



US 20070120386A1

(19) **United States**

(12) **Patent Application Publication**
Benysh et al.

(10) **Pub. No.: US 2007/0120386 A1**

(43) **Pub. Date: May 31, 2007**

(54) **TEMPORARY LIFTING DEVICE FOR AN ELECTRONIC CHASSIS**

(22) Filed: **Nov. 30, 2005**

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Publication Classification

(51) **Int. Cl.**
A45F 5/00 (2006.01)

(52) **U.S. Cl.** **294/153**

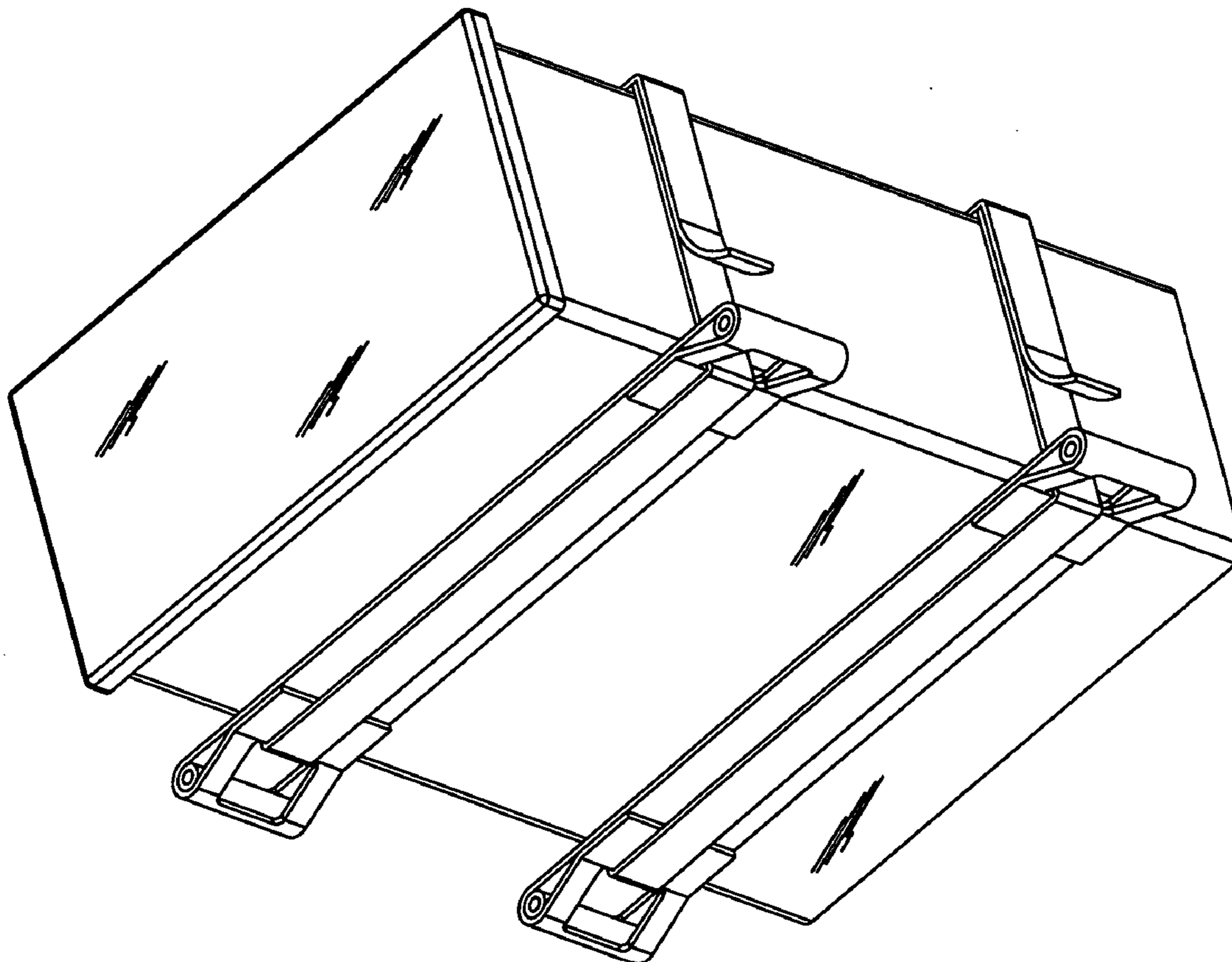
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(57) **ABSTRACT**

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Embodiments of the present invention provide a temporary lifting device for electronic chassis such as a server chassis. The lifting device comprises a customized sling connected to a server using a strap to secure the server on the sling. The strap can be removed to detach the server from the sling as it is installed in a rack.

