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(54) **AUTOMATIC FOLDING-PLATE DEVICE OF ROOF TENT**

(57) Provided in the present invention is an automatic folding-plate device of a roof tent, the automatic folding-plate device comprising a first bottom frame, a top frame, first scissor-type lifting supports, folding plates, driving devices, pull ropes and torsion springs, wherein the folding plates are rotatably connected to the sides of the first bottom frame; the first scissor-type lifting supports are arranged between the first bottom frame and the top frame; in each first scissor-type lifting support, the upper end of a first scissor arm and the lower end of a second scissor arm are sliding ends located on the same side, and the two sliding ends are slidingly arranged on the top frame and the first bottom frame, respectively; each driving device is connected to at least one of the scissor arms to drive the two scissor arms to rotatably open and close around a cross pivot joint; the torsion springs are arranged between each folding plate and the first bottom frame; and one end of each pull rope is connected to a sliding end, and the other end of same is connected to a folding plate. In the present invention, by means of the cooperation of pull force of the pull ropes and torsion force of the torsion springs, the folding plates are linked to automatically fold and unfold during the lifting and unfolding and folding of a tent, such that the automatic folding-plate device is convenient to use and is time-saving and laborsaving. In addition, the structure of the automatic folding-plate device is simple and stable.

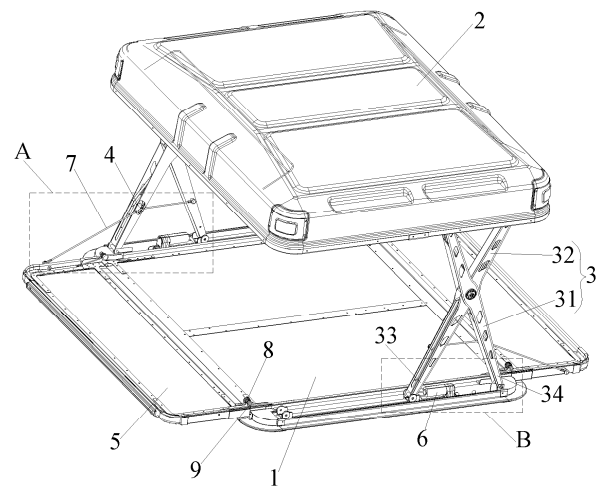


FIG. 1

Description

TECHNICAL FIELD

[0001] The present application relates to the technical field of roof tents, and in particular to an automatic folding-plate device of a roof tent.

BACKGROUND

[0002] In recent years, camping in the wild has gradually become one of indispensable recreational activities for the people. A road trip is the most popular and convenient way of travel for the people when going camping in the wild. People usually carry tents and camping goods, thus the portability of the tents is getting more and more attention from consumers.

[0003] Nowadays, there are some folding tents with different functions on the market, some of which are folding tents installed on a roof or a rear bucket of a vehicle. When the folding tents are used, the folding tents only need to be unfolded vertically upward. A first bottom frame of an existing roof tent has a limited space, and a folding plate is generally arranged on a side portion of the first bottom frame. The folding plate, also called a side plate or a bed plate, is arranged to increase a usable area of the tent when it is unfolded. The folding plate is also mostly in a form of a foldable structure. As disclosed in patent CN218623632U, an existing folding plate is generally rotatable manually. After a tent is unfolded, the folding plate is manually rotatable to extend outside a bottom frame to allow the folding plate to be unfolded. Before the tent is folded, the folding plate is rotatable to be folded above the bottom frame to allow the folding plate to be folded.

[0004] Therefore, the existing folding plate usually requires a user to manually rotate the folding plate to allow the folding plate to be unfolded and folded. An unfolding and folding action of the folding plate and an unfolding and folding action of the tent need to be carried out separately and cannot be completed simultaneously. This operation method not only takes time and effort, but also increases the difficulty of use for the user, and has a low degree of automation, which cannot meet the user's needs for a convenient and efficient use experience.

SUMMARY

Technical problems

[0005] An object of the present application is to provide an automatic folding-plate device of a roof tent, which allows a folding plate to be automatically unfolded and folded when a tent is raised to be unfolded and lowered to be folded. In this way, the use is facilitated, the time and effort are saved, and the structure is simple and stable.

Technical solutions

[0006] In order to achieve the above object, the solution of the present application is to provide an automatic folding-plate device of a roof tent, which includes a first bottom frame, a top frame, at least one first scissor-type lifting frame, at least one folding plate, a driving device, at least one pull rope, and a torsion spring.

[0007] The at least one folding plate is rotatably connected to at least one side portion of the first bottom frame, and is rotatable to be folded above the first bottom frame or is rotatable to extend outside the first bottom frame. The first scissor-type lifting frame is arranged between the first bottom frame and the top frame, to drive the top frame to be lowered to cover the folding plate and the first bottom frame, or to be raised away from the folding plate and the first bottom frame.

[0008] The first scissor-type lifting frame includes a first branch and a second branch that are cross-hinged to each other. A lower end of the first branch and an upper end of the second branch are two fixed ends located at a same side. An upper end of the first branch and the upper end of the second branch is pivotally connected to the top frame, and the lower end of the first branch and a lower end of the second branch is pivotally connected to the first bottom frame. The upper end of the first branch and the lower end of the second branch are two sliding ends located at a same side. One of the two sliding ends is slidably arranged on the top frame, and another one of the two sliding ends is slidably arranged on the first bottom frame. The driving device is connected to at least one of the first branch and the second branch to drive the first branch and the second branch to be rotatably unfolded and folded around a cross-hinged connection of the first branch and the second branch.

[0009] The torsion spring is arranged between the folding plate and the first bottom frame. One end of the pull rope is connected to a respective one of the two sliding ends, and another end of the pull rope is connected to the folding plate. When the driving device drives the top frame to be lowered, the respective one of the two sliding ends slides to tighten the pull rope, and the pull rope pulls the folding plate to allow the folding plate to be rotated and folded above the first bottom frame. When the driving device drives the top frame to be raised, the respective one of the two sliding ends slides in a reverse direction to relax the pull rope, and a torsion force of the torsion spring drives the folding plate to tighten the pull rope and allows the folding plate to be rotated and extend outside the first bottom frame.

[0010] Further, a respective one of the two fixed ends is positioned between the respective one of the two sliding ends and the folding plate. A pulley block is arranged on the respective one of the two fixed ends, and a middle part of the pull rope cooperates with the pulley block.

[0011] Further, the pulley block includes a pulley seat, a first pulley and a second pulley. The pulley seat is fixed to the respective one of two fixed ends. The first pulley and

the second pulley are arranged on the pulley seat in an upper and lower arrangement manner. The middle part of the pull rope is arranged between the first pulley and the second pulley and cooperates with the first pulley and the second pulley. A height of the one end of the pull rope is flush with a height of the pulley seat.

[0012] Further, the one end of the pull rope is connected to an inner side of the lower end of the second branch, and the another end of the pull rope is connected to a middle part of an outer side of the folding plate. The pulley block is arranged at an inner side of the lower end of the first branch.

[0013] Further, the automatic folding-plate device of the roof tent includes two folding plates. One of the two folding plates is rotatably connected to a left side portion of the first bottom frame, and another one of the two folding plates is rotatably connected to a right side portion of the first bottom frame. The automatic folding-plate device of the roof tent includes two first scissor-type lifting frames. One of the two first scissor-type lifting frames is located at a front side of the first bottom frame, and located in one end position at the front side of the first bottom frame. Another one of the two first scissor-type lifting frames is located at a rear side of the first bottom frame, and located in another end position different from the one end position at the rear side of the first bottom frame.

[0014] Further, the automatic folding-plate device of the roof tent further includes a second bottom frame and at least one second scissor-type lifting frame. The second bottom frame is arranged below the first bottom frame, and the second bottom frame is installed on a vehicle. The second scissor-type lifting frame is arranged between the second bottom frame and the first bottom frame. A structure of the second scissor-type lifting frame is the same as a structure of the first scissor-type lifting frame. The second scissor-type lifting frame includes a first branch and a second branch that are cross-hinged to each other. An upper end of the first branch and an upper end of the second branch of the second scissor-type lifting frame are pivotally connected to the first bottom frame, and a lower end of the first branch and a lower end of the second branch of the second scissor-type lifting frame are pivotally connected to the second bottom frame. The upper end of the first branch and the lower end of the second branch are two sliding ends located at a same side. One of the two sliding ends is slidably arranged on the first bottom frame, and another one of the two sliding ends is slidably arranged on the second bottom frame. The first branch and the second branch rotatably unfolded and folded around a cross-hinged connection of the first branch and the second branch. The lower end of the first branch of the first scissor-type lifting frame and the upper end of the second branch of the second scissor-type lifting frame are coaxially and pivotally connected to and fixedly arranged on the first bottom frame, and are two fixed ends. The lower end of the second branch of the first scissor-type lifting frame

and the upper end of the first branch of the second scissor-type lifting frame are coaxially and pivotally connected to and slidably arranged on the first bottom frame, and are two sliding ends. One first scissor-type lifting frame and one second scissor-type lifting frame are provided as one group of scissor-type lifting frames. The roof tent is provided with two groups of scissor-type lifting frames. Another one group of the two groups of scissor-type lifting frames is symmetrically arranged at another side of the first bottom frame with respect to the one group of scissor-type lifting frames.

[0015] Further, the two groups of scissor-type lifting frames are arranged at same end positions at a front side and a rear side of the first bottom frame. The automatic folding-plate device of the roof tent includes two folding plates. One of the two folding plates is rotatably connected to one side of the first bottom frame, and another one of the two folding plates is rotatably connected to another side of the first bottom frame. One folding plate located at one side close to the two groups of scissor-type lifting frames is connected to a respective one of the two sliding ends of one first scissor-type lifting frame by a first pull rope.

[0016] Another folding plate located at another side away from the two groups of scissor-type lifting frames is connected to a respective one of the two sliding ends of another first scissor-type lifting frame by a second pull rope. A third pulley is arranged at a side of the first bottom frame in a position near a respective one of the two fixed ends of the another first scissor-type lifting frame. One end of the second pull rope is connected to the another folding plate, and another end of the second pull rope is connected to the respective one of the two sliding ends of the another first scissor-type lifting frame by winding around the third pulley.

[0017] Further, a pulley block is arranged on a respective one of the two fixed ends of the one first scissor-type lifting frame connected to the first pull rope, and a middle part of the first pull rope cooperates with the pulley block. A fourth pulley is arranged on the respective one of the two sliding ends of the another first scissor-type lifting frame connected to the second pull rope, and arranged above the second pull rope. A middle part of the second pull rope sequentially cooperates with the fourth pulley and the third pulley.

