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(11) **EP 1 297 866 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.04.2003 Bulletin 2003/14

(51) Int Cl.7: **A63B 69/00**, G09F 15/00,
E04B 2/74

(21) Application number: **02256592.3**

(22) Date of filing: **23.09.2002**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
IE IT LI LU MC NL PT SE SK TR**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **27.09.2001 GB 0123197**

(71) Applicants:
• **Bates, Andrew John**
Burton-on-Trent, Staffordshire DE13 8EU (GB)
• **Cartwright, John**
Gt. Canford, Nr. Dunmow, Essex CM6 1JU (GB)
• **Caveney, Maureen Ann**
Weston, Staffordshire (GB)

(72) Inventors:
• **Bates, Andrew John**
Burton-on-Trent, Staffordshire DE13 8EU (GB)
• **Cartwright, John**
Nr. Dunmow, Essex CM6 1JU (GB)
• **Caveney, Thomas Matthew**
Deceased (GB)
• **Caveney, Maureen Ann**
Weston, Staffordshire (GB)

(74) Representative: **Parr, Ronald Edward**
R.E. Parr & Co.,
Colman House,
Station Road
Knowle, Solihull, West Midlands B93 0HL (GB)

(54) **Portable walls for ball games**

(57) Portable walls, in particular, walls for use in playing or practising ball games, for example Association Football (soccer) comprise:

a plurality of impact-resistant panels;
a plurality of hinges hingedly connecting together adjacent ones of the panels at adjacent edges thereof; and
one or more support members to support the wall in a substantially upright disposition, each support member being secured, respectively, to one of the hinges.

In a preferred form, the portable walls have hinges comprising a hinge pin in engagement with edge portions of adjacent panels, the edge portions being of a shape such that they each provide a plurality of hinge knuckles, the hinge knuckles of one of the adjacent panels engaging with the hinge knuckles of the other of the adjacent panels.

There are also described methods for producing components of the portable walls.

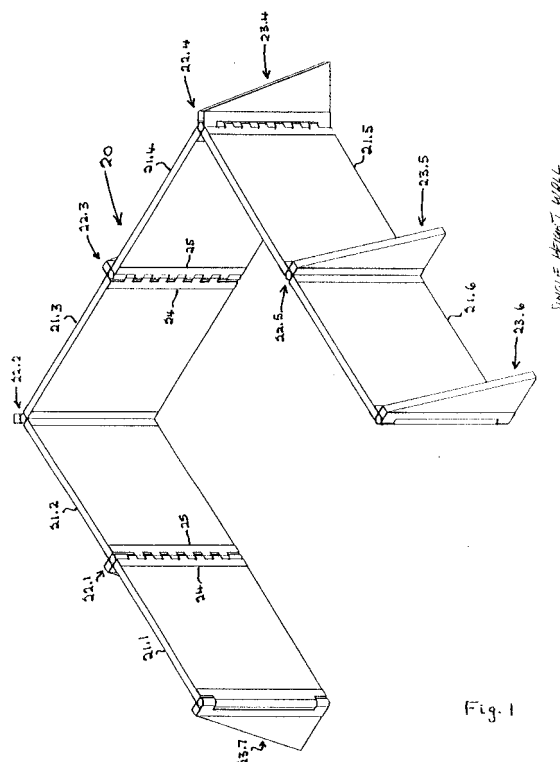


Fig. 1

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Description

[0001] This invention relates to portable walls, in particular, to walls for use in playing or practising ball games, (referred to herein as "games walls"). More especially, it relates to portable walls for use in practising football (in particular Association Football, referred to herein as soccer). However, some, at least, of the games walls described herein can be used for practising other ball games, for example tennis, squash, Rugby football and cricket. The invention is described below with particular reference to portable walls for use in soccer.

[0002] According to preferred forms of the present invention there is provided a portable games wall which can readily be assembled, disassembled, transported and stored, the wall being comprised of a relatively few, mainly interchangeable, component parts.

[0003] In one aspect the present invention provides a portable wall suitable for use in playing or practising ball games comprising:

- a plurality of impact-resistant panels;
- a plurality of hinges hingedly connecting together adjacent ones of said panels at adjacent edges thereof; and
- one or more support members to support the wall in a substantially upright disposition, each support member being secured, respectively, to one of said hinges.

[0004] In a preferred form of the present invention the portable wall comprises:

- a plurality of impact-resistant panels connectable one to another at adjacent edge portions by a hinge to form a substantially upright, lateral assembly, said hinge comprising:

- first and second mateable hinge leafs secured respectively along said edge portions of first and second of said panels, and a hinge pin to interconnect said first and second hinge leafs; and

- one or more support members to support the wall in a substantially upright disposition, the support member or support members being secured, respectively, to said hinge or hinges.

[0005] In a further preferred form of the present invention, the hinges comprise a hinge pin in engagement with edge portions of said adjacent panels, said edge portions being of a shape such that they each provide a plurality of hinge knuckles, the hinge knuckles of one of said panels engaging with the hinge knuckles of the other of said panels,

[0006] The present invention also provides a method

of producing a panel for a portable wall, which comprises:

(a) pre-forming a sheet of rigid plastics material to form therein precursor apertures of pre-determined shape and size for subsequent conversion to knuckles and knuckle-receiving apertures for a hinge, thereby producing a preformed blank;

(b) securing to a middle portion of the preformed blank a layer of a plastics foam to form a laminate leaving other portion or portions of the blank uncovered by plastics foam;

(c) folding over the reverse face of the plastics foam layer the uncovered portions of the blank, said folding being along a line or lines intersecting said precursor apertures, whereby said precursor apertures are converted to provide said hinge knuckles and knuckle-receiving apertures;

(d) securing said uncovered portions to said reverse face.

[0007] The general purpose of the portable wall of the invention is to provide a rebound or return surface against which a ball can be kicked or otherwise projected and returned in the general direction of the player for subsequent control and/or re-play. The wall is particularly of value for practice by a solo player.

[0008] The nature of the impact-resistant panels of the portable wall depends to some extent on the game for which it is to be used. In general, however, the panels will be of such a construction that they are suitable for practice of soccer. The rebound surface of the panel (referred to herein also as the "front") is preferably a continuous surface, thereby facilitating its manufacture. In a preferred form of the invention the panels each comprise a layer of cellular plastics material covered on at least its rebound surface by a sheet of tough, lightweight plastics material.

[0009] The panels are conveniently of square or other rectangular shape, which facilitates edge-to-edge connection of adjacent panels.

[0010] The rebound surface of the panels can be planar. However, where it is intended that the rebound surface should return the ball at an "unexpected" angle, thereby to test the skill of the player, the rebound surface can be shaped accordingly, for example by the inclusion therein of corrugations or other projections. Alternatively, or in addition, the rebound surface can have apertures or recesses therein which will provide return of the ball at said "unexpected" angle.

[0011] The hinges by which adjacent panels are connected together comprise, in general, first and second mateable hinge leafs secured along opposed side edge portions of the panels, and a hinge pin engaging the hinge leafs. The hinge leafs are conveniently formed,

according to the present invention, from a sheet of suitable plastics material (for example high density polyethylene) by a process of cutting and shaping to provide a generally U-shaped hinge leaf as is described in greater detail below with reference to the accompanying drawings.

[0012] The purpose of the support members of the portable wall is to prevent unwanted collapse of the wall, especially when struck by a kicked soccer ball or other ball having substantial energy. It is an important feature of the present invention that the supports, or at least some of them, are secured respectively to hinges connecting together adjacent panels. In a preferred form of the invention the support member is hingedly connected to the same hinge pin as are the hinge leaves of adjacent panels. In this form, the support members can be regarded as being a third hinge leaf of the hinge assembly. A preferred form of support member comprises a ground-contacting support leg and an attachment or engagement member secured to the support leg and for hinged or other engagement with the respective hinge.

[0013] As stated above, the portable wall of the invention is of particular value in practising soccer. For that purpose is is normally sufficient for the component panels to be in a single tier. However, for certain purposes it is preferable for the wall to include at least one further tier. For example, the increased height obtained by using a further tier obviates the risk of unintentional stray balls passing over the top of a single tier of panels. The use of such a further tier facilitates use of the wall for games such as tennis and squash where the height of the wall is important. Where a further tier is used it is conveniently composed of panels similar to those of the lower tier and having hinge assemblies and support members similar to those used for a single tier construction, as is described in greater detail below with reference to the accompanying drawings.

[0014] Thus, in a further aspect the present invention provides a portable wall according to the invention, wherein the wall including a plurality of auxiliary impact-resilient panels connectable to one another at adjacent side edge portions by means of a hinge, to form a substantially upright, second tier, said second tier being disposed above, and in juxtaposition to, said lateral assembly.

[0015] Advantages provided by at least preferred embodiments of the portable wall of the invention in practising various games are as follows:

Soccer

[0016] The hinged construction of the portable wall allows the angle defined by adjacent adjoined panels to be varied to suit the needs of the player, for example by effecting return of the ball in a wide range of angles. For heading practice, a foldable flap or other ramp can be provided for one or more of the panels of the wall, so that when the ball is kicked up the ramp it rises to a suit-

able height in returning to the player for subsequent playing back against the wall.

Squash

[0017] A double tier wall can have a line drawn on it or a fitting clipped to it to form the "tin line".

Tennis

[0018] A double tier wall can have a line drawn on it or a fitting clipped to it corresponding to the height of a tennis net. If desired, sensors can be incorporated in the wall so the player can be advised of any ball that would not have cleared the top of the notional net.

Cricket

[0019] Stumps can be placed against the wall for bowling practice, preferably using a soft ball, whereby the ball will rebound from the wall and return to the bowler for continued practice.

[0020] There are now described by way of example and with reference to the accompanying drawings several embodiments of portable walls of the present invention.

[0021] Figs. 1 to 9 relate to a first embodiment of the invention;

Fig. 10 relates to a second embodiment;

Figs. 11 to 13 relate to a third embodiment;

Figs. 14 to 24 relate to a fourth embodiment;

Figs. 25A and 25B relate to a fifth embodiment;

Figs. 26A, 26B and 27 relate to a sixth embodiment;

Figs. 28 and 29 relate to a seventh embodiment, a method of producing components of other embodiments of the invention.

In the drawings:

[0022]

FIG. 1 is a perspective view of the first embodiment of a portable wall according to the invention, comprising six impact-resistant panels connected edge-to-edge in a U-shape configuration and comprising three lateral portions, by means of vertically-extending elongate hinges, each hinge having secured thereto a support member;

FIG. 2 illustrates a hinge leaf of the portable wall of FIG. 1;

FIG. 3 illustrates a hinge pin for use with the hinge leaf of Fig. 2;

FIG. 4 illustrates a support member of the portable wall of FIG. 1;

FIG. 5 is an exploded perspective front view of a hinge joint assembly of two adjoining panels and a rearwardly-extending support member, the panels being disposed at 180° to each other;

FIG. 6 is a perspective rear view, corresponding to FIG. 5;

FIG. 7 is a perspective rear view of a hinge joint assembly of two adjoining panels and a rearwardly-extending support member, the panels being disposed at a right angle to each other;

FIG. 8 is a perspective front view of the assembly of FIG. 7;

FIG. 9 is an exploded perspective front view of an end panel of the portable wall of FIG. 1 and a rearwardly-extending support member;

FIG. 10 is a perspective view of a second embodiment of a portable wall according to the invention, the wall comprising three impact-resistant panels connected edge-to-edge in a L-shape by vertically-extending, elongate hinges, each hinge having secured thereto a support member;

FIG. 11 is a perspective view of a third embodiment of a portable wall according to the invention, comprising six double-tier impact-resistant panels, the side edges of adjoining panels being connected edge-to-edge;

FIG. 12 is an exploded perspective front view of a hinge joint assembly between two adjoining double-tier panels of FIG. 11, the two double tiers being arranged at 180° to each other;

FIG. 13 is an exploded perspective front view of an end double tier panel of the portable wall of FIG. 11 and a rearwardly-extending support member;

FIG. 14 is a perspective view of the fourth embodiment of a portable wall according to the invention, comprising six impact-resistant panels connected edge-to-edge in a U-shape configuration and comprising three lateral portions, by means of vertically-extending elongate hinges, each hinge having secured thereto a support member;

FIGS. 15, 16 and 17 are respectively front, rear and exploded perspective views of a hinge joint assembly

of two adjoining panels and a rearwardly-extending support member, the panels being disposed at 180° to each other;

FIGS. 18, 19, 20 and 21 are respectively front, rear, side and exploded perspective views of a hinge joint assembly of two adjoining panels and a rearwardly-extending support member, the panels being disposed at a right angle to each other;

FIGS. 22, 23 and 24 are respectively front, rear and exploded perspective views of an end panel of the portable wall of FIG. 14 and a rearwardly-extending support member;

FIGS. 25A and 25B are two exploded perspective views of the portable wall shown in Fig. 14.

FIGS. 26A and 26B are two exploded perspective views of a fifth embodiment of a portable wall according to the invention, comprising six double-tier impact-resistant panels, the side edges of adjoining panels being connected edge-to-edge;

FIG. 27 is a perspective view of one of the connectors shown in Figs. 26A and 26B, used to connect, end-to-end, upper and lower hinge pins; and

FIGS. 28 and 29 illustrate the method of the invention. Fig. 28 is a plan view of a blank of plastics material used in the production of panels of the portable walls of the invention. Figs. 28A and 28B illustrate stages of the method. Fig. 29 is a plan view of a blank of plastics material (for example high density polyethylene) used in the production of support members of the portable walls of the invention.

[0023] With reference to FIGS. 1,2,3 and 4, the portable wall (20) comprises six like, rectangular wall panels (21.1 to 21.6) each panel being connected to its adjoining panel or panels by means of like hinges (22.1 to 22.5). Panels pair 21.1 and 21.2 are disposed to each other at substantially 180°, as are panel pairs (21.3 and 21.4) and (21.5 and 21.6). Panels 21.2 and 21.3 are disposed to each other at substantially 90°, as are panels 21.4 and 21.5.

[0024] The panels are of a laminate of a core sheet of polyethylene foam bonded on each face thereof to a sheet of high density polyethylene. The sheet of high density polyethylene has a thickness of 0.8mm but it can, in the general context of the invention, have, for example, a thickness in the range of 0.5 to 2.5mm, for instance in the range 0.8 to 1.5mm. The polyethylene foam core sheet has a thickness of 45mm and a density of 30kg/m³. However, in the general context of the invention, the polyethylene foam sheet (or alternative resilient foam plastics sheet) can, for example, have a thickness in the range 20 to 60mm, for instance 30 to 50 mm. Where a polyethylene foam sheet is used its

density can, for example, be in the range 30 to 100 kg./m³.

[0025] Hinges 22.1 to 22.5 have secured thereto, respectively, five, like, outwardly-extending, ground-contacting supports (23.1 to 23.5) of which two (23.4 and 23.5) are shown substantially in full.

[0026] The free ends of panels 21.1 and 21.6, that is ends having no adjoining panel, are provided, respectively, with like supports 23.6 and 23.7. These two supports are conveniently like the supports 23.1 to 23.5.

[0027] Each of hinges 22.1 to 22.5 comprises first and second elongate, mateable hinge leafs (24, 25) which extend, respectively, along side edges and from upper edge to lower edge of adjoining panels. The hinge leafs are interconnected by an elongate, tubular hinge pin (26). The hinge leafs and the hinge pins are conveniently of high density polyethylene.

[0028] The supports (23.1 to 23.5) and supports (23.6 and 23.7) each comprise a triangular support leg (26) and an elongate attachment member (27) to which the triangular leg (26) is secured by bookbinder-type fasteners (not shown). The attachment member (27) provides the means by which the leg is secured to the hinge, as is described in greater detail below.

[0029] Fasteners of the "bookbinder-type" are fasteners comprising two flat-headed screws having, respectively, interengageable male and female screw-threaded shanks for insertion and retention in apertures in sheet-like articles which it is wished to fasten together.

[0030] With reference to FIGS. 1, 5 and 6, the hinge joint assembly (22.1) by means of which impact-resistant sheets (21.1 and 21.2) are connected together, comprises: hinge leafs (24, 25) (secured by means of bookbinder-type fasteners (not shown) to opposed edge portions of the two panels), support member (23.1) and hollow cylindrical hinge pin (26).

[0031] Hinge leafs (24 and 25) are each of a sheet of high density polyethylene (thickness 3mm) which has been cut and shaped so as to provide a leaf having opposed planar portions (24.1, 25.1) interconnected by a series of spaced-apart U-shaped members (24.2, 25.2) so disposed that the interconnecting U-shaped portions of one of said leafs are such that they can mate with the corresponding U-shaped portions of the other leaf.

[0032] Support member (23.1) comprises a triangular support leg (26) and an attachment member (27) secured along the vertical edge of triangular leg (26) by means of fasteners of the bookbinder type (not shown). The attachment member (27) has been formed from a sheet of high density polyethylene (thickness 3mm) by cutting and shaping such that it comprises two elongate, planar portions (27.1) interconnected by U-shaped portions (27.2) at its upper and lower extremities, those portions being such that they can mate respectively with the uppermost U-shaped portion of leaf (25) and the lowermost U-shaped portion of leaf (24). In that assembled condition the U-shaped portions of leafs (24, 25) and the U-shaped portions of attachment member (27) are so

aligned that they can slidably receive hinge pin (26). In that assembled condition hinge pin (26) connects together panels (21.1 and 21.2) and support member (23.1) thereby permitting the relative angular disposition of the two panels and the support member to be adjusted as required. In the assembled position the lower end of hinge pin (26) rests on the ground.

[0033] With reference to FIGS. 7 and 8, the connected panels, hinge assembly and support member are as described above with reference to FIGS. 5 and 6 but in FIGS. 7 and 8 the panels are disposed substantially at a right angle to each other.

[0034] FIG. 9 shows, in an exploded view, the means of attachment of a support member to an edge of an end panel of the portable wall of FIG. 1, the end panel being one having no adjoined adjacent panel. In FIG. 9 the support member and the hinge pin are as described above with reference to FIGS. 5 and 6. However, the hinge leaf shown in FIG. 9, connected to the free edge portion of the panel is different from that of FIG. 5 and 6 in that, instead of having a series of spaced-apart U-shaped portions it has a single elongate U-shaped portion of a length such that it can mate with the U-shaped portions of the support attachment member, thereby to permit the panel and the support member to be hingedly interconnected by the hinge pin.