(21) Appl. No.: **11/290,886**



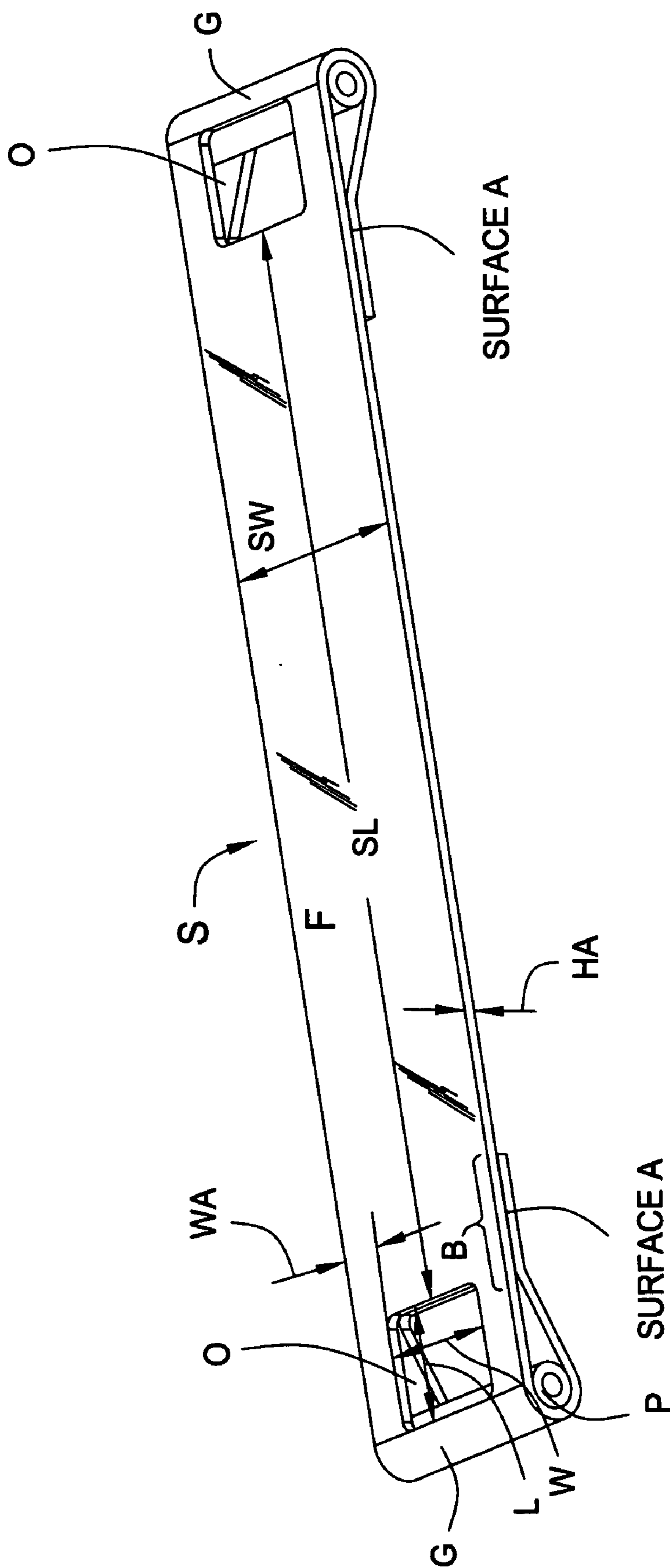


FIGURE 1

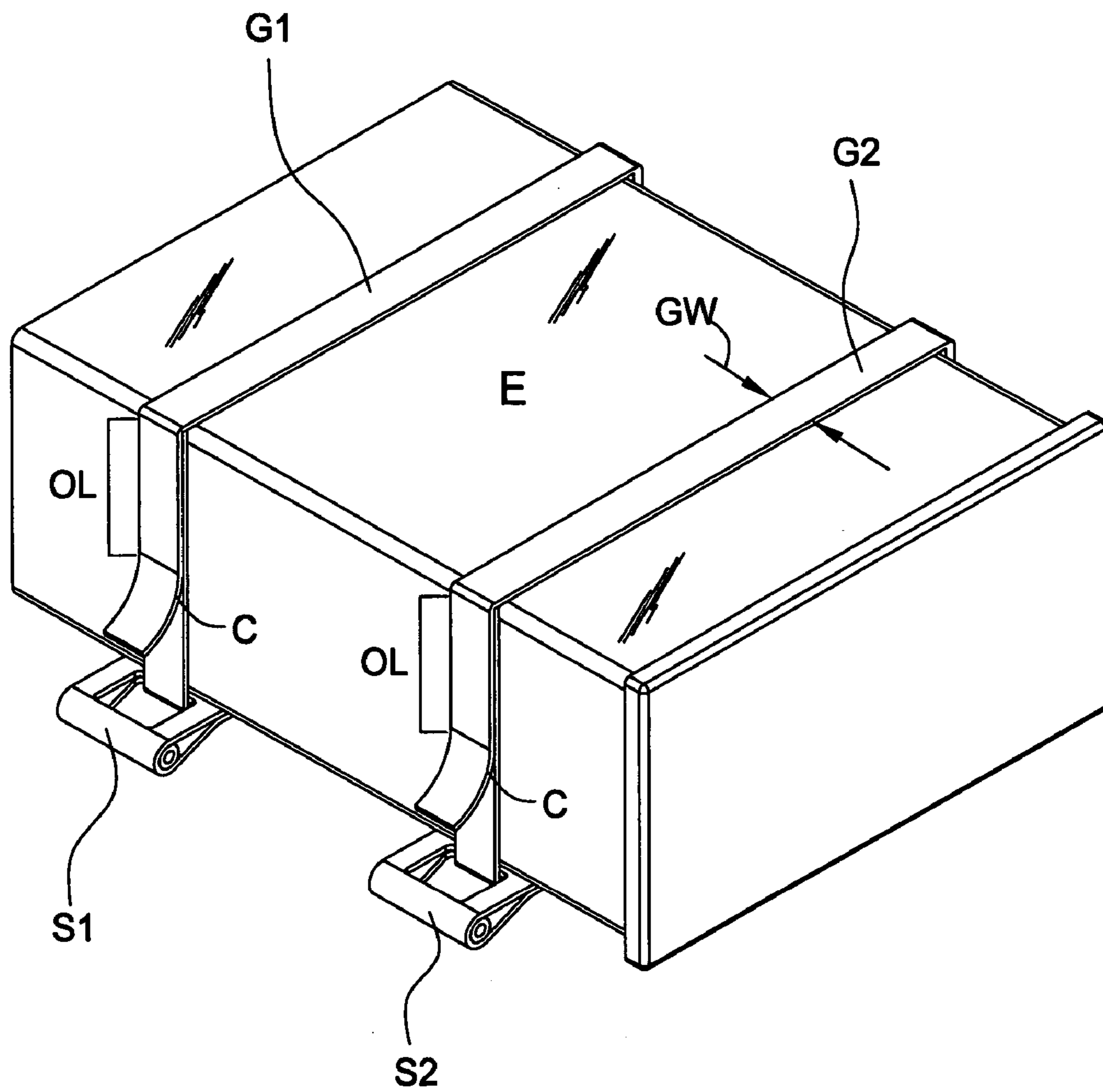


FIGURE 2A

