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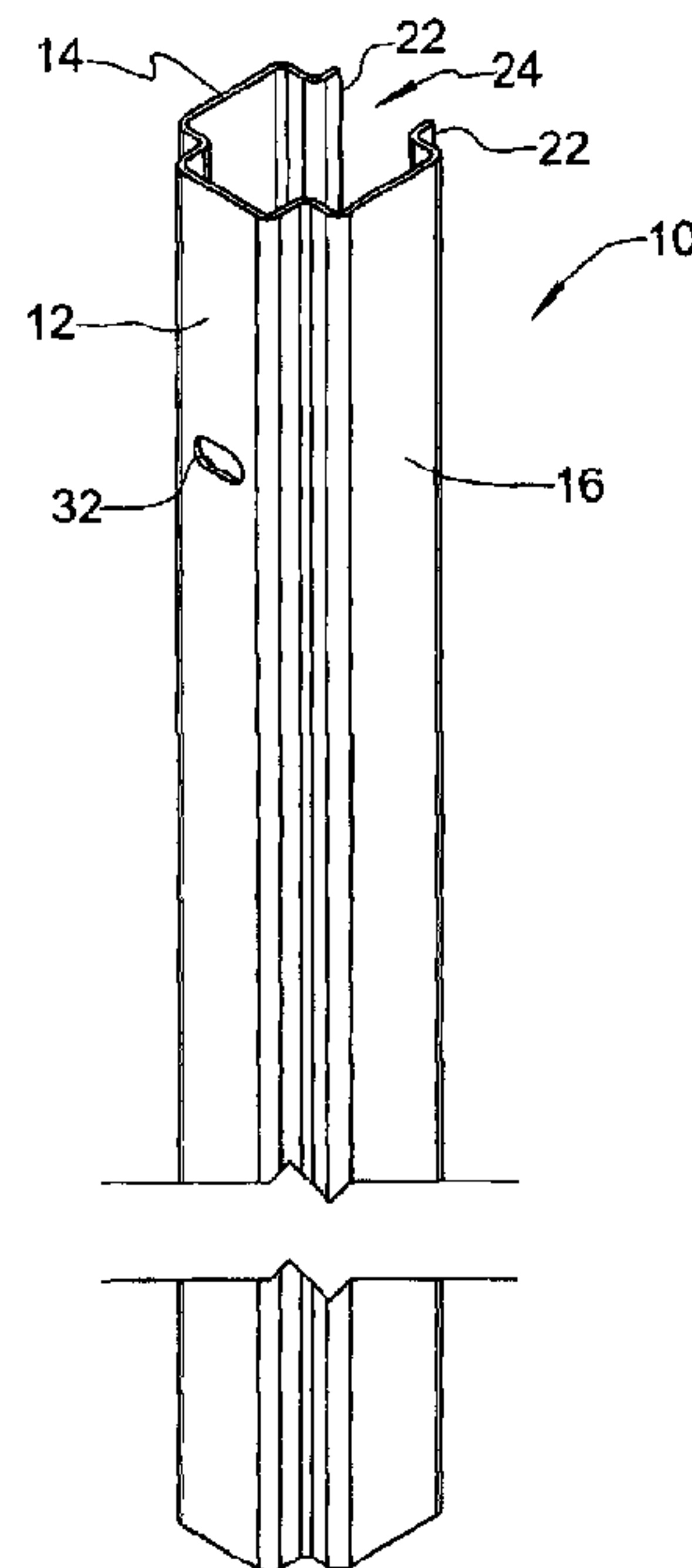
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(54) **Titre : POTEAU POUR GLISSIERE DE SECURITE D'AUTOROUTE**

(54) **Title: HIGHWAY GUARDRAIL POST**



(57) **Abrégé/Abstract:**

A highway guardrail post comprises an elongated one-piece roll-formed metal body including a front wall defining an attachment face, a pair of opposing side walls orthogonal to the front wall, a first pair of inverted corners respectively connecting the pair of side walls to the front wall, and a second pair of inverted corners respectively extending from the pair of side walls and terminating in a pair of spaced rear edges to define a rear access opening opposite the front wall. The guardrail posts may be manufactured by roll-forming a metal sheet or coil and cutting the roll-formed metal sheet or coil into lengths.

ABSTRACT

A highway guardrail post comprises an elongated one-piece roll-formed metal body including a front wall defining an attachment face, a pair of opposing side walls orthogonal to the front wall, a first pair of inverted corners respectively
5 connecting the pair of side walls to the front wall, and a second pair of inverted corners respectively extending from the pair of side walls and terminating in a pair of spaced rear edges to define a rear access opening opposite the front wall. The guardrail posts may be manufactured by roll-forming a metal sheet or coil and cutting the roll-formed metal sheet or coil into lengths.

HIGHWAY GUARDRAIL POST

FIELD OF THE INVENTION

[0001] The invention relates generally to guardrails (also referred to as fences or barriers) placed alongside roads and highways to stop errant vehicles, and more
5 particularly to an improved support post for use in constructing such guardrails.

BACKGROUND OF THE INVENTION

[0002] Safety barriers and guardrails are installed alongside highways and roads as a means of stopping out-of-control vehicles. They may be strategically located alongside curves and in zones where a steep drop, oncoming traffic, or other hazard
10 awaits. A primary consideration in constructing prior art barriers and guardrails is the ability to withstand vehicle impact, including impact from large trucks and buses which may be travelling at speed, to stop the vehicle.

[0003] Concrete safety barriers are quite strong, but do not yield to absorb vehicle kinetic energy. Consequently, they can be unsafe to passengers in a vehicle hitting
15 the barrier, particularly if the vehicle is a small vehicle or a heavy truck. Also, they are expensive to make and transport.

[0004] Guardrails constructed by driving a plurality of vertical posts into the ground at spaced intervals and connecting horizontal rails to the vertical posts are also known. The horizontal rails are typically a series of W-beams bolted to the posts, or
20 cables arranged to extend through U-bolts or eye-bolts connected to the posts. The rails are commonly offset from the vertical posts by spacer blocks respectively fastened to the posts, wherein the W-beams or U-bolts or eye-bolts are fastened to the spacer blocks.

[0005] Vertical guardrail posts in widespread use include hot-formed steel I-beams, shown in Fig. 1, and solid wooden posts. These tend to be heavy and require
25 significant force to drive into the ground, especially where rocks protrude into pre-dug post holes. Where steel I-beams are used, the I-beams will sometimes bend if they hit an obstruction such as a rock while being driven into the ground. When this occurs, the bent I-beam may no longer be suitable for use, and may be quite difficult
30 to remove from the ground because it is no longer straight.

5 [0006] Cold-formed steel posts are also known, particularly in Europe. These include C-channel, U-channel, and sigma channel cross-sections as depicted in Fig. 2A, 2B, and 2C, respectively. These posts are cold-formed from steel sheet or coil of suitable thickness, e.g. 5 mm, and subsequently treated (e.g. galvanized) to improve weathering.

SUMMARY OF THE INVENTION

10 [0007] A highway guardrail post of the present invention generally comprises an elongated one-piece roll-formed metal body including a front wall defining an attachment face, a pair of opposing side walls orthogonal to the front wall, a first pair of inverted corners respectively connecting the pair of side walls to the front wall, and a second pair of inverted corners respectively extending from the pair of side walls and terminating in a pair of spaced rear edges to define a rear access opening opposite the front wall. The guardrail posts may be manufactured by roll-forming a metal sheet or coil and cutting the roll-formed metal sheet or coil into lengths.

