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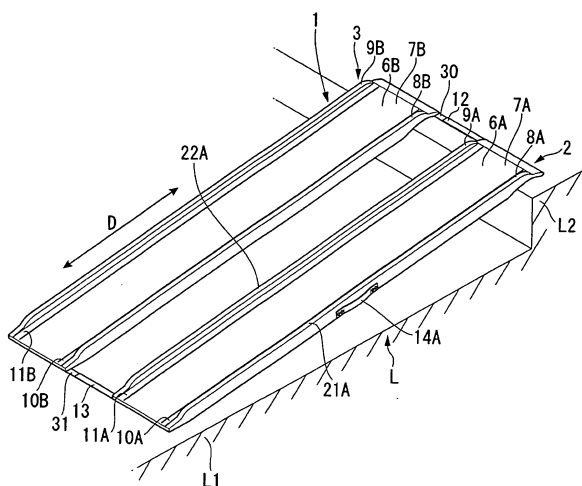
(54) **SLOPE DEVICE FOR WHEELCHAIR**

(57) A slope device for a wheelchair is provided, which enhances safety at a time of operation of a wheelchair by notifying a user that a wheel approaches a wall section before the wheel contacts the wall section.

A slope device for a wheelchair 1, which is used by being laid over a step L, the slope device for wheelchair comprising;
a body section 7A having a flat upper surface 6A;
at least a pair of wall sections 8A and 9A protruding from the upper surface of the body section and disposed sub-

stantially in parallel with the laying direction D in which the body section is laid over the step; and
an attention-attracting section 10A, 11A provided on the upper surface of the body section at a position between said at least a pair of wall sections so as to be present within a predetermined range from one of the pair of wall sections, the attention-attracting section protruding or recessed from the upper surface and provided further toward the upper surface side than the most distant portion 21 A, 22A of said wall section from the upper surface.

Fig. 1



Description

TECHNICAL FIELD

[0001] The present invention relates to a slope device for a wheelchair to be used by being laid over a step.

BACKGROUND ART

[0002] There is a case where a step formed between objects prevents passage of a user of a wheelchair in a construction such as a building or a public facility. Such a step is formed on stairs in a building or a border between a car lane and a pavement, etc. Among such steps, there are ones provided with a slope for wheelchairs, but not all steps are provided with such a slope for wheelchairs.

[0003] There are steps that are not problematic for a normal person but difficult for a user of a wheelchair to go over.

[0004] In order to solve this problem, for example, a portable slope (slope for wheelchair) shown in Patent Document 1 is known, which facilitates passage of a user of a wheelchair over such a step.

[0005] The portable slope is provided with two plate members (body sections) connected by a hinge section, and a run-off prevention wall (wall section) provided on one surface of each of the plate members and along a side thereof opposite to a side connected by the hinge section.

[0006] The run-off prevention wall has a height of from 15 to 30 mm, a thickness of from 8 to 15 mm and a pressure resistance of from 2,941,995 to 3,922,660 N/m² that is a maximum durable pressure per 1 cm² of the wall on each side. Further, the plate member and the run-off prevention wall are integrally formed by winding a carbon fiber and/or a glass fiber around a surface of a core member made of a hard foamed polyurethane, setting the member and the fiber(s) in a die, and casting at least one type of resin selected from the group consisting of polyethylene, polyester and vinyl ester into the die.

[0007] With a portable slope having such a construction, even if a wheel of a wheelchair runs over the run-off prevention wall, the run-off prevention wall is hard to be broken according to the document.

PRIOR ART DOCUMENTS

PATENT DOCUMENT

[0008]

Patent Document 1: Japanese Patent No. 4090751

DISCLOSURE OF INVENTION

TECHNICAL PROBLEM

[0009] However, the run-off prevention wall of the port-

able slope shown in the above Patent Document 1 is one only for physically preventing run-off of a wheelchair. Accordingly, although it is possible to prevent run-off itself, there is a problem that it is not possible to prevent unstable movement of the wheelchair such that the wheelchair quickly turns the direction or suddenly stops when a wheel of the wheelchair contacts the run-off prevention wall.

[0010] The present invention has been made considering these problems, and it is an object of the present invention to provide a slope for a wheelchair which enhances the safety of passage of a wheelchair by notifying the user of approach of a wheel to a wall section before it contacts the wall section.

SOLUTION TO PROBLEM

[0011] In order to solve the above problem, the present invention proposes the following means.

[0012] The slope device for wheelchair of the present invention is a slope device for a wheelchair, which is used by being laid over a step, the slope device for a wheelchair comprising:

a body section having a flat upper surface;
at least a pair of wall sections protruding from the upper surface of the body section and disposed substantially in parallel with the laying direction in which the body section is laid over the step; and
an attention-attracting section provided on the upper surface of the body section at a position between said at least a pair of wall sections so as to be present within a predetermined range from one of the pair of wall sections, the attention-attracting section protruding or recessed from the upper surface and provided further toward the upper surface side than the most distant portion of said wall section from the upper surface.

[0013] Further, in the slope device for a wheelchair, it is preferred that the body section, the at least a pair of wall sections and the attention-attracting section are integrally formed of a fiber-reinforced plastic.

[0014] Further, in the above slope device for a wheelchair, the attention-attracting section is preferably disposed so as to continue to the wall section.

[0015] Further, in the above slope device for a wheelchair, it is more preferred that the attention-attracting section has a contact surface extending upwardly from the upper surface of the body section, and leaving from said one of the wall sections from one end toward the other end in the laying direction.

[0016] Further, the above slope device for a wheelchair more preferably comprises a plurality of the attention-attracting sections with intervals in the laying direction.

[0017] Further, in the above slope device for a wheelchair, it is more preferred that the attention-attracting section protrudes from the upper surface of the body section,

and in a cross-section of the attention-attracting section in parallel with the laying direction and perpendicular to the upper surface of the body section, a first angle between the upper surface of the body section and a surface of the attention-attracting section continuing to one side of the upper surface in the laying direction, is different from a second angle between the upper surface of the body section and a surface of the attention-attracting section continuing to the other side of the upper surface in the laying direction.

[0018] Further, it is more preferred that the width of the attention-attracting section in a direction perpendicular to the laying direction is at least 10 mm and at most 50 mm, and the height difference of the attention-attracting section from the upper surface of the body section is at least 3 mm and at most 15 mm.

[0019] Further, it is more preferred that the body section has a tapered section formed in one end portion of the body section in the laying direction over the width of the body section in a direction perpendicular to the laying direction, wherein the thickness of the body section in the tapered section decreases toward the leading edge side of said one end portion.

[0020] Further, in the above slope device for a wheelchair, it is more preferred that the body section has a groove section formed in one end portion of the body section in the laying direction over the width of the body section in a direction perpendicular to the laying direction, wherein the groove section is recessed in a curved shape.

[0021] Further, the slope device for a wheelchair more preferably further comprises an elastic member attached to a lower surface of at least one end portion of the body section in the laying direction.

[0022] Further, in the above slope device for a wheelchair, it is preferred that each of the first body section and the second body section is provided with at least one wall section.

[0023] Further, the above slope device for a wheelchair preferably further comprises a connecting member for connecting the first body section and the second body section so as to be detachable.

[0024] Further, the above slope device for a wheelchair more preferably comprises a plurality of the connecting members with intervals in the laying direction.

ADVANTAGEOUS EFFECT OF INVENTION

[0025] With the slope device for a wheelchair of the present invention provided with the attention-attracting section, it is possible to notify a user of a wheelchair that a wheel approaches to a wall section before the wheel contact the wheel portion, thereby to enhance safety of passage of the wheelchair.

BRIEF DESCRIPTION OF DRAWINGS

[0026]

Fig. 1 is a perspective view showing a state that a slope device for a wheelchair of a first embodiment of the present invention is laid over a step.

Figs. 2(a) and 2(b) are front cross-sectional views of the slope device for a wheelchair.

Fig. 3 is a side cross-sectional view of the slope device for a wheelchair.

Fig. 4(a) is an enlarged view of one end portion in Fig. 3, and Fig. 4(b) is an enlarged view of the other end portion in Fig. 3.

Fig. 5 is an exploded view of a first body section of the slope device for a wheelchair.

Figs. 6(a) and 6(b) are views showing a slope device for a wheelchair of a modified example of the first embodiment of the present invention, wherein Fig. 6(a) is a cross-sectional view of one end portion of a first body section, and Fig. 6(b) is a cross-sectional view of the other end portion of the first body section. Fig. 7 is a cross-sectional view of the first body section of the slope device for a wheelchair of the modified example of the first embodiment of the present invention.

Fig. 8 is an exploded view of the first body section of the slope device for a wheelchair.

Fig. 9(a) to 9(c) are perspective views of reinforcing members employed in the first body section of the slope device for a wheelchair of the modified example of the first embodiment of the present invention. Figs. 10(a) and 10(b) show the slope device for a wheelchair of a modified example of the first embodiment of the present invention, wherein Fig. 10(a) is a plan view of a first slope, and Fig. 10(b) is a cross-sectional view along a section line A1-A1 in Fig. 10(a).

Figs. 11(a) and 11(b) show a slope device for a wheelchair of a modified example of the first embodiment of the present invention, wherein Fig. 11(a) is a plan view of a first slope, and Fig. 11(b) is a cross-sectional view along a section line A2-A2 in Fig. 11(a).

Figs. 12(a) and 12(b) show a slope device for a wheelchair of a modified example of the first embodiment of the present invention, wherein Fig. 12(a) is a plan view of a first slope, and Fig. 12(b) is a cross-sectional view along a section line A3-A3 in Fig. 12(a).

Figs. 13(a) and 13(b) show a slope device for a wheelchair of a modified example of the first embodiment of the present invention, wherein Fig. 13(a) is a plan view of a first slope, and Fig. 13(b) is a cross-sectional view along a section line A4-A4 in Fig. 13(a).

Fig. 14 is a cross-sectional view showing a state that the slope device for a wheelchair shown in Figs. 13(a) and 13(b) is laid over a step.

Figs. 15(a) and 15(b) show a slope device for a wheelchair of a modified example of the first embodiment of the present invention, wherein Fig. 15(a) is

a plan view of a first slope, and Fig. 15(b) is a cross-sectional view along a section line A5-A5 in Fig. 15 (a).

Figs. 16(a) and 16(b) show a slope device for a wheelchair of a modified example of the first embodiment of the present invention, wherein Fig. 16(a) is a plan view of a first slope, and Fig. 16(b) is a cross-sectional view along a section line A6-A6 in Fig. 16 (a).

Figs. 17(a) and 17(b) show a slope device for a wheelchair of a modified example of the first embodiment of the present invention, wherein Fig. 17(a) is a plan view of a first slope, and Fig. 17(b) is a cross-sectional view along a section line A7-A7 in Fig. 17 (a).

Figs. 18(a) and 18(b) show a slope device for a wheelchair of a modified example of the first embodiment of the present invention, wherein Fig. 18(a) is a plan view of a first slope, and Fig. 18(b) is a cross-sectional view along a section line A8-A8 in Fig. 18 (a).

Figs. 19(a) and 19(b) show a slope device for a wheelchair of a modified example of the first embodiment of the present invention, wherein Fig. 19(a) is a plan view of a first slope, and Fig. 19(b) is a cross-sectional view along a section line A9-A9 in Fig. 19 (a).

Figs. 20(a) and 20(b) show a slope device for a wheelchair of a modified example of the first embodiment of the present invention, wherein Fig. 20(a) is a plan view of a first slope, and Fig. 20(b) is a cross-sectional view along a section line A10-A10 in Fig. 20(a).

Fig. 21 is a cross-sectional view of the slope device for a wheelchair of a modified example of the first embodiment of the present invention.

Fig. 22 is a cross-sectional view illustrating a state of carrying the slope device for a wheelchair shown in Fig. 21 after use.

Fig. 23 is a cross-sectional view of the slope device for a wheelchair of a modified example of the first embodiment of the present invention.

Fig. 24 is a cross-sectional view illustrating a state of carrying the slope device for a wheelchair shown in Fig. 23 after use.

Fig. 25 is a plan view of a slope device for a wheelchair of a second embodiment of the present invention.

