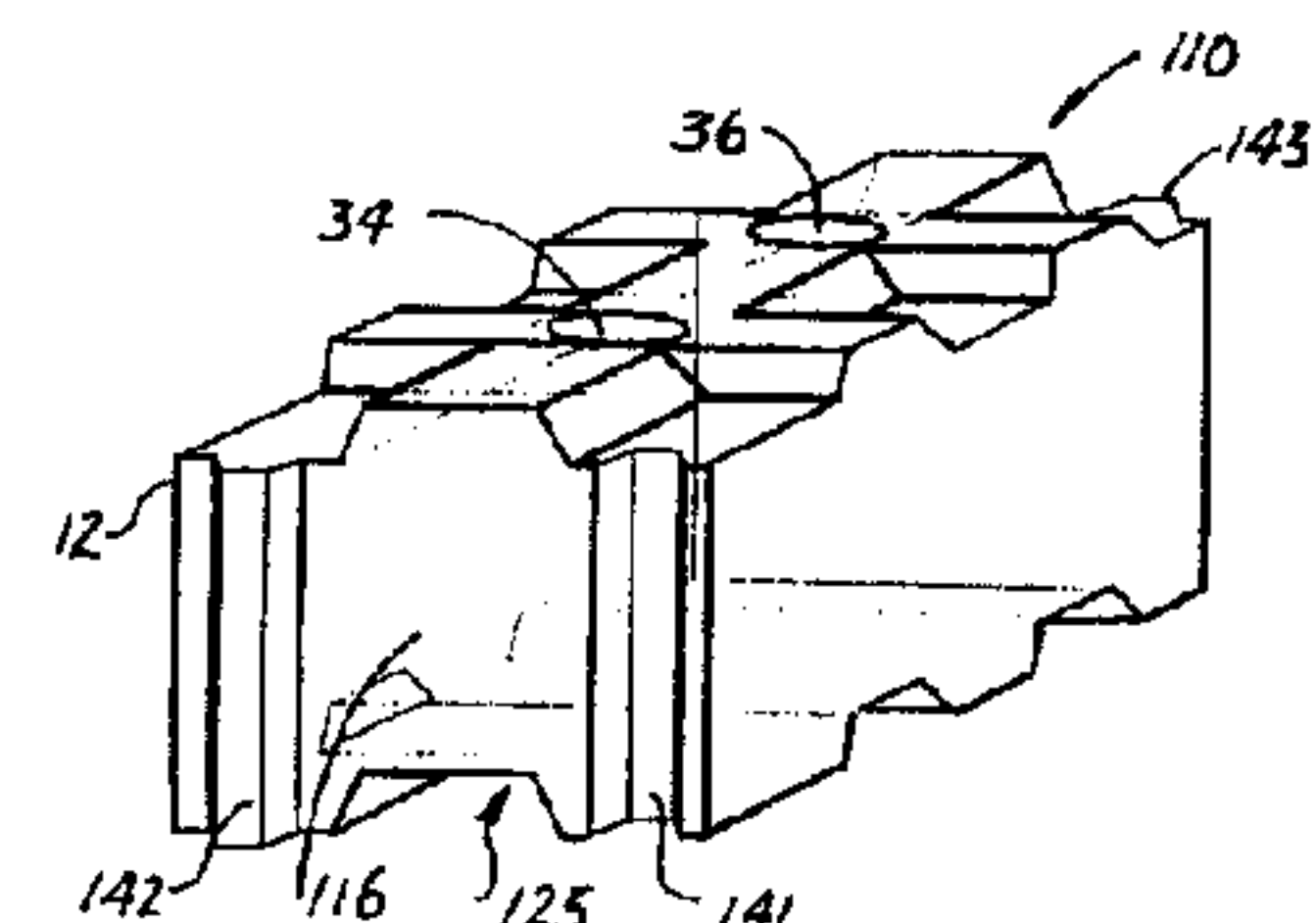
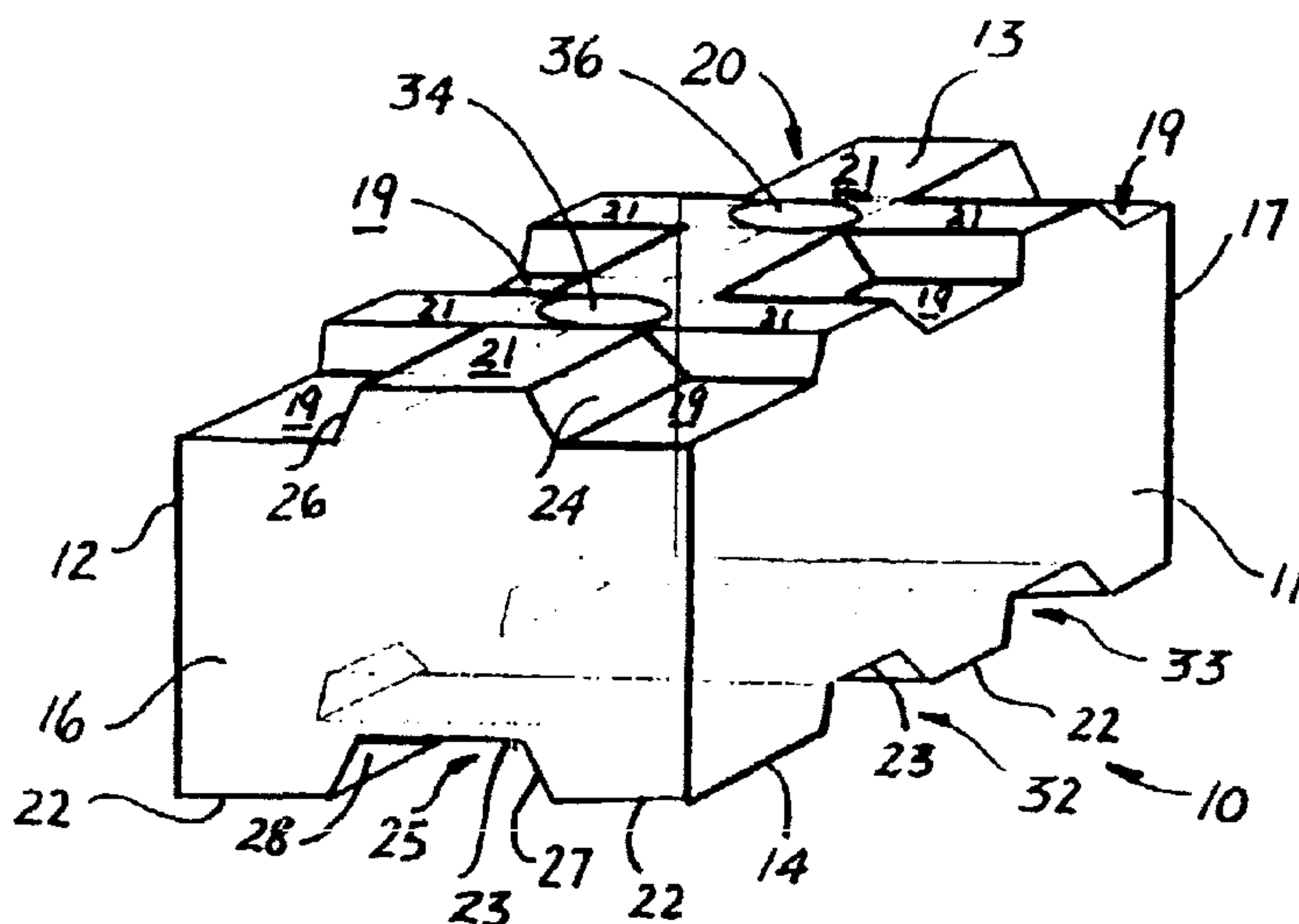




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(54) Titre : BLOCS DE MACONNERIE A EMBOITEMENT
(54) Title: INTERLOCKING BUILDING BLOCK



(57) Abrégé/Abstract:

A building block (10, 110) having opposed front (11) and rear (12) faces, opposed upper (13) and lower (14) faces and opposed end faces (16, 17), the upper face (13) having a first protuberance (20) extending across the block from end to end, and a pair of second spaced apart protuberances (21) extending across the face from front to back, the lower face (14) having a first recess (25) extending across the block from end to end, and a pair of second spaced apart recesses (32, 33) extending across the face from front to back, the first and second recesses (25, 32, 33) being adapted to receive first and second protuberances (20, 21) of an underlying block, and a pair of spaced apertures (34, 36) extending through the block from upper (13) to lower (14) faces. In another aspect, each of the end faces (116) has a protuberance (142) and a recess (141) extending from upper (13) to lower (14) faces, the recess (141) being adapted to receive the protuberance (142) of an adjoining block. Methods of constructing walls using these blocks and a cylindrical building block are also disclosed.

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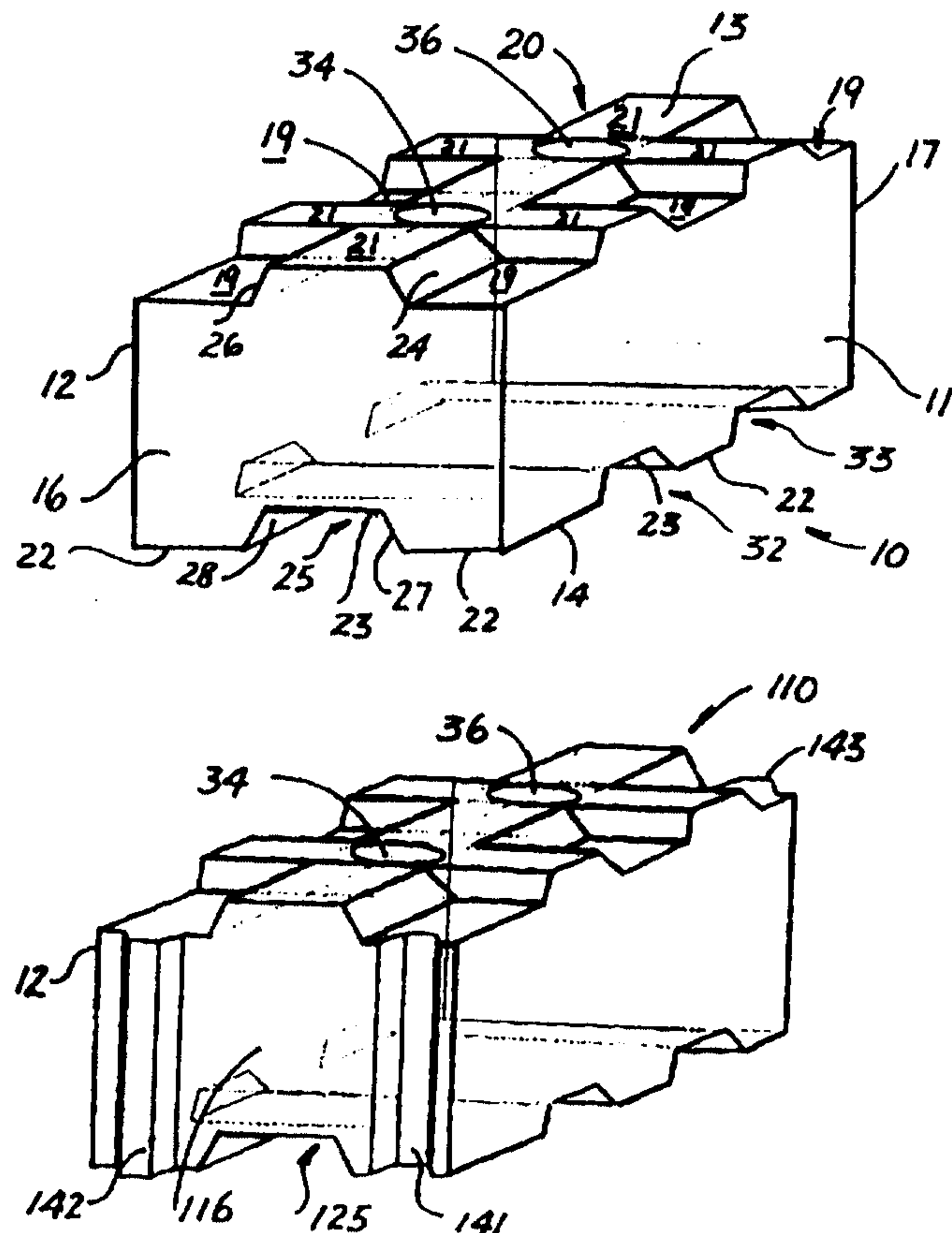
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(54) Title: INTERLOCKING BUILDING BLOCK

(57) Abstract

A building block (10, 110) having opposed front (11) and rear (12) faces, opposed upper (13) and lower (14) faces and opposed end faces (16, 17), the upper face (13) having a first protuberance (20) extending across the block from end to end, and a pair of second spaced apart protuberances (21) extending across the face from front to back, the lower face (14) having a first recess (25) extending across the block from end to end, and a pair of second spaced apart recesses (32, 33) extending across the face from front to back, the first and second recesses (25, 32, 33) being adapted to receive first and second protuberances (20, 21) of an underlying block, and a pair of spaced apertures (34, 36) extending through the block from upper (13) to lower (14) faces. In another aspect, each of the end faces (116) has a protuberance (142) and a recess (141) extending from upper (13) to lower (14) faces, the recess (141) being adapted to receive the protuberance (142) of an adjoining block. Methods of constructing walls using these blocks and a cylindrical building block are also disclosed.