[0035] With reference to FIG. 10, the panels, hinge assemblies and support members are as those described above with reference to FIGS. 1 to 9.

[0036] The portable wall illustrated in FIGS. 11 to 13 corresponds to the portable wall of FIG. 1, the principal difference being that instead of the panels being disposed as a single tier (as in FIG. 1) the panels are arranged in a double tier. Owing to its increased height compared with the wall of FIG. 1, the double tier embodiment is preferred for use in practising games in which the ball is required to be returned to the player from at least a minimum height, for example, tennis and squash. In the embodiment shown in FIG. 11 the impact-resistant panels and the hinge leafs can be identical with those described above with reference to FIG. 1. However, at least in the embodiments shown in FIGS. 11 to 13, the hinge pins and support members are of an increased length compared with those of FIG. 1 and correspond to the increased height provided by the double tier structure. Use of the longer hinge pins provides a simple yet most effective means of holding in upright alignment corresponding panels of the upper and lower tiers.

[0037] With reference to FIGS. 12 and 13, the hinge leafs and attachment members can be identical with those used in the embodiment of FIG. 1, thereby enabling the same panels and attachment members to be used either in a single tier arrangement (as in FIG. 1) or in a double tier arrangement (as in FIGS. 11 to 13). The hinge leafs of the panels of the upper and lower tiers are so disposed that the U-shaped portions of the hinged leafs secured to one set of upper and lower panels not

only mate with the corresponding U-shaped portions of the hinge leafs secured to the opposed set of upper and lower panels but also the U-shaped portions of the two attachment members are such that the hinge pin can slidably engage all of said U-shaped portions thereby hingedly interconnecting the two sets of panels. As in the embodiment of FIG. 1, the hinge pins, when assembled with the hinged leafs and support attachment members do not require special means for their vertical support but can rest simply on the ground.

[0038] In the embodiment shown in FIGS. 11 to 13 the support member is of a height corresponding to the height of the double tier of panels, and the respective two attachment members are secured to the vertical edge of the support leg by means of fasteners of the bookbinder type (not shown).

[0039] From the foregoing description it will be seen that, in preferred embodiments of the invention described above with reference to Figs. 1 to 13 of the accompanying drawings, the hinge leafs and support attachment members can all be produced by the cutting and shaping of planar sheets of high density polyethylene or other suitable plastics or other material. The hinge pins can readily be formed by cutting lengths of tubular high density polyethylene or other suitable plastics or other material.

[0040] With reference to FIGS. 14 to 24, the portable wall (120) comprises six like, rectangular wall panels (121.1 to 121.6) each panel being connected to its adjoining panel or panels by means of like hinges (122.1 to 122.5). Panels pair 121.1 and 121.2 are disposed to each other at substantially 180°, as are panel pairs 121.3 and 121.4 and 121.5 and 121.6. Panels 121.2 and 121.3 are disposed to each other at substantially 90°, as are panels 121.4 and 121.5.

[0041] The panels are each of a laminate of a core sheet of polyethylene foam bonded on each face thereof to a facing sheet of high density polyethylene. The facing sheet has a thickness of 1.0mm but it can, in the general context of the invention, have, for example, a thickness in the range of 0.5 to 2.5mm, for instance in the range 0.8 to 1.5mm. The polyethylene foam sheet has a thickness of 42.5mm and a density of 30kg/m³. However, in the general context of the invention, the polyethylene foam sheet (or alternative resilient foam plastics sheet) can, for example, have a thickness in the range 20 to 60mm, for instance 30 to 50mm. Where a polyethylene foam sheet is used its density can, for example, be in the range 30 to 100 kg./m³.

[0042] The core sheet of foam material is enveloped in a folded facing sheet of the high density polyethylene, said facing sheet providing a smooth, obverse, forwardly-facing surface (for example 121.7) and two returned, folded-back opposed end portions (121.8, 121.9) which are in an opposed, contiguous relationship (for example abutting) on the reverse, rearwardly-facing surface of the panel. The opposed ends of the polyethylene sheet are covered by a cover member (121.10).

[0043] The polyethylene sheet has (FIG. 17) in the region of each side edge fold (121.11, 121.12) a plurality of spaced apart recesses (slots or apertures) (121.13, 121.14), consecutive ones of which define U-shaped hinge knuckles (121.15, 121.16) for hinged engagement with corresponding recesses in the adjacent panel.

[0044] Hinges (122.1 to 122.5) have secured thereto, respectively, five, like, outwardly-extending, ground-contacting supports (123.1 to 123.5) of which two (123.4 and 123.5) are shown substantially in full.

[0045] The free ends of panels (121.1 and 121.6), that is, ends having no adjoining panel, are provided, respectively, with like supports (123.6 and 123.7). These two supports are conveniently like the supports (123.1 to 123.5). As indicated above, adjacent panels, in effect, constitute hinge leafs of the respective hinges. For example (FIG. 1), panels (121.1 and 121.2) constitute hinge leafs of hinge (122.1). The hinge leafs are interconnected by elongate, tubular hinge pins (127) which are conveniently of high density polyethylene.

[0046] By way of example, the hinge joint assembly (122.1) by means of which panels (121.1 and 121.2) are connected together, comprises opposed edge portions of panels (121.1 to 121.2), support member (123.1) and hollow cylindrical hinge pin (127).

[0047] The support members (123.1 to 123.5), exemplified by support member (123.1) (FIG. 16), have a structure very similar to that of panels (121.1 to 121.6). Thus, the supports are each of a laminate of a core sheet of polyethylene foam bonded on each face thereof to a facing sheet of high density polyethylene. The facing sheet has a thickness of 1.0mm but it can, in the general context of the invention, have, for example, a thickness in the range of 0.5 to 2.5mm, for instance in the range 0.8 to 1.5mm. The polyethylene foam sheet has a thickness of 42.5mm and a density of 30kg/m³. However, in the general context of the invention, the polyethylene foam sheet (or alternative resilient foam plastics sheet) can, for example, have a thickness in the range 20 to 60mm, for instance 30 to 50mm. Where a polyethylene foam sheet is used its density can, for example, be in the range 30 to 100 kg./m³.

[0048] The core sheet of foam material is enveloped in a folded facing sheet of the high density polyethylene, said facing sheet providing a smooth, obverse, forwardly-facing surface and two returned, folded-back opposed end portions which are in an opposed, contiguous relationship (for example abutting) on the reverse, rearwardly-facing surface of the panel. The opposed ends of the polyethylene sheet are covered by a cover member.

[0049] The polyethylene sheet has in the region of each side edge fold a plurality of spaced apart recesses (slots or apertures), consecutive ones of which define U-shaped hinge knuckles for hinged engagement with corresponding recesses in an adjacent panel.

[0050] In the assembled condition the knuckles of leafs (121.1 and 121.2) and the knuckles of support

member (123.1) are so aligned that they can slidably receive hinge pins (127). In that assembled condition hinge pin (127.1) connects together panels (121.1) and (121.2) and support member (123.1) thereby permitting the relative angular disposition of the two panels and the support member to be adjusted as required. In the assembled position the lower end of hinge pin (127.1) rests on the ground.

[0051] With reference to FIGS. 18 to 21, the connected panels, hinge assembly and support member are as described above with reference to FIGS. 15, 16 and 17 but in FIGS. 18 to 21 the panels are disposed substantially at a right angle to each other.

[0052] FIGS. 22 to 24 show, by way of example, the means of attachment of a support member (123.7) to an edge of an end panel of the portable wall of FIG. 1. The support member (123.7) and the hinge pin (127.7) are as described above with reference to FIGS 15 to 17.

[0053] The portable wall illustrated in FIGS. 26A to 26B corresponds to the portable wall of FIG. 1, the principal difference being that instead of the panels being disposed as a single tier (as in FIG. 1) the panels are arranged in a double tier. Owing to its increased height compared with the wall of FIG. 1, the double tier embodiment is preferred for use in practising games in which the ball is required to be returned to the player from at least a minimum height, for example, tennis and squash. In the embodiment shown in FIGS. 26A and 26B the impact-resistant panels and the hinge leafs can be identical with those described above with reference to FIG. 1. However, the hinge pins and support members are of an effective increased length compared with those of FIG. 1 and correspond to the increased height provided by the double tier structure. Use of the longer hinge pins provides a simple yet most effective means of holding in upright alignment corresponding panels of the upper and lower tiers.

[0054] The "longer hinge pins" can be integral, single piece pins or they can comprise two shorter pins, for example, two like pins of the sort used in the panel of FIG. 1, connected by a connector. Such a connector, in the form of a tube (128) is shown in FIG. 27, the connector having a circumferential O-ring to prevent the connector, in use, from accidentally sliding down the lower of the two connected hinge pins beyond its intended position.

[0055] In the embodiment shown in FIGS. 26A and 26B the support member is of a height corresponding to the height of the double tier of panels. The hinge pins do not require special means for their vertical support but can simply rest on the ground.

EXAMPLE I

[0056] Reference is now made to FIGS. 28, 28A, and 28B which relate to a preferred embodiment of the method of the invention for producing a panel suitable for use in the portable wall shown in FIG. 14.

[0057] The sequence of steps of that embodiment is

as follows:

[0058] A blank (130) is severed from a sheet of high density polyethylene (referred to below as "Hdpe"), the blank including along its respective longitudinal side edges, securement strips (C,D,E,F) and (K,L,M,N).

[0059] Simultaneously with the severing of the blank from the sheet of Hdpe: a separate strip (131) for subsequent use as cover strip (121.10, Fig. 14), is severed from the Hdpe; and incisions and fold lines are formed in the blank in six spaced-apart, aligned incised areas, three of which lie between (B,C) and (N,O) and a second, like, set extends between (F,G) and (J,K). By way of example reference is made to the middle one of the three areas lying between (F,G) and (J,K). In that area incisions are made along the lines (Q,R), (R,S) and (T,Q) and fold lines are formed along the lines (S,T) and (U,V). Fold lines are also formed at the securement strips along (C,F) and (K,N) and along parallel, outwardly disposed lines as shown in Fig. 28.

[0060] Adhesive is then applied to the area (C,F,K,N) and a sheet of polyethylene foam (not shown), to form the core of the intended panel, is firmly secured to that area. Adhesive is also applied to the areas (A,B,O,P) and (G,H,I,J).

[0061] The blank is then folded along two parallel lines extending between the two longitudinal edges of the blank. One of the lines is coincident with the fold line (S,T); the other line is coincident with the corresponding fold line in the left hand group of incised areas. That folding brings the adhesive-coated areas (A,B,O,P) and (G,H,I,J) of the Hdpe into overlapping, adhered contact with the exposed surface of polyurethane foam secured to the Hdpe area (C,F,K,N). At the same time incised area (Q,R,S,T) is converted into a flap by folding along fold lines (S,T) and (U,V). The folded flap (Fig. 28A) after adhesive has been applied thereto, is then brought into contact with the reverse face of Hdpe area (G,H,I,J) and adhered thereto, thereby covering the previously exposed edge of the polyurethane foam. The folded flaps, thus adhered, are shown (128) on Fig. 14.

[0062] Corresponding folding, adhesive application and adhesion is applied to the two incised areas aligned with (Q,R,S,T)

[0063] The folding and securement of the three adhesive-coated flaps results in the two zones extending, respectively, between (Q,R,S,T) and the adjacent flaps upper and lower incised areas being bent (Fig. 28B) into a feature of U-shape cross section thereby forming the desired hinge knuckles (121.15) of the resulting panel shown in Figure 17.

[0064] The adhesive coated securement strips (C,D,E,F) and (K,L,M,N) are brought into embracing contact with the longitudinal edges of the laminate of (Hdpe) and polyurethane foam.

[0065] Corresponding folding, adhesive application and adhesion is applied to all three of the other set of aligned incised areas of the blank.

[0066] The separate strip (131) is coated with adhe-

sive and applied to the abutted zones of the edges of the Hdpe, that is, along the contiguous lines (A,P) and (H,I), thereby providing the cover strip (121.10, Fig. 14).

[0067] A portion of the panel resulting from the method of this Example is shown in Figure 17 of the drawings. In that drawing an end portion of panel (121.1) has the two hinge knuckles (121.15 and 121.16) that had been formed by said bending of the blank of Hdpe, and the end portion has hinge knuckle-receiving recesses (121.17, 121.18 and 121.19) that had been formed by said folding and securement of flap (Q,R,S,T). Recess (121.17) is to receive the upper of two hinge knuckles of the associated support member (123.1), and recesses (121.18 and 121.19) are to receive respectively, hinge knuckles of panel (121.2).

EXAMPLE II

[0068] Reference is now made to FIG. 29 which relates to a preferred embodiment of the method of the invention for producing a support member suitable for use in the portable wall shown in FIG. 14.

[0069] The sequence of steps of that embodiment is as follows:

[0070] A blank (140) is severed from a sheet of high density polyethylene (referred to below as "Hdpe"), the blank including along its respective longitudinal side edges, securement strips (C,D,E,F) and (K,L,M,N).

[0071] Simultaneously with the severing of the blank from the sheet of Hdpe: a separate strip (141) for subsequent use as cover strip (123.8, Fig. 21), is severed from the Hdpe; and incisions and fold lines are formed in the blank at the incised elongate area Q,R,S,T. In that area, incisions are made along the lines (Q,R), (R,S) and (T,Q) and fold lines are formed along the lines (S,T) and (U,V). Fold lines are also formed at the securement strips along (C,F) and (K,N) and along parallel, outwardly disposed lines as shown in Fig. 29.

[0072] Optionally, for the purpose mentioned below, incisions and full lines are formed in two spaced-apart, aligned, incised areas (referred to below as "optional incised areas") lying between (B,C) and (N,O). By way of example reference is made to the area designated (W,X,Y,Z) in Fig. 29. In that area incisions are made along the lines (WX, WY and XZ) and fold lines are formed along lines (YZ and Y'Z').

[0073] The following description refers to the method where said optional incised areas are utilised.

[0074] Adhesive is applied to the area (C,F,K,N) and a sheet of polyethylene foam (not shown) to form the core of the intended support member, is firmly secured to that area. Adhesive is also applied to the areas (A,B,O,P) and (G,H,I,J). The blank is then folded along two parallel lines extending between the two longitudinal edges of the blank. One of the lines is coincident with, or adjacently parallel to, the fold line (S,T); the other line is coincident with, or adjacently parallel to, the fold line (Y,Z). That folding brings the adhesive-coated areas (A,

B,O,P) and (G,H,I,J) of the Hdpe into overlapping, adhered contact with the exposed surface of polyurethane foam secured to the Hdpe area (C,F,K,N). At the same time incised area (Q,R,S,T) and the optional incised areas are converted into flaps by folding along their fold lines. The folded flaps after adhesive has been applied thereto, are brought into contact with the reverse face of Hdpe areas (G,H,I,J) and (A,B,O,P) and adhered thereto, thereby embracingly covering exposed edges of the polyurethane foam and Hdpe sheet. The folded flaps, thus adhered, are shown (128) on Fig. 14.

[0075] The folding and securement of the adhesive-coated flap (Q,R,S,T) results in the two zones extending, respectively, between (Q,R,S,T) and the longitudinal side edges of the blank being bent into features of U-shape cross section thereby forming the desired upper and lower hinge knuckles shown (123.9, 123.10) in Figure 21.

[0076] The adhesive-coated securement strips (C,D,E,F) and (K,L,M,N) are brought into embracing contact with the longitudinal edges of the laminate of Hdpe and polyurethane foam.

[0077] The separate strip (141) is coated with adhesive and applied to the abutted zones of the edges of the Hdpe, that is, along the contiguous lines (A,P) and (H,I).

[0078] With reference to Figure 21 of the drawings, the support member (123.4) is the product of the method of this Example where the optional incised areas have been utilised. Hinge knuckles (123.9 and 123.10), the means by which support member (123.4) is secured to hinge pin (127.4), are hingedly received, respectively, in panels (121.5 and 121.4).

[0079] The hinge knuckles (123.11, 123.12 and 123.13) are optional, auxiliary hinge knuckles for use in securing to support member (123.4) a further panel (not shown) as an extension of the portable wall. As indicated above, those three hinge knuckles are formed by utilisation of the optional incised areas shown in Figure 29.

[0080] In Figure 21 the adhesively-secured elongate flap and the adhesively-secured auxiliary flaps are shown respectively at (123.14) and at (123.15, 123.16).

[0081] Where the support member is to be used as the support at an end of the portable wall, for example support member (123.6), Figure 14, the use of said optional incised areas is effected so that the auxiliary hinge knuckles are used for hinged connection with the end panel of the wall. Use of a support member in that way is illustrated in Figs. 22, 23 and 24 of the drawings.

[0082] From the foregoing description it will be seen that, in preferred embodiments of the invention, described with reference to Figs. 14 to 29 of the accompanying drawings, the facing sheets of the panels and of the support members can all be produced by the cutting and shaping of planar sheets of high density polyethylene or other suitable plastics or other material. The

hinge pins can readily be formed by cutting lengths of tubular high density polyethylene or other suitable plastics or other material.

[0083] Although the portable walls of the invention have been described with particular reference to their use in the playing or practising of ball games they are, in general, suitable for other purposes, for example horse jumping fences, screens (for use, for instance, in gardens or on the beach) and for constructional use in general.

Claims

1. A portable wall suitable for use in playing or practising ball games comprising:

a plurality of impact-resistant panels;
a plurality of hinges hingedly connecting together adjacent ones of said panels at adjacent edges thereof; and
one or more support members to support the wall in a substantially upright disposition, each support member being secured, respectively, to one of said hinges.

2. A portable wall according to Claim 1, wherein said adjacent panels and the respective support member are mounted on a single hinge pin.

3. A portable wall according to Claim 2, wherein said adjacent panels and respective support member are mounted for rotational movement on the hinge pin.