Fig. 26 is a plan view of a slope device for a wheelchair of a third embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS

(FIRST EMBODIMENT)

[0027] Now, the first embodiment of a slope device for a wheelchair according to the present invention will be described with reference to Figs. 1 to 24. Here, in all of

the following Figures, dimensions are appropriately modified from actual dimensions for convenience of explanation.

[0028] As shown in Fig. 1, a slope device 1 for a wheelchair of this embodiment is to be used by being laid between a step-foot portion L1 that is the lower side of a step L and a step-top portion L2 present on the upper side of the step L, and to be used for moving a wheelchair, not shown, along the upper surface.

[0029] The slope device 1 for a wheelchair is formed into a substantially plate shape, and is provided with a first slope 2 and a second slope 3 to be laid in a predetermined laying direction over the step L, and surface fasteners (connecting members) 12, 13, 30 and 31 for connecting the first slope 2 and the second slope 3 so as to be detachable. Since the first slope 2 and the second slope 3 are the same in the construction, first, the construction the first slope 2 will be described.

[0030] Here, elements common to the first slope 2 and the second slope 3 are indicated by symbols having a common numeral portion followed by an alphabet "A" for the elements of the first slope 2 and an alphabet "B" for the elements of second slope 3.

[0031] As shown in Figs. 1 to 3, the first slope 2 has a first body section (body section) 7A of substantially plate shape having a flat upper surface 6A, a pair of wall sections 8A and 9A protruding from the upper surface 6A, attention-attracting sections 10A and 11A provided between the pair of wall sections 8A and 9A, and a handle 14A provided on a side surface of the wall section 8A.

[0032] As shown in Figs. 3 and 4 (a), the first body section 7A has a tapered section 18A formed in one end portion 17A of the first body section 7A over the width of the first body section 7A, wherein the thickness of the first body section 7A in the tapered section 18A narrows toward the leading edge side of the end portion 17A. A lower surface of the tapered section 18A has a corrugated shape in side view.

[0033] Further, as shown in Figs. 3 and 4(b), the first body section 7A has a groove section 20A formed in the other end portion 19A of the first body section 7A in the laying direction over the width of the first body section 7A in a direction perpendicular to the laying direction, wherein the groove section 20A is recessed in a cured shape. A lower surface of the groove section 20A has a corrugated shape in side view.

[0034] Here, the first body section 7A, the wall sections 8A and 9A and the attention-attracting sections 10A and 11A are integrally formed of a fiber reinforced plastic as described later.

[0035] As shown in Figs. 1 to 3, the wall sections 8A and 9A are provided on the upper surface 6A of the first body section 7A along both ends of the first body section 7A in a direction perpendicular to the laying direction D, so as to extend over a length substantially equal to that of the first body section 7A and substantially in parallel with the laying direction D. The height H1 of the wall section 8A from an upper surface, to be described later, of

the attention-attracting section 10A, and the height H1 of the wall section 9A from the upper surface of the attention-attracting section 11A, are about from 20 to 100 mm, the width W1 of the wall section 8A and 9A (width in a direction perpendicular to the laying direction D) is set to be about from 10 to 30 mm.

[0036] The attention-attracting section 10A is formed so as to protrude from the upper surface 6A of the first body section 7A. The upper surface of the attention-attracting section 10A has a flat shape, and is in parallel with the upper surface 6A of the first body section 7A. The attention-attracting section 10A continues to the wall section 9A side of the wall section 8A, and has a length substantially equal to that of the wall section 8A. The attention-attracting section 11A continues to the wall section 8A side of the wall section 9A and has a length substantially equal to that of the wall section 9A in the same manner as the attention-attracting section 10A.

[0037] The height H2 of the attention-attracting sections 10A and 11A protruding from the upper surface 6A of the first body section 7A is preferably at least 3 mm and at most 15 mm, more preferably at least 3 mm and at most 10 mm. Further, the width W2 is preferably at least 10 mm and at most 50 mm, more preferably at least 15 mm and at most 30 mm.

[0038] Thus, the attention-attracting sections 10A and 11A are provided further toward the upper surface 6A side than the top portions 21A and 22A, respectively, that are portions of the wall sections 8A and 9A being the most distant (protruded) from the upper surface 6A.

[0039] Here, the attention-attracting sections 10A and 11A are not necessarily provided in a predetermined length from one end portion 17A in the laying direction D and in a predetermined length from the other end portion 19A in the laying direction D for the purpose of attracting attention of the user. This predetermined length is, for example, at most 100 mm.

[0040] Here, in this embodiment, on the upper surface 6A and upper surfaces of the attention-attracting sections 10A and 11A, nonslip sections, not shown, are provided (there is a case where no nonslip section is provided on the upper surface of the attention-attracting sections 10A and 11A). The nonslip sections are formed by sanding coating, and for example, it is formed by blowing a silica sand having a size of at most 1 mm (most of the sand particles are about from 100 to 500 μm) together with an adhesive coating material against the upper surface 6A and the upper surfaces of the attention-attracting sections 10A and 11A and thereby fixing the sand. Namely, the nonslip sections have fine irregularities having an irregularity height of about 1 mm.

[0041] Thus, in this embodiment, the height of the upper surface of each of the attention-attracting sections 10A and 11A from the upper surface 6A of the first body section 7A is at least 3 mm, and the height of the upper surface of the nonslip section from the upper surface 6A is about 1 mm. Accordingly, the step height of at least 3 mm of the attention-attracting sections 10A and 11A is

at least three times as large as the irregularities of about 1 mm of the upper surface 6A, and accordingly, a user of a wheelchair can distinguish and recognize these step height and irregularities.

[0042] As in this embodiment, when irregularities are present on the upper surface 6A of the first body section 7A, in order to make a user of a wheelchair securely recognize the attention-attracting sections, the protruding height H2 of the attention-attracting sections is preferably at least three times and at most 150 times as large as the irregularity height of the upper surface 6A.

[0043] As described above, the first body section 7A, the wall sections 8A and 9A and the attention-attracting sections 10A and 11A are integrally formed, and the cross-section of the first body section 7A is as shown in Figs. 2(a), 2(b) and 5.

[0044] Namely, the first body section 7A is constituted by a plate-shaped core member 23A made of a foamed material such as an urethane resin or a vinyl chloride resin; first layers 25A provided on the upper surface and the lower surface of the core member 23A and each having carbon fibers 24A; second layers 28A provided on the upper surface of the first layer 25A disposed at the upper position and on a lower surface of the first layer 25A disposed at the lower position and each having glass or carbon fibers 26A and 27A; and a thermosetting resin, not shown, impregnated into the first layers 25A and the second layers 28A.

[0045] In the first layer 25A, the carbon fibers 24A are disposed in parallel in the laying direction D. Fibers 26A constituting the second layer 28A are disposed in parallel in the laying direction D, and fibers 27A constituting the layer are disposed in a direction not parallel with the laying direction D and substantially perpendicular to the fibers 26A. The thermosetting resin is at least one type of resin selected from the group consisting of an unsaturated polyester resin, a vinyl ester resin and an epoxy resin.

[0046] The first body section 7A, the wall sections 8A and 9A and the attention-attracting sections 10A and 11A are integrally formed of a fiber reinforced plastic formed by disposing the core member 23A, the first layers 25A and the second layers 28A in a molding dye and impregnating with a thermosetting resin. Accordingly, the wall sections 8A and 9A and the attention-attracting sections 10A and 11A are formed mainly of the fibers 26A and 27A of the second layers 28A and the thermosetting resin.

[0047] As shown in Fig. 1, two surface fasteners 12 and 13 are disposed at respective ends of the first slope 2 in the laying direction D with an interval. The surface fasteners 12 and 13 are each formed in a tape shape of a material having flexibility, and one end of each of the surface fasteners 12 and 13 is connected to a lower surface of the first body section 7A, and a lower surface of the other end is provided with a connecting surface, not shown.

[0048] The second slope 3 has a second body section (body section) 7B, wall sections 8B and 9B, attention-

attracting sections 10B and 11 B and a handle 14B (not shown) provided on an outer side surface of the wall section 9B.

[0049] The surface fasteners 30 and 31 are disposed at respective ends of the second slope 3 in the laying direction D with an interval, that are positions corresponding to the positions of the surface fasteners 12 and 13.

[0050] The surface fasteners 30 and 31 are each formed in a tape shape of a material having flexibility, one end portion of each of the surface fasteners 30 and 31 is connected to a lower surface of the second body section 7B, and an upper surface of the other end portion is provided with a connecting surface, not shown. The connecting surfaces of the surface fasteners 30 and 31 are connectable to the connecting surfaces of the surface fasteners 12 and 13 so as to be detachable.

[0051] Here, the construction is made so that when the surface fastener 12 is connected to the surface fastener 30, the surface fastener 13 is connected with the surface fastener 31 and the surface fasteners 12, 13, 30 and 31 are tensed in a direction perpendicular to the laying direction D, then, the distance between the upper surface 6A of the first body section 7A and the upper surface 6B of the second body section 7B in a direction perpendicular to the laying direction D, becomes substantially equal to the distance between left and right wheels of a typical wheelchair having four wheels.

[0052] Next, operation method of the slope device 1 for a wheelchair having the above construction will be described.

[0053] A user presses the connecting surface of the surface fastener 12 against the connecting surface of the surface fastener 30 and presses the connecting surface of the surface fastener 13 against the connecting surface of the surface fastener 31, to connect the first slope 2 with the second slope 3. Then, in a state that the surface fasteners 12, 13, 30 and 31 are tensed in a direction perpendicular to the laying direction D, the first slope 2 and second slope 3 are laid over a step L.

[0054] Next, among wheels provided on left and right sides of the wheelchair, a wheel provided on one side is placed on the upper surface 6A of the first body section 7A, and a wheel provided on the other side is placed on the upper surface 6B of the second body section 7B, to move the wheelchair along the first slope 2 and the second slope 3.

[0055] When use of the slope 1 for a wheelchair of this embodiment is finished, the user deforms and folds the surface fasteners 12, 13, 30 and 31 so as to overlap the first slope 2 with the second slope 3 so that the positions of the handle 14A approaches the handle 14B. Then, the slope device 1 for a wheelchair is carried by holding the handles 14A and 14B.

[0056] As described above, with the slope device 1 for a wheelchair of this embodiment, a user lays the first slope 2 and the second slope 3 over a step L. Then, a wheel provided on one side of a wheelchair is placed on the upper surface 6A of the first body section 7A and

between a pair of wall sections 8A and 9A, a wheel provided on the other side is placed on the upper surface 6B of the second body section 7B between a pair of wall sections 8B and 9B, and a wheelchair is moved in the laying direction D.

[0057] When the moving direction of the wheelchair deviates from the laying direction D, a wheel of the wheelchair contacts with a wall section 8A or 9A protruding from the upper surface 6A of the first body section 7A, whereby runoff of the wheelchair from the first slope 2 is prevented. At this time, on the upper surface 6A of the first body section 7A, between a pair of wall sections 8A and 9A, attention-attracting sections 10A and 11A continuing to the wall sections 8A and 9A are provided. Accordingly, before a wheel of the wheelchair contacts with the wall section 8A or 9A, when the wheel approaches the wall section 8A or 9A and runs on the attention-attracting section 10A or 11A protruding from the upper surface 6A of the body section 7A, a user feels a force received by the wheel, whereby the user recognizes that the wheel of the wheelchair reaches the attention-attracting section 10A or 11A.

[0058] Since the attention-attracting sections 10A and 11A are provided on the upper surface 6A side of the top portions 21A and 22A of the wall sections 8A and 9A of the first body section 7A, it is possible to prevent a wheelchair from running off the first body section 7A by the wall sections 8A and 9A, and to make the user recognize that a wheel of the wheelchair approaches the wall section 8A or 9A by the attention-attracting section 10A or 11A, whereby the user can correct the course of the wheelchair and it is possible to enhance the safety of the operation of the wheelchair.

[0059] Further, the first body section 7A, the wall sections 8A and 9A and the attention-attracting sections 10A and 11A are integrally formed of a fiber reinforced plastic, it is possible to increase the strength of the entire slope device 1 for a wheelchair and to make the device lightweight.