INTERLOCKING BUILDING BLOCK

This invention relates to building blocks.

The invention has particular application to building blocks
5 adapted for the construction of mortarless walls and for
illustrative purposes reference will be made to such application.
However, it is to be understood that the invention is not limited
to such applications and could be utilised satisfactorily with
mortar or other adhesives or sealing materials.

10 In the construction of mortarless block walls it will be
appreciated that the weather, particularly driving rain, can
cause moisture to migrate from an exterior surface to an interior
surface unless excessively wide blocks are utilised. However,
wide blocks are expensive to produce and transport and difficult
15 to lay, being much heavier than desired and also more awkward to
handle than commonly used blocks.

BACKGROUND ART

United Kingdom Patent Specification No. 2185276 by Du
20 Plessis describes an interlocking block which goes partway to
solving some of the problems associated with mortarless walls.
However, the block of the Du Plessis specification does not
sufficiently inhibit the passage of moisture and wind between the
ends of the blocks. Additionally, the blocks illustrated in the
25 Du Plessis specification are not easily adapted for holding
together as rows of blocks and thus walls constructed with such
blocks must rely only on their own weight to seal therebetween
if used without mortar. Moreover, such blocks do not provide
suitable means for holding down to a foundation.

30 The present invention aims to alleviate the aforementioned
problem and to provide a building block which can be utilised to
construct mortarless block walls.

DISCLOSURE OF THE INVENTION

35 With the foregoing in view this invention in one aspect resides
broadly in a building block having opposed front and rear faces,
opposed upper and lower faces and opposed end faces, said upper
face having a first surface and a second surface, said second

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surface being elevated with respect to said first surface and being formed by a first protuberance extending across the block from one end face to the other end face and a pair of spaced apart second protuberances extending across the block from said front face to said rear face and intersecting said first protuberance;

said lower face having a first surface and a second surface, said second surface being elevated with respect to said first surface and being formed by a first recess extending across the block from one end face to the other end face and a pair of spaced apart second recesses extending across the block from said front face to said rear face and intersecting said first recess, said first and second recesses being adapted to receive therein the first and second protuberances extending across the upper face of a like block;

a pair of spaced apart apertures extending through the block from said second surface of said upper face to said second surface of said lower face, the axes of said apertures being parallel and extending between the respective intersections of said protuberances and said recesses. Preferably, said apertures are equally spaced from the opposite ends of said block and are spaced apart by a distance equal to twice the distance of each aperture from an end of the block.

Preferably one of said end faces has a first surface and a second surface, said second surface being outward with respect to said first surface and being formed by a protuberance extending across the block from the upper face to the lower face and the other end face having a first surface and a second surface said second surface being inward with respect to said first surface and being formed by a recess extending across the block from the upper face to the lower face, said recess being adapted to receive therein the protuberance extending across said one end face of a like block.

In another aspect the invention resides broadly in a building block having opposed front and rear faces, opposed upper and lower faces and opposed end faces, said upper face having a first surface and a second surface, said second surface being elevated with respect to said first surface and being formed by

a first protuberance extending across the block from one end face to the other end face and a pair of spaced apart second protuberances extending across the block from said front face to said rear face and intersecting said first protuberance;

5 said lower face having a first surface and a second surface, said second surface being elevated with respect to said first surface and being formed by a first recess extending across the block from one end face to the other end face and a pair of spaced apart second recesses extending across the block from said
10 front face to said rear face and intersecting said first recess, said first and second recesses being adapted to receive therein the first and second protuberances extending across the upper face of a like block;

one of said end faces having a first surface and a second
15 surface, said second surface being outward with respect to said first surface and being formed by a protuberance extending across the block from the upper face to the lower face and the other end face having a first surface and a second surface said second surface being inward with respect to said first surface and being
20 formed by a recess extending across the block from the upper face to the lower face, said recess being adapted to receive therein the protuberance extending across said one end face of a like block. Preferably, said one end face includes a protuberance and a parallel recess in spaced apart relation and said other end
25 face includes a protuberance and a parallel recess in equally spaced apart relation, said protuberance and recess of said one end face being adapted to cooperate with the recess and protuberance respectively of said other end face of a like block. In such form, it is preferred that such protuberance and recess
30 be spaced, in end view, outside the protuberance and recess of the upper and lower faces. In other forms of the block, similar recesses and protuberances may be provided on the front and/or rear faces to provide "corner" blocks to allow the protuberances and recesses to engage with complementary recesses
35 and protuberances of the blocks previously described so that building corners can be formed.

Preferably, said first surfaces and said second surfaces of said protuberances and said recesses of said upper and lower

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faces are joined by tapered surfaces of complementary form, such tapered surfaces being adapted to assist in alignment of one block upon an adjacent block in the process of laying rows of blocks. Similarly, it is also preferred that the first and
5 second surfaces of the end faces may be joined by tapered surfaces.

It will be appreciated that said apertures extending from said second surface of said upper face to said second surface of said lower face are suitable for the passing therethrough of
10 reinforcing bar or tie down bolts which may be secured to the blocks by pumping grout, mortar or other suitable filler therein during or after erection of a wall comprised of a plurality of layers of blocks. It will also be appreciated that the pair of
15 second protuberances and recesses extending across the upper and lower faces is effective to ensure that blocks can only be laid with the apertures of rows of blocks in alignment, so that reinforcing bars can be placed in the apertures after erection of a plurality of rows of blocks.

In another aspect, the invention resides broadly in a method
20 of constructing a wall including:

providing a plurality of blocks as previously described;

laying a first row of said blocks end to end in abutting engagement, and

laying a second row of blocks on top of said first row of
25 blocks, and

placing reinforcing bar or the like through the aligned apertures of two of said blocks and connecting the lower end of said reinforcing bar to a foundation, bottom plate or base member and pouring or pumping a grouting material such as concrete into
30 said apertures or alternatively fitting clamping means to the upper end of said reinforcing bar and clamping said rows of blocks together with said clamping means.

In yet another aspect the invention resides broadly in a method of constructing a wall including:

35 placing a first layer of flexible material such as hard rubber mat on a foundation, said layer of flexible material being adapted to accommodate slight movements of the foundation;

placing a bottom plate or base member on said flexible mat;

providing a plurality of blocks each having opposed front and rear faces, opposed upper and lower faces and opposed end faces, said upper face having a first surface and a second surface, said second surface being elevated with respect to said first surface and being formed by a first protuberance extending across the block from one end face to the other end face and a pair of spaced apart second protuberances extending across the block from said front face to said rear face and intersecting said first protuberance, said lower face having a first surface and a second surface, said second surface being elevated with respect to said first surface and being formed by a first recess extending across the block from one end face to the other end face and a pair of spaced apart second recesses extending across the block from said front face to said rear face and intersecting said first recess, said first and second recesses being adapted to receive therein the first and second protuberances extending across the upper face of a like block and a pair of spaced apart apertures extending through the block from said second surface of said upper face to said second surface of said lower face, the axes of said apertures being parallel and extending between the respective intersections of said protuberances and said recesses;

laying a first row of said blocks end to end in abutting engagement on said flexible mat, and

laying a second row of said blocks on top of said first row of blocks , and

placing reinforcing bar or the like through the aligned apertures of two of said blocks and connecting the lower end of said reinforcing bar to said bottom plate or base member and fitting clamping means such as a nut to the upper end of said reinforcing bar and clamping said rows of blocks together with said clamping means. Advantageously, such method of construction allows construction of a wall upon a solid foundation such as concrete or even an earth foundation without a rigid connection thereto such that slight movements of the ground such as earth tremors or earthquakes can be absorbed by the layer of flexible material. Preferably, the method also includes placing a layer of deformable material such as foamed rubber on said layer of flexible material, said layer of deformable material being

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adapted to deform sufficiently under the weight of the blocks to fill or at least partially fill the first and second recesses provided in the lower face of the blocks. Preferably, the method also includes pouring or pumping a grouting material such as concrete into said apertures and preferably such grouting material is poured or pumped into said apertures prior to fitting said clamping means. It is also preferred that one of the end faces of at least some of the blocks used in the method of construction has a first surface and a second surface, said second surface being outward with respect to said first surface and being formed by a protuberance extending across the block from the upper face to the lower face and the other end face having a first surface and a second surface said second surface being inward with respect to said first surface and being formed by a recess extending across the block from the upper face to the lower face, said recess being adapted to receive therein the protuberance extending across said one end face of a like block.

It will be seen that the present invention provides a building block which can be used to construct walls without the aid of mortar, the protuberances and recesses in combination being effective to inhibit the passage of water and other elements through the joints between blocks. Furthermore, the apertures provide a means of tying many rows of blocks to a foundation or base member. In the case of a base member, the reinforcing bar may be a length of threaded rod which may be tensioned to clamp the rows of blocks together by a nut adapted to threadedly engage the rod. In such case, the wall can be quickly dismantled for relocation if desired.

In yet another aspect the invention resides broadly in a building block having a cylindrical outer face, opposed upper and lower faces and opposed end faces, said upper face having a first surface and a second surface, said second surface being elevated with respect to said first surface and being formed by a first protuberance extending about the axis of the cylindrical outer face and a plurality of spaced apart second protuberances extending across said first protuberance;

said lower face having a first surface and a second surface,

said second surface being elevated with respect to said first surface and being formed by a first recess extending about the axis of the cylindrical outer face and a plurality of spaced apart second recesses extending across said first recess, said first and second recesses being adapted to receive therein the first and second protuberances extending of a like block, and

a central aperture extending axially through the block from said upper face to said lower face.

10

BRIEF DESCRIPTION OF THE DRAWINGS

In order that this invention may be more readily understood and put into practical effect reference will now be made to the accompanying drawings which illustrate a preferred embodiment of the invention and wherein:

15

Fig. 1a is a pictorial representation of a block according to the invention of two units length;

Fig. 1b is a pictorial representation of another block according to the invention of approximately two units length;

20

Fig. 2 is a plan view of the block of Fig 1a;

Fig. 3 is a pictorial representation of another block of one unit length for use with the block of Fig. 1a;

Fig. 4 is a plan view of the block of Fig 3;

Fig. 5 is a pictorial representation of another block of two units length according to the invention;

25

Fig. 6 is a plan view of the block of Fig 5;

Fig. 7 is a pictorial representation of another block according to the invention of two units length;

Fig. 8 is a plan view of the block of Fig. 7;

30

Fig. 9a illustrate a method of constructing a wall according to the invention;

Fig. 9b illustrates the construction of a corner for the wall of Fig. 9a according to the invention;

Figs. 10 illustrates a tank constructed according to the invention utilising the blocks of Fig. 1b;

35

Fig. 11 illustrates in perspective view, various forms of recesses and protuberances for the blocks according to the invention;

Figs. 12 and 13 illustrate a metal door frame having locating pins adapted to engage with building blocks according to the present invention ;

Fig. 14 illustrates the use of the apertures of the block of any one of the previous figures for the provision of building services;

Figs. 15 and 16 illustrate alternative methods of anchoring the blocks of the present invention;

Fig. 17 illustrates another method of constructing a wall according to the invention;

Fig. 18 illustrates a block adapted for use with the block of Fig. 1 for capping a wall;

Fig. 19 illustrates a block adapted for use with the block of Fig. 1a for capping a wall to allow for building surfaces to enter the apertures of the block of Fig. 1a;

Fig. 20 illustrates a block adapted for use with the block of Fig. 1a for capping a wall and receiving thereon corrugated iron;

Fig. 21 illustrates an alternative block according to the invention; and

Fig. 22 is a plan view of the block of Fig. 21.

