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(71) Applicant: **Ogawa Tent Co., Ltd.**
Tokyo (JP)

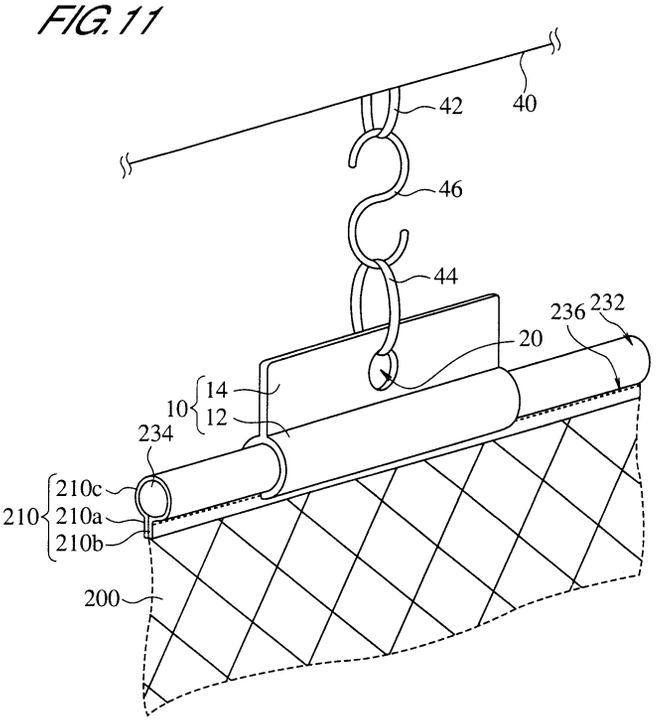
(72) Inventor: **Suzuki, Michiharu**
Koto-ku, Tokyo (JP)

(74) Representative: **Price, Paul Anthony King et al**
D. Young & Co.,
21 New Fetter Lane
London EC4A 1DA (GB)

(54) Suspension element and suspended member

(57) The operation of mounting and removing an inner sheet or safety net on the inside wall of a container is made simpler, labor is alleviated and working time is shortened. A suspension element (10) has a retaining body (12) that holds an inner sheet (30) or a net (200) and a coupling part (14) that is coupled with container inside wall (40) and is provided integrally with the retaining body. The retaining body is of tubular shape having a gap (18) provided in linear fashion along tube axis (16). The inner sheet or a net is provided with linear projections (32, 232). The shape and size of the transverse cross-section of the projections are substantially uniform in the direction of extension of such projections. The projections fit within the tube of the tubular body in a condition in which the suspension element can slide along the projection in question.

FIG. 11



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Description

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The present invention relates to a suspension element for suspending a suspended member in a suspension and fixing location, in particular to a suspension element employed for suspending an inner sheet within a container or employed for suspending a falling object prevention net for catching falling objects suspended on structural members in a location where catching of falling objects is necessary.

[0002] Furthermore, the present invention relates to a suspended member adapted to be suspended by this suspension element, in particular, a sheet or a net.

Description of Related Art

[0003] Containers are employed for transporting cargo in aircraft and ships. During transportation of the container, a container inner bag is employed as a countermeasure to deal with smells or other contamination within the container, or as a countermeasure for dampness. The presence of dampness produces condensation on the inside wall of the container and/or the outer surface of the inner bag. Or moisture adheres to the upper surface of the main body of the inner bag in the form of accumulations of water or water drops. Or again, water may accumulate on the bottom surface in the container. As a result, there is a risk that such moisture will cause contamination or damage to the cargo.

[0004] In order to protect the cargo from dampness within the container or in order to prevent contamination within the container caused by the cargo, inner bags have been proposed provided with a water-absorbent member or water-wetting prevention member on the outer surface of the inner bag (for example Laid-open Japanese Utility Model No. H.3-87696 and Published Japanese Utility Model No. H.3-12711).

[0005] Also, another means of protecting the cargo from dampness within the container is an inner sheet, different from the inner bag, called a wetting damage prevention sheet. Such a wetting damage prevention sheet is a member that is employed arranged facing the ceiling wall of the container. This wetting damage prevention sheet is provided with a water-absorbing member stuck on to it in the form of a strip in a desired location on the side facing the ceiling wall of the container.

[0006] Mounting of an inner sheet equipped with such water-wetting prevention on to the ceiling wall of the container is performed as follows. The description will now be given taking an inner sheet as an example. One adhesive face of a double-sided adhesive tape is stuck on to the ceiling wall side of an inner sheet. The inner sheet is then fixed on to the ceiling wall by sticking the other adhesive surface of the double-sided adhesive tape on to the ceiling wall of the container by pressing it on manually from one end to the other end.

[0007] However, this task of affixing the inner sheet manually requires some force and prolongs the working time. Also, sometimes the double-sided adhesive tape peels off either during the affixing operation or after affixing. Furthermore, after the inner sheet which has been stuck on by the double-sided adhesive tape is peeled off from the ceiling wall of the container, it is necessary to remove residual adhesive adhering to the ceiling wall. This involves extra labor and working time for the operation of adhesive removal.

[0008] Also, the mounting parts of the suspension elements provided on the container inside wall are arranged in different positions in different containers. Consequently, since the suspended portions of the inner sheet are usually fixed in position on the inner sheet, it is not possible to adjust the positions of the suspended portions of the inner sheet to correspond to the positions of the mounting elements on the container inside wall. This makes the operation of engaging the suspended portions with the mounting elements difficult. Or if some portions of the inner sheet cannot be thus engaged, they hang down, interfering with the operation of inserting or removing cargo.

[0009] Also, in the case of a net such as a safety net for catching falling objects, there are often restrictions on the points where this net may be fixed in regard to the structural members at the location where this is required. The positions of the points where the safety net is hung therefore cannot be adjusted: this increases the time required for hanging the net or, in the worst case, may make it impossible to hang the net at all.

[0010] The inventor of the present application, as a result of conducting various studies, arrived at the concept that, if techniques for coupling the inner sheet and inner wall of the container could be improved the task of mounting the inner sheet could be alleviated and the inner sheet could be prevented from coming off after mounting and furthermore the time required for the mounting operation could be shortened, without using double-sided adhesive tape.

[0011] The inventor further arrived at the concept that, by making this coupling means a coupling means of the sliding type, which is unlikely to malfunction, the coupling positions of the mounting elements and suspended portions could be adjusted and the operation of coupling these two thereby made even easier; furthermore, repeated use over a long time could be made possible.

[0012] It was further concluded that such coupling means could be applied not just to an inner sheet but to a wide range of suspended members including sheets and nets.

SUMMARY OF THE INVENTION

[0013] A first object of the present invention is to provide a suspension element whereby the labor required

for the task of suspending and detaching a suspended member can be alleviated, wherein the suspended member cannot come off after mounting, and wherein the time required for the task of mounting and detaching can be shortened.

[0014] A second object of the present invention is to provide a suspended member that is ideal when used coupled with this suspension element.

[0015] A third object of the present invention is to provide a suspended member equipped with this suspension element.

[0016] In order to achieve this first object, a suspension element for suspending a suspended member according to the present invention comprises a retaining body that holds the suspended member and a coupling part for coupling with a fixed suspension point, provided integrally with this retaining body. This retaining body is a tubular body provided with a linear gap along the tube axis.

[0017] Mounting of the suspended member on to a suspension element of such a construction is performed as follows. First of all, when the suspended member is a sheet, the sheet is wrapped in one layer on to a core such as a rope-shaped body or rod-shaped body that is narrower than the internal diameter of the tubular body constituting the retaining body but thicker than the width of the gap. The meeting surfaces of the sheet after it has been wrapped around are sewn together along the core. In this way, a linear projection is formed in the sheet. This projection is fitted into the tubular body of the suspension element by sliding the tubular body from the end of the projection. As a result, the sheet is held by the tubular body of the suspension element. Also, where the suspended member is a net, this projection may be a rope coupled with the net or a projection may be provided in the same way as in the case of the sheet described above on a border sheet provided coupled with the periphery of the net.

[0018] Such suspension elements are freely slidable along the projection and are not restricted to a single element but could be mounted in any desired number on a projection. Although the mounting parts provided in the container on a wall are positionally fixed, coupling can be effected with any desired mounting parts through the coupling parts of the suspension elements by sliding these suspension elements.

[0019] Since these suspension elements can be mounted one at a time on the mounting parts, the work is simple and easy, so the labor involved in the mounting operation is alleviated, and the time required for the mounting operation is shortened.

[0020] In putting this invention into practice, the coupling part may be preferably provided opposite the gap on the other side of the tube axis of the tubular body. With such a construction, when the coupling part of the suspension element is coupled with a fixed suspension point, the suspended member is positioned on the opposite side from the coupling part and so cannot interfere with the mounting operation; efficiency of the operation is thereby improved. In putting the present invention into practice, preferably, the transverse cross-section of the tubular body may be C-shaped or triangular-shaped. With such a construction, since the suspension elements have a construction wherein their transverse cross-sectional shape is annular with a gap in part thereof, the suspended member can be mounted in sliding fashion on the suspension elements.

