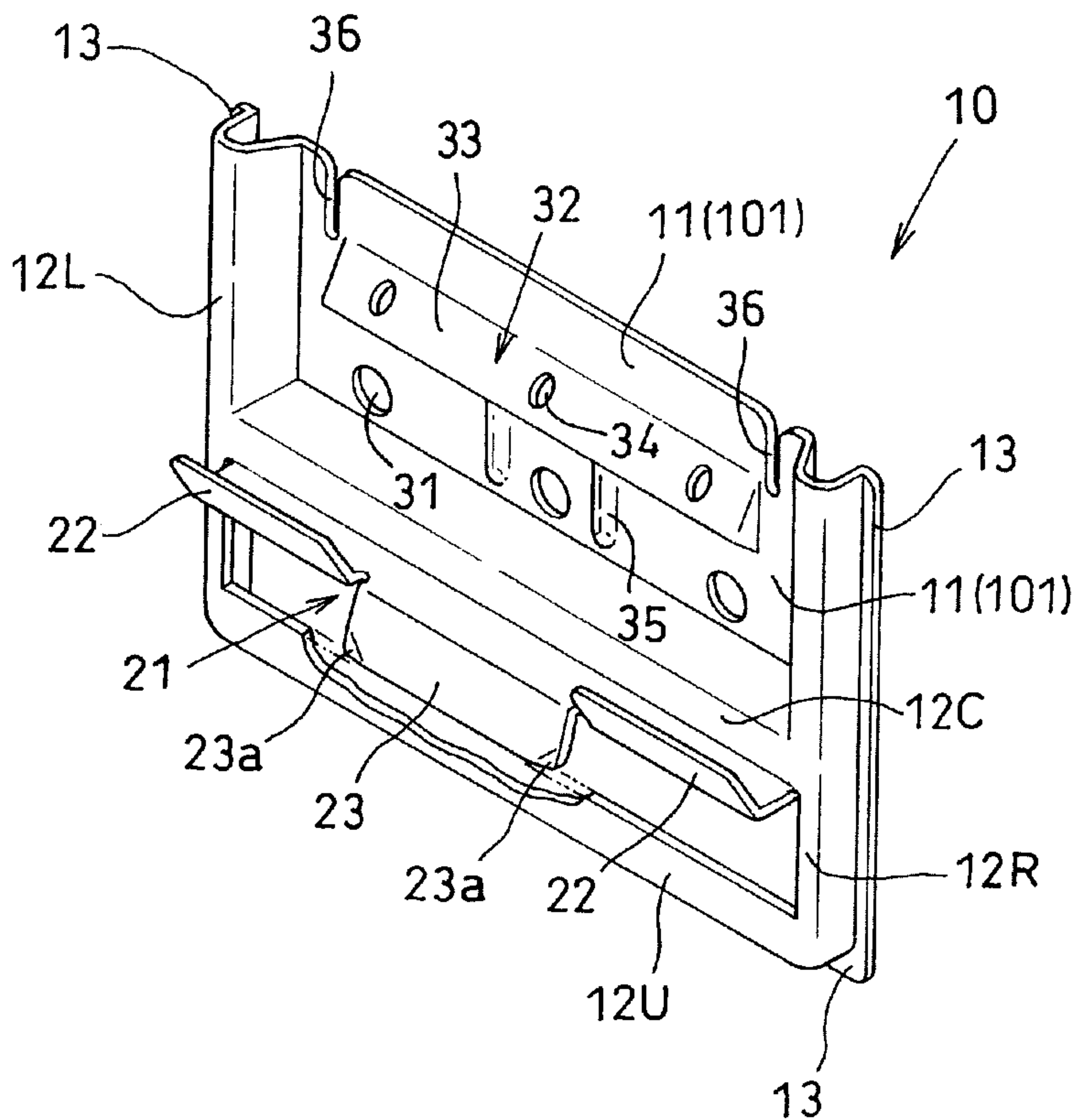




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 A CET ELEMENT  
 (54) Title: FASTENING MEMBER AND SIDING BOARDS ATTACHMENT STRUCTURE USING THE FASTENING MEMBER



(57) Abrégé/Abstract:

A fastening member 10 produced from a single steel sheet that is capable of stably supporting an exterior wall board and ensuring ventilation between the board and a building frame. The fastening member 10 comprises a left-side support portion 12L and a right-

(57) **Abrégé(suite)/Abstract(continued):**

side support portion 12R on either side thereof that abut on the back surface of a board when fastened. In the intermediate region between the left-side and right-side support portions 12L and 12R, there are provided, from top to bottom, a substrate portion 11 that functions as a mount portion to be fixed to the building frame, a central support portion 12C to be abutted against the back surface of a board when fastened, a locking portion 21 to be locked on the upper and lower edges of boards when fastened, and a lower support portion 12U to be abutted against the back surface of a board when fastened.

FASTENING MEMBER AND SIDING BOARDS ATTACHMENT  
STRUCTURE USING THE FASTENING MEMBER

ABSTRACT OF THE DISCLOSURE

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A fastening member 10 produced from a single steel sheet that is capable of stably supporting an exterior wall board and ensuring ventilation between the board and a building frame. The fastening member 10 comprises a left-side support portion 12L and a right-side support portion 12R on either side thereof that abut on the back surface of a board when fastened. In the intermediate region between the left-side and right-side support portions 12L and 12R, there are provided, from top to bottom, a substrate portion 11 that functions as a mount portion to be fixed to the building frame, a central support portion 12C to be abutted against the back surface of a board when fastened, a locking portion 21 to be locked on the upper and lower edges of boards when fastened, and a lower support portion 12U to be abutted against the back surface of a board when fastened.

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TITLE OF THE INVENTIONFASTENING MEMBER AND SIDING BOARDS ATTACHMENT  
STRUCTURE USING THE FASTENING MEMBER

5

BACKGROUND OF THE INVENTIONField of the Invention

The present invention relates to a fastening member used for fastening exterior wall boards such as ceramic siding boards to a building frame. The invention also relates to siding boards attachment structure employing the fastening member.