DETAILED DESCRIPTION OF DRAWINGS

The building block 10 illustrated in Figs. 1a and 2 is substantially a rectangular prism having front face 11 opposed rear face 12, upper face 13, opposed lower face 14 and two end faces 16 and 17. The upper face has a first surface 19 and a second surface 21 elevated with respect to said first surface. Similarly said lower face 14 has a first surface 22 and a second surface 23 elevated with respect to said first surface. The first surface 19 is joined to the second surface 21 via tapered intermediate surfaces 24 and 26 respectively on each side of the elevated surface 21. The surface 22 is joined to the elevated surface 23 via similar tapered surfaces 27 and 28. In this embodiment the elevated surface 21 is formed by a protuberance 20 which extends across the full length of the block from end face 16 to end face 17 and two other protuberances 29 and 31 which extend from the front face 11 to the rear face 12 and

intersect the protuberance 20. Similarly, the elevated second surface 23 is formed by a recess 25 which extends from end face 16 to end face 17 parallel to the protuberance 20. Two further recesses 32 and 33 extend across the block from front face 11 to rear face 12 parallel to the respective protuberances 29 and 30 and intersect the recess 25. Vertically extending spaced apart apertures 34 and 36 extend through the block opening at the intersections of the protuberances and the recesses respectively.

The building block 60 illustrated in Figs. 3 and 4 is equivalent in size to half of the block illustrated in Fig. 1, there being only one protuberance and recess extending from the front face to the rear face rather than the two as in Fig. 1. In all other respects the block is the same being only one unit in length as opposed to the block of Fig 1 being two units in length.

The building block 110 illustrated in Figs. 5 and 6 is the same as the block of Fig. 1 in all respects except that the end face 116 corresponding to end face 16 includes a recess 141 adjacent its front face 111 and extending vertically along the full height of the block from surface 119 to surface 122 similarly a protuberance 142 is provided adjacent the rear face 112 and extends parallel to the recess 141. The recess and the protuberance are complementary in form and are substantially the same shape as the protuberance 20 and recess 25 described in relation to Fig. 1. At its other end the block 110 has a further protuberance and recess 143 and 144 respectively of complementary form to the recess and protuberance 141 and 142 but with the protuberance adjacent the front face 11 and the recess adjacent the rear face 12 whereby in use the protuberances main gauge in the complementary recesses of adjacent blocks.

The building block 210 illustrated in Figs. 7 and 8 is the same as the block 110 illustrated in Fig. 5 except that it does not have the recess and protuberance 141 and 142 and instead a similar recess and protuberance 151 and 152 have been provided in the front face 11 and are adapted to engage with the recess and protuberance 141 and 142 of an adjacent block.

The advantages of the blocks previously described can be appreciated from Figs. 9a, and 9b in which the engagement of the

complementary recesses and protuberances can be clearly seen. It will be appreciated that rain and wind impinging on the front faces of the blocks will be inhibited from passing completely through the blocks along the joint by the tortuous path they must travel to pass the respective protuberance.

The building block 310 illustrated in Fig. 1b is the same as the block 110 illustrated in Fig. 5 except that it is curved. Advantageously, this block can be effectively utilised for the construction of curved walls and water tanks as illustrated in Fig. 10. It will be seen that the protuberance 320, corresponding to protuberance 20 and the complementary recess 325, corresponding to recess 25 are also curved and that the protuberances 329 and 331 and recesses 332 and 333 meet the former protuberance and recess respectively at right angles.

Whilst the protuberances and recesses have been described in a preferred form having tapered joining intermediate faces other shaped protuberances can be utilised to good effect as illustrated in Fig. 11.

Other advantages of the invention can be appreciated from Figs. 12 and 13 which illustrates a metal door frame having a plurality of spigots or plugs 160 suitably spaced apart to engage in the apertures 34 and 36 provided in the building blocks. Furthermore the apertures can be utilised to provide passage for building services such as electrical wires or conduits as illustrated in Fig. 14.

The method of constructing a wall illustrated in Fig. 15 includes providing a clamping bar for example threaded rod 161 having a hooked end 162 adapted to engage in the recess 25 of the bottom row of blocks and to extend through the apertures 34 and 36 of subsequent rows of blocks. A nut or other clamping collet 165 can be applied to the upper end of the rod to clamp a plurality of rows together. If desired the threaded rod 161 can be anchored in a concrete foundation to tie the wall to the foundation.

An alternative method of maintaining the integrity of a wall constructed of the blocks previously described is illustrated in Fig. 16 in which a bottom plate 164 is provided and adapted to be confined within the recess 25, and extending under a plurality

of blocks. A pincer clip 166 is adapted to fit within the aperture 34 and 36 and to engage the plate 164 for securement thereto. The pincer clip has a upper cross-portion 167 under which a hooked clamping rod 168 can engage for clamping by a nut or collet as previously described.

Fig. 17 illustrates an alternative method of constructing a wall according to the invention which is particularly advantageous in earthquake prone areas or where significant movement of the ground occurs. In this embodiment, a layer of relatively hard rubber 171 (such as that used for conveyor belting) is placed on a concrete floor 170 or other suitable foundation such as level ground. Subsequently, a layer of softer foamed rubber 172 is placed on the layer 171 and then the first layer of blocks is placed on the layer 172 and so on as described earlier to form a wall 173. Advantageously, the layer of hard rubber absorbs or allows slight movement of the foundation to occur without damage to the wall 173 whilst the layer of softer foamed rubber seals against the block and the hard rubber and deforms sufficiently to fill the recesses 25 to prevent ingress of moisture, wind and dust. It will be understood that the grade of material required for the layers 171 and 172 will depend on the height and size of wall to be erected and the dead and live loads to be applied.

The capping blocks 80, 90 and 100 illustrated in Figs. 18, 19 and 20 are the same as the block 10 in respect of the lower face so that they can engage with the upper face of blocks 10, but the upper face differs to provide optional top surfaces. The block 80 has a top face 81 which is substantially flat and adapted to simply cap a wall constructed of blocks 10 and to provide a seat for timber bearers or joists. The block 90 has a top face 91 which is substantially flat except for recesses 92 and 93 extending from the apertures 34 and 36 respectively to the front and rear faces 11 and 12 respectively for providing passages for connection of building services such as water and electricity. The block 100 has a top face 101 which has recesses in the form of corrugations 102 extending from the front face to the rear face and adapted to engage with corrugated roofing iron. It will be appreciated that other shaped recesses could be

provided for other types of roofing if desired.

The cylindrical block 410 illustrated in Figs. 21 and 22 is particularly adapted for constructing columns for roof support. The block has a cylindrical outer face 403 and a central cylindrical aperture 404 extending therethrough and adapted to receive therein reinforcing bar and to be filled with grouting material such as concrete. The block cooperates with similar blocks in a manner similar to the block 10 and the block 310. The upper face 413 has an annular protuberance 420 formed thereon and six radially extending protuberances 431 crossing the annular protuberance 420. The lower face 414 has an annular recess 425 for receiving therein the protuberance 420 of a like block and six radial recesses 432 for receiving therein the complementary protuberances 431 of a like block. Advantageously, the radial protuberances and recesses ensure that the apertures 434 of adjacent blocks are aligned.

It will of course be realised that while the foregoing description has been given by way of illustrative example of this invention all such and other modifications and variations thereto as would be apparent to persons skilled in the art are deemed to fall within the broad scope and ambit of this invention as defined in appended claims.

CLAIMS

1. A building block having opposed front and rear faces, opposed upper and lower faces and opposed end faces, said upper face having a first surface and a second surface, said second surface being elevated with respect to said first surface and being formed by a first protuberance extending across the block from one end face to the other end face and a pair of spaced apart second protuberances extending across the block from said front face to said rear face and intersecting said first protuberance;

said lower face having a first surface and a second surface, said second surface being elevated with respect to said first surface and being formed by a first recess extending across the block from one end face to the other end face and a pair of spaced apart second recesses extending across the block from said front face to said rear face and intersecting said first recess, said first and second recesses being adapted to receive therein the first and second protuberances extending across the upper face of a like block;

each of said end faces having a first surface, a second surface and a third surface, said second surface being outward with respect to said first surface and said third surface being inward with respect to said first surface, said second surface being formed by a protuberance extending across the block from said upper face to said lower face and said third surface being formed by a recess extending across the block from said upper face to said lower face and spaced from said protuberance, the recess of one end face being adapted to receive therein the protuberance extending across the other end face of a like block and the protuberance of said one end face being adapted to engage with the recess extending across the said other end face of a like block.

2. A building block according to claim 1, and further including a pair of spaced apart apertures extending through the block from said second surface of said upper face to said second surface of said lower face, the axes of said apertures being parallel and extending between the respective intersections of said protuberances and said recesses.

3. A building block according to claim 1 or claim 2, wherein

said protuberance in one end face and said recess in said other end face are spaced, in end view, outside the protuberance and recess of the upper and lower faces.

4. A building block according to claim 1, wherein said first surfaces and said second surfaces of said protuberances and said recesses of said upper and lower faces are joined by tapered surfaces of complementary form, said tapered surfaces being adapted to assist in alignment of one block upon an adjacent block in the process of laying rows of blocks.

5. A building block according to claim 1, wherein said first and second surfaces and said first and third surfaces of said end faces are joined by tapered surfaces of complementary form, said tapered surfaces being adapted to assist in alignment of one block with an adjacent block in the process of laying rows of blocks.

6. A building block according to claim 1, wherein said apertures are equally spaced from the opposite ends of said block and are spaced apart by a distance equal to twice the distance of each aperture from an end of the block.

7. A method of constructing a wall including:

providing a plurality of blocks according to any one of claims 2 to 6;

laying a first row of said blocks end to end in abutting engagement, and

laying a second row of blocks on top of said first row of blocks with an aperture of each block in alignment with an aperture of the block below, and

placing reinforcing bar or the like through the aligned apertures of two of said blocks and connecting the lower end of said reinforcing bar to a foundation, bottom plate or base member and pouring or pumping a grouting material such as concrete into said apertures or alternatively fitting clamping means to the upper end of said reinforcing bar and clamping said rows of blocks together with said clamping means.

8. A method of constructing a wall including:

placing a first layer of flexible material such as hard rubber mat on a foundation, said layer of flexible material being adapted to accommodate slight movements of the foundation;

placing a bottom plate or base member on said flexible mat;

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providing a plurality of blocks according to any one of claims 1 to 6;

laying a first row of said blocks end to end in abutting engagement on said flexible mat, and

5 laying a second row of said blocks on top of said first row of blocks , and

placing reinforcing bar or the like through the aligned apertures of two of said blocks and connecting the lower end of said reinforcing bar to said bottom plate or base member and
10 fitting clamping means such as a nut to the upper end of said reinforcing bar and clamping said rows of blocks together with said clamping means.

9. A method of constructing a wall according to claim 7 and further including placing a layer of deformable material such as
15 foamed rubber on said layer of flexible material, said layer of deformable material being adapted to deform sufficiently under the weight of the blocks to fill or at least partially fill the first and second recesses provided in the lower face of the blocks.

20 10. A method of constructing a wall according to claim 7 or claim 8 and further including pouring or pumping a grouting material such as concrete into said apertures.

11. A building block having a cylindrical outer face, opposed upper and lower faces and opposed end faces, said upper face
25 having a first surface and a second surface, said second surface being elevated with respect to said first surface and being formed by a first protuberance extending about the axis of the cylindrical outer face and a plurality of spaced apart second protuberances extending across said first protuberance;

30 said lower face having a first surface and a second surface, said second surface being elevated with respect to said first surface and being formed by a first recess extending about the axis of the cylindrical outer face and a plurality of spaced apart second recesses extending across said first recess, said
35 first and second recesses being adapted to receive therein the first and second protuberances extending of a like block, and

a central aperture extending axially through the block from said upper face to said lower face.

