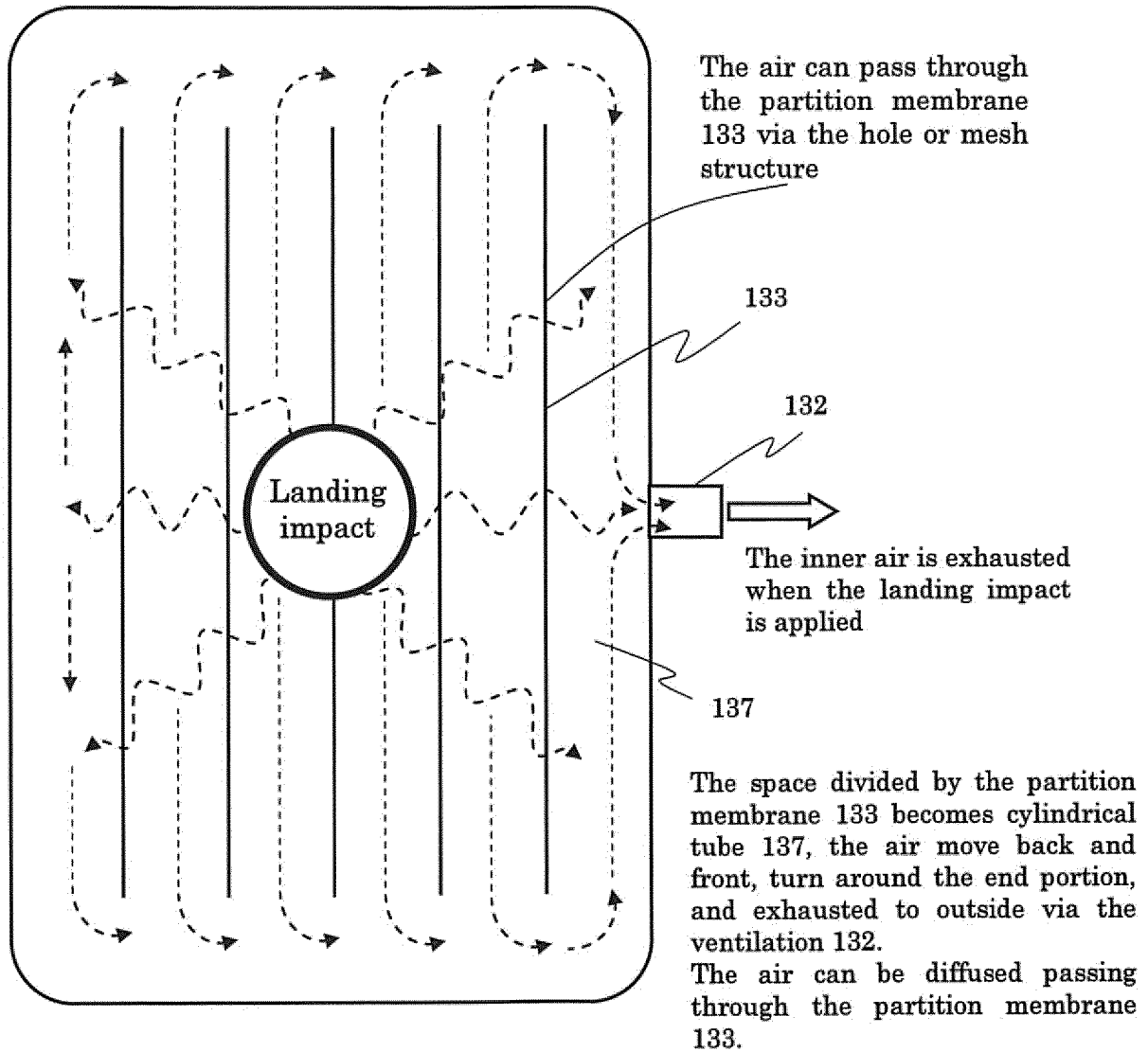
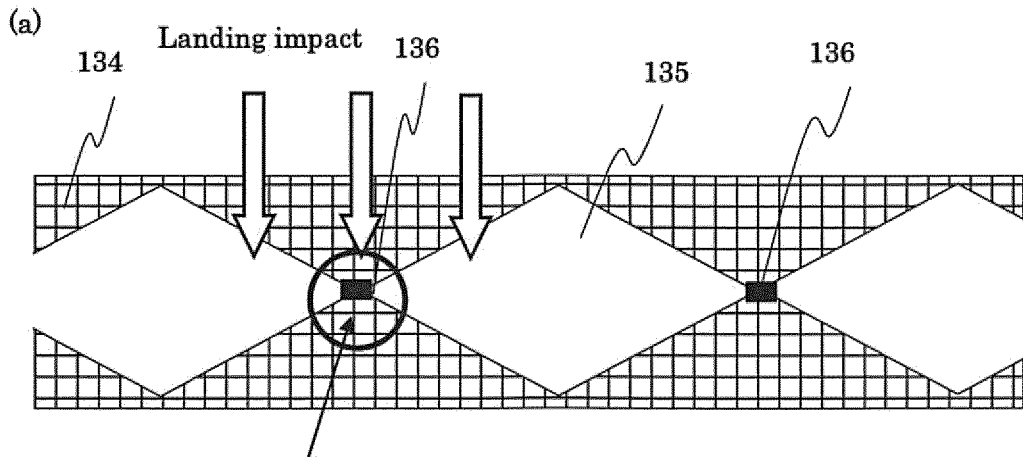
