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(54) Improved load-bearing bracket

(57) The present invention relates to a load bearing bracket 10 for coupling a first wall 46 to a second wall 48. The bracket 10 comprises an arm 11 having a load bearing surface 19 and a stop 16 located adjacent the load bearing surface 19; and a support member 24 having first and second limbs 26, 28, the first and second limbs 26, 28 preferably defining an obtuse angle therebetween. The first limb 26 is shaped and dimensioned for abutment against the load bearing surface 19 and against the stop 16. The load bearing surface 19 is disposed such that, in use, the second limb 28 is substantially horizontally disposed. The stop 16 is preferably shaped and dimensioned to receive a rim 37 of the first limb 26, and to substantially prevent the outward displacement of the first limb 26 from the load bearing surface 19. The stop 16 is also preferably shaped and dimensioned to enable the rim 37 of the first limb 26 to be engaged therewith, and the support member 24 to be moved about said rim 37 in order to bring the first limb 26 into register with the load bearing surface 19.

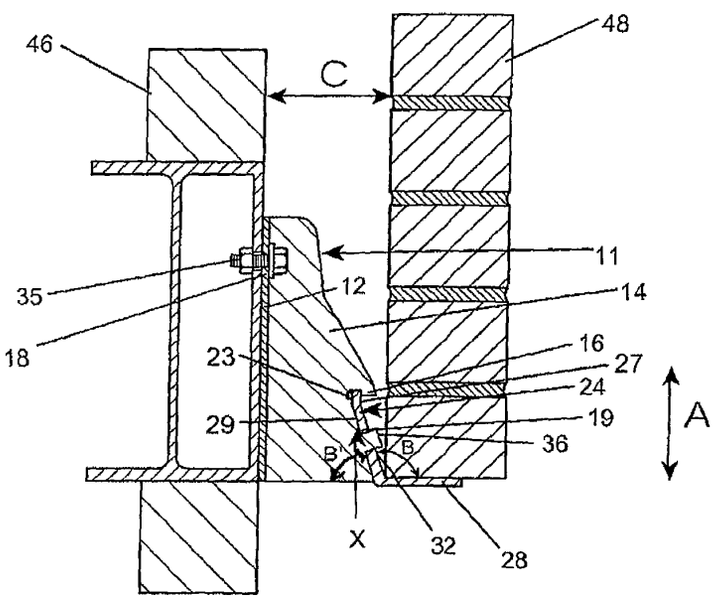

Figure 3A

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Description

[0001] The present invention relates to an improved load-bearing bracket, for example, for coupling a structural frame of a building with a spaced-apart outer wall. A cavity-walled building, or structure, has an inner structural frame and an outer wall, mutually spaced-apart by a cavity. The invention is particularly suitable for use with such cavity-walled buildings in which the structural frame is formed from concrete and the outer wall, or leaf, is formed from conventional brickwork.

[0002] It is a well known problem in cavity-walled buildings, particularly of two storeys or more, that the different physical properties of the structural frame and the outer wall cause relative movement over a period of time. For example, a concrete structural frame tends to shrink as it cures and creeps under load, while an outer wall of clay brickwork tends to expand over a period of time. It is desirable to reduce the pressure bearing down on the bricks forming the structural frame. Conventionally, a load-bearing support apparatus is employed to restrict the relative vertical movement between the structural frame and the outer wall. Typically, such an apparatus includes a load-bearing bracket which is mountable on the structural frame using a conventional bolt, nut and washer arrangement.

[0003] Such a conventional apparatus, however, is prone to problems due to the load bearing down on the apparatus. Over time, the apparatus is prone to buckling under the weight of the load. In addition, conventional brackets are generally made to bridge a specified gap between two walls. Problems arise when trying to provide a load-bearing bracket between a gap having a variable width, whilst providing a bracket with a suitable load bearing capacity.

[0004] It is also known to have conventional brackets which comprise a supporting arm and a support member. The support member comprises first and second limbs, wherein the second limb is shaped and dimensioned to be placed between two layers of bricks, in use. The supporting arm has a contact edge which is substantially vertical in use, and the support member is shaped and dimensioned so that the first limb is also substantially vertical in use. The support member is slid into place in a side-on direction to fit into the supporting arm. This construction has the disadvantage that when a single elongate support member is used with a number of supporting arms, the support member must be slid in a side-on direction to fit successively into the number of supporting arms, which tends to be difficult, and does not allow for any variance in the width of the cavity.

[0005] It is an object of the present invention to provide a load-bearing bracket which mitigates the aforementioned disadvantages of the prior art.

[0006] According to a first aspect of the present invention, there is provided a load bearing bracket for coupling a first wall to a second wall, the bracket comprising an arm having a load bearing surface and a stop adjacent the load bearing surface; a support member having first and second limbs, the first limb having opposing first and second surfaces, the first limb further having a free edge shaped and dimensioned for abutment of the first surface against the stop and the first limb being shaped and dimensioned for abutment of the second surface against the load bearing surface; wherein the load bearing surface and the stop are disposed such that, in use, the support member is located adjacent the arm by moving the free edge of the first limb until the first surface of the free edge of the first limb abuts against the stop and the opposing second surface of the first limb abuts against the load bearing surface; and means for inter-engaging the arm and the support member.

[0007] Preferably, the arm further has a recess between the load bearing surface and the stop, wherein the load bearing surface, the recess and the stop are disposed such that, in use, the first limb is located adjacent the arm by pivoting the free edge of the first limb in the recess until the first surface of the free edge of the first limb abuts against the stop and the opposing second surface of the first limb abuts against the load bearing surface.

[0008] Preferably, the securing means comprises means for reversibly inter-engaging the arm and the support member. It will be appreciated that irreversibly inter-engaging the arm and the support member is also envisaged (see the third embodiment) but is not preferred, in that the lateral (or side to side) flexibility of assembling the bracket is, thereby, lost. More preferably, the securing means comprises at least one tab projecting from one of the arm and the support member and extending, when assembled, towards the other of the arm and the support member; and at least one aperture in the other of the arm and the support member, the, or each, aperture being sized and disposed to receive the, or each, tab.

[0009] Preferably, the securing means permits side to side (or substantially horizontal) movement of the support member relative to the arm or of the arm relative to the support member.

[0010] Preferably, the stop is shaped and dimensioned to receive a rim of the first limb and so to substantially prevent the outward displacement of the first limb from the load bearing surface.

[0011] Preferably, the stop is shaped and dimensioned to enable the rim of the first limb to be engaged therewith, and the support member to be moved, preferably pivoted, adjacent said rim in order to bring the first limb into register with the load bearing surface.

[0012] Preferably, the, or each, aperture is sized to permit horizontal movement of the, or each, aperture relative to the, or each, tab.

[0013] Preferably, the arm is provided with the at least one tab and the first limb is provided with the at least one

aperture, so that, when the first limb is in register with the load bearing surface, the, or each, tab projects through the, or each, aperture. More preferably, a pair of tabs project from the load bearing surface and the first limb is provided with a pair of the apertures for receiving same.

[0014] Preferably, the first and second limbs of the support member define an obtuse angle therebetween. More preferably, the angle defined between the first and the second limb is between 92° and 150°, more preferably between 100° and 110°, and most preferably about 105°.

[0015] Preferably, the arm is substantially U-shaped in transverse cross section. Preferably, the arm is defined by a back plate and a pair of spaced apart side plates projecting therefrom. Preferably, the load bearing surface is defined by at least a portion of a free edge of each of the side plates.

[0016] Preferably, the arm is provided with at least one retaining tab projecting from the load bearing surface (contact edge), the first limb being provided with a corresponding at least one aperture through which the tab projects when the first limb is in register with the load bearing surface.

[0017] Preferably, the retaining tab projects from the free edge of each side plate, the first limb being provided with a pair of the apertures for receiving same.

[0018] Preferably, the load bearing bracket further includes a spacer plate, which is shaped and dimensioned to fit, in use, between the load bearing surface and the support member.