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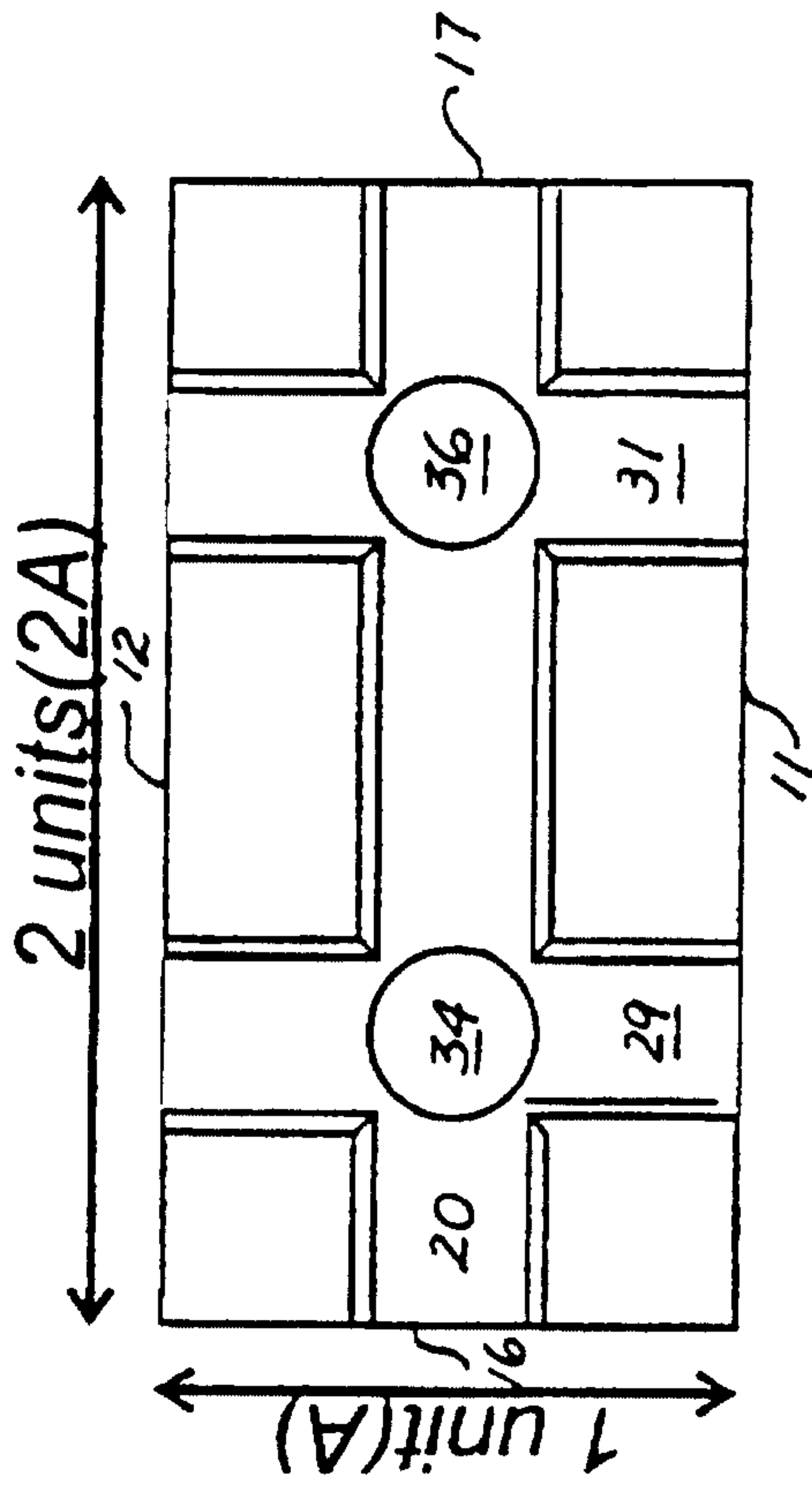