Description of the Related Art

During the construction of an exterior wall of a building, a siding board 40 as shown in Fig. 5 that has an underlying rabbeted portion 44 and an overlying rabbeted portion 42 at peripheral edges thereof, is fastened to a building frame using a fastening member. Fig. 6 shows a fastening member 50 disclosed in JP Patent Publication (Kokai) No. 2001-27031 A. The fastening member 50, which is formed by sheet metal work, includes support portions 51a, 51b adapted to abut on a back surface of an upper and a lower building board, respectively, when fastened, a locking portion 52 formed by successively bending a central portion of the support portion 51, a substrate portion 53 above the support portion 51a, and a bend portion 54 at the lower edge of the support portion 51b. When the metal fastening member 50 is fixed to the building frame, the substrate portion 53 and the end of the bend portion 54 constitute the mount portions via which the metal fastening member 50 is mounted on the building frame.

During construction, the overlying rabbeted portion 42 at the lower edge of an upper board is locked on the locking portion 52, with the back surface of the exterior wall abutting against the support portion 51a. The underlying rabbeted

portion 44 at the upper edge of a lower board is locked on the locking portion 52, with the back surface of the board abutting against the support portion 51b. The fastening member 50 further includes a depressed opening 61 formed in the support portion 51a that has such a depth as to reach the building frame and that helps stabilize the mounting of the fastening member 50 to the building frame. When the boards have been fastened, a space is established between the back surface of the boards and the building frame, the space corresponding to the interval between the face of the substrate portion 53 and the face of the support portion 51, so that ventilation can be ensured.

JP Patent Publication (Kokai) No. 9-302889 A (1997) discloses a fastening member 70 that is also formed by sheet metal work, as shown in Fig. 7. The fastening member 70 includes a substrate portion 71 that constitutes a mount portion that is fixed to the building frame, and support portions 72, 72 formed at either side edge of the substrate portion 71 such that they protrude forwardly while extending longitudinally. The fastening member further includes a locking portion 73 formed laterally between the support portions 72, 72 on either side, with the end of the locking portion 73 located more forwardly than the support portions 72, 72. The locking portion 73 is formed by bending a lower region of the substrate portion 71. The locking portion 73 includes rise portions 75, 75 formed by bending either side of the end thereof upward, and a fall portion 76 formed by bending a center portion of the end thereof downward. The upper board is fastened by having the overlying rabbeted portion 42 at the lower edge thereof locked on the rise portions 75, 75, with the back surface of the board abutting against the support portions 72, 72. The lower board is fastened by having the underlying rabbeted portion 44 at the upper edge thereof locked on the fall portion 76, with the back surface of the board similarly abutting against the support portions 72, 72. When the boards have been fastened, a space is established between the back surface of the boards and the structural frame that corresponds to the height of the support portions 72, so that ventilation is ensured.

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SUMMARY OF THE INVENTION

In the fastening member 50 shown in Fig. 6, since the locking portion 52 is  
5 formed by laminating the steel sheet two fold, the fastening member is rather  
heavy and requires much steel, resulting in higher cost.

In the fastening member 70 shown in Fig. 7, the locking portion 73 is  
formed of a single sheet and is therefore less heavy and less costly. However,  
since the locking portion 73 is extended from the substrate portion 71 that is the  
10 mount portion on the building frame, the locking portion 73 of the fastening  
member 70 is longer than the locking portion 52 of the fastening member 50  
shown in Fig. 6, in which the locking portion 52 is extended from the support  
portion 51. Thus, the strength of the locking portion 73 is rather unreliable,  
particularly when a heavy, large-sized board is to be fastened.

15 Further, the fastening member 70 is designed to support the back surface  
of the board exclusively with the left and right support portions 72, 72. Thus,  
when the adjacent portions of two laterally adjacent boards are to be fastened with  
a single fastening member 70, the back surface of each board must be supported by  
one of the two, i.e., left and right, support portions 72, resulting in a fastening  
20 stability problem.

In view of the aforementioned problems of the prior art, some embodiments  
of the present invention provide an improved fastening member formed of a single  
steel sheet that can be manufactured using a smaller amount of steel so that it is  
light and inexpensive, that is equipped with a sufficiently strong locking portion,  
25 and that is capable of stably supporting a board. Some embodiments of the  
present invention provide a highly stable exterior wall structure that employs the  
aforementioned fastening member.

In one aspect, the invention provides a fastening member for boards, said  
fastening member comprising a left-side and a right-side support portion on either

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side thereof, said support portions being adapted to abut on a back surface of a board when said board is fastened, said fastening member comprising, in an intermediate region between said left-side and right-side support portions, from  
5 top to bottom: a substrate portion that constitutes a mount portion to be fixed to a building frame; a central support portion that abuts on the back surface of a board when fastened; a locking portion extending from a lower edge of said central support portion and being adapted to be locked  
10 on an upper and a lower edge of boards when fastened; and a lower support portion that abuts on the back surface of a board when fastened, wherein: said fastening member is formed from a single sheet of steel; each of said left-side support portion, right-side support portion, lower support portion,  
15 and central support portion has the shape of a long and narrow strip and is formed as a continuous part by drawing the single sheet of steel; said substrate portion is formed in a large area of an upper region of the steel sheet, excluding the regions of said left-side support portion,  
20 right-side support portion and central support portion; said left-side support portion, right-side support portion and central support portion together form an H shape; said substrate portion is formed by depressing a portion of an upper region of the steel sheet toward a back surface of the  
25 fastening member; and said locking portion is formed by cutting a portion of a lower region of the steel sheet and raising it toward a front surface of the fastening member.

In the above fastening member, the locking portion is provided by cutting out a portion of the steel sheet as  
30 the material for the metal fastening member and then utilizing the cut-out steel sheet. Thus, the fastening member can be manufactured entirely from a single steel sheet, so that the weight and cost of the fastening member

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of the invention can be reduced as compared with the conventional fastening member 50 shown in Fig. 6. Moreover, as the locking portion is extended from a support portion, the length of the locking portion can be reduced as compared  
5 with the conventional fastening member 70 shown in Fig. 7, in which the locking portion 73 is extended from the substrate portion 71. As a result, the locking portion of the invention has a sufficient strength despite the fact that it is made from a single sheet.