15 [0008] The invention also encompasses a guardrail assembly generally comprising a plurality of guardrail posts as summarized above, and a horizontal rail connected to the front wall of each of the plurality of guardrail posts.

20 [0009] The invention further provides a method of making a plurality of guardrail posts generally comprising the steps of (i) providing an elongated rectangular sheet or coil of metal having a longitudinal central axis and a pair of lateral edges parallel to and equidistant from the central axis; (ii) feeding the sheet or coil of metal lengthwise into a roll-forming machine, wherein the roll-forming machine is configured to form a plurality of right-angle bend pairs, each bend pair being arranged symmetrically about the central axis, wherein the plurality of bend pairs includes, in order of progression from the central axis toward the pair of lateral edges, a first pair of internal bends, a first pair of external bends, a second pair of internal bends, a third pair of internal bends, and a second pair of external bends; and (iii) cutting the roll-formed sheet or coil of metal into lengths.

BRIEF DESCRIPTION OF THE DRAWING VIEWS

30 [0010] The invention will be explained further with reference to drawing figures in which:

Fig. 1 is an orthogonal view showing a hot-rolled I-beam guardrail post of the prior art;

Fig. 2A, 2B, and 2C are cross-sectional views showing cold-formed guardrail posts of the prior art;

5 Fig. 3 is an orthogonal view of a cold-formed guardrail post of the present invention;

Fig. 4 is a top plan view of the guardrail post shown in Fig. 3;

Fig. 5 is a front elevational view of a guardrail assembly made using cold-formed guardrail posts in accordance with the present invention;

10 Fig. 6 is an elevational view, partially sectioned, showing nested W-beams fastened directly to the top portion of a guardrail post of the present invention;

Fig. 7 is a view similar to that of Fig. 6, however the W-beams are shown connected to the guardrail post by way of a spacer block;

15 Fig. 8 is an orthogonal view showing a plurality of cables connected directly to a guardrail post of the present invention by U-bolts (eye-bolts may be substituted for the depicted U-bolts);

Fig. 9 is a view similar to that of Fig. 8, however the cables are shown connected to the guardrail post by way of a spacer block;

20 Fig. 10 is a plan view showing various roll-forming bend locations on a rectangular piece of sheet or coil stock from which guardrail posts in accordance with Figs. 3 and 4 may be cold formed by a roll-forming machine; and

25 Fig. 11 is an end view of the rectangular piece of sheet or coil stock, schematically showing which side of the sheet or coil stock is contacted by forming rollers to form the various bends as the sheet or coil stock is passed through a roll-forming machine.

DETAILED DESCRIPTION OF THE INVENTION

[0011] Figs. 3-4 show a roll-formed metal guardrail post 10 configured in accordance with an embodiment of the present invention. Guardrail post 10 comprises an elongated one-piece body that includes a front wall 12 defining an attachment face 12A, a pair of opposing side walls 14 and 16 orthogonal to the front wall 12, a first pair of inverted corners 18 respectively connecting the pair of side walls to the front wall, and a second pair of inverted corners 20 respectively extending

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from the pair of side walls and terminating in a pair of spaced rear edges 22 to define a rear access opening 24 opposite front wall 12.

[0012] In the present specification, the term “inverted corner” refers to a junction between two adjacent walls (e.g. front wall 12 and side wall 14) wherein each wall includes a respective bend (e.g. bends 26 and 28) such that a corner bend where the walls meet (e.g. bend 30) points toward an interior region of guardrail post 10. In the embodiment shown, bends 26, 28 and 30 are right-angle bends, however other angles may be used, so long as the corner bend 30 points inward rather than outward.

[0013] As seen in Fig. 3, front wall 12 includes a through-hole 32 near a top end of post 10 for receiving a fastener used to attach a rail member or spacer block to the post as described in greater detail below. One or more through-holes 32 may be provided depending on attachment requirements. Through-hole 32 may be elongated for easier alignment with a corresponding hole in a rail member or spacer block.

[0014] In one embodiment, a distance D1 between attachment face 12A and a plane P1 containing rear edges 22 may be equal to a distance D2 between respective external faces 14A and 16A of side walls 14 and 16. In this way, the overall dimension of guardrail post 10 front-to-rear may be the same as its overall dimension side-to-side. In the same embodiment, or in an independent embodiment, the width W1 of each of the pair of side walls 14, 16 may be greater than the width W2 of front wall 12. In the same embodiment, or in an independent embodiment, the rear access opening 24 may have a width W3 equal to the width W2 of front wall 12.

[0015] Figs. 5 and 6 illustrate a guardrail assembly 40 made using cold-formed guardrail posts 10 in accordance with the present invention. Guardrail assembly 40 generally comprises a plurality of vertical guardrail posts 10 spaced from one another, and a horizontal rail 50 connected to the front wall 12 of each of the guardrail posts 10. As best seen in Fig. 6, horizontal rail 50 may be constructed of overlapping, substantially rigid “W-beams” 52 known in the art of highway guardrails. One W-beam 52, or two overlapping W-beams 52, may be fastened directly against the attachment face 12A of a post 10 by a threaded fastener 54 and a nut 56 mated with fastener 54. Fastener 54 may be arranged to extend through aligned holes in the W-beams and also through through-hole 32 to the interior of guardrail post 10. A washer 57 may be provided between nut 56 and an internal face of front wall 12. Where two W-beams overlap at a guardrail post 10, as shown in Fig. 6, additional fasteners 58

and nuts 60 may be used to fasten the W-beams to one another. As depicted in Fig. 5, the length of W-beams 52 and the spacing between guardrail posts 10 may be chosen such that adjacent W-beams 52 overlap at every other guardrail post 10.

[0016] As shown in Fig. 7, guardrail assembly 40 may further comprise a spacer block 64 fastened directly against the attachment face 12A of each guardrail post 10, wherein the horizontal rail 50 is connected to the front wall 12 of the guardrail post by way of the spacer block. Spacer block 64, itself known in the guardrail art, is typically made of wood, plastic, or steel. Spacer block 64 and W-beams 52 may be fastened to a post 10 by one elongated fastener 54 and mating nut 56, similar to the arrangement shown in Fig. 6. Alternatively, a pair of fasteners may be used, one through the W-beams 52 and into a front portion of spacer block 64, and the other in an opposite direction through through-hole 32 and into a rear portion of spacer block 64.

[0017] Reference is made now to Figs. 8 and 9, which illustrate that horizontal rail 50 may be embodied as a flexible cable 70 or plurality of flexible cables 70 connected to the front wall 12 of each guardrail post 10 by a respective U-bolt 72 through which the cable extends. Eye-bolts may be substituted for U-bolts 72. As shown in Fig. 9, a spacer block 64 may be installed between cables 70 and guardrail post 10.

[0018] Methods of making guardrail posts 10, and constructing guardrail assemblies 40, will now be described.

[0019] Reference is made now to Figs. 10 and 11. To make guardrail posts 10, an elongated rectangular sheet or coil of metal 80 is provided having a longitudinal central axis and a pair of lateral edges 22 parallel to and equidistant from the central axis. The sheet or coil of metal is fed lengthwise into a conventional roll-forming machine of a type having a series of stations with rollers set up to progressively form bends in the sheet or coil of metal. To manufacture the embodiment depicted in Figs. 3 and 4, the roll-forming machine is configured to form a plurality of right-angle bend pairs, each bend pair being arranged symmetrically about the central axis. The plurality of bend pairs includes, in order of progression from the central axis toward the pair of lateral edges, a first pair of internal bends 26, a first pair of external bends 30, a second pair of internal bends 28, a third pair of internal bends 29, and a second pair of external bends 31. The location of the bends is indicated schematically in

Figs. 10 and 11. Fig. 11 also indicates which side of sheet or coil 80 is contacted by rollers of the roll-forming machine to form the various bends. In Fig. 11, internal bends are made by contacting what is initially a top surface of sheet or coil 80, while external bends are made by contacting what is initially a bottom surface of sheet or coil 80. As will be understood, this roll-forming arrangement may be inverted.