[0018] Further, a synchronous rod is arranged between the two groups of scissor-type lifting frames. Two ends of the synchronous rod are fixedly connected to the sliding ends symmetrically arranged at the front side and the rear side of the first bottom frame. The two groups of scissor-type lifting frames are linked to be unfolded and folded through the synchronous rod.

[0019] Further, a plurality of rotation components are arranged at a rotation connection of the folding plate and the first bottom frame. Each rotation component includes two L-shaped connecting members and a pivot shaft. One of two ends of one of the two L-shaped connecting members is fixed to the folding plate, one of two ends of

another one of the two L-shaped connecting members is fixed to the first bottom frame, and another one of the two ends of one of the two L-shaped connecting members and another one of the two ends of another one of the two L-shaped connecting members are pivoted together through the pivot shaft to form a herringbone structure. The torsion spring is arranged around the pivot shaft. One of two ends of the torsion spring is fixed to the folding plate, and another one of the two ends of the torsion spring is fixed to the first bottom frame.

Beneficial effects

[0020] After adopting the above technical solutions, the present application has the following beneficial effects.

[0021] In the present application, a torsion spring is arranged between a folding plate and a first bottom frame, an original state of the torsion spring is a stretched state to allow the folding plate to be kept in an unfolded state where the folding plate extends outside the first bottom frame, and a respective one of two sliding ends and the folding plate are connected to each other by a pull rope. In this way, the folding plate and a top frame are linked together. A linkage process is as follows. When a driving device drives the top frame to be lowered, each of the two sliding ends will slide away from a respective one of two fixed ends until a roof tent is folded. In this process, the respective one of the two sliding ends will tighten the pull rope, and the pull rope will drive the folding plate to rotate until the folding plate is folded above the first bottom frame. At this time, the torsion spring is compressed to store a torsion force. When the driving device drives the top frame to be raised, each of the two sliding ends will slide close to a respective one of the two fixed ends in a reverse direction. At this time, the torsion spring is released. The folding plate is pushed to rotate by a torsion return of the torsion spring, the pull rope is tightened by the folding plate, and a traction force of the pull rope will allow the folding plate to be rotated slowly until the folding plate extends outside the first bottom frame. Thus, the present application has the following advantages.

1. In the present application, the structure of the pull rope and the torsion spring is specially designed, to skillfully realize a synchronous action of driving the folding plate to be unfolded and folded when the tent is raised and lowered. When the top frame needs to be raised or lowered, a user only needs to operate one driving device to allow the folding plate and the top frame to move simultaneously. In this way, the complexity of operation and required time are reduced, the use is facilitated, and the time and effort are saved, which meets the user's needs for a convenient and efficient use experience.
2. If manual rotation of the folding plate or direct rotation of the folding plate by the pull rope are

adopted, the folding plate will immediately rotate into place to make the folding plate to hit the first bottom frame, which causes noise generation as well as damage to the first bottom frame and the folding plate. In the present application, by the cooperation of the traction force of the pull rope and the torsion force of the torsion spring, the folding plate will slowly rotate until the folding plate is folded and unfolded, without immediately rotating into place. In this way, no noise is generated, the first bottom frame and the folding plate are not easily damaged, and the service life is long.

3. In the present application, raising and lowering the folding plate and the tent in a linked manner can be realized using only the pull rope and the torsion spring. Compared with other designs adopting complex structures such as connecting rod articulation and rack transmission, the present application has a simpler structure, a small occupied space, a low cost, and a good stability of the whole structure, which meets the market demand.

4. The original state of the torsion spring allows the folding plate to be kept in the unfolded state where the folding plate extends outside the first bottom frame. Without a sufficient driving force, the folding plate will not rotate easily. This design can prevent children or pets from being accidentally caught between the first bottom frame and the folding plate, which improves the safety of use.

5. The design of the pull rope and the torsion spring also has highly interchangeability and adjustability, and can adapt to the use needs of tents with different specifications and sizes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

FIG. 1 is a perspective view of a tent according to an embodiment of the present application in an unfolded state.

FIG. 2 is a partially enlarged view at a portion A of FIG. 1.

FIG. 3 is a schematic diagram illustrating a cooperation of a pulley seat and a pull rope according to an embodiment of the present application.

FIG. 4 is a partially enlarged view at a portion B of FIG. 1.

FIG. 5 is a front view of a tent according to an embodiment of the present application in an unfolded state.

FIG. 6 is a first schematic diagram of an unfolding and folding process of a tent according to an embodiment of the present application.

FIG. 7 is a second schematic diagram of an unfolding and folding process of a tent according to an embodiment of the present application.

FIG. 8 is a third schematic diagram of an unfolding

and folding process of a tent according to an embodiment of the present application.

FIG. 9 is a schematic diagram of a tent according to an embodiment of the present application in a fully folded state.

FIG. 10 is a first perspective view of a tent according to another embodiment of the present application in an unfolded state.

FIG. 11 is a second perspective view of a tent according to another embodiment of the present application in an unfolded state.

FIG. 12 is a third perspective view of a tent according to another embodiment of the present application in an unfolded state.

FIG. 13 is a partially enlarged view at a portion C of FIG. 12.

FIG. 14 is a front view of a tent according to another embodiment of the present application in an unfolded state.

FIG. 15 is a schematic diagram of an unfolding and folding process of a tent according to another embodiment of the present application.

FIG. 16 is a schematic diagram of a tent according to another embodiment of the present application in a fully folded state.

List of reference symbols

[0023] 1. first bottom frame; 11. slide rail; 12. second bottom frame; 2. top frame; 3. first scissor-type lifting frame; 31. first branch; 32. second branch; 33. sliding end; 34. fixed end; 35. second scissor-type lifting frame; 4. pulley block; 41. pulley seat; 42. first pulley; 43. second pulley; 44. third pulley; 45. fourth pulley; 5. folding plate; 6. driving device; 61. lead screw; 62. motor; 63. lead screw nut; 7. pull rope; 71. first pull rope; 72. second pull rope; 8. torsion spring; 9. rotation component; 91. L-shaped connecting member; 92. pivot shaft; 10. synchronous rod.

DETAILED DESCRIPTION

[0024] The present application will be described in detail below in combination with the drawings and the specific embodiments.

[0025] As shown in FIG. 1 to FIG. 16, the present application provides an automatic folding-plate device of a roof tent, which includes a first bottom frame 1, a top frame 2, at least one first scissor-type lifting frame 3, at least one folding plate 5, a driving device 6, at least one pull rope 7, and a torsion spring 8.

[0026] Referring emphatically to FIG. 1 and FIG. 2, the at least one folding plate 5 is rotatably connected to at least one side portion of the first bottom frame 1. A plurality of rotation components 9 are arranged at a rotation connection of the folding plate 5 and the first bottom frame 1. Each rotation component 9 preferably includes two L-shaped connecting members 91 and a

pivot shaft 92. One of two ends of one of the two L-shaped connecting members 91 is fixed to the folding plate 5, one of two ends of another one of the two L-shaped connecting members 91 is fixed to the first bottom frame 1, and another one of the two ends of one of the two L-shaped connecting members 91 and another one of the two ends of another one of the two L-shaped connecting members 91 are pivoted together through the pivot shaft 92 to form a herringbone structure. The herringbone structure is simple and portable. The folding plate 5 is rotatable more easily without jamming. Specifically, the folding plate 5 is rotatable to be folded above the first bottom frame 1 or is rotatable to extend outside the first bottom frame 1. In addition, the torsion spring 8 is arranged around the pivot shaft 92, one of two ends of the torsion spring 8 is fixed to the folding plate 5, and another one of the two ends of the torsion spring 8 is fixed to the first bottom frame 1. An original state of the torsion spring 8 is a stretched state to allow the folding plate 5 to be kept in an unfolded state where the folding plate 5 extends outside the first bottom frame 1. Without a sufficient driving force, the folding plate 5 will not rotate easily. This design can prevent children or pets from being accidentally caught between the first bottom frame 1 and the folding plate 5, which improves the safety of use.

[0027] The first scissor-type lifting frame 3 is arranged between the first bottom frame 1 and the top frame 2, to drive the top frame 2 to be lowered to cover the folding plate 5 and the first bottom frame 1, or to be raised away from the folding plate 5 and the first bottom frame 1. Specifically, the first scissor-type lifting frame 3 includes a first branch 31 and a second branch 32 that are cross-hinged to each other in a middle part. An upper end of the first branch 31 and an upper end of the second branch 32 is pivotally connected to the top frame 2, and a lower end of the first branch 31 and a lower end of the second branch 32 is pivotally connected to the first bottom frame 1. The upper end of the first branch 31 and the lower end of the second branch 32 are two sliding ends 33 located at a same side. One of the two sliding ends 33 is slidably arranged on the top frame 2, and another one of the two sliding ends 33 is slidably arranged on the first bottom frame 1. That is, the two sliding ends 33 are symmetrically arranged up and down. The lower end of the first branch 31 and the upper end of the second branch 32 are two fixed ends 34 located at a same side, and the two fixed ends 34 are also symmetrically arranged up and down. Herein, the upper end of the first branch 31 refers to a portion thereof between an upper end surface of the first branch 31 and a cross-hinged connection of the first branch 31 and the second branch 32, and the lower end of the first branch 31 refers to a portion thereof between a lower end surface of the first branch 31 and the cross-hinged connection. The upper end of the second branch 32 refers to a portion thereof between an upper end surface of the second branch 32 and the cross-hinged connection, and the lower end of the second branch 32 refers to a portion thereof between a lower

end surface of the second branch 32 and the cross-hinged connection. The driving device 6 is connected to at least one of the first branch 31 and the second branch 32 to drive the first branch 31 and the second branch 32 to be rotatably unfolded and folded around the cross-hinged connection of the first branch 31 and the second branch 32. Specifically, as shown in FIG. 6 to FIG. 9, when each of the two sliding ends 33 slides away from a respective one of the two fixed ends 34 located on the first bottom frame 1 and the top frame 2, the first branch 31 and the second branch 32 rotate. The upper end of the first branch 31 is lowered close to the lower end of the second branch 32, and the upper end of the second branch 32 is lowered close to the lower end of the first branch 31, thereby driving the top frame 2 to be lowered until the top frame 2 completely covers the first bottom frame 1 and the folding plate 5. On the contrary, when each of the two sliding ends 33 slides close to a respective one of the two fixed ends 34 located on the first bottom frame 1 and the top frame 2, the first branch 31 and the second branch 32 rotate in a reverse direction and return to the original position, thereby driving the top frame 2 to be raised and unfolded.

