(12) UK Patent Application (19) GB (11) 2464466 (13) A

(43) Date of A Publication 21.04.2010

(21) Application No: 0818823.7

(22) Date of Filing: 14.10.2008

(51) INT CL:
E04H 17/14 (2006.01)

(56) Documents Cited:
DE 003121681 A1 JP 2006249722 A
US 3768798 A

(58) Field of Search:
INT CL E04F, E04G, E04H
Other: EPODOC & WPI

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(54) Title of the Invention: **Brick wall structures**
Abstract Title: **A perforated brick wall support structure**

(57) A brick wall structure 2 comprises a series of vertically extending support columns 4, a plurality of brick receiving brackets 6, 6' mounted to and projecting forwardly from the support columns in aligned rows and a plurality of bricks 8 supported between respective pairs of brackets. The brackets may be fixed or removable and, in use, the brackets may be pivotally retractable to a non supporting position. The brackets may be L shaped with a laterally extending support face to support a brick. A bonding or frictional material may be used between the support face of the bracket and the brick. Each bracket may further comprise a locator extending upwardly from the bracket and may preferably take the form of a pin which locates in a bore or recess of the brick. Further independent claims for the brickwork support and a gridwork structure for supporting brickwork are included. In use, the brick wall structure of the invention is intended to provide a wall which enables ventilation, screening or shading for example.

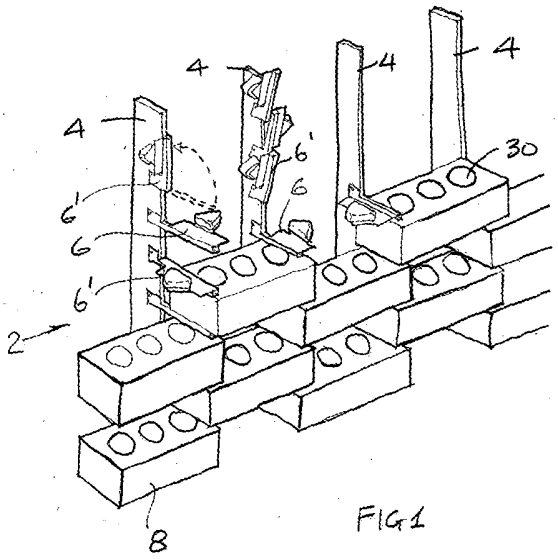

FIG 1

GB 2464466 A

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 2007.

The claims were filed later than the filing date but within the period prescribed by Rule 22(1) of the Patents Rules 2007.