4. A portable wall according to Claim 1, which comprises:

a plurality of impact-resistant panels connectable one to another at adjacent edge portions by a hinge to form a substantially upright, lateral assembly, said hinge comprising:

first and second mateable hinge leafs secured respectively along said edge portions of first and second of said panels, and a hinge pin to interconnect said first and second hinge leafs; and
one or more support members to support the wall in a substantially upright disposition, the support member or support members being secured, respectively, to said hinge or hinges.

5. A portable wall according to Claim 4, having a plurality of said support members each secured, respectively to one of said hinges.

6. A portable wall according to Claim 4 or 5, wherein the support member (or each support member) comprises a ground-contacting leg and is secured to an engagement means to engage the hinge pin.

7. A portable wall according to Claim 1 wherein each hinge comprises a hinge pin in engagement with edge portions of said adjacent panels, said edge portions being of a shape such that they each provide a plurality of hinge knuckles, the hinge knuckles of one of said panels engaging with the hinge knuckles of the other of said panels.

8. A portable wall according to Claim 7, wherein the panels comprise a sheet of substantially rigid material, said edge portions being of a channel cross-section having formed longitudinally therein a plurality of slots defining the hinge knuckles.

9. A portable wall according to Claim 7, wherein said panels have been produced from a sheet of substantially rigid material by forming in said sheet a plurality of spaced apart apertures substantially parallel to a side edge of the panel and of pre-determined shape and size corresponding to the desired hinge knuckles, and folding the sheet along a zone which is substantially parallel to the side edge of the panel and which intersects said apertures thereby to define the desired hinge knuckles.

10. A portable wall according to any of the preceding claims, wherein the wall includes a plurality of auxiliary impact-resistant panels connected to one another at adjacent side edge portions to form a second tier of panels.

11. A method of producing a panel or a support member for the portable wall claimed in Claim 7, which comprises:

securing a layer of resilient foam material to a sheet of impact-resistant plastics material so as to cover a middle portion of said sheet but leaving uncovered one or more end portions of said sheet;

folding said one or more end portions of said sheet over said layer so as to form for each end portion a U-shaped channel in said sheet, said folding of each of said one or more end portions being along a respective fold line;

removing, concurrently with, before or after said folding, one or more portions of the U-shaped channel, thereby to define in the remaining length or lengths of the U-shaped channel one or more hinge pin-receiving knuckles; and

securing to said layer the folded end portion or portions of said sheet, either concurrently with, or after, said folding.

12. A method according to Claim 11, wherein said removing of one or more portions of the U-shaped channel results in the formation of one or more longitudinally-disposed recesses in the channel suitable for subsequently receiving one or more hinge knuckles of an adjacent panel or support member of the portable wall. 5 10
13. A method according to Claim 11 or 12, wherein said removing of one or more portions of the U-shaped channel is effected by said sheet having formed therein, prior to said folding, one or more apertures disposed adjacent said respective fold line. 15
14. A method according to Claim 13, wherein said one or more apertures are formed by pre-forming said sheet with incisions to define a displaceable incised area which, prior to or concurrently with said folding of said sheet, is displaced from the plane of said sheet to provide a flap, which is subsequently brought over and secured to the folded said one or more end portions of said sheet, thereby embracingly to cover edges of said sheet and said layer at an edge of the respective recess. 20 25
15. A method according to any of Claims 11 to 14, wherein said folded one or more end portions of said sheet are of a size and shape such that, when folded, their terminal edges substantially abut each other; and securing said terminal edges to the layer of resilient foam material. 30 35

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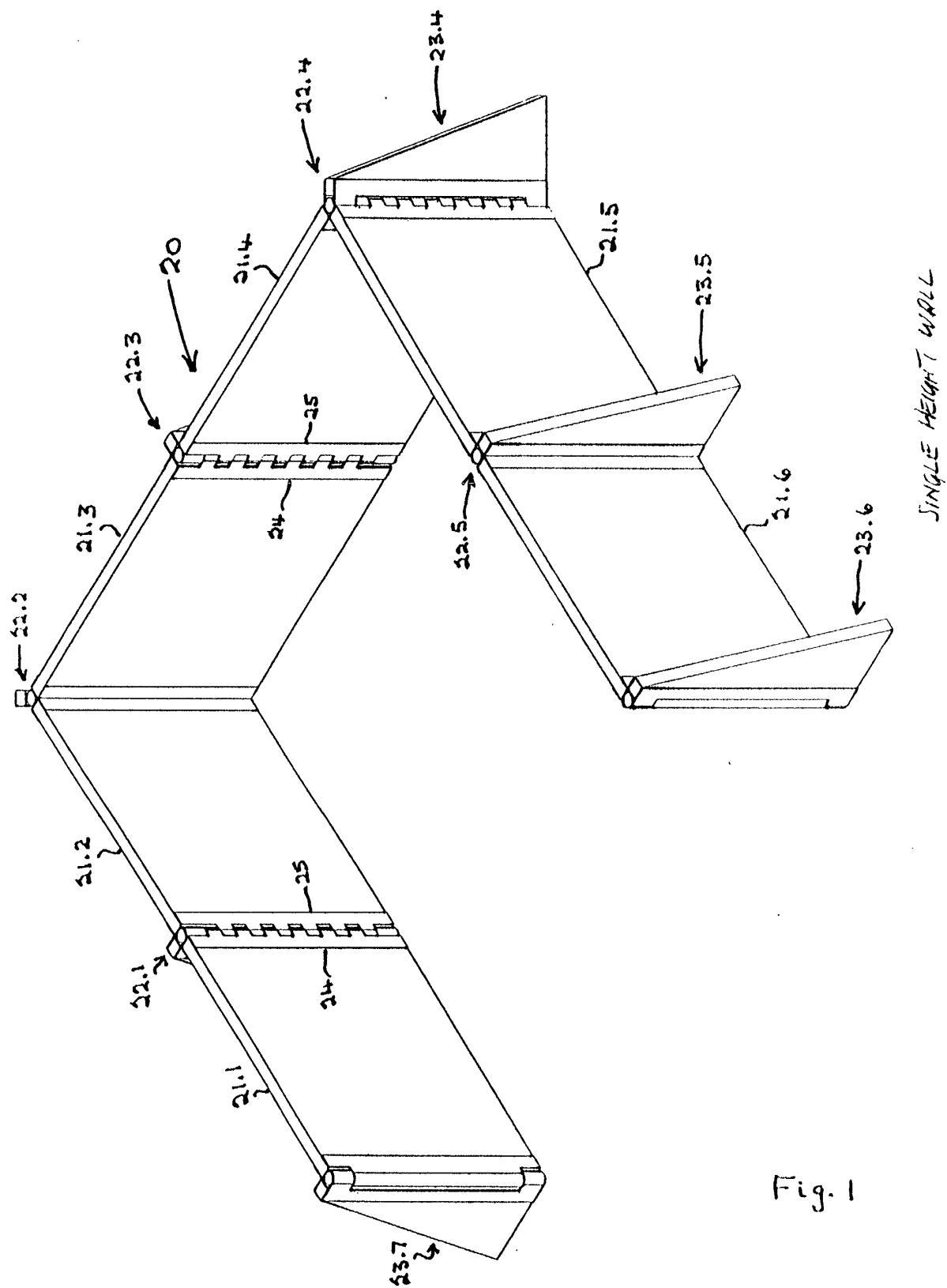


Fig. 1

HINGE SUPPORT & OFF
 MATL- HDPE 3mm thick Nominal

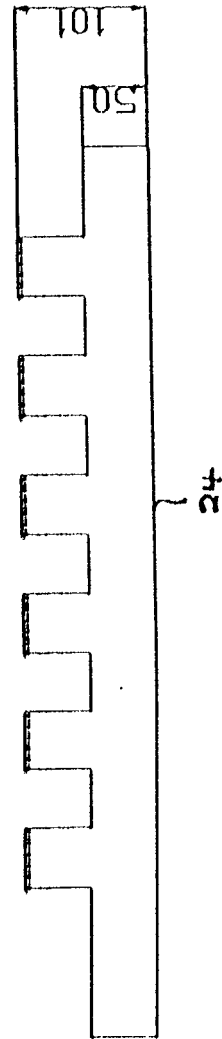
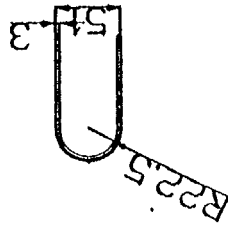
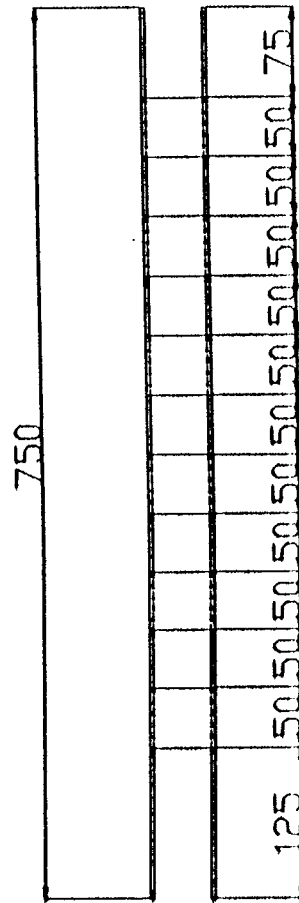


Fig. 2

HINGE PIN 7 OFF
SINGLE HEIGHT
MAT - UPVC

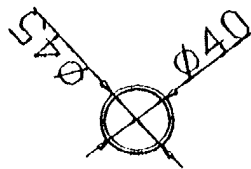
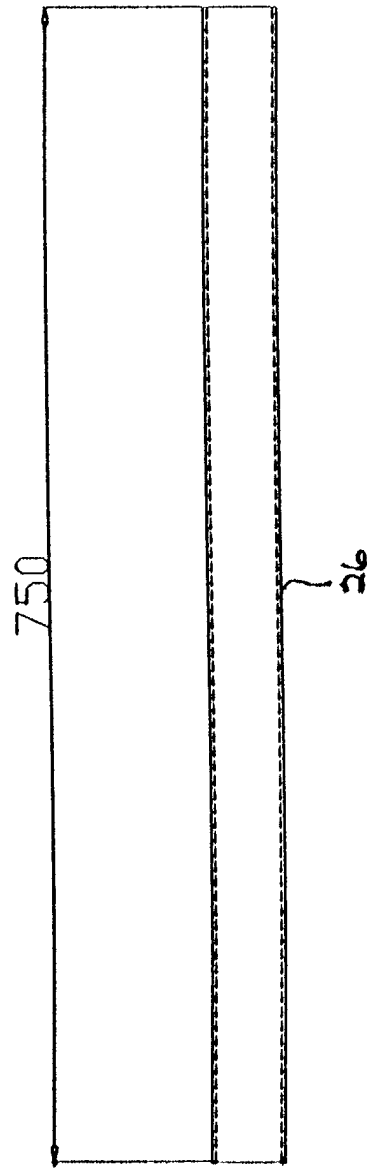


Fig. 3

LEG SUPPORT 4 OFF

May 1 - HDPE 3mm thick nominal

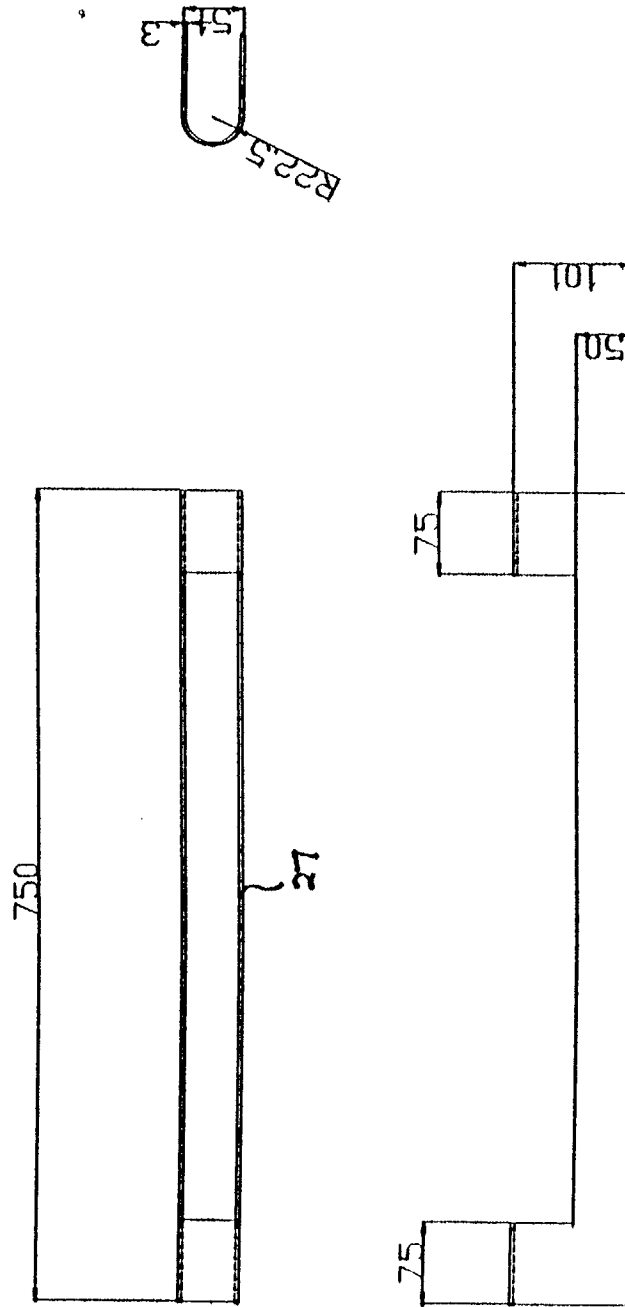


Fig. 4

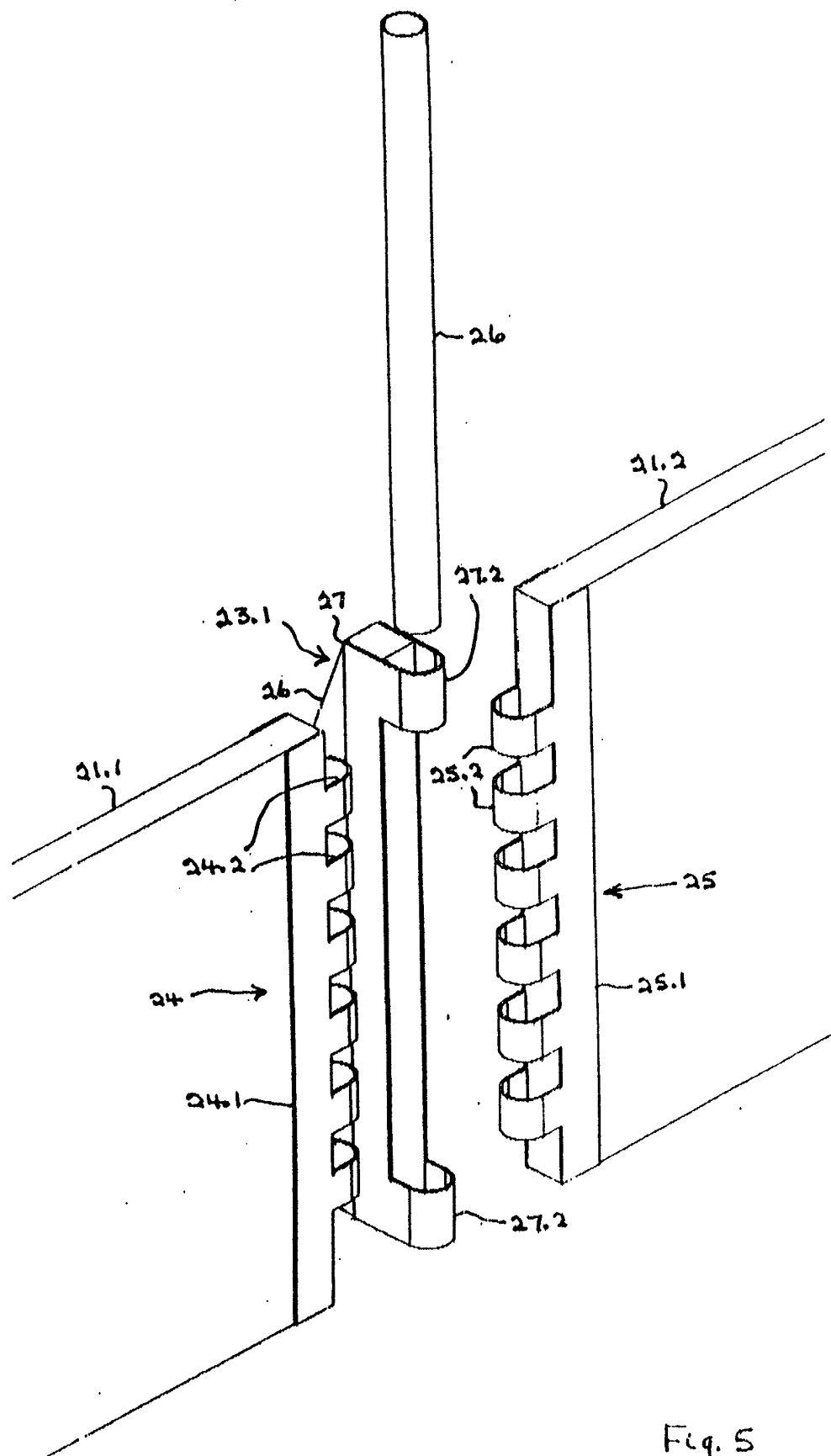
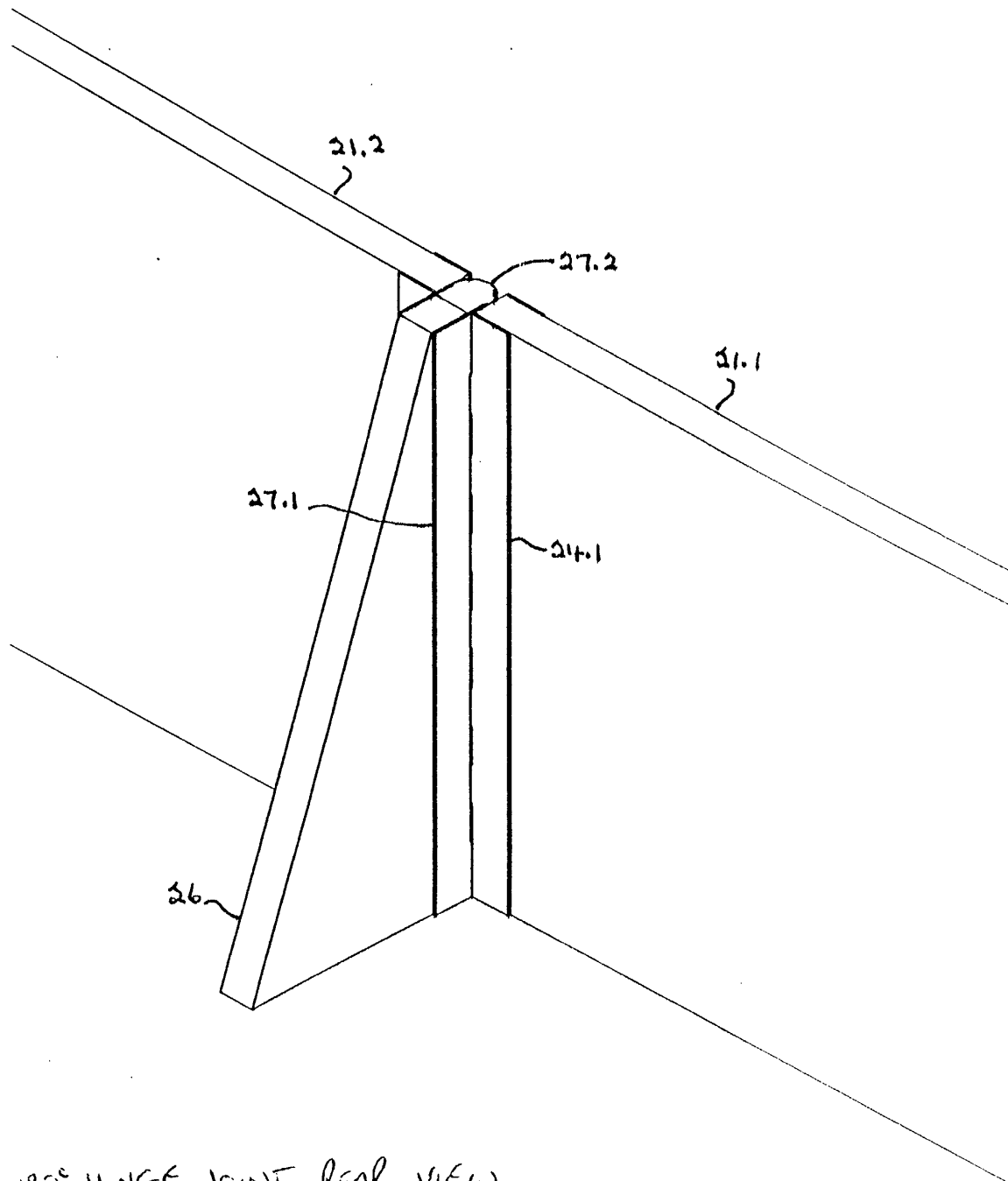