[0028] A key aspect of the present application lies in the arrangement of the pull rope 7 and the torsion spring 8. The torsion spring 8 is arranged between the folding plate 5 and the first bottom frame 1, and as described above, the torsion spring 8 can be arranged around the pivot shaft 92. One end of the pull rope 7 is connected to a respective one of the two sliding ends 33, and another end of the pull rope 7 is connected to the folding plate 5. Each of the two fixed ends 34 is positioned between the respective one of the two sliding ends 33 and the folding plate 5. In the present application, the folding plate 5 and the top frame 2 are raised and lowered in a linked manner by the cooperation of the pull rope 7 and the torsion spring 8, and a specific linkage process is as follows.

[0029] As shown in FIG. 6 to FIG. 9, when the driving device 6 drives the top frame 2 to be lowered, each of the two sliding ends 33 slides away from a respective one of the two fixed ends 34 located on the first bottom frame 1 and the top frame 2, that is, the respective one of the two sliding ends 33 moves away from the folding plate 5, until the roof tent is folded. In this process, the respective one of the two sliding ends 33 will tighten the pull rope 7, and the pull rope 7 will drive the folding plate 5 to rotate until the folding plate 5 is folded above the first bottom frame 1. At this time, the torsion spring 8 is compressed to store a torsion force. When the driving device 6 drives the top frame 2 to be raised, the two sliding ends 33 will slide gradually close to the folding plate 5 in a reverse direction. At this time, the torsion spring 8 is released. The folding plate 5 is pushed to rotate by a torsion return of the torsion spring 8, the pull rope 7 is tightened by the folding plate 5, and a traction force of the pull rope 7 will allow the folding plate 5 to be rotated slowly until the folding plate 5 extends outside the first bottom frame 1.

[0030] Thus, in the present application, the structure of

the pull rope 7 and the torsion spring 8 is specially designed, to skillfully realize a synchronous action of driving the folding plate 5 to be unfolded and folded when the tent is raised and lowered. When the top frame 2 needs to be raised or lowered, a user only needs to operate one driving device 6 to allow the folding plate 5 and the top frame 2 to move simultaneously. In this way, the complexity of operation and required time are reduced, the use is facilitated, and the time and effort are saved, which meets the user's needs for a convenient and efficient use experience. In addition, compared with other designs adopting complex structures such as connecting rod articulation and rack transmission, the present application has a simpler structure, a small occupied space, a low cost, and a good stability of the whole structure, which meets the market demand.

[0031] As a preferred solution, as shown in FIG. 2 and FIG. 3, a pulley block 4 is arranged on the respective one of the two fixed ends 34 between the respective one of the two sliding ends 33 and the folding plate 5, and a middle part of the pull rope 7 cooperates with the pulley block 4. The pull rope 7 is preferably a steel wire rope, and the steel wire rope cooperates with the pulley block 4 to form a steel wire rope pulley mechanism. In this way, the friction coefficient is small, and the power transmission is stable, which is beneficial to improving the stability and reliability of the whole linked structure.

[0032] Further, as shown in FIG. 3, the pulley block 4 can be provided with only one pulley to cooperate with the pull rope 7, or two pulleys to cooperate with the pull rope 7. Preferably, the two pulleys are provided. The pulley block 4 includes a pulley seat 41, a first pulley 42 and a second pulley 43. The pulley seat 41 is fixed to the respective one of the two fixed ends 34. The first pulley 42 and the second pulley 43 are arranged on the pulley seat 41 in an upper and lower arrangement manner. The middle part of the pull rope 7 is arranged between the first pulley 42 and the second pulley 43 and cooperates with the first pulley 42 and the second pulley 43. During the rotation of the folding plate 5, a stress direction of the pull rope 7 will change, and the two pulleys are provided to allow the pull rope 7 to always slidably cooperate with the two pulleys.

[0033] Specifically, the one end of the pull rope 7 is connected to an inner side of the lower end of the second branch 32, and the another end of the pull rope 7 is connected to a middle part of an outer side of the folding plate 5. The pulley block 4 is arranged at an inner side of the lower end of the first branch 31. In this way, when the tent is folded, the pulley seat 41 and the pull rope 7 are accommodated inside the tent, and the two ends and the middle part of the pull rope 7 are located on a same vertical plane, thereby reducing a friction force between the pull rope 7 and the first pulley 42 or the second pulley 43. Furthermore, the two ends of the pull rope 7 may be fixed by bolts, screws, or other fixing members.

[0034] The one end of the pull rope 7 is preferably fixed at a middle position between the lower end surface of the

second branch 32 and the cross-hinged connection, that is, a middle and lower part of the second branch 32, so that there is a distance between the pull rope 7 and the first bottom frame 1. A height of the middle part of the pull rope 7 is flush with a height of the one end of the pull rope 7, that is, a position of the pulley seat 41 is flush with a position of the one end of the pull rope 7, and the another end of the pull rope 7 is connected to an outer side portion of the folding plate 5. In this way, when the folding plate 5 is unfolded, there is an angle between the folding plate 5 and the pull rope 7, to allow the folding plate 5 to be pulled more easily. The pull rope 7, the folding plate 5 and the respective one of the two fixed ends 34 form a triangular structure, and the triangular shape has stability, to allow the whole linked structure to be more stable and reliable.

[0035] Referring emphatically to FIG. 1, the number of the first scissor-type lifting frame 3 and the folding plate 5 can be set according to the needs. The automatic folding-plate device of the roof tent preferably includes two first scissor-type lifting frames 3. One of the two first scissor-type lifting frames is arranged on a front side of the top frame 2 and the first bottom frame 1, and another one of the two first scissor-type lifting frames is arranged on a rear side of the top frame 2 and the first bottom frame 1, to allow the tent to be raised and lowered more stably. The automatic folding-plate device of the roof tent preferably includes two folding plates 5. One of the two folding plates 5 is rotatably connected to one side portion of the first bottom frame 1, and another one of the two folding plates 5 is rotatably connected to another side portion of the first bottom frame 1. In order to make the two folding plates 5 and the top frame 2 to be raised and lowered in a linked manner, the one of the two first scissor-type lifting frames is located in one end position at the front side of the first bottom frame 1, and the another one of the two first scissor-type lifting frames is located in another end position different from the one end position at the rear side of the first bottom frame 1. For example, the one of the two first scissor-type lifting frames is located at a left end at the front side of the first bottom frame 1, and the another one of the two first scissor-type lifting frames is located at a right end at the rear side of the first bottom frame 1. In this way, the two first scissor-type lifting frames 3 are staggered and not arranged at a same end and a same side of the first bottom frame 1, to allow each of the two first scissor-type lifting frames 3 to cooperate with a respective one of the two folding plates 5. Correspondingly, two pull ropes 7 and two torsion springs 8 are provided.

[0036] Referring emphatically to FIG. 1 and FIG. 4, each of the front side and the rear side of the first bottom frame 1, and a front side and a rear side of the top frame 2 is provided with a slide rail 11 extending in a longitudinal direction. Each sliding end 33 slidably cooperates with the respective slide rail 11 and is arranged on the respective slide rail 11, and each fixed end 34 is located at one end of the respective slide rail 11. Each sliding end 33 slides on the respective slide rail 11 by the driving device

6. Specifically, the driving device 6 can be an electric push rod or a lead screw nut transmission mechanism, preferably a lead screw nut transmission mechanism in the present application. The driving device 6 includes a lead screw 61, a motor 62 and a lead screw nut 63. The lead screw 61 and the motor 62 are arranged on the respective slide rail 11. An end of the lead screw 61 is connected to the motor 62 to allow the lead screw 61 to rotate, and the lead screw nut 63 is arranged on the lead screw 61 to slide along the lead screw 61. Each sliding end 33 is pivotally connected to the lead screw nut 63. In use, the motor 62 starts to drive the lead screw 61 to rotate. The lead screw nut 63 on the lead screw 61 moves along the lead screw 61, while driving the sliding end 33 on the lead screw nut 63 to move along the lead screw 61 and rotate around a pivot connection of the sliding end 33 and the lead screw nut 63. In this way, the automatic unfolding and folding of the first branch and the second branch is realized, and the automatic covering and separation of the top frame 2 relative to the first bottom frame 1 is further realized. In addition, the driving device 6 may only be arranged on the slide rail 11 of the first bottom frame 1, and the lower end of the second branch 32 is pivotally connected to the lead screw nut 63. The driving device 6 may not be arranged on the slide rail 11 of the top frame 2, a roller (not shown in the figures) is arranged on the upper end of the first branch 31, and the roller slidably cooperates with the slide rail 11 of the top frame 2.

[0037] In another embodiment, referring emphatically to FIG. 10 to FIG. 16, the roof tent can be a double-layer structure. The roof tent is also provided with a second bottom frame 12 and at least one second scissor-type lifting frame 35. The second bottom frame 12 is arranged below the first bottom frame 1, and the second bottom frame 12 is installed on a vehicle. The second scissor-type lifting frame 35 is arranged between the second bottom frame 12 and the first bottom frame 1. A structure of the second scissor-type lifting frame 35 is the same as a structure of the first scissor-type lifting frame 3. The second scissor-type lifting frame 35 includes a first branch 31 and a second branch 32 that are cross-hinged to each other. An upper end of the first branch 31 and an upper end of the second branch 32 of the second scissor-type lifting frame 35 are pivotally connected to the first bottom frame 1, and a lower end of the first branch 31 and a lower end of the second branch 32 of the second scissor-type lifting frame 35 are pivotally connected to the second bottom frame 12. The upper end of the first branch 31 and the lower end of the second branch 32 are two sliding ends 33 located at a same side. One of the two sliding ends 33 is slidably arranged on the first bottom frame 1, and another one of the two sliding ends 33 is slidably arranged on the second bottom frame 12. The first branch 31 and the second branch 32 are rotatably unfolded and folded around a cross-hinged connection of the first branch 31 and the second branch 32. The lower end of the first branch 31 of the first scissor-type lifting frame 3 and the upper end of the second branch 32 of the

second scissor-type lifting frame 35 are coaxially and pivotally connected to and fixedly arranged on the first bottom frame 1, and are two fixed ends 34. The lower end of the second branch 32 of the first scissor-type lifting frame 3 and the upper end of the first branch 31 of the second scissor-type lifting frame 35 are coaxially and pivotally connected to and slidably arranged on the first bottom frame 1, and are two sliding ends 33.

