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CA 2617377 A1 2007/02/15

(21) 2 617 377

(12) DEMANDE DE BREVET CANADIEN
CANADIAN PATENT APPLICATION

(13) A1

(86) Date de dépôt PCT/PCT Filing Date: 2006/08/04
(87) Date publication PCT/PCT Publication Date: 2007/02/15
(85) Entrée phase nationale/National Entry: 2008/01/30
(86) N° demande PCT/PCT Application No.: US 2006/030931
(87) N° publication PCT/PCT Publication No.: 2007/019523
(30) Priorité/Priority: 2005/08/05 (US60/705,758)

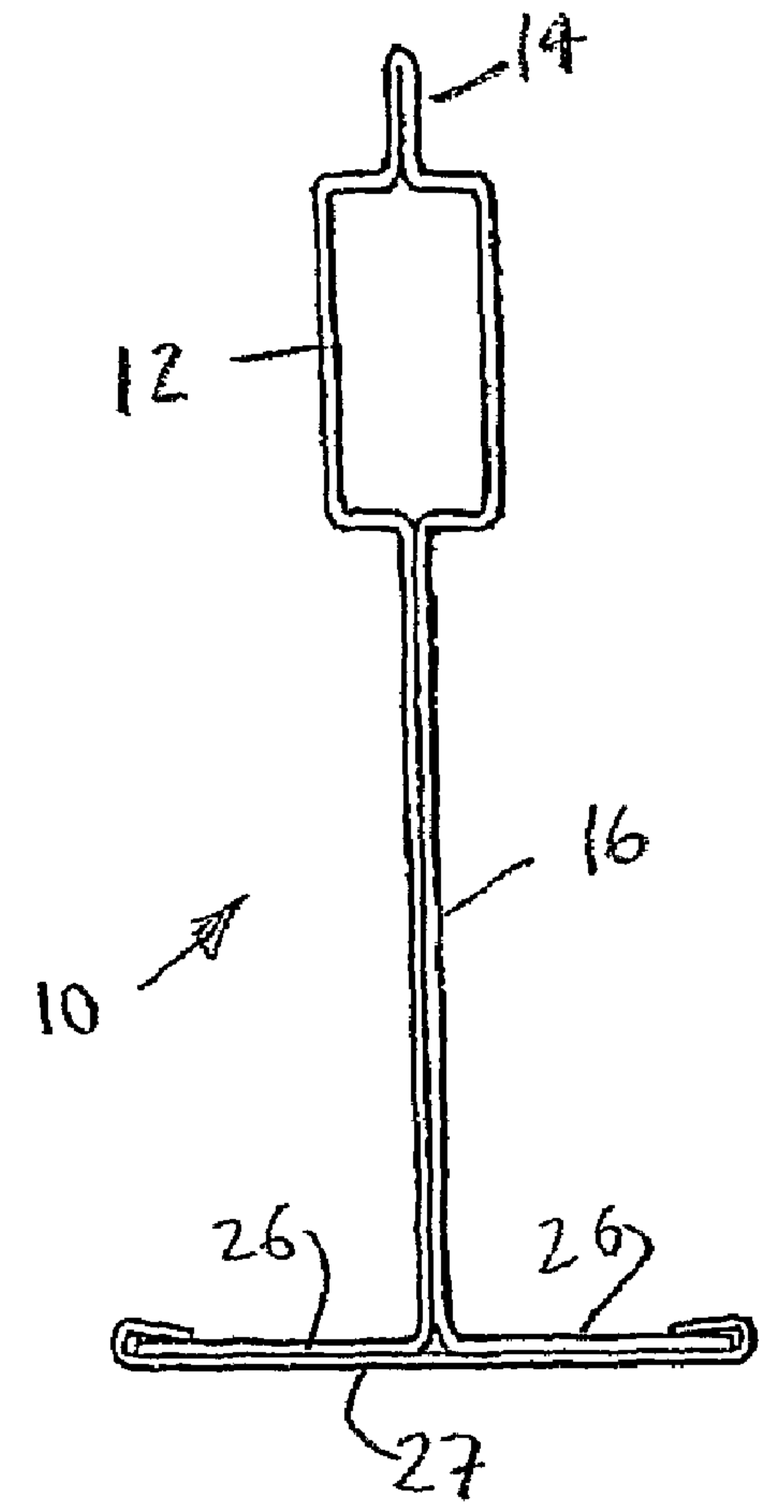
(51) Cl.Int./Int.Cl. *E04B 9/00* (2006.01), *E04B 2/00* (2006.01), *E04B 5/00* (2006.01)

(71) Demandeur/Applicant:
CHICAGO METALLIC CORPORATION, US

(72) Inventeurs/Inventors:
FERRELL, JAMES, US;
MCCLAIN, RICHARD, US;
JANKOVEC, SCOTT G., US;
JAHN, PETER G., US

(74) Agent: FINLAYSON & SINGLEHURST

(54) Titre : COULISSEAU A RESISTANCE ELEVEE
(54) Title: HIGH STRENGTH RUNNER



(57) Abrégé/Abstract:
A suspended ceiling grid beam is provided that has an increased beam height to provide enhanced resistance to downward deflection. The beam has a cross-section generally in the form of an inverted T, with a central web, a pair of panel support flanges

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(13) A1

(57) Abrégé(suite)/Abstract(continued):
extending from one edge of the web, and a reinforcing bulb extending from the other edge of the web. The reinforcing bulb has a generally planar, fin-like structure extending therefrom opposite to and generally co-planar with the central web.