[0060] Further, since the attention-attracting sections 10A and 11A are disposed so as to continue to the wall sections 8A and 9A, it is possible to widen the width of the center portion of the first body section 7A on which a wheel of a wheelchair rolls.

[0061] In this embodiment, the width W2 of the attention-attracting sections 10A and 11A is at least 10 mm and at most 50 mm, the height H2 of these sections is set to be at least 3 mm and at most 15 mm.

[0062] If the width W2 of the attention-attracting sections 10A and 11A is less than 10 mm, a wheel of the wheelchair contacts with the wall section 8A or 9A as soon as the wheel runs on the attention-attracting section 10A or 11A, and accordingly, it is not possible to prevent e.g. the wheelchair from being suddenly stopped. If the width W2 exceeds 50 mm, the effect of attracting attention of the user does not improve any more, and the width of the upper surface 6A of the first body section 7A narrows when the width of the first slope 2 is constant.

[0063] Further, if the protruding height H2 of the attention-attracting sections 10A and 11A is less than 3 mm, it is difficult for the user to recognize presence or absence of the attention-attracting section 10A or 11A through the wheelchair, and if the height H2 exceeds 15 mm, the wheelchair may suddenly stop or change the direction in the same manner as the case where the wheel of the wheelchair contacts with the wall section 8A or 9A.

[0064] Further, the first body section 7A has a tapered section 18A provided in one end portion 17A, and a groove section 20A formed in the other end portion 19A. Accordingly, by disposing the first slope 2 so that an end of the first body section 7A on which the tapered section 18A is provided is present on the step bottom L1 side, and that the other end of the first body section 7A on which the groove section 20A is provided is present on the step top L2 side, then, it is possible to reduce the height difference between the step bottom portion L1 and said one end 17A of the first body section 7A by the tapered section 18A. Further, by the groove section 20A, it is possible to securely engage said the other end portion 19A of the first body section 7A with the step top portion L2.

[0065] The device has the first body section 7A and the second body section 7B as a body section. Accordingly, by constructing the device so that, among wheels provided on left and right of a typical wheelchair having four wheels, wheels provided on one side roll on the first body section 7A and wheels provided roll on the other side on the second body section 7B, it is possible to narrow the widths of the first body section 7A and the second body section 7B in a direction perpendicular to the laying direction D. Accordingly, it is possible to reduce the weight of the entire slope device 1 for a wheelchair.

[0066] Further, since the device has surface fasteners 12 and 13 and surface fasteners 30 and 31 for connecting the first body section 7A and the second body section 7B so as to be detachable, it is possible to position the first body section 7A with respect to the second body section 7B.

[0067] Further, the surface fasteners 12 and 13 and the surface fasteners 30 and 31 are disposed with an interval in the laying direction D, it is possible to more securely position the first slope 2 with respect to the second slope 3.

[0068] Further, since the first layers 25A containing carbon fibers 24A and the second layer 28A containing fibers 26A are employed in the first body section 7A, it is possible to improve the bending rigidity of the first body section 7A.

[0069] Here, in this embodiment, two surface fasteners 12 and 13 are connected to the first slope 2 with an interval in the laying direction D. However, the number of surface fasteners to be connected to the first slope 2 may be any number of at least 1.

[0070] Further, as the connecting member, other than a surface fastener having flexibility, for example, one having a rod shape and a certain rigidity and having both

ends each provided with a connecting mechanism such as a hinge, may be employed.

[0071] Further, as shown in Figs. 6(a) and 6(b), an elastic member 41A, 42A may be attached to a lower surface of at least one end of the first body section 7A in the laying direction D.

[0072] Namely, in Fig. 6(a), a recessed portion is formed on the lower surface of one end portion 17A of the first body section 7A, and an elastic member 41A made of e.g. a rubber is attached to the recessed portion by e.g. an adhesive agent.

[0073] The lower surface of the elastic member 41A may have a corrugated shape in side view.

[0074] Further, in Fig. 6(b), a recessed portion is formed on the lower surface of the other end portion 19A of the first body section 7A, and an elastic member 42A made of e.g. a rubber is attached. The lower surface of the elastic member 42A may have a corrugated shape in side view.

[0075] By forming the lower surfaces of the elastic member 41A and the elastic member 42A into corrugated shapes, it is possible to increase a gripping force for engaging the first slope 2 with a step L.

[0076] Further, as shown in Figs. 7 and 8, between the core member 23A and each of the first layers 25A constituting the first body section 7A, a third layer 46A having glass fibers 45A whose directions are random, may be provided. The third layer 46A is one produced by impregnating the above thermosetting resin into the glass fibers 45A.

[0077] As a reinforcing member for improving the bending rigidity of the first body section 7A, for example, ones shown in Figs. 9(a) to 9(c) are appropriately selected for use.

[0078] Fig. 9(a) shows a cloth 49 containing fibers 47 provided in parallel with the laying direction D and fibers 48 provided in a direction not in parallel with the laying direction D and substantially perpendicular to the fibers 47. Fig. 9(b) shows a mat 51 containing fibers 50 whose directions are random. Fig. 9(c) shows a bias cloth 54 having fibers 52 and fibers 53 having fiber directions not parallel with the laying direction D and substantially perpendicular to each other.

[0079] As the above fibers 47, 48, 50, 52 and 53, besides carbon fibers or glass fibers, optional fibers for increasing the elasticity of resin may be selected for use.

[0080] Further, in this embodiment, the nonslip section of the first body section 7A is formed by sanding coating. However, the nonslip section is not limited thereto, and it may be a nonslip tape having an adhesive layer on one surface and an irregular portion on the other surface, or an irregular section formed on the upper surface 6A of the first body section 7A itself.

[0081] Further, in this embodiment, the wall sections 8A and 9A are provided on both ends of the first body section 7A in the direction perpendicular to the laying direction D, and the wall sections 8B and 9B are provided on both ends of the second body section 7B in a direction

perpendicular to the laying direction D. However, when one wall section is provided for each of the first body section 7A and the second body section 8A, by adjusting the distance between the first body section 7A and the second body section 8A, it is possible to prevent a wheelchair from running off the body sections 7A and 7B. Accordingly, it is sufficient that at least one wall section is provided for each of the first body section 7A and the second body section 8A.

[0082] Further, instead of the attention-attracting sections 10A and 11A provided in the first slope 2 of this embodiment, attention-attracting sections having various shapes shown below may be provided.

[0083] For example, the attention-attracting section 57A shown in Figs. 10(a) and 10(b) is formed to have a length substantially equal to the length of the wall section 9A in the laying direction D, and formed so that the distance between the upper surface 58A and the upper surface 6A of the first body section 7A becomes small as the upper surface 58A leaves from the wall section 9A.

[0084] By this construction, it is possible to produce a force of moving a wheel of a wheelchair, that have run on the attention-attracting section 57A, away from the wall section 10A, thereby to return the wheel to the upper surface 6A.

[0085] The attention-attracting section 61 A shown in Figs. 11 (a) and 11 (b) is formed to have a length substantially equal to that of the wall section 9A and formed so that it is recessed from the upper surface 6A of the first body section 7A.

[0086] A plurality of attention-attracting sections 64A shown in Figs. 12(a) and 12(b) are provided so as to protrude from the upper surface 6A of the first body section 7A with intervals in the laying direction D. The cross-section of each attention-attracting section 64A (cross-section shown in Fig. 12(b)) along an imaginary plane P in parallel with the laying direction D and perpendicular to the upper surface 6A of the first body section 7A, is rectangular.

[0087] When a wheel of a wheelchair moves in the laying direction D on the attention-attracting sections 64A of the slope devices 1 for a wheelchair having such a construction, the wheel repeats to run on and over the attention-attracting sections 64A. Accordingly, it is possible to make a user more securely recognize that the wheel is on the attention-attracting sections 64A.

[0088] A plurality of attention-attracting sections 67A shown in Figs. 13(a) and 13(b) are provided with intervals in the laying direction D so as to protrude from the upper surface 6A of the first body section 7A.

[0089] In the cross-section (cross-section shown in Fig. 13(b)) of each attention-attracting section 67A along the imaginary plane P, a first angle θ_1 between the upper surface 6A of the first body section 7A and the surface 68A of the attention-attracting section 67A continuing to one side of the upper surface 6A in the laying direction D, is different from a second angle between the upper surface 6A and a surface 69A of the attention-attracting

section 67A continuing to the other side of the upper surface 6A in the laying direction D.

[0090] The slope device 1 for a wheelchair having such a construction is laid over a step L so that, for example, a first angle θ_1 , that is a smaller angle among the first angle θ_1 and second angle θ_2 , that are different from each other, is located on the step bottom portion L1 side of the step L as shown in Fig. 14.

[0091] By this method, it is possible to suppress an angle θ_3 between the attention-attracting section 67A and a horizontal plane S when a wheel of a wheelchair runs on the attention-attracting section 67A when the wheelchair climbs up the slope device 1 for a wheelchair, and to make the wheel easily run on the attention-attracting sections 67.

[0092] A plurality of attention-attracting sections 72A shown in Figs. 15(a) and 15(b) are provided with intervals in the laying direction D so as to recess downwardly from the upper surface 6A of the first body section 7A.

[0093] A plurality of attention-attracting sections 75A shown in Figs. 16(a) and 16(b) are provided with intervals in the laying direction D so as to be staggered alternately and so as to protrude from the upper surface 6A of the first body section 7A at positions apart from the wall section 9A.

[0094] In this modified example, each of the attention-attracting sections 75A is formed to have a substantially circular column shape in plan view.

[0095] A plurality of attention-attracting sections 78A shown in Figs. 17(a) and 17(b) are provided with intervals in the laying direction D so as to be alternately staggered from each other so as to protrude from the upper surface 6A of the first body section 7A at positions apart from the wall section 9A in the same manner as the attention-attracting sections 75A of the above modified example.

[0096] In a cross-section (cross-section shown in Fig. 17(b)) of each attention-attracting section 78A along the imaginary plane P, a first angle θ_5 between the upper surface 6A of the first body section 7A and a surface 79A of the attention-attracting section 78A continuing to one side of the upper surface 6A in the laying direction D, is different from a second angle θ_6 between the upper surface 6A and a surface 80A of the attention-attracting section 78A continuing to the other side of the upper surface 6A in the laying direction D.

[0097] With the slope device 1 for a wheelchair having such a construction, in the same manner as the slope device 1 for a wheelchair provided with the attention-attracting sections 67A of the above modified example, it is possible to make a wheel of a wheelchair easily run on the attention-attracting sections 78A when the wheelchair climbs the slope device 1 for a wheelchair.

[0098] The attention-attracting section 83A shown in Figs. 18(a) and 18(b) has first attention-attracting sections 84A, second attention-attracting sections 85A and third attention-attracting sections 86A, that are formed so as to protrude from the upper surface 6A of the first body section 7A at positions apart from the wall section

9A.

[0099] The attention-attracting sections 84A, 85A and 86A are each formed into substantially rectangular shapes extending in respective directions in plan view, the extending direction of the first attention-attracting sections 84A and the third attention-attracting sections 86A is substantially perpendicular to the extending direction of the second attention-attracting sections 85A. The first attention-attracting sections 84A and the third attention-attracting sections 86A are disposed so as to sandwich the second attention-attracting sections 85A in a direction perpendicular to the laying direction D. Then, a plurality of the attention-attracting sections 84A, 85A and 86A are each provided with intervals in the laying direction D.

[0100] A plurality of attention-attracting sections 89A shown in Figs. 19(a) and 19(b) are provided with intervals in the laying direction D so as to continue to the wall section 9A and protrude from the upper surface 6A of the first body section 7A. Then, each attention-attracting section 89A has contact surfaces 90A and 91A extending upwardly from the upper surface 6A of the first body section 7A and leaving from the wall section 9A from one end portion toward the other end portion in the laying direction D.

[0101] In this modified example, each attention-attracting section 89A is formed to have a substantially triangular shape having a bottom side along the wall section 9A in plan view.

[0102] With the slope device 1 for a wheelchair having such a construction, for example, when a wheel K of a wheelchair contacts with the contact surface 90A of the attention-attracting section 89A, a portion of the wheel K in contact with the contact surface 90A receives a reaction force F from the contact surface 90A in a direction perpendicular to the contact surface 90A. Accordingly, by the contact surface 90A, a force of moving the wheel K away from the wall section 9A functions.