Fig 2

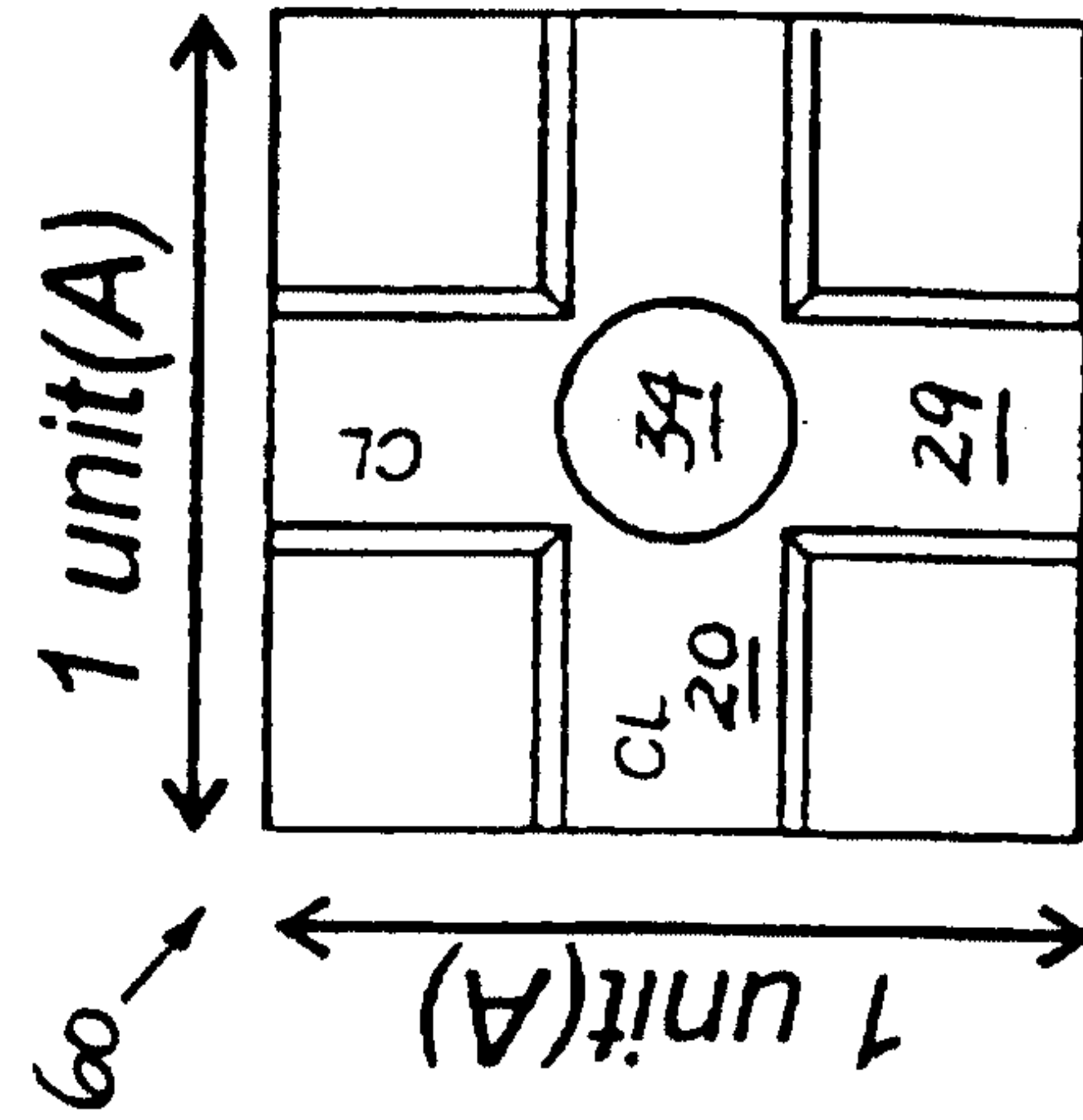


Fig 4

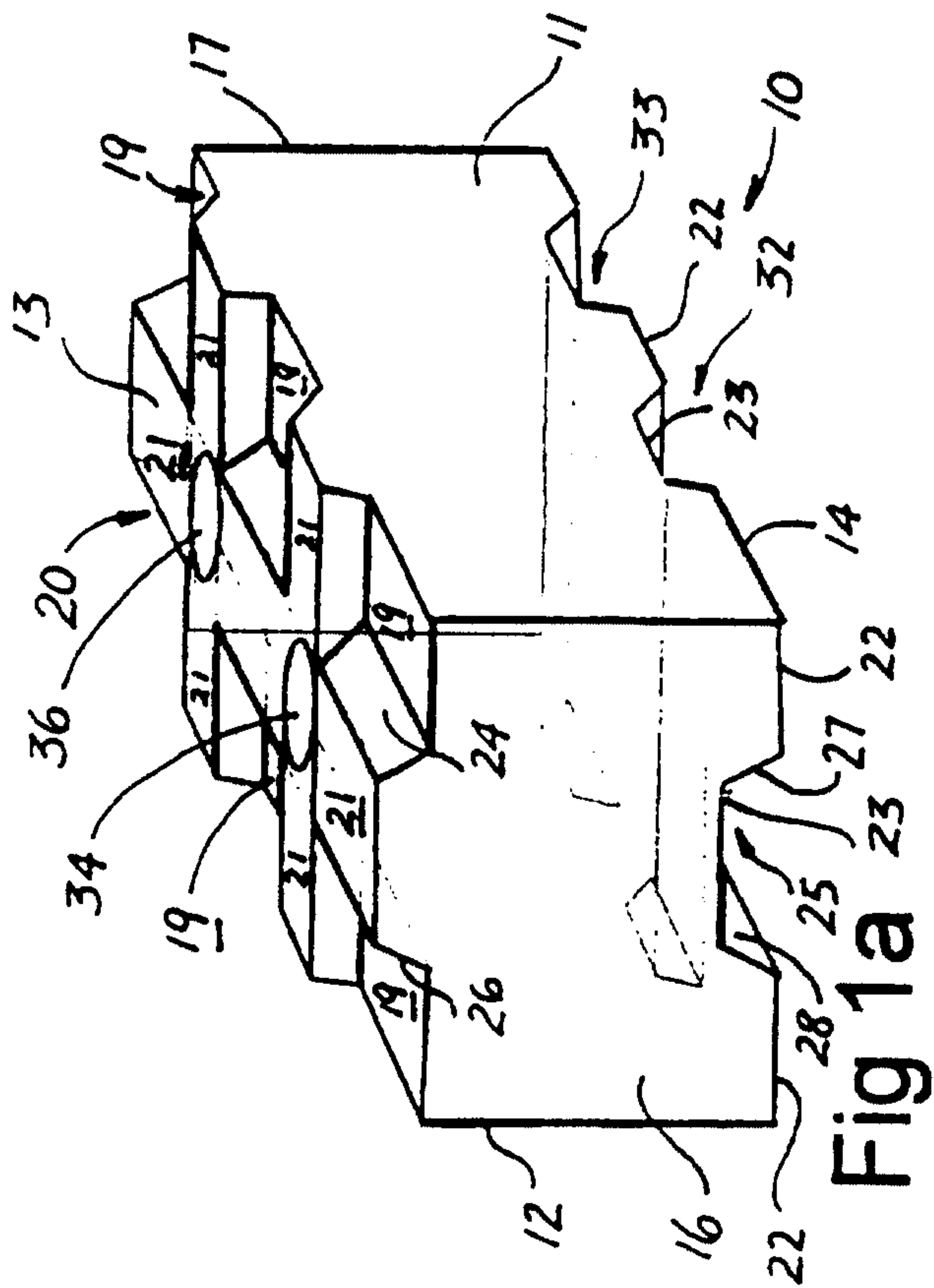


Fig 1a

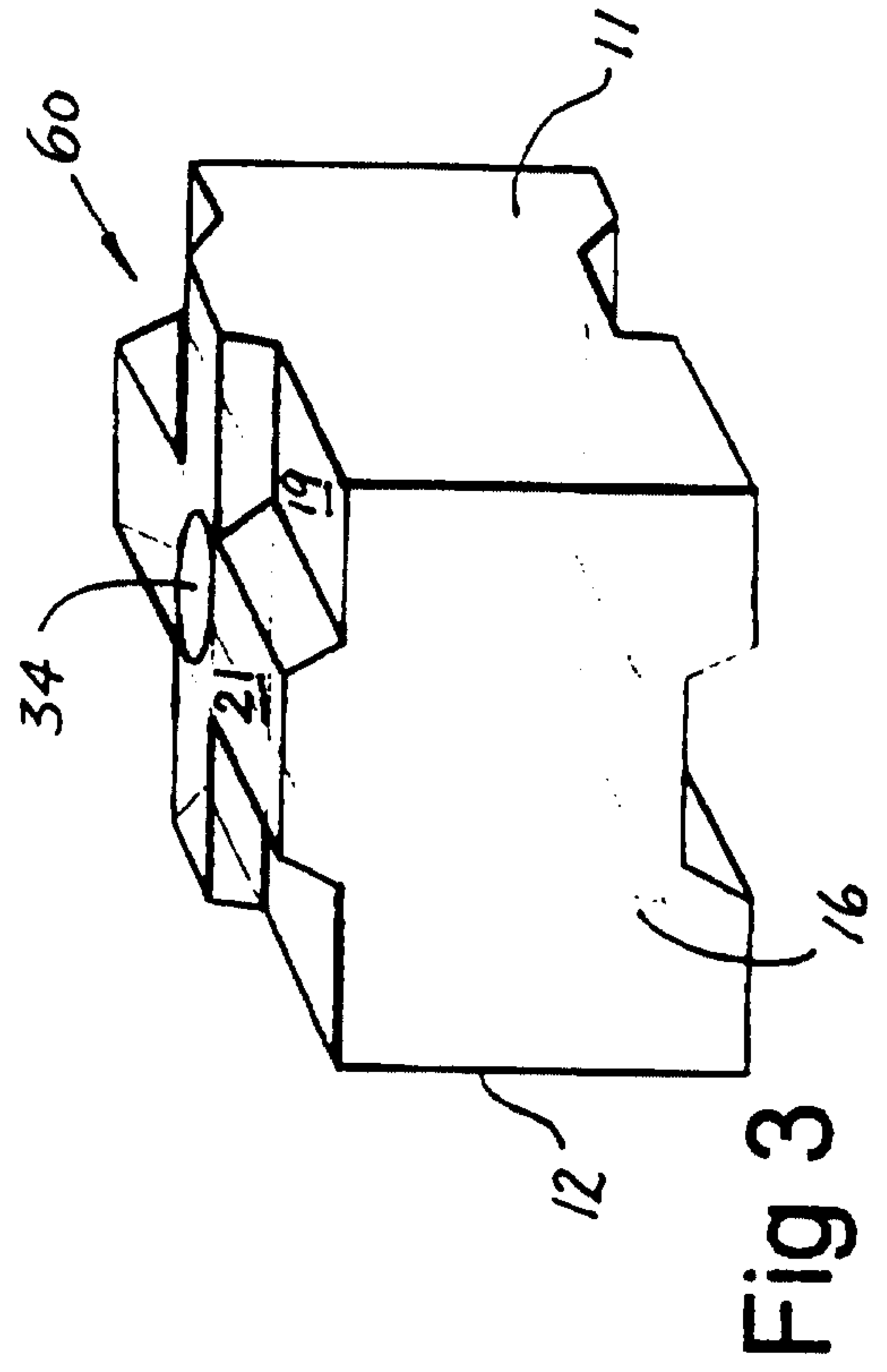
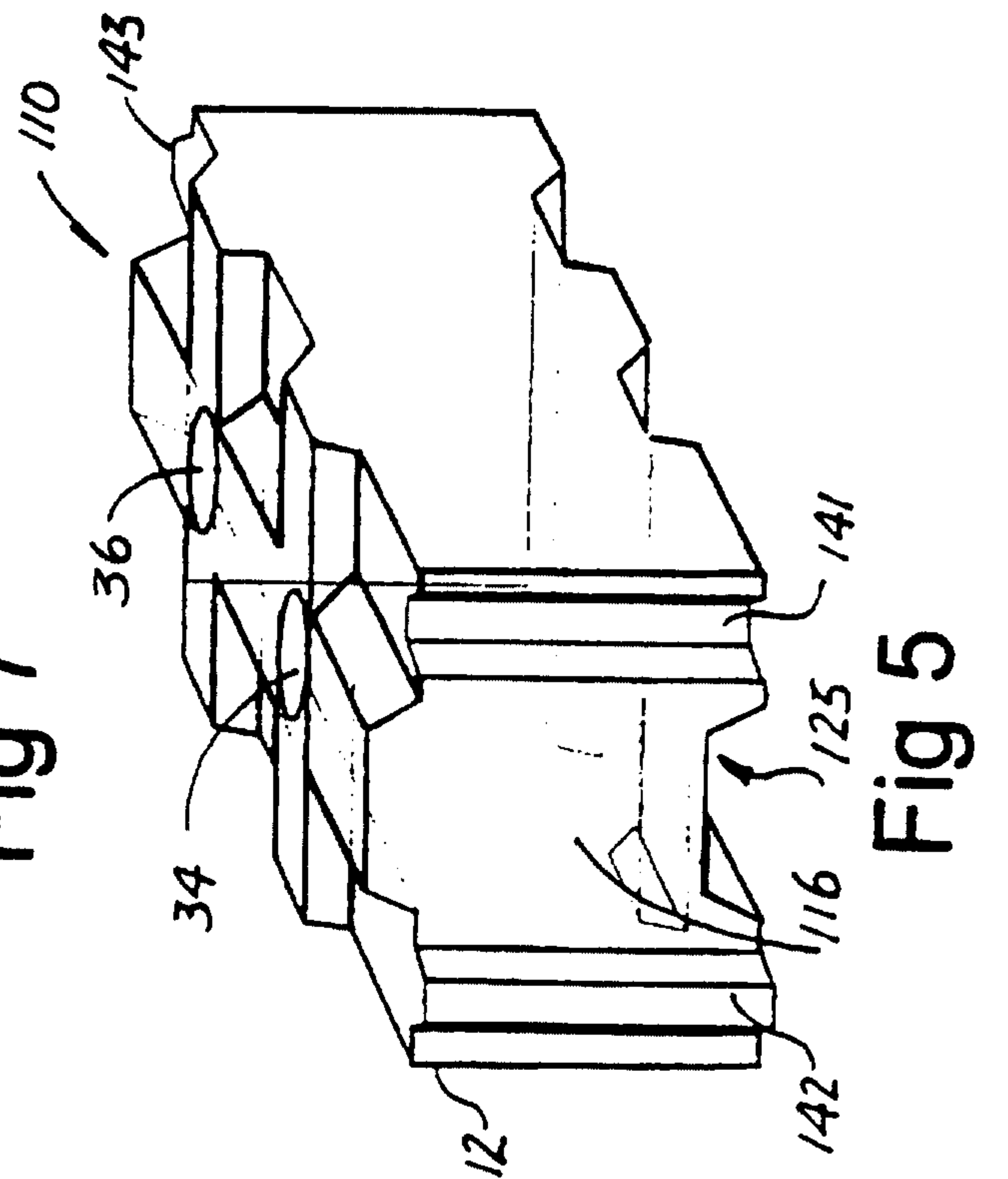
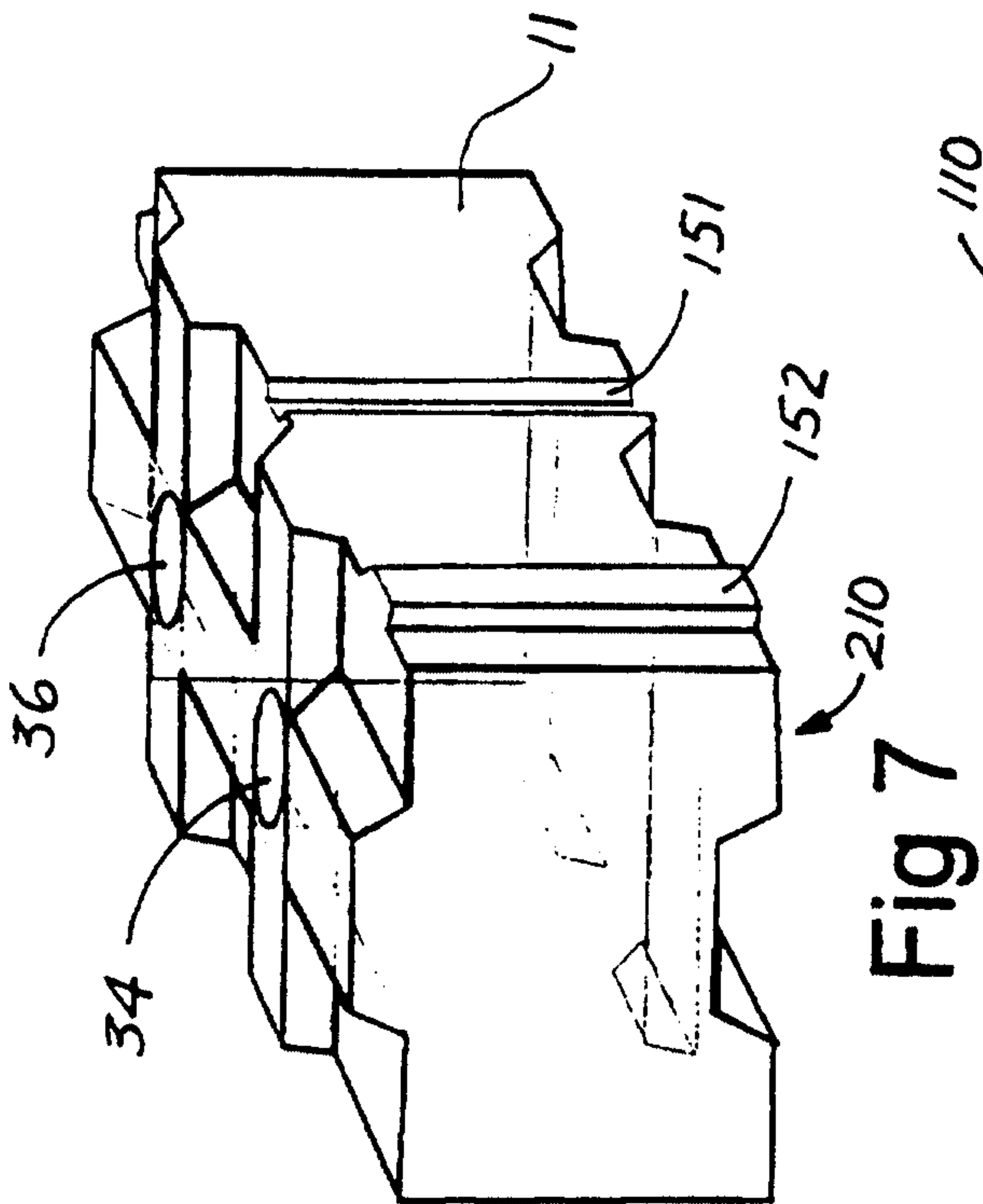
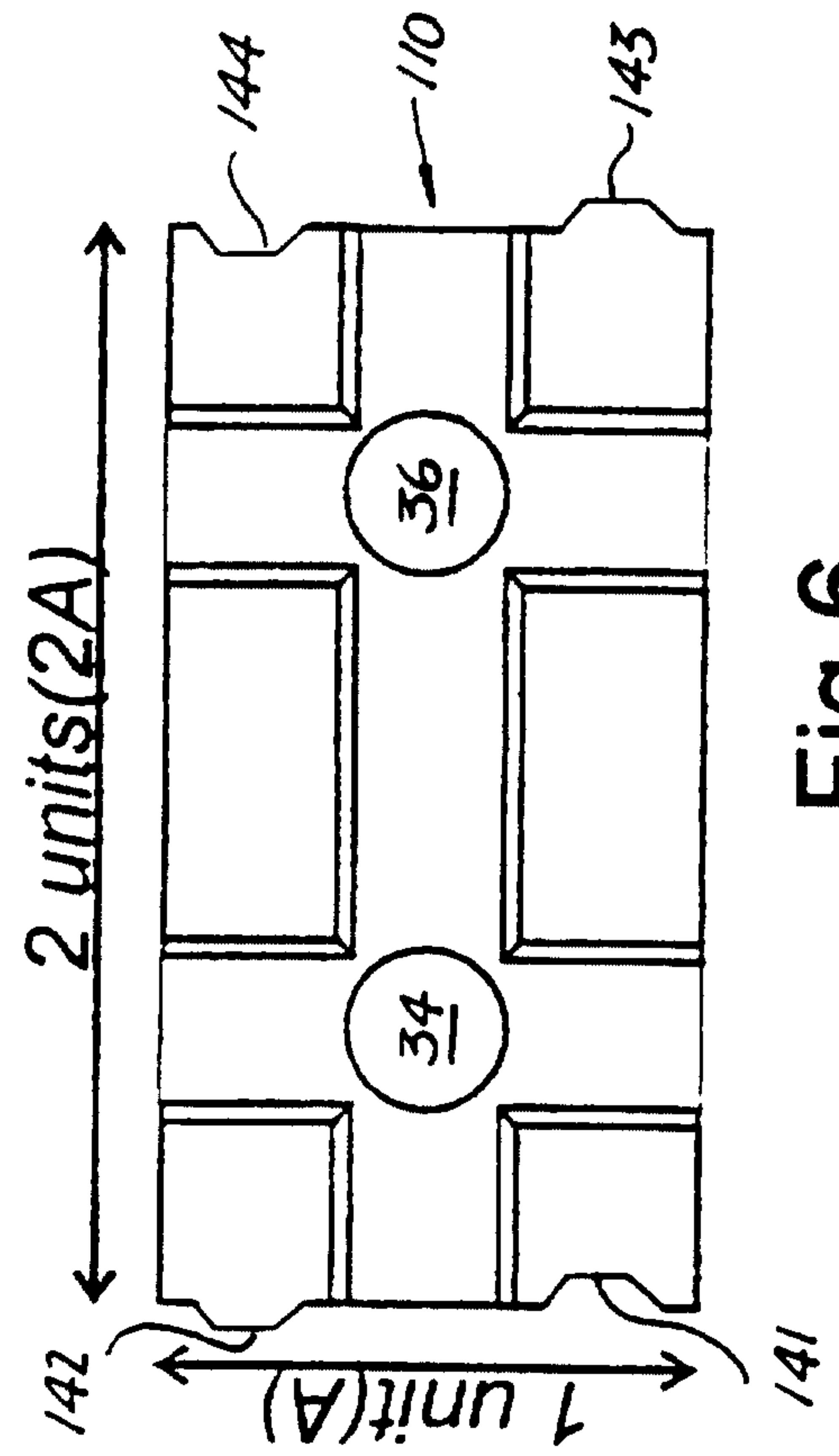
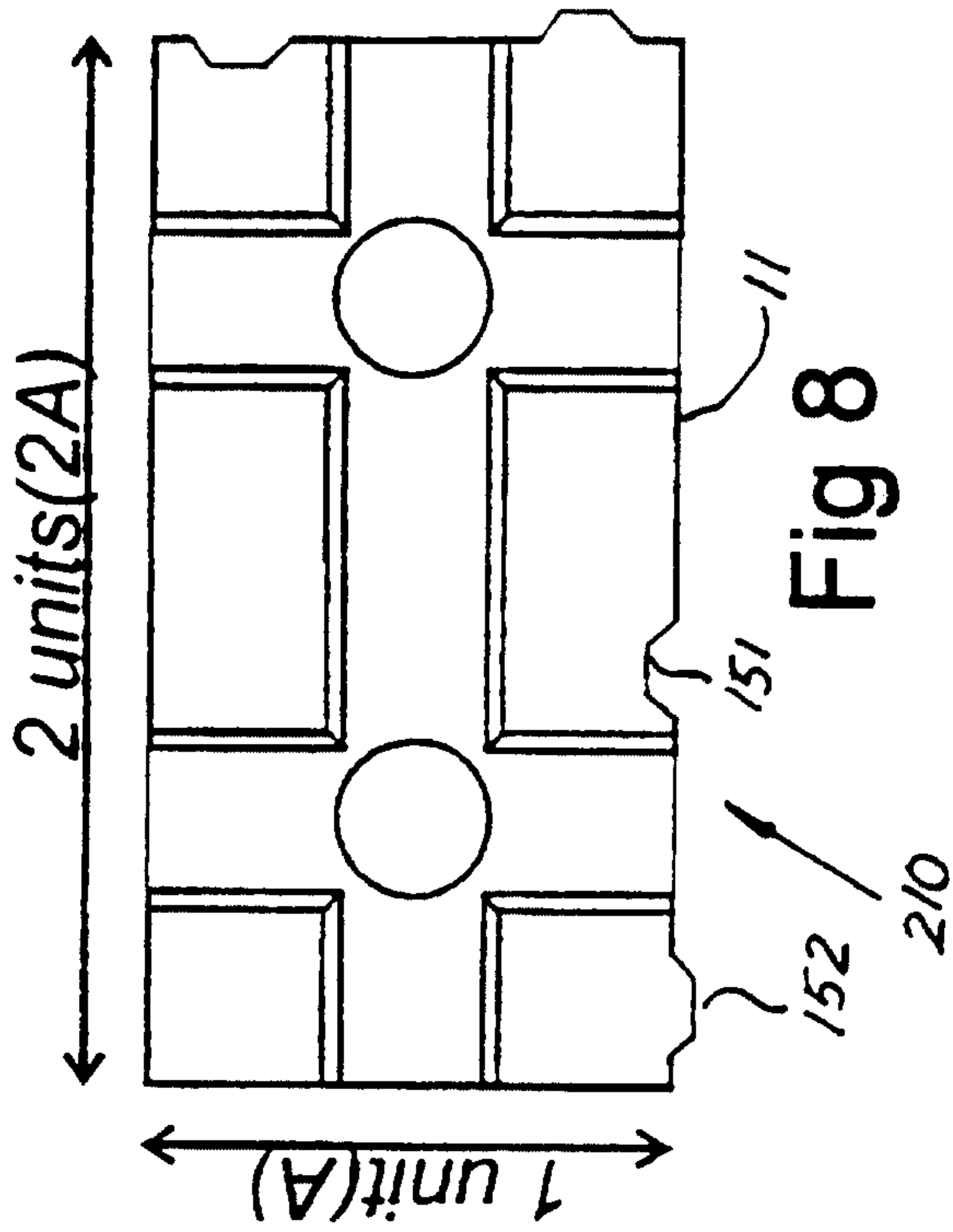
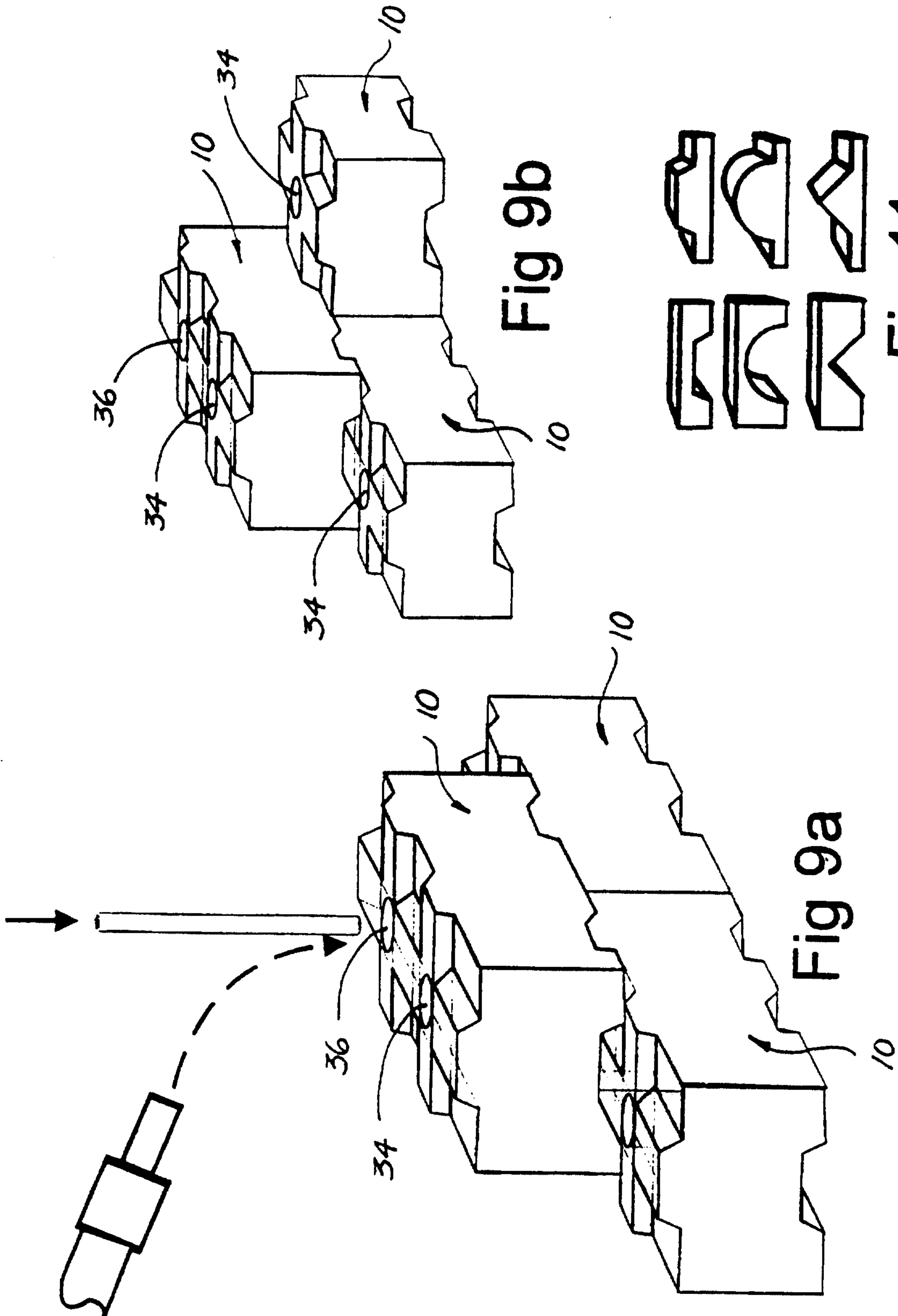