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
15 February 2007 (15.02.2007)

PCT

(10) International Publication Number
WO 2007/019523 A2

(51) International Patent Classification:
E04B 9/00 (2006.01) ***E04B 5/00*** (2006.01)
E04B 2/00 (2006.01)

(21) International Application Number:
PCT/US2006/030931

(22) International Filing Date: 4 August 2006 (04.08.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/705,758 5 August 2005 (05.08.2005) US

(71) Applicant *(for all designated States except US)*: **CHICAGO METALLIC CORPORATION** [US/US]; 4849 South Austin Avenue, Chicago, IL 60638 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: **FERRELL, James** [US/US]; 2 South 281 Kiowa Court, Wheaton, IL 60187 (US). **MCCLAIN, Richard** [US/US]; 58 East Elm Street, Chicago, IL 60611 (US). **JANKOVEC, Scott, G.** [US/US]; 584 Comstock Avenue, Elmhurst, IL (US). **JAHN, Peter, G.** [US/US]; 11440 West 123rd Place, Palos Park, IL (US).

(74) Agent: **HELLER, Stephen, B.**; Cook, Alex, McFarron, Manzo, Cummings & Mehler, Ltd., 200 West Adams Street, Suite 2850, Chicago, IL 60606 (US).

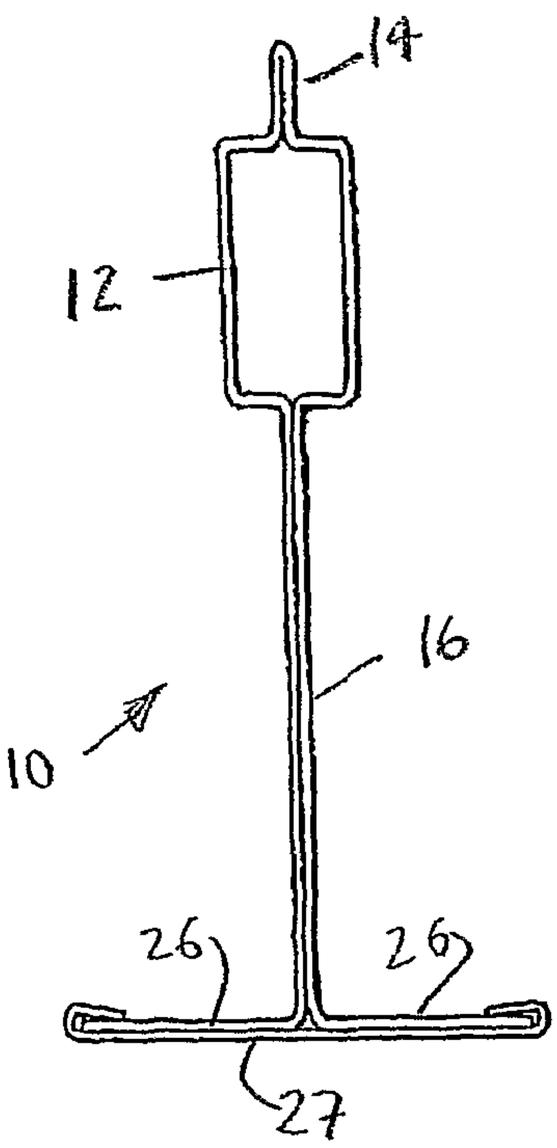
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *without international search report and to be republished upon receipt of that report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: HIGH STRENGTH RUNNER



(57) Abstract: A suspended ceiling grid beam is provided that has an increased beam height to provide enhanced resistance to downward deflection. The beam has a cross-section generally in the form of an inverted T, with a central web, a pair of panel support flanges extending from one edge of the web, and a reinforcing bulb extending from the other edge of the web. The reinforcing bulb has a generally planar, fin-like structure extending therefrom opposite to and generally co-planar with the central web.

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HIGH STRENGTH RUNNER

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a beam or runner having a generally inverted T cross section that is used in a support grid for suspended ceilings.

[0002] Suspended ceilings typically require a support grid comprising a plurality of interconnected beams for supporting ceiling tiles or panels, light fixtures, air diffusers, etc. The beams, also referred to as runners or tees, are generally inverted T-shaped with a reinforcing bulb at the top, a vertical web extending downwardly from the bulb, and opposed horizontal flanges at the bottom of the web for supporting drop-end ceiling panels. In standard practice, the height of the beam, as measured from the top of the flange to the top of the beam, is approximately 1-1/2 inches, so as to accommodate the frames of conventional fluorescent ceiling light fixtures. The beams are typically made in a roll-forming operation from a flat strip of sheet metal, as is well known in the art.