[0019] Preferably, the arm of the load bearing bracket includes at least one slot, which is, in use, substantially vertically disposed, which slot is adapted to receive a mounting member, wherein, in use, the slot and mounting member arrangement is suitable for mounting the bracket to the first wall.

[0020] Preferably, the bracket includes a spacer plate, which is shaped and dimensioned to fit, in use, between the side plates and the support member.

[0021] Preferably, the support member is adapted for sliding engagement relative to the arm.

[0022] Preferably, the, or each, aperture of the first limb is elongate in a horizontal plane to permit side to side movement of the first limb relative to the load bearing surface.

[0023] According to a second aspect of the invention there is provided a method for coupling a first wall to a second wall, the method comprising fixing an arm to the first wall, the arm having a load bearing surface and a stop adjacent the load bearing surface, the arm preferably having a recess between the load bearing surface and the stop; locating a support member having first and second limbs, the first limb having opposing first and second surfaces, the first limb further having a free edge shaped and dimensioned for abutment of the first surface against the stop and the first limb being shaped and dimensioned for abutment of the second surface against the load bearing surface; wherein the load bearing surface, the recess, if present, and the stop are disposed, such that the support member is located adjacent the arm, by pivoting the free edge of the first limb in the recess until the first surface of the free edge of the first limb abuts against the stop and the opposing second surface of the first limb abuts against the load bearing surface; inter-engaging the arm and the support member; and contacting the arm with the second wall.

[0024] Embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which similar numerals are used to represent like parts and in which:

Figure 1 is a perspective view of a first embodiment of a load-bearing bracket according to the invention, the bracket comprising an arm, and a support member in contact with the arm ;

Figure 2 is a perspective view of a single elongate support member, the support member being adjacent with a plurality of the arms of Figure 1;

Figure 3 is a plan view of a spacer plate, which is shaped and dimensioned to fit, in use, between the arm and the support member;

Figure 3A is a sectioned side elevation of the load-bearing bracket of Figure 1, in use, in a cavity wall structure;

Figure 4 is a perspective view of a second embodiment of a load-bearing bracket according to the invention, the bracket comprising an arm, and a support member in contact with the arm;

Figure 5 is a perspective view of a mounting member shaped and dimensioned to fit, in use, within slots provided in the arm of the bracket of Figure 4;

Figure 5A is a plan view of a blank of the mounting member of Figure 5 ;

Figure 6 is a plan view of blank of the arm of Figure 1 and of two variations of the arm;

Figure 7 is a perspective view of a third embodiment of a load-bearing bracket according to the invention, the bracket comprising an arm, and a support member in contact with the arm; and

Figure 8 is a schematic sectioned side elevation of a testing system used to test the bracket of the first embodiment.

[0025] Referring to the accompanying drawings, a first embodiment of a load-bearing bracket 10 according to the present invention comprises an arm 11 which includes an elongated back plate 12 and two spaced-apart side plates 14. The side plates 14 are integrally formed with the back plate 12 and project, in use, substantially perpendicularly forwardly from the back plate 12 but substantially parallel with one another so that the overall arm 11 is substantially U-shaped in transverse cross-section. The side plates 14 include first and second ends 15, 17. The side plates 14 are generally tapered towards the first ends 15 thereof. At a distance approximately two-thirds from the first end 15, a free edge of each side plate 14, distal the back plate 12, is shaped and dimensioned to form a lip which forms, in use, a stop 16. The stop 16 has an inner wall 21, as shown, for example, in Figure 6. There is a recess 23 intermediate a load bearing surface 19 (contact edge) and the stop 16. The recess 23 is generally beneath a notional rectilinear extrapolation beyond the load bearing surface 19 and is opposite the inner wall 21.

[0026] A portion of each of the side plates 14 between the stop 16 and the second end 17 has the load bearing surface which, together with the tabs/apertures to be described hereunder, generally comprise the contact edge 19. The side plates 14 are tapered along at least a portion of the contact edge 19 between the second end 17 and the stop 16, towards the first end 15. Optionally, the whole of the contact edge 19 may be tapered towards the first end 15. The tapering of the side plates 14 along the contact edges 19 can be defined by the angle B' formed between the respective second ends 17 and contact edges 19 (see Figure 3A).

[0027] The angle B' is preferably an acute angle which is preferably from approximately 30° to about 88°, further preferably from approximately 70° to approximately 80°, and most preferably approximately 75°. The arm 11 is preferably made from stainless steel, however any other suitable material may be used.

[0028] A pair of vertically spaced mounting apertures 18, 20 are formed in the back plate 12. The mounting apertures 18 , 20 are elongate in shape and have respective longitudinal axes which are substantially parallel with one another and perpendicular to a load bearing direction A, as shown in Figure 1. The mounting apertures 18, 20 are preferably substantially obround in shape.

[0029] A positioning aperture 22 is also formed in the back plate 12, spaced from the mounting apertures 18, 20, as shown, for example, in Figure 6 (positioning aperture 22 not visible in Figure 1). The positioning aperture 22 is elongate in shape and has a longitudinal axis which is substantially vertical, i.e. substantially parallel to the load bearing direction A. Preferably, the positioning aperture 22 is substantially obround in shape.

[0030] First and second projections in the form of tabs or retaining tabs 34, 36, preferably extend from the contact edges 19 of the side plates 14 in substantially the same plane as the side plates 14. The retaining tabs 34, 36 are located along the contact edges 19 approximately 1-2 cm from the second end 17 of the side plates 14, but their location is not limited thereto. Thus, it will be appreciated that, with the exception of the projecting retaining tabs 34, 36, the side plates 14 are tapered from the second end 17 towards the first end 15, at least as far as the stop 16.

[0031] The bracket 10 also comprises a load-engaging member in the form of a support member 24. The support member 24, which is preferably made from stainless steel, includes a first limb 26 having first and second opposing surfaces 27, 29 and a second limb 28. The first and second limbs 26, 28 are so disposed relative to one another that an obtuse angle B exists between the limbs 26, 28, as shown in Figure 1. The obtuse angle B is preferably approximately 92 - 150°, preferably 100 - 110°, more preferably 103 - 107°, most preferably about 105°. Thus, the angles B' and B, respectively, ensure that the contact edges 19 and the first limb 26 of the support member 24 are shaped and dimensioned for a complementary fit with each other, as will be described in more detail hereinafter. It will be appreciated that the angle B' is only preferably an acute angle, and is not limited thereto. What is more important is to preferably ensure that the second limb 28 is substantially horizontally disposed, in use. The support member 24 further comprises first and second apertures 30, 32, which apertures 30, 32 are shaped and dimensioned, in use, to releasably locate the respective first and second retaining tabs 34, 36 of the arm 11 and to permit limited pivotable movement of the apertures 30, 32 about the tabs 34, 36.

[0032] The bracket 10 may also optionally comprise a spacer plate 42, which spacer plate 42 is substantially rectangular in shape, having two indentations 44 as shown in Figure 3. The spacer plate 42 is relatively thin, and is constructed and adapted to enable the indentations 44 to be seated about the inner edges of the retaining tabs 34, 36, in use, such that the spacer plate 42 is releasably engaged therein. It will be appreciated that the support member 24 is generally formed from stainless steel, or the like, of uniform thickness, the thickness being chosen to firmly engage between the stop 16 and the contact edge 19. However, if the support member 24 is made from material thinner than would firmly engage between the stop 16 and the contact edge 19, the spacer plate 42 is releasably engaged with the arm 11 as previously described herein, prior to engaging the support member 24 with the arm 11. In this manner, the spacer plate 42 is retained between the arm 11 and the support member 24, in the approximate location marked X in

Figure 3A, thus enabling a thinner support member 24 to have a secure fit with the arm 11.

[0033] In use, and referring now to Figure 3A, the arm 11 is mounted to a first wall 46, such as an inner structural frame, with the longitudinal axis of the back plate 12 substantially vertical, i.e. substantially parallel to the load-bearing direction A, as shown in Figures 1 and 3A.