Fig. 5



180° HINGE JOINT REAR VIEW.

Fig. 6

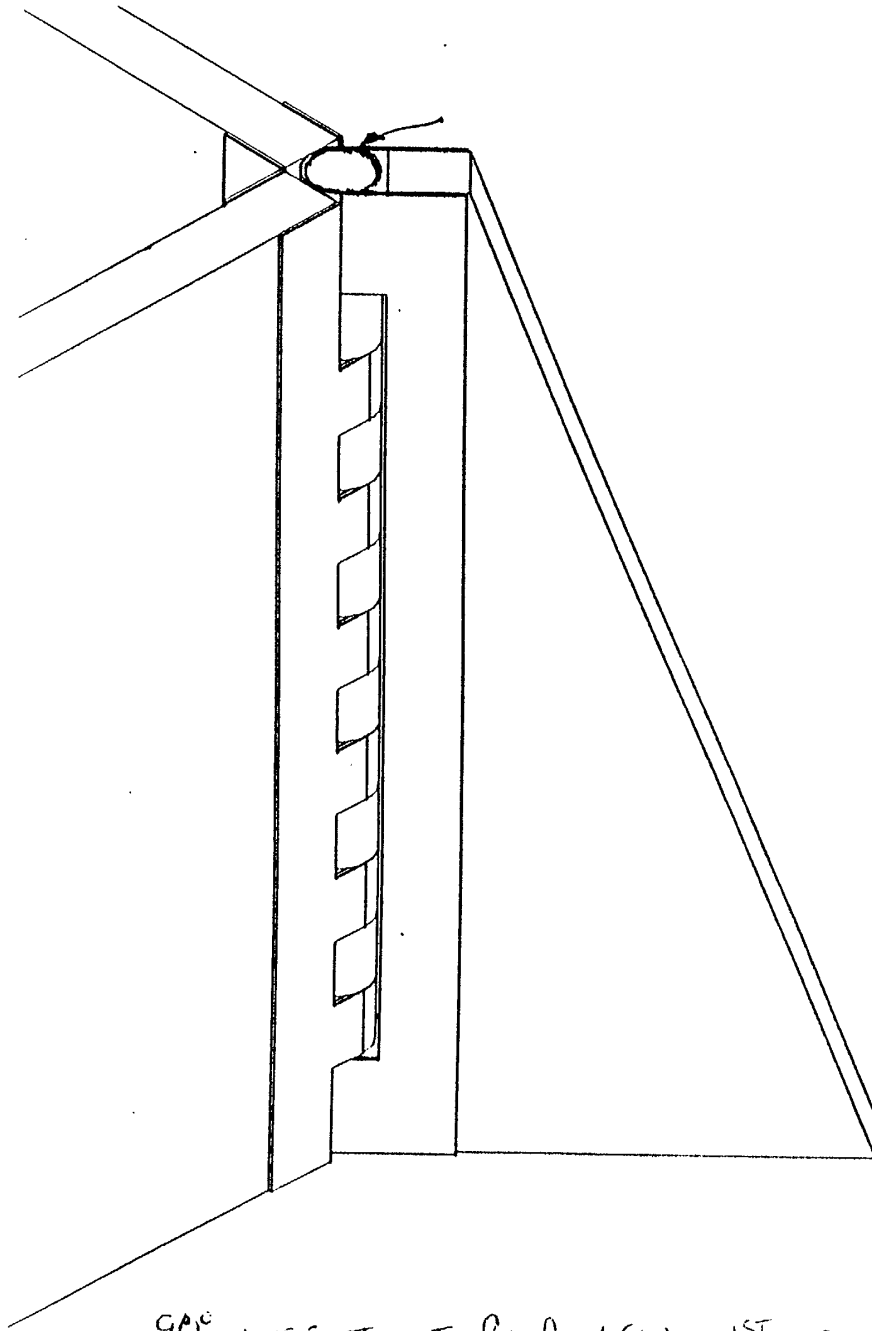
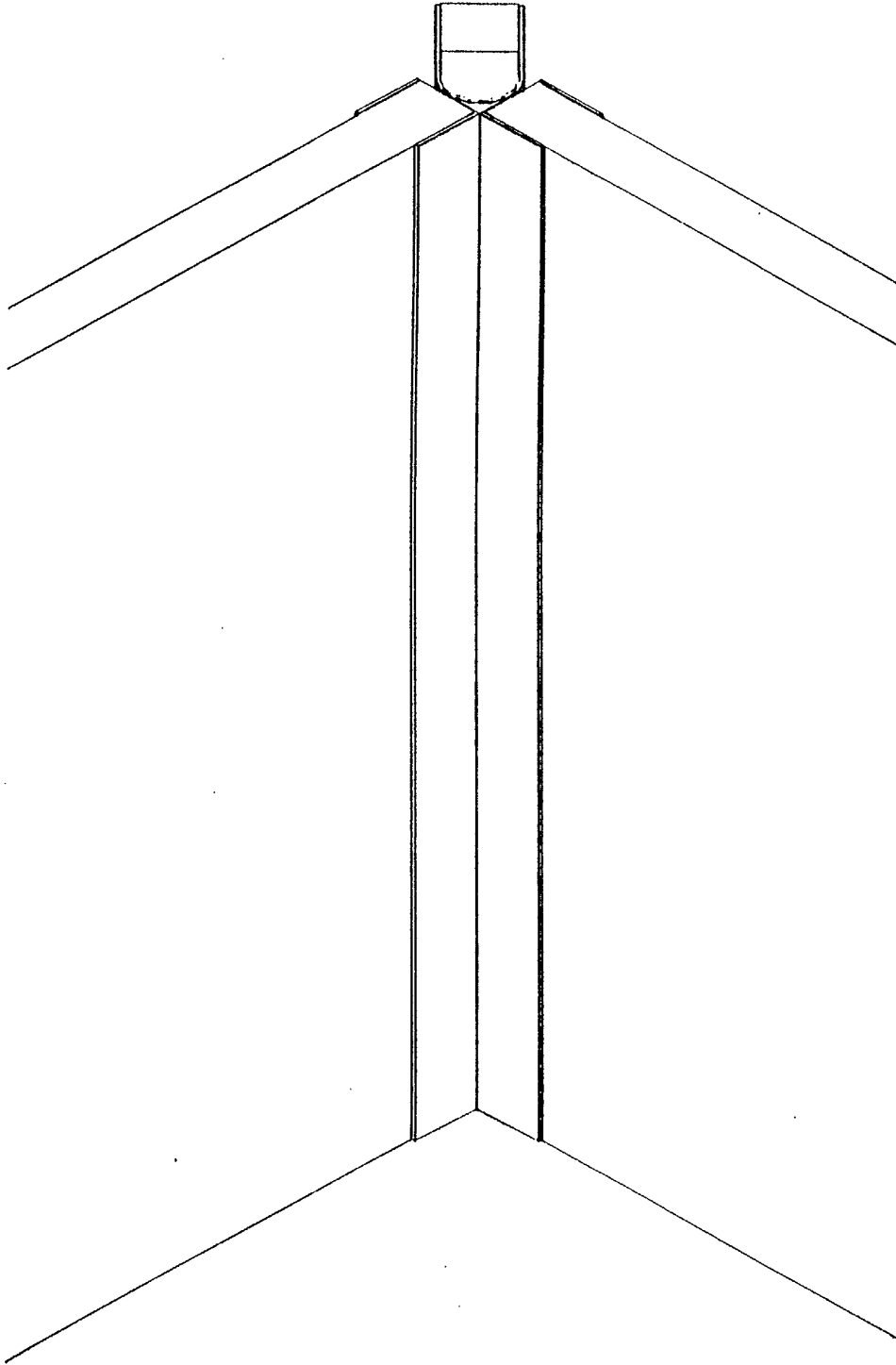