[0021] Also, in preferred embodiments of the present invention, in view of manufacturing costs and ease of the suspension operation, the coupling part may be a plate-shaped body formed with a through-hole, a ring-shaped body, or a hook-shaped body, in accordance with the design.

[0022] In order to achieve the second object of the present invention, the suspended member may suitably be provided with a projection extending therealong and fitting into the interior of a tubular body. Thanks to the provision of such a projection, the suspended member can be held by the tubular body of a suspension element as described above without falling off.

[0023] According to a preferred embodiment of the present invention, when the suspended member is a sheet, this projection may be formed by covering a linear core by wrapping around it one layer of part of the sheet, and sewing together the meeting surfaces of the sheet where they meet after such covering. In this way, a linear projection whose transverse cross-sectional shape and diameter are uniform can be formed simply and easily, and the tubular body can be slidably fitted on to this projection. Also, if the suspended member is a net, this projection may be constituted by a rope coupled to the net, or a projection may be provided in the same way as in the case of the sheet described above in a border sheet by providing a border sheet coupled to the periphery of the net.

[0024] Preferably also this suspension element is formed of metal, synthetic resin or ceramics. If the suspension element is formed of such material, it can be made of light weight, so handling is facilitated and working efficiency is improved.

[0025] In order to mount this suspension element on a mounting part constituting a fixed suspension point, there may preferably be mounted on this coupling part a flexible cord-shaped body. By adopting such a construction, even if the coupling part is rigid, since the cord-shaped body mounted thereon is flexible, this cord-shaped body can easily be mounted individually on a mounting part constituting a fixed suspension point, thus facilitating the mounting operation.

[0026] Also, suitably, a freely extensible cord-shaped body may be mounted on this coupling part for coupling to a fixed suspension point. If such a freely extensible cord-shaped body is mounted on the coupling part, even if the coupling part and the mounting part of the fixed suspension location are a little separated, this can be mounted on the mounting part through the intermediary

of the cord-shaped body. The efficiency of the mounting operation is thereby improved.

[0027] A suspended member according to the present invention that is suspended using a suspension element on a fixed suspension point comprises a projection coupled with the suspension element and provided extending linearly therealong. The shape and size of the transverse cross-section of this projection are essentially uniform in the direction of extension of this projection. The shape and size of the transverse cross-section of this projection are formed matching the shape and size of the transverse cross-section of the inner wall face of the retaining body, such that this projection fits into the retaining body (tubular body) of the suspension element described above and the retaining body is free to slide along the projection. Consequently, the suspension element can be freely slidably mounted on the suspended member and moreover the suspension element can firmly hold this such that the suspended member does not fall out during the operation of mounting on the mounting part of the fixed suspension point or during use.

[0028] This projection may suitably be formed as already described. If this is done, a linear projection whose cross-sectional shape and diameter are uniform along the rope can be formed simply and easily, and the tubular body can be slidably fitted on to this projection. There is thus no possibility of impairment of the ability of the suspension element and projection to co-operate, or the slidability of the suspension element.

[0029] Preferably, the core described above is a rope and this rope is made of vinylon or hemp. Since a rope made of vinylon or hemp is flexible and strong, it has the advantages that a suspended member such as for example a sheet or net can be stored by folding up or stored by rolling up and furthermore is fully able to withstand repeated use.

[0030] Also, in order to achieve the third object of the present invention, with a suspended member fitted with suspension elements according to the present invention, suspension elements as described above and a suspended member as described above are provided. Thus, this projection is fitted into the tube of the tubular body of the suspension element such that the suspension element can be freely slid along this projection.

[0031] Thanks to the construction as above, since the suspension element and suspended member have the respective operational effects as described above, the task of mounting the suspended member on to the fixed suspension points becomes simple and easy, so labor is alleviated and the time required for the mounting operation can be shortened; furthermore, once fixing on to the fixed suspension points has been performed, there is no possibility of the suspension elements and suspended member becoming separated.

[0032] A suspended member as described above can suitably be the inner sheet of a container. In this case, the fixed suspension points are preferably the inside wall of the container. Also, this suspended member could suitably be a safety net i.e. a net for catching falling objects. In this case, the fixed suspension points may be any desired structural members at the periphery of the space or within the space where falling objects are to be caught.

BRIEF DESCRIPTION OF THE DRAWINGS

[0033] The foregoing and other objects, features and advantages of the present invention will be better understood from the following description taken in connection with the accompanying drawings; in which:

Fig. 1(A) is a front view of a suspension element according to the present invention, and Fig. 1(B) is a cross-sectional view sectioned along the line I-I of Fig. 1(A);

Fig. 2(A) is a transverse cross-sectional view illustrating an example of the transverse cross-sectional shape of a tubular body of this suspension element according to the present invention and Fig. 2(B) is a transverse cross-sectional view illustrating another example of the transverse cross-sectional shape of this tubular body;

Fig. 3(A) is a front view showing an example of the construction of a coupling part of a suspension element according to the present invention, Fig. 3(B) is a front view showing another example of the construction of a coupling part according to the present invention, and Fig. 3(C) is a side view showing an example wherein a coupling part according to the present invention is arranged on the circumferential surface of the tubular body facing in a direction perpendicular to the tube axis;

Fig. 4(A) is a partial perspective view given in explanation of an inner sheet constituting an example of a suspended member according to the present invention, and Fig. 4 (B) is a cross-sectional view sectioned along the line II-II of Fig. 4(A);

Fig. 5 is a perspective view showing how a suspension element constituting an example of a suspended member according to the present invention is mounted;

Fig. 6 is a diagram given in explanation of an example of a method of mounting an inner sheet constituting an example of a suspended member according to the present invention on the container ceiling wall using a suspension element according to the present invention, and illustrating the mounted condition;

Fig. 7 is a diagram given in explanation of a further example of a method of mounting an inner sheet constituting an example of a suspended member according to the present invention on a container ceiling wall using a suspension element according to the present invention, and illustrating the mounted condition;

Fig. 8 is a diagram given in explanation of a constructional example of an inner sheet constituting an example of a suspended member provided with a suspension element according to the present invention;

Fig. 9 is a diagram given in explanation of a further constructional example of an inner sheet constituting an example of a suspended member according to the present invention;

Fig. 10 is a diagram given in explanation of a constructional example of the inner sheet illustrated in Fig. 9;

Fig. 11 is a diagram given in explanation of a constructional example of a net constituting an example of a suspended member according to the present invention; and

Fig. 12 is a diagram given in explanation of a constructional example of the net constituting a net for catching falling objects illustrated in Fig. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0034] Embodiments of the present invention will be described below with reference to the drawings. It should be noted that the drawings that are referred to merely illustrate diagrammatically the shape, size and positional relationships of the various structural constituents so as to enable the construction of the present invention to be understood. Also, although the example construction described below is a preferred example of the present invention, the present invention is clearly not restricted in any way to such constructional examples.

[0035] In the description below, an inner sheet for a container and a net for catching falling objects are described as examples of the suspended member.

[0036] Fig. 1 is a view given in explanation of a constructional example of a suspension element according to the present invention; Fig. 1(A) is a front view of the suspension element, and Fig. 1(B) is a cross-sectional view showing sectioned along the line I-I of Fig. 1(A).

[0037] Suspension element 10 according to the present invention comprises a retaining body 12 and coupling part 14. Suspension element 10 is employed to suspend an inner sheet constituting a suspended member on a container inside wall constituting a fixed suspension point. Retaining body 12 has a construction that retains an inner sheet. Coupling part 14 is provided integrated with this retaining body 12. Also, this coupling part 14 is coupled with a mounting part provided on an inside wall of the container, for example the ceiling wall of the container, and suspension element 10 is suspended on this mounting part.

[0038] This retaining body 12 is a tubular body. This tubular body is provided with a gap 18 provided in linear fashion along the tube axis 16. Part of the inner sheet that is to be held suspended is held within the tube of tubular body 12, while the remaining portions of the sheet extend outside the tube from the gap. The width of this gap 18 should therefore be made such that the sheet portion that is held therein cannot fall out of the tube, as will be clear from the subsequent description.

[0039] In the constructional example of suspension element 10 shown in Fig. 1(A) and (B), the transverse cross-sectional shape of tubular body 12 is a C-shaped arc. Furthermore, coupling part 14 is a plate-shaped body formed with a through-hole 20. This plate-shaped coupling part 14 is provided along the entire length of the tubular body along this tube axis 16 on the outer surface of tubular body 12, but could be provided along part only of tubular body 12. Also, through-hole 20 could be provided at any suitable desired point in the plate-shaped body, but, in this constructional example, is provided at an intermediate position in the length direction of the tubular body.