5 [0020] The method of making guardrail posts 10 also comprises the step of cutting the roll-formed sheet or coil of metal 80 into lengths corresponding to the height of each guardrail post. By way of example, sheet or coil 80 may be an initial length of material that is cut into a plurality of 75-inch (1.91 meter) or 72-inch (1.83 meter) lengths after roll-forming. If the roll-forming machine is equipped with a cut-off mechanism, then the lengths may be cut as the roll-formed sheet or coil is discharged from the roll-forming machine.

10 [0021] Holes 32 may be formed by a drilling, milling, or punching operation performed at spaced intervals along sheet or coil 80 prior to, during, or after roll-forming. Each of the plurality of holes is located between the first pair of internal bends 26, such as along the central axis.

15 [0022] With respect to moisture-proofing, it is advantageous that sheet or coil 80 be pre-galvanized before roll-forming, thereby obviating the need for the finished posts to be dipped after roll-forming. Sheet or coil 80 may be cold-rolled steel, 3 mm thick, and may be hot dip galvanized. Of course, other materials and treatments may be used.

20 [0023] Guardrail assembly 40 is constructed by driving guardrail posts 10 vertically into the ground at spaced intervals, and then connecting horizontal rail 50 to the posts as described above. Guardrail posts 10 may be driven the same way guardrail posts of the prior art are driven, which typically involves the use of an automated post driver. Pilot holes may be provided in the ground to locate each post prior to engagement by the automated post driver. Guardrail posts 10 of the present invention have improved performance during installation over prior art guardrail posts because front wall 12 and side walls 14, 16 will deflect inward when a large rock or other obstacle is encountered, but the overall post will remain straight, making it easier to pull the post out of the ground than a prior art post, which will bend under the same circumstances and become difficult to extract.

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5 [0024] It will be appreciated that access opening 24 in each post 10 gives an installer easy access to the interior of the post so that the installer may tighten nut 56 onto threaded fastener 54, or drive a fastener to attach spacer block 64, as the case may be. In a current embodiment, the access opening is at least 2.75 inches (70 mm) wide.

Application No. 2,727,318

Attorney Docket No. 23118-29

WHAT IS CLAIMED IS:

1. A highway guardrail post to be driven to the ground, comprising an elongated one-piece roll-formed metal body including a front wall defining an attachment face for receiving a fastener to form a highway guardrail, a pair of
5 opposing side walls orthogonal to the front wall, a first pair of inverted corners respectively connecting the pair of side walls to the front wall, and a second pair of inverted corners respectively extending from the pair of side walls and terminating in a pair of spaced rear edges to define a rear access opening opposite the front wall.
- 10 2. The highway guardrail post according to claim 1, wherein the front wall includes a through-hole for receiving said fastener.
3. The highway guardrail post according to claim 1, wherein a distance between the attachment face and a plane containing the pair of rear edges is equal to a distance between respective external faces of the pair of side walls.
- 15 4. The highway guardrail post according to claim 3, wherein each of the pair of side walls is wider than the front wall.
5. The highway guardrail post according to claim 4, wherein the rear access opening is equal in width to the front wall.

6. A highway guardrail assembly comprising:

first and second vertical guardrail posts to be driven to the ground and spaced from one another, each guardrail post comprising an elongated one-piece roll-formed metal body including a front wall defining an attachment face, a pair of opposing side walls orthogonal to the front wall, a first pair of inverted corners respectively connecting the pair of side walls to the front wall, and a second pair of inverted corners respectively extending from the pair of side walls to define a rear access opening opposite the front wall; and a horizontal rail connected to the front wall of each of the first and second guardrail posts.

7. The highway guardrail assembly according to claim 6, wherein the horizontal rail is a substantially rigid section fastened directly against the attachment face of at least one of the vertical guardrail posts.

8. The highway guardrail assembly according to claim 6, wherein the horizontal rail is a flexible cable connected to the front wall of each of the first and second guardrail posts by a respective U-bolt or eye-bolt.

9. The highway guardrail assembly according to claim 6, further comprising a spacer block fastened directly against the attachment face of at least one of the first and second guardrail posts, wherein the horizontal rail is connected to the front wall of the at least one guardrail post by way of the spacer block.

10. The highway guardrail assembly according to claim 9, wherein the horizontal rail is a substantially rigid section fastened directly against a surface of the spacer block.

11. The highway guardrail assembly according to claim 9, wherein the horizontal rail includes a flexible cable connected to the spacer block by a U-bolt or an eye-bolt.

Application No. 2,727,318

Attorney Docket No. 23118-29

12. A method of making a plurality of highway guardrail posts to be driven to the grounds at a spaced interval, comprising the steps of:

5 providing an elongated rectangular sheet or coil of metal having a longitudinal central axis and a pair of lateral edges parallel to and equidistant from the central axis;

feeding the sheet or coil of metal lengthwise into a roll-forming machine, wherein the roll-forming machine is configured to form a plurality of right-angle bend pairs, each bend pair being arranged symmetrically about the central axis, wherein the plurality of bend pairs includes, in order of
10 progression from the central axis toward the pair of lateral edges, a first pair of internal bends, a first pair of external bends, a second pair of internal bends, a third pair of internal bends, and a second pair of external bends; and
cutting the roll-formed sheet or coil of metal into lengths.

13. The method according to claim 12, further comprising the step of forming a
15 plurality of holes through the sheet or coil of metal at spaced locations along the length of the sheet or coil, wherein each of the plurality of holes is between the first pair of internal bends.

14. The method according to claim 12, wherein the sheet or coil of metal is hot rolled steel coil.

20 15. The method according to claim 14, wherein the hot rolled steel coil is provided as galvanized hot rolled steel coil.

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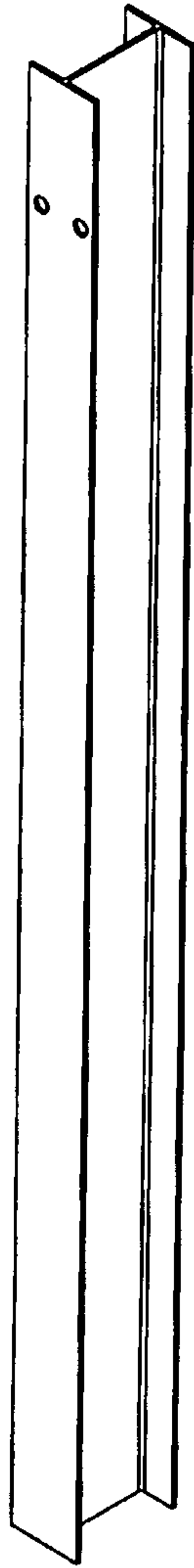