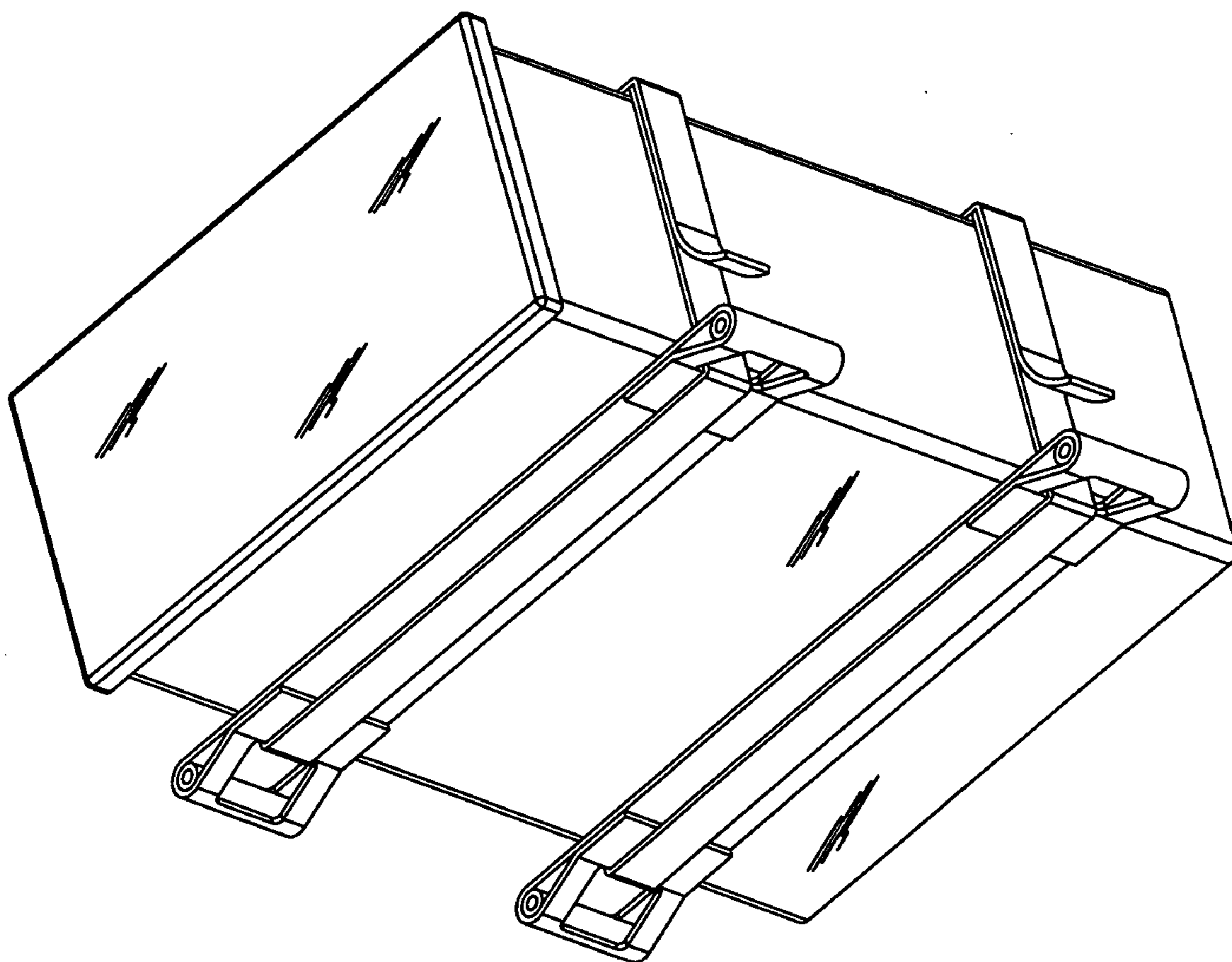


FIGURE 2B

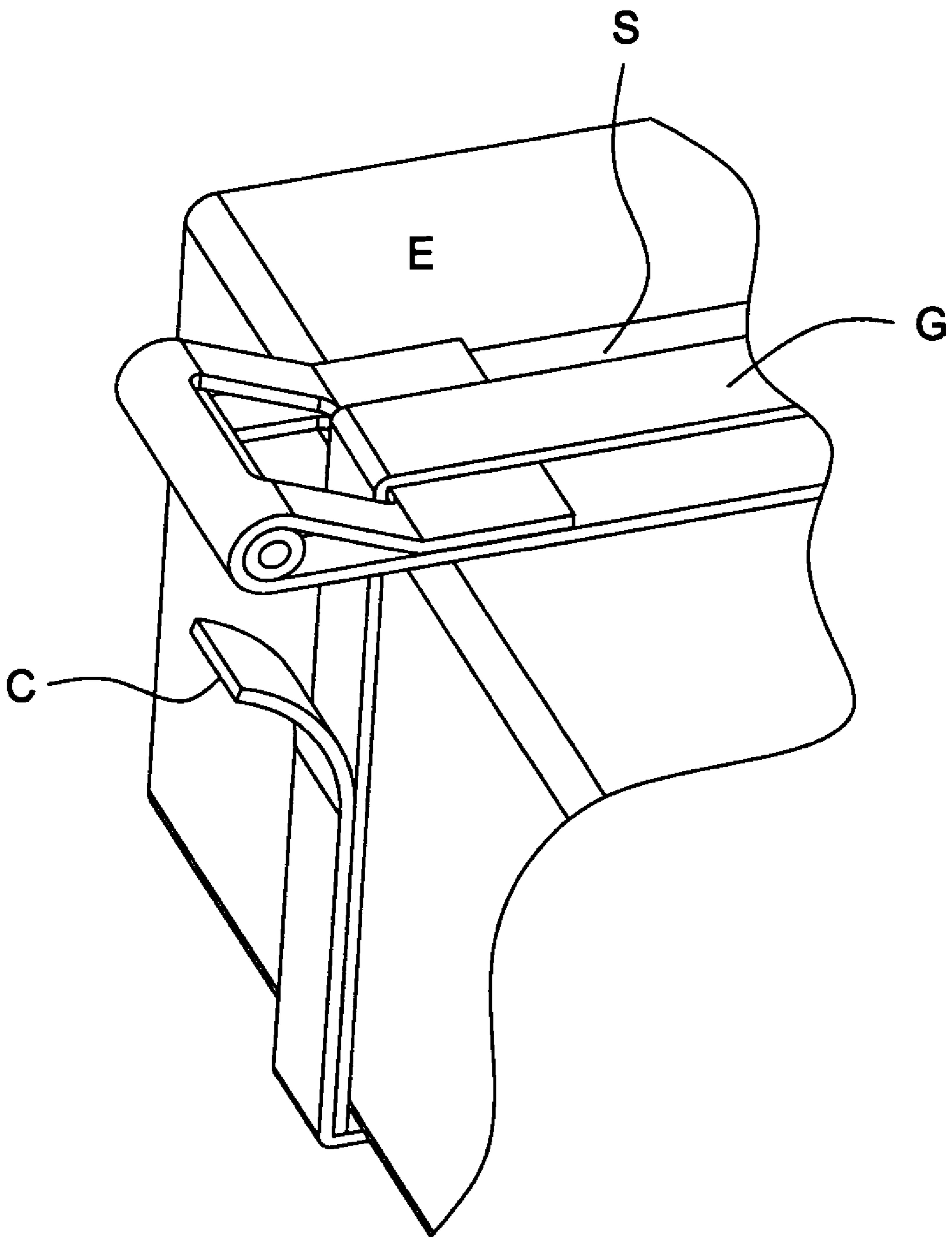


FIGURE 3

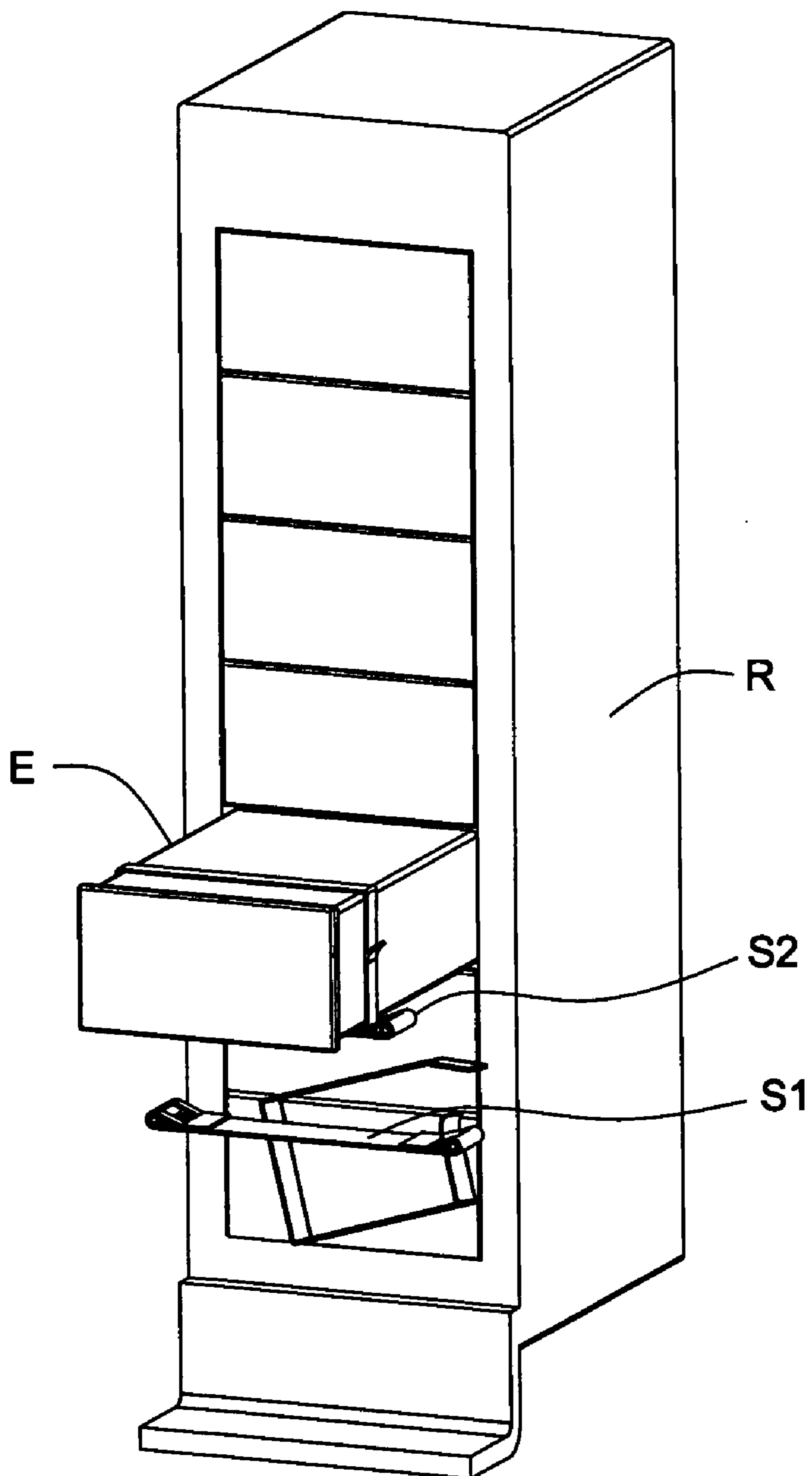