[0003] It is well known that resistance to downward deflection in a beam can be increased by increasing the height of the beam, thus increasing the moment of inertia of the beam. Modifications to suspended ceiling beams have been proposed to increase the beam height. See, U.S. Patent No. 6,138,416, where the beam is formed with a peak or angle at the top of the bulb to both increase the height of the beam and to accommodate the frame of a lighting fixture that

may be supported by the beam.

SUMMARY OF THE INVENTION

[0004] By way of the present invention, an improved beam configuration is provided that has an increased beam height to provide enhanced resistance to downward deflection. The beam or grid tee has a cross-section generally in the form of an inverted T, with a central web, a pair of panel support flanges extending from one edge of the web, and a reinforcing bulb extending from the other edge of the web. In keeping with an aspect of the invention, the reinforcing bulb has a generally planar, "fin-like" structure extending therefrom opposite to and generally co-planar with the central web.

[0005] The fin has narrow width in comparison with the width of the reinforcing bulb. In a first embodiment, the fin is generally planar. In a second embodiment, the fin is more in the shape of a drop, with the narrow portion of the drop being adjacent to the reinforcing bulb.

[0006] In keeping with another aspect of the invention, the two layers forming the web of the beam are stitched together to provide additional resistance to torque.

[0007] Other features and advantages will become apparent upon reference to the drawings and detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Figs. 1-5 show cross-sectional views of five different embodiments of suspended ceiling grid beam that include a reinforcing fin in accordance with the present invention.

[0009] Fig. 6 is a perspective view of a beam according to the present invention, in which the fin includes a hole for receiving the hanger wire for suspending the beam.

[00010] Fig. 7 is a fragmentary cross-sectional view of

the strengthening fin taken along line 7-7 of Fig. 6.

[00011] Fig. 8 is a perspective view of a beam according to the present invention showing a stitching method in which the web of the beam has a series of horizontal stitches with a vertical cut therein spaced at intervals along the length of the runner.

[00012] Fig. 9 is a cross-sectional view of a stitch taken along line 9-9 of Fig. 8.

[00013] Fig. 10 is a cross-sectional view of the stitch prior to having the vertical cut being made therein.

DETAILED DESCRIPTION

[00014] With reference to Figs. 1-5, a runner or tee 10 for use in a suspended ceiling is disclosed comprising a reinforcing bead or bulb 12, a central web 16, and a pair of opposed flanges 26 for supporting ceiling panels or tiles, with a cap 27 covering the exposed portions of the flanges 26, all as is well known in the art.

[00015] In keeping with one aspect of the invention, the bulb 12 of the runner 10 is modified to provide for a greater beam height than the standard runner configuration. This is accomplished by forming the bulb 12 with a central fin 14. While the bulb 12 typically has a rectangular cross-sectional shape, as seen in Figs 1-4, other cross-sectional shapes are contemplated, such as the I-beam or dog-bone shape seen in Fig. 5, in which the bulb has a relatively narrow central portion between an enlarged top and bottom. The fin 14 extends from the bulb 12 generally opposite to, and coplanar with, the web 16 of the runner. This provides for greater strength, and thus greater resistance to deflection, than a runner of identical configuration but without the fin. The fin 14 preferably has a generally flat configuration (as seen in Figs. 1-3),

and is narrow in width as compared to the width of the strengthening bulb 12. However, other narrow configurations may be used for the fin 14, such as the inverted drop shape seen in Figs. 4 and 5. The fin 14 may be of different heights, with the overall height of the runner or tee being maintained, as shown in Figs. 1 and 2. Thus, while the total height of the tee is a predetermined value, the heights of each of the bulb 12 and fin 14 may vary.

[00016] The enhanced strength provided by the fin configuration permits the runner to be formed of thinner material than the prior art runner without compromising the beam strength of the runner. This results in a runner that is more economical to manufacture (because less material is required) is easier to handle, particularly in bulk or carton quantities (because each runner is lighter in weight), and is easier to cut.

[00017] The fin 14 also facilitates the creation of a runner suitable for long spans by stacking a second, inverted, runner on top of the first runner, with their fins 14 lying along each other, and preferably secured to each other through the fins. Such a configuration can also be used to create a coffer.

[00018] With reference to Fig. 3, the fin 14 can be reinforced by introducing an elongated strengthening element 18 of the same material of the remainder of the runner that is bonded in place between the opposed faces of the two layers that comprise the fin by, e.g., adhesive, solder, spot welding, plasma welding, toggle locks, or by stitching or the creation of embossed hanger wire holes in the fin, as discussed below.

[00019] To provide the beam with added resistance to torque, the two layers of the web are preferably secured to

each other by means of locking stitches or lances that mechanically join together the two layers of the web. See, e.g., U.S. Patent No. 4,489,529, which is incorporated herein by reference. This patent shows the web of a suspended ceiling beam fastened together by either a horizontal or a vertical stitch.

[00020] The stitch 20 may be of any configuration known in the art, but is preferably of the configuration shown in Figs. 8 and 9. Figs. 8 and 9 show a 2-axis stitch 20 applied at spaced intervals along the length of the web. This stitch 20 includes a vertical cut 21 to resist motion in the horizontal direction.