10 Furthermore, as the back surface of the board is supported by the individual support portions provided on either side of the fastening member and at the top and bottom of the locking portion, the back surface of the board can be more reliably supported than it is supported only by  
15 the two support portions provided on either side of the conventional fastening member 70 shown in Fig. 7. In particular, when fixing the lower ends of two boards where they are laterally adjoined to each other, using a single fastening member, each board can be supported at two  
20 locations, namely either one of the support portions on the sides and the central support portion. Thus, the boards can be fastened in a stable manner.

In one embodiment, the locking portion comprises at least one rise portion and at least one fall portion at  
25 an edge thereof. In this embodiment, the locking portion can be formed by a simple bending process and yet the upper and lower ends of the board can be reliably locked by the thus formed locking portion.

In one embodiment, an area on either side of lower  
30 edges of said fall portion is bent toward the back surface of said fastening member such that the bent portions press against the board when fastened. In this embodiment, the

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board can be maintained in a position such that it is continuously pressed against the support portions, thereby stabilizing the fastened state. Moreover, by forming the tip of the bent portion in such a shape that the tip cuts  
5 into the surface of the board, an additional fastening stability can be provided by the wedge effect.

In one embodiment, at least one of said right-side, left-side, and lower support portions comprises a collar portion extending from an external edge thereof  
10 further outward, wherein said collar portion is located in the same plane as that of said substrate portion. In this embodiment, the collar portion as well as the substrate portion is abutted against the building frame, so that the fastening member can be fixed to the building frame more  
15 stably.

In one embodiment, a cut is provided in an upper edge of said substrate portion near said left-side and right-side support portion. In this embodiment, should a strong wind pressure (negative pressure) act on a board that  
20 has been fastened, the areas

of the substrate portion near the cuts are temporarily deformed to absorb the wind pressure (negative pressure), thereby preventing an excessive load from being put on the rabbeted portion of the board that is locked on the locking portion. Thus, a stable fastened condition can be maintained for a long time.

5           In another aspect, the invention provides siding boards attachment structure comprising a plurality of said fastening members that are mounted in multiple rows such that their substrate portions abut on a fixing surface of a building frame, and a plurality of boards each with a rabbeted portion provided at at least an upper edge and a lower edge, wherein said boards are fastened in  
10 multiple rows such that they have their back surfaces abutting on said left-side, right-side, central, and lower support portions of the fastening members, the rabbeted portion at the upper edge is locked on said locking portion of an upper fastening member, and the rabbeted portion at the lower edge is locked on said  
locking portion of a lower fastening member.

15           In this exterior wall structure, as the fastening member is lightweight and less costly, construction cost can be reduced while achieving a reliable fastened state. Furthermore, as a ventilation space is formed on the back surface of the boards that are fastened, the problem of dew condensation, for example, can be prevented.

20           Thus, the fastening member of the invention is made from a single sheet and is therefore lightweight and low cost, and yet the fastening member is capable of reliably supporting the board via the locking portion and support portions thereof. Thus, the fastened state of the board can be maintained in a stable manner for a long time using the exterior wall structure according to the invention.

25

#### BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection

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with the accompanying drawings, wherein:

Fig. 1 is a perspective view of an embodiment of the fastening member according to the invention.

Fig. 2 is a plan view of a steel sheet as the material of the fastening member shown in Fig. 1.

Fig. 3 is a perspective view of an board having been fastened to a building frame using the fastening member shown in Fig. 1.

Fig. 4 is a cross section taken along line IV – IV of Fig. 3.

Fig. 5 shows an example of an board.

Fig. 6 shows an example of the conventional fastening member.

Fig. 7 shows another example of the conventional fastening member.

#### DESCRIPTION OF EMBODIMENTS

With reference to the drawings, a fastening member according to an embodiment of the invention and siding boards attachment structure utilizing the fastening member are described. Fig. 1 is a perspective view of the embodiment of the fastening member of the invention. Fig. 3 is a perspective view of the exterior wall structure utilizing the fastening member.

A fastening member 10 shown includes a left-side supporting portion 12L and a right-side supporting portion 12R on the sides thereof that will abut on the back surface of an exterior wall when fastened. The fastening member 10 also includes, in the intermediate region between the left- and right-side portions 12L and 12R, a substrate portion 11 that is to be fixed to a building frame. Below the substrate portion 11, the intermediate region includes a central support portion 12C that will abut on the back surface of a board when fastened. Further below, there are a locking portion 21 to be locked on the upper and lower edges of boards when fastened, and then a lower-side support portion 12U that will abut on the back surface of a board when fastened. The support portions 12L, 12R, 12C, 12U

have the same height and are formed as a continuous portion. These support portions 12L, 12R, 12C, 12U support the back surface of a board.

The fastening member 10 is formed by punching, drawing and bending a single sheet of steel, such as a stainless steel plate or alloy plated steel plate. Fig. 2 shows a steel plate 100 as the material for the fastening member 10. The steel plate 100 has a thickness of about 1.0 mm, which is rather thick, such that the number of reinforcing ribs to be provided in the fastening member 10 can be reduced. Numerals in parentheses shown in Fig. 2 indicate the corresponding parts of the finished fastening member 10 of Fig. 1.

An example of the process of manufacturing the fastening member 10 will be described below. First, the steel plate 100 (see Fig. 2), in which fixing screw openings 31, nail openings 34, cuts 36, and a cut N are already formed, is punched. The cut N is formed in a lower portion 100B of the steel plate 100 roughly in the U shape as seen in a plan view. The area encircled by the cut N forms an extending portion 102 that will form the locking portion 21 of the fastening member 10 when the processing of the plate is finished. The extending portion 102 includes three protruding portions 102a, 102b, and 102c at the end thereof that will form the rise portions 22 and fall portion 23 of the locking portion 21 when the processing of the plate is finished.