Fig. 1
PRIOR ART

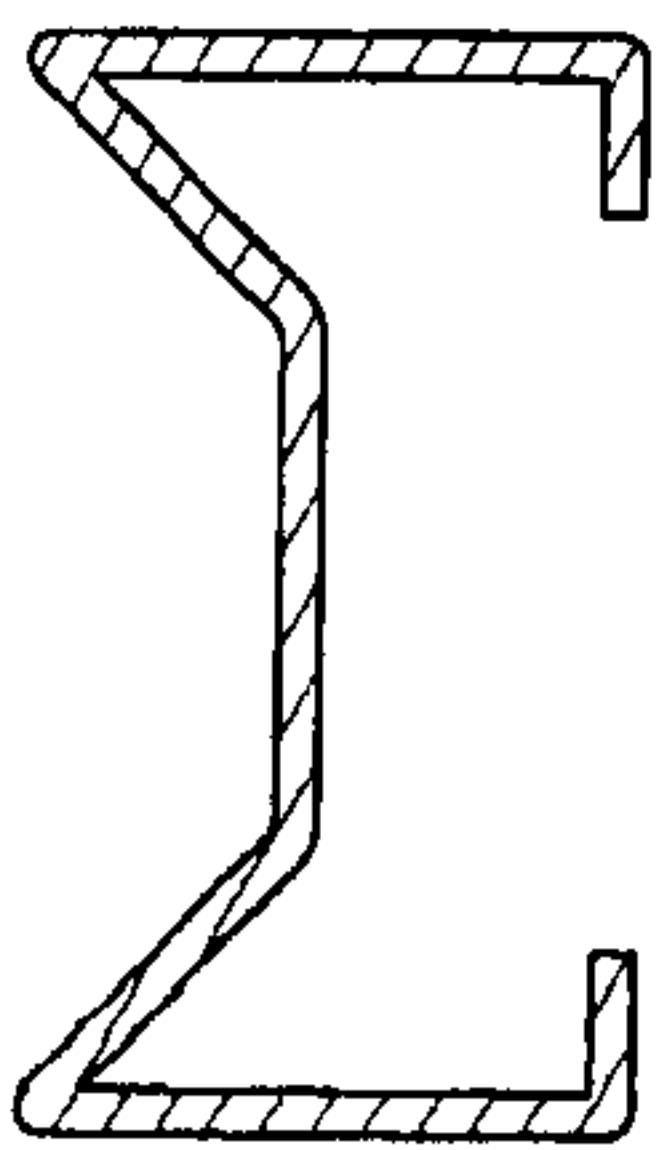


Fig. 2A
PRIOR ART

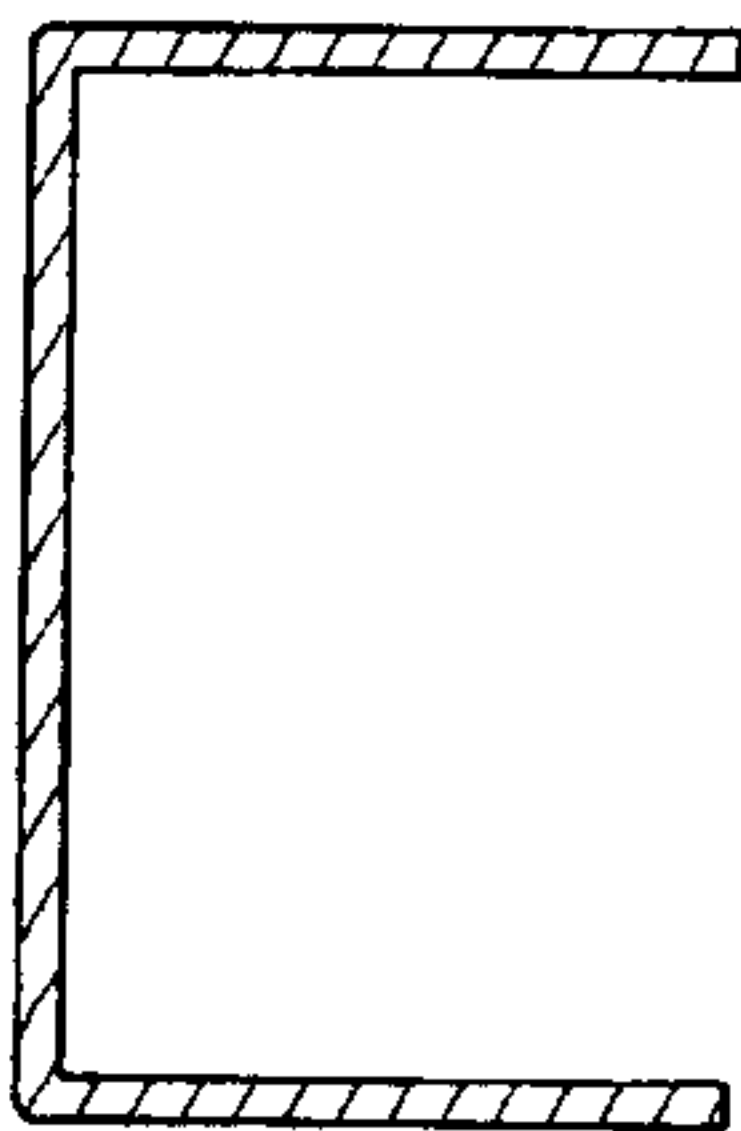