[0103] Accordingly, when the wheel K of the wheelchair moving along the upper surface 6A of the first body section 7A approaches the wall section 9A side, it is possible to exert a force of moving the wheel K away from the wall section 9A, and to more securely prevent the wheelchair from running off the first slope 2.

[0104] The attention-attracting section 94A shown in Figs. 20(a) and 20(b) is formed so as to continue to the wall section 9A and protrude from the upper surface 6A of the first body section 7A. Then, in the attention-attracting section 89A, in the same manner as the slope device 1 for a wheelchair provided with the attention-attracting section 89A of the above modified example, contact surfaces 95A and 96A extending upwardly from the upper surface 6A of the first body section 7A and leaving from the wall section 9A from one end portion in the laying direction D toward the other end portion.

[0105] In this modified example, the attention-attracting section 94A is formed into a substantially trapezoidal shape having a bottom side along the wall section 9A

side in plan view.

[0106] As described in detail above, it is sufficient that the attention-attracting section is formed within a predetermined range from the wall sections 8A and 9A, so as to protrude or be recessed into the upper surface 6A of the first body section 7A and provided on the upper surface 6A side of the top portions 21A and 22A of the wall sections 8A and 9A, respectively.

[0107] Further, in this embodiment, by changing the constructions of the surface fasteners 12, 13, 30 and 31 provided on the slope device 1 for a wheelchair to be ones described below, it is possible to improve the portability of the slope device for a wheelchair after use.

[0108] For example, the slope device 101 for a wheelchair shown in Fig. 21 is provided with a surface fastener (connecting member) 102 having one end connected with a first body section 7A instead of the surface fasteners 12 and 13 of the slope device 1 of the above embodiment, and a surface fastener (connecting member) 103 having one end connected with a second body section 7B instead of the surface fasteners 30 and 31.

[0109] The surface fastener 102 is formed into a tape shape of a material having flexibility, and a lower surface of the other end side of the surface fastener is provided with a first connecting surface 102a.

[0110] Meanwhile, the surface fastener 103 is formed into a tape shape of a material having flexibility, and an upper surface of the other end side of the surface fastener is provided with a second connecting surface 103a. Further, on a lower surface of the surface fastener 103, a first connecting surface 103b is provided on the other end side, and a second connecting surface 103c is provided in a central portion.

[0111] Here, in the surface fasteners 102 and 103, only the first connecting surface and the second connecting surface are connectable to each other. More specifically, for example, the first connecting surface 102a of the surface fastener 102 is connectable and detachable from the second connecting surface 103a and the second connecting surface 103c of the surface fastener 103, and is not connectable with the first connecting surface 103b of the surface fastener 103.

[0112] With respect to the slope device 101 for a wheelchair having such a construction, as shown in Fig. 21, a user presses the first connecting surface 102a of the surface fastener 102 against the second connecting surface 103a of the surface fastener 103 to connect the first slope 2 with the second slope 3. Then, in a state that the surface fasteners 102 and 103 are tensed in a direction perpendicular to the laying direction D, the first slope 2 and the second slope 3 are laid over a step L for use.

[0113] After use of the slope device 101 for a wheelchair is completed, as shown in Fig. 22, the user presses the first connecting surface 103b against the second connecting surface 103c of the surface fastener 103, so that the end portion of the first slope 2 on which the surface fastener 102 is connected approaches the end portion of the second slope 3 on which the surface fastener 103

is connected. Then, the user overlaps the first slope 2 with the second slope 3 and holds the handles 14A and 14B to carry the slope 101 for a wheelchair.

[0114] Further, the slope device 111 for a wheelchair shown in Fig. 23 is provided with a surface fastener (connecting member) 112 having one end connected with the first body section 7A instead of the surface fasteners 12 and 13 of the slope device 1 for a wheelchair of the above embodiment, and a surface fastener (connecting member) 113 having one end connected with the second body section 7B instead of the surface fasteners 30 and 31.

[0115] In this modified example, the lengths of the surface fasteners 112 and 113 are set to be longer than the width of the slopes 2 and 3.

[0116] The surface fastener 112 is formed into a tape shape of a material having flexibility, and a first connecting surface 112a is provided on the other end side of a lower surface of the surface fastener, and a first connecting surface 112b is provided on one end side of the lower surface. The surface fastener 113 is formed into a tape shape of a material having flexibility, and a second connecting surface 113a is provided on the other end side of an upper surface of the surface fastener, and a second connecting surface 113b is provided on one end side of the upper surface.

[0117] Here, portions of the surface fastener 112 provided with the first connecting surfaces 112a and 112b are substantially equal to the portions of the surface fastener 113 provided with the second connecting surfaces 113a and 113b in the position in a direction perpendicular to the document face of Fig. 23 so that they can be connected with each other. Meanwhile, portions of the surface fastener 112 not provided with the first connecting surfaces 112a and 112b are different from portions of the surface fastener 113 not provided with the second connecting surfaces 113a and 113b in the position in a direction perpendicular to the document face (for example, the surface fastener 112 is disposed more front side of the document face than the surface fastener 113) so as not to interfere with each other.

[0118] With respect to the slope device 111 for a wheelchair having such a construction, as shown in Fig. 23, a user presses the first connecting surface 112b of the surface fastener 112 against the second connecting surface 113b of the surface fastener 113, to connect a first slope 2 with a second slope 3. Then, in a state that the surface fasteners 112 and 113 are tensed in a direction perpendicular to the laying direction D, the user lays the first slope 2 and the second slope 3 over a step L for use.

[0119] When use of the slope device 111 for a wheelchair is completed, as shown in Fig. 24, the user overlaps the first slope 2 with the second slope 3 so that the respective wall sections 8A and 9A meet to each other and the respective wall sections 8B and 9B meet to each other, and the user winds the surface fastener 113 around the outside of the first slope 2 and the surface fastener 112 around the second slope 3. Then, the user presses the first connecting surface 112a of the surface fastener

112 against the second connecting surface 113a of the surface fastener 113 to connect them, and holds the handles 14A and 14B to carry the slope device 111 for a wheelchair.

SECOND EMBODIMENT

[0120] Next, a second embodiment of the present invention will be described. Portions common to those of the above embodiment are designated as the same symbols, their explanations are omitted and only different points will be described.

[0121] As shown in Fig. 25, a slope device 121 for a wheelchair of this embodiment has a single body section 122 instead of two body sections 7A and 7B of the slope device 1 for a wheelchair of the above embodiment.

[0122] The slope device 121 for a wheelchair has the above body section 122 having a substantially plate shape whose upper surface 122a is flat, a pair of wall sections 123 and 124 provided so as to protrude from the upper surface 122a, and a pair of attention-attracting sections 125 and 126 provided between the pair of wall sections 123 and 124 on the upper surface 122a.

[0123] In this embodiment, the shape and the construction of the attention-attracting section may be the same as those of the first embodiment.

[0124] In this embodiment, the width W3 of the upper surface 122a of the body section 122 in a direction perpendicular to the laying direction D is set to be larger than the span between left and right wheels of a typical wheelchair having four wheels.

[0125] With the slope device 121 for a wheelchair of this embodiment having such a construction, it is possible to make a user recognize that a wheel approaches a wall section 123 or 124 before it contacts with the wall section 123 or 124, thereby to enhance the safety at the time of operation of the wheelchair.

[0126] Further, it is possible to simplify the construction of the slope device 121 for a wheelchair.

THIRD EMBODIMENT

[0127] Next, a third embodiment of the present invention will be described. Portions common to those of the above embodiments are designated by the same symbols, their explanations are omitted and only different points will be described.

[0128] As shown in Fig. 26, a slope device 131 for a wheelchair of this embodiment has four body sections 132 to 135 instead of the single body section 122 of the slope device 121 for a wheelchair of the above second embodiment.

[0129] Further, in this embodiment, the shape and the construction of the attention-attracting section may be the same as those of the first embodiment.

[0130] Between the body section 132 and the body section 133, between the body section 133 and the body section 134 and between the body section 134 and the

body section 135, respective hinge mechanisms 136 are provided, so that the body sections 132 to 135 can be folded alternately.

[0131] In this embodiment, the distance W4 between an attention-attracting section 125 and an attention-attracting section 126 in a direction perpendicular to the laying direction D is set to be larger than the distance between left and right wheels of a typical wheelchair having four wheels.

[0132] With the slope device 131 for a wheelchair of this embodiment having such a construction, it is possible to enhance the safety at a time of operation.

[0133] Further, it is possible to carry the slope device 131 for a wheelchair as it is compactly folded.

[0134] In the foregoing descriptions, the first to third embodiments of the present invention have been described with reference to Drawings, but specific constructions of the present invention are not limited to these embodiments, but they include e.g. modified constructions within the range not deviating from the gist of the present invention.

[0135] For example, in the first to third embodiments, both of the tapered section 18A and the groove section 20A are formed. However, even if the tapered section 18A or the groove section 20A is not formed, it is possible to lay the slope device for a wheelchair over a step L. Accordingly, it is acceptable that none of the tapered section 18A and the groove section 20A are formed or either one of them is formed.

[0136] Further, in the first to third embodiments, the body sections, the wall sections and the attention-attracting sections are integrally formed of a fiber reinforced plastic, but they may be formed of e.g. an aluminum or steel plate.

INDUSTRIAL APPLICABILITY

[0137] The slope device for a wheelchair of the present invention is provided with an attention-attracting section adjacently to a wall section. Accordingly, it is possible to notify a user that a wheel approaches the wall section before the wheel contacts with the wall section, whereby it is possible to enhance the safety at a time of operation of a wheel chair, and the present invention is useful.

[0138] The entire disclosure of Japanese Patent Application No. 2009-222456 filed on September 28, 2009 including specification, claims, drawings and summary is incorporated herein by reference in its entirety.

REFERENCE SYMBOLS

[0139]

1, 101, 111, 121 and 131: slope device for a wheelchair
6A, 6B, 122a: upper surface
7A: first body section (body section)
7B: second body section (body section)

8A, 8B, 9A, 9B, 123 and 124: wall section
10A, 10B, 11 A, 11 B, 57A, 61 A, 64A, 67A, 72A, 75A, 78A, 83A, 89A, 94A, 125 and 126: attention-attracting section
12, 13, 30, 31, 102, 103, 112, 113: surface fastener (connecting member) 18A: tapered section
20A: groove section
90A, 91A, 95A, 96A: contact surface
122, 132 to 135: body section
41A and 42A: elastic member
θ1 and θ5: first angle
θ2 and θ6: second angle
D: laying direction
L: step

Claims

1. A slope device for a wheelchair, which is used by being laid over a step, the slope device for a wheelchair comprising;
a body section having a flat upper surface;
at least a pair of wall sections protruding from the upper surface of the body section and disposed substantially in parallel with the laying direction in which the body section is laid over the step; and
an attention-attracting section provided on the upper surface of the body section at a position between said at least a pair of wall sections so as to be present within a predetermined range from one of the pair of wall sections, the attention-attracting section protruding or recessed from the upper surface and provided further toward the upper surface side than the most distant portion of said wall section from the upper surface.
2. The slope device for a wheelchair, wherein the body section, the at least a pair of wall sections and the attention-attracting section are integrally formed of a fiber-reinforced plastic.
3. The slope device for a wheelchair according to Claim 1 or 2, wherein the attention-attracting section is disposed so as to continue to the wall section.
4. The slope device for a wheelchair according to any one of Claims 1 to 3, wherein the attention-attracting section has a contact surface extending upwardly from the upper surface of the body section, and leaving from said one of the wall sections from one end toward the other end in the laying direction.
5. The slope device for a wheelchair according to any one of Claims 1 to 4, wherein a plurality of the attention-attracting sections are provided at intervals in the laying direction.
6. The slope device for a wheelchair according to any

one of Claims 1 to 5, wherein the attention-attracting section protrudes from the upper surface of the body section, and in a cross-section of the attention-attracting section in parallel with the laying direction and perpendicular to the upper surface of the body section, a first angle between the upper surface of the body section and a surface of the attention-attracting section continuing to one side of the upper surface in the laying direction, is different from a second angle between the upper surface of the body section and a surface of the attention-attracting section continuing to the other side of the upper surface in the laying direction.