[0038] One first scissor-type lifting frame 3 and one second scissor-type lifting frame 35 are provided as one group of scissor-type lifting frames. The roof tent is provided with two groups of scissor-type lifting frames, and two folding plates 5 are provided correspondingly. One of the two folding plates 5 is rotatably connected to a left side of the first bottom frame 1 which is not provided with the two groups of scissor-type lifting frames, and another one of the two folding plates 5 is rotatably connected to a right side of the first bottom frame 1 which is not provided with the two groups of scissor-type lifting frames. The two groups of scissor-type lifting frames are staggered and not arranged at a same end and a same side of the first bottom frame 1, thus a connection method of a pull rope between each of the two folding plates 5 and a respective one of the two fixed ends 34 is the same as that of the previous embodiment.

[0039] However, in order to make the double-layer roof tent to be raised and lowered more stably, the two groups of scissor-type lifting frames can be symmetrically arranged. Another one group of the two groups of scissor-type lifting frames is symmetrically arranged at another side of the first bottom frame 1 with respect to the one group of scissor-type lifting frames. The two groups of scissor-type lifting frames are arranged at same end positions at a front side and a rear side of the first bottom frame 1, for example located at left end positions or right end positions at the front side and the rear side of the first bottom frame 1. As shown in FIG. 8, a synchronous rod 10 is arranged between the two groups of scissor-type lifting frames. Two ends of the synchronous rod 10 are fixedly connected to the sliding ends symmetrically arranged at the front side and the rear side of the first bottom frame 1. The two groups of scissor-type lifting frames are linked to be unfolded and folded through the synchronous rod 10. In this way, one driving device 6 is provided to drive the tent to be raised and lowered. In the structure, one of the two folding plates 5 is closer to the two groups of scissor-type lifting frames, and another one of the two folding plates 5 is distant from the two groups of scissor-type lifting frames. Each of the two folding plates 5 is connected to a respective one group of the two groups of scissor-type lifting frames to allow the two folding plates 5 and the two groups of scissor-type lifting frames to be linked. However, two connection methods are slightly different, and the specific situation is as follows.

[0040] Referring emphatically to FIG. 11 to FIG. 13, one folding plate 5 located at one side close to the two groups of scissor-type lifting frames is connected to a respective one of the two sliding ends 33 of one first

scissor-type lifting frame 3 by a first pull rope 71. The connection structure is the same as that of the previous embodiment. A respective one of the two fixed ends 34 of the one first scissor-type lifting frame 3 is positioned between the respective one of the two sliding ends 33 of the one first scissor-type lifting frame 3 and the one folding plate 5. When the top frame 2 is raised, the respective one of the two sliding ends 33 of the one first scissor-type lifting frame 3 moves away from the one folding plate 5, and the first pull rope 71 is tightened to pull the one folding plate 5.

[0041] Another folding plate 5 located at another side away from the two groups of scissor-type lifting frames is connected to a respective one of the two sliding ends 33 of another first scissor-type lifting frame 3 by a second pull rope 72. At this time, the respective one of the two sliding ends 33 of the another first scissor-type lifting frame is positioned between a respective one of the two fixed ends 34 of the another first scissor-type lifting frame 3 and the another folding plate 5. A third pulley 44 is arranged at a side of the first bottom frame 1 in a position near the respective one of the two fixed ends 34 of the another first scissor-type lifting frame. One end of the second pull rope 72 is connected to the another folding plate 5, and another end of the second pull rope 72 is connected to the respective one of the two sliding ends 33 of the another first scissor-type lifting frame by winding around the third pulley 44. The third pulley 44 can change a pulling direction of the second pull rope 72. In this way, when the top frame 2 is lowered and the respective one of the two sliding ends 33 of the another first scissor-type lifting frame slides close to the another folding plate 5, the second pull rope 72 is also tightened, and the another folding plate 5 is pulled to be rotated and folded above the first bottom frame 1. When the top frame 2 is raised, the another folding plate 5 is also driven to be rotated and unfolded by the torsion force of the torsion spring 8.

[0042] Further, similar to the previous embodiment, a pulley block 4 is arranged on the respective one of the two fixed ends 34 of the one first scissor-type lifting frame 3 connected to the first pull rope 71, and a middle part of the first pull rope 71 cooperates with the pulley block 4. The first pull rope 71 cooperates with the pulley block 4 to form a steel wire rope pulley mechanism, which is beneficial to improving the stability and reliability of the whole linked structure. That is, a position of the pulley seat 41 is also flush with a position of one end of the first pull rope 71, and another end of the first pull rope 71 is connected to an outer side portion of the one folding plate 5, to allow the linked structure to be more stable and reliable.

[0043] A fourth pulley 45 is arranged on the respective one of the two sliding ends 33 of the another first scissor-type lifting frame 3 connected to the second pull rope 72, and arranged above the second pull rope 72, and a middle part of the second pull rope 72 sequentially cooperates with the fourth pulley 45 and the third pulley 44. The fourth pulley 45 allows an angle to be formed between the second pull rope 72 and the another folding

plate 5, to allow the another folding plate 5 to be pulled more easily. The second pull rope 72, the another folding plate 5 and the second bottom frame 12 form a triangular structure, to likewise allow the linked structure to be more stable and reliable.

[0044] What described above are merely preferred embodiments of the present application, and are not intended to limit the design of the present application. Any equivalent changes made according to the design key of the present application fall within the scope of protection of the present application.

Claims

1. An automatic folding-plate device of a roof tent, comprising a first bottom frame, a top frame, at least one first scissor-type lifting frame, at least one folding plate, a driving device, at least one pull rope, and a torsion spring;

wherein the at least one folding plate is rotatably connected to at least one side portion of the first bottom frame, and is rotatable to be folded above the first bottom frame or is rotatable to extend outside the first bottom frame; the first scissor-type lifting frame is arranged between the first bottom frame and the top frame, to drive the top frame to be lowered to cover the folding plate and the first bottom frame, or to be raised away from the folding plate and the first bottom frame;

the first scissor-type lifting frame comprises a first branch and a second branch that are cross-hinged to each other, a lower end of the first branch and an upper end of the second branch are two fixed ends located at a same side, an upper end of the first branch and the upper end of the second branch is pivotally connected to the top frame, and the lower end of the first branch and a lower end of the second branch is pivotally connected to the first bottom frame; the upper end of the first branch and the lower end of the second branch are two sliding ends located at a same side, one of the two sliding ends is slidably arranged on the top frame, another one of the two sliding ends is slidably arranged on the first bottom frame, and the driving device is connected to at least one of the first branch and the second branch to drive the first branch and the second branch to be rotatably unfolded and folded around a cross-hinged connection of the first branch and the second branch;

the torsion spring is arranged between the folding plate and the first bottom frame, one end of the pull rope is connected to a respective one of the two sliding ends, and another end of the pull

rope is connected to the folding plate; when the driving device drives the top frame to be lowered, the respective one of the two sliding ends slides to tighten the pull rope, and the pull rope pulls the folding plate to allow the folding plate to be rotated and folded above the first bottom frame; when the driving device drives the top frame to be raised, the respective one of the two sliding ends slides in a reverse direction to relax the pull rope, and a torsion force of the torsion spring drives the folding plate to tighten the pull rope and allows the folding plate to be rotated and extend outside the first bottom frame.

2. The automatic folding-plate device of the roof tent according to claim 1, wherein a respective one of the two fixed ends is positioned between the respective one of the two sliding ends and the folding plate, a pulley block is arranged on the respective one of the two fixed ends, and a middle part of the pull rope cooperates with the pulley block.
3. The automatic folding-plate device of the roof tent according to claim 2, wherein the pulley block comprises a pulley seat, a first pulley and a second pulley, the pulley seat is fixed to the respective one of two fixed ends, the first pulley and the second pulley are arranged on the pulley seat in an upper and lower arrangement manner, the middle part of the pull rope is arranged between the first pulley and the second pulley and cooperates with the first pulley and the second pulley, and a height of the one end of the pull rope is flush with a height of the pulley seat.
4. The automatic folding-plate device of the roof tent according to claim 2 or 3, wherein the one end of the pull rope is connected to an inner side of the lower end of the second branch, the another end of the pull rope is connected to a middle part of an outer side of the folding plate, and the pulley block is arranged at an inner side of the lower end of the first branch.
5. The automatic folding-plate device of the roof tent according to claim 2, wherein the automatic folding-plate device of the roof tent comprises two folding plates, one of the two folding plates is rotatably connected to a left side portion of the first bottom frame, and another one of the two folding plates is rotatably connected to a right side portion of the first bottom frame; the automatic folding-plate device of the roof tent comprises two first scissor-type lifting frames, one of the two first scissor-type lifting frames is located at a front side of the first bottom frame, and located in one end position at the front side of the first bottom frame, and another one of the two first scissor-type lifting frames is located at a rear side of the first bottom frame, and located in another end position different from the one end position at the rear

side of the first bottom frame.

6. The automatic folding-plate device of the roof tent according to claim 1, wherein the automatic folding-plate device of the roof tent further comprises a second bottom frame and at least one second scissor-type lifting frame, the second bottom frame is arranged below the first bottom frame, the second bottom frame is installed on a vehicle, the second scissor-type lifting frame is arranged between the second bottom frame and the first bottom frame, a structure of the second scissor-type lifting frame is the same as a structure of the first scissor-type lifting frame; the second scissor-type lifting frame comprises a first branch and a second branch that are cross-hinged to each other, an upper end of the first branch and an upper end of the second branch of the second scissor-type lifting frame are pivotally connected to the first bottom frame, and a lower end of the first branch and a lower end of the second branch of the second scissor-type lifting frame are pivotally connected to the second bottom frame; the upper end of the first branch and the lower end of the second branch are two sliding ends located at a same side, one of the two sliding ends is slidably arranged on the first bottom frame, another one of the two sliding ends is slidably arranged on the second bottom frame, and the first branch and the second branch rotatably unfolded and folded around a cross-hinged connection of the first branch and the second branch; the lower end of the first branch of the first scissor-type lifting frame and the upper end of the second branch of the second scissor-type lifting frame are coaxially and pivotally connected to and fixedly arranged on the first bottom frame, and are two fixed ends; the lower end of the second branch of the first scissor-type lifting frame and the upper end of the first branch of the second scissor-type lifting frame are coaxially and pivotally connected to and slidably arranged on the first bottom frame, and are two sliding ends; one first scissor-type lifting frame and one second scissor-type lifting frame are provided as one group of scissor-type lifting frames, the roof tent is provided with two groups of scissor-type lifting frames, another one group of the two groups of scissor-type lifting frames is symmetrically arranged at another side of the first bottom frame with respect to the one group of scissor-type lifting frames.
7. The automatic folding-plate device of the roof tent according to claim 6, wherein the two groups of scissor-type lifting frames are arranged at same end positions at a front side and a rear side of the first bottom frame; the automatic folding-plate device of the roof tent comprises two folding plates, one of the two folding plates is rotatably connected to one side of the first bottom frame, and another one of the

two folding plates is rotatably connected to another side of the first bottom frame; one folding plate located at one side close to the two groups of scissor-type lifting frames is connected to a respective one of the two sliding ends of one first scissor-type lifting frame by a first pull rope; another folding plate located at another side away from the two groups of scissor-type lifting frames is connected to a respective one of the two sliding ends of another first scissor-type lifting frame by a second pull rope; a third pulley is arranged at a side of the first bottom frame in a position near a respective one of the two fixed ends of the another first scissor-type lifting frame; one end of the second pull rope is connected to the another folding plate, and another end of the second pull rope is connected to the respective one of the two sliding ends of the another first scissor-type lifting frame by winding around the third pulley.