Fig. 2B
PRIOR ART

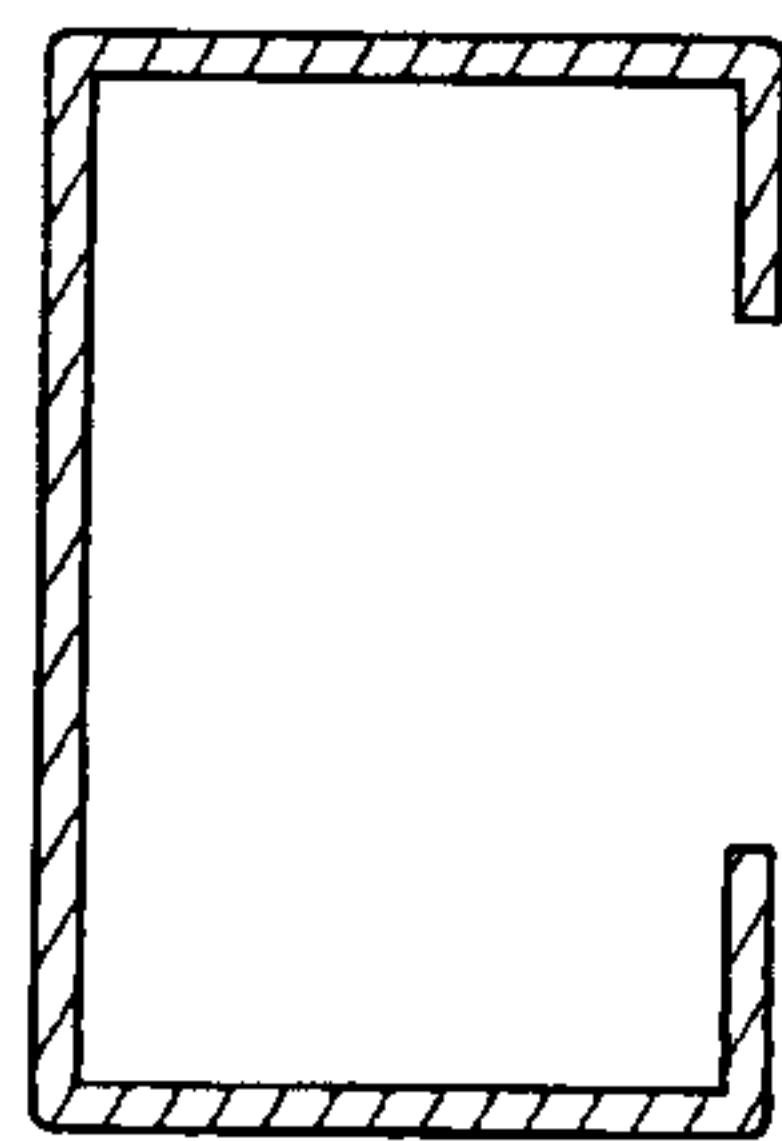
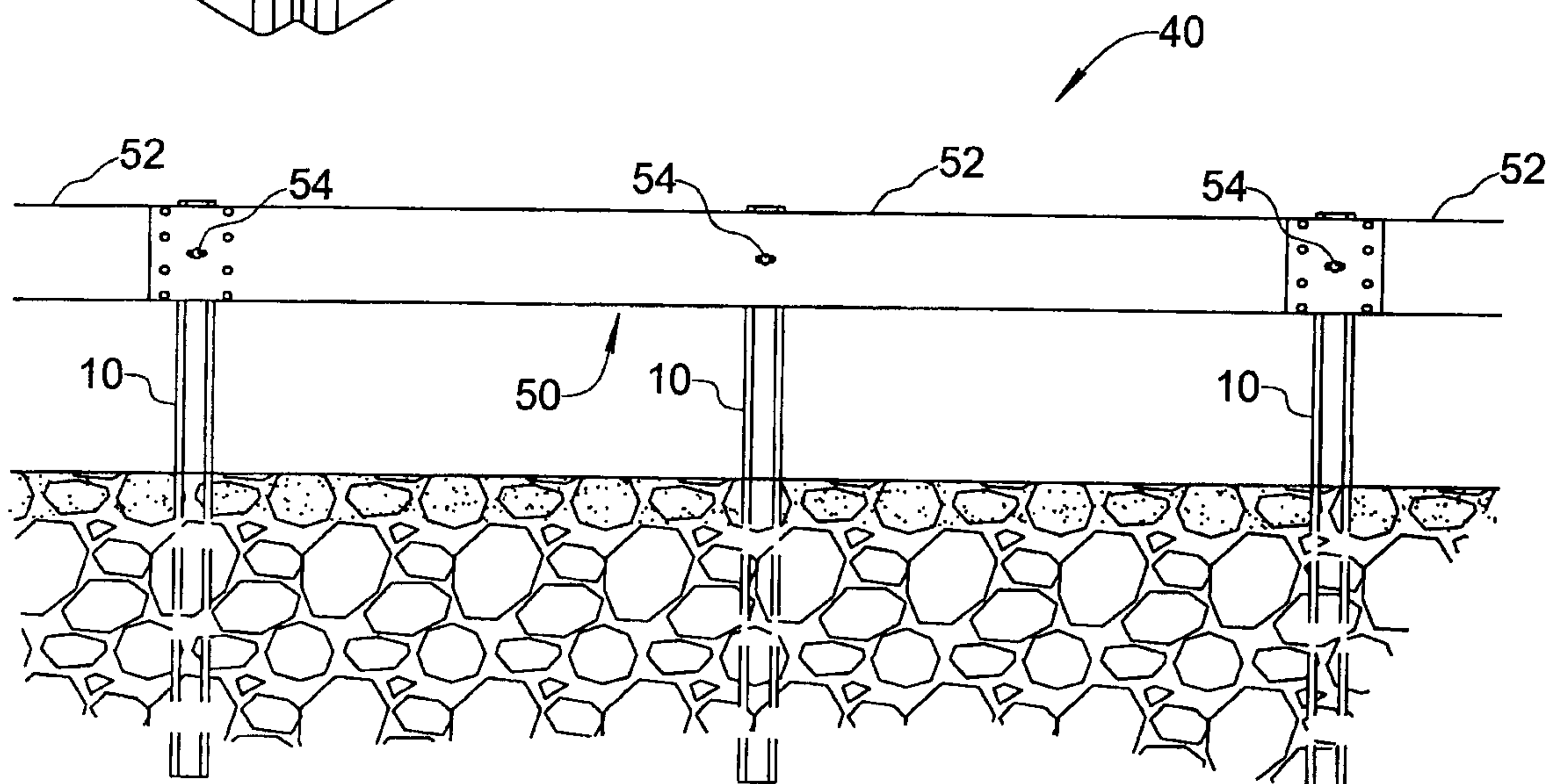