[0034] Once the arm 11 is in the desired position against the first wall 46, the user then inserts at least one positioning nail (not shown) through the positioning aperture 22 to temporarily hold the arm 11 in the approximate desired location. The length of the positioning aperture 22 is greater than the diameter or width of the positioning nail so that the nail is insertable through the positioning aperture 22 in a number of vertically spaced-apart locations.

[0035] The mounting apertures 18, 20 are shaped and dimensioned to receive a load-bearing bolt 35, or other suitable fixing element. Once the arm 11 has been approximately positioned with at least one positioning nail or the like (not shown), the user can select either of the vertically separated mounting apertures 18, 20, and can further select where, in a number of horizontally spaced-apart locations, to insert the bolt 35. Since the horizontal width of each mounting aperture 18, 20 is greater than the diameter or width of the bolt 35, the bolt 35 is insertable through either one of the mounting apertures 18, 20 in more than one horizontally spaced-apart location. Typically, the horizontal width of the mounting apertures 18, 20 is 2-3 times greater than the diameter of the load-bearing bolt 35. The vertical height of the apertures 18, 20 is preferably substantially equal to, or slightly greater than, the diameter of the bolt 35.

[0036] Referring now to Figure 4, a load-bearing bracket 110 according to a second embodiment of the invention comprises an arm 111 and a support member 124 as previously described herein. However, instead of comprising the pair of vertically spaced-apart mounting apertures 18, 20 and the positioning aperture 22, the back plate 112 includes a single elongate aperture 60 having a longitudinal axis which is substantially vertical, i.e. substantially parallel to the load bearing direction A. Preferably, the elongate aperture 60 is also substantially obround in shape.

[0037] The side plates 114 are also provided with first and second elongate slots 62, 64, located where the respective side plates 114 abut the back plate 112, as shown in Figure 4. The slots 62, 64 are substantially vertical, i.e. substantially parallel to the load bearing direction A. Each of the slots 62, 64 is provided with one or more notches 66 (three are illustrated but the invention is not confined thereto) extending substantially perpendicular to the longitudinal axis of the slots 62, 64 and extending away from the back plate 112. The back plate 112 is also provided with four grooves 68, in a direction substantially orthogonal to the slots 62, 64, adjacent the otherwise free ends of the slots 62, 64. The grooves 68 are present to prevent any buckling of the material of the arm 111, during construction, when the material forming a blank of the arm 111 is bent so as to form the side plates 114 extending from the back plate 112.

[0038] A mounting member 70 is also provided for use with the bracket 110 of the second embodiment, as shown in Figure 5 and as shown by a blank of the mounting member 70 in Figure 5A. The mounting member 70 is preferably substantially tetragonal in plan, having first and second sides 72, 74 disposed between first and second ends 76, 78. The mounting member 70 preferably tapers along the second side 74 towards the first end 76 as shown in Figure 5, however, it will be appreciated that this is not necessarily an essential feature of the invention.

[0039] The mounting member 70 is provided with an elongate, preferably substantially obround, mounting hole 80 in a base 82 of the mounting member 70. The longitudinal axis of the mounting hole 80 is located at an angle with respect to the first side 72 and/or to the second end 78. In the present embodiment, the longitudinal axis of the mounting hole 80 is located such that it is substantially parallel to the second side 74, although it is not so limited. The first side 72 and the second end 78 are both provided with a lip 84 extending preferably orthogonally therefrom. The lips 84 are constructed so that they have a height over the base 82, which is slightly less than the length of the notches 66 present in the side plates 14.

[0040] In use, and referring to Figures 4 and 5, the arm 111 is mounted to a first wall (not shown), with the longitudinal axis of the back plate 112 substantially vertical. Once the arm 111 is in the desired position against the first wall, the user may insert a positioning nail (not shown) through the aperture 60, if desired, as hereinbefore described.

[0041] The aperture 60 is also shaped and dimensioned to conveniently receive a load-bearing bolt (not shown), or other suitable fixing element. Once the arm 111 has been approximately positioned, the mounting member 70 is used to provide a secure and accurate location for the bolt. The user can select any one of the vertically spaced-apart notches 66. The mounting member 70 is aligned with the arm 111 such that the lip 84 of the first side 72 is positioned so as to be entered through one of the notches 66. As the mounting member 70 is inserted into the arm 111, the lip 84 passes through a pair of opposed notches 66 provided in the first and second slots 62, 64. The respective heights of the lip 84 and lengths of the notches 66 are such as to enable the lip 84 to easily pass through the notches 66, whilst being in register with the notches 66 for a precise fit.

[0042] As the mounting member 70 is pushed through the arm 111, the mounting hole 80 overlaps the aperture 60 in a number of different vertically spaced-apart locations along the aperture 60. As the mounting member 70 is slid further into the arm 111, moving in a direction from right to left with reference to Figure 4, the overlap of the aperture 60 with the mounting hole 80 provides a hole (not shown) which moves vertically in a direction towards the second end 117 of the arm 111. The height and width of the hole created by the overlap of the aperture 60 with the mounting hole 80 is preferably substantially equal to, or slightly greater than, the diameter of the bolt. Once the mounting member

70 has been inserted into the arm 111 so as to reach the desired location, the bolt is fastened in the hole created by the overlap. The lip 84 of the second end 78 prevents the mounting member 70 from passing all the way through the arm 111 - the mounting member 70 is only free to move through the arm 111 until the lip 84 of the second end 78 abuts against the side plate 114 adjacent the first slot 62. It will be appreciated that the lip 84 of the second end 78 could be omitted.

[0043] Thus, it will be apparent that the arm 111 of the second embodiment provides a mounting arrangement which is precise and accurate. Furthermore, the engagment of the mounting member 70 with the arm 111 prevents the bracket 110 from slipping over time, since the hole through which the bolt is inserted is not wide enough to enable any slipping of the bolt therein. It will be further apparent that the mounting member 70 may be used on its side, such that the lip 84 of the second end 78 would be inserted into opposed notches 66 of the second and first slots 64, 62, i.e. from left to right referring to Figure 4. In this embodiment, the lip 84 of the first side 72 could be omitted.

[0044] Following the securing of the arm 11 ; 111 to the first wall 46, the support member 24; 124 is held in front of the arm 11; 111 (or arms 11; 111, shown in Figure 2) with the apertures 30; 130, 32; 132 in registry with the retaining tabs 34; 134, 36; 136. An otherwise free rim 37; 137 of the support member 24; 124 is firstly pivoted towards the arm 11; 111, into the recess 23; 123 (the latter 123 not visible but present) and then away from the arm 11 ; 111 so as to bring the first surface 27; 127 into contact against the inner wall 21 ; 121 of the stop(s) 16; 116 and so as to bring the second surface 29; 129 into contact with the load bearing surface 19; 119, while simultaneously pivoting the aligned apertures 30; 130, 32 ; 132 about the retaining tabs 34; 134, 36; 136, thereby effecting a secure, but releasable, fit. The stop 16; 116 thus prevents the outward displacement of the first limb 26; 126 from the contact edge 19; 119 (or the load bearing surface).

[0045] The apertures 30; 130, 32; 132 are dimensioned to enable the support member 24; 124 to have pivotable contact about the tabs 34;134, 36 ; 136, and relative to the arm 11 ; 111. This pivotable contact, together with the shape of the recess 23, enable the support member 24; 124 to have a "rocking" motion adjacent the stop 16; 116, and further enable the support member 24; 124 to be removed when required.

[0046] It will be apparent that the sum of the angles B and B' is preferably 180°. It will be further apparent that if a support member 24; 124 of a greater obtuse angle B is desired, the arm 11; 111 will tend to have a smaller acute angle B' so as to form a total sum of 180°. However, it will also be apparent that the angles B, B' are not limited to having a sum total of 180° - for example, the arm 11 ; 111 may be adapted so that the angle B' is no longer an acute angle.