[00021] The stitches 20 are preferably made as part of the roll forming operation for the beam in which the beam is passed between a pair of cooperating rollers. One roller has a series of small punches with opposed cutting edges spaced around its circumference, while the other roller has a continuous circumferential groove aligned so that the punches penetrate the groove. Thus, in a first roll pass, the web passes through the rollers, and the punches in the first wheel cut out parallel slots and displace a slug out of the plane of the web and into the groove of the second roller, with the slug from one of the layers protruding through the hole in the other layer to form a horizontally-oriented D-shaped stitch, when viewed in horizontal section as shown in Fig. 10. This resists vertical displacement between the two layers of the vertical web. See also U.S. Patent No. 6,047,511, Figs. 1-2a and associated description, and U.S. Patent No. 5,979,055, Figs. 1-3 and associated description, both of which are incorporated by reference.

[00022] The beam is then passed through a second pair of rollers in which one of the rollers has an edge that creates

a vertical displacement in the D-stitch formed in the first roll pass to complete the stitch. As shown in Fig. 9, the illustrated stitch includes a vertical cut that completely severs the layers of the web. However, this is not required and the second roll pass operation may simply press a central portion of the D-shaped stitch back into the plane of the layers forming the web.

[00023] As shown in Fig. 7, the fin 14 is preferably provided with a series of spaced holes 22 for receiving the hanger wire 24 for suspending the assembled grid from the ceiling. Preferably, the series of holes 22 is spaced so that a hole 22 is aligned with apertures in the web of the beam for receiving the cross beams. Having the fin 14, rather than the web 16, carry the hanger wire allows for the hanger wire to be aligned with the cross-tee and for the hanger wire to be more tightly wrapped about itself. This, in turn, lessens the likelihood of damaging the edges of the ceiling tiles by the hanger wire when the tiles are dropped into place on the flanges 26 of the runner 10 because there is greater clearance. The greater clearance also facilitates faster installation of the ceiling tile. The hanger holes 22 are also preferably formed as part of an embossment 28 for additional strength. The embossment 28 also provides a tapered hole, which allows easier hanger wire insertion.

[00024] Thus, an improved beam for a suspended ceiling grid has been provided. While the invention has been described in terms of certain preferred embodiments, there is no intent to limit the invention to the same. Instead, the invention is defined by the scope of the following claims.

WHAT IS CLAIMED IS:

1. A grid tee for a suspended ceiling having a cross-section generally in the form of an inverted T with a central web with first and second opposed edges, a pair of panel support flanges extending from the first edge of the web, a reinforcing bulb extending from the second edge of the web, and a fin that is generally co-planar with the central web extending from the reinforcing bulb opposite to the central web.

2. The grid tee of claim 1 wherein the fin and the reinforcing bulb each having a height that is variable, with the sum of the heights of the fin and the bulb being a predetermined value.

3. The grid tee of claim 1 wherein the fin comprises a double layer web with a reinforcing strip disposed between the layers.

4. The grid-tee of claim 1 wherein the fin includes a series of spaced apertures adapted to receive hangar wire for suspending the grid tee.

5. The grid tee of claim 1 wherein the fin includes a series of spaced embossments, each embossment having an aperture adapted to receive a hangar wire for suspending the grid tee.

6. The grid tee of claim 1 wherein the fin has an inverted, drop-shaped cross section.

7. The grid tee of claim 1 wherein the web comprises a double layer, the layers being secured together by a plurality of stitches at spaced intervals along the web, the stitches being formed with a pair of opposed horizontally oriented cuts through the two layers of the web and each stitch including a vertical displacement to resist motion in a horizontal direction.

8. The grid tee of claim 7 wherein the vertical displacement in each stitch comprises a vertical cut through the stitch.

9. The grid tee of claim 7 wherein the vertical displacement in each stitch comprises a central portion of each stitch being displaced back into a plane defined by the layers of the web.

10. A grid tee for a suspended ceiling, having a cross-section generally in the form of an inverted T with a central double layer web having first and second opposed edges, a pair of panel support flanges extending from a first edge of the web, a reinforcing bulb extending from the second edge of the web, and a plurality of stitches at spaced intervals in the web to secure the layers together, the stitches being formed with a pair of opposed, horizontally oriented cuts through the two layers of the web and each stitch including a vertical displacement to resist motion in a horizontal direction.

11. The grid tee of claim 10 wherein the vertical displacement in each stitch comprises a vertical cut through the stitch.

12. The grid tee of claim 10 wherein the vertical displacement in each stitch comprises a central portion of each stitch being displaced back into a plane defined by the layers of the web.

13. A grid tee for a suspended ceiling having a cross-section generally in the form of an inverted T with a central web with first and second opposed edges, a pair of support flanges extending from the first edge of the web, and a reinforcing bulb extending from the second edge of the web, the reinforcing bulb having a cross section with a narrow central portion and a relatively wider top and bottom portion.