7. The slope device for a wheelchair according to any one of Claims 1 to 6, wherein the width of the attention-attracting section in a direction perpendicular to the laying direction is at least 10 mm and at most 50 mm, and the height difference of the attention-attracting section from the upper surface of the body section is at least 3 mm and at most 15 mm. 5 10 15 20
8. The slope device for a wheelchair according to any one of Claims 1 to 7, wherein the body section has a tapered section formed in one end portion of the body section in the laying direction over the width of the body section in a direction perpendicular to the laying direction, wherein the thickness of the body section in the tapered section decreases toward the leading edge side of said one end portion. 25 30
9. The slope device for a wheelchair according to any one of Claims 1 to 7, wherein the body section has a groove section formed in one end portion of the body section in the laying direction over the width of the body section in a direction perpendicular to the laying direction, wherein the groove section is recessed in a curved shape. 35
10. The slope device for a wheelchair according to any one of Claims 1 to 9, which further comprises an elastic member attached to a lower surface of at least one end portion of the body section in the laying direction. 40 45
11. The slope device for a wheelchair according to any one of Claims 1 to 10, which comprises as the body section, a first body section and a second body section, wherein each of the first body section and the second body section is provided with at least one wall section. 50
12. The slope device for a wheelchair according to Claim 11, which further comprises a connecting member for connecting the first body section and the second body section so as to be detachable. 55
13. The slope device for a wheelchair according to Claim

12, which comprises a plurality of the connecting members disposed with intervals in the laying direction.

Fig. 1

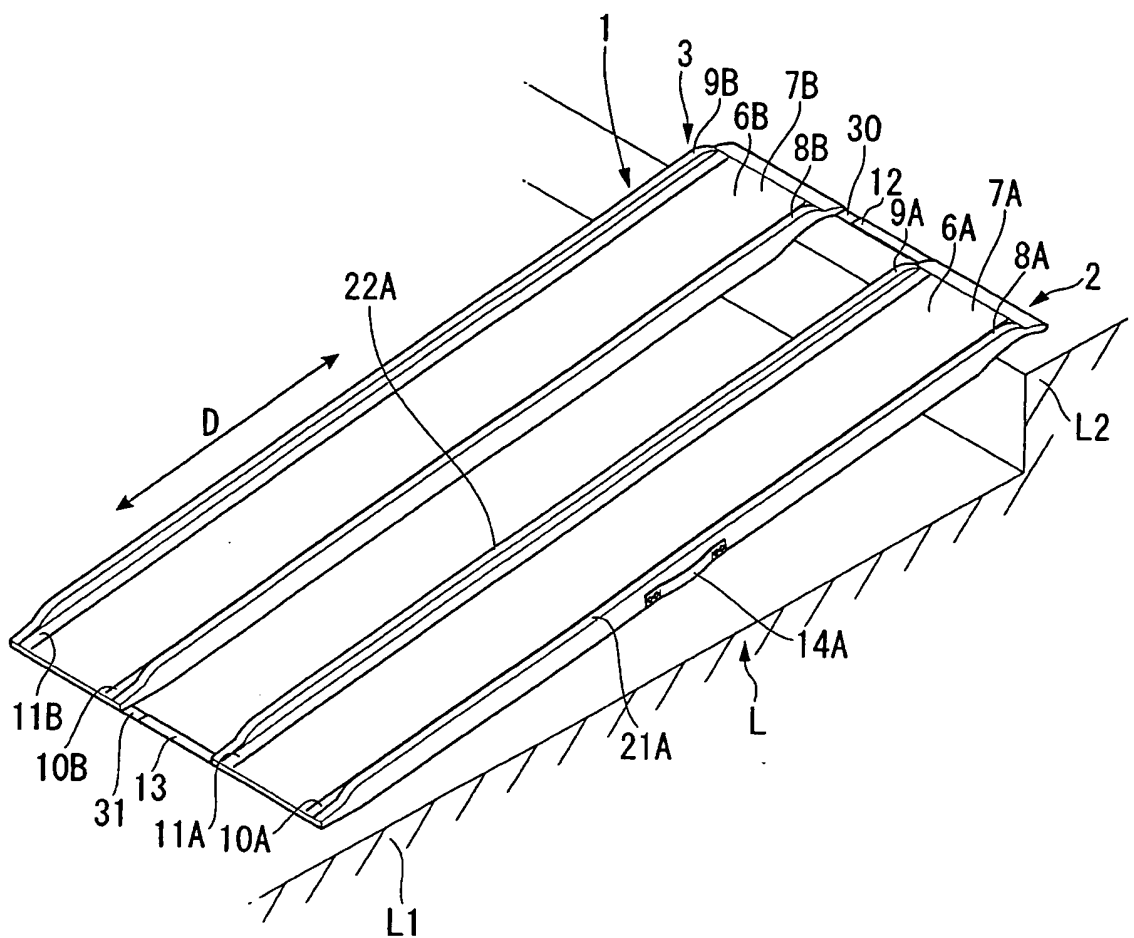


Fig. 2(a)

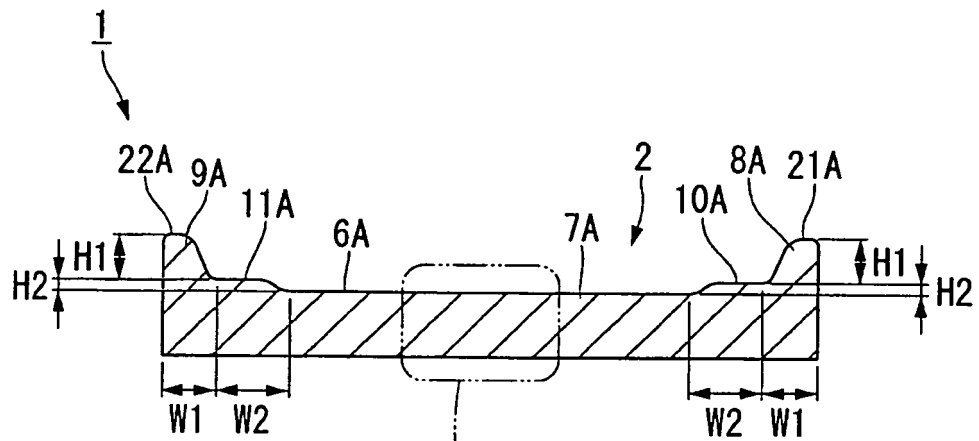


Fig. 2(b)

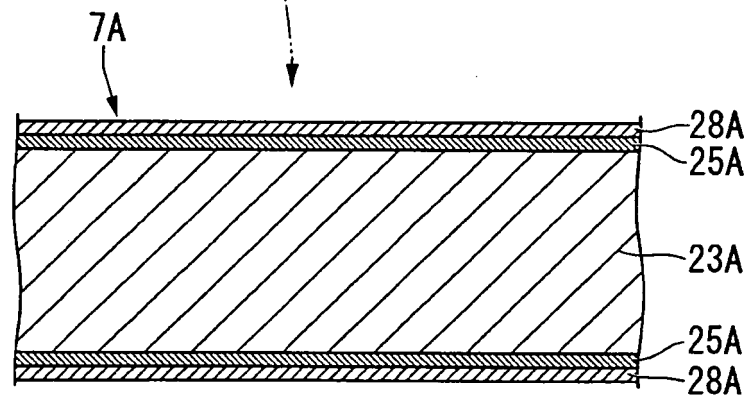


Fig. 3

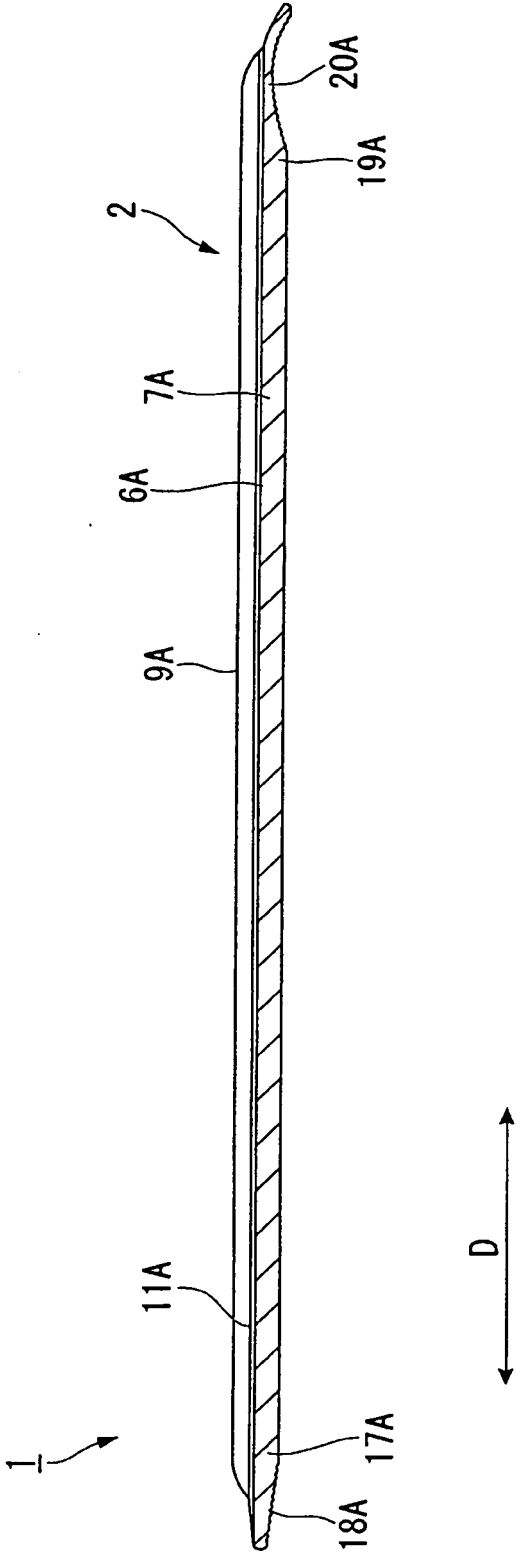


Fig. 4(a)

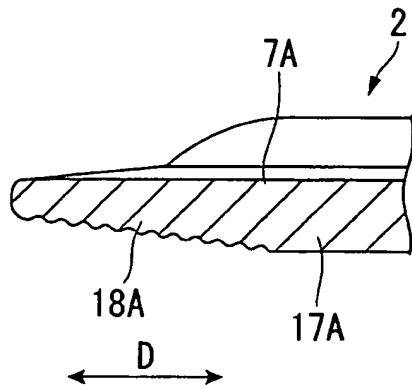


Fig. 4(b)

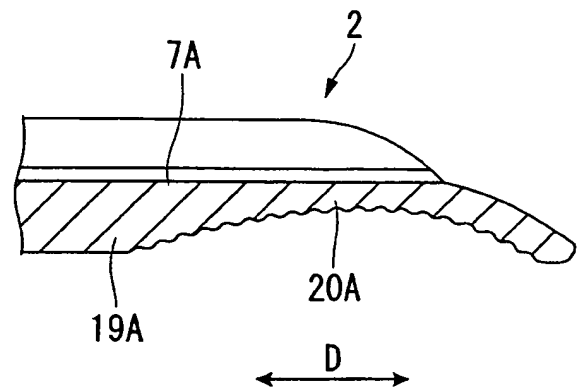


Fig. 5

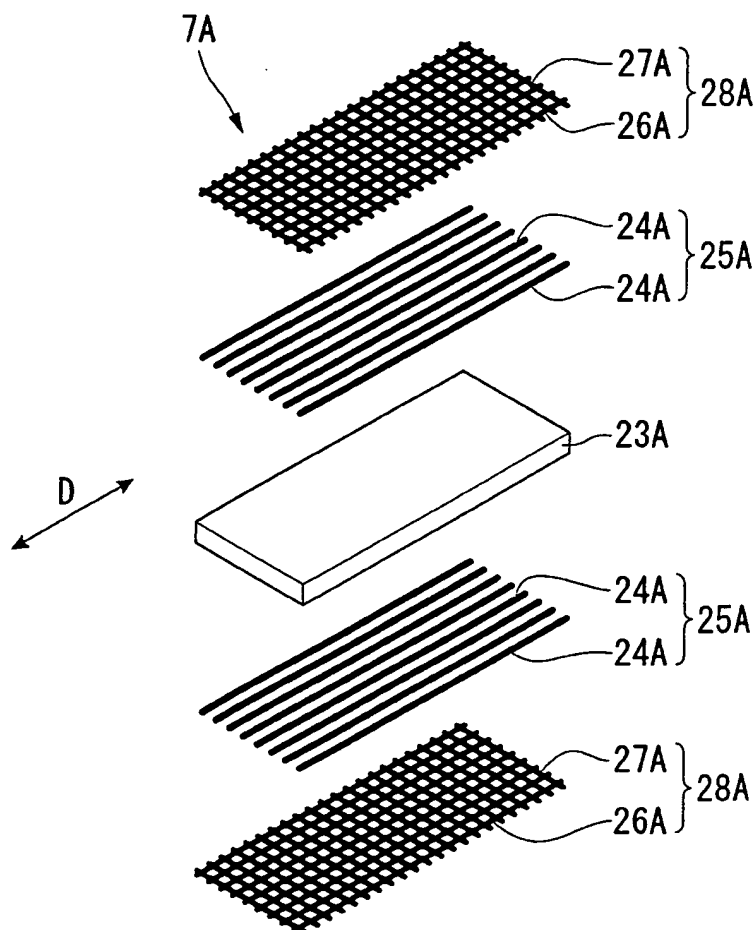


Fig. 6
(a)