Fig. 7



90° HINGE JOINT, FRONT VIEW

Fig. 8

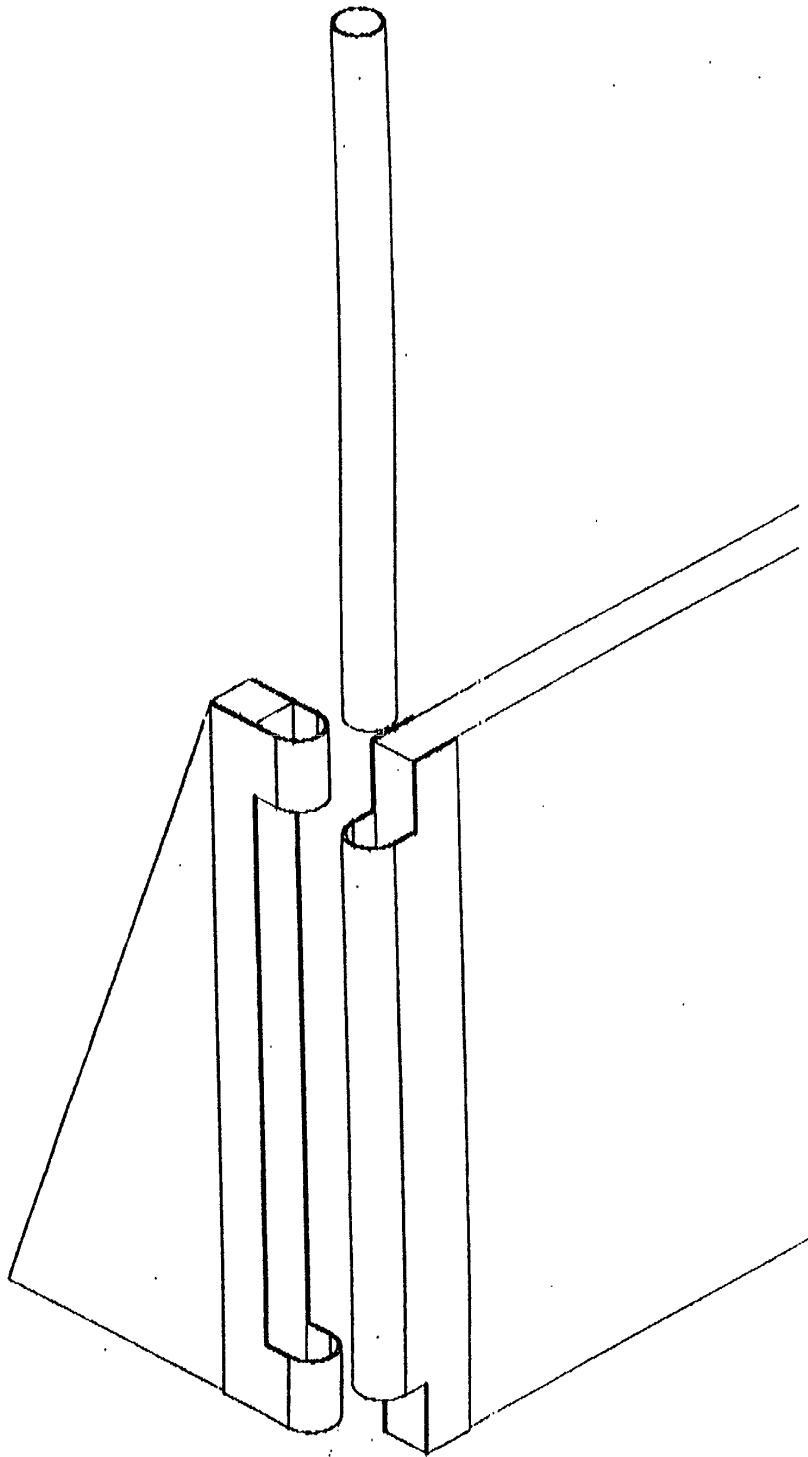


Fig. 9

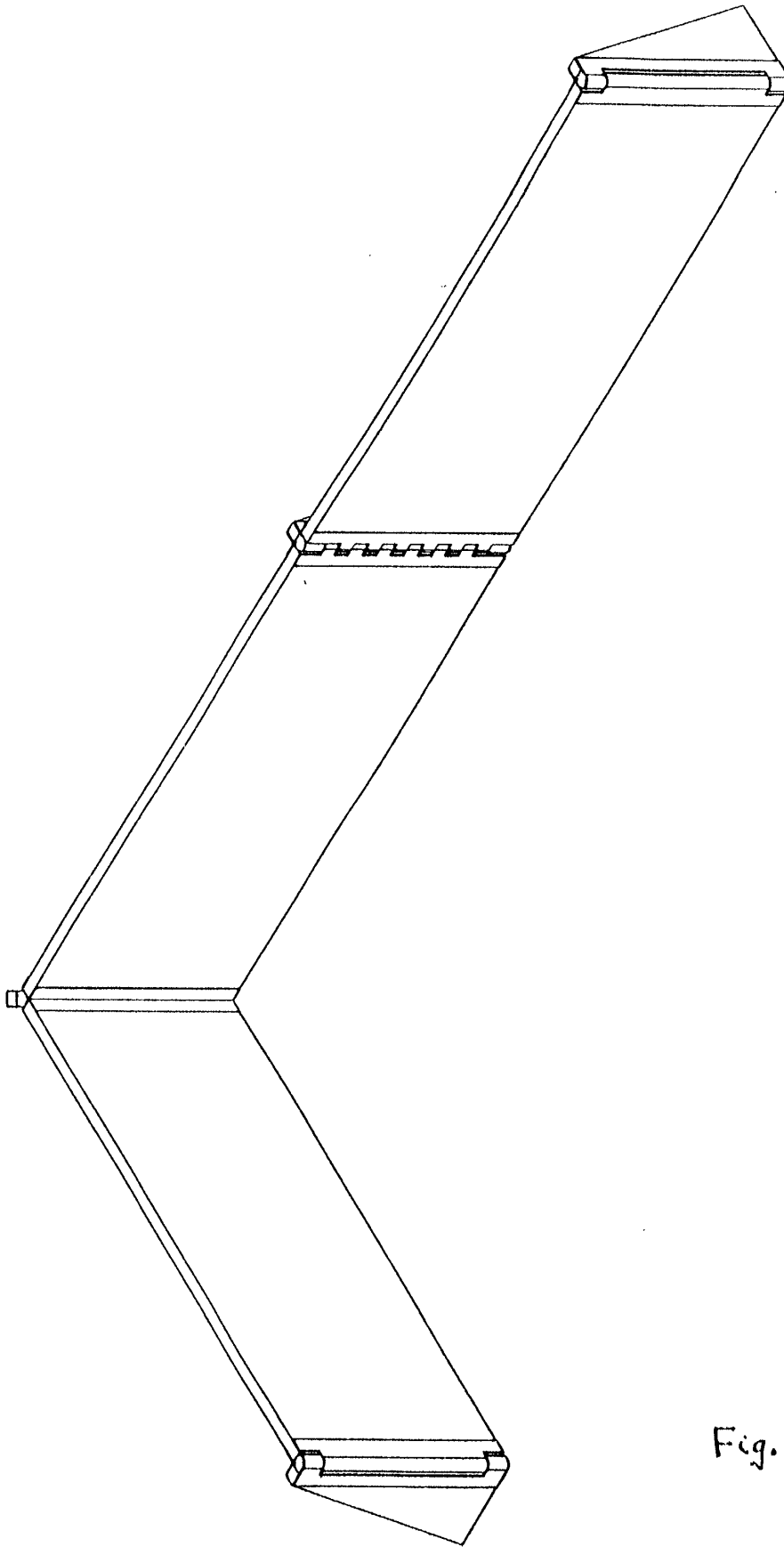
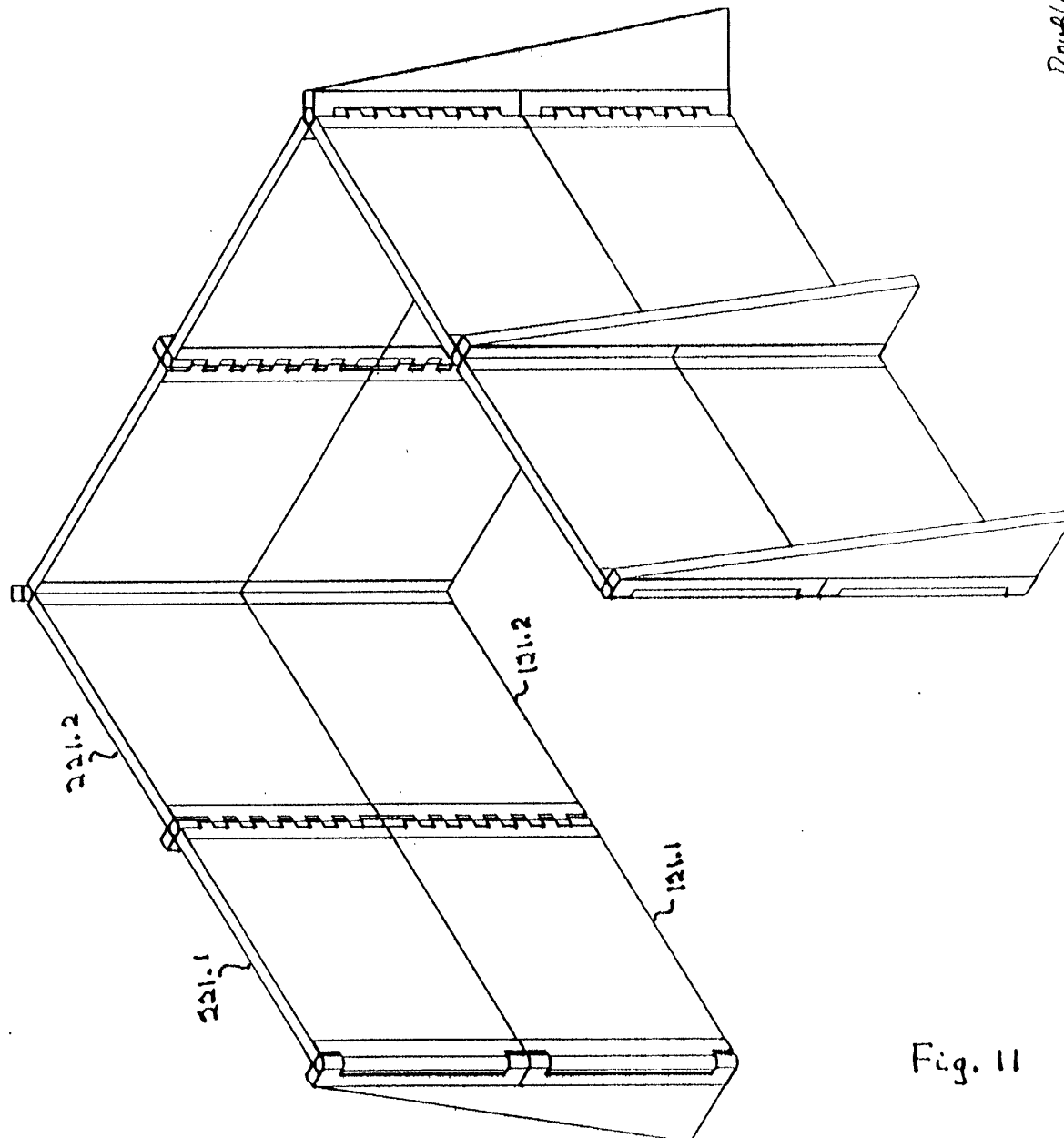


Fig. 10

WALL SET AT MAXIMUM ANGLE 180°



DOUBLE HEIGHT WALL

Fig. 11

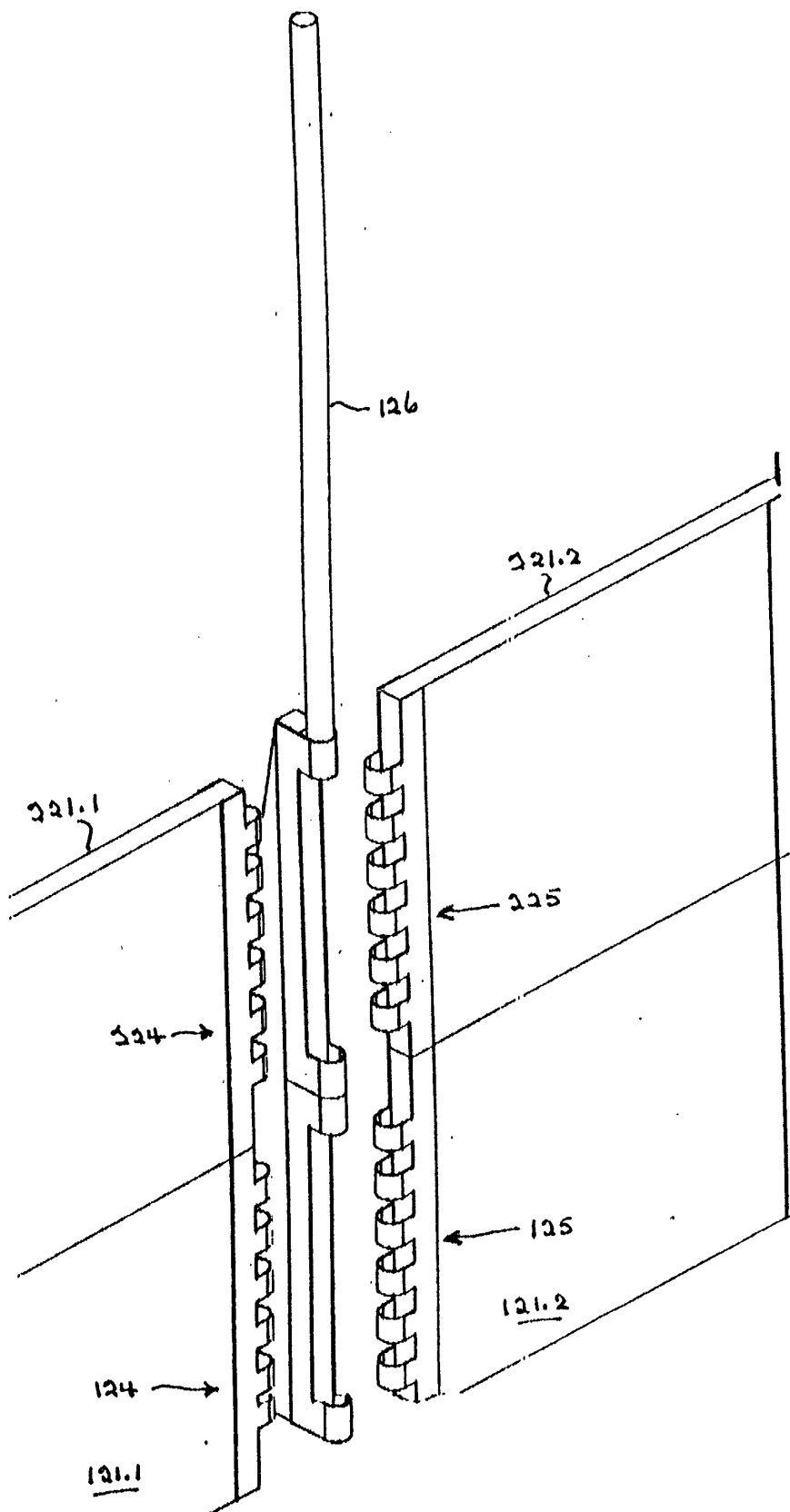


Fig. 12

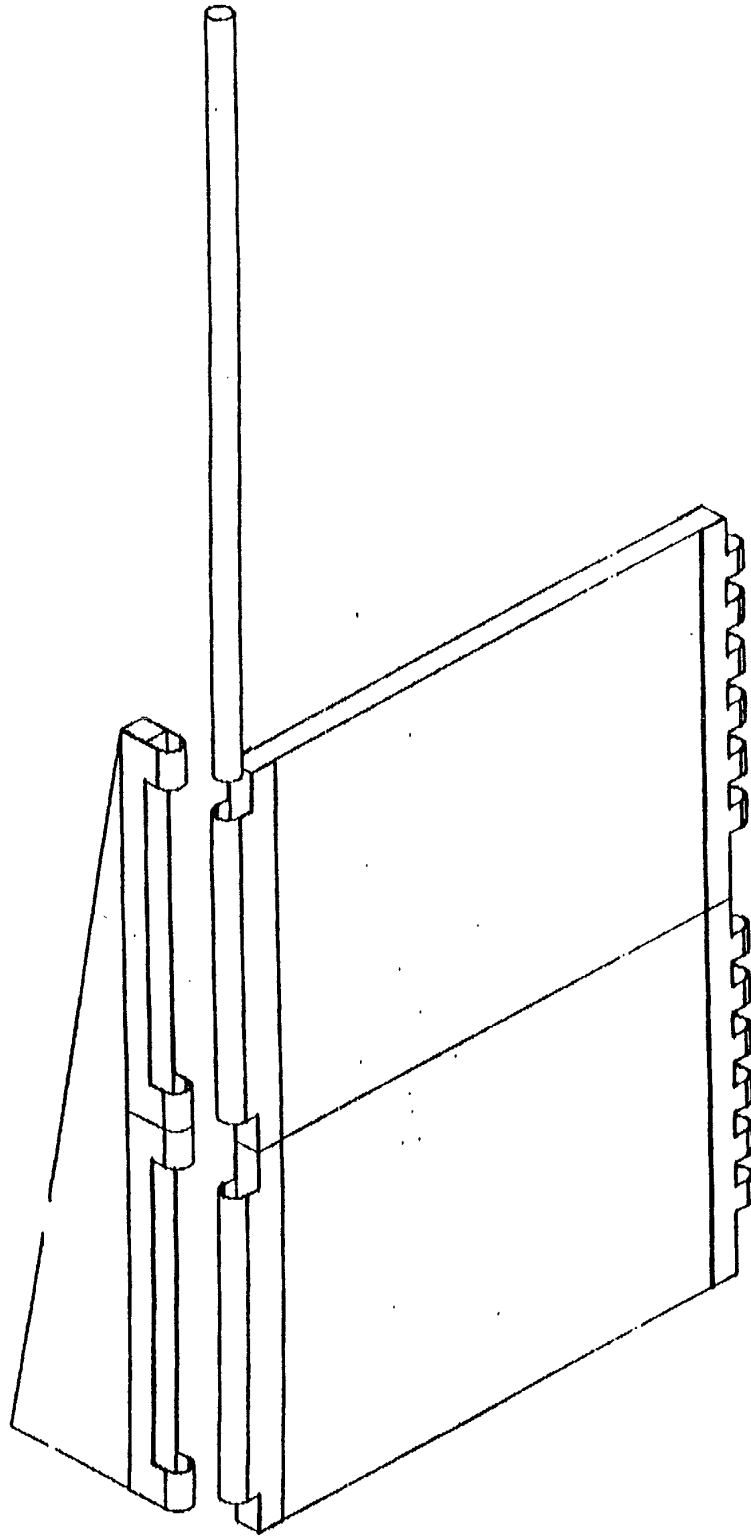
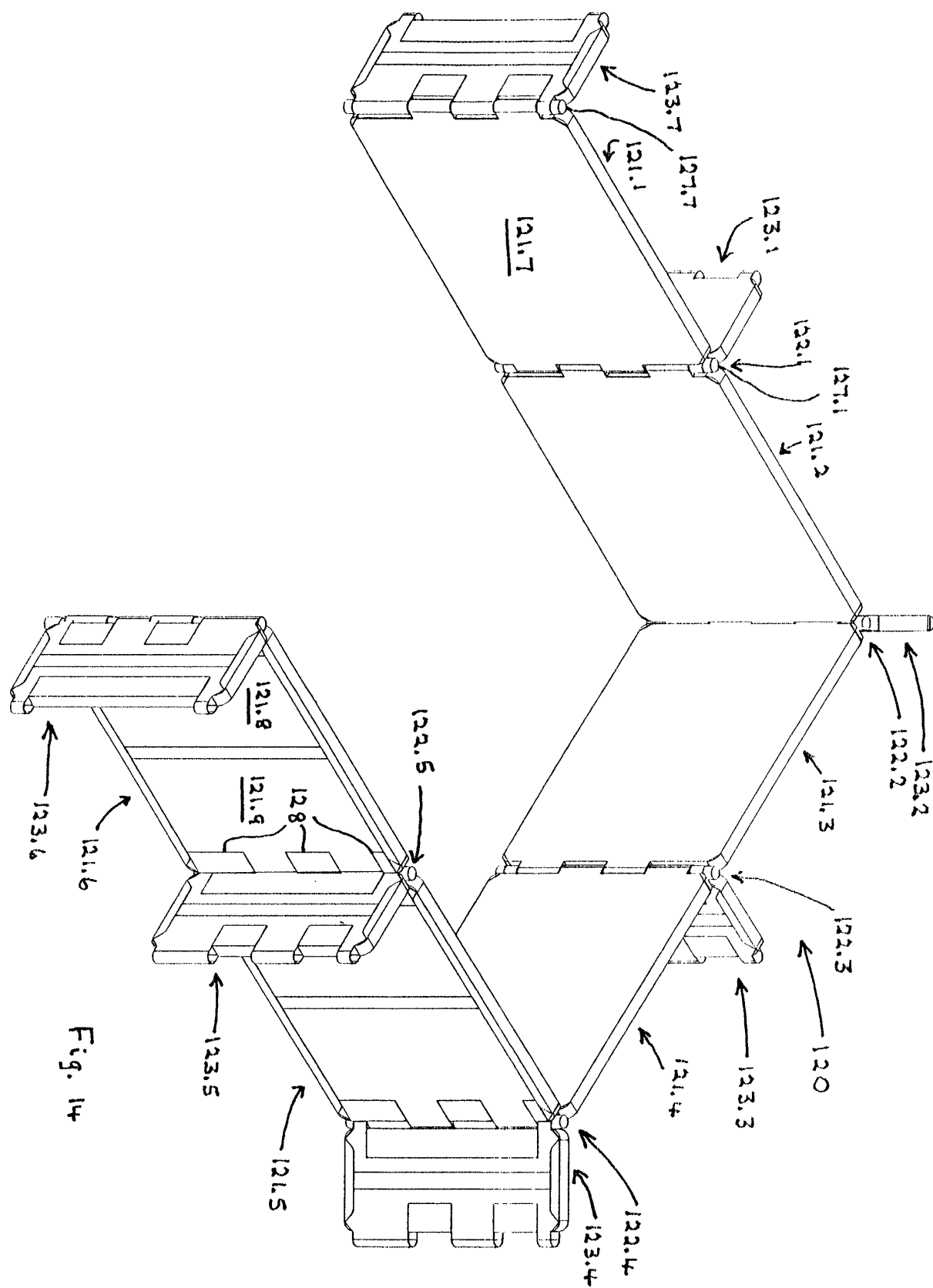
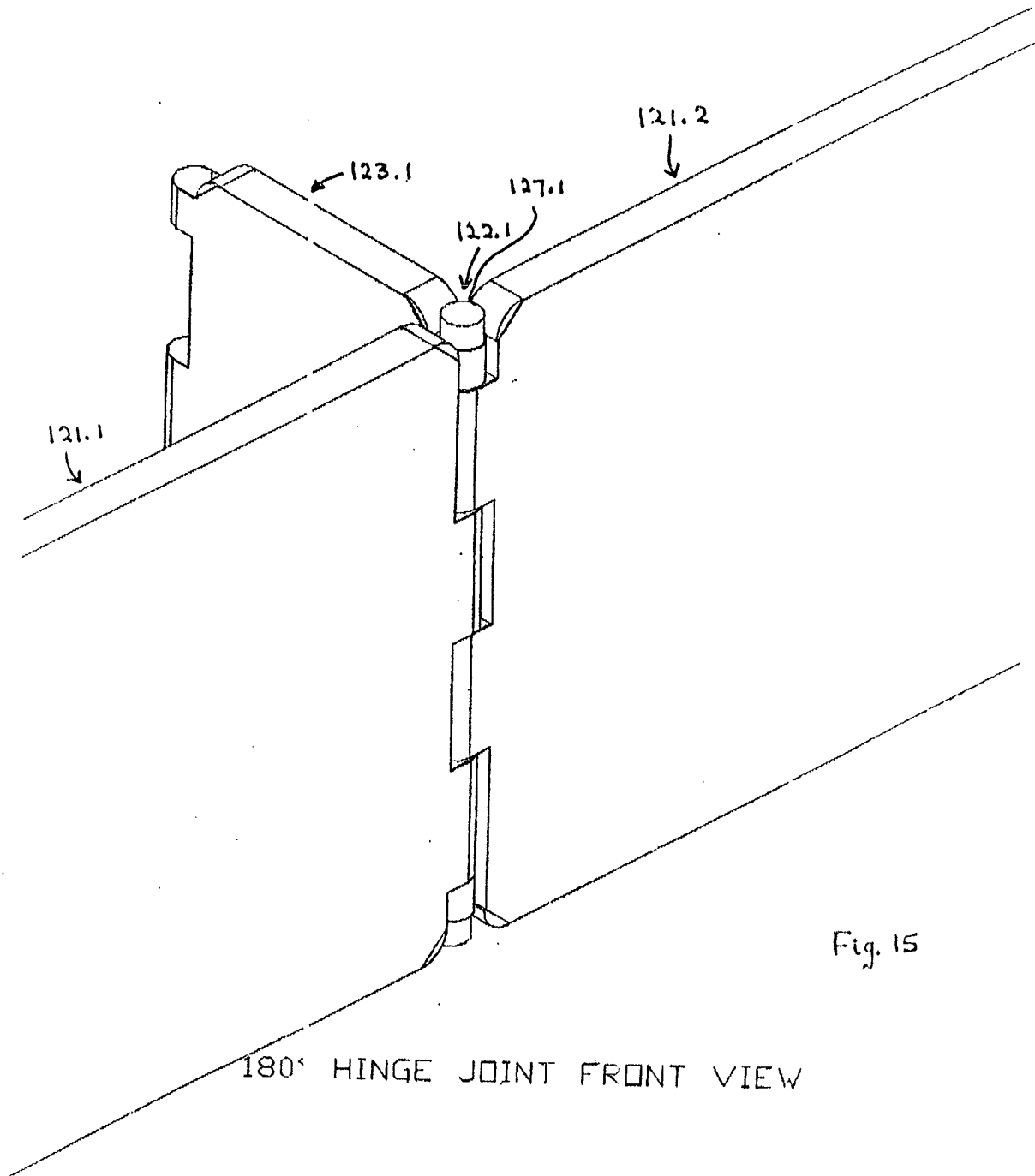