8. The automatic folding-plate device of the roof tent according to claim 7, wherein a pulley block is arranged on a respective one of the two fixed ends of the one first scissor-type lifting frame connected to the first pull rope, and a middle part of the first pull rope cooperates with the pulley block; a fourth pulley is arranged on the respective one of the two sliding ends of the another first scissor-type lifting frame connected to the second pull rope, and arranged above the second pull rope, and a middle part of the second pull rope sequentially cooperates with the fourth pulley and the third pulley.
9. The automatic folding-plate device of the roof tent according to claim 7, wherein a synchronous rod is arranged between the two groups of scissor-type lifting frames, two ends of the synchronous rod are fixedly connected to the sliding ends symmetrically arranged at the front side and the rear side of the first bottom frame, and the two groups of scissor-type lifting frames are linked to be unfolded and folded through the synchronous rod.
10. The automatic folding-plate device of the roof tent according to claim 1, wherein a plurality of rotation components are arranged at a rotation connection of the folding plate and the first bottom frame, each rotation component comprises two L-shaped connecting members and a pivot shaft; one of two ends of one of the two L-shaped connecting members is fixed to the folding plate, one of two ends of another one of the two L-shaped connecting members is fixed to the first bottom frame, and another one of the two ends of one of the two L-shaped connecting members and another one of the two ends of another one of the two L-shaped connecting members are pivoted together through the pivot shaft to form a herringbone structure; the torsion spring is arranged

around the pivot shaft, one of two ends of the torsion spring is fixed to the folding plate, and another one of the two ends of the torsion spring is fixed to the first bottom frame.

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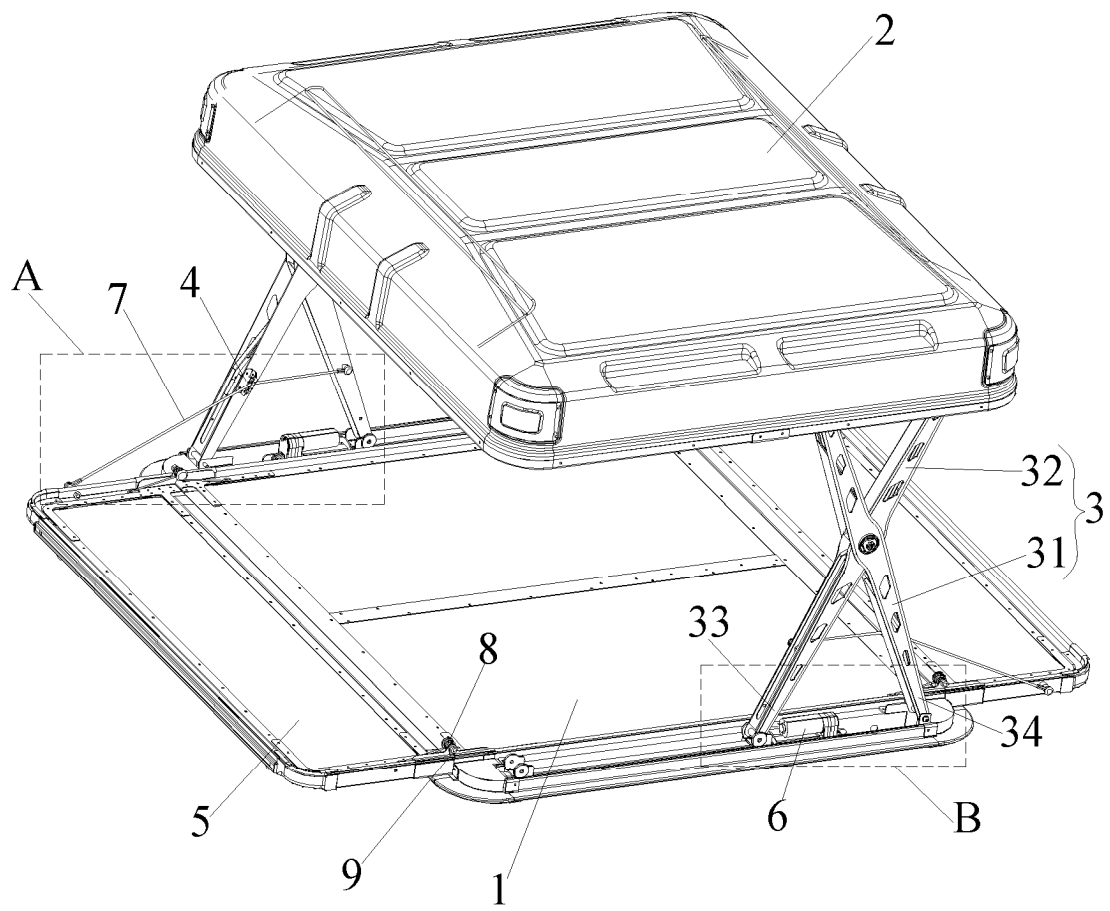