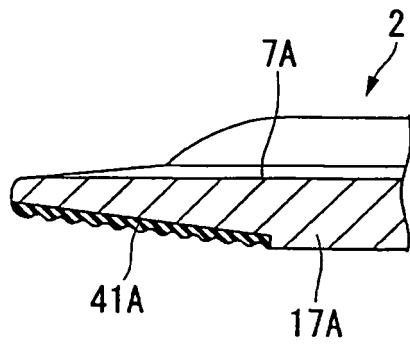


Fig. 6
(b)

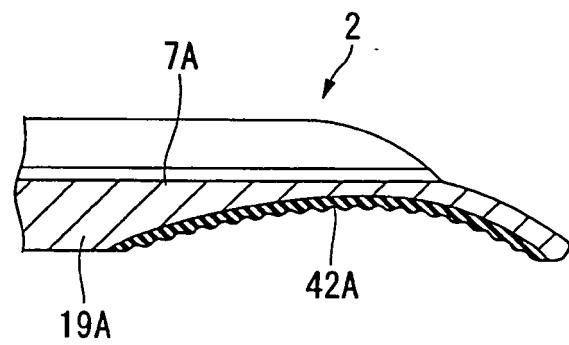


Fig. 7

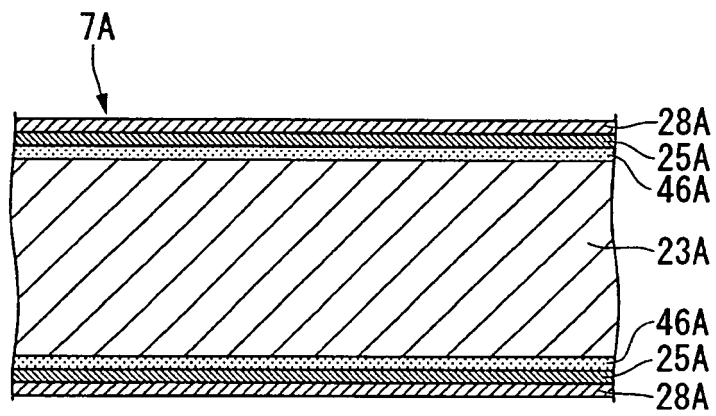


Fig. 8

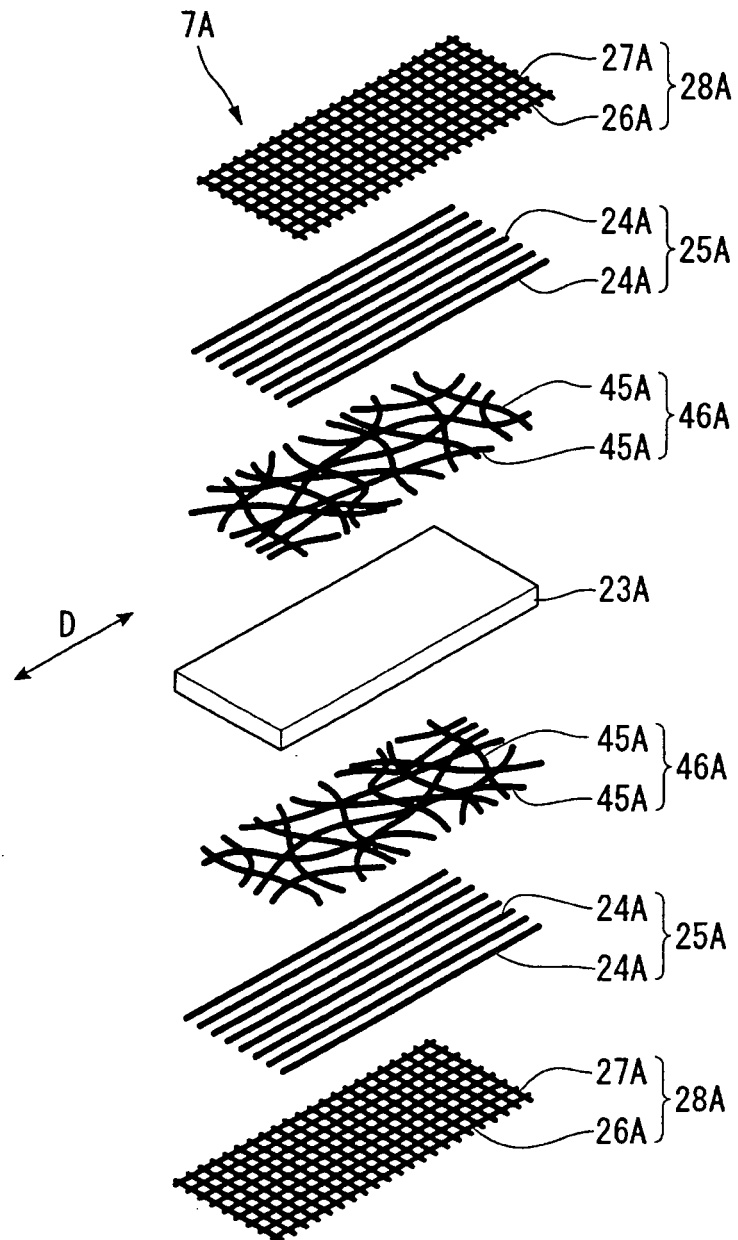


Fig. 9(a)

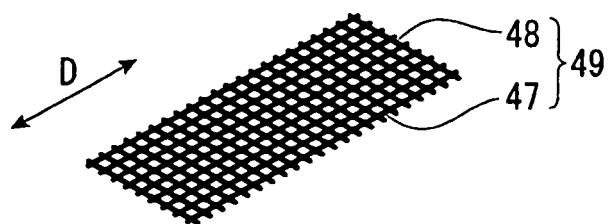


Fig. 9(b)

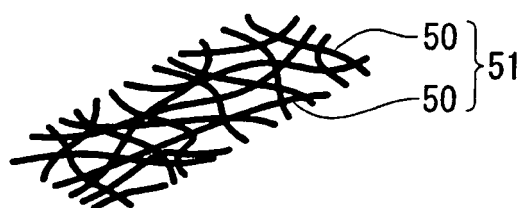


Fig. 9(c)

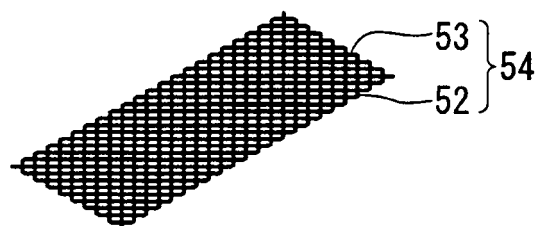


Fig. 10(a)

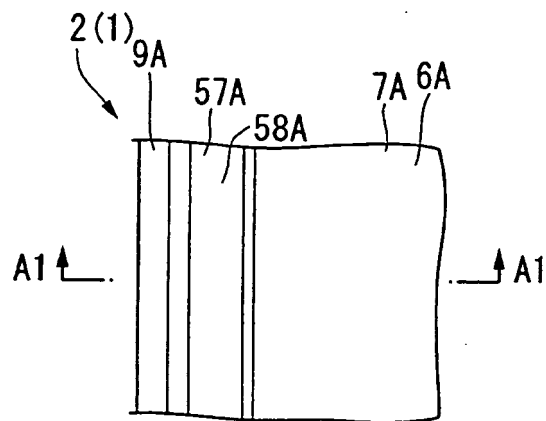


Fig. 10(b)

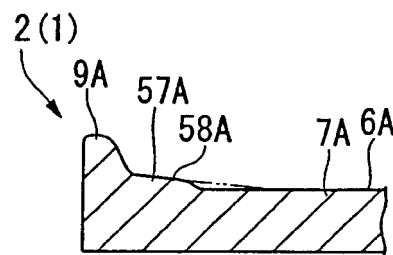


Fig. 11(a)

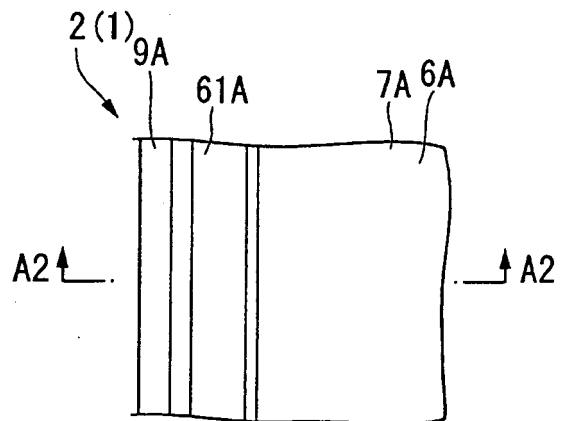


Fig. 11(b)

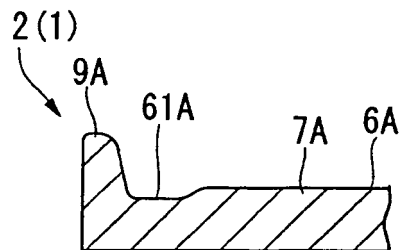


Fig. 12
(a)

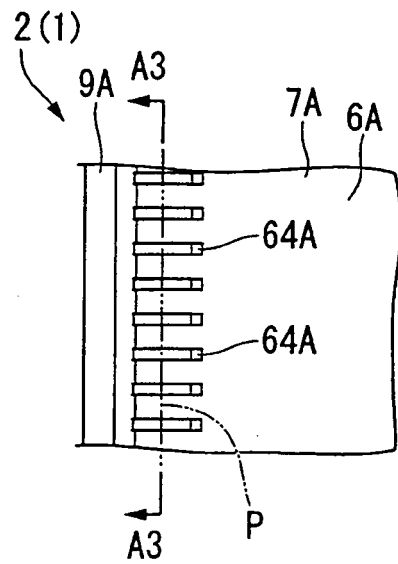


Fig. 12
(b)

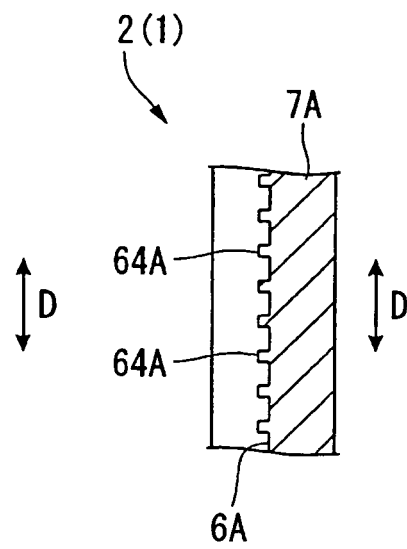


Fig. 13
(a)