[0047] The pivotable contact of the support member 24; 124 adjacent the stops 16; 116, and the associated movement about the retaining tabs 34; 134, 36; 136, is clearly advantageous in the assembly of the bracket 10. Due to the pivotable contact, the support member 24; 124 is releasably engagable with the arm 11 ; 111 by a number of different engaging methods. Many conventional brackets are limited to contacting an arm (not shown) with an support member (not shown) by sliding a leading edge (not shown) of the support member into a slot provided on the arm, thereby approaching the arm in a "side-on" manner. Such an engaging method is not always easy to carry out in practice, and would present problems, for example, if a single elongate support member 24 and a plurality of arms 11 is used, as shown in Figure 2. In contrast, the pivotable contact of the present invention provides enough "play" between the support member 24 and the arm 11, to enable the support member 24 to engage the arm 11 by approaching the arm "front-on".

[0048] It is an important feature of the present invention that, after the arm 11 ; 111 is fixed to the first wall 46;146, the support member 24 ;124 is both contacted with the arm 11 ; 111 and inter-engaged therewith by moving the support member 24;124 generally towards the arm 11 ; 111/ first wall 46 ; 146 i.e., by positioning the support member 24 ; 124 substantially parallel to, but spaced-apart from, the arm 11 ; 111 on the first wall 46 ; 146 and by then moving the support member 24 ; 124 in a generally horizontal direction towards the arm 11 ; 111 and into contact and interengagement therewith. The movement of the support member 24 ;124 towards the arm 11 ; 111/ / first wall 46 ; 146 is in a generally horizontal direction which is at substantially right angles to the usually substantially upright or vertical plane defined by the first wall 46; 146. This teaching is also applicable to the third embodiment to be described hereunder. The subsequent pivotable movement of the support member 24;124 as it enters the recess 23;123 and is pivoted back to contact the stop 16;116 and the load bearing surface 19;119 whilst pivoting about the tabs of the reversible inter-engaging means is in a plane which is substantially at right angles both to the plane defined by the first wall 46 ; 146 and to the plane defined by the initial movement of the support member 24 ; 124 towards the arm 11 ; 111 / first wall 46 ; 146. It is these structural features which facilitate the contacting and inter-engaging of the arm and the support member from a position in front of the first wall 46; 146 i.e. at right angles to the first wall 46;146, rather than a contacting and/or inter-engaging step which is effected by a relative movement which is in a plane substantially parallel to the plane defined by the first wall 46;146. Either a contacting step or an inter-engaging step or both which is/are effected by a relative movement which is in a plane substantially parallel to the plane defined by the first wall 46; 146 is not intended to be part of the present invention.

[0049] Although Figure 2 illustrates the arm 11 and support member 24 of the first embodiment, it will be appreciated that the arm 111 of the second embodiment is also suitable to be used with a single elongate support member (not shown). It will also be appreciated that, alternatively, a plurality of single support members 24; 124 may be used with

a plurality of arms 11 ; 111, each arm 11 ; 111 being the same or of different size, depending on the required use. The spacer plate 42 may also be placed, if desired, between the support member 24; 124 and the arm 11; 111 at this assembly stage, as previously described herein.

[0050] The particular advantages of the present invention can be readily appreciated by considering the installation and performance of the bracket 10; 110, as will be described below. Following the assembly of the bracket 10 ; 110 as outlined above, the second limb 28; 128 of the support member 24; 124 is placed horizontally between two adjacent layers of bricks of a second wall 48, for example an outer wall of brickwork, such that the second limb 28; 128 is substantially perpendicular with respect to the plane in which the second wall is disposed. A layer of compressible filler (not shown) is located beneath the second limb 28; 128 and a gap (not shown) is provided above the second limb 28; 128. The gap is typically filled with mortar.

[0051] In addition to the pivotable movement the support member 24; 124 has with respect to the arm 11 ; 111, the width of each aperture 30; 130, 32; 132 in a horizontal plane is approximately 4-6 times greater than the width of each retaining tab 34; 134, 36; 136, again in the horizontal plane. The retaining tabs 34; 134, 36; 136, acting as part of the load bearing surface, are therefore insertable through the respective apertures 30; 130, 32; 132 in more than one horizontally spaced-apart location. Thus, the retaining tab/elongate aperture arrangement is easily adjustable, thus providing the support member 24; 124 with a number of horizontally spaced-apart locations with respect to the arm 11; 111. The retaining tab/elongate aperture arrangement facilitates location and positioning of a series of arms 11; 111 in the second limb 28; 128 within the second wall prior to filling the gap with mortar.

[0052] Referring now to Figure 6, the arm 11 of the first embodiment of the invention, and two variations thereof, are shown as blanks. It will be appreciated that the arms 11, 11A, 11B are generally initially formed in this unfolded state when it is cut from a sheet of source material (not shown). The arms 11A, 11B of the two variations are shown to comprise a back plate 12, side plates 14, stops 16 and retaining tabs 34, 36, as hereinbefore described. It can be seen that the respective distances X_1, X_2 and X_3, between a point at approximately a longitudinal mid-line (half the length across) the back plate 12 to a point on the contact edge 19 of each of the side plates 14, of the arms 11, 11A and 11B, increase in size, such that the side plates 14 project from the back plate 12 to different distances, producing different sizes of arms 11, 11A, 11B and, therefore, permitting coupling of first and second walls with differing cavity gaps.

[0053] In Figure 6, the dimensions of the stops 16 and the retaining tabs 34, 36 can be substantially the same for each of the arms 11, 11A, 11B but is not so limited. This is, of course, advantageous in that the same support member 24 can be used with these different sizes of brackets. In this manner, the present invention provides a bracket 10 which, by use of a plurality of different sizes of arms, 11, 11A, 11B, one support member 24 can be used to provide a bracket 10 which is capable of bridging walls of different cavity sizes. For example, if a cavity C, as shown in Figure 3A, is not of uniform width, an arm 11 of the first embodiment could be used at a narrow point, whilst using one of the variations it A, 11B at a point of increased cavity width.

[0054] In the Figure 6 blank variations, the dimensions of the various stops 16 and retaining tabs 34, 36, the angles B', together with the dimensions of the first limb 26, the positioning and dimensions of the apertures 30, 32, and the angles B, can remain substantially constant across different sizes of arms 11, 11 A, 11B- this is merely preferred and is not an essential feature of the present invention. It will be appreciated that the bracket 110, in particular the arm 111, of the second embodiment may also be produced in the form of a blank (not shown).

[0055] Furthermore, a number of variations of the blank may be produced so as to produce arms of different widths (not shown). Such a blank would tend to have one or more grooves 68 which would enable the arm 111 to be folded without any of the material becoming buckled during folding, as hereinbefore described.

[0056] It will be appreciated that the invention is not limited to the embodiments described herein. In particular, and referring now to Figure 7, a bracket according to a third embodiment of the invention is indicated generally as 210. It will be appreciated that this embodiment of the invention is generally less preferred but nonetheless still forms part of the present invention. The support member 224 is not provided with any apertures. The contact edge is not provided with any retaining tabs, so that the contact edge itself comprises the load bearing surface. The angles B' and B of the arm 211 and the support member 224, respectively, enable the arm 211 and the support member 224 to have a complementary fit as hereinbefore described. However, it will be appreciated that the support member is generally welded along the contact edge 219 and against the stop 216 of the arm 211 of this third embodiment, to secure the support member 224 in place. Thus, in the third embodiment, the inter-engaging means is irreversible.

[0057] It will be apparent that the side plates 14; 114; 214 need not necessarily be integrally formed with the back plate 12; 112; 212 but rather, in an alternative embodiment (not shown), can be fixed thereto in a conventional manner such as welding.

[0058] It will further be appreciated that there need not necessarily be two side plates 14; 114; 214. A single side plate, or other suitable spacing member, may suffice, or more than two may be required, depending on the application.