[0040] Also, this coupling part 14 is provided at a position opposite gap 18 on the other side of tube axis 16 of tubular body 12. With such an arrangement, when tubular part 14 of suspension element 10 is coupled to the inside wall of the container, the inner sheet is positioned on the opposite side to the coupling part 14. It cannot therefore interfere with the operation of mounting the inner sheet, thus improving the efficiency of the operation.

[0041] Apart from a C-shaped arcuate shape, the transverse cross-sectional shape of tubular body 12 described above could be a rectangular C shape or triangular shape. The rectangular C-shaped transverse cross-sectional shape of such a tubular body is shown in Fig. 2(A). The triangular shape of the transverse cross-section of such a tubular body is shown in Fig. 2 (B). Thus, by making tubular body 12 of a ring-shaped construction in transverse cross-section, the suspension element has a structure which is of annular transverse cross-sectional shape with a gap formed in part thereof, so the inner sheet can be mounted in the suspension element in slidable fashion.

[0042] Also, with the aim of lowering manufacturing costs and facilitating the suspension operation, coupling part 14 may be made of a shape depending on the design, being either a plate-shaped body formed with a through-hole 20 as described above, or, instead, an annular body or hook-shaped body. Fig. 3(A) shows a front view of a constructional example in which the coupling part is constituted as an annular body 22. Also, Fig. 3 (B) shows a front view of a constructional example in which the coupling part is constituted as a hook-shaped body 24.

[0043] The construction shown in Fig. 3 (C) is an example in which the coupling unit is directed at right angles to the tube axis, on the circumferential surface of tubular body 12. This coupling part can be of any suitable desired shape depending on the design; in the example illustrated, it is shown as a lug-shaped element 28 formed with a through-hole 26 in the middle.

[0044] The tube diameter and length of the suspension element described above and the size and shape

of coupling part 14 can be determined as desired in accordance with the design with a view to ease of handling.

[0045] Also, this suspension element 10 is preferably formed of metal, synthetic resin or ceramics. If the suspension element is formed of such material, it can be made of light weight, facilitating handling and improving operating efficiency. For example, this suspension element 10 may desirably be formed of aluminum.

[0046] Next, a suspended member for example inner sheet employed coupled with a suspension element according to the present invention will be described. Fig. 4(A) is a partial perspective view given in explanation of the inner sheet and Fig. 4(B) is a cross-sectional view shown sectioned along the line II-II of Fig. 4 (A) . In the inner sheet 30 shown in this Fig. 4 (A) and Fig. 4 (B), the vicinity of the edge of the sheet is illustrated. This inner sheet 30 comprises a projection 32 in part thereof. This projection 32 is provided extending linearly, having a shape that can fit within tubular body 12 described above.

[0047] This projection 32 is therefore provided with a linear-shaped core 34. This core has a portion of inner sheet 30 wrapped around it in a single layer. The wrapped-round portion of this sheet is designated by 30c. The sheet portions on both sides of this wrapped-around portion 30c are respectively designated as 30a and 30b. The meeting surfaces of inner sheet portions 30a and 30b where these meet after being wrapped around are sewn together along core 34. These sewn-together portions are designated by 36 in Fig. 4 (B) and the seam is indicated by 38 in Fig. 4 (A) . By using a long core 34 of uniform transverse cross-sectional shape and diameter and sewing together a portion of inner sheet 30 after wrapping it around this core 34, a linear projection 32 can be formed simply and easily.

[0048] Since the inner sheet is stored by being folded up or rolled up, the core described above is preferably formed of strong flexible material. For example, this core may be a rope made of vinylon or hemp. A rope formed of vinylon or hemp has flexibility and high strength, so it has the advantage that the inner sheet can be stored by folding or stored by rolling up and can satisfactorily withstand repeated use.

[0049] Fig. 5 is a perspective view illustrating the condition in which suspension element 10 is mounted on projection 32 of inner sheet 30. Projection 32 formed as described above is inserted within the tube of tubular body 12 of suspension element 10 as described above from its end. When this is done, sheet seamed portion 36 fits within the gap 18 of tubular body 12. In this way, guided by projection 32, the suspension element mounted on inner sheet 30 is slid to a suitable location (shown by the arrow A in Fig. 5). In this way, thanks to the presence of this projection 32, when the suspension element is employed, this suspension element 10 can hold inner sheet 30 within tubular body 12 of this suspension element 10 without it falling. It should be noted that instead of just a single projection 32, any desired suitable number could be provided in accordance with the design.

[0050] Also, after suspension element 10 has been mounted on projection 32, suspension element 10 can be prevented from slipping off the end of projection 32 by tying the end 34a of core 34 or by increasing its diameter by some other technique.

[0051] Next, a method of mounting this suspension element 10 on the inside wall of the container will be described with reference to Fig. 6 and Fig. 7. The mounting parts of the container inside wall may have various types of shape. Suspension elements 10 may therefore be directly coupled to these mounting parts. Usually however, as shown in Fig. 6 and Fig. 7, they are of U shape, arranged projecting from the container inside wall 40.

[0052] In order to mount suspension element 10 on a mounting part 42 on container inside wall 40, for example the ceiling wall, as in the constructional example shown in Fig. 6, a C-ring 44 made for example of metal, synthetic resin or ceramics is mounted on coupling part 14 of this suspension element 10. This C-ring 44 is provided through the through-hole 20 provided in coupling part 14. One hook of a so-called S-shaped link (simply called an S link) 46 is hooked on to this C-ring 44, while the other hook of this S link 46 is hooked on to a mounting part 42. If this is done, the C-ring 44 and S link 46 are in a flexible condition, so, even if the direction of suspension element 10 and the direction of mounting part 42 do not coincide, S link 46 can be mounted on mounting part 42 with S link 46 directed in a direction in which it is easily mounted.

[0053] Alternatively, as in the constructional example shown in Fig. 7, mounting may be effected using a flexible cord-shaped body or freely extensible cord-shaped body. As such a cord-shaped body 48, for example a rubber cord may be employed. In this case, rubber cord 48 may be constituted in the form of a ring passing through through-hole 20 provided in coupling part 14 of suspension element 10. One hook of S link 46 described above may be hung on the ring of this rubber cord 48, while the other hook is mounted on mounting part 42. Thus, even if suspension element 10 itself is formed by a rigid body, since cord-shaped body 48 mounted thereon is flexible, this cord-shaped body 48 can easily be separately mounted on a container mounting part 42, facilitating the mounting operation.

[0054] In the case of a flexible cord-shaped body 48 as described above, the direction of S link 46 can be freely altered, so the operation of mounting S link 46 on to a mounting part 42 becomes straightforward. Also, if a freely extensible cord-shaped body 48 is employed, even if the distance between S link 46 and mounting part 42 is somewhat widened, S link 46 can still be hung on mounting part 42 by stretching cord-shaped body 48. Consequently, in this case also, suspension element 10 can easily be mounted on mounting part 42.

[0055] Also, instead of a cord-shaped body having either one of the properties of flexibility and extensibility,

a cord-shaped body having both these properties could be employed. If a cord-shaped body 48 having flexibility and/or extensibility is employed, the stretching condition of the inner sheet can be adjusted and the efficiency of the mounting operation can be improved.

[0056] Fig. 8 is a perspective view showing a constructional example of an inner sheet whereon a plurality of suspension elements are mounted. This inner sheet 50 is of rectangular shape. A water-wetting preventing member 52 is mounted in the middle of the sheet along the direction of elongation. Linear projections 54 and 56 are arranged in parallel on both sides of water-wetting preventing member 52. A plurality of suspension elements 64a ~ 64e and 66a ~ 66e are respectively fitted on to projections 54 and 56.

[0057] Also, a conventional mounting element is provided at both edges facing the longitudinal direction. At the two corners of one edge of inner sheet 50, there are provided for example carabiner-type mounting rings 70a and 70b. At the two corners of the other edge opposite thereto, there are provided for example buckle-type strap-shaped fastening elements 72a and 72b.

[0058] In order to mount such an inner sheet 50 fitted with suspension elements on to a container inner wall, for example the container ceiling wall, first of all, the mounting rings 70a and 70b on one edge side of the inner sheet are respectively hung on and coupled with the mounting part provided at one corner of the ceiling wall. Coupling is then effected in sequence on to the mounting parts of the ceiling wall, starting from the suspension element that was first coupled. Finally, the strap-shaped fastening elements 72a and 72b on the other edge side of the inner sheet are coupled with the mounting parts provided in the corners on the other side of the ceiling wall, and the stretched condition of the inner sheet is adjusted using the buckles. In this way, the inner sheet can be suspended on the inside wall of the container.

[0059] The inner sheet described with reference to Fig. 4 - Fig. 8 has a construction wherein the projections are provided in the inner sheet region from the periphery of the suspended member i.e. the inner sheet. However, in another preferred embodiment of the present invention, these projections may be provided at the periphery of the suspended member i.e. the inner sheet.