FIGURE 4A

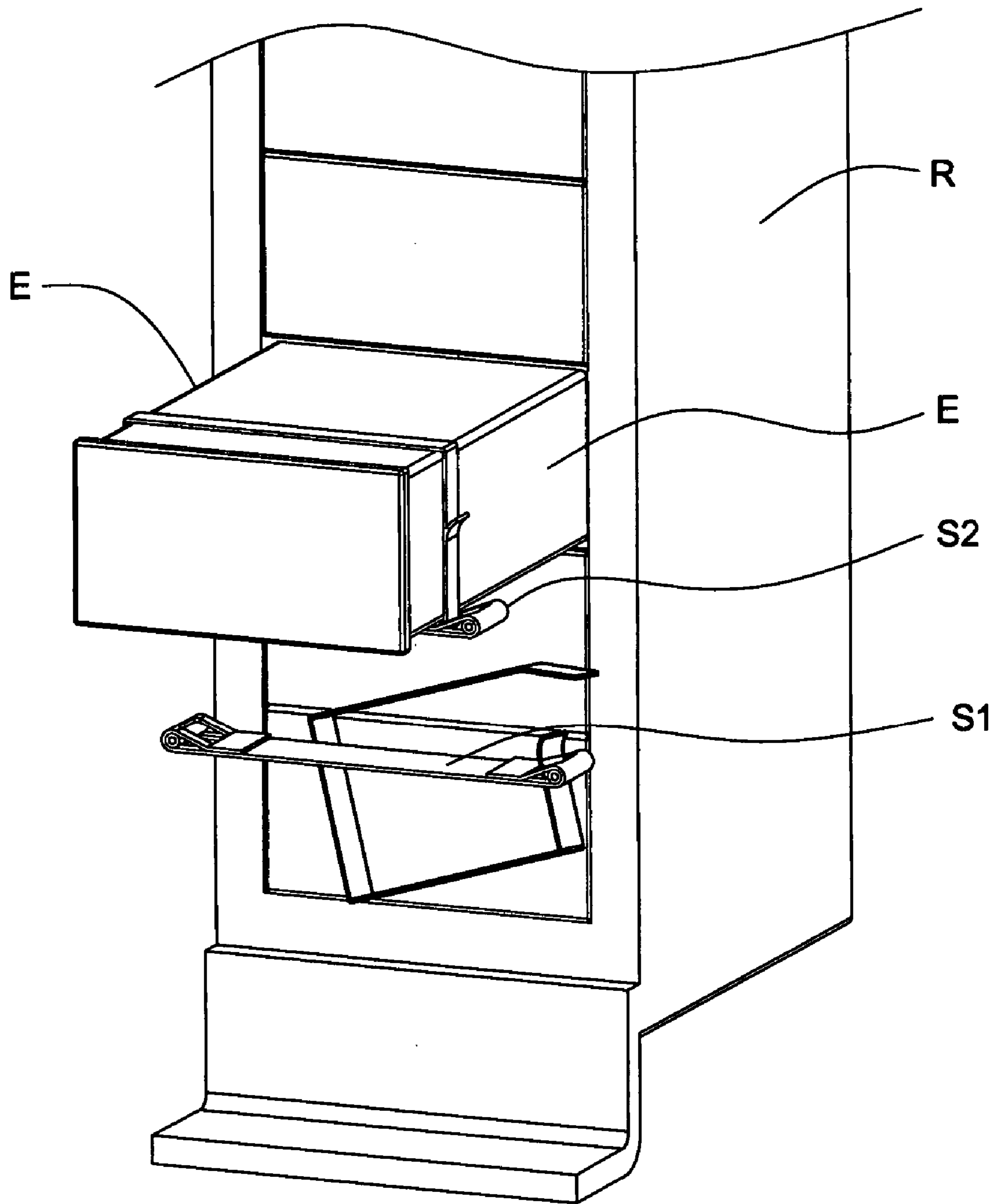


FIGURE 4B

TEMPORARY LIFTING DEVICE FOR AN ELECTRONIC CHASSIS

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention generally relates to temporary lifting devices for electronic chassis such as server chassis.