FIG.5

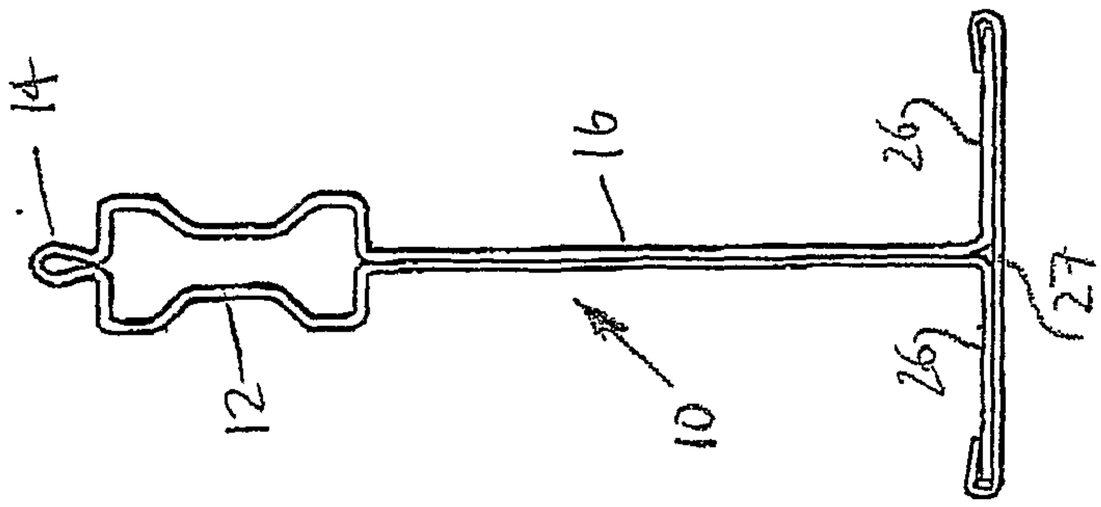


FIG.4

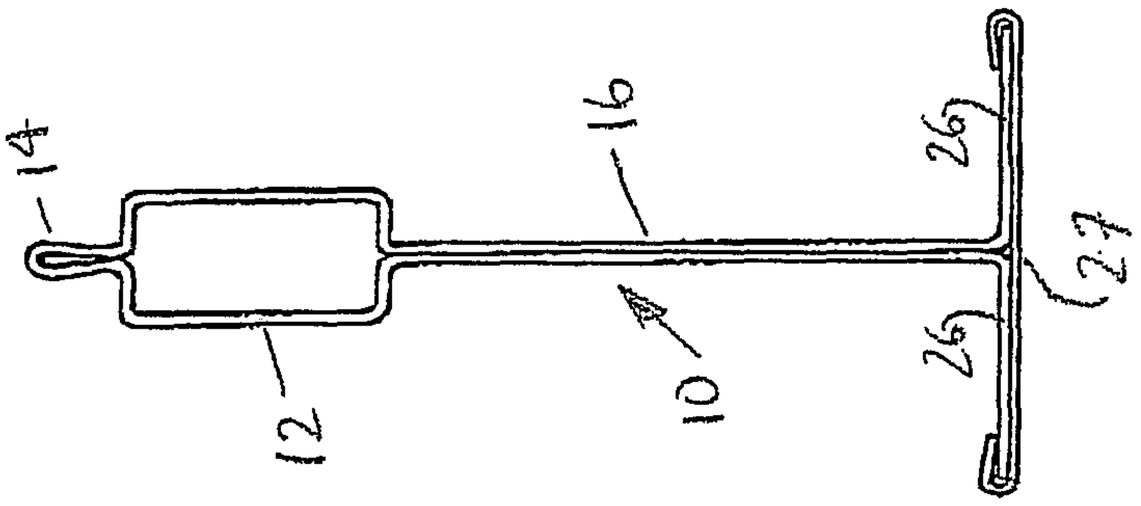


FIG.3

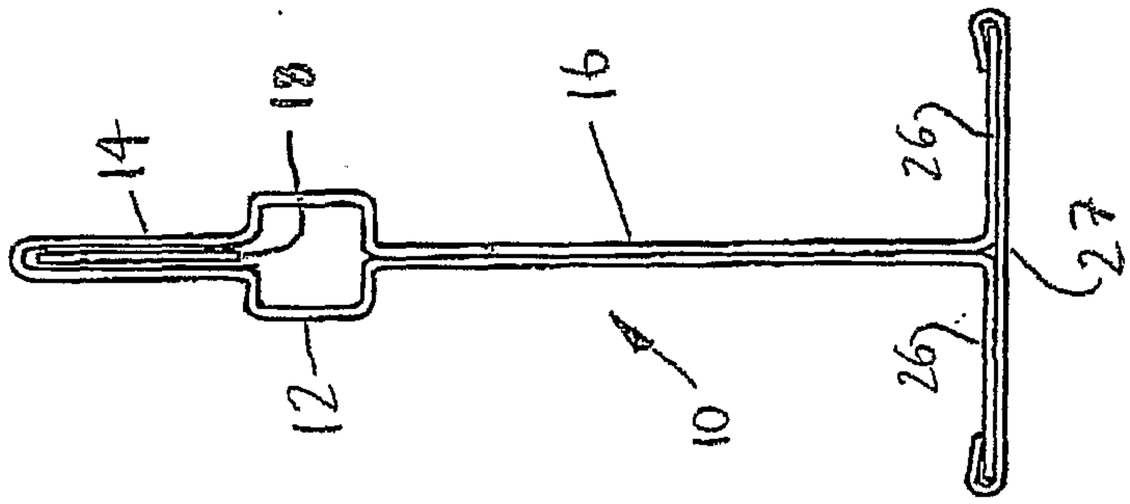