Fig. 13





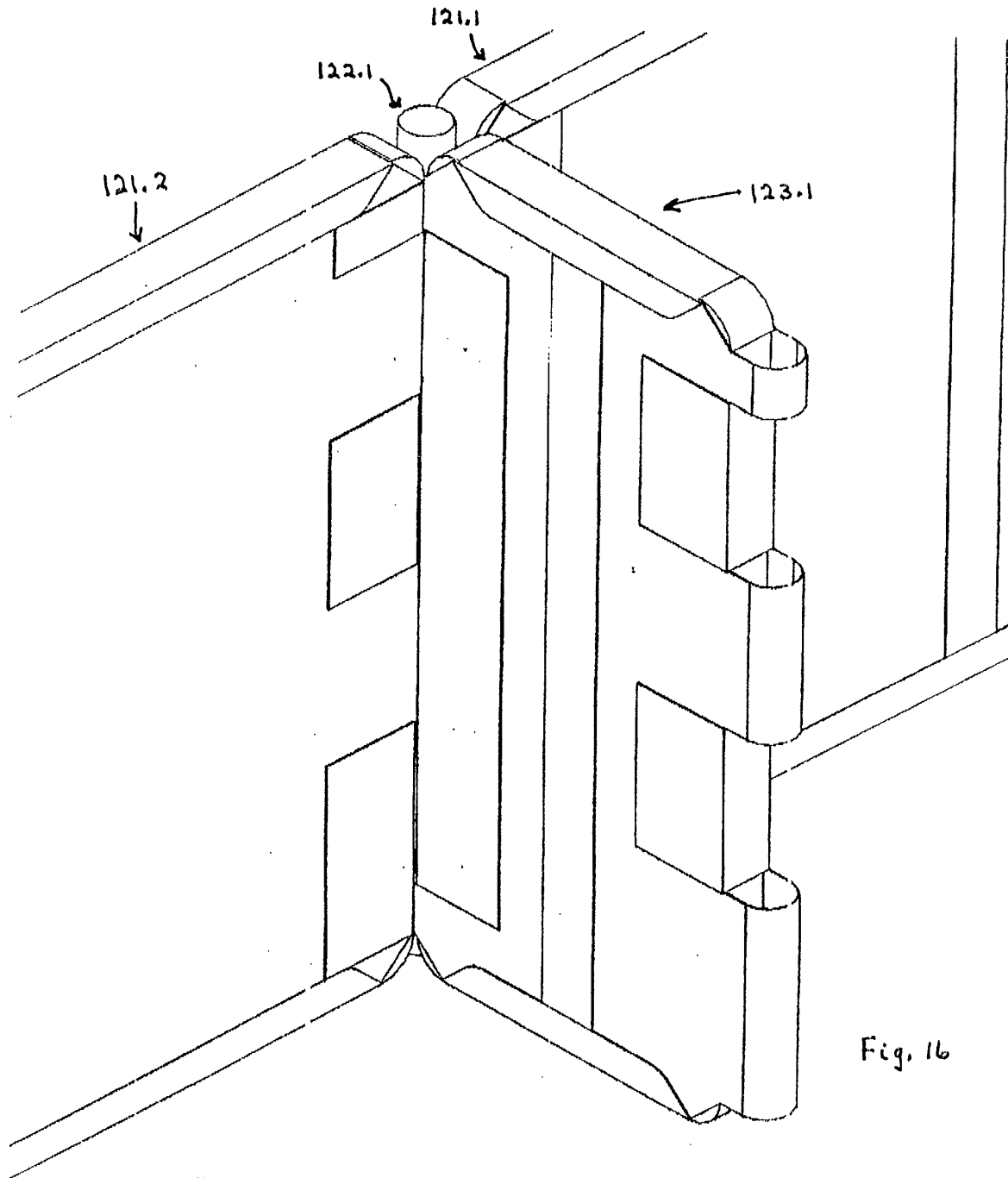
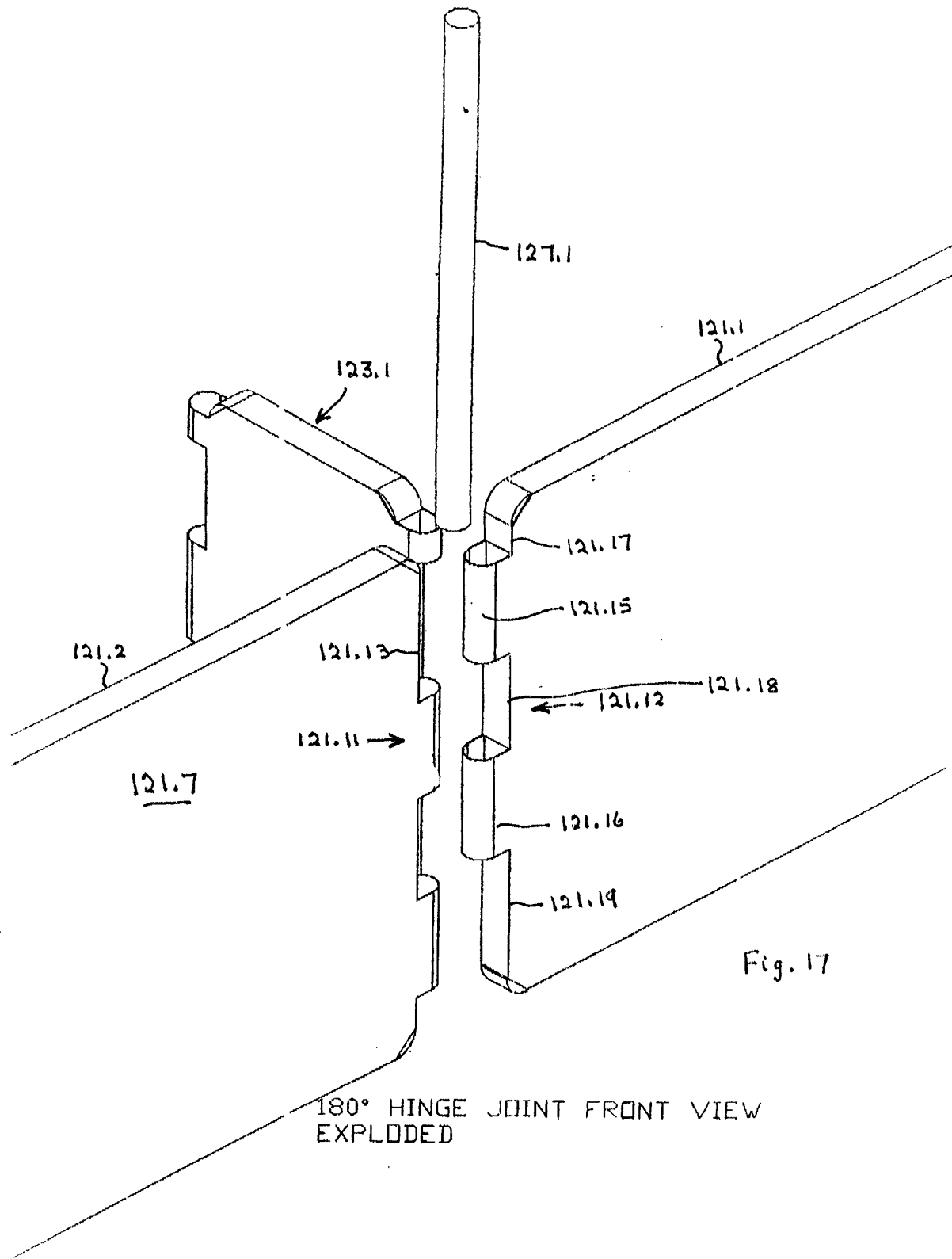


Fig. 16

180° HINGE JOINT REAR VIEW



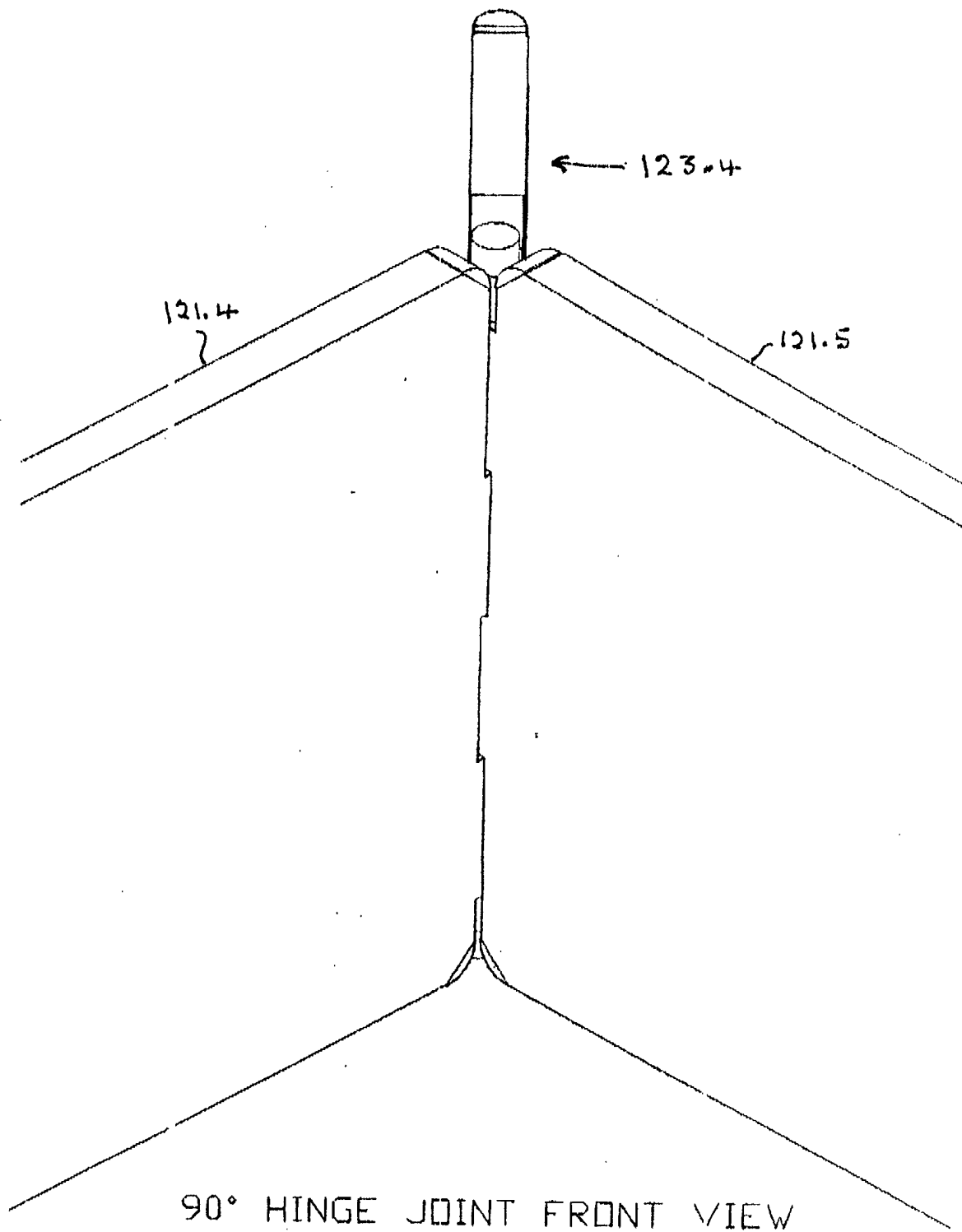
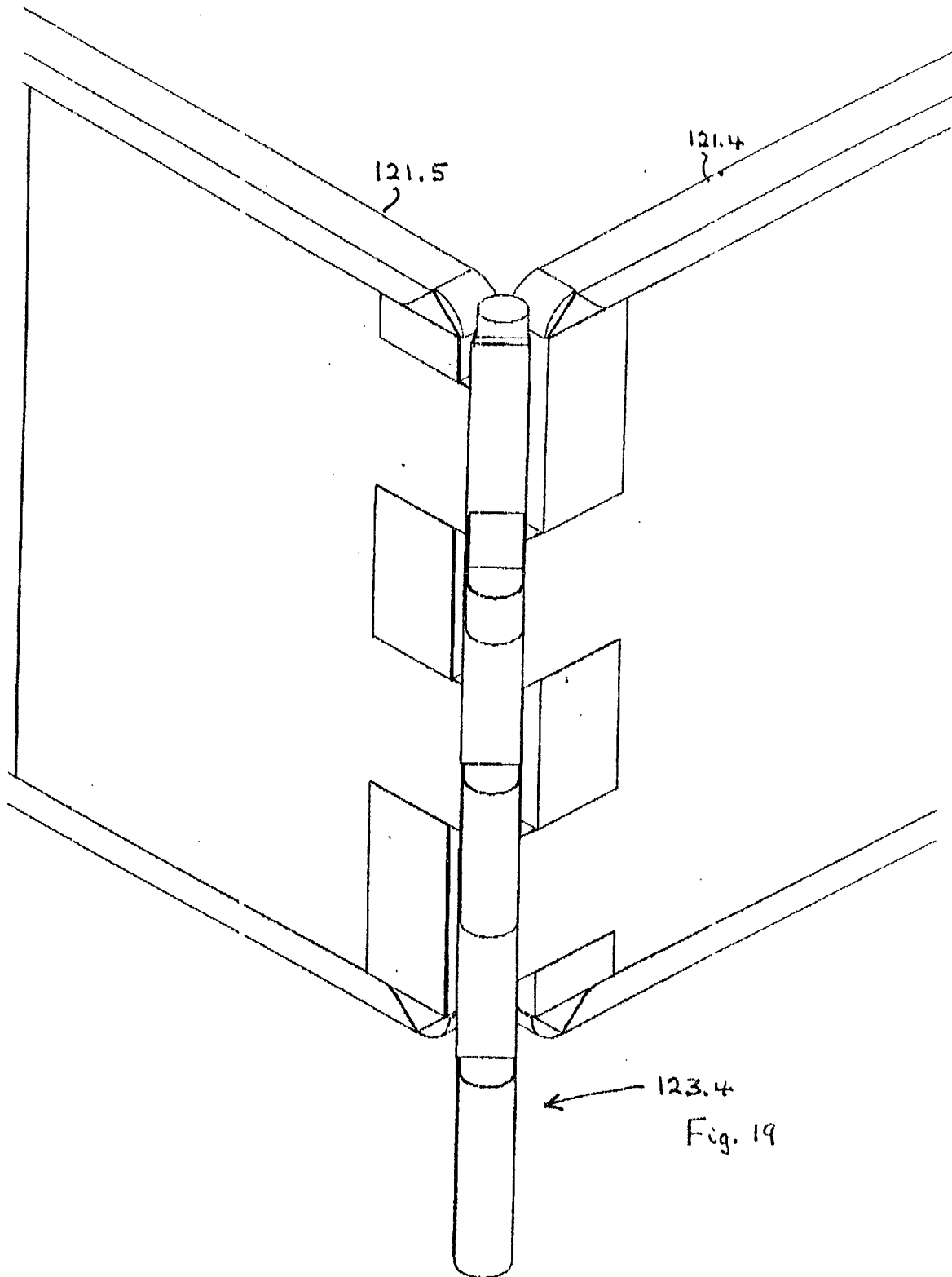