[0060] Fig. 9 shows a constructional example in which these projections are provided at the periphery of the suspended member i.e. the inner a sheet, and is a perspective view similar to Fig. 6. In the case of the constructional example of this sheet 30, a projection 32 is provided at the edge of the sheet. This projection 32, as already described with reference to Fig. 4(A) and (B), can be provided at the edge of sheet 30. In this way, temporary positional location can be effected by fitting in and sliding projection 32 provided at the sheet edge into the tubular body 12 of suspension element 10, from its end.

[0061] Fig. 10 is a perspective view showing an example in which projections are respectively provided along a portion, namely, in this constructional example, both edges, of the periphery of the inner sheet, a plurality of suspension elements being mounted on respective projections. Just as described with reference to Fig. 8, a water leakage prevention member 152, mounting rings 170a and 170b, buckle-type strap-shaped fastening elements 172a and 172b are provided on inner sheet 150. However, in contrast to the constructional example of a sheet shown in Fig. 8, in the constructional example of a sheet shown in Fig. 10, projections 154 and 156 are provided on both edges of inner sheet 150, along these edges. Suspension elements 164a, 164b, 164c, 164d and 164e are mounted on one projection 154 and suspension elements 166a, 166b, 166c, 166d and 166e are mounted on the other projection 156. In the case of the constructional example shown in Fig. 10, there is the advantage that there is no risk of portions at the edge of the inner sheet sagging downwards when inner sheet 150 is suspended.

[0062] Next, the results of comparative tests of an inner sheet employing the conventional double-sided adhesive tape and an inner sheet employing a suspension element according to the present invention will be described.

[0063] The inner sheets that were employed were both sheets of the 40-foot type, and were provided with a water-wetting preventing member having a water absorption capacity of 40 liters through the middle of the sheet, as shown in Fig. 10. In the case of the conventional sheet, double-sided adhesive tape was provided on both sides of the water-wetting prevention member. In contrast, in the case of the sheet according to the present invention, one row in each case of a plurality of suspension elements was arranged on each side of the water-wetting prevention member, as shown in Fig. 10.

[0064] When such inner sheets were actually mounted on the ceiling walls of identical containers, in the case of a sheet according to the present invention, mounting and removal was straightforward, little labor being needed for the operation, the respective operations being completed in about 10 minutes. In contrast, in the case of the prior art sheet, a considerable amount of labor was required to mount and remove it, taking a considerable working time, about twice the time i.e. 20 minutes being required until the respective operations were completed.

[0065] Also, in the case of a sheet according to the present invention, since it suffices simply to couple the suspension elements to the mounting parts on the container ceiling wall, there is no possibility of failure in mounting and removal. In contrast, in the case of the prior art sheet, since mounting involves sticking the sheet on whilst pressing on to it one adhesive face of the double-sided adhesive tape, the adhesive tape came off during the operation. Consequently, it had to be pressed back on again. Also, not only during this operation but also during use there is a risk of the sheet

itself coming off and falling down.

[0066] Furthermore, with the sheet according to the present invention, there was no contamination of the inside of the container by use of this sheet. In contrast, in the case of the conventional sheet, the inside wall surface was contaminated by adhesive left sticking on to it after use of the sheet. Consequently, further work was needed to remove this contamination.

[0067] Furthermore, in the case of a sheet according to the present invention, a condition in which re-use was possible was produced by replacing the water-wetting preventing member. In contrast, in the case of the conventional sheet, since adhesive had stuck to the sheet surface, it was in a condition in which re-use of the sheet was not possible.

[0068] Also, as regards overall costs, it was found that those of the sheet according to the present invention were lower than those of the conventional sheet.

[0069] Although in the description of the above embodiments, an inner sheet was taken as an example, the suspended member could be a net, for example a safety net or net for catching falling objects. Fig. 11 and Fig. 12 are perspective views showing diagrammatically constructional examples in which the suspended member is a net. In the case of the constructional example of the net shown in Fig. 11, a net border sheet 210 is provided at the edge of net 200. A projection 232 is provided on this border sheet 210 in the same way as in the case of the inner sheet already described. Specifically, this projection 232 comprises a linear core 234. This core 234 is covered by wrapping on to it part of the border sheet 210 as a single layer. The wrapped-around portion of this border sheet 210 is indicated by 210c. The sheet portions on both sides of this wrapped-around portion 210c are respectively indicated by 210a and 210b. Also, the meeting faces of inner sheet portions 210a and 210b where they meet after being wrapped around are sewn along core 234. This seam portion is indicated by 236. This border sheet 210 is coupled with the net during this sewing or separately from the sewing. The suspension elements 10 described above are then coupled to these projections 232. By means of such a construction, the net can be suspended at suitable fixed points by the same operation as in the case of suspending a sheet, as already described.

[0070] Fig. 12 shows a constructional example of a net wherein respective projections 240, 250, 260 and 270 are provided at the four sides (periphery) of a rectangular net. In this constructional example, a plurality, for example four respective suspension elements are freely slidably coupled to each projection. In the Figure, suspension elements provided on each projection are respectively representatively indicated by 245, 255, 265 and 275. Using these suspension elements, in the same way as in the case of the sheet already described, falling objects catching net 200 can be suspended and extended in a space so as to catch falling objects, for example. A net according to the present invention may in particular be suitably employed in the gap beside an elevator, the gap beside a stairway, at a site where civil engineering work is being carried out, or at other work sites etc.

[0071] As will be clear from the above description, with the suspension element and suspended member of the present invention, the following advantages can be obtained.

[0072] By fitting the suspension elements on to projections provided on the suspended member, the suspension elements are freely slidably mounted on the projections. Consequently, the suspension elements can be mounted on corresponding mounting parts by effecting positional adjustment of the suspension elements by moving the suspension elements one at a time to positions where they can be easily mounted on the prescribed mounting parts. Consequently, the mounting and removal operations become straightforward and easy, so the labor of the mounting and removal operations is alleviated and the working time required for the mounting and removal is shortened.

[0073] Furthermore, since mounting can be effected on to fixed suspension points without employing any sort of adhesive tape on the suspended member of the present invention, there can be no contamination of the fixed suspension points.

[0074] Furthermore, since the construction of the suspension elements and suspended member according to the present invention is straightforward, manufacturing costs can be kept low and re-use is feasible; also, the labor involved in the operation is alleviated and the working time is shortened, so, overall, costs are lower than those of prior art suspended members such as for example container inner sheets or nets for catching falling objects.

[0075] Suspension elements and suspended members according to the present invention are ideal in particular when applied to inner sheets for containers or nets for catching falling objects.

Claims

1. Suspension element(10) for suspending a suspended member(30, 200) at a fixed suspension point, comprising:

   a retaining body(12) for retaining the suspended member; and
   a coupling part(14) coupled with a fixed suspension point provided integrally with this retaining body wherein this retaining body is a tubular body provided with a linear gap(18) along the tube axis(16).

2. The suspension element according to claim 1, wherein the coupling part is provided at a position opposite the gap, on the other side of the tube axis (16) of the tubular body.

3. The coupling element according to claim 1, wherein the transverse cross-section of the tubular body is C-shaped.

4. The suspension element according to claim 1, wherein the transverse cross-section of the tubular body is triangular in shape.

5. The coupling element according to claim 1, wherein the coupling part is a plate-shaped body(14, 28) formed with a through-hole(20, 26).

6. The suspension element according to claim 1, wherein the coupling part is an annular body(22).

7. The suspension element according to claim 1, wherein the coupling part is a hook-shaped body (24).

8. The suspension element according to claim 1, wherein the suspended member(30, 200) is provided with a projection(32, 232) extending therealong for fitting into the inside of the tubular body(12).

9. The suspension element according to claim 1, wherein the suspension element is made of metal, synthetic resin, or ceramics.

10. The suspension element according to claim 1, wherein the coupling part has mounted thereon a flexible cord-shaped body(48) for coupling to the fixed suspension point.

11. The suspension element according to claim 1, wherein the coupling part has mounted thereon a freely extensible cord-shaped body(48) for coupling to the fixed suspension point.

12. The suspension element according to claim 1, wherein the suspended member is a sheet.

13. The suspension element according to claim 12, wherein the sheet is a container inner sheet(30).

14. The suspension element according to claim 1, wherein the suspended member is a net(200).

15. The suspension element according to claim 14 wherein the net is a net for catching falling objects.

16. The suspension element according to claim 8, wherein the suspended member is a sheet(30) and the projection(32) comprises a linear core(34) and a portion(30c) of the sheet that covers this core, being wrapped around it as a single layer, meeting faces of the sheet that meet after covering the core being sewn together.

17. The suspension element according to claim 16, wherein the core is a rope.

18. The suspension element according to claim 17, wherein the rope is made of vinylon or hemp.

19. The suspension element according to claim 8, wherein the suspended member is a net (200) and the projection(232) is a rope entwined with the net.