[0003] 2. Description of the Related Art

[0004] An organization may maintain several servers to store and process large volumes of data, software and provide other network services. These servers are typically placed in one or more racks in a server room. Racks are typically box-like structures with shelves to house one or more servers. Servers may be placed in the rack by lifting the server and sliding it into a shelf or onto slides or rails in the rack.

[0005] One problem with placing servers in a rack is that servers can be quite heavy and difficult to handle while lifting. Therefore, servers typically include handles that are integrated into the frame of the product. However, adding permanently integrated handles has several disadvantages. First, the cost associated with including the permanent handles may be prohibitive, making the product less feasible to manufacture and adding too much cost to pass along to customers. Second, rack mounted servers have become increasingly complex and packed with several components. However, because each server must fit into the predefined configuration and dimensions of the rack, any additional features or components must fit within the dimensional limitations. The handles, which are used only for lifting, may occupy valuable space that could be used to add such desirable features and components.

[0006] Therefore, what is needed is an apparatus and method for providing inexpensive, temporary and/or disposable handles to safely lift, move and install a rack mountable server in a rack.

SUMMARY OF THE INVENTION

[0007] Embodiments of the present invention generally provide methods and apparatus for temporarily lifting electronic chassis such as server chassis for rack installation.

[0008] One embodiment provides a method for installing a server chassis into a server rack using a temporary lifting device. The method generally includes placing the server chassis on top of at least one server sling comprising a handle at both ends of the server sling, the server sling being customized to hold the server chassis. The method further includes fastening the server chassis to the one or more slings using one or more straps to bind each server sling to the server chassis wherein the straps wrap around the server chassis and the server sling through an opening at both ends of the server chassis. The method further includes lifting and moving the server chassis using the one or more server slings, inserting one end of the server chassis into the server rack, removing each of the one or more straps to detach each server sling from the server chassis as the server chassis is inserted into the server rack, and sliding the server into the server rack.

[0009] Another embodiment of the invention provides a temporary server chassis lifting device generally comprising a server sling and a strap. The server sling generally comprises a customizable server chassis holding surface, a handle at both ends of the sling to carry the sling, and an opening at both ends of the sling, the openings being provided to allow for clasping a human fist around the handle and for strapping the sling to the server chassis. The strap fastens the server chassis to the sling by wrapping around the server and the sling, through the openings at both ends of the sling.

[0010] Another embodiment provides a kit that includes a temporary server chassis lifting device and an instruction manual. The instruction manual includes instructions for operating the server sling to install a server chassis into a server rack. In one embodiment, the instructions define user steps including placing the server chassis on top of the server sling; fastening the server chassis to the sling using the strap to bind the server sling to the server chassis wherein the strap wraps around the server chassis and the server sling through the openings at both ends of the server chassis; lifting and moving the server chassis using the server sling; inserting one end of the server chassis into the server rack; removing the strap to detach the server sling from the server chassis as the server chassis is inserted into the server rack; and sliding the server into the server rack.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] So that the manner in which the above recited features, advantages and objects of the present invention are attained and can be understood in detail, a more particular description of the invention, briefly summarized above, may be had by reference to the embodiments thereof which are illustrated in the appended drawings.

[0012] It is to be noted, however, that the appended drawings illustrate only typical embodiments of this invention and are therefore not to be considered limiting of its scope, for the invention may admit to other equally effective embodiments.

[0013] FIG. 1 is an illustration of an exemplary server sling according to one embodiment of the invention.

[0014] FIGS. 2A and 2B illustrate how a server may be secured to two server slings using straps, according to one embodiment of the invention.

[0015] FIG. 3A is a close-up bottom view of a server secured to a sling using a strap, according to one embodiment of the invention.

[0016] FIGS. 4A and 4B illustrate detachment of the slings during rack installation, according to one embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] Embodiments of the present invention provide a temporary lifting device for electronic chassis such as a server chassis. The lifting device comprises a customized sling connected to a server using a strap to secure the server on the sling. The strap can be removed to detach the server from the sling as it is installed in a rack.

[0018] In the following, reference is made to embodiments of the invention. However, it should be understood that the invention is not limited to specific described embodiments. Instead, any combination of the following features and elements, whether related to different embodiments or not, is contemplated to implement and practice the invention. Furthermore, in various embodiments the invention provides numerous advantages over the prior art. However, although embodiments of the invention may achieve advantages over other possible solutions and/or over the prior art, whether or not a particular advantage is achieved by a given embodiment is not limiting of the invention. Thus, the following aspects, features, embodiments and advantages are merely illustrative and not considered elements or limitations of the appended claims except where explicitly recited in the claim(s). Likewise, reference to “the invention” shall not be construed as a generalization of any inventive subject matter disclosed herein and shall not be considered to be an element or limitation of the appended claims except where explicitly recited in a claim(s).