Fig. 18



90° HINGE JOINT REAR VIEW

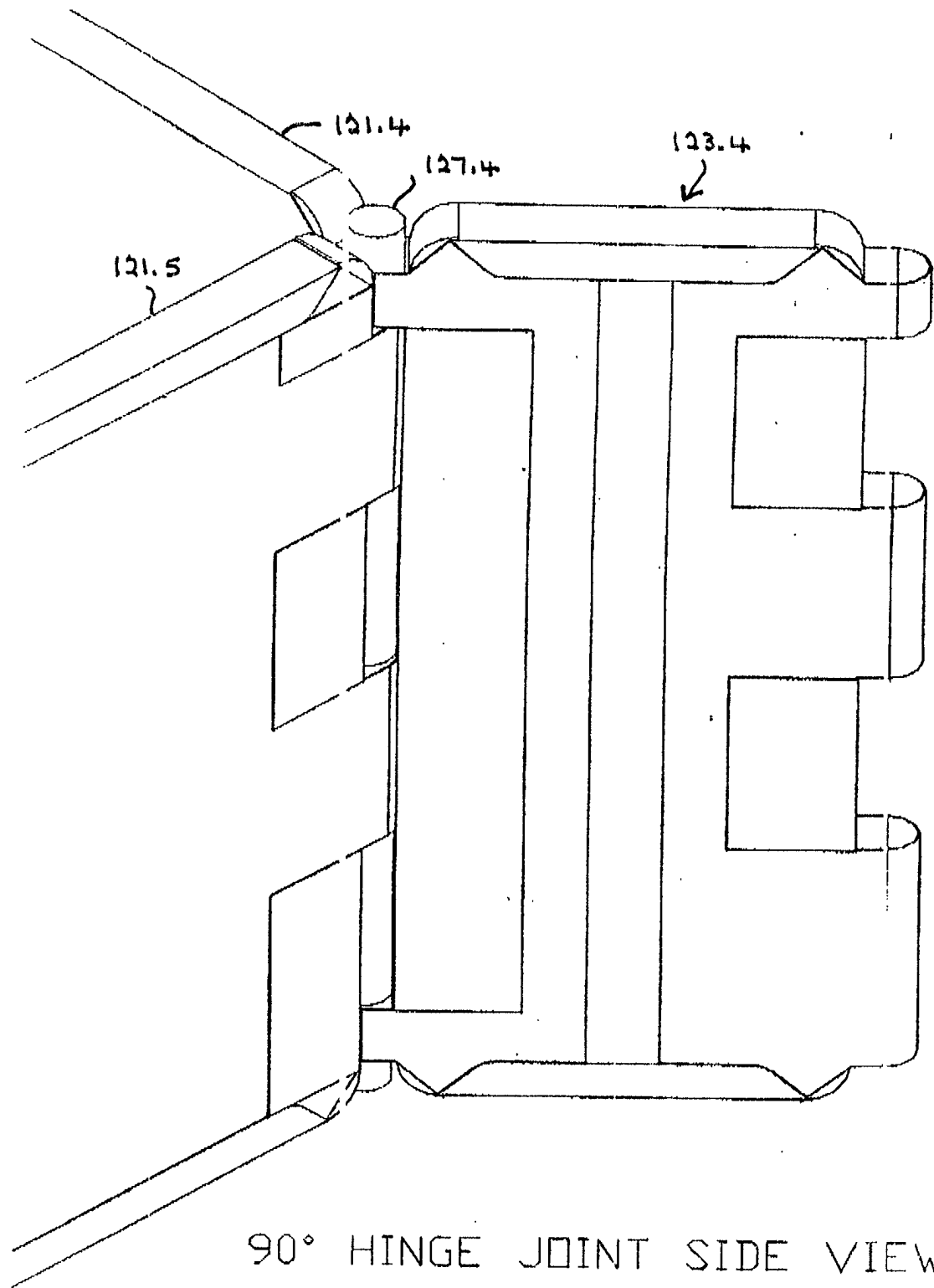


Fig. 10

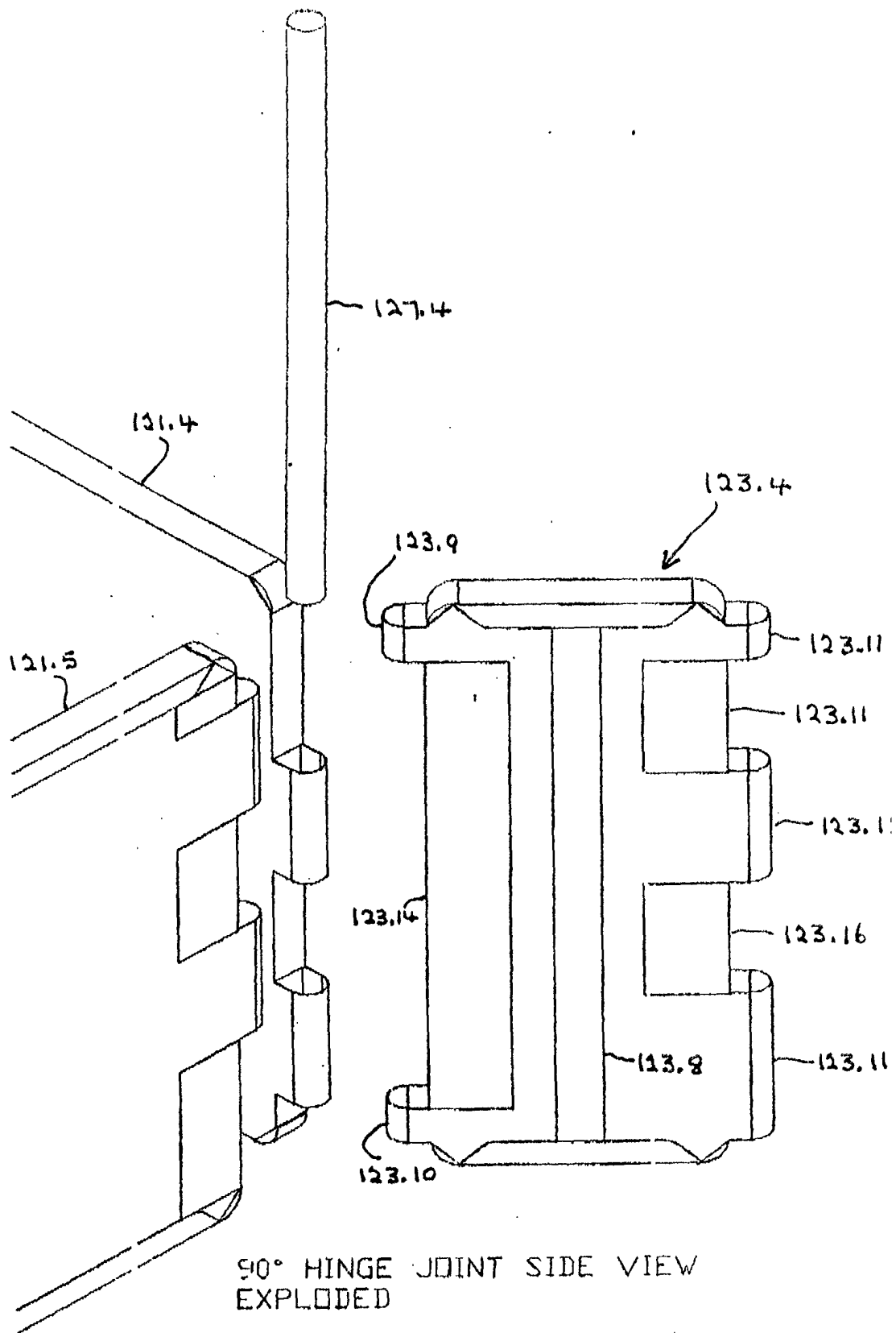
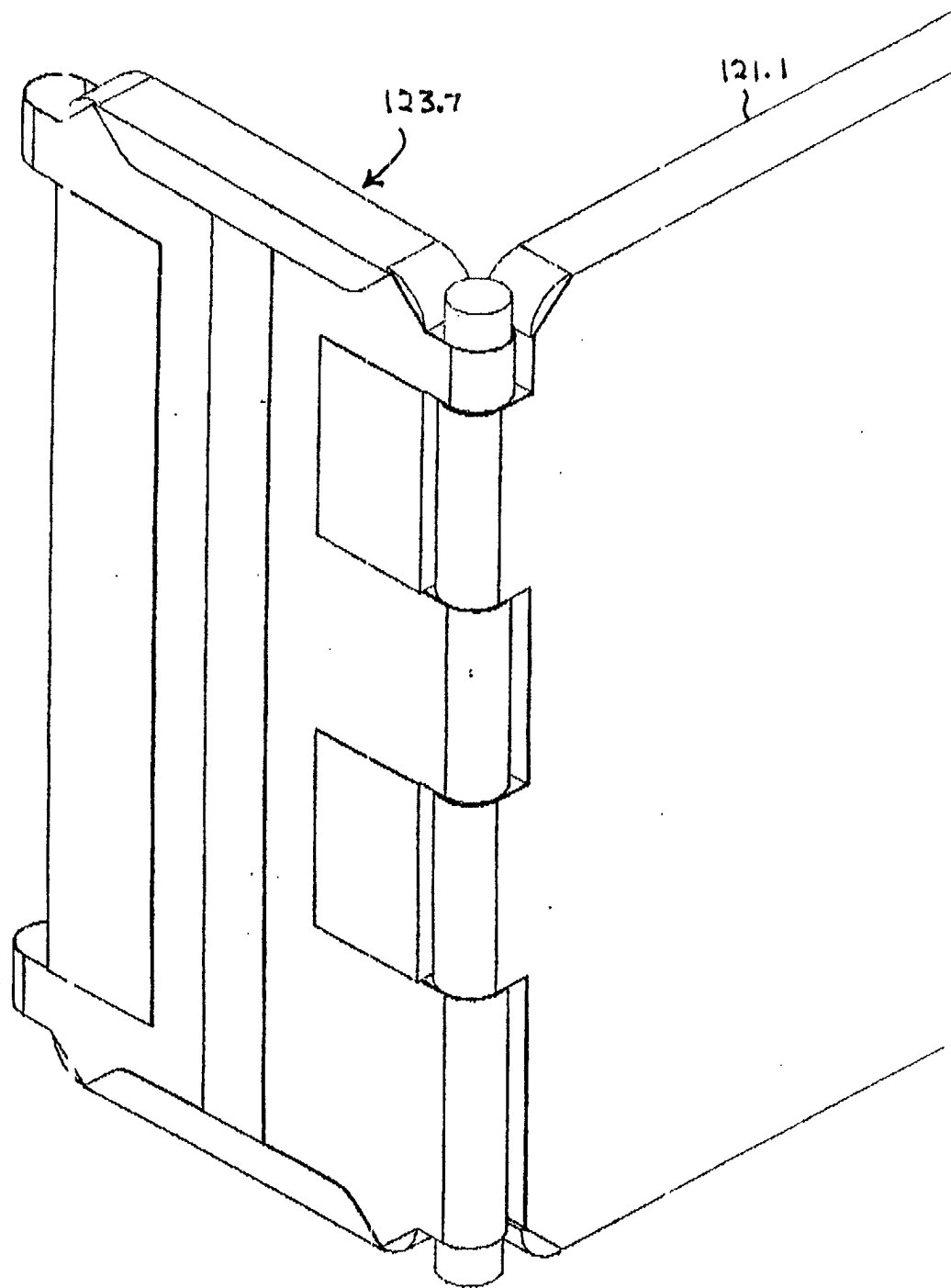
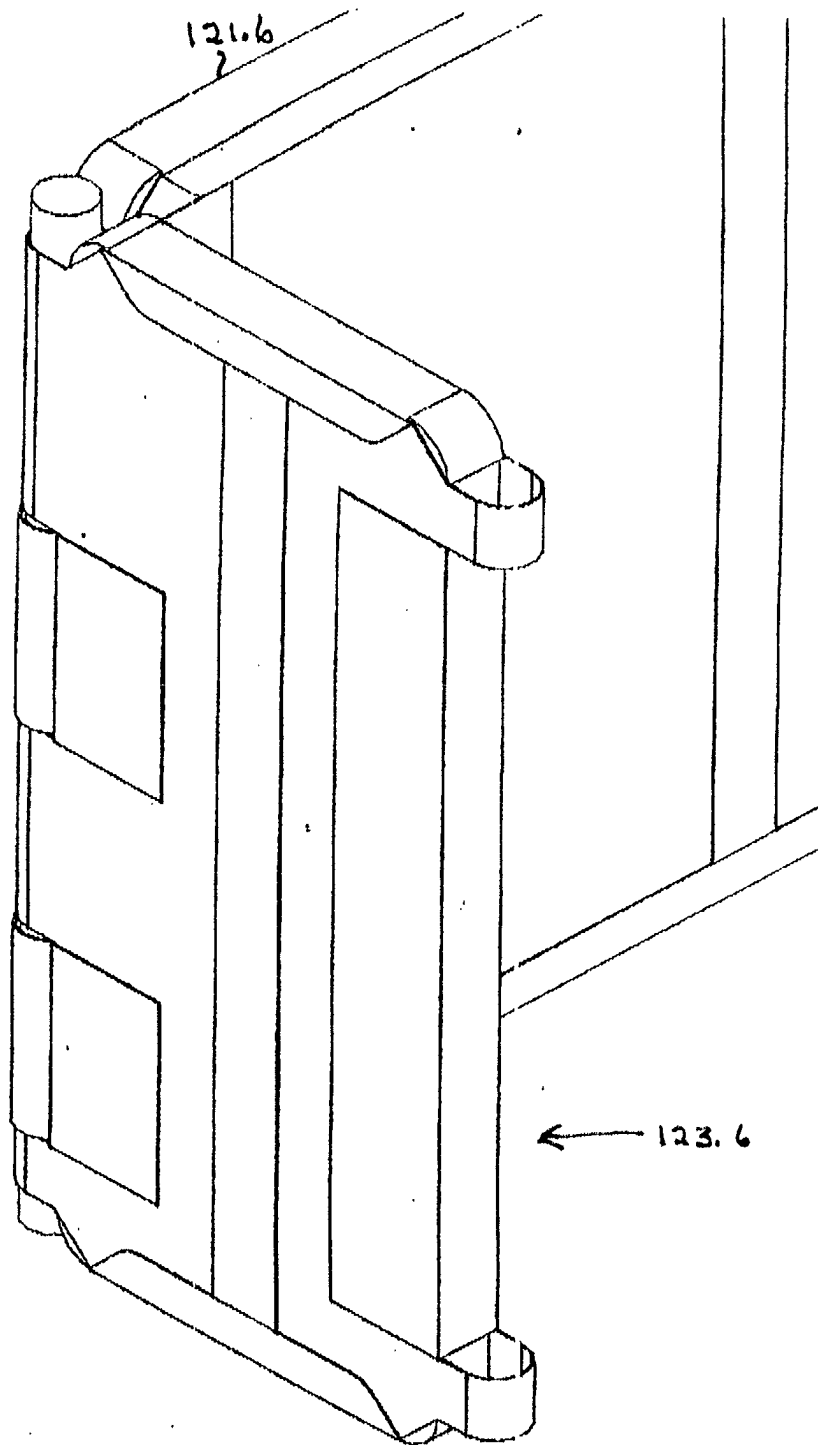