FIG.2

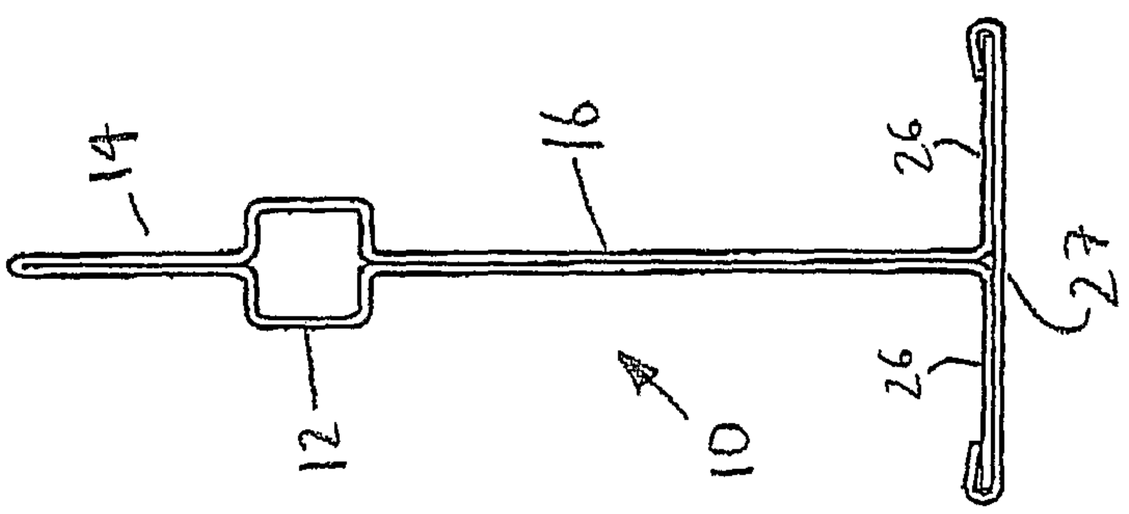


FIG.1

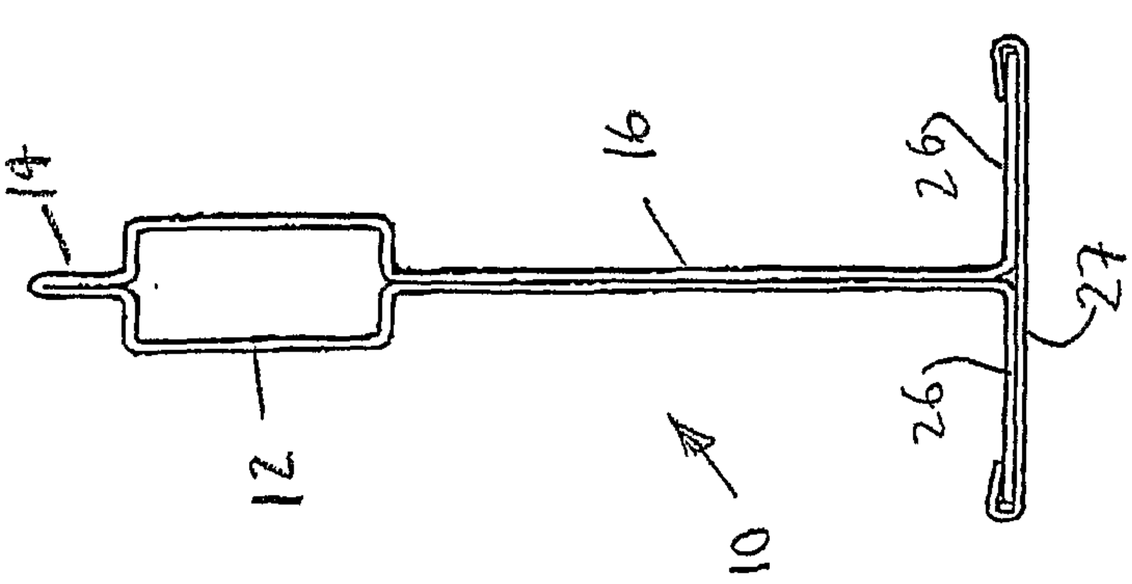


FIG.9