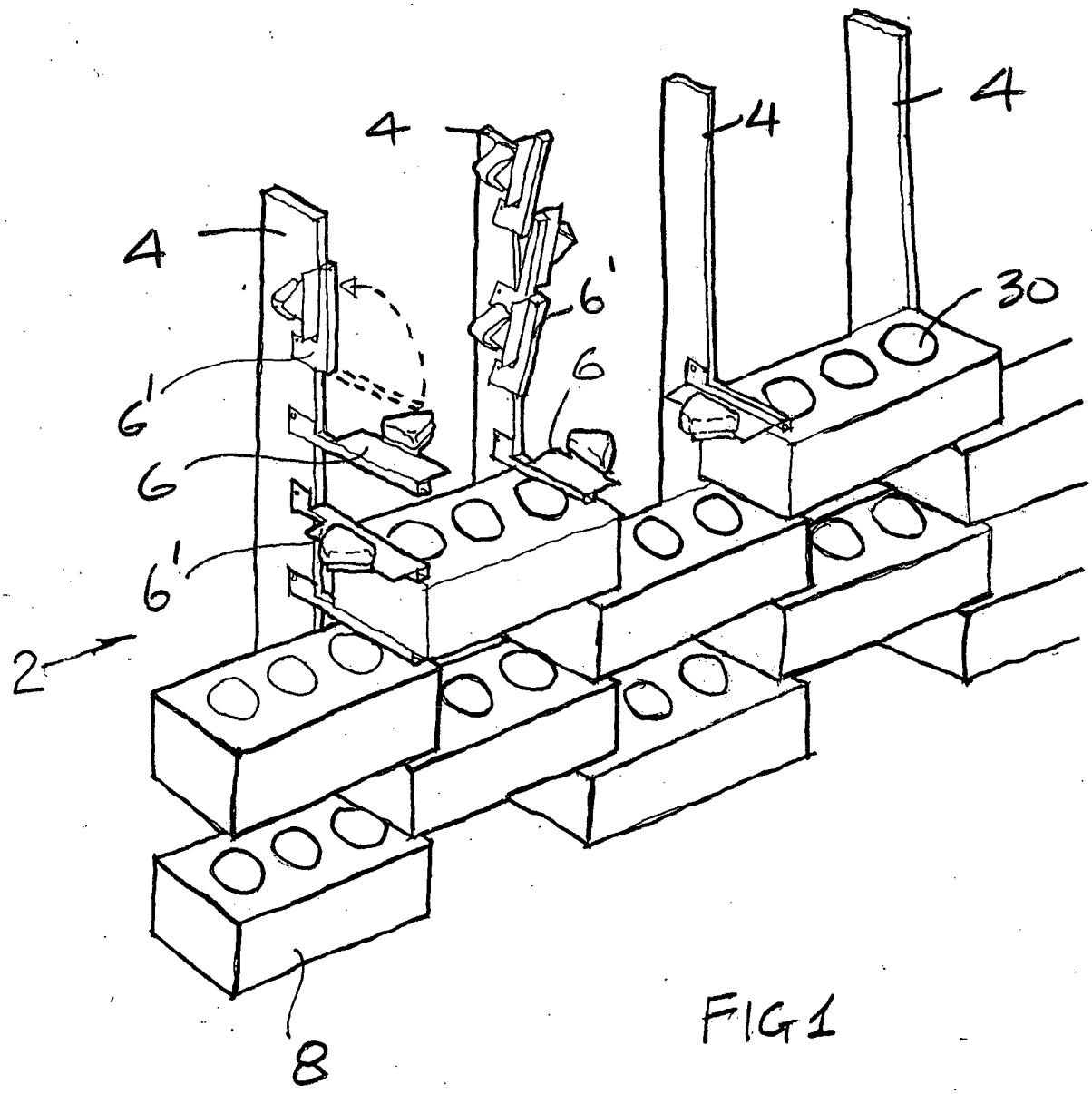

FIG 1

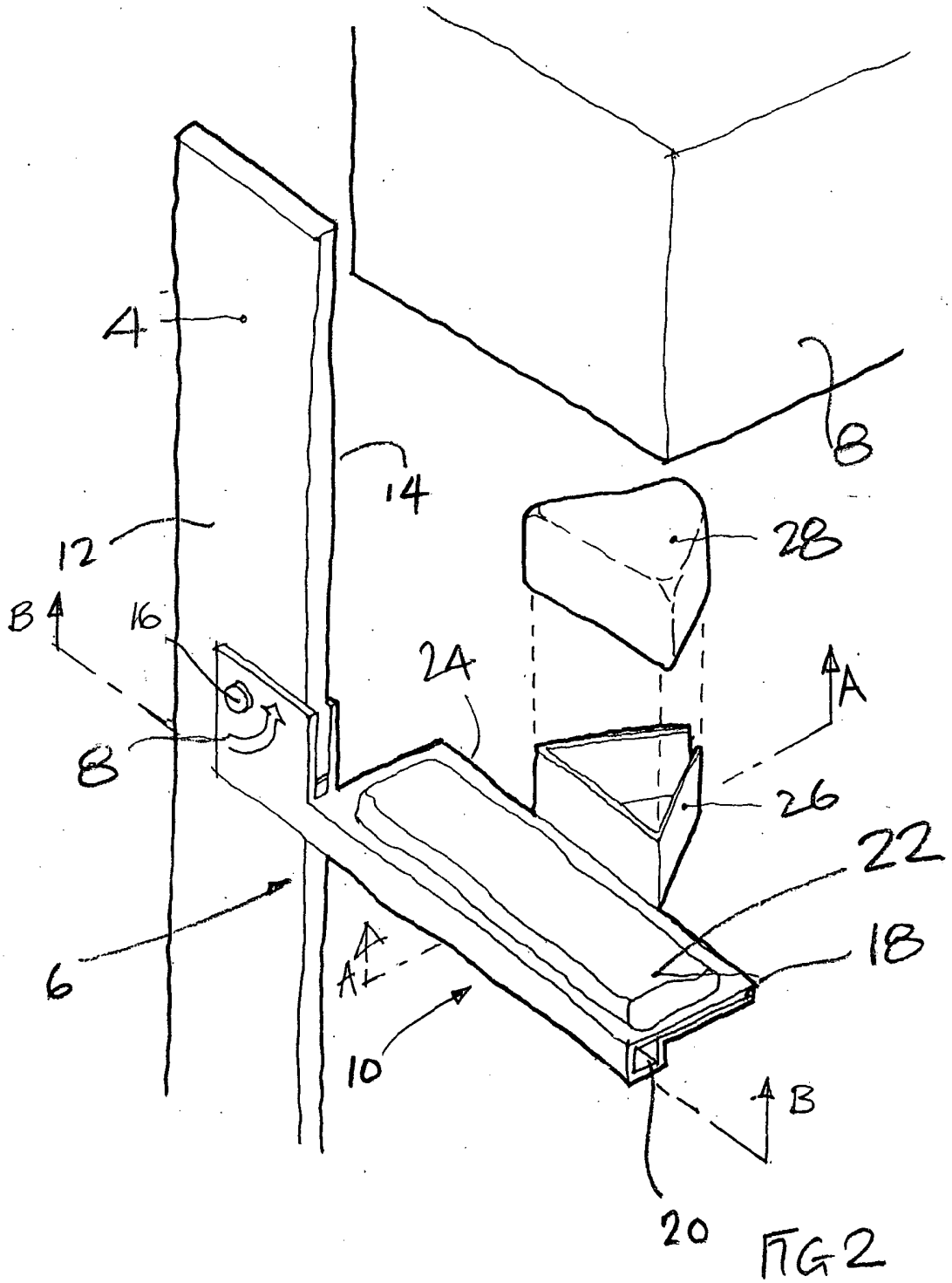

FIG 2