Fig 3

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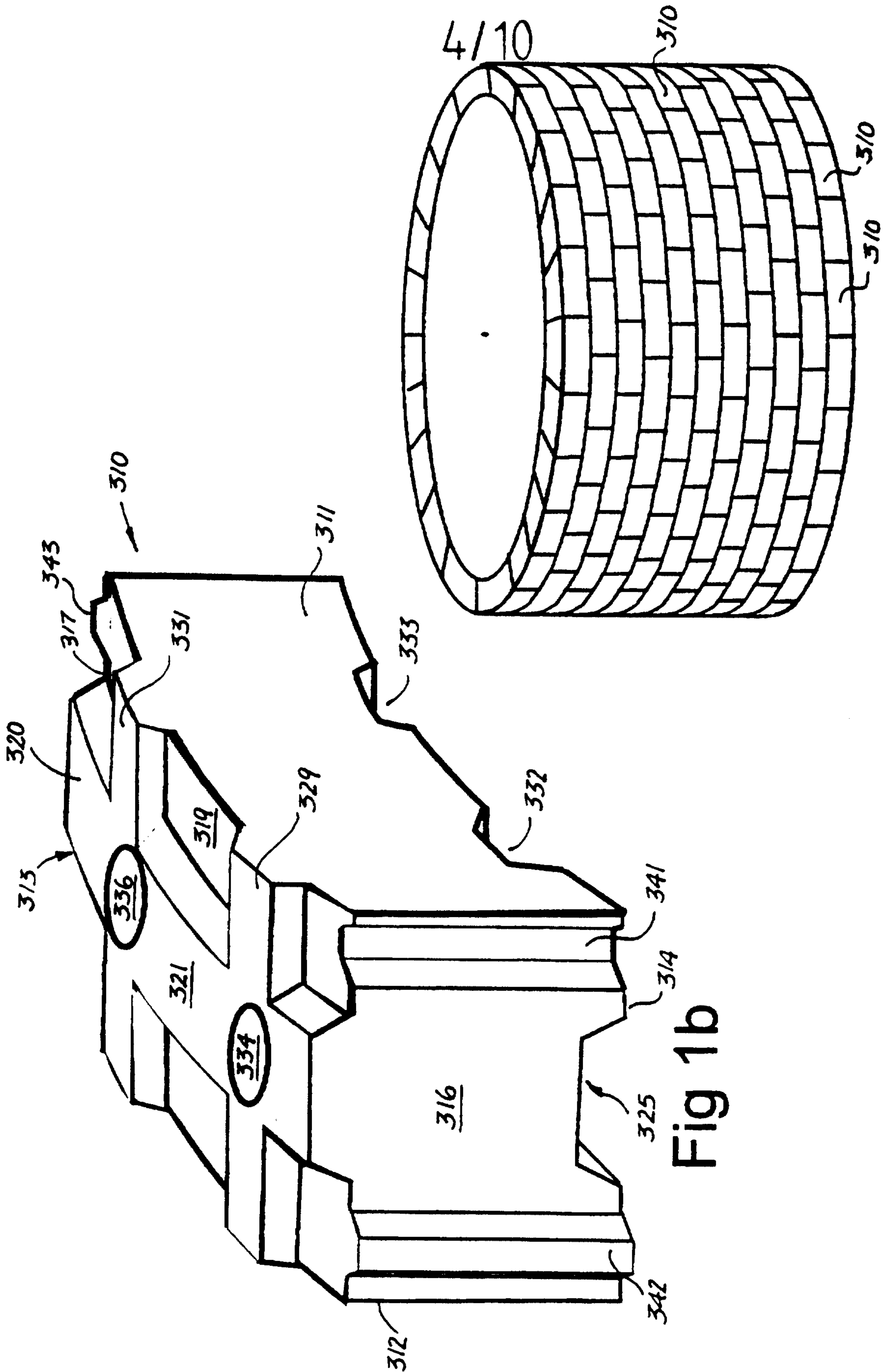
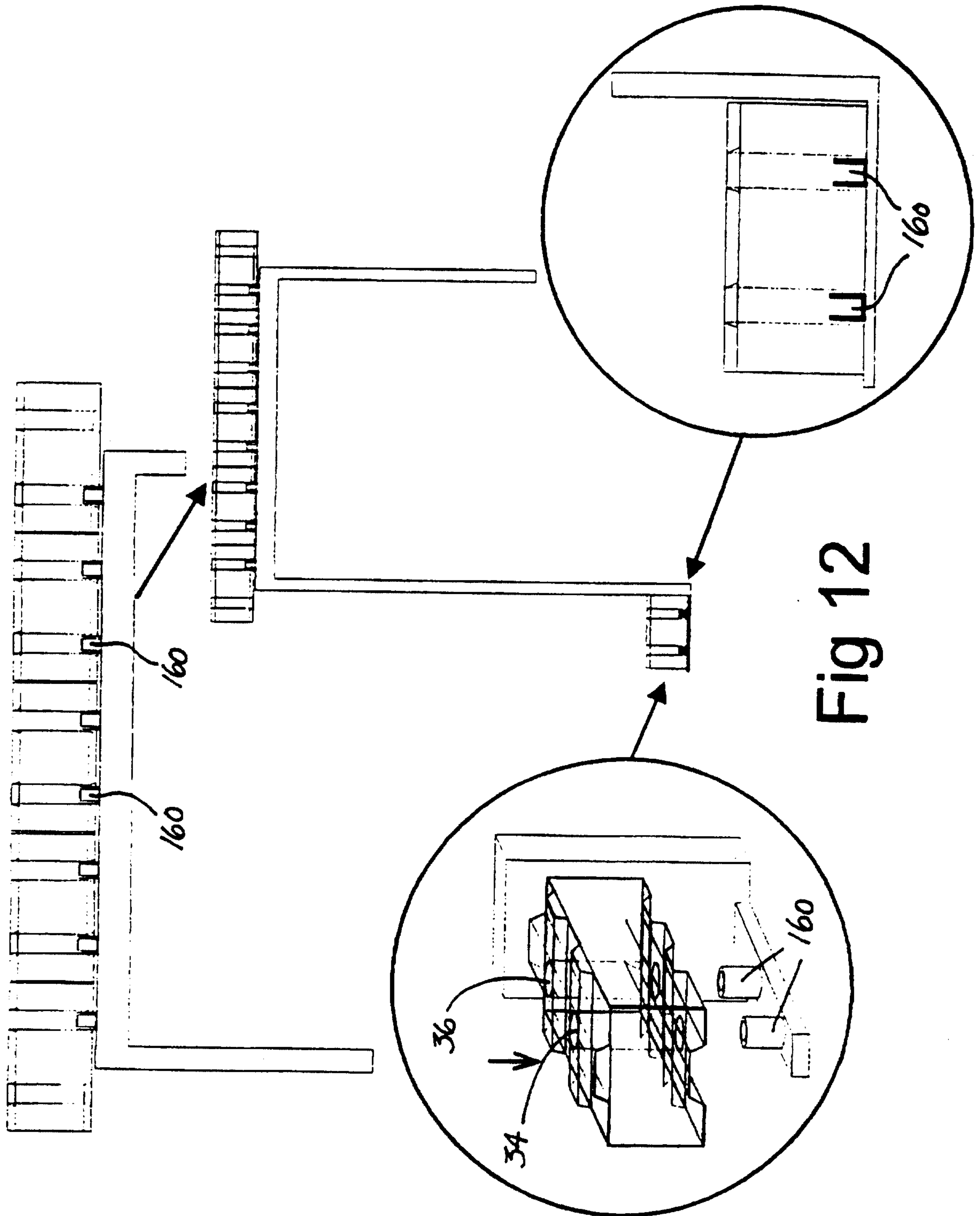