[0059] It will be apparent that the mounting aperture arrangement is not limited to the apertures 18, 20, 22 of the first embodiment, or the aperture 60 and associated slots 62, 64 and notches 66 of the second embodiment, shown in Figures 4 and 5 and that any other suitable mounting aperture arrangement may be used. Equally, the mounting mech-

anism illustrated in the second and third embodiments could be used in the first embodiment and vice versa.

[0060] The following Examples serve to illustrate the invention but it will be appreciated that the invention is not limited to these Examples.

[0061] Figure 8 schematically shows a testing system used in Examples 1 and 2 to test the bracket 10 of the first embodiment of the present invention. The same general procedure was used for both Example 1 and Example 2 as follows:

[0062] An arm 11 of a bracket 10 was bolted to a steel beam 54, using a bolt 35. A support member 24 was then engaged with the arm 11 by means of apertures 30, 32, retaining tabs 34, 36 and stops 16 as previously described herein. A steel roller 52 was placed on the support member 24. A load was then applied at a rate of 0.02 mm/s, using a 160kN Dartec Loading Machine. The initial stiffness of a variety of brackets 10 was tested as outlined in Examples 1 and 2 below:

EXAMPLE 1:

[0063] The general procedure was followed including the following details:

- The bolt used had a length of 57.5 mm and a diameter of 11.5 mm.
- Two washers were used having dimensions of (I) 2.95 mm thick and 36 mm diameter; and (II) 1.60 mm thick and 23 mm diameter.
- The distance Q from the bolt 35 to the second end 17 of the arm 11 was 185 mm.
- The steel roller 52 was placed on the support member 24 at a distance of R = 123mm from the back plate 12.

[0064] Tests were carried out on the following:

Test (a): A bracket 10 according to the invention having an arm 11 of thickness 3 mm. The second limb 28 was disposed at an obtuse angle B of 103.5° to the first limb 26, as shown in Figure 8.

Test (b): A bracket as used in test (a) save for having an arm of thickness 4 mm.

Test (c): A conventional bracket having a thickness of 3 mm, wherein the angle B was approximately 90°. Also, due to the shape of the conventional bracket, the first limb 26 was engaged within the arm 11 substantially parallel to the vertical plane of the back plate 12.

Test (d): A bracket as used in test (c) save for having a thickness of 4 mm.

[0065] The results obtained are given in Table 1:

Table 1

	Thickness of Bracket Wall	**Width of Bracket (i.e. length of side plate)**	**Initial Stiffness of Bracket**
Test (a)	3 mm	52 mm	3.33 kN/mm
Test (b)	4 mm	53.5 mm	4.75 kN/mm
Test (c)	3 mm	---	2.38 kN/mm
Test (d)	4mm	---	3.33 kN/mm

[0066] From the results obtained, the brackets of Tests (a) and (b) clearly produced improved initial stiffness values when compared with conventional brackets of the same thickness. The bracket of test (a) shows a 40% improvement over the bracket of test (c). Similarly, the bracket of test (b) shows a 43% improvement over the bracket of test (d). It should be noted that tests (c) and (d) used a distance R of 135 mm. However, this reduction in the distance from the steel beam to the steel roller 52 (i.e. lever arm) from 135 mm to 123 mm for tests (a) and (b) is only approximately 10%. Therefore, it can be concluded that the majority of the improvement shown in tests (a) and (b) is due to the increase in the angle B to an obtuse angle between the two limbs 26, 28 of the support member 24, compared with the angle B of 90° of the conventional bracket.

EXAMPLE 2:

[0067] The general procedure was followed including the following details:

- The bolt 35 used had a length of 47.5 mm and a diameter of 12 mm.
- The distance Q from the bolt to the bottom edge of the arm 11 was 160 mm.
- The steel roller 52 was placed on the support member 24 at a distance of R= 100 mm.

[0068] Tests were carried out on the following:

Test (e): The bracket 10 used in test (b).
Test (f): A conventional bracket marked by Ancon, which used the "side-on" mechanism to engage the support member with the arm, as previously described herein.

[0069] The results obtained are given in Table 2. In each case, the support member had a thickness of 5 mm.

Table 2

	Thickness of Bracket Wall	Width of Bracket (i.e. length of side plate)	Initial Stiffness of Bracket
Test (e)	4mm	52mm	3.3 kN/mm
Test(f)	4 mm	53 mm	2.7 kN/mm

[0070] The bracket and support member of test (e) shows a 22% improvement over the Ancon (Trade Mark) bracket and support member of test (f).

[0071] From the results obtained in Examples 1 and 2 above, it is clear that the bracket 10 of the present invention having a support member 24 with an obtuse angle B produces superior results in terms of strength and stiffness, and hence load-bearing capacity. It has therefore been found that the bracket 10 of the present invention is a superior bracket to conventional Ancon (Trade Mark) brackets (having an angle B of approximately 90°), and wherein the first limbs of the conventional brackets are mounted substantially vertically. Although the Examples described herein relate to the bracket 10 of the first embodiment, it will be apparent that the brackets 110; 210 of the second and third embodiments also produce superior results as described above.

Claims

1. A load bearing bracket for coupling a first wall to a second wall, the bracket comprising an arm having a load bearing surface and a stop adjacent the load bearing surface; a support member having first and second limbs, the first limb having opposing first and second surfaces, the first limb further having a free edge shaped and dimensioned for abutment of the first surface against the stop and the first limb being shaped and dimensioned for abutment of the second surface against the load bearing surface; wherein the load bearing surface and the stop are disposed such that, in use, the support member is located adjacent the arm by moving the free edge of the first limb until the first surface of the free edge of the first limb abuts against the stop and the opposing second surface of the first limb abuts against the load bearing surface; and means for inter-engaging the arm and the support member.

2. A load bearing bracket according to claim 1 in which the arm further has a recess between the load bearing surface and the stop, wherein the load bearing surface, the recess and the stop are disposed such that, in use, the first limb is located adjacent the arm by pivoting the free edge of the first limb in the recess until the first surface of the free edge of the first limb abuts against the stop and the opposing second surface of the first limb abuts against the load bearing surface.

3. A load bearing bracket according to claim 1 or 2 in which the securing means comprises means for reversibly inter-engaging the arm and the support member.

4. A load bearing bracket according to claim 3 in which the securing means comprises at least one tab projecting from one of the arm and the support member and extending, when assembled, towards the other of the arm and

the support member; and at least one aperture in the other of the arm and the support member, the, or each, aperture being sized and disposed to receive the, or each, tab.

5. A load bearing bracket according to claim 3 or 4 in which the securing means permits side to side movement of the support member relative to the arm or of the arm relative to the support member.

6. A load bearing bracket according to claim 5 in which the, or each, aperture is sized to permit horizontal movement of the, or each, aperture relative to the, or each, tab.

7. A load bearing bracket according to any one of claims 4 to 6 wherein the arm is provided with the at least one tab and the first limb is provided with the at least one aperture, so that, when the first limb is in register with the load bearing surface, the, or each, tab projects through the, or each, aperture.

8. A load bearing bracket according to claim 7, wherein a pair of tabs project from the load bearing surface and the first limb is provided with a pair of the apertures for receiving same.

9. A load bearing bracket according to any one of claims 1 to 8 in which the first and second limbs of the support member define an obtuse angle therebetween, the obtuse angle being preferably between 92° and 150°, more preferably between 100° and 110°, and most preferably about 105°.

10. A load bearing bracket according to any one of claims 1 to 9, the bracket further including a spacer plate, which is shaped and dimensioned to fit, in use, between the load bearing surface and the support member.

11. A load bearing bracket according to any one of claims 1 to 10, wherein the arm includes at least one slot, which is, in use, substantially vertically disposed, which slot is adapted to receive a mounting member, wherein, in use, the slot and mounting member arrangement is suitable for mounting the bracket to the first wall.