Fig. 21



END HINGE JOINT FRONT VIEW

Fig. 22



END HINGE JOINT REAR VIEW

Fig. 23

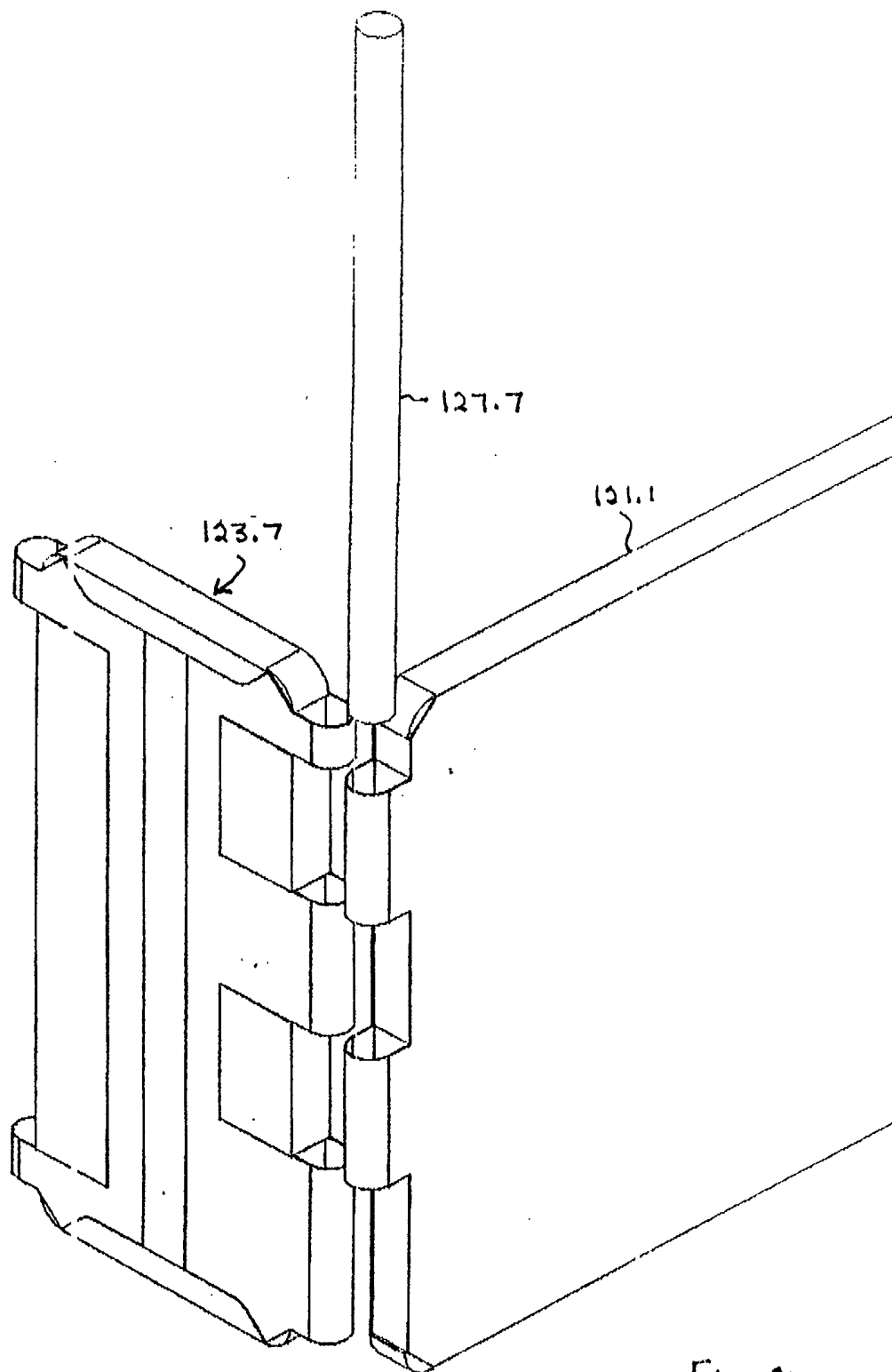


Fig. 24

END HINGE JOINT FRONT VIEW
EXPLODED

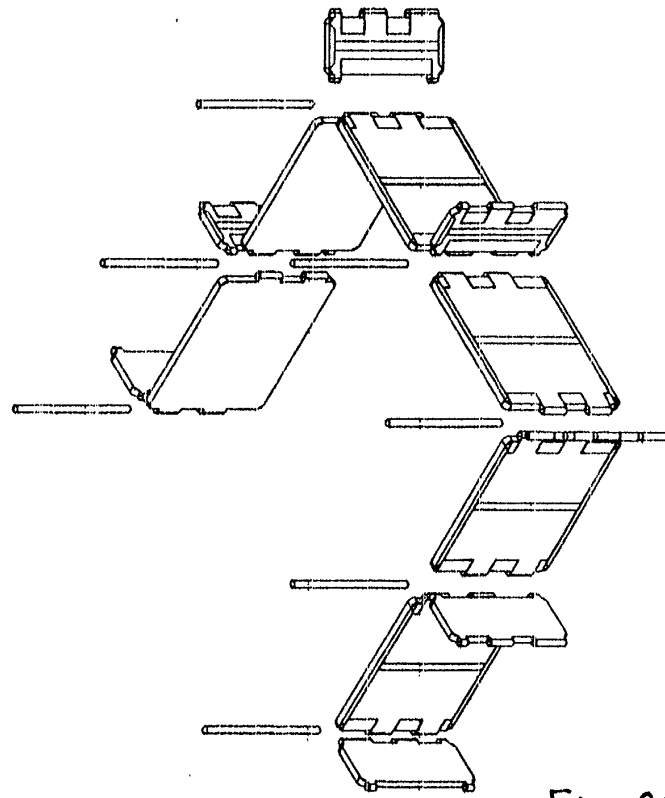


Fig. 25A

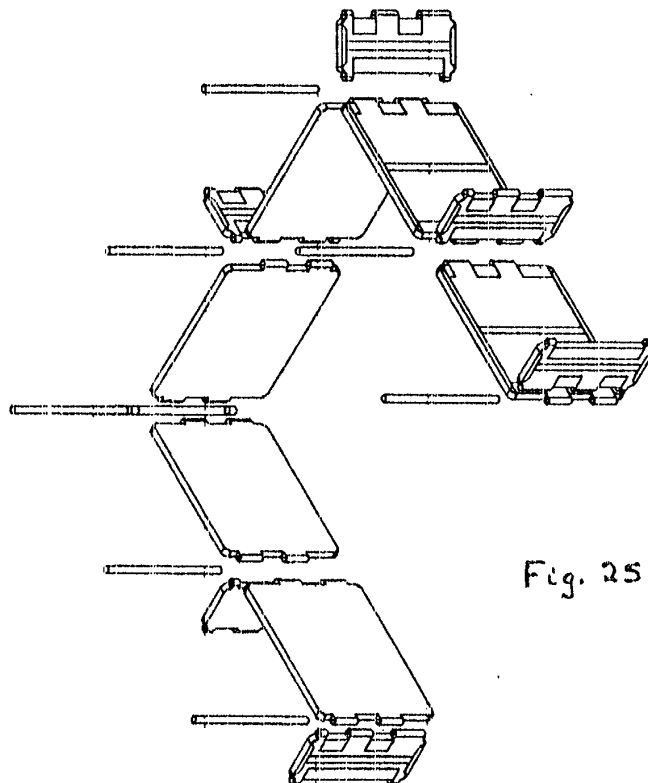


Fig. 25B

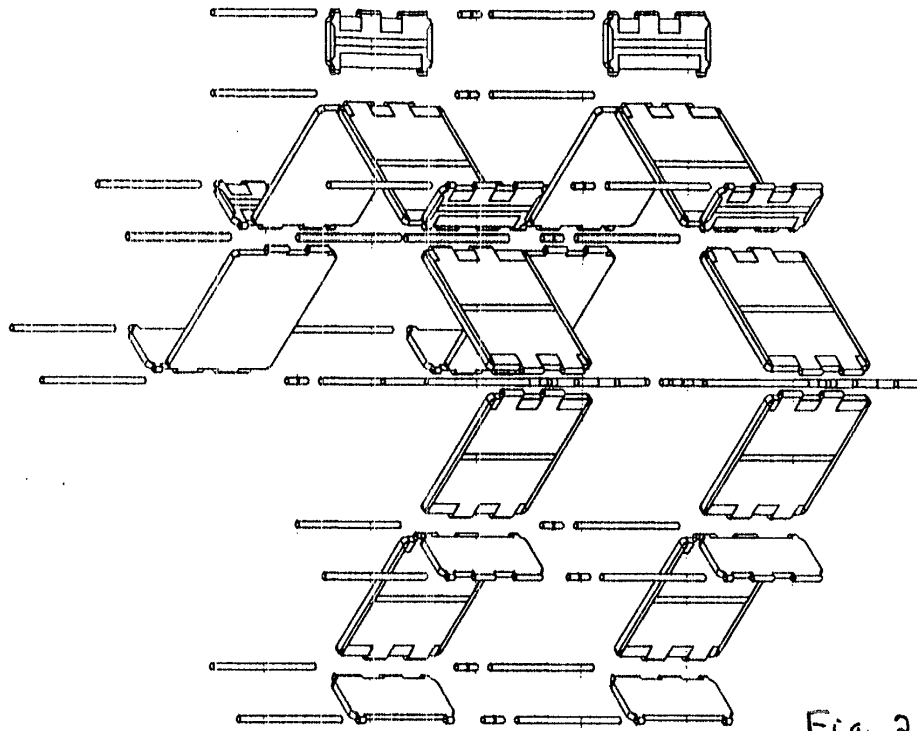


Fig. 26A

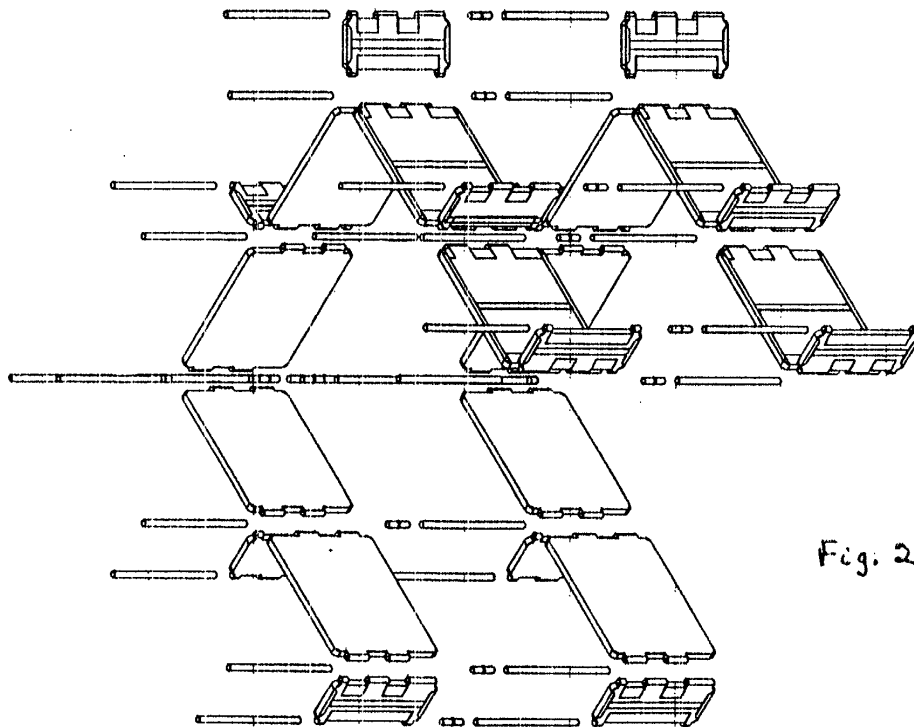


Fig. 26B

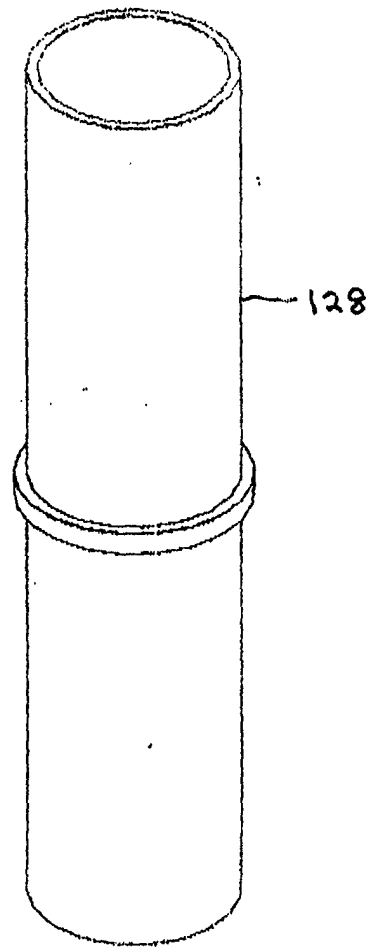
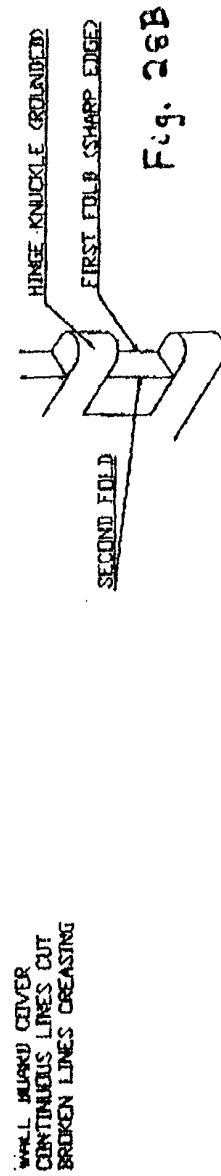
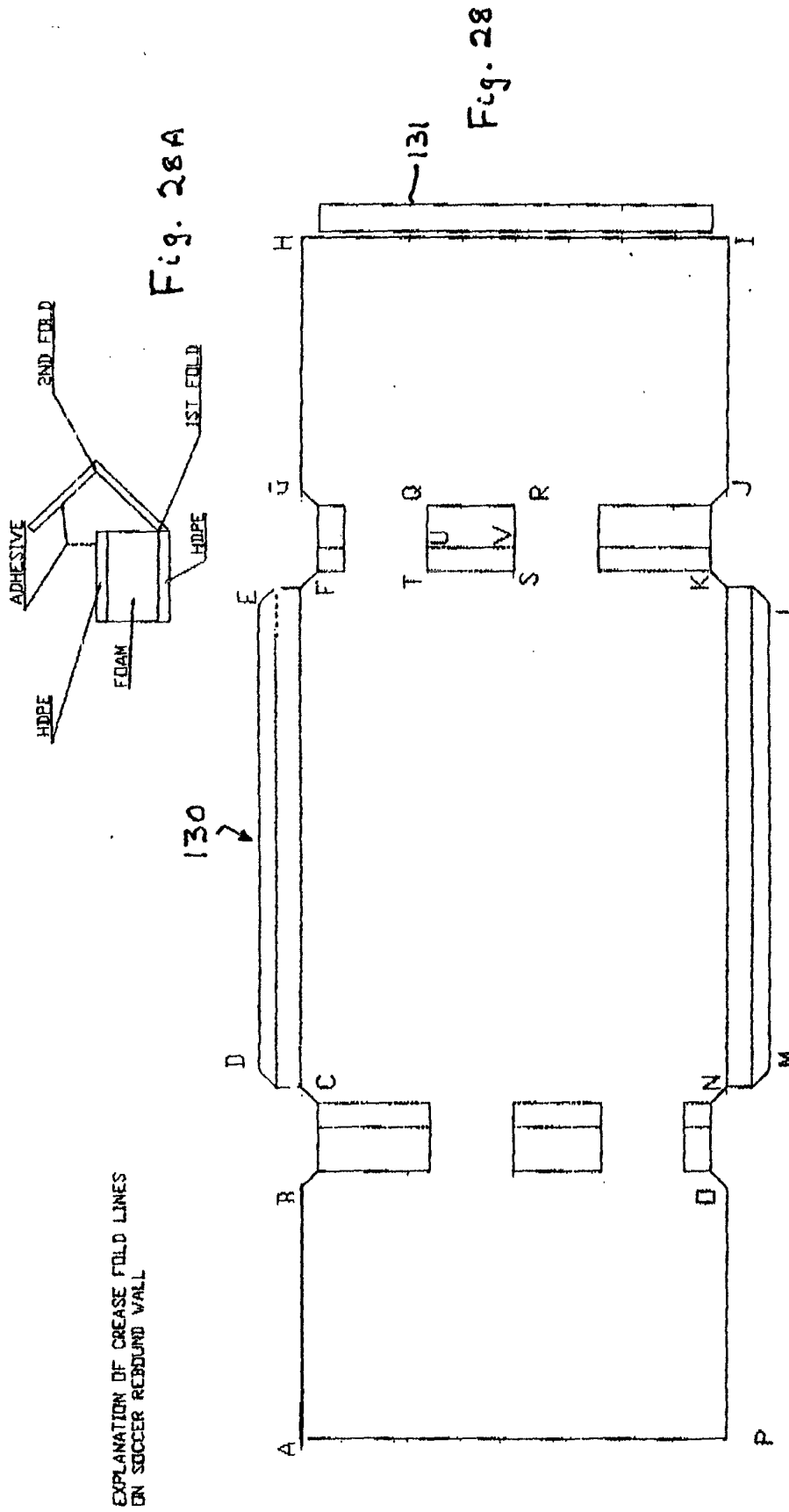
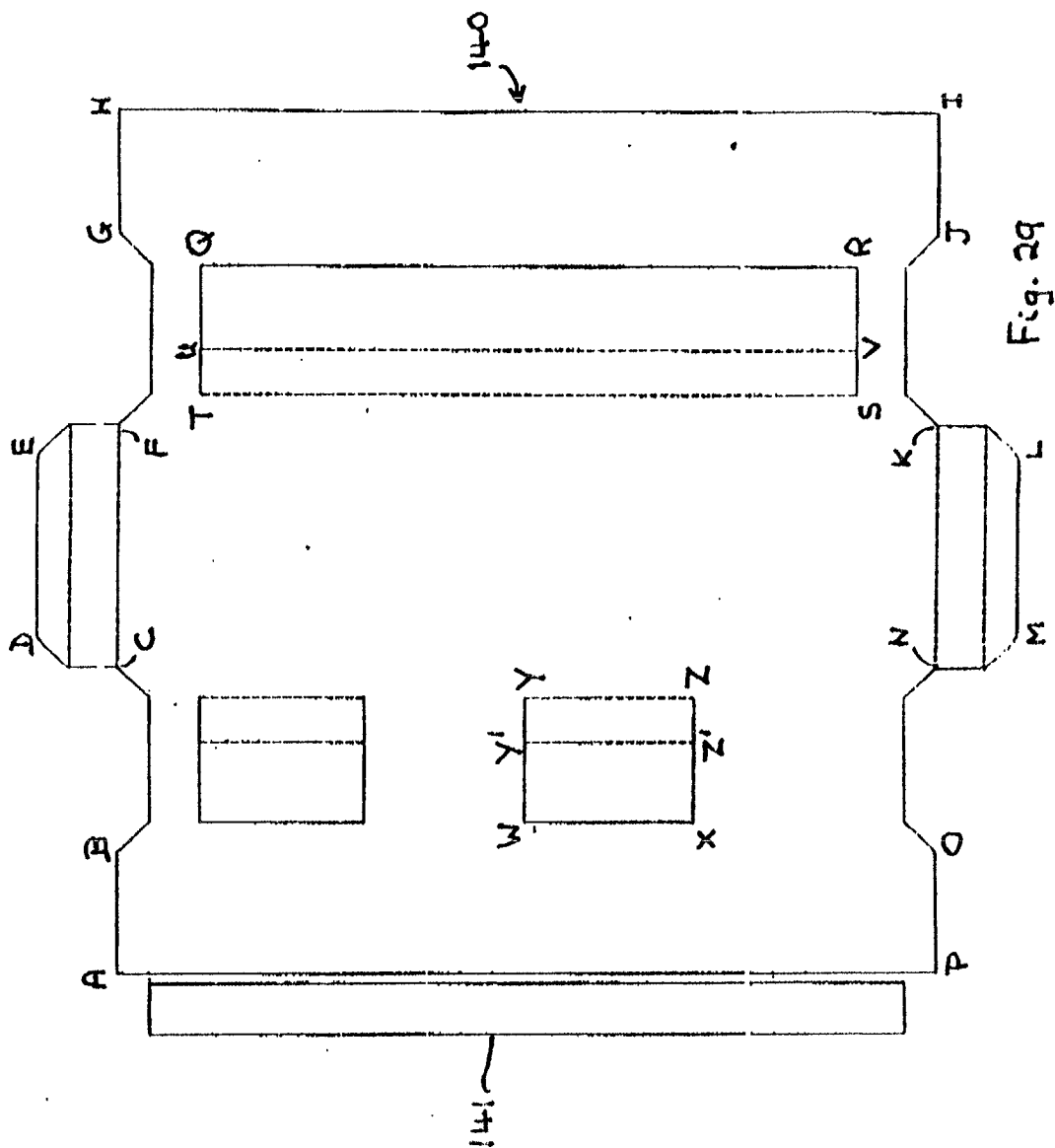


Fig. 27

TUBE CONNECTOR FOR DOUBLE WALL







European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 25 6592

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	DE 85 28 731 U (KLUG GERHARD) 2 April 1987 (1987-04-02) * the whole document *	1	A63B69/00 G09F15/00 E04B2/74
X	GB 2 267 722 A (VERGO MARMIE SYDNEY) 15 December 1993 (1993-12-15) * the whole document *	1-6	
X	GB 2 105 084 A (LANGENBACH AG J) 16 March 1983 (1983-03-16) * the whole document *	1-3,7-9, 11-15	
X	US 5 537 766 A (NICKENS LOWELL W ET AL) 23 July 1996 (1996-07-23) * the whole document *	1,10	
X	US 5 375 641 A (SCHLUETER DONALD D) 27 December 1994 (1994-12-27) * figures *	1,10	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			G09F A63B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		29 November 2002	Knoflachner, N
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPC FORM 1503 03 82 (P04C01)



European Patent
Office

Application Number
EP 02 25 6592

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



European Patent
Office

**LACK OF UNITY OF INVENTION
SHEET B**

Application Number
EP 02 25 6592

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. Claims: 1-10

portable wall for ball games

2. Claims: 11-15

method of producing panels or support members for a portable wall for ball games

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 02 25 6592

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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29-11-2002

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
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GB 2267722	A	15-12-1993	NONE	
GB 2105084	A	16-03-1983	NONE	
US 5537766	A	23-07-1996	NONE	
US 5375641	A	27-12-1994	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82