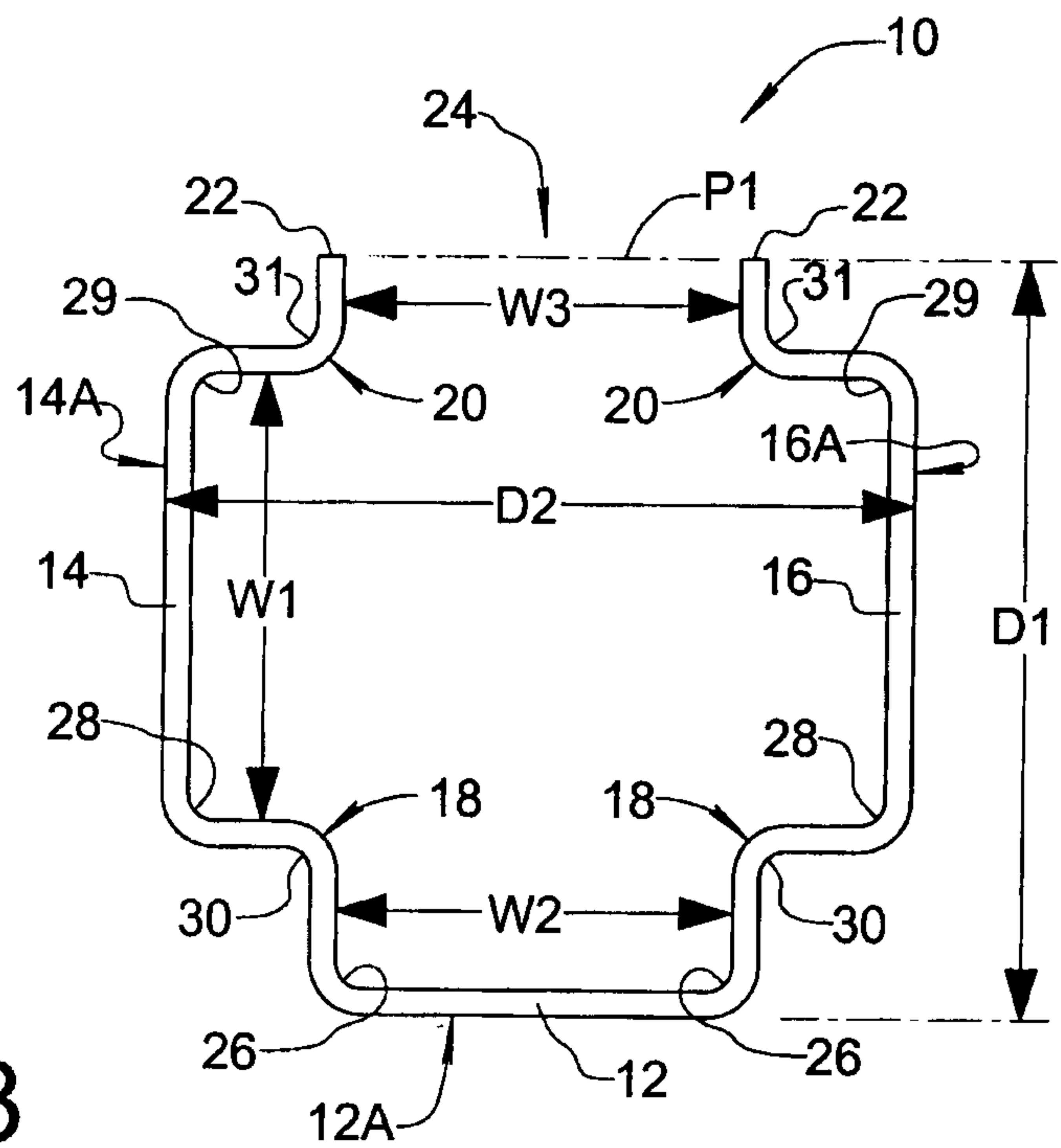
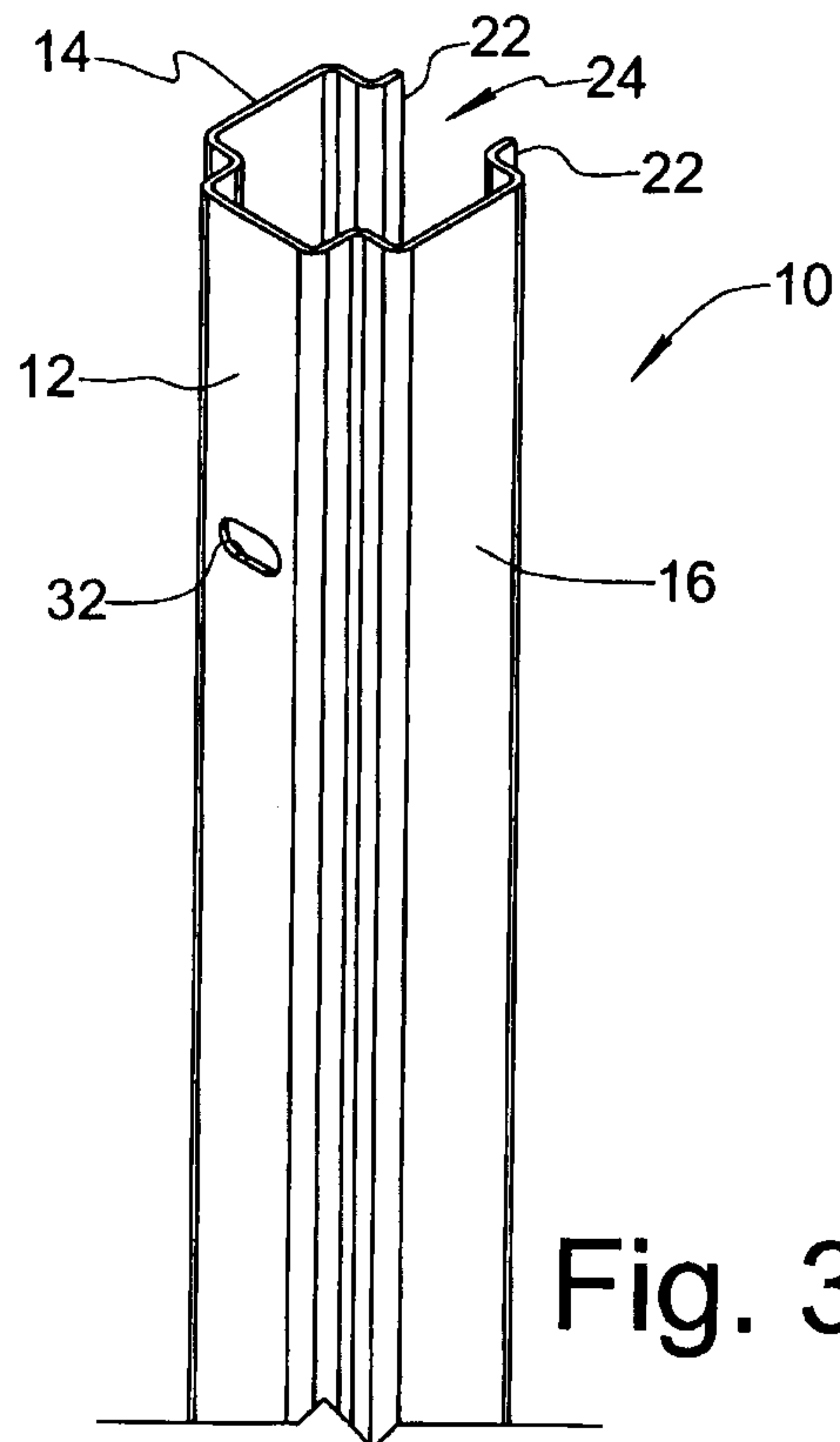