20. The suspension element according to claim 8, wherein the suspended member is a net (200) and the projection(232) comprises a linear core(234) and the border sheet(210) wherein meeting surfaces(210a, 210b) of the border sheet that meet by being wrapped around and covering the core in a single layer(210c), and the edge of this border sheet along the core is coupled with the peripheral region of the net.

21. The suspension element according to claim 1, wherein the fixed suspension point is an inner wall (40) of the container.

22. The suspension element according to claim 1, wherein the fixed suspension point is a structural member.

23. A suspended member(30, 200) for suspension by a suspension element(10) at a fixed suspension point, comprising:

a projection(32, 232) extending therealong for being coupled with the suspension element, the shape and size of the transverse cross-section of this projection being substantially uniform in the direction of extension of this projection.

24. The suspended member according to claim 23, this suspended member being a sheet(30), wherein the projection(32) is formed by covering a linear rope (34) by wrapping it in a single layer(30c) with part of this sheet and sewing together the meeting surfaces(30a, 30b) of this sheet that meet after covering the rope.

25. The suspended member according to claim 23, wherein the suspended member is a net(200) and the projection(232) is a rope coupled with the net.

26. The suspended member according to claim 23 wherein, the suspended member is a net(200) and the projection(232) comprises a linear core(234) and a border sheet(210) that covers this core by wrapping around it in a single layer (210c), the meeting surfaces(210a, 210b)of this border sheet being sewn together where they meet after covering the core, and the edge of this border sheet along the core is coupled with the peripheral region of the

net.

27. The suspended member according to claim 26, wherein the core is a rope.

28. The suspended member according to claim 23 wherein, the fixed suspension point is the inside wall(40) of a container and the sheet is a container inner sheet.

29. The suspended member according to claim 23 wherein, the fixed suspension point is a structural member and the suspended member is a net for catching falling objects.

30. The suspended member according to any of claim 24, 25 and 27, wherein the rope is made of vinylon or hemp.

31. A suspended member(30, 200) provided with a suspension element (10) that is used in suspending it at a fixed suspension point, the suspension element comprising:

a retaining body(12) that holds the suspended member and a coupling part (14) provided integrally with the retaining body and that is coupled to the fixed suspension point,
the retaining body being a tubular body provided with a linear gap(18) along the tube axis(16),
the suspended member comprising a linear projection(32, 232),
the shape and size of the transverse cross-section of the projection being substantially uniform in the direction of extension of the projection; and
the projection fitting within the tube of the tubular body in a condition in which the suspension element is slidable along the projection.

FIG. 1(A)

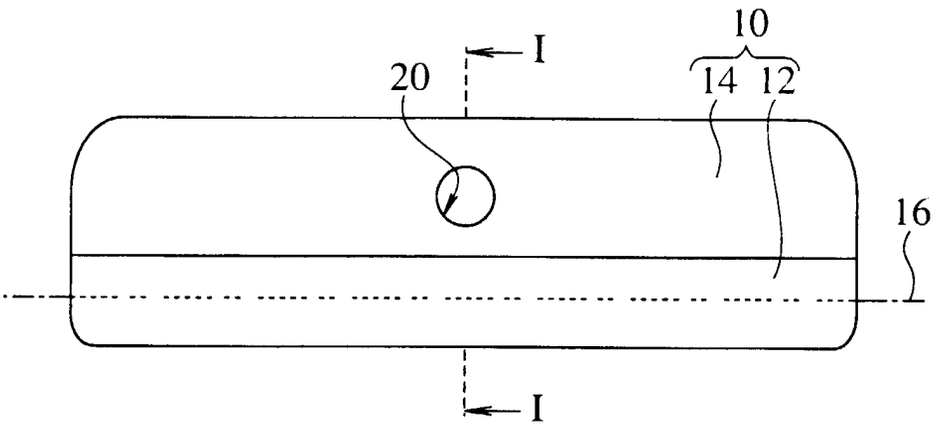


FIG. 1(B)

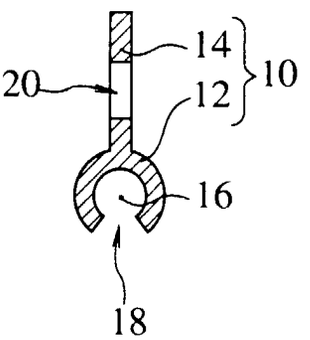


FIG.2(A)

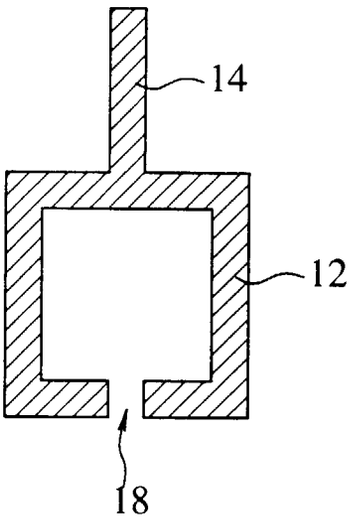


FIG.2(B)

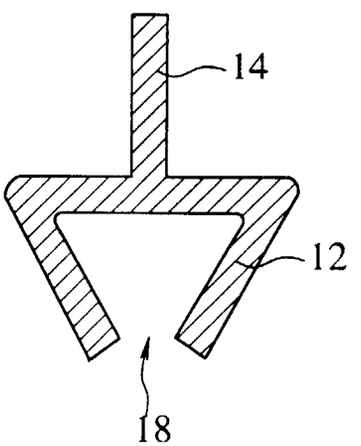


FIG.3(A)

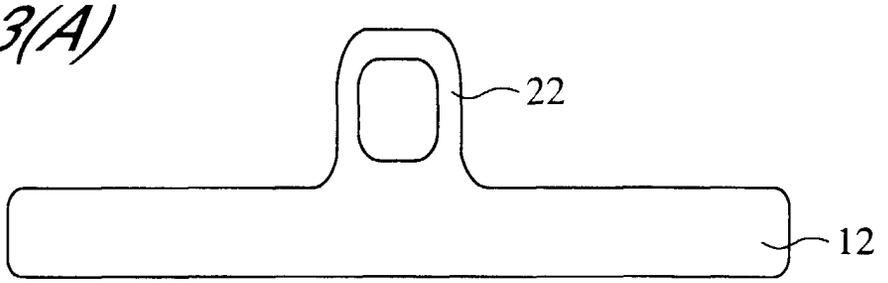


FIG.3(B)

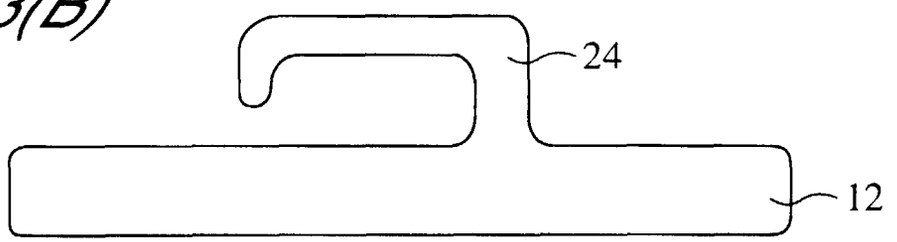


FIG.3(C)

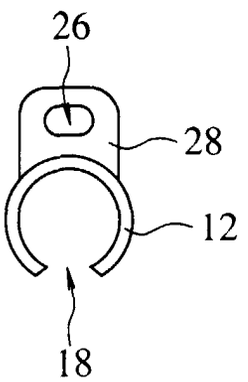


FIG. 4(A)

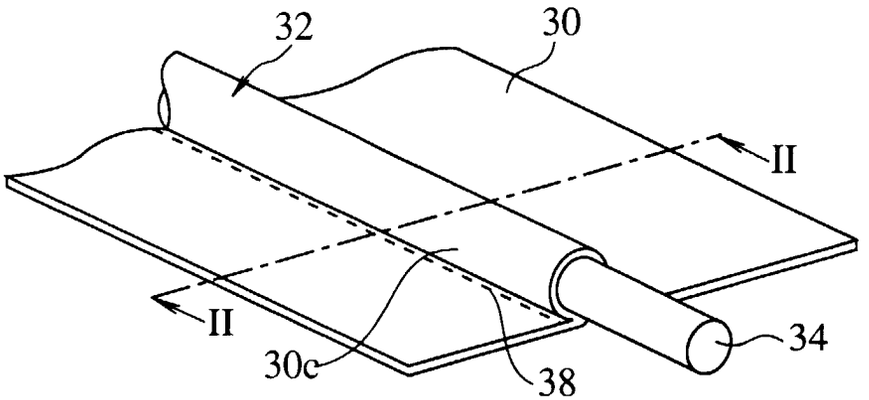
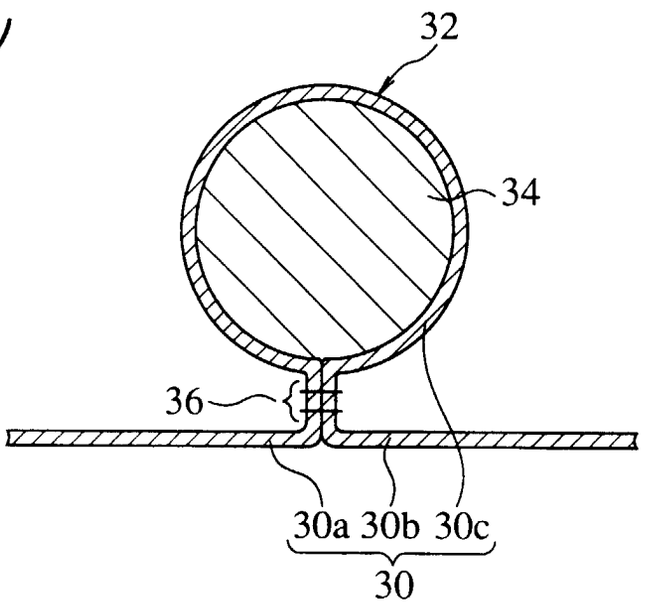