[0019] FIG. 1 illustrates an exemplary sling S according to one embodiment of the invention. As illustrated, the sling may have a gripping surface G at either end to provide handles for lifting the sling. The gripping surface may be curved to fit the contours of the human hand so that a firm grip may be attained when lifting the sling. Curved surface G may be achieved by bending the ends of the sling and bonding the ends of the sling along surfaces A as illustrated. The length B of surface A may be any length that is sufficiently large to ensure that the integrity of the sling is maintained while in use. One skilled in the art will recognize that the length B, for example, may depend on the material of the sling, bonding method or material and weight restrictions for the sling, among other factors.

[0020] Furthermore, sling S may also have openings O at either end of the sling to enhance the ability to grip the sling. The openings O may have a width W wide enough to allow the fingers of a human hand to wrap around the gripping surface, thereby allowing for a firmer grip. Openings O may also have a length L. Length L may depend on the dimensions of a particular server footprint. For example, length L may depend on server length. Therefore, length L may be long enough so that length SL of surface F of sling is at or near the server length. In one embodiment of the invention, openings O may be made by using a laser cutting process. However, one skilled in that art will recognize that any reasonable means for cutting sling S to make openings O may be used. Accordingly, in one embodiment, the openings O are formed in a monolithic piece of material from which the sling S is fabricated.

[0021] The cuts made to create openings O may leave sharp edges along the gripping surface G. Therefore, in one embodiment, cylindrical pressboard tubes P are placed inside the curvature at the ends of Sling S. The curved surface of the cylindrical pressboard tubes P may prevent cuts (to the operator's hands) caused by gripping Sling S along the gripping surface G and the edges of opening O. In one embodiment of the invention, Sling S may be made from reinforced cardboard. Therefore, pressboard tubes P may be provided to prevent paper cuts. However, one skilled in the art will recognize that any appropriate material, such as wood or metal, may be used to make sling S. The choice of material, for example, may depend on the cost, weight,

strength and elasticity among other properties of the material. The physical properties of the material may also be a factor determining the width WA and height HA of the sling illustrated in FIG. 1.

[0022] FIGS. 2A and 2B are examples of how a server E may be mounted on a pair of slings S1 and S2. The two slings S1 and S2 may be placed parallel to each other and the server E may be placed on the surfaces F of slings S1 and S2. Server E is fastened to the slings using straps G1 and G2. For example, Strap G1 is run along the top of the server chassis, through an opening O of sling S1, as illustrated in FIG. 2A. The strap is also run along the bottom surface of sling S1, through the other opening O of sling S1 (as illustrated in FIG. 2B), and back around to the top of the server. Similarly strap 2 is used to fasten server E to sling S2.

[0023] The length of straps G1 and G2 may be such that there is an overlap when they are wrapped around the server E to fasten it to slings S1 and S2. The straps may be bonded to themselves along the overlap length OL as illustrated. The overlap length OL, along which the strap is bonded to itself, may depend on the strength of the bonding or bonding method used. The bonding itself may be sufficiently strong to fasten the server to the sling as the server is being lifted and moved, while at the same time being removable to detach the sling from server during rack installation. In one embodiment of the invention, the straps may be thermally bonded along the overlap length OL. However, one skilled in the art will recognize that any reasonable means for bonding, Velcro or a buckle for example, may be used in a manner that accomplishes the above stated goals of bonding the straps.

[0024] In one embodiment of the invention, to facilitate unstrapping, one end of the strap along the bonding length may be left unbonded to create a flap C, as illustrated. The strap may therefore be removed by pulling flap C to unstrap the sling. While a flap is described above and in the figures as a means for unstrapping, embodiments of the invention are not limited to using flaps for unstrapping. One skilled in the art will recognize that any reasonable means for removing the strap, such as cutting the strap, may be used.

[0025] The width of the strap GW may be smaller than the width W of opening O to facilitate passing the strap through the openings. The width of the strap may also depend on cost and strength of the strapping material, among other factors.

[0026] FIG. 3 is a bottom view of a server E strapped to a sling S according to an embodiment of the invention. As illustrated, the strap G is run along the server and the bottom of sling S through an opening to secure the sling to the server. Strap G is bonded to itself, and a flap C is provided to facilitate detachment of the sling from the server.

[0027] While the above descriptions illustrate the server E being mounted on two slings, one skilled in the art will recognize that one advantage of at least one embodiment of the present invention is that any number of slings may be used. Due to their temporary nature and detachability, any number of slings may be attached to any number of locations along the dimensions of the server. The number of slings attached may depend, for example on the number of persons required to lift the server, the weight of the server and the strength of the sling material, among other factors.

[0028] Another advantage of using a detachable sling according to embodiments of the present invention is the

relative ease of rack installation. FIGS. 4A and 4B illustrate how a server E attached to two slings S1 and S2 may be installed in a rack R. One end of the server E is first placed into an opening in the rack R, as illustrated in FIG. 4A. As shown in FIG. 4A, sling S1 may be detached from the server, for example, by pulling the flap along the strap to free the sling. The server may be slid into the rack for some distance so that more of the server weight is transferred into the rack. Sling S2 may be removed the same way that sling S1 was removed. The server may then be fully secured in the rack by sliding it all the way into the rack.

[0029] FIG. 4B is a close-up view of FIG. 4A and illustrates rack installation. An advantage of this method of rack installation is that control of the server may be maintained as it is being installed in a rack. During rack installation it is likely that the server will be tilted and turned to maneuver it into an empty shelf on a rack. This may especially be true if the shelf into which the server is installed is a high shelf. Securing the server to the sling ensures that the server does not slide along the sling and fall when such tilting and turning occurs.