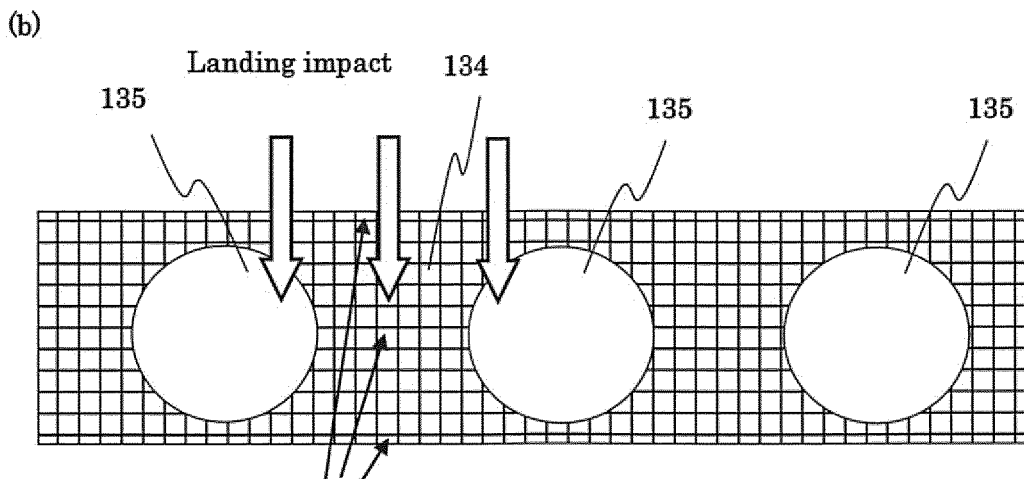