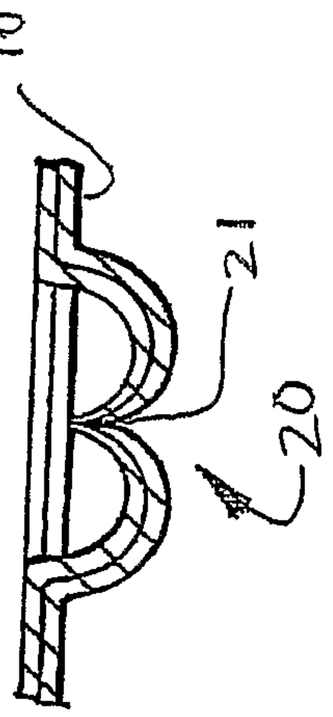


FIG.10

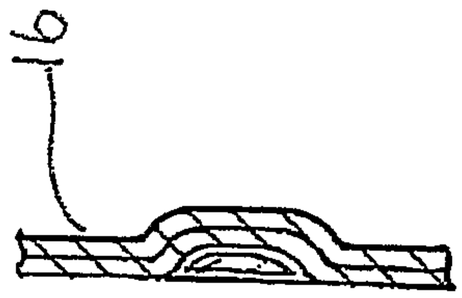


FIG.7

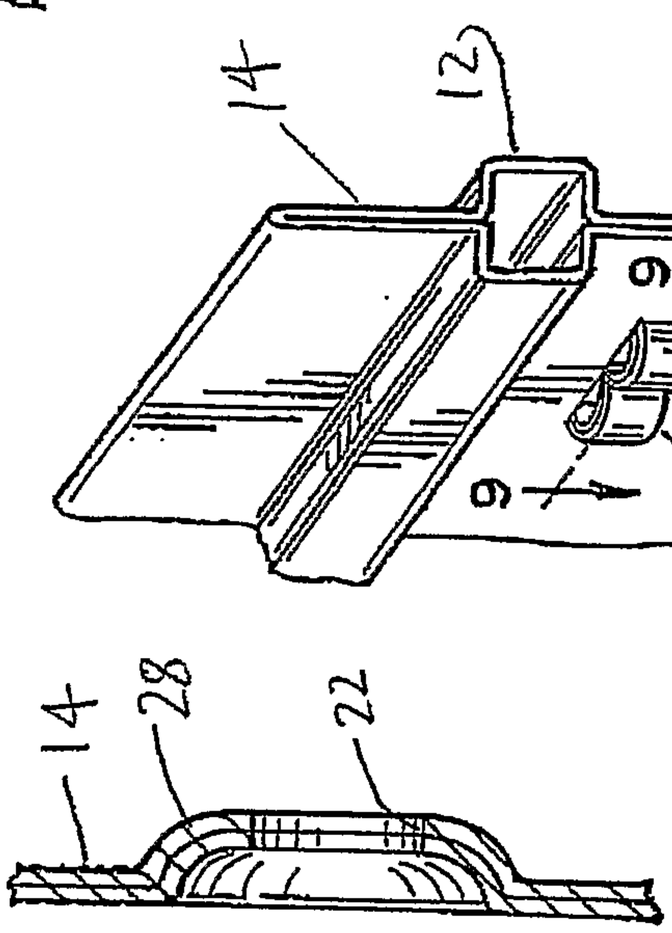