Fig 10

Fig 1b

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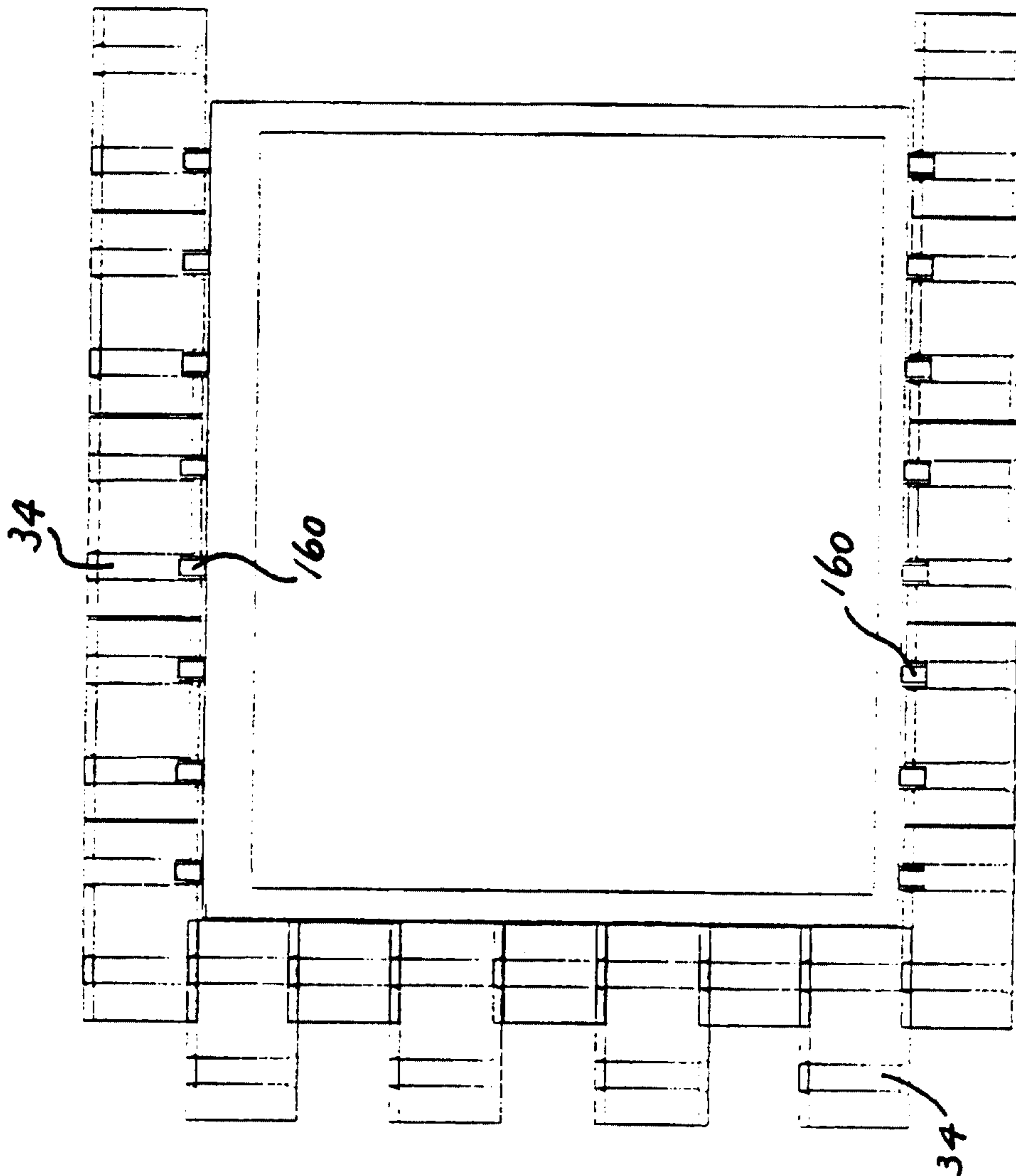