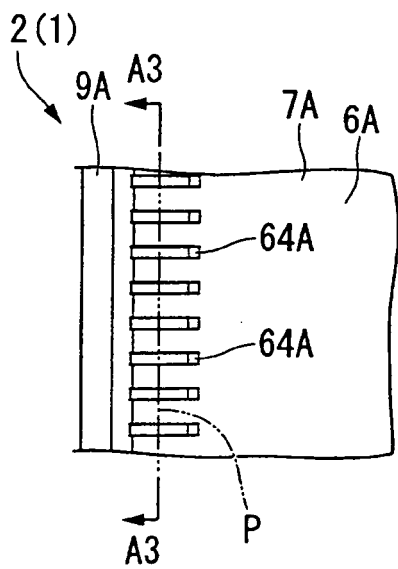


Fig. 13
(b)

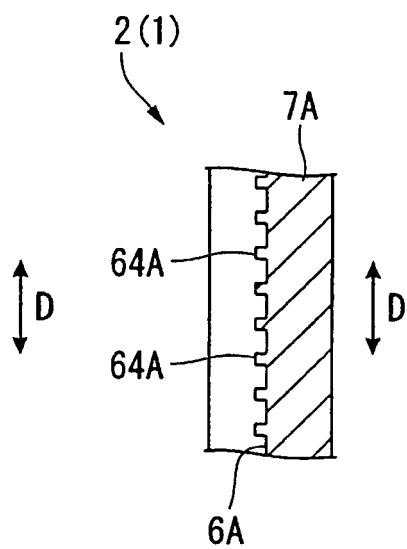


Fig. 14
(a)

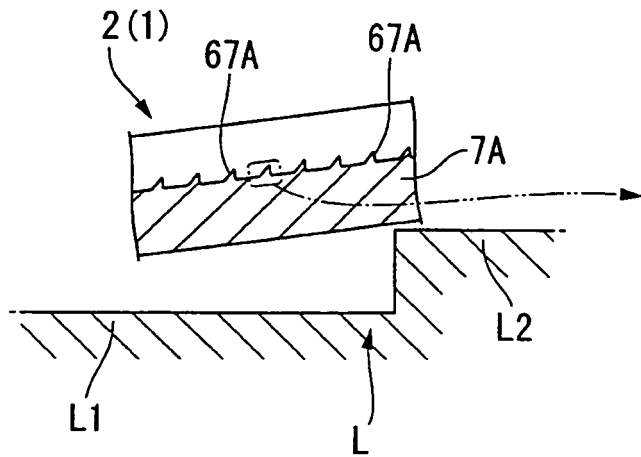


Fig. 14
(b)

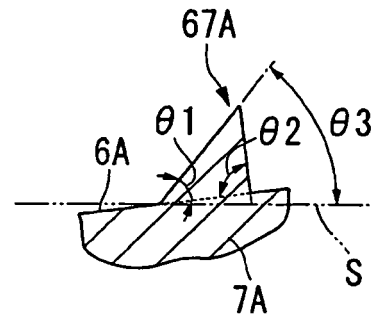


Fig. 15(a)

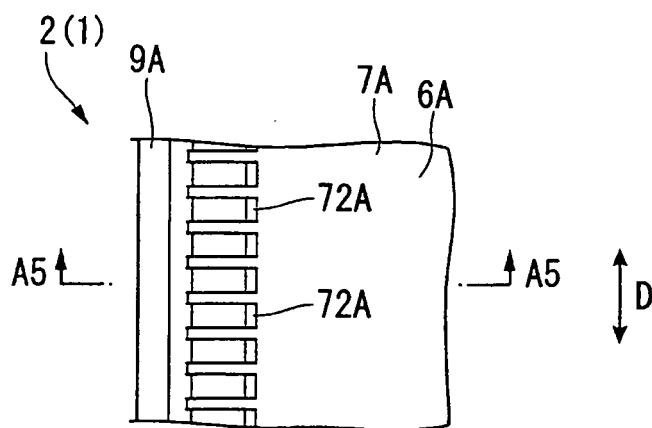


Fig. 15(b)

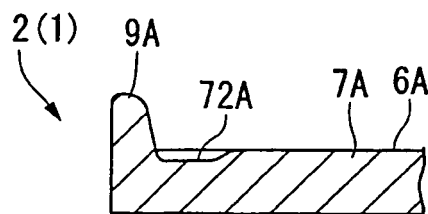


Fig. 16
(a)

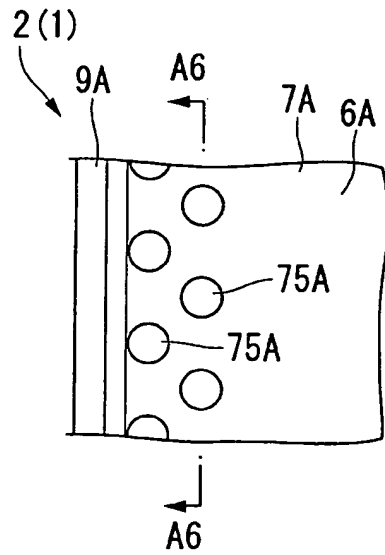


Fig. 16
(b)

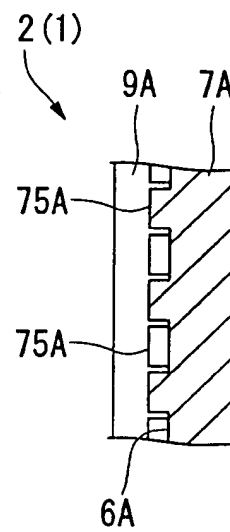


Fig. 17
(a)

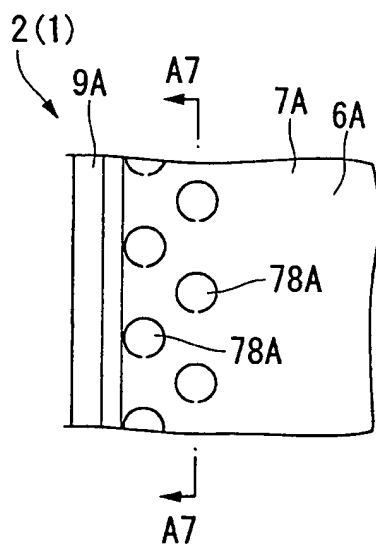


Fig. 17
(b)

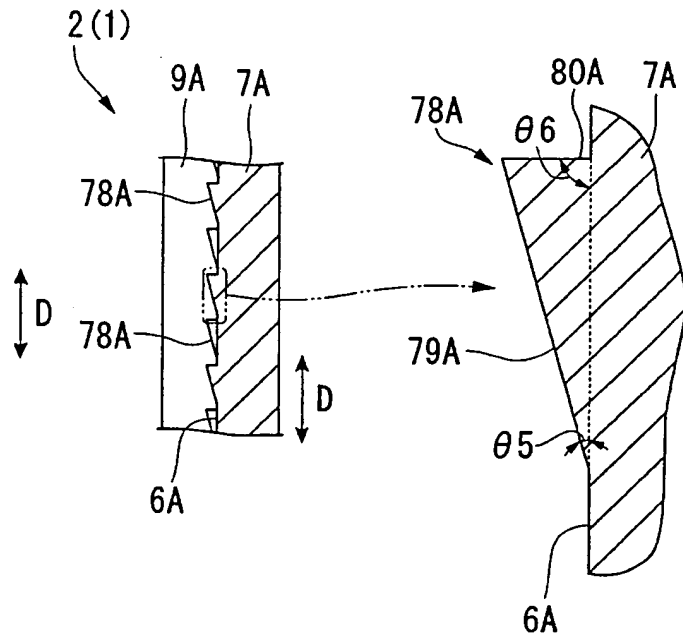


Fig. 18(a)

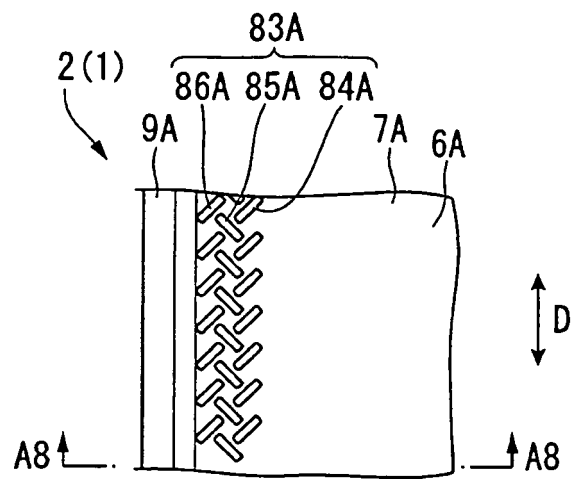


Fig. 18(b)

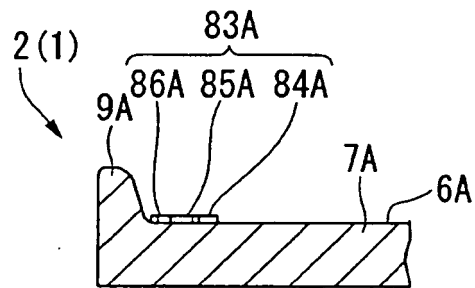


Fig. 19(a)

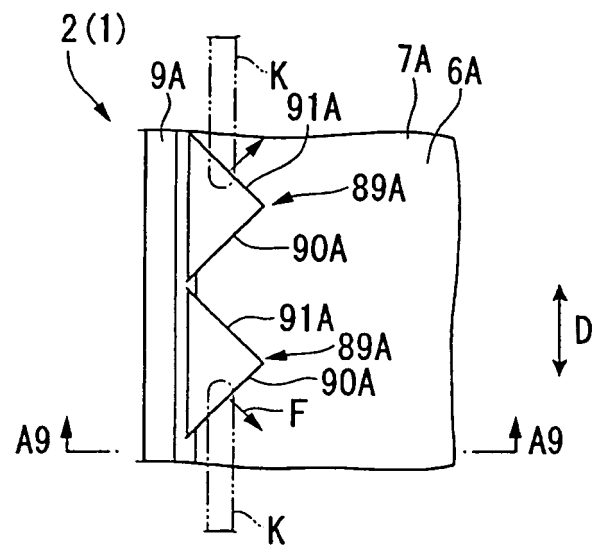


Fig. 19(b)

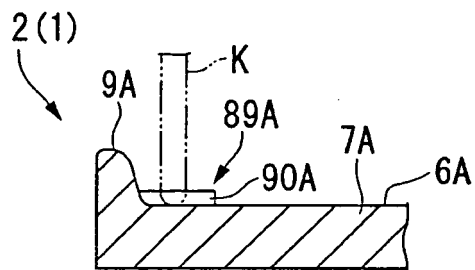


Fig. 20(a)

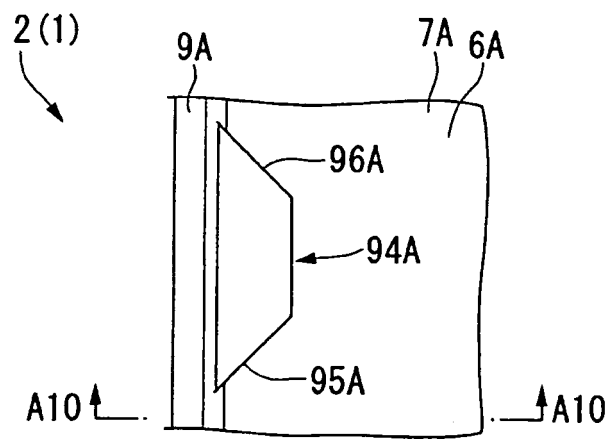


Fig. 20(b)