Fig. 2C
PRIOR ART

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3/4

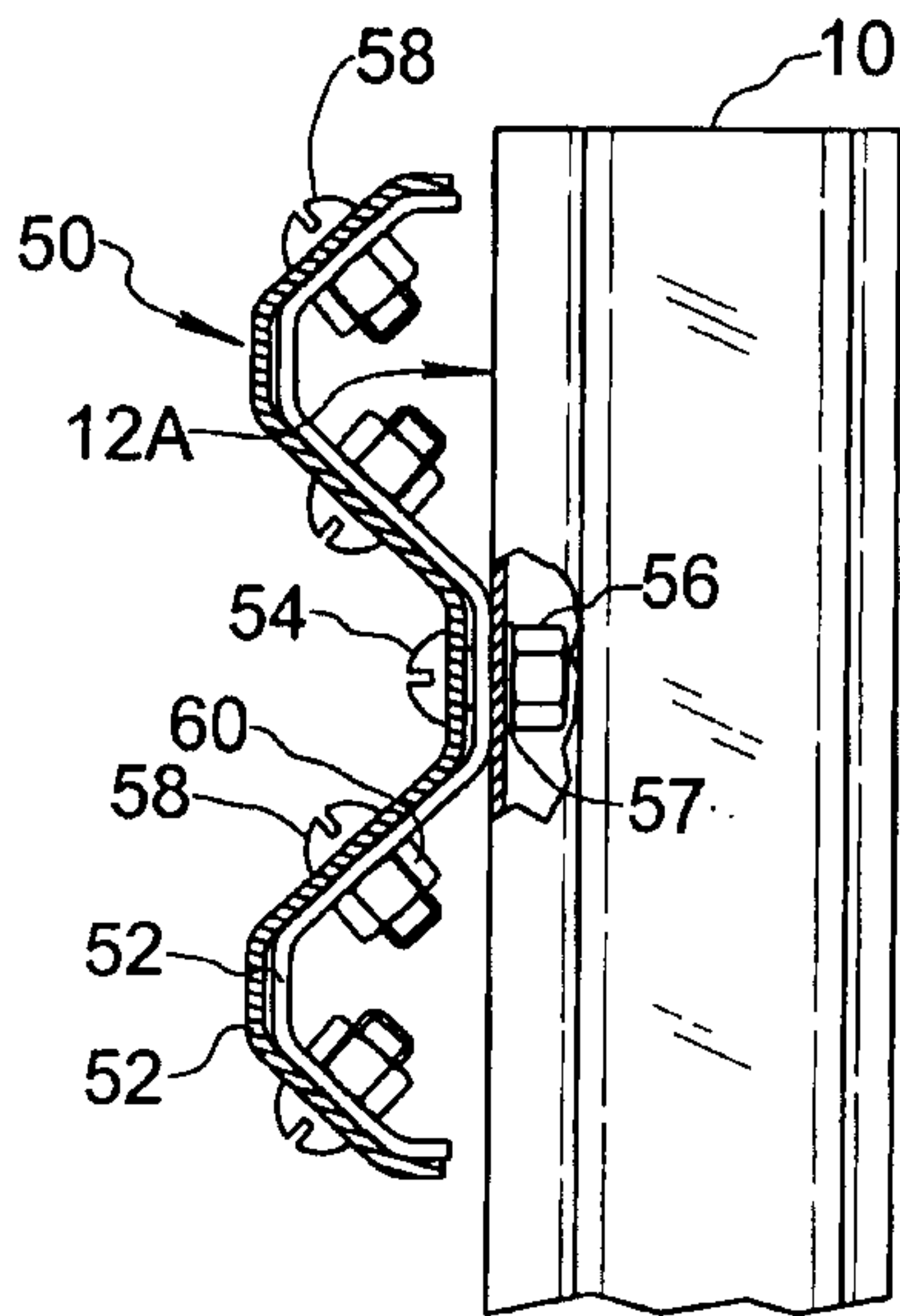


Fig. 6

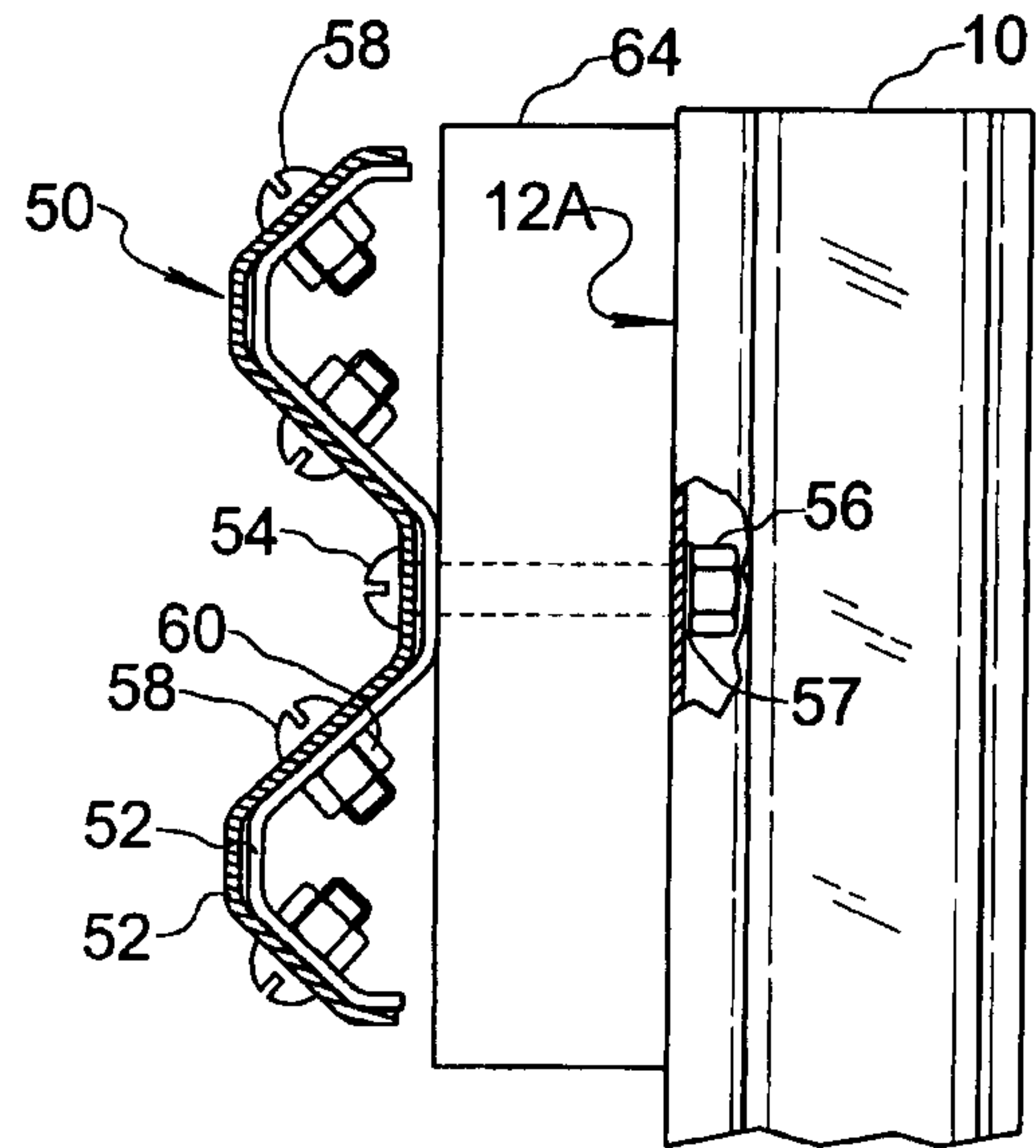


Fig. 7