FIG. 1

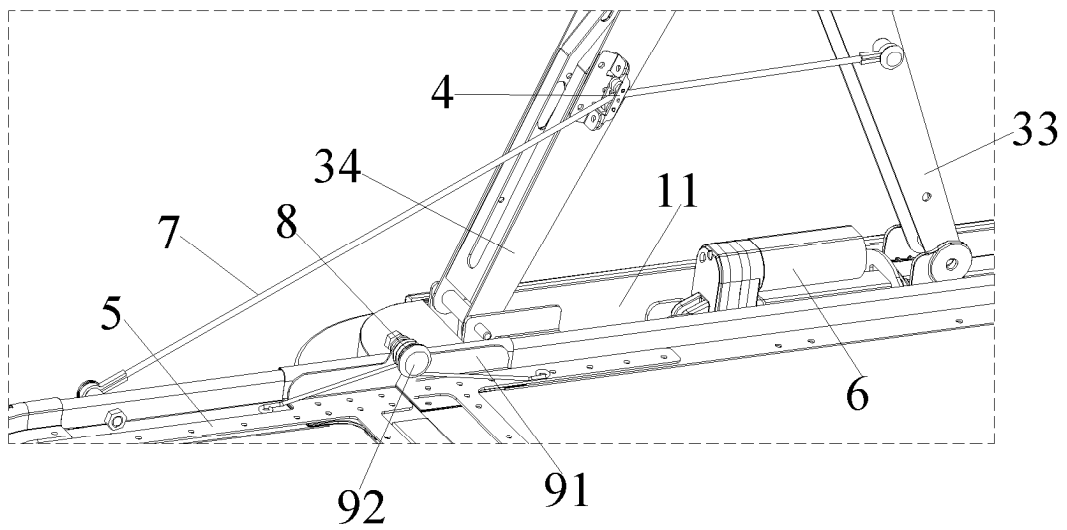


FIG. 2

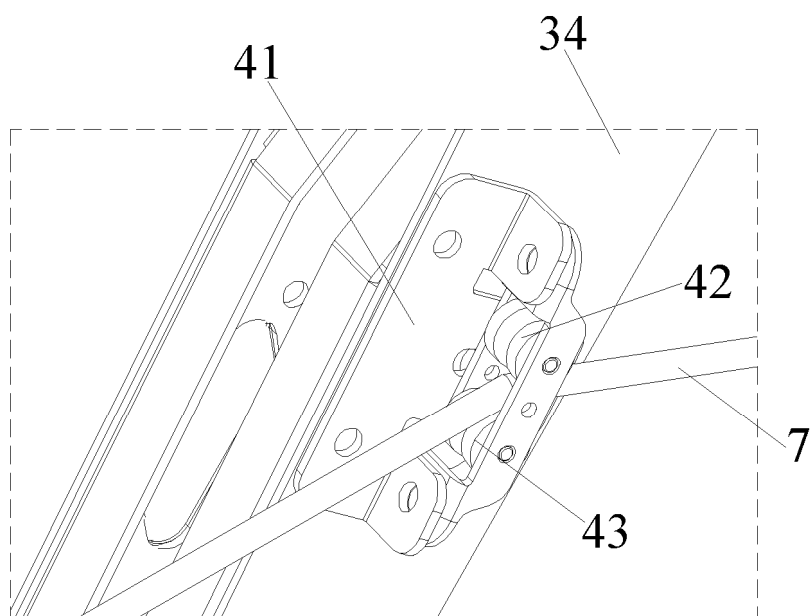


FIG. 3

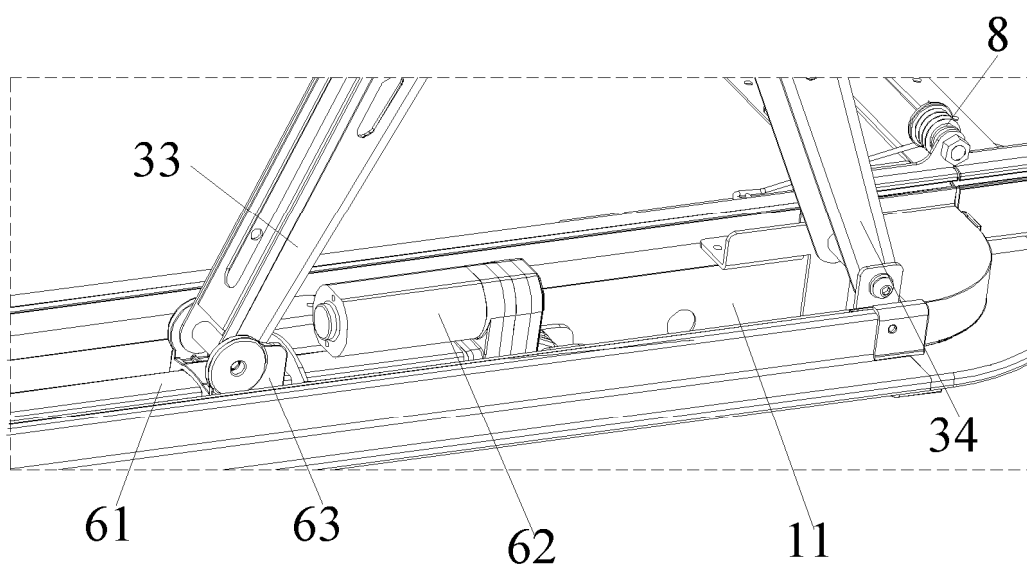


FIG. 4

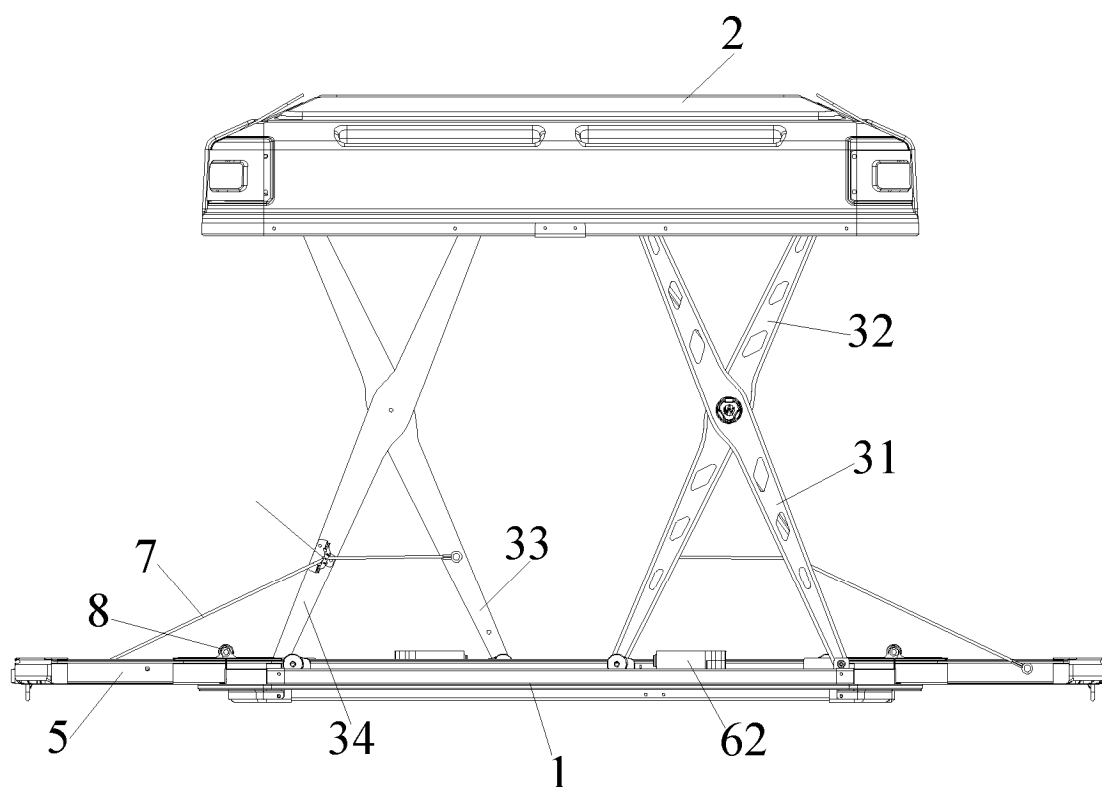


FIG. 5

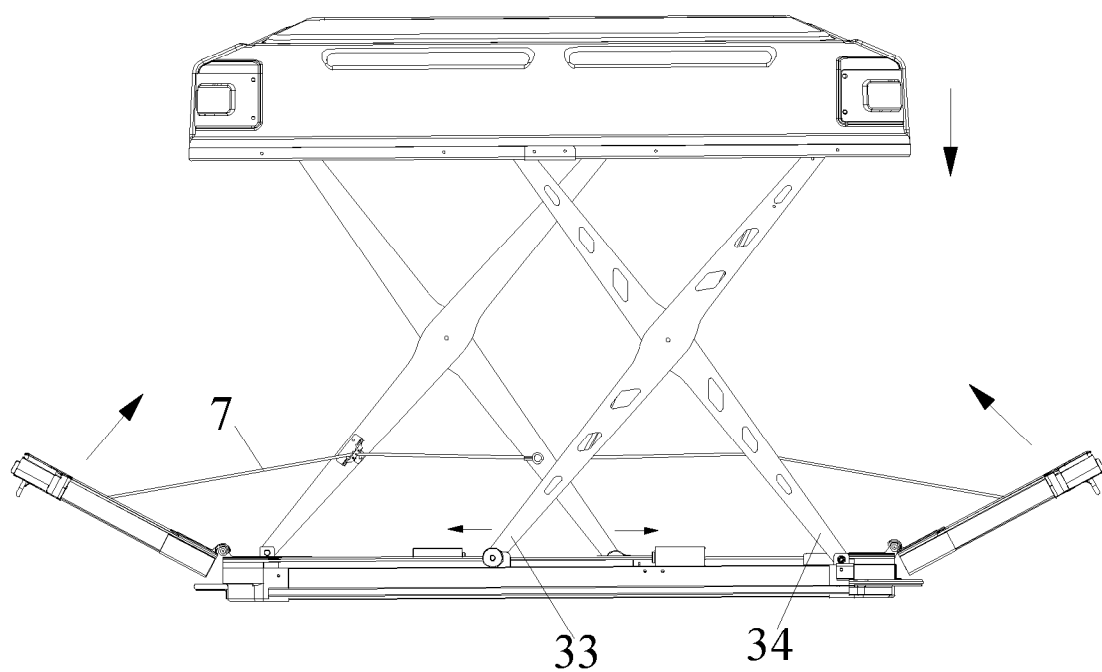


FIG. 6

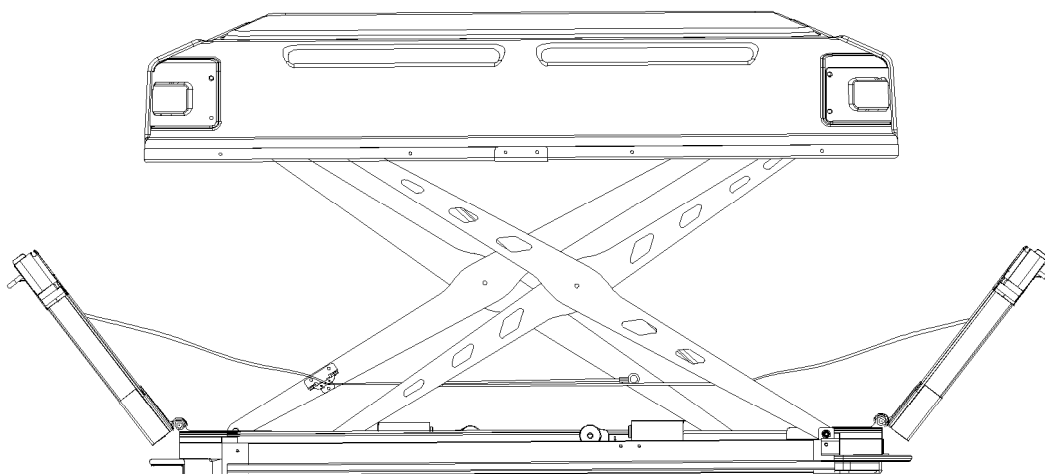


FIG. 7

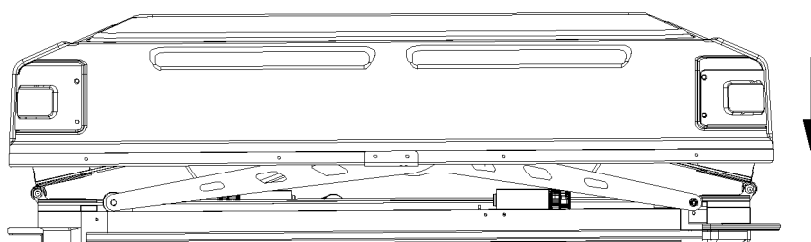


FIG. 8

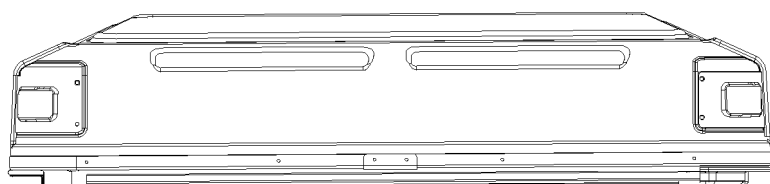


FIG. 9

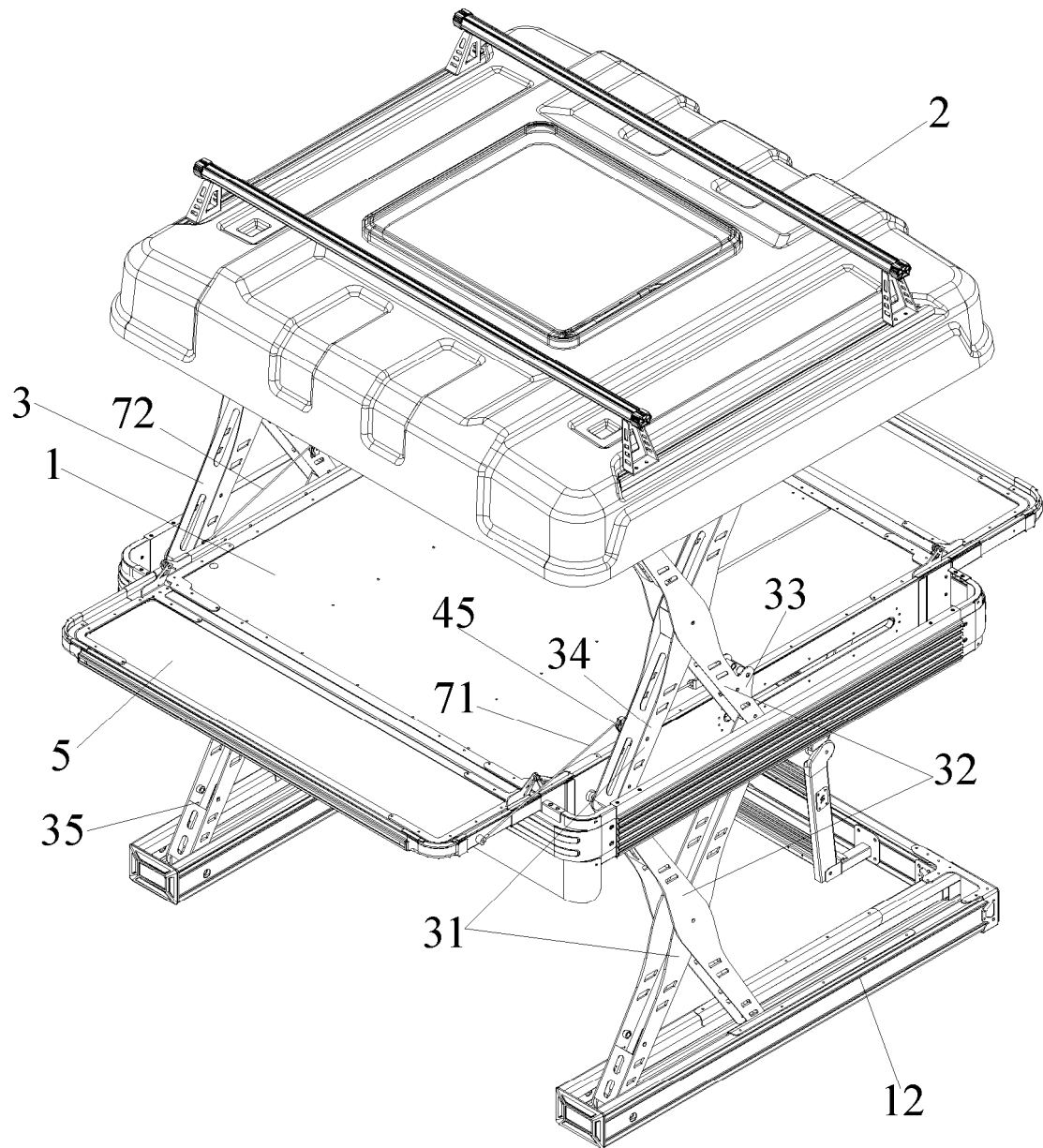


FIG. 10

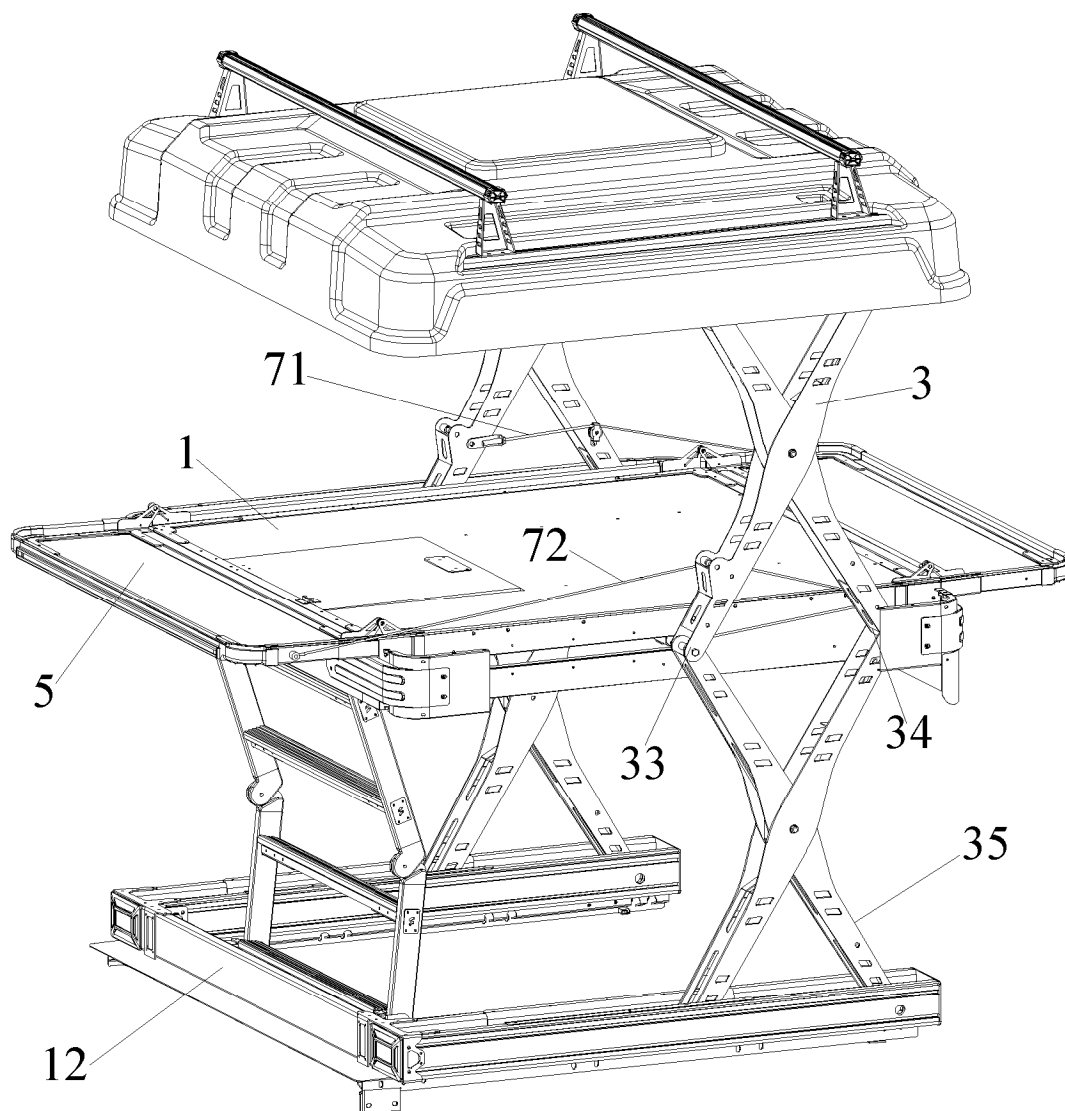


FIG. 11

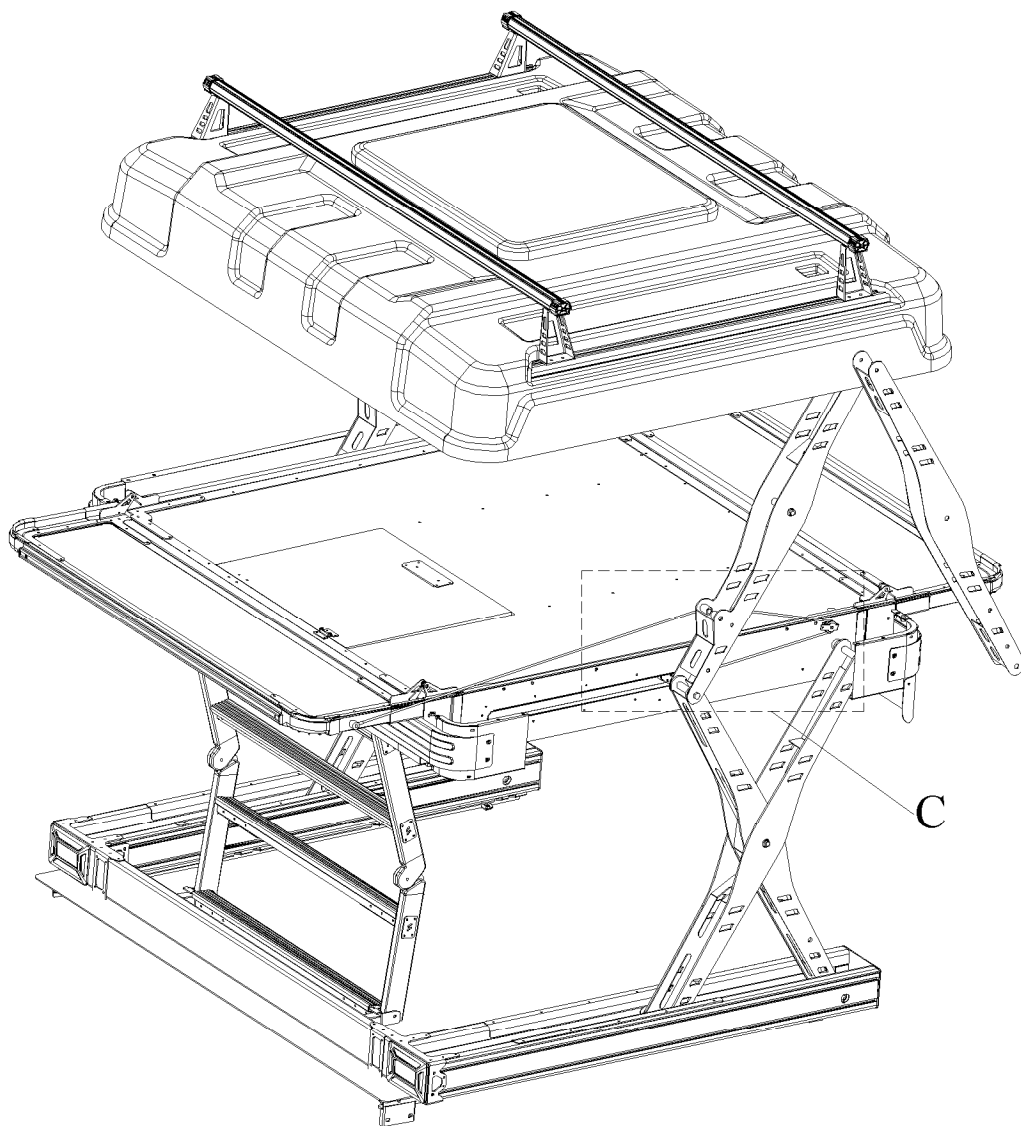


FIG. 12

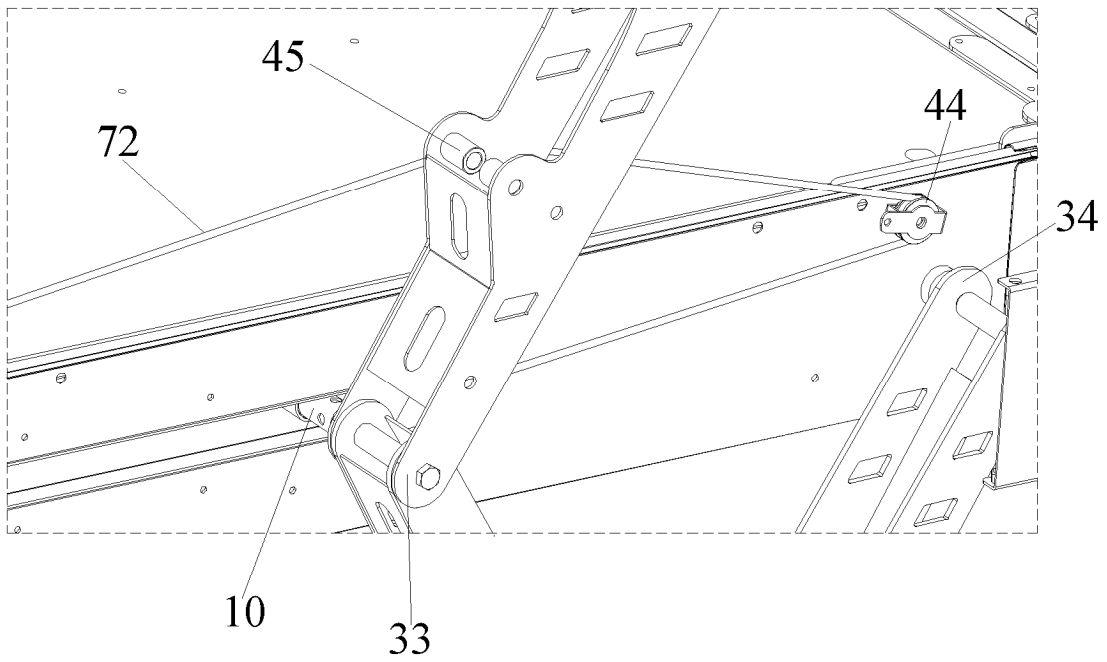


FIG. 13

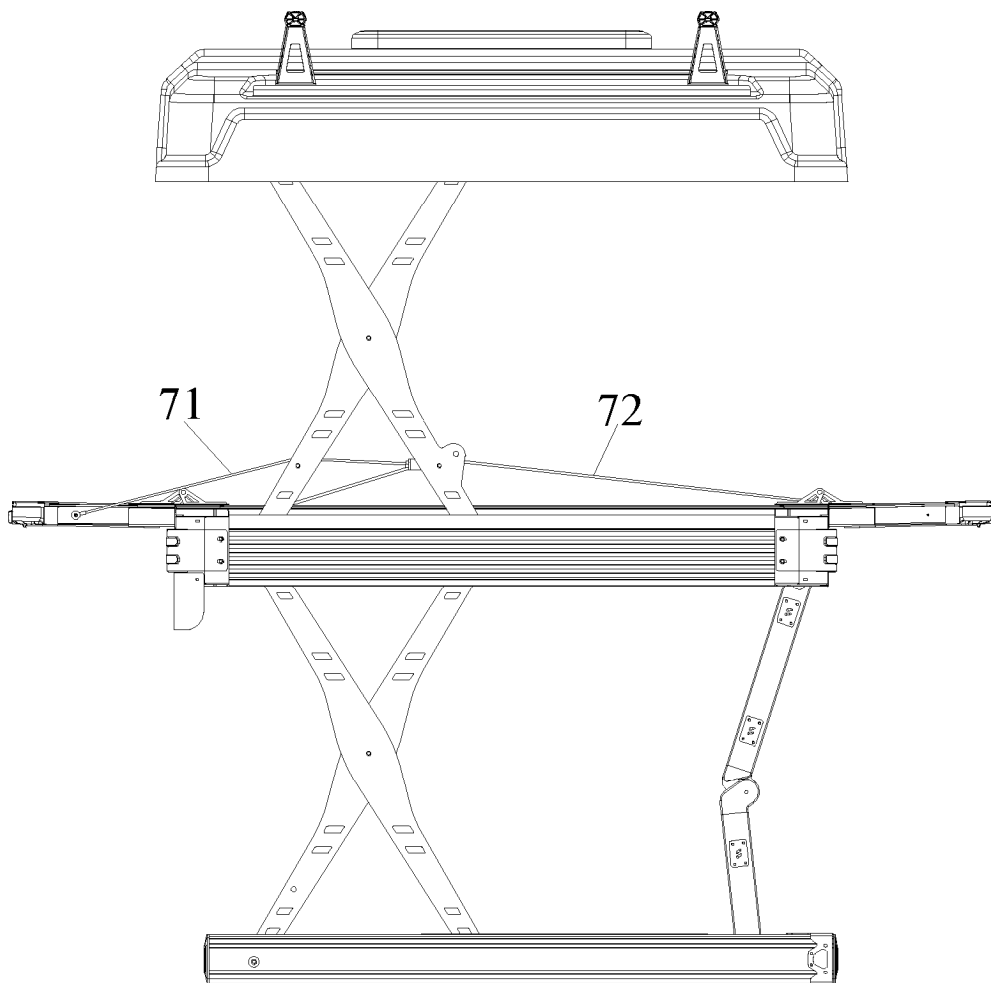


FIG. 14

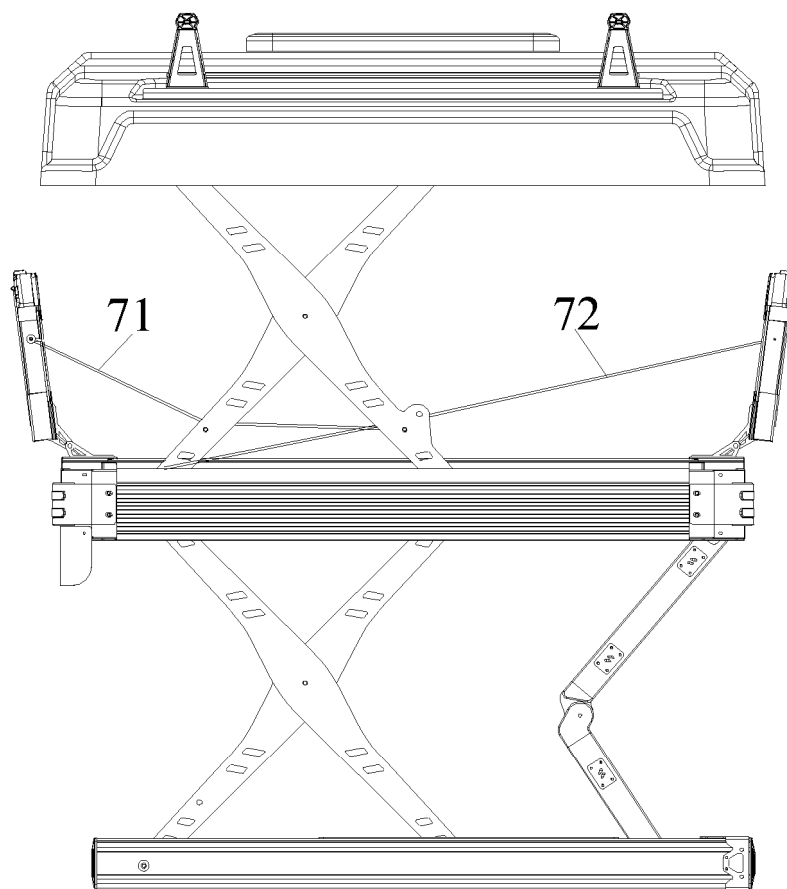


FIG. 15

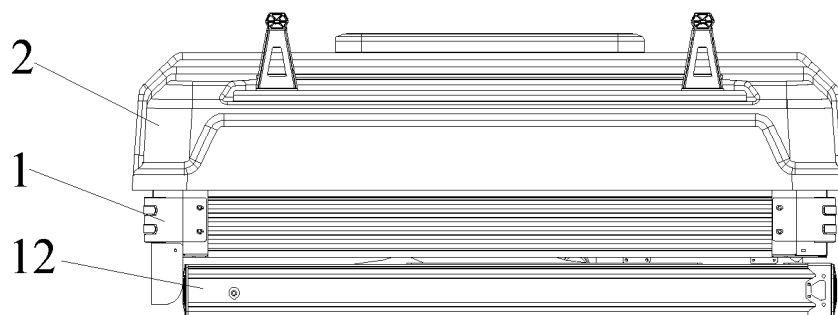


FIG. 16

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2024/126465

A. CLASSIFICATION OF SUBJECT MATTER

E04H15/06(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)