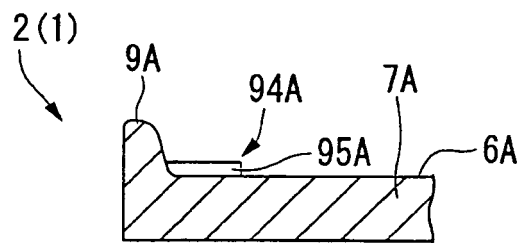


Fig. 21

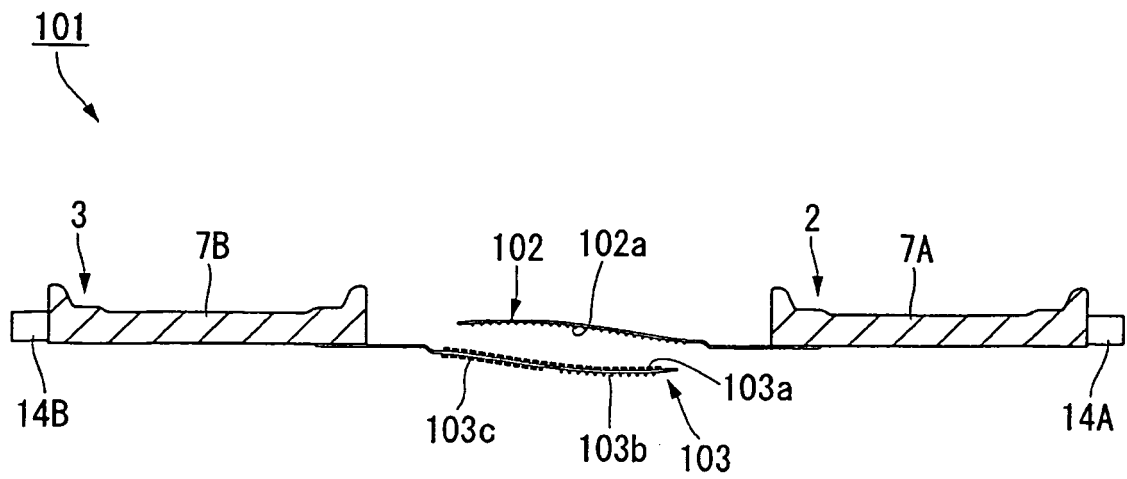


Fig. 22

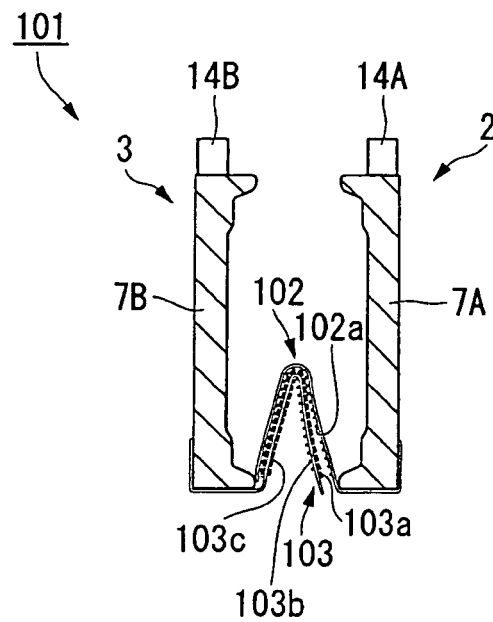


Fig. 23

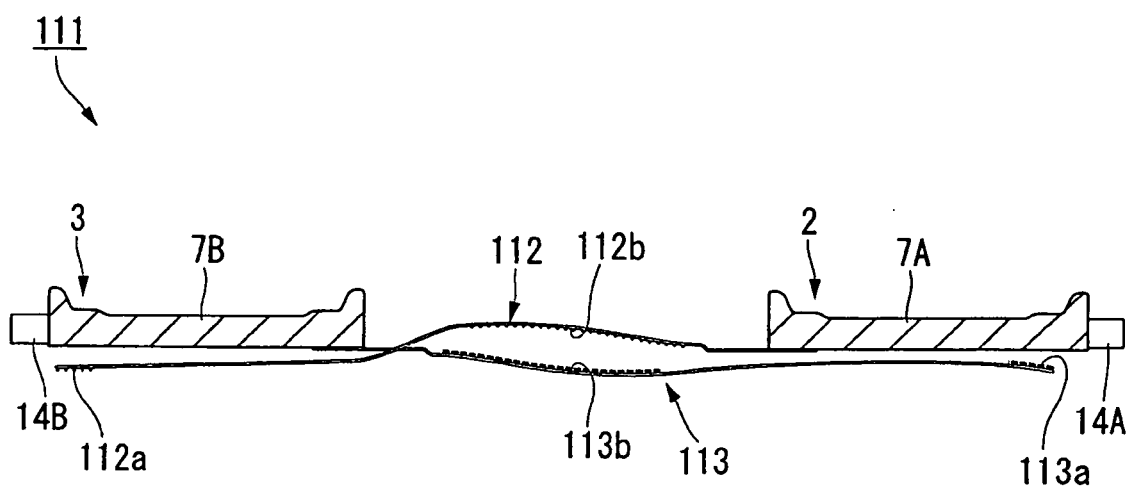


Fig. 24

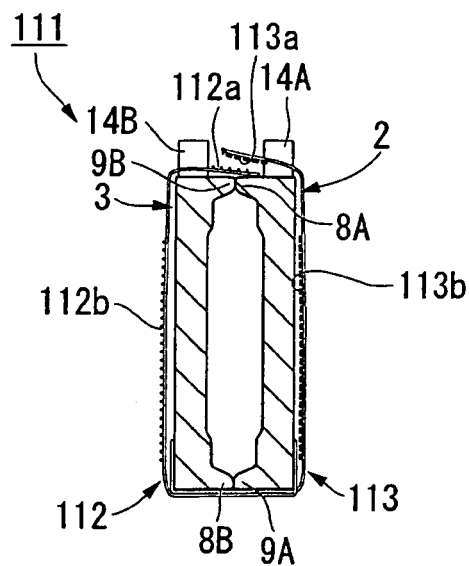


Fig. 25

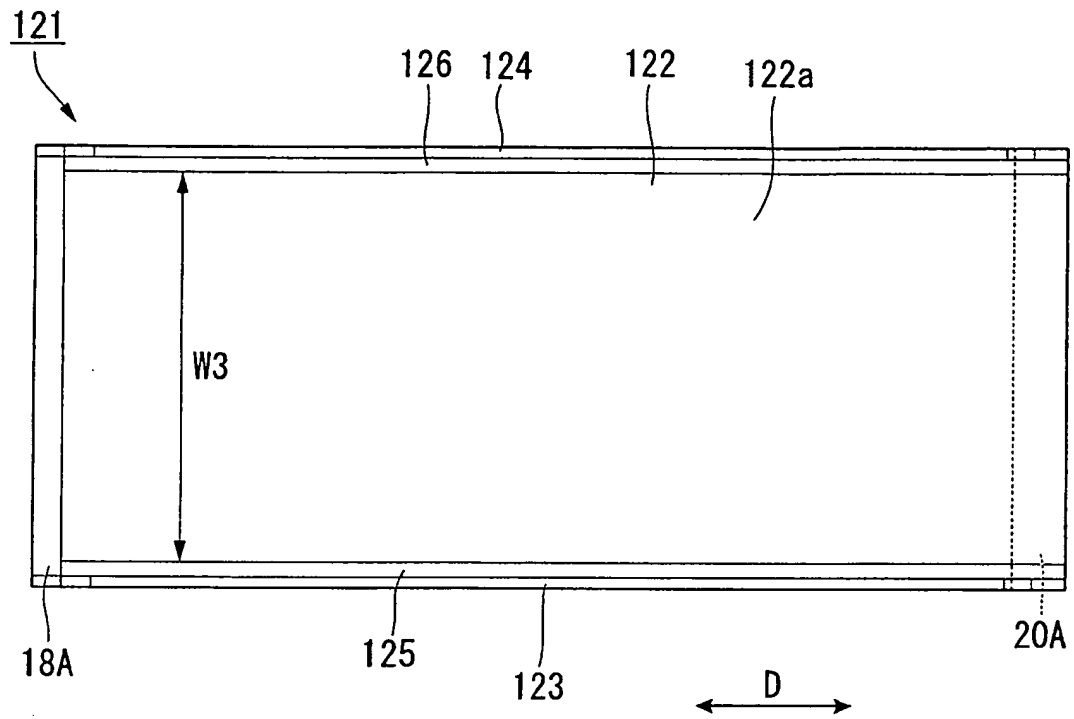
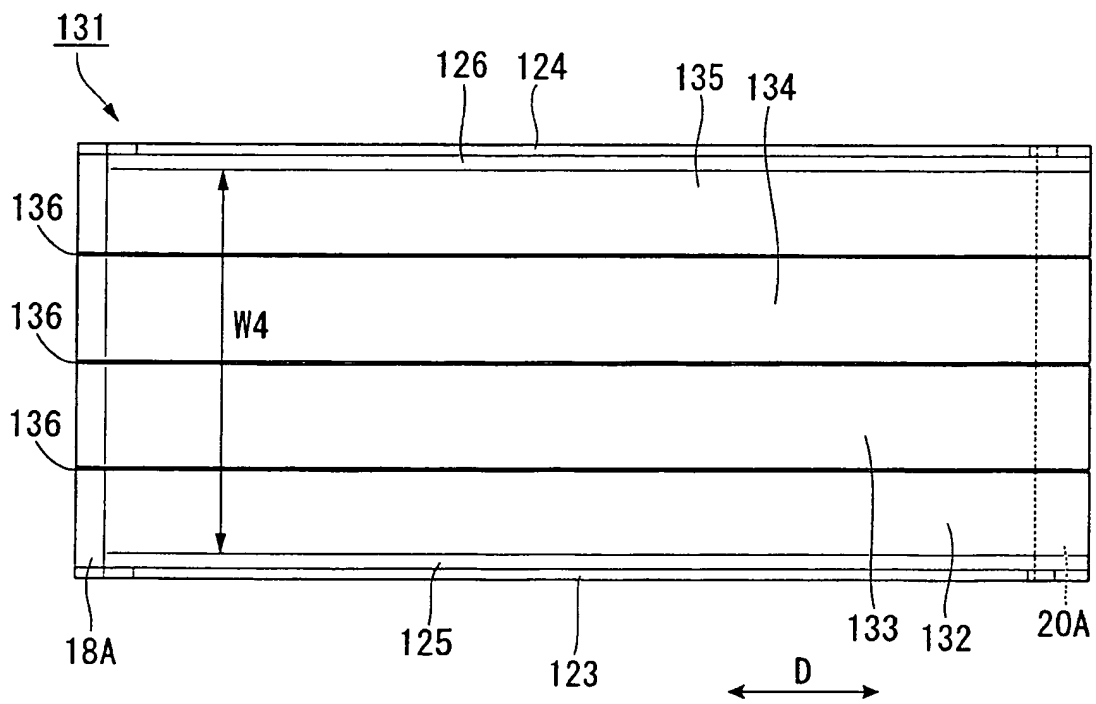


Fig. 26



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/066589

A. CLASSIFICATION OF SUBJECT MATTER A61G3/00 (2006.01) i, A61G5/00 (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) A61G3/00, A61G5/00 Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2010 Kokai Jitsuyo Shinan Koho 1971-2010 Toroku Jitsuyo Shinan Koho 1994-2010 Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2007-118758 A (Sumitomo Rubber Industries, Ltd.), 17 May 2007 (17.05.2007), paragraphs [0017] to [0041]; fig. 1 to 7 (Family: none)	1-13
Y	JP 47-038098 Y1 (Sugiaki KUSATAKE), 26 September 1972 (26.09.1972), column 2, line 2 to column 4, line 38; fig. 1 to 5 (Family: none)	1-13
Y	JP 2004-190446 A (Matsuoka Concrete Industry Co., Ltd.), 08 July 2004 (08.07.2004), paragraphs [0011] to [0023]; fig. 1 to 16 (Family: none)	1-13
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "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 "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 03 December, 2010 (03.12.10)		Date of mailing of the international search report 14 December, 2010 (14.12.10)
Name and mailing address of the ISA/ Japanese Patent Office		Authorized officer
Facsimile No.		Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2010/066589

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 08-502106 A (Allan Smith & Associates Pty Ltd.), 05 March 1996 (05.03.1996), page 6, lines 3 to 6; page 7, lines 1 to 4; fig. 1, 4 & US 5671496 A & WO 1993/025781 A1	9-13
Y	JP 2002-017787 A (Nippon Light Metal Co., Ltd.), 22 January 2002 (22.01.2002), paragraphs [0022] to [0052]; fig. 1 to 16 (Family: none)	11-13
Y	JP 2001-279898 A (Kabushiki Kaisha Daise), 10 October 2001 (10.10.2001), paragraphs [0017] to [0035]; fig. 1 to 14 (Family: none)	13

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REFERENCES CITED IN THE DESCRIPTION

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