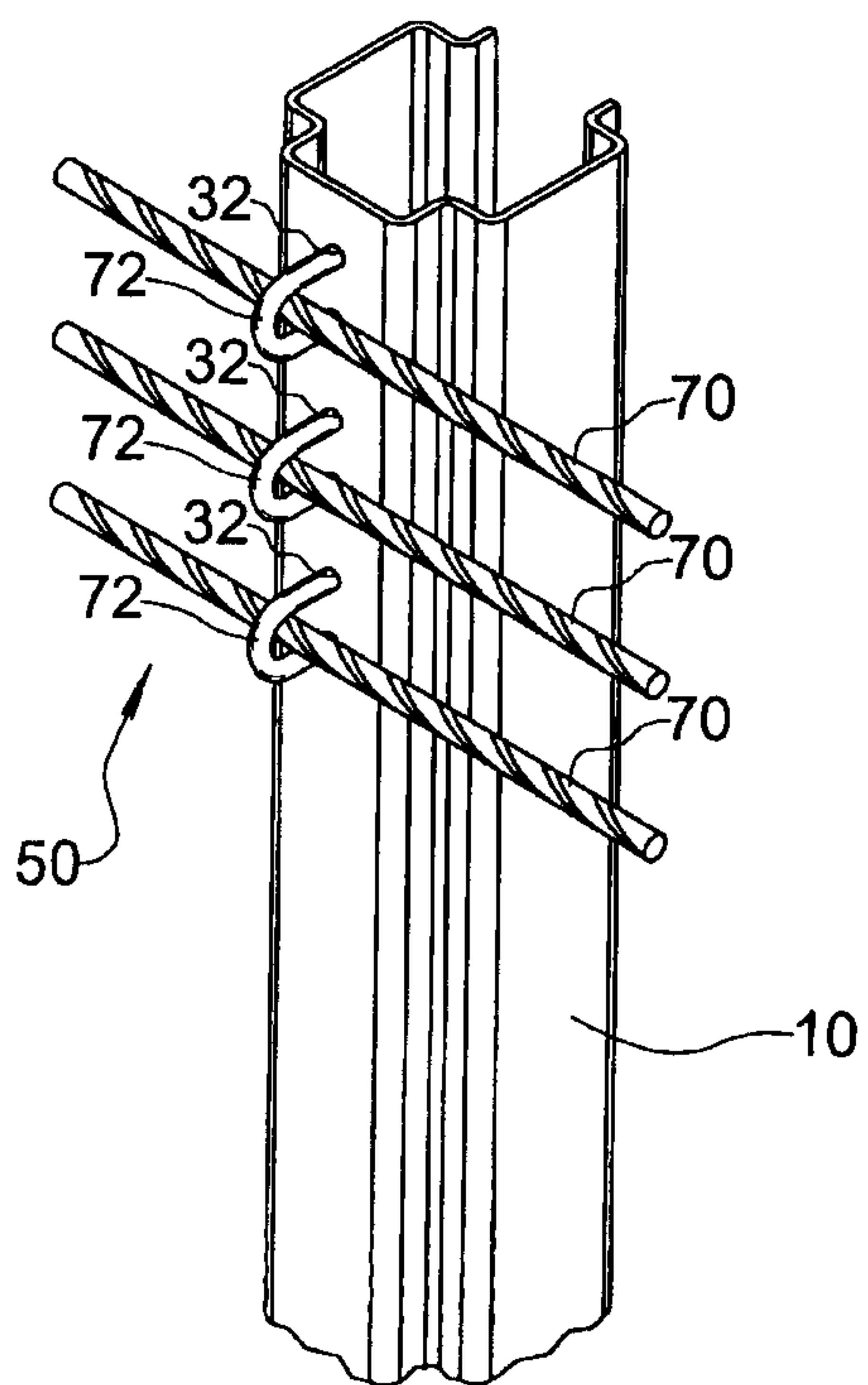


Fig. 8

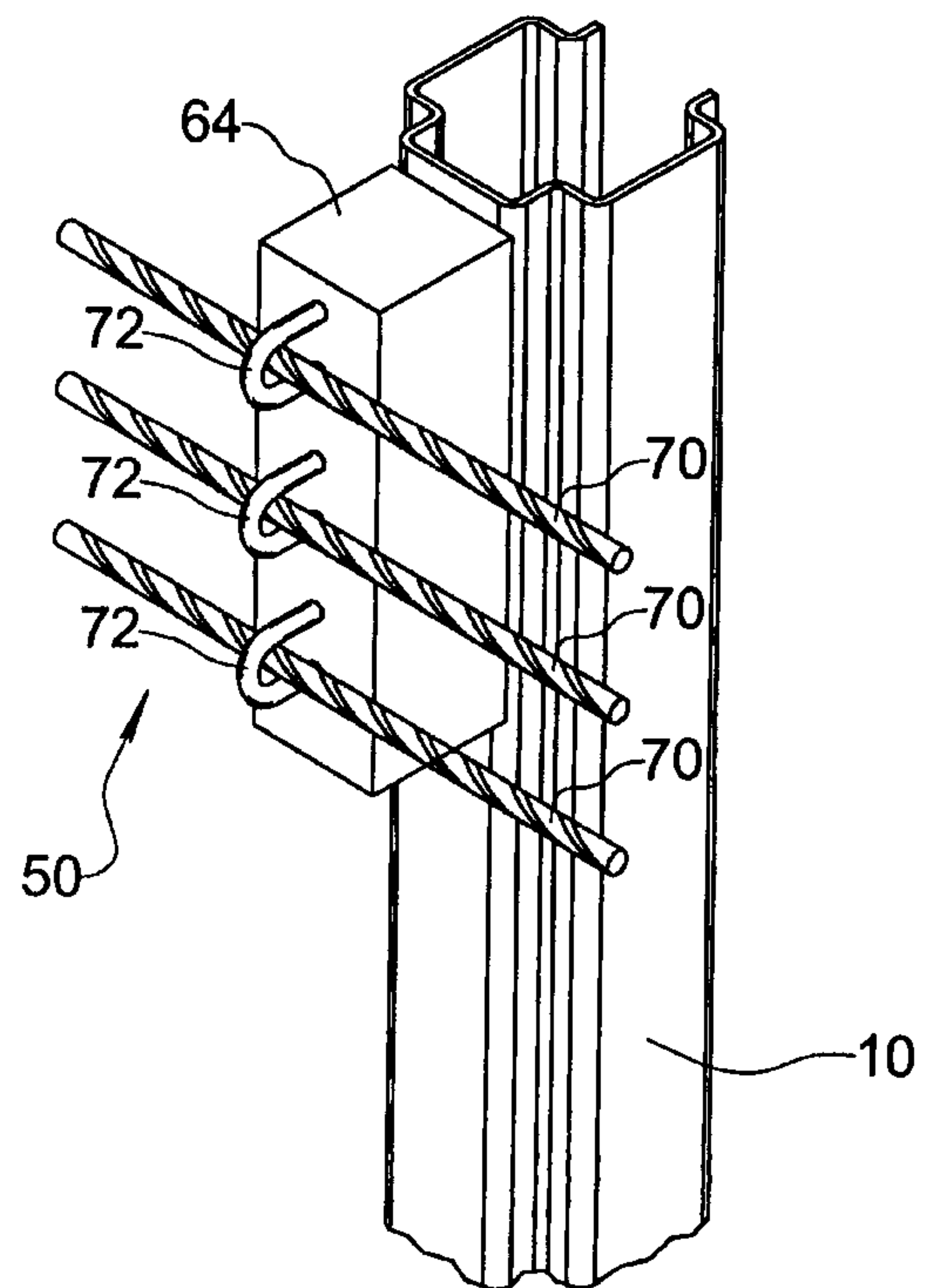


Fig. 9

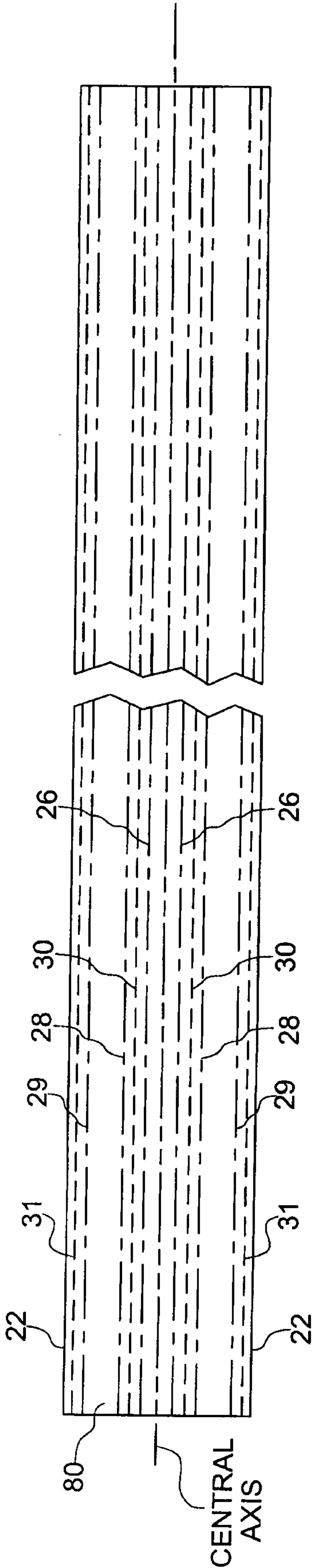


Fig. 10

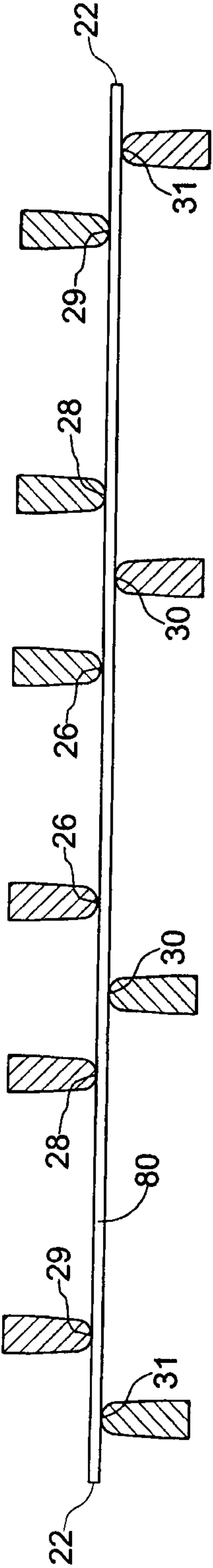


Fig. 11