Fig. 8

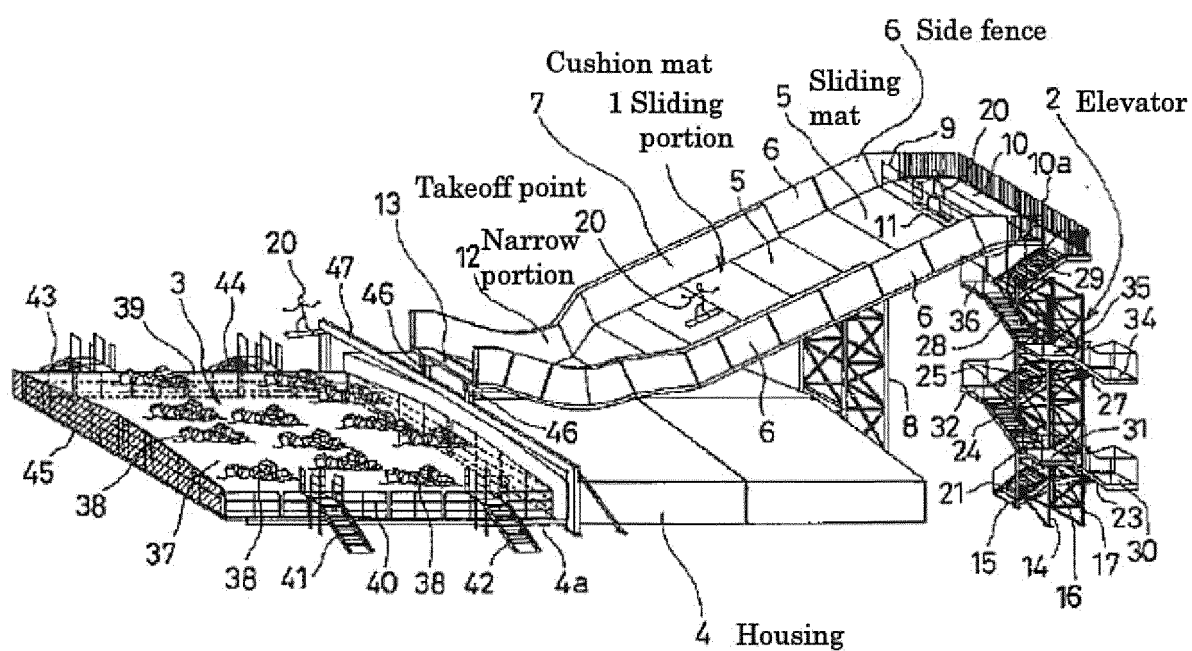


If the force exceeding the proof stress of the mesh structure 134 of partition membrane 133 is applied, the cutting portion 136 will be cut first in order to avoid the entire breaking.



If the cutting portion 136 is not provided, the force exceeding the proof stress of the mesh structure 134 of partition membrane 133 is applied, such force is applied to the entire of the partition membrane 133, the connection portion of the partition membrane to the inner wall or the mesh structure can be broken.

Fig. 9



The recreational equipment for ski jumping disclosed in the prior art (2001-70497 JP)

Fig. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/064584

A. CLASSIFICATION OF SUBJECT MATTER
A63C19/10(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A63C19/10, A63B6/02, A62B1/22

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2014
Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	JP 3-139375 A (Mataichi CHIBA), 13 June 1991 (13.06.1991), page 2, upper left column, line 7 to page 4, upper left column, line 8; fig. 1 to 12 (Family: none)	1-7, 9-11 8
Y A	WO 2010/009541 A1 (KATAL INNOVATIONS INC.), 28 January 2010 (28.01.2010), page 7, line 1 to page 13, line 13; fig. 1 to 12 (Family: none)	1-7, 9-11 8

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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"P" document published prior to the international filing date but later than the priority date claimed

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Date of the actual completion of the international search
26 August, 2014 (26.08.14)

Date of mailing of the international search report
02 September, 2014 (02.09.14)

Name and mailing address of the ISA/
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/064584

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 4-28380 A (Akira OKU, Kyoshin Shoji Kabushiki Kaisha), 30 January 1992 (30.01.1992), page 2, lower right column, line 13 to page 3, upper right column, line 15; fig. 1, 4, 5 (Family: none)	2
Y	JP 9-262303 A (Masao KOSAKA), 07 October 1997 (07.10.1997), paragraph [0005]; fig. 3 (Family: none)	4
Y	JP 3010142 U (Mitsuhiro FUJIWARA), 25 April 1995 (25.04.1995), paragraphs [0006], [0016]; fig. 8 (Family: none)	6
Y	JP 5-31420 A (The Furukawa Electric Co., Ltd.), 09 February 1993 (09.02.1993), paragraphs [0009], [0012]; fig. 1 to 3 (Family: none)	9

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 11029904 A [0003] [0004]
- JP 2001070497 A [0003] [0004] [0108]