12. A method for coupling a first wall to a second wall, the method comprising fixing an arm to the first wall, the arm having a load bearing surface and a stop adjacent the load bearing surface, the arm preferably having a recess between the load bearing surface and the stop; locating a support member having first and second limbs, the first limb having opposing first and second surfaces, the first limb further having a free edge shaped and dimensioned for abutment of the first surface against the stop and the first limb being shaped and dimensioned for abutment of the second surface against the load bearing surface; wherein the load bearing surface, the recess, if present, and the stop are disposed, such that the support member is located adjacent the arm, by moving the free edge of the first limb until the first surface of the free edge of the first limb abuts against the stop and the opposing second surface of the first limb abuts against the load bearing surface; inter-engaging the arm and the support member; and contacting the arm with the second wall.

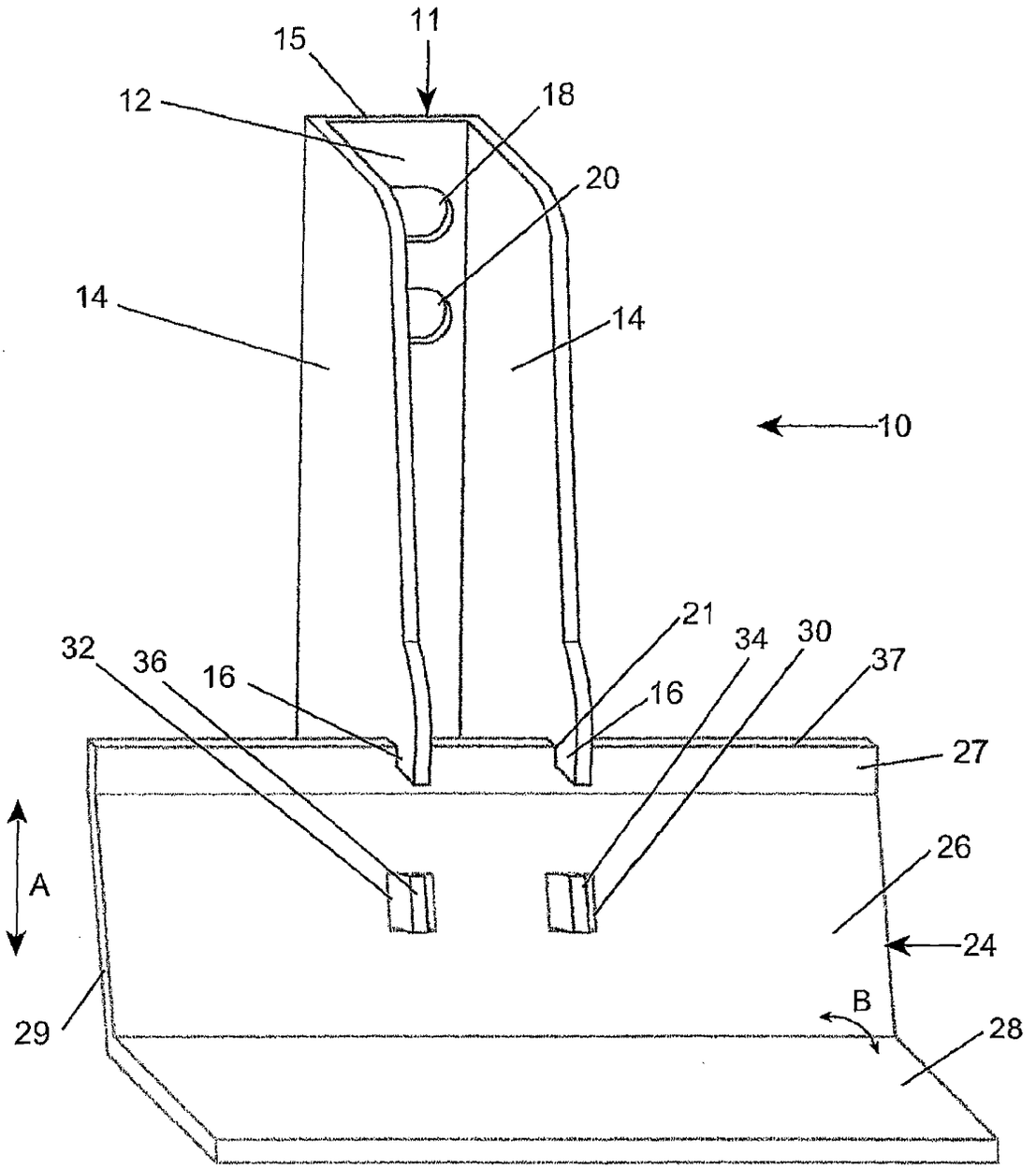

Figure 1

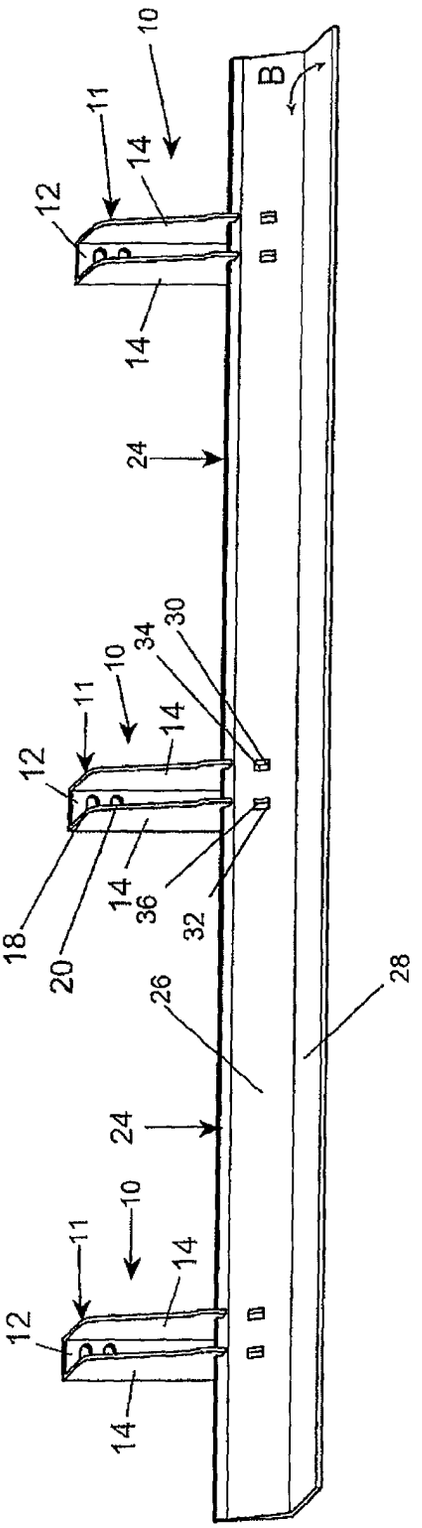
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Figure 2