Fig 13

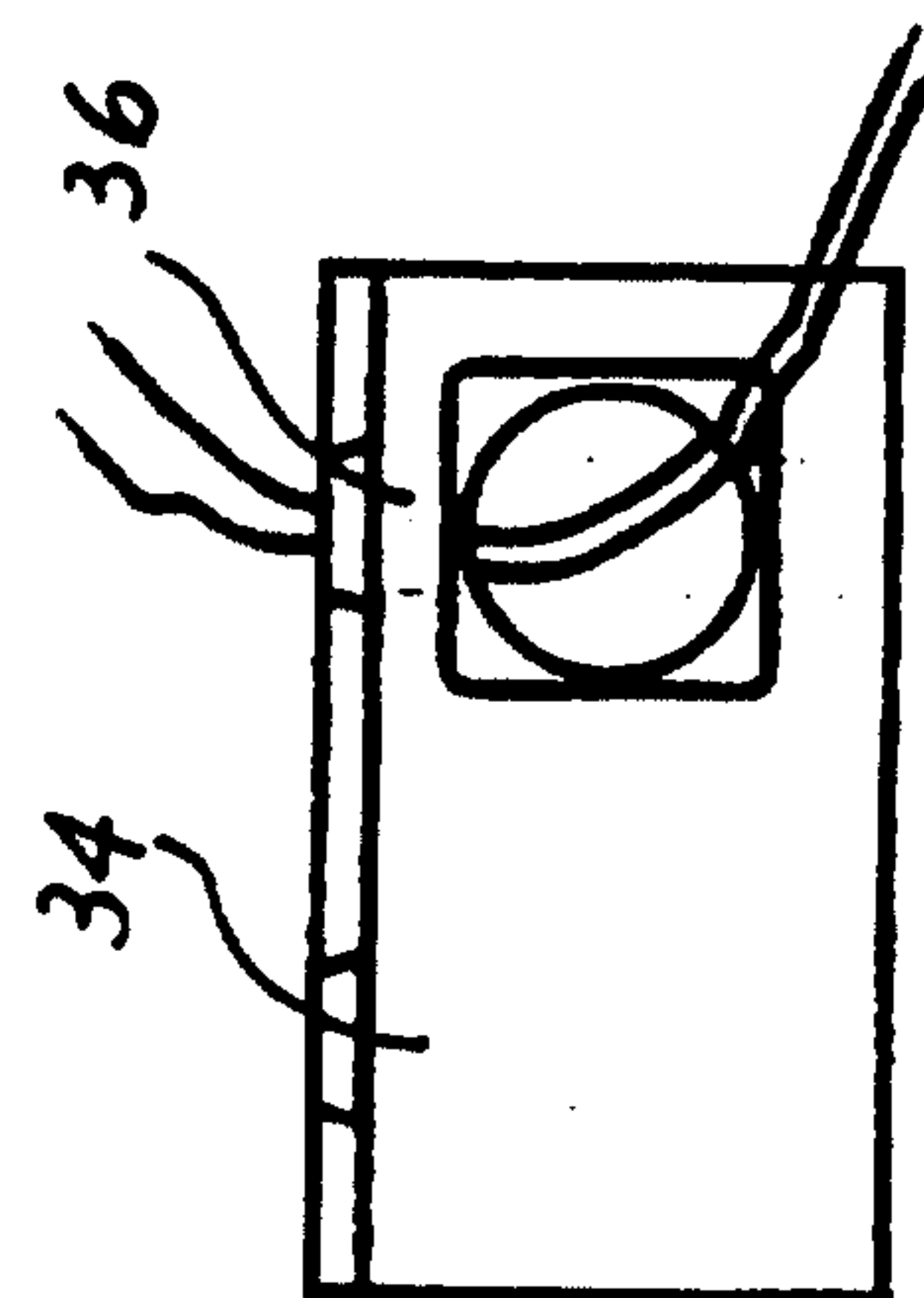
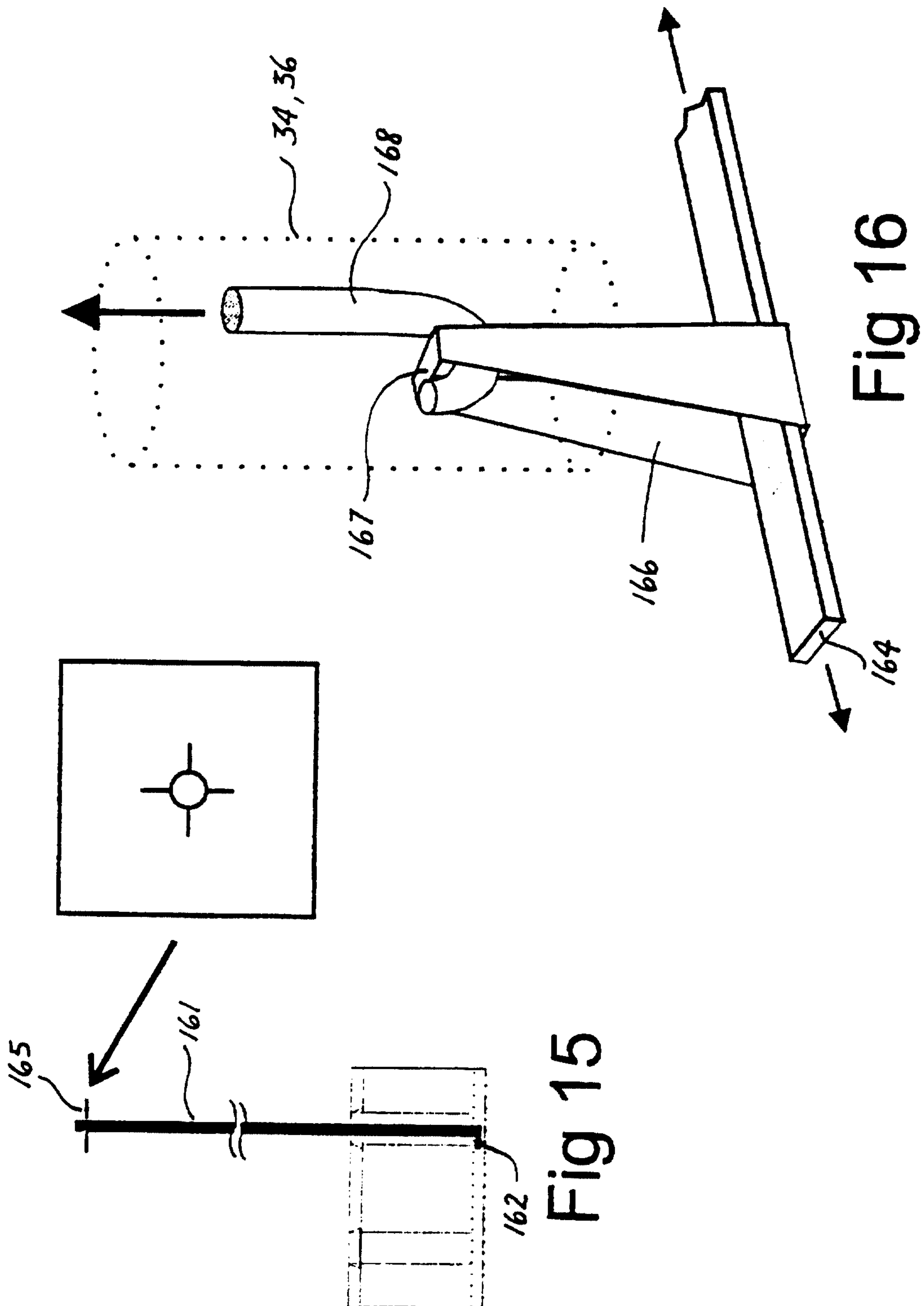
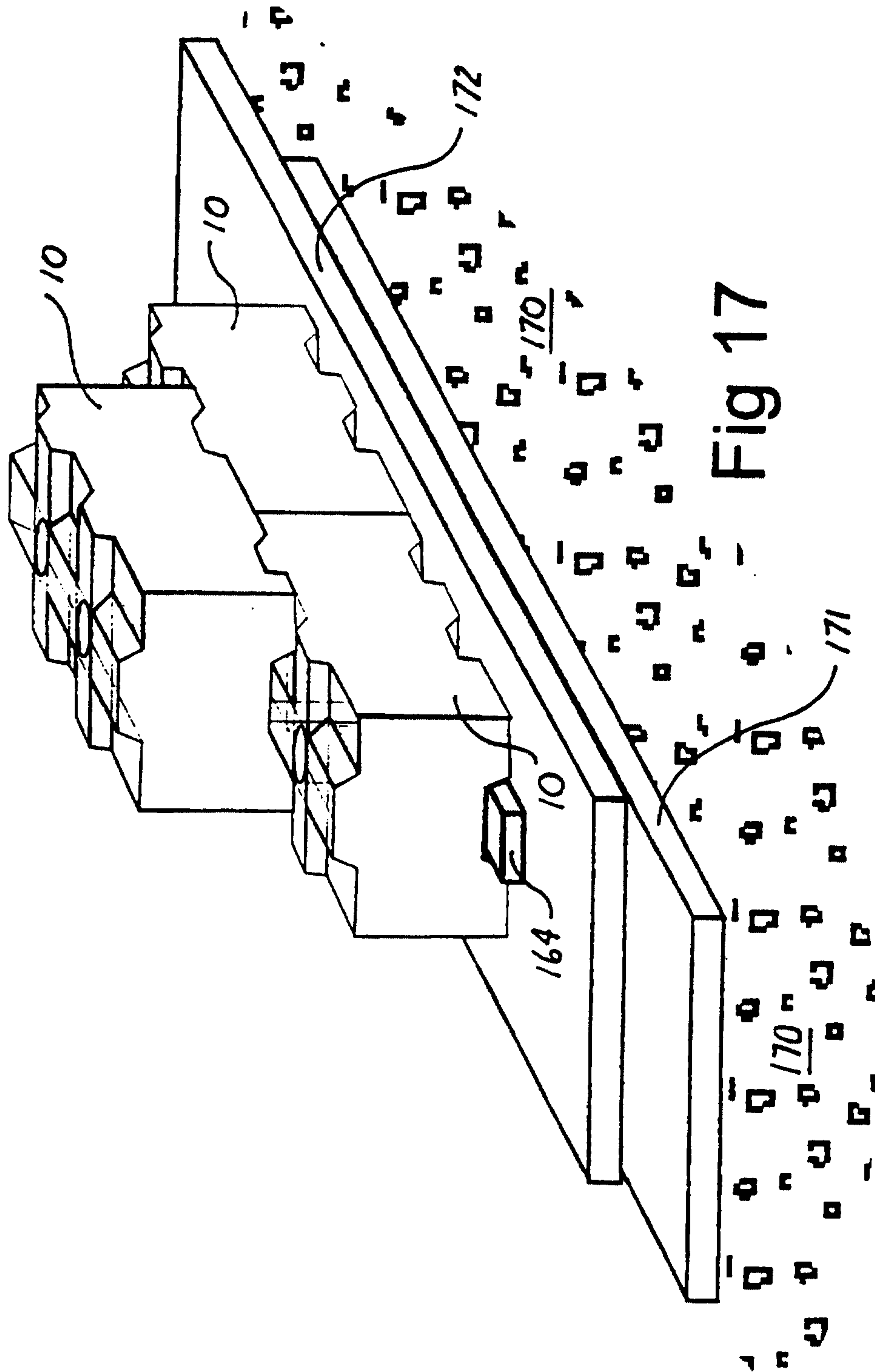


Fig 14

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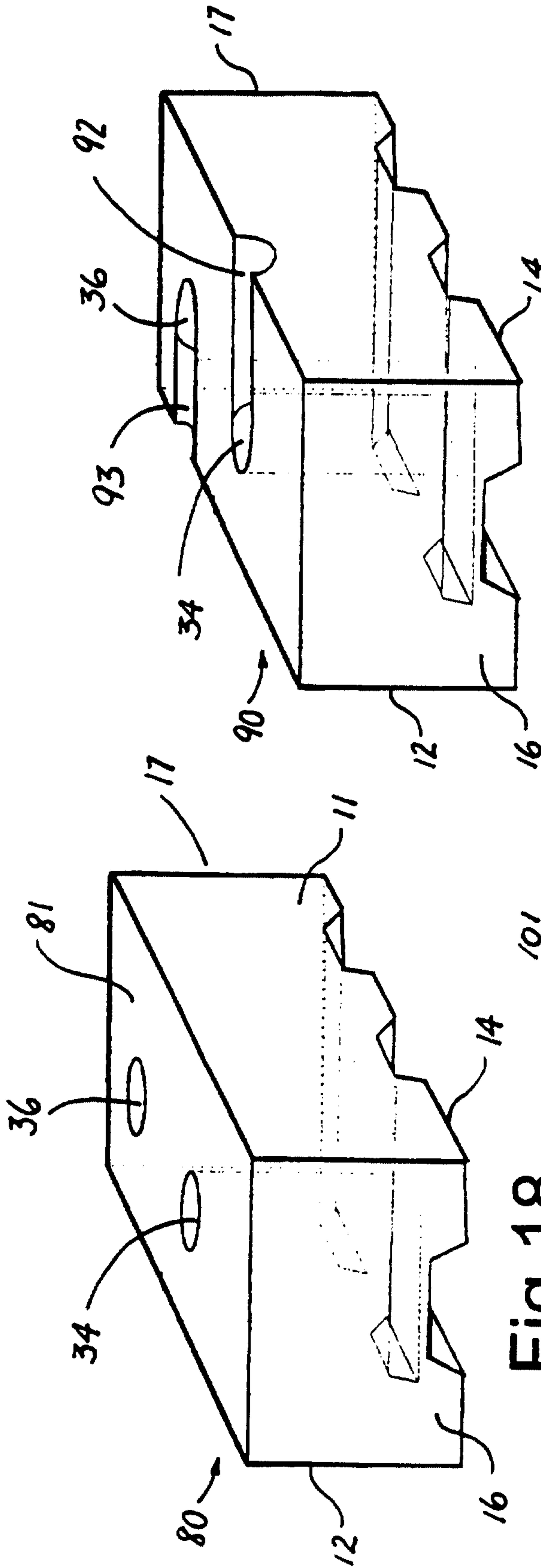


Fig 19

Fig 18

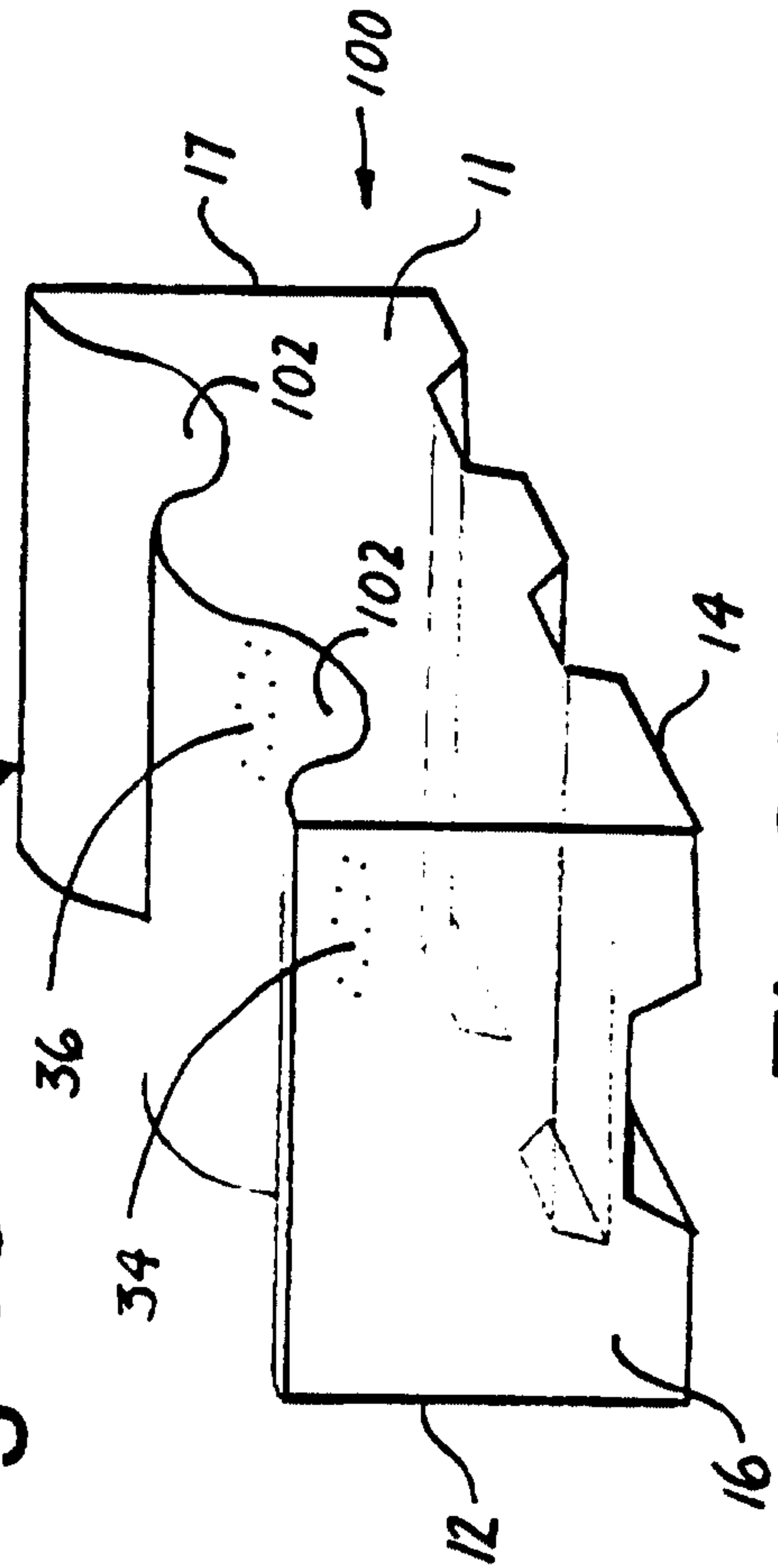


Fig 20