FIG. 4(B)



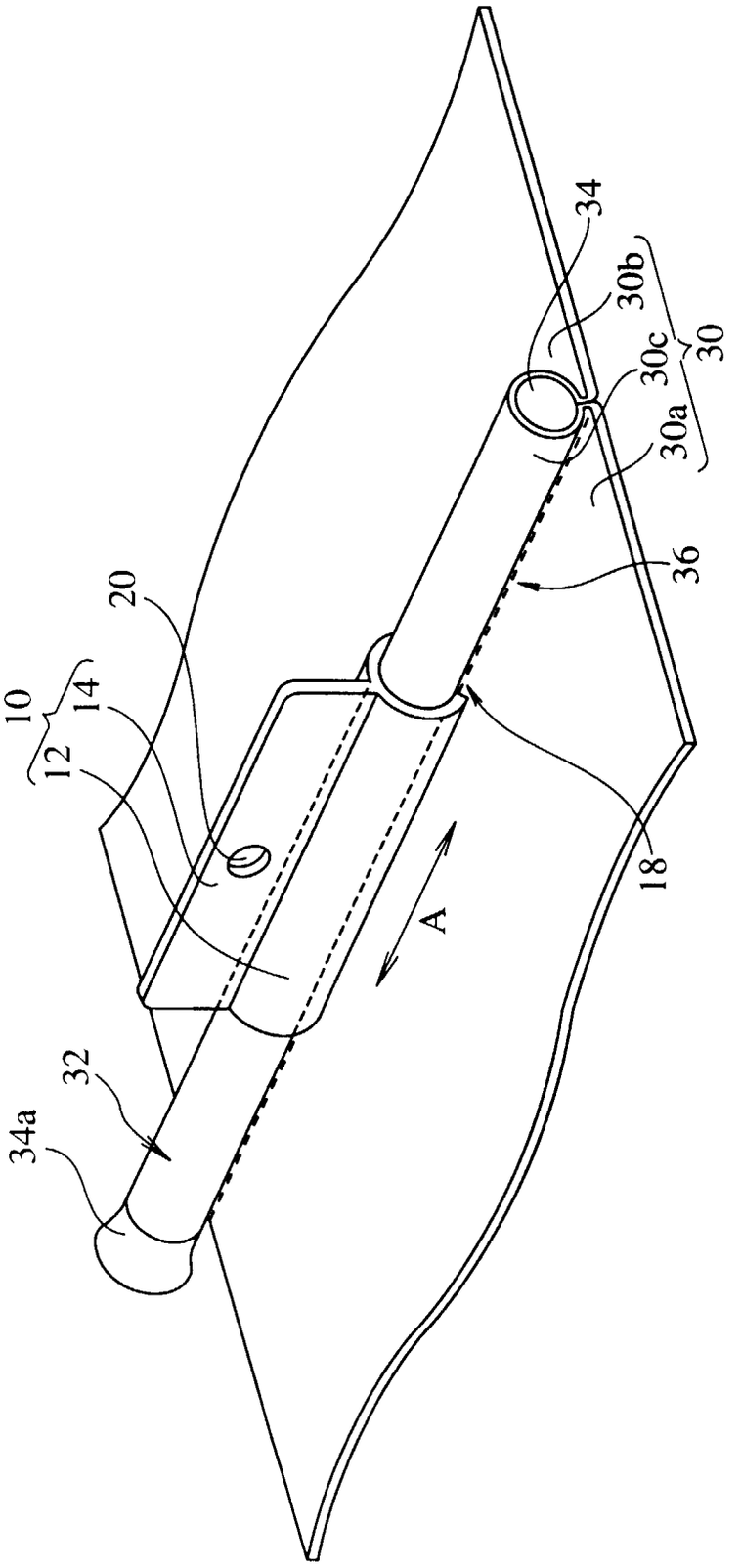


FIG.5

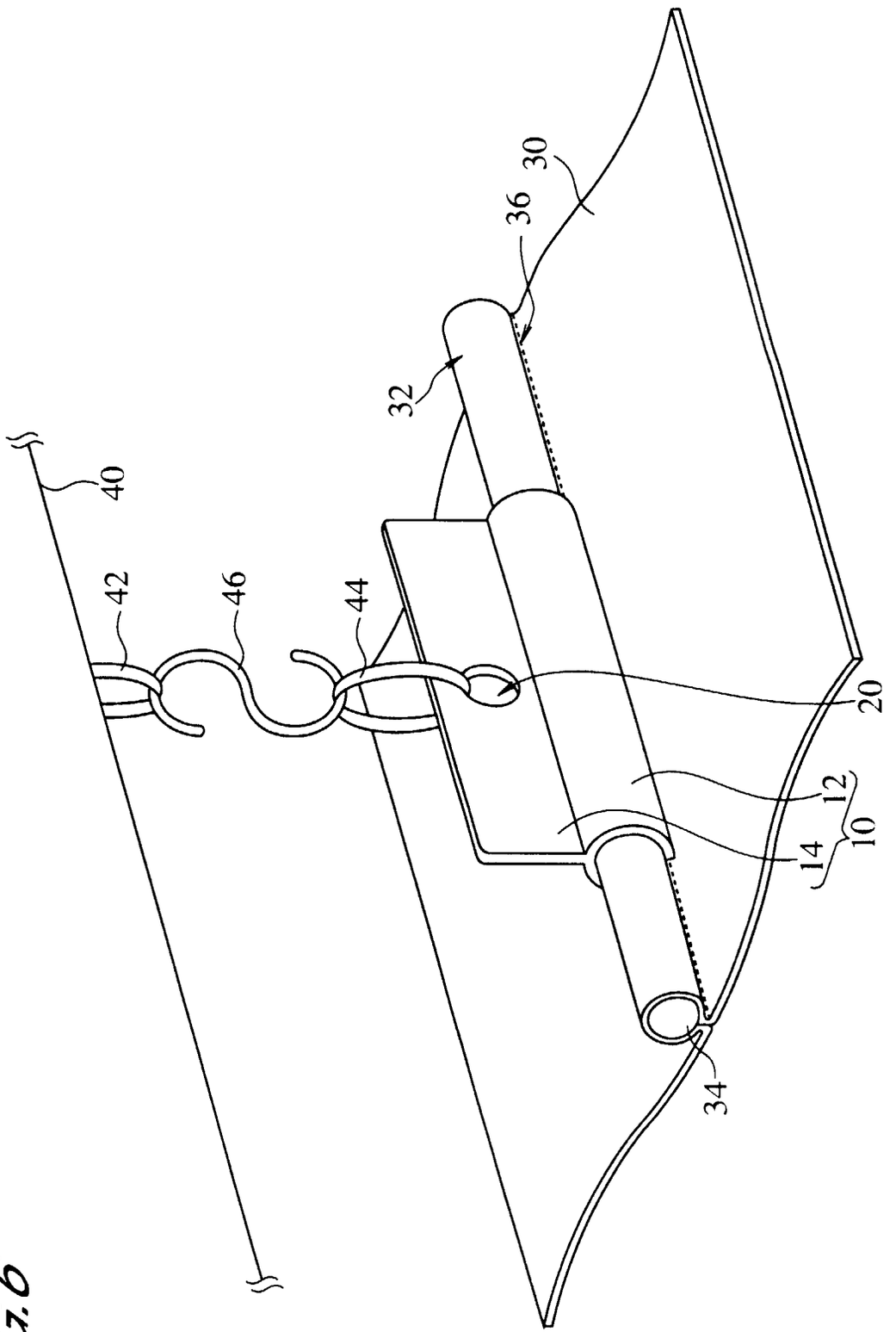
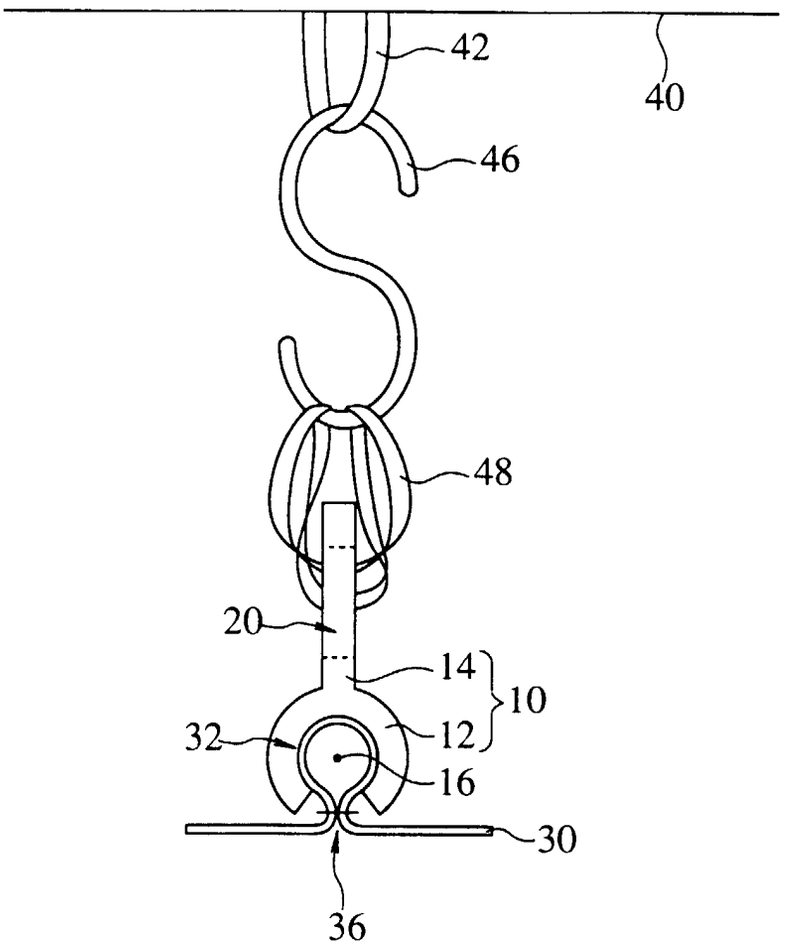