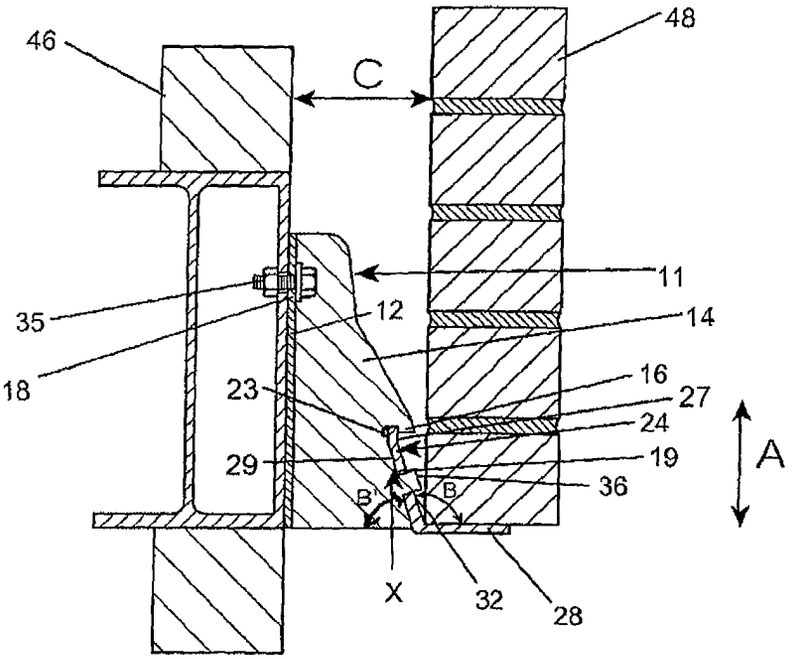

Figure 3A

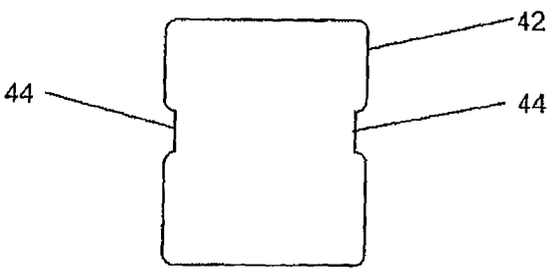

Figure 3

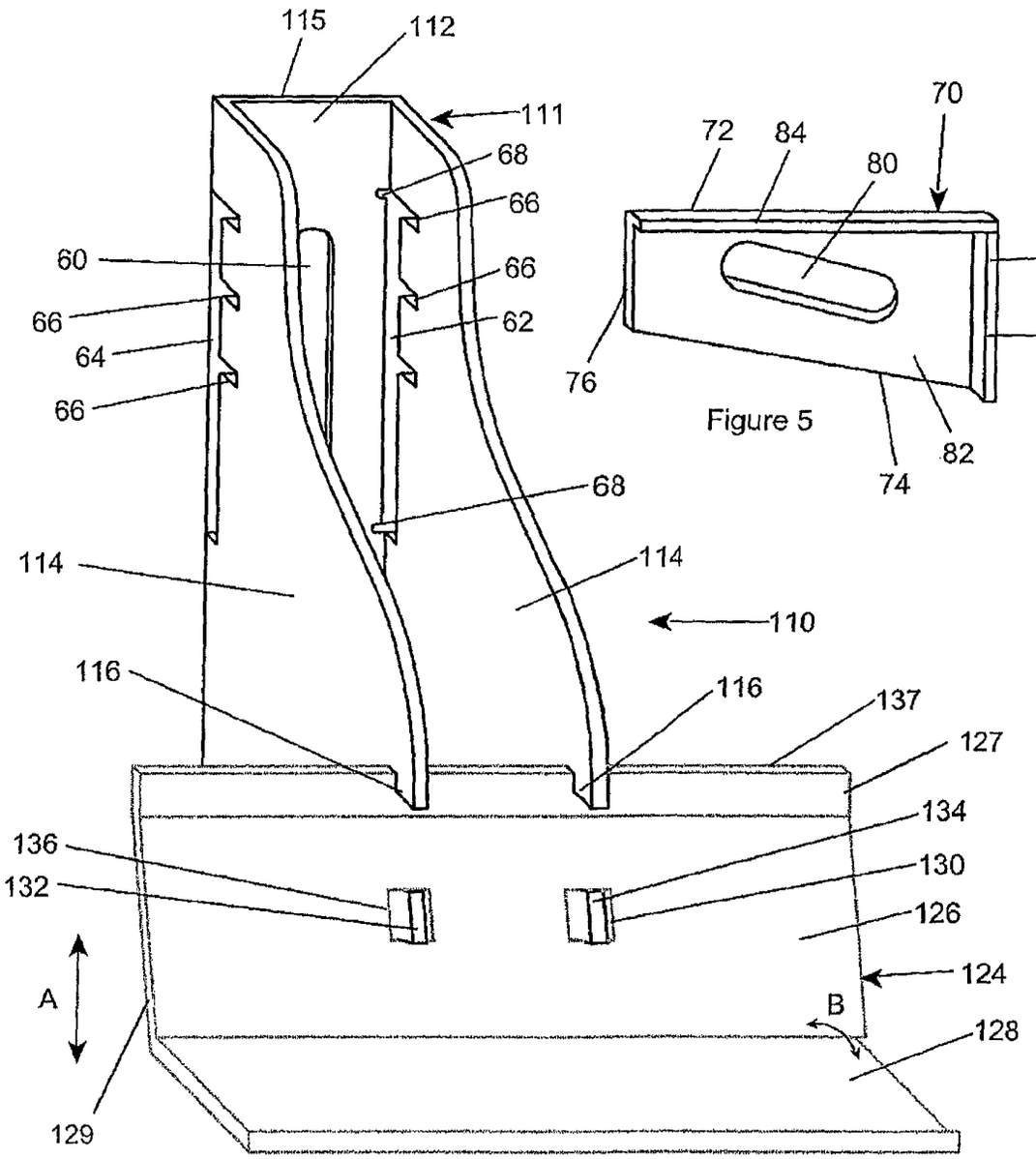

Figure 4

Figure 5

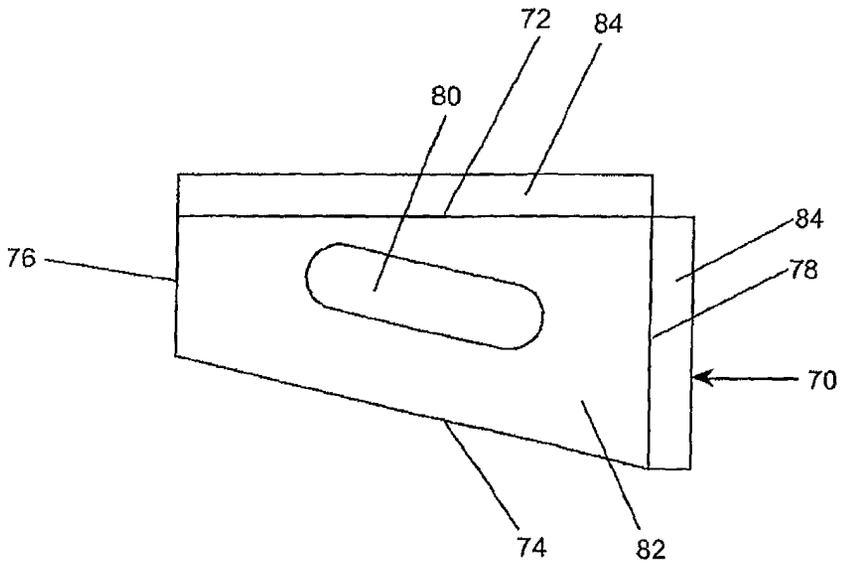

Figure 5A

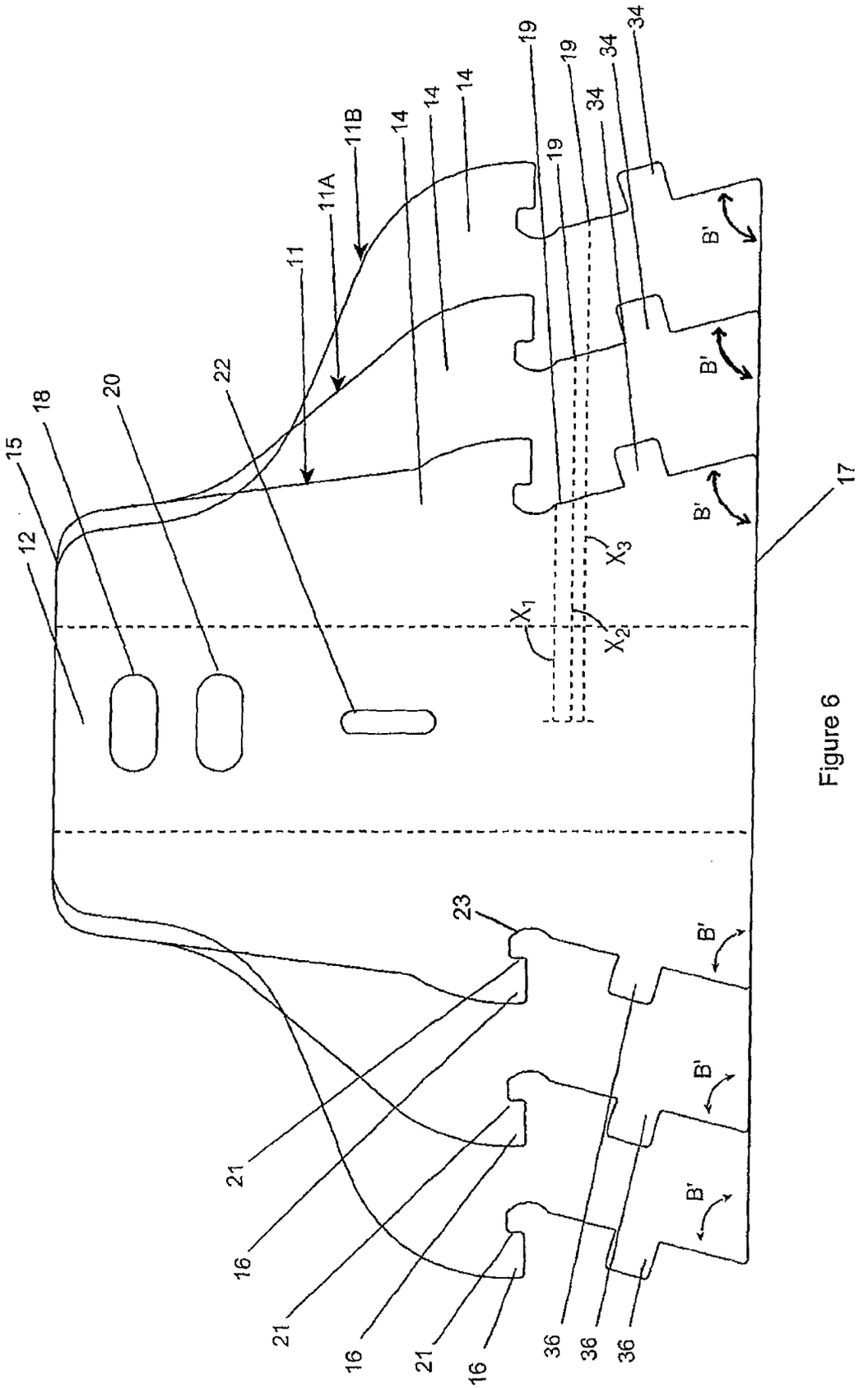
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Figure 6

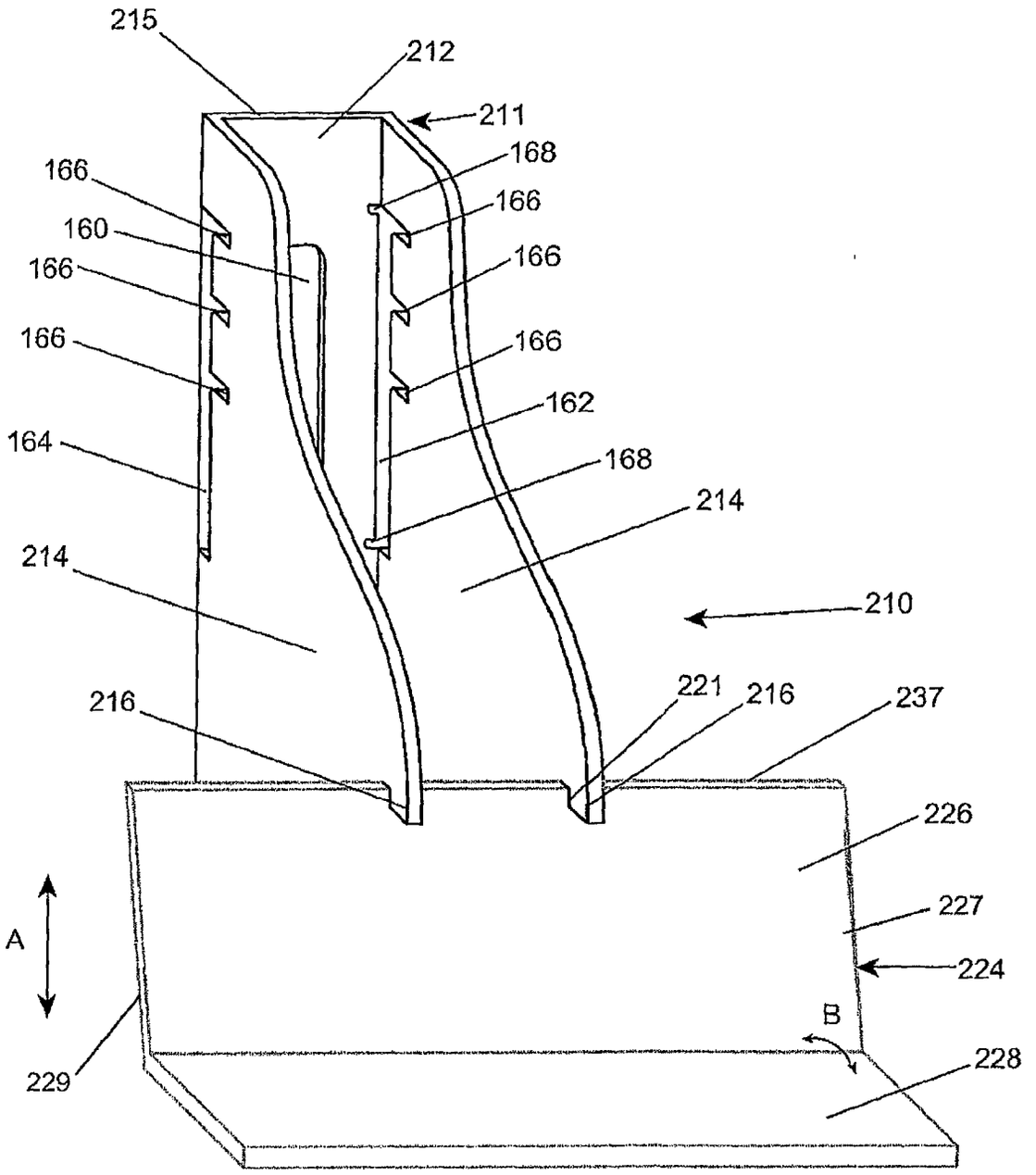