IPC:E04H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

CJFD, CNTXT, ENTXTC, VEN, WFB, WFCPP, WFC, WFCJ, WFCOA, WFCSTA, WFFCP, WFFD, WFFJ, WFFOA, WFS, WFSTR, CNKI: 侧板, 床板, 弹, 翻板, 翻动, 翻折, 翻转, 拉线, 露营, 罗云林, 毛慕华, 扭簧, 秋野地, 绳, 收纳, 收折, 丝, 旋转, 展开, 帐篷, 折叠, 周南庆, 转动

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 118407661 A (WILD LAND (XIAMEN) OUTDOOR EQUIPMENT TECHNOLOGY CO., LTD.) 30 July 2024 (2024-07-30) claims 1-10	1-10
E	CN 222350397 U (WILD LAND (XIAMEN) OUTDOOR EQUIPMENT TECHNOLOGY CO., LTD.) 14 January 2025 (2025-01-14) claims 1-10	1-10
A	CN 117967121 A (WILD LAND (XIAMEN) OUTDOOR EQUIPMENT TECHNOLOGY CO., LTD.) 03 May 2024 (2024-05-03) description, paragraphs 55-58, and figures 1-4	1-10
A	CN 110067310 A (HANDAN FUXING ZHONGHUAN ENVIRONMENTAL PROTECTION TECHNOLOGY SERVICE CO., LTD.) 30 July 2019 (2019-07-30) description, paragraphs 15-17 and 25, and figures 1-13	1-10
A	CN 118025023 A (WILD LAND (XIAMEN) OUTDOOR EQUIPMENT TECHNOLOGY CO., LTD.) 14 May 2024 (2024-05-14) entire document	1-10

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

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

01 February 2025

Date of mailing of the international search report

06 February 2025

Name and mailing address of the ISA/CN

China National Intellectual Property Administration (ISA/
CN)
China No. 6, Xitucheng Road, Jimenqiao, Haidian District,
Beijing 100088

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/CN2024/126465

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
CN	118407661	A	30 July 2024	CN	222350397	U	14 January 2025
CN	222350397	U	14 January 2025	CN	118407661	A	30 July 2024
CN	117967121	A	03 May 2024	CN	222101653	U	03 December 2024
CN	110067310	A	30 July 2019	CN	210562640	U	19 May 2020
CN	118025023	A	14 May 2024	CN	221623653	U	30 August 2024

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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