FIG.6

FIG. 7



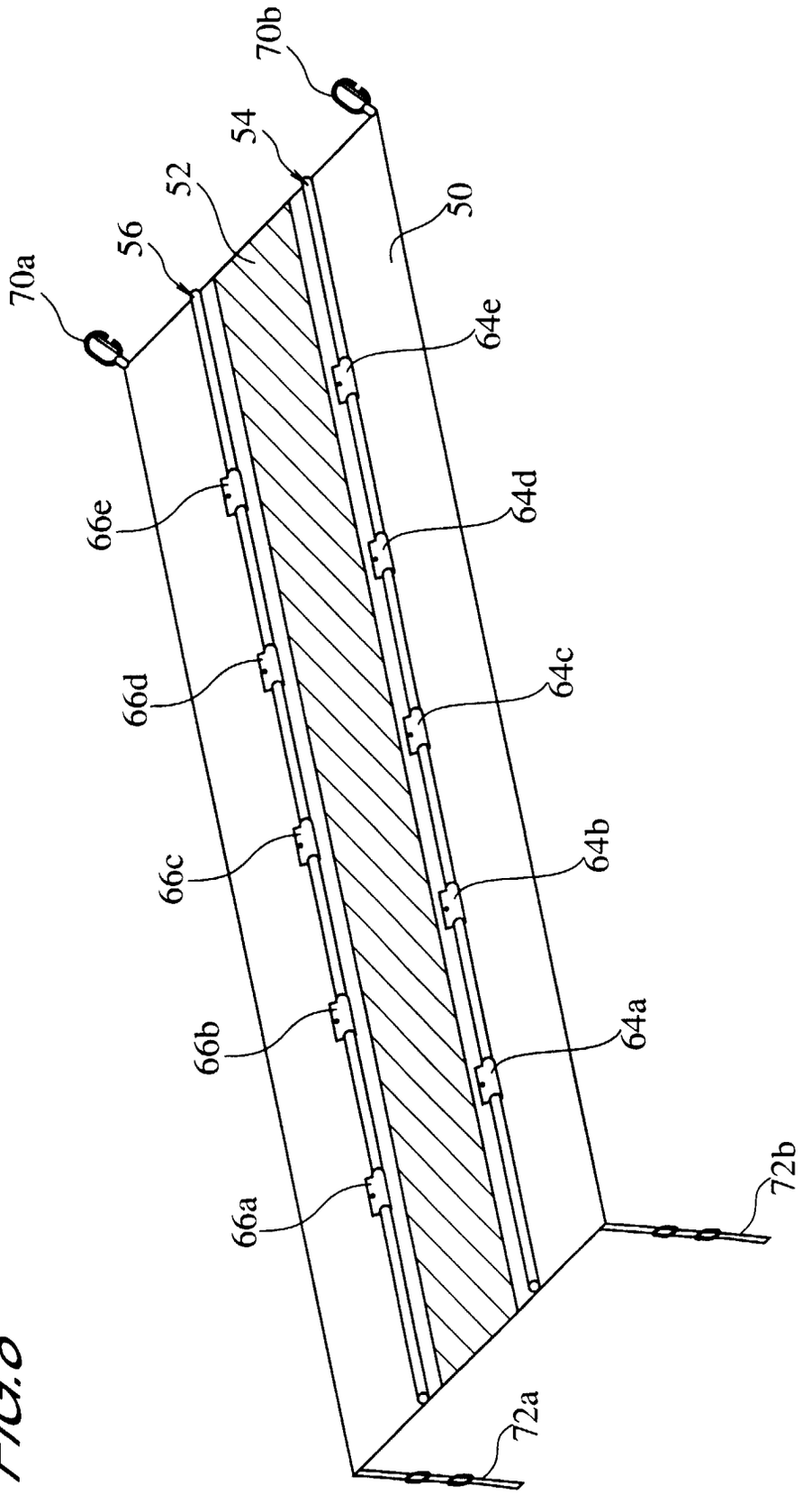

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FIG.8

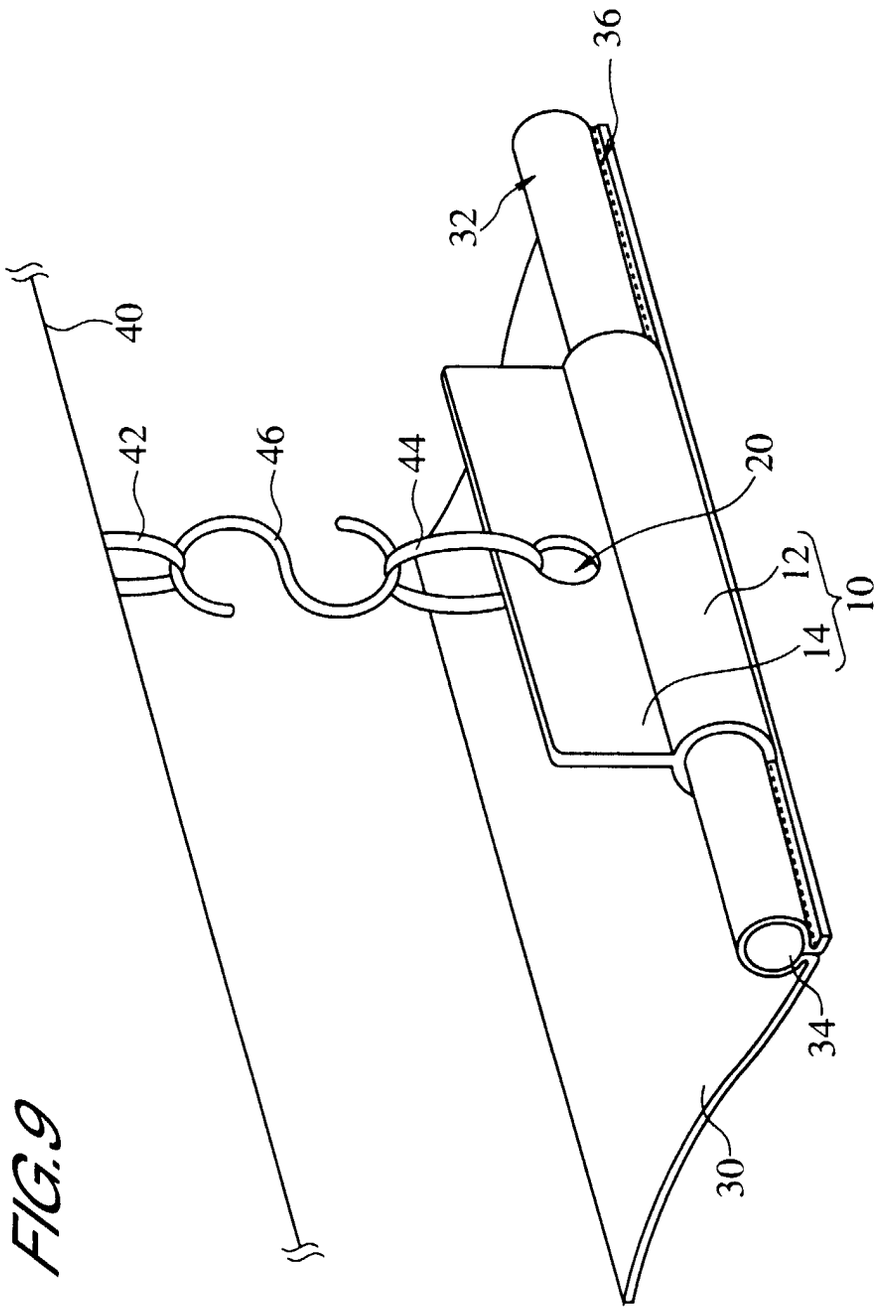