The steel plate 100 is then drawn along the two-dot chain lines of Fig. 2 such that the steel plate 100 is partly bulged to form the left-side support portion 12L and the right-side support portion 12R on either side of the steel plate 100, the central support portion 12C at the lower region 100B, and the lower support portion 12U. As a result, in the central portion 101 in the upper region 100A of the steel plate 100, there is formed the substrate portion 11 that is depressed toward the back surface by about several millimeters. Further, a collar portion 13 is formed along the outer edge portions of the left-side, right-side, and lower support portions 12L, 12R, and 12U. During the aforementioned drawing process, a raised portion 32 within which nail openings 34 are to be disposed and

reinforcing ribs 35 are simultaneously formed.

Then, the extending portion 102 that is formed in the lower region 100B of the steel plate 100 in advance is bent at a right angle along the upper side thereof (dashed line L1 in Fig. 2) towards the front surface. Further, the left and right protruding portions 102a and 102c at the end of the extending portion 102 are bent diagonally upward along dashed lines L2a and L2c of Fig. 2 such that the rise portions 22, 22 are formed. The protruding portion 102b at the center of the end of the extending portion 102 is bent diagonally downward along a dashed line L2b of Fig. 2 such that the fall portion 23 is formed. The locking portion 21 is thus formed in a shape that conforms to the rabbeted portions of the board that is fastened. The edge portions on either side of the end of the fall portion 21 are further bent toward the back surface along dashed lines L3, L3 shown in Fig. 2 such that bent portions 23a, 23a are formed.

While the fastening member 10 is completed by the above-described bending process, the fastening member of the invention is not limited to the above-described embodiment. For example, the collar portion 13 and the cuts 36 may be omitted.

Hereafter siding boards attachment structure utilizing the above-described fastening member 10 will be described. Fig. 3 shows an board 40 as shown in Fig. 5 that has been fastened using the fastening member 10. Fig. 4 shows a cross section taken along line IV - IV of Fig. 3. In the illustrated example, the fastening member 10 is fixed, via a waterproof paper P and a furring strip 2, to a building frame 1 by a nail 3 passed through the nail opening 34 formed in the substrate portion 11. Specifically, after the fastening member 10 is positioned such that the locking portion 21 externally fits on the underlying rabbeted portion 44 at the upper edge of a lower board 40A that is located at a lower position, the fastening member 10 is fixed by utilizing the nail opening 34. The nail opening 34 is formed in an upper slanted surface 33 of the raised portion 32. Thus, the fastening member 10 is pushed downward as a whole as the nail is driven, so that

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the fastening member 10 can be stably fixed. Furthermore, the board 40A is pressed against the building frame 1 by the bent portions 23a, 23a formed on either side of the fall portion 23. The back surface of the board is therefore pressed against the support portions 12L, 12R, and 12U in an air-tight manner, and the lateral movement of the board is prevented by the resultant wedge action, so that the fastening member can be more stably fixed. The fastening member 10 can be fixed alternatively by a bis utilizing the screw openings 31.

Near the root of the underlying rabbeted portion 44 at the upper edge of the lower board 40A, there is placed a caulking material 4 in advance for leakage control purposes. After a required number of the fastening members 10 are fixed horizontally at predetermined intervals, a required number of upper boards 40B, which are located at a higher position, are disposed laterally such that the overlying rabbeted portions 42 at the lower edges thereof internally fit on the locking portions 22 of the fastening members 10. Thereafter, additional fastening members 10 are mounted on the underlying rabbeted portions 44 of the upper edge of the upper boards 40B, which are now lower boards, in a similar manner, and are then fixed by nails. The same process is repeated for a required number of rows, thereby completing the exterior wall structure of the invention.

In the above-described exterior wall structure, the board 40 can be stably supported by the locking portion 11 and the individual support portions 12L, 12R, 12C, and 12U of the fastening member 10. Between the back surface of the board 40 and the furring strip 2, there is formed a space S by the support portions 12L, 12R, 12C, and 12U of the fastening member 10 that corresponds to the height of the support portions. As a result, good ventilation can be obtained on the back surface of the board, so that the problem of dew condensation, for example, can be prevented. In accordance with the exterior wall structure of the invention, the fastening member is lightweight and yet has an excellent mechanical strength, so that it can maintain the fastened condition for a long time in a stable manner. Moreover, in cases where the cuts 36 are provided in the substrate portion 11, as in

the fastening member 10 in the above embodiment, areas near the cuts 36 would be deformed if a strong wind pressure (negative pressure) acted on the board, thereby reducing the load that is put on the rabbeted portion of the board 40 locked on the locking portion 21.

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CLAIMS:

1. A fastening member for an exterior wall board, said fastening member comprising a left-side and a right-side support portion on either side thereof, said support  
5 portions being adapted to abut on a back surface of a board when said board is fastened, said fastening member comprising, in an intermediate region between said left-side and right-side support portions, from top to bottom:

a substrate portion that constitutes a mount  
10 portion to be fixed to a building frame;

a central support portion that abuts on the back surface of a board when fastened;

a locking portion extending from a lower edge of said central support portion and being adapted to be locked  
15 on an upper and a lower edge of boards when fastened; and

a lower support portion that abuts on the back surface of a board when fastened, wherein:

said fastening member is formed from a single sheet of steel;

20 each of said left-side support portion, right-side support portion, lower support portion, and central support portion has the shape of a long and narrow strip and is formed as a continuous part by drawing the single sheet of steel;

25 said substrate portion is formed in a large area of an upper region of the steel sheet, excluding the regions of said left-side support portion, right-side support portion and central support portion;

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said left-side support portion, right-side support portion and central support portion together form an H shape;

said substrate portion is formed by depressing a portion of an upper region of the steel sheet toward a back surface of the fastening member; and

said locking portion is formed by cutting a portion of a lower region of the steel sheet and raising it toward a front surface of the fastening member.

10 2. The fastening member according to claim 1, wherein said locking portion comprises:

a central portion having a downwardly directed portion at its edge; and

15 two side portions located on opposite sides of the central portion, each of the side portions having an upwardly directed portion at its edge.

3. The fastening member according to claim 2, wherein an area on either side of lower edges of said downwardly directed portion is bent toward the back surface of said fastening member such that the bent portions press against the board when fastened.