[0030] In some embodiments the handles of the sling may bend around the edges of the server as shown in FIG. 4B. As illustrated, the handles of slings S1 and S2 bend upwards when the server is lifted, thereby creating a well to further secure the server on the slings.

[0031] It is also contemplated the sling may be distributed with an instruction manual. The instruction manual may be a printed sheet, a booklet, a pamphlet or even a CD-ROM or other article of manufacture. The instruction manual may also be made available via Internet download instead of, or in addition to, being distributed (sold) with the sling. The instruction manual includes instructions for operating the server sling to install a server chassis into a server rack. In one embodiment, the instructions define user steps including placing the server chassis on top of the server sling; fastening the server chassis to the sling using the strap to bind the server sling to the server chassis wherein the strap wraps around the server chassis and the server sling through the openings at both ends of the server chassis; lifting and moving the server chassis using the server sling; inserting one end of the server chassis into the server rack; removing the strap to detach the server sling from the server chassis as the server chassis is inserted into the server rack; and sliding the server into the server rack.

Conclusion

[0032] Accordingly, embodiments for transporting servers are provided. In particular, embodiments for transporting servers onto racks are provided. In one embodiment, a sling is provided which may be inexpensive, temporary and/or include disposable or consumable elements (e.g., handles). In one aspect, such a sling may allow a server to be firmly attached to the sling and prevent the server from sliding as it is moved around, thereby reducing the possibility of the server being dropped and damaged. Furthermore, the slings may be sized proportionate to the server footprint, thereby reducing the possibility of the server sliding along the sling and facilitating installation of the server in a rack.

[0033] While the foregoing is directed to embodiments of the present invention, other and further embodiments of the

invention may be devised without departing from the basic scope thereof, and the scope thereof is determined by the claims that follow.

What is claimed is:

1. A method for installing a server chassis into a server rack using a temporary lifting device comprising:

placing the server chassis on top of at least one server sling comprising a handle at both ends of the server sling, the server sling being customized to hold the server chassis;

fastening the server chassis to the one or more slings using one or more straps to bind each server sling to the server chassis wherein the straps wrap around the server chassis and the server sling through an opening at both ends of the server chassis;

lifting and moving the server chassis using the one or more server slings;

inserting one end of the server chassis into the server rack;

removing each of the one or more straps to detach each server sling from the server chassis as the server chassis is inserted into the server rack; and

sliding the server into the server rack.

2. The method of claim 1, wherein the server slings are parallel to one another when strapped to the server chassis.

3. The method of claim 1, wherein the overlapped portion comprises a portion at the end of the strap that is not bonded to the strap to create a flap, the flap facilitating the removing of the strap to detach the server sling from the server chassis.

4. The method of claim 3, wherein the overlapped portion comprises a portion at the end of the strap that is not bonded to the strap to create a flap, the flap facilitating the removing of the strap to detach the server sling from the server chassis.

5. The method of claim 1, wherein the server sling is made from reinforced cardboard.

6. The method of claim 1, wherein customizing the server sling comprises adjusting the size of the opening.

7. The method of claim 1, wherein the handles at both ends of the server sling comprise a pressboard tube.

8. The method of claim 1, wherein the handle comprises the opening.

9. The method of claim 1, wherein the handles bend around the edge of the server chassis.

10. A temporary server chassis lifting device, comprising:

a server sling, comprising:

a customizable server chassis holding surface;

a handle at both ends of the sling to carry the sling; and

an opening at both ends of the sling, the openings being provided to

allow for clasping a human fist around the handle and for strapping the sling to a server chassis; and

a strap, wherein the strap fastens the server chassis to the sling by wrapping around the server chassis and the sling, through the openings at both ends of the sling.

11. The temporary server chassis lifting device of claim 10, wherein the handle of the server sling comprises the opening in the server sling.

12. The temporary server chassis lifting device of claim 10, wherein the strap wrapped around the server chassis and the server sling is overlapped, wherein the overlapped portions are bonded together.

13. The temporary server chassis lifting device of claim 12, wherein the overlapped portion of the strap comprises a portion at the end of the strap that is not bonded to create a flap, the flap facilitating the removing of the strap to detach the server sling from the server chassis.

14. The temporary server chassis lifting device of claim 10, wherein the server sling is made from reinforced cardboard.

15. The temporary server chassis lifting device of claim 10, wherein the size of the openings in the server sling is adjusted to customize the server sling to a particular server.

16. The temporary server chassis lifting device of claim 10, wherein the handles at the ends of the server sling comprise a pressboard tube.

17. The temporary server chassis lifting device of claim 10, wherein the handles bend around the edge of the server chassis.

18. A kit, comprising:

a) a server sling, comprising:

- a customizable server chassis holding surface;
- a handle at both ends of the sling to carry the sling; and
- an opening at both ends of the sling, the openings being provided to allow for clasping a human fist around the handle and for strapping the sling to a server chassis;

b) a strap, wherein the strap fastens the server chassis to the sling by wrapping around the server chassis and the sling, through the openings at both ends of the sling; and

c) an instruction manual including instructions for operating the server sling to install a server chassis into a server rack; the instructions defining user steps comprising:

placing the server chassis on top of the server sling;

fastening the server chassis to the sling using the strap to bind the server sling to the server chassis wherein the strap wraps around the server chassis and the server sling through the openings at both ends of the server chassis;

lifting and moving the server chassis using the server sling;

inserting one end of the server chassis into the server rack;

removing the strap to detach the server sling from the server chassis as the server chassis is inserted into the server rack; and

sliding the server into the server rack.

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