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Figure 7

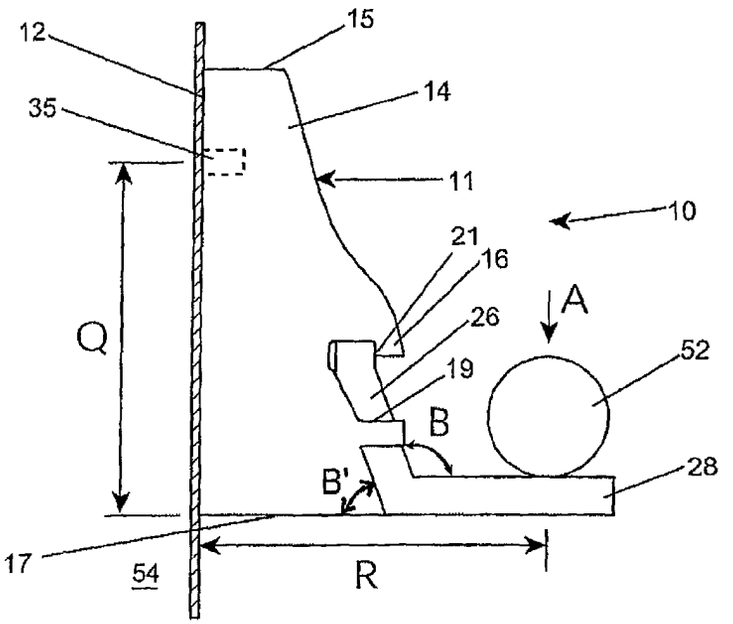

Figure 8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 07 7009

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	9 October 2003	Khera, D

CATEGORY OF CITED DOCUMENTS

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