FIG.9

FIG. 10

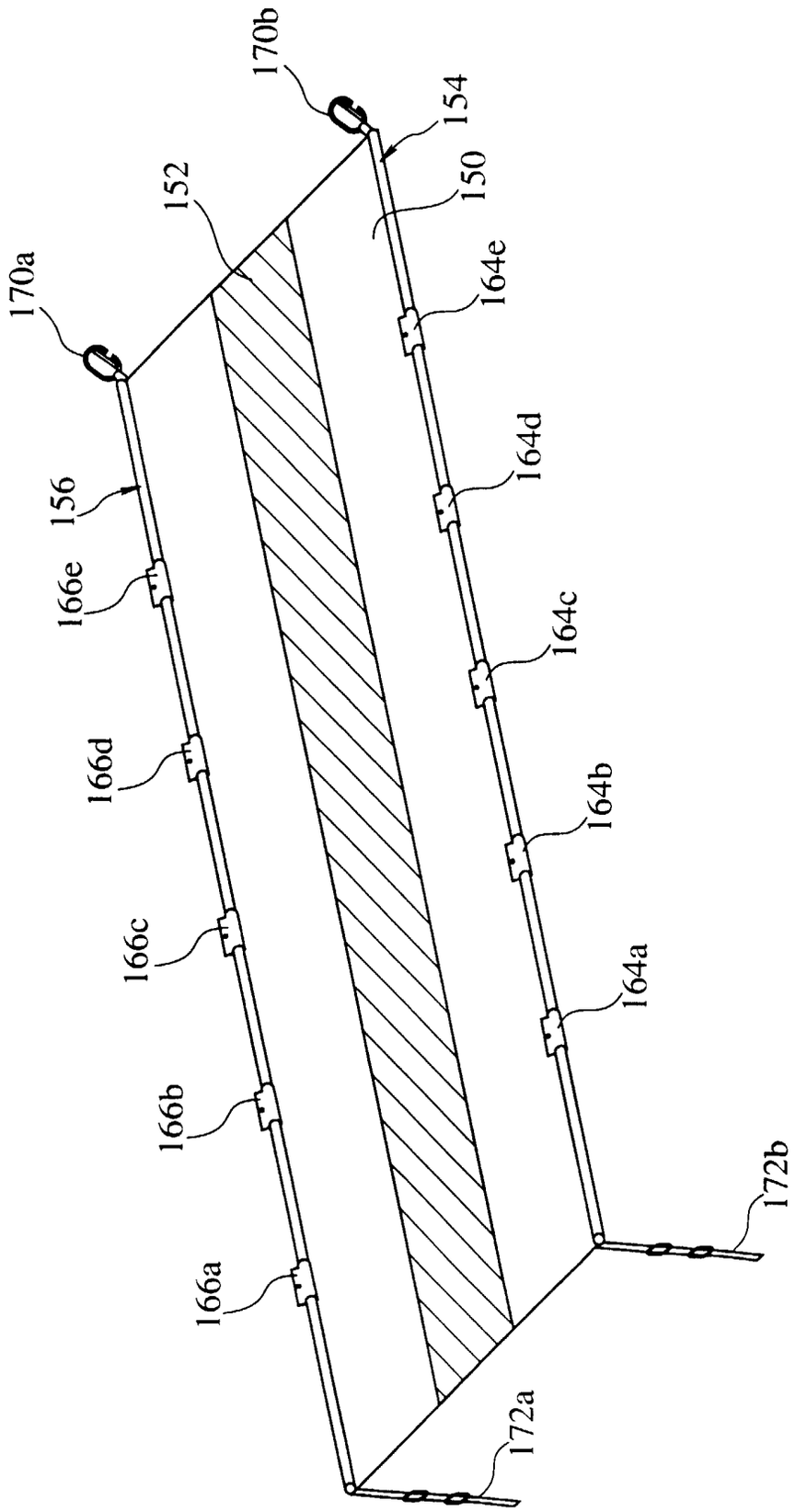
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FIG. 11

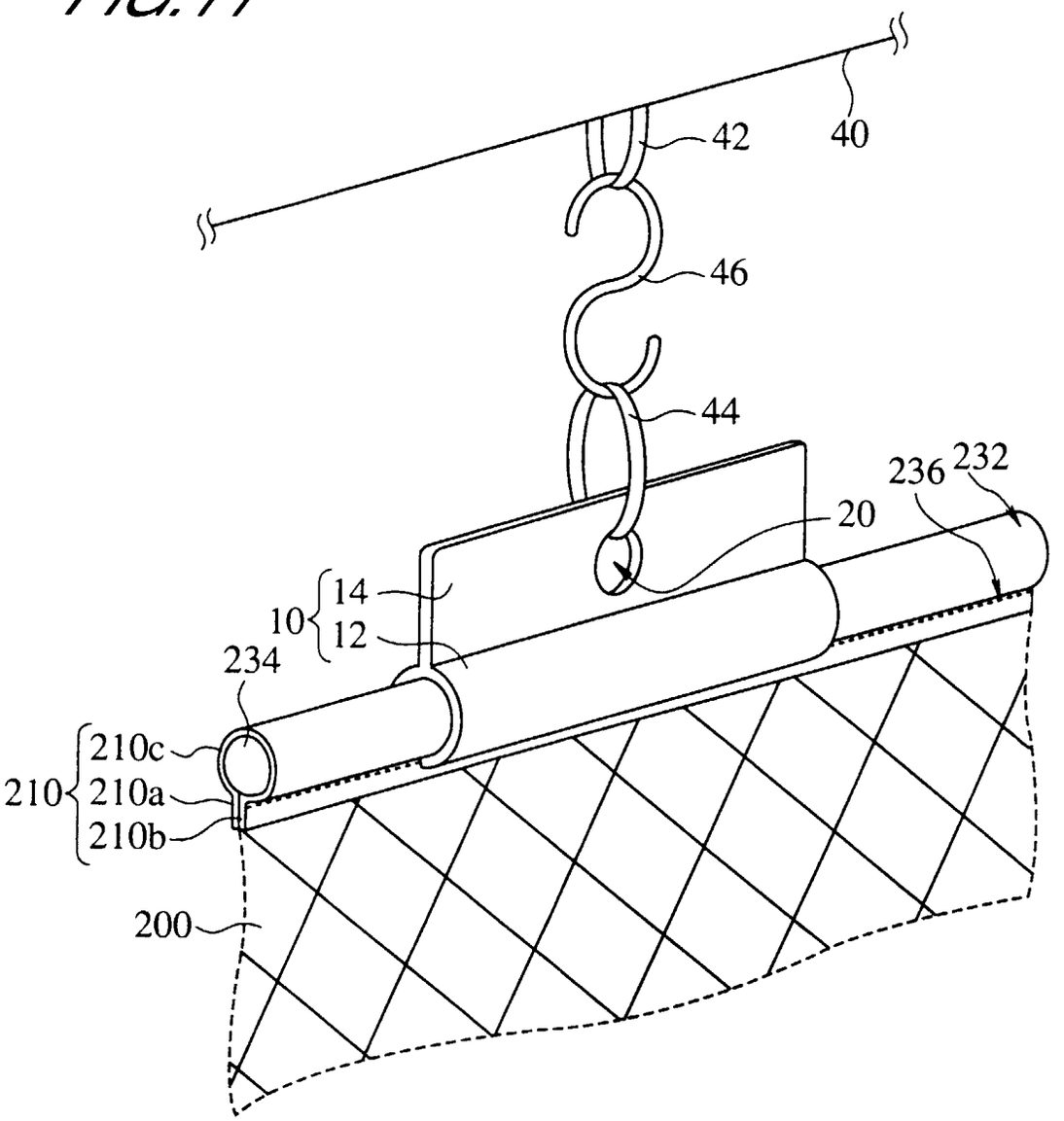

FIG. 12