4. The fastening member according to any one of claims 1 to 3, wherein at least one of said right-side, left-side, and lower support portions comprises a collar portion extending from an external edge thereof further outward, wherein said collar portion is located in the same plane as that of said substrate portion.

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5. The fastening member according to any one of claims 1 to 4, wherein a cut is provided in an upper edge of said substrate portion near said left-side and right-side support portion.

5 6. An exterior-wall structure comprising a plurality of said fastening members according to any one of claims 1 to 5 that are mounted in multiple rows such that their substrate portions abut on a fixing surface of a building frame, and a plurality of boards each with a  
10 rabbetted portion provided at at least an upper edge and a lower edge, wherein said boards are fastened in multiple rows such that they have their back surfaces abutting on said left-side, right-side, central, and lower support  
15 portions of the fastening members, the rabbetted portion at the upper edge is locked on said locking portion of an upper fastening member, and the rabbetted portion at the lower edge is locked on said locking portion of a lower fastening member.

SMART &amp; BIGGAR

OTTAWA, CANADA

PATENT AGENTS

FIG. 1

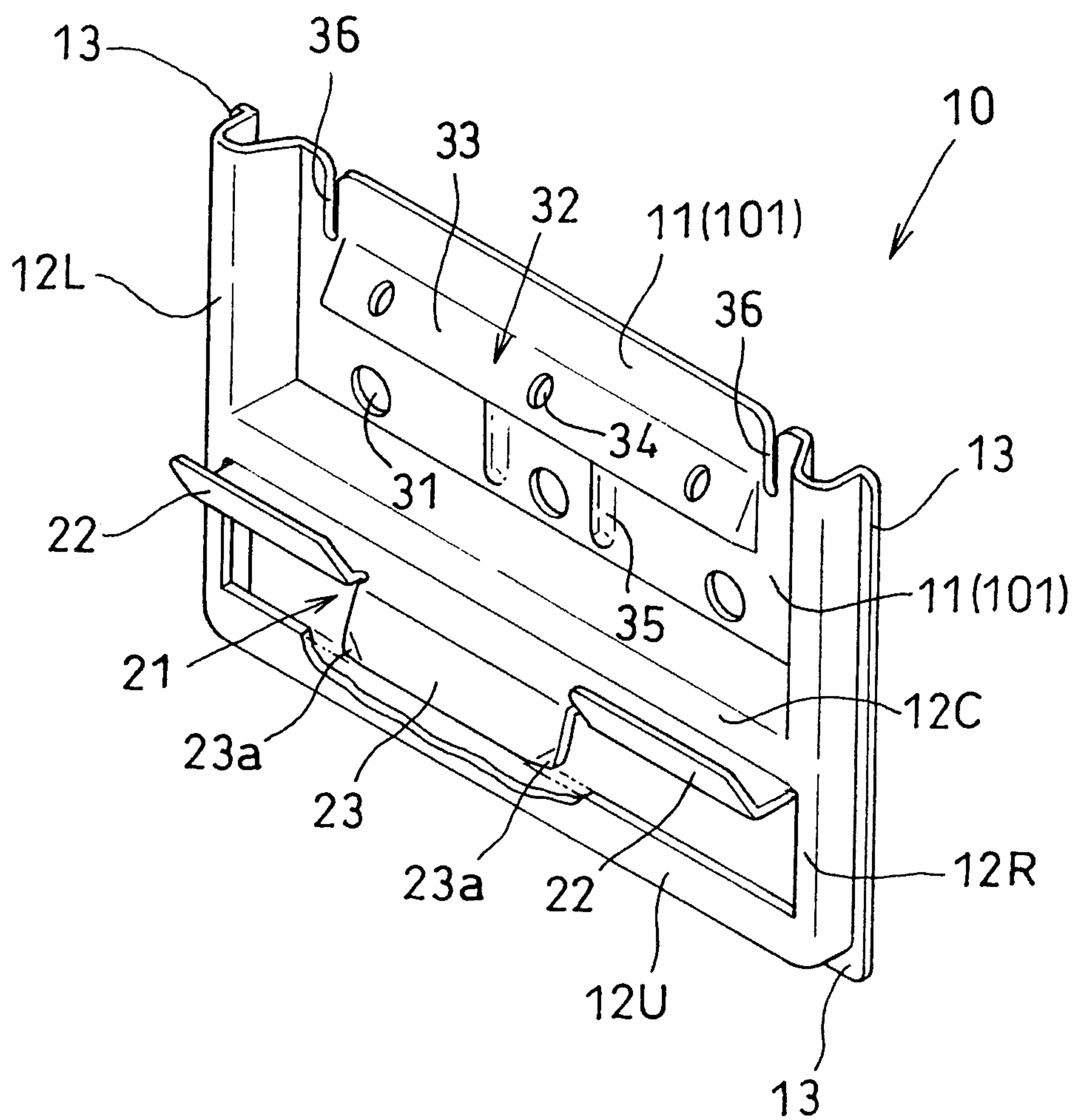


FIG. 2

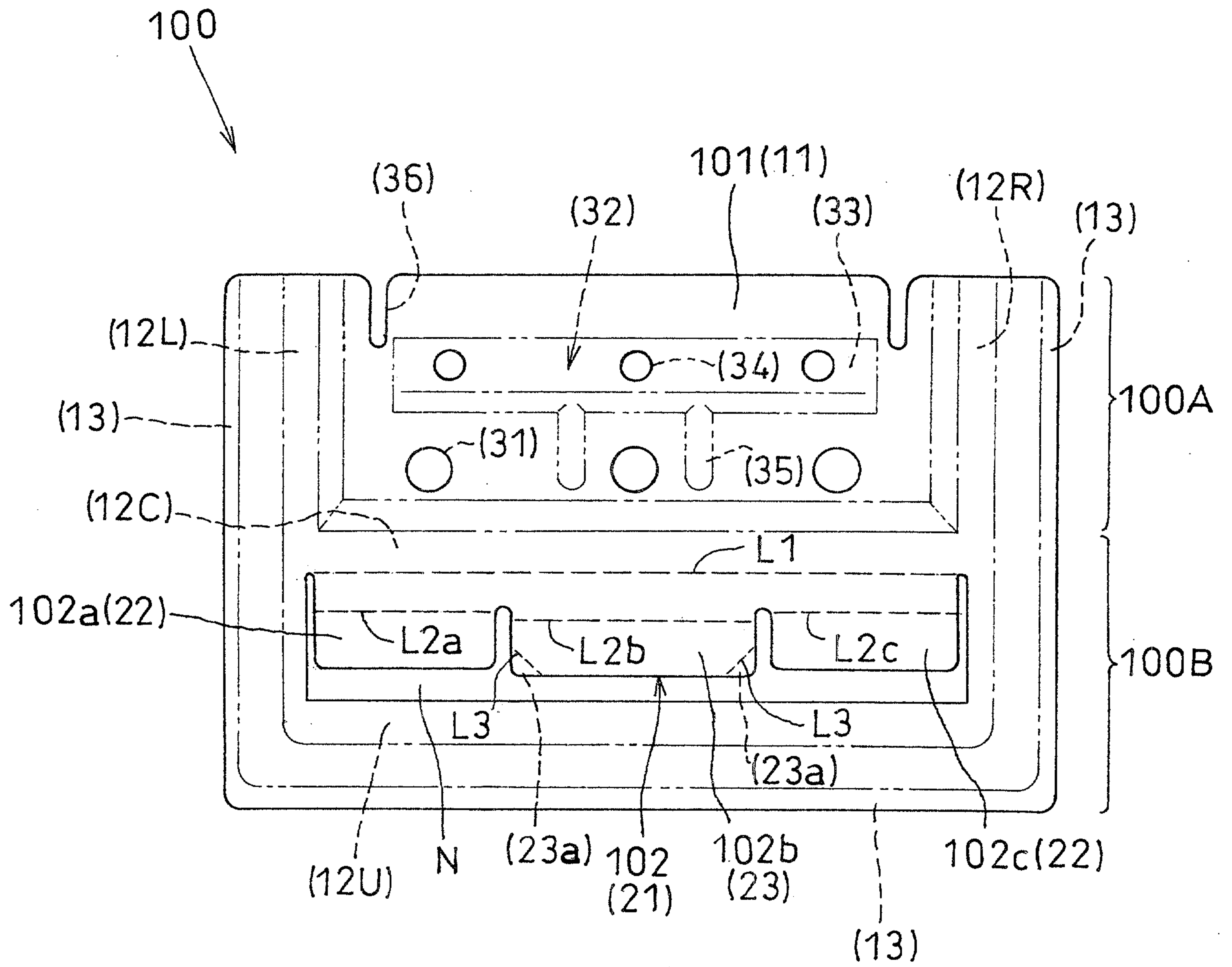


FIG. 3

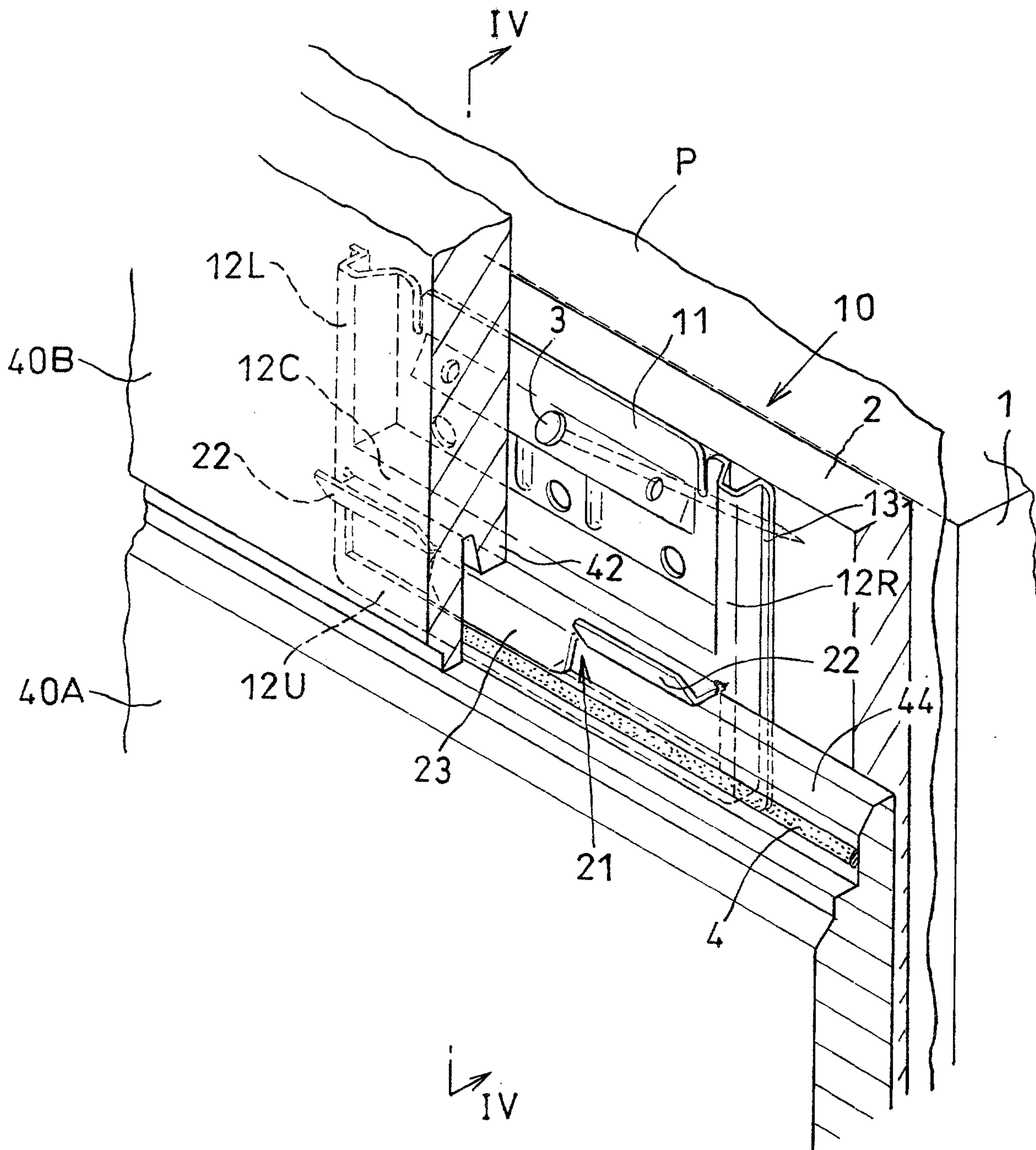


FIG. 4

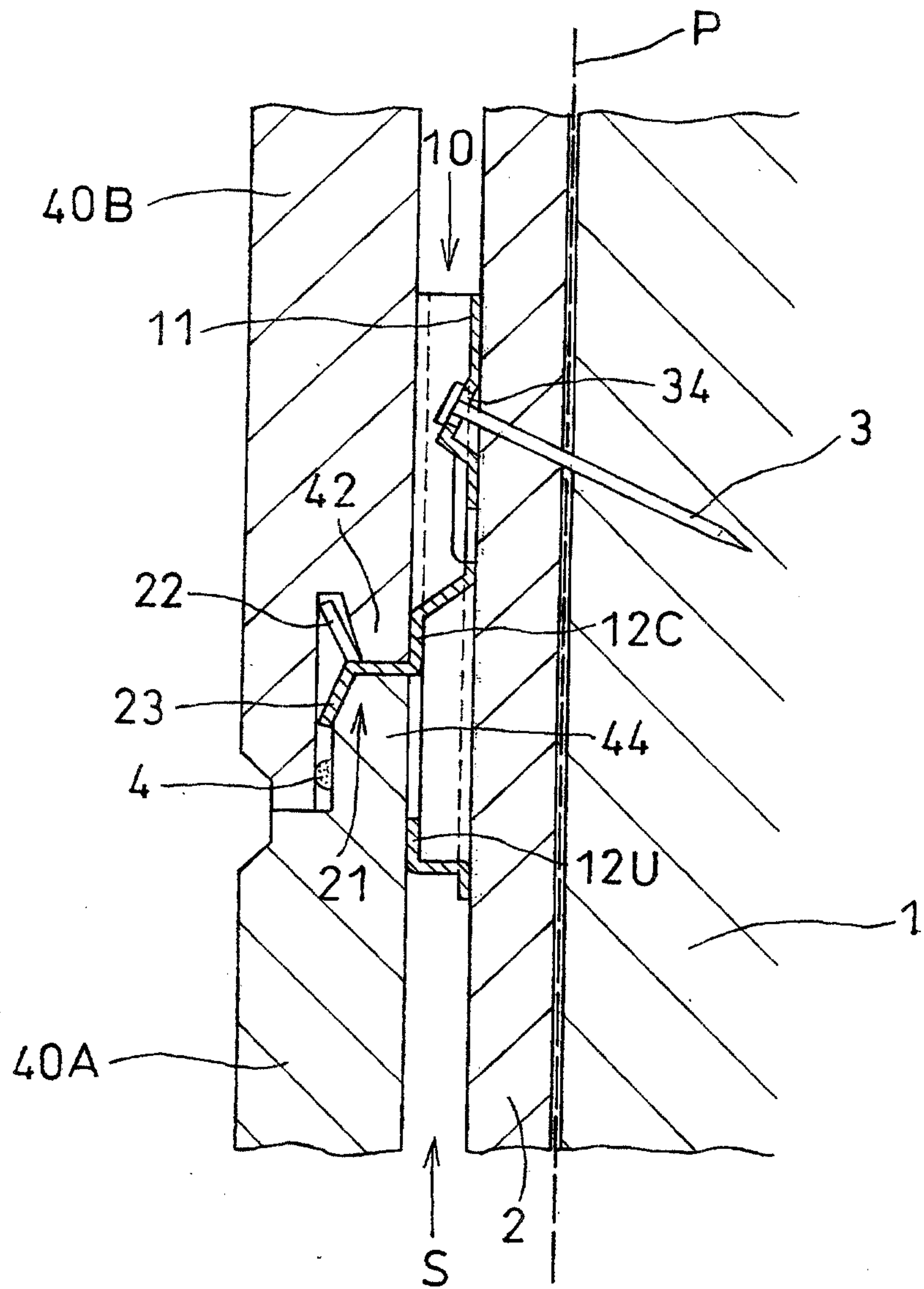


FIG. 5 PRIOR ART

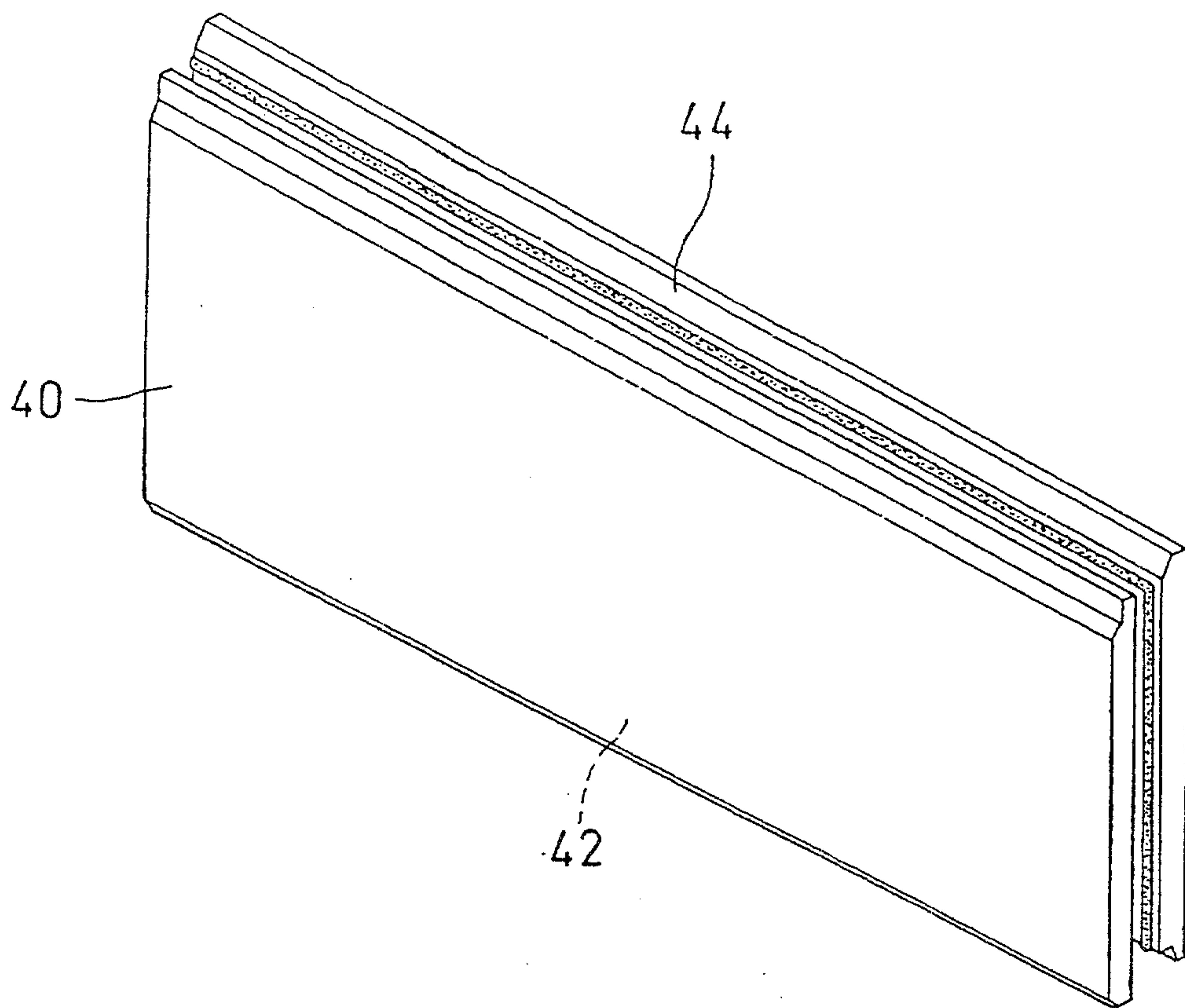


FIG. 6 PRIOR ART

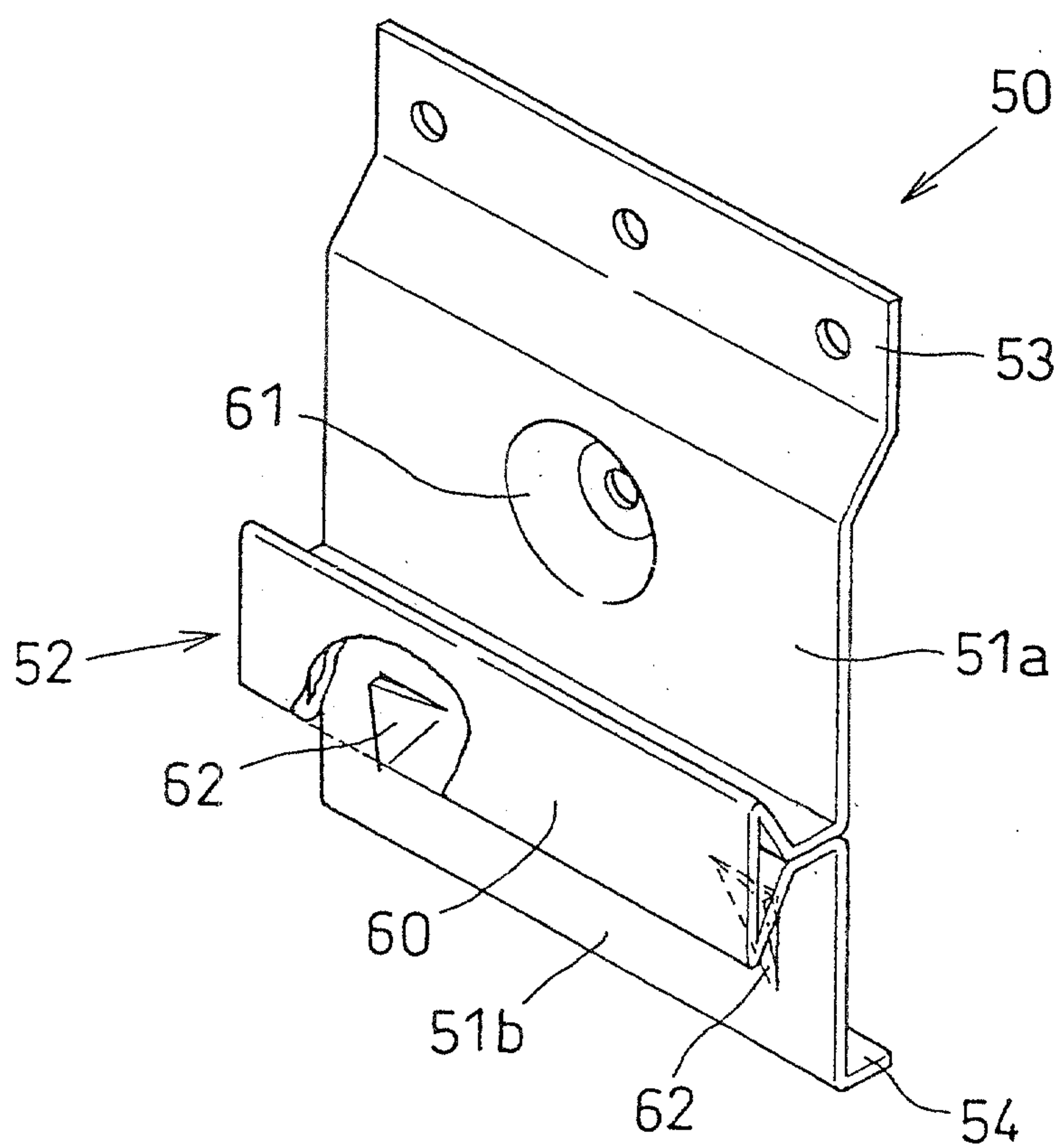


FIG. 7 PRIOR ART