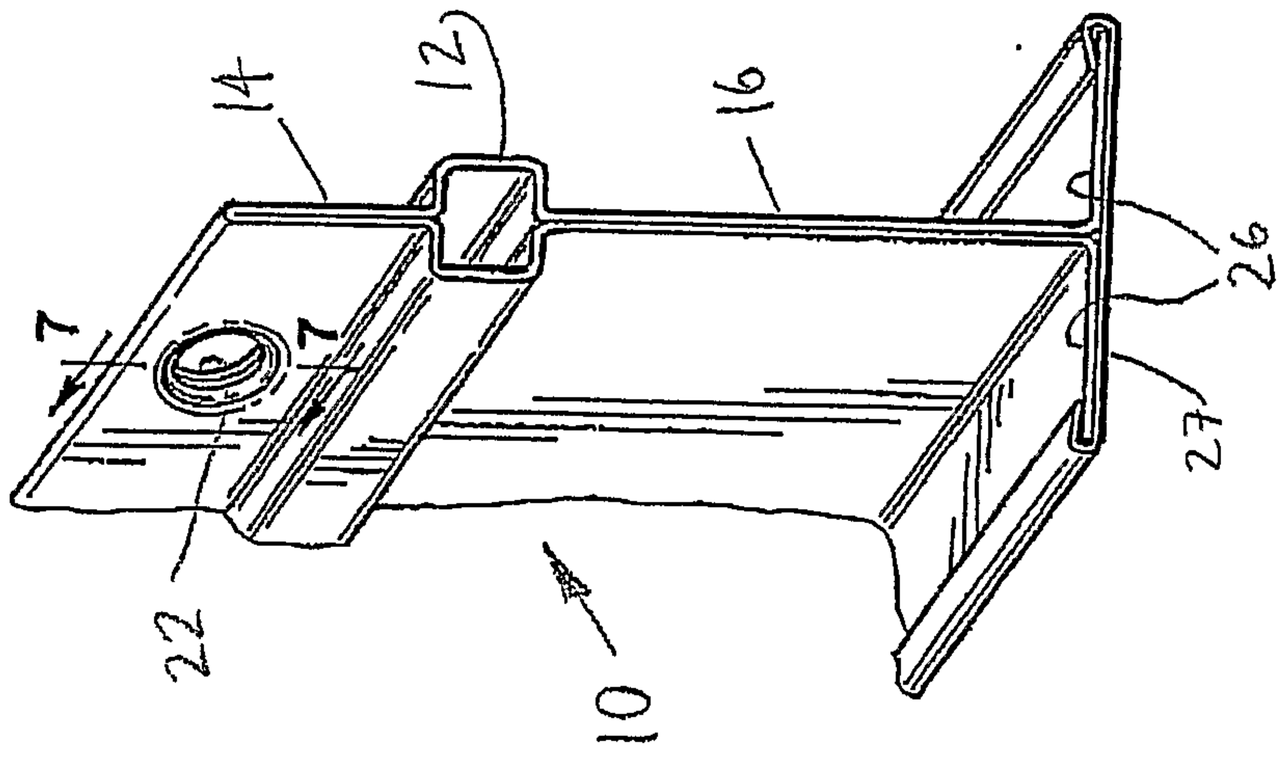
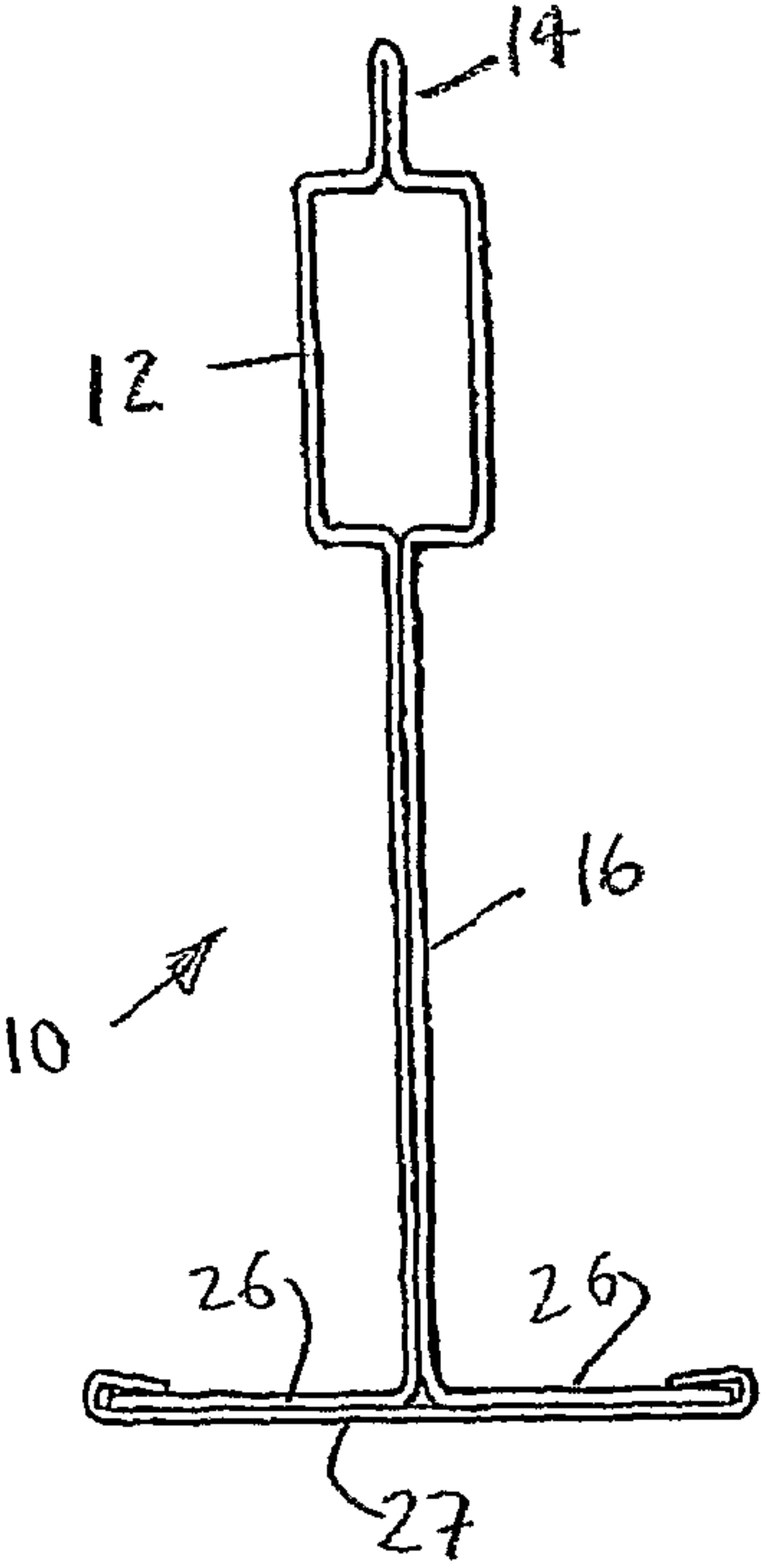


FIG.8

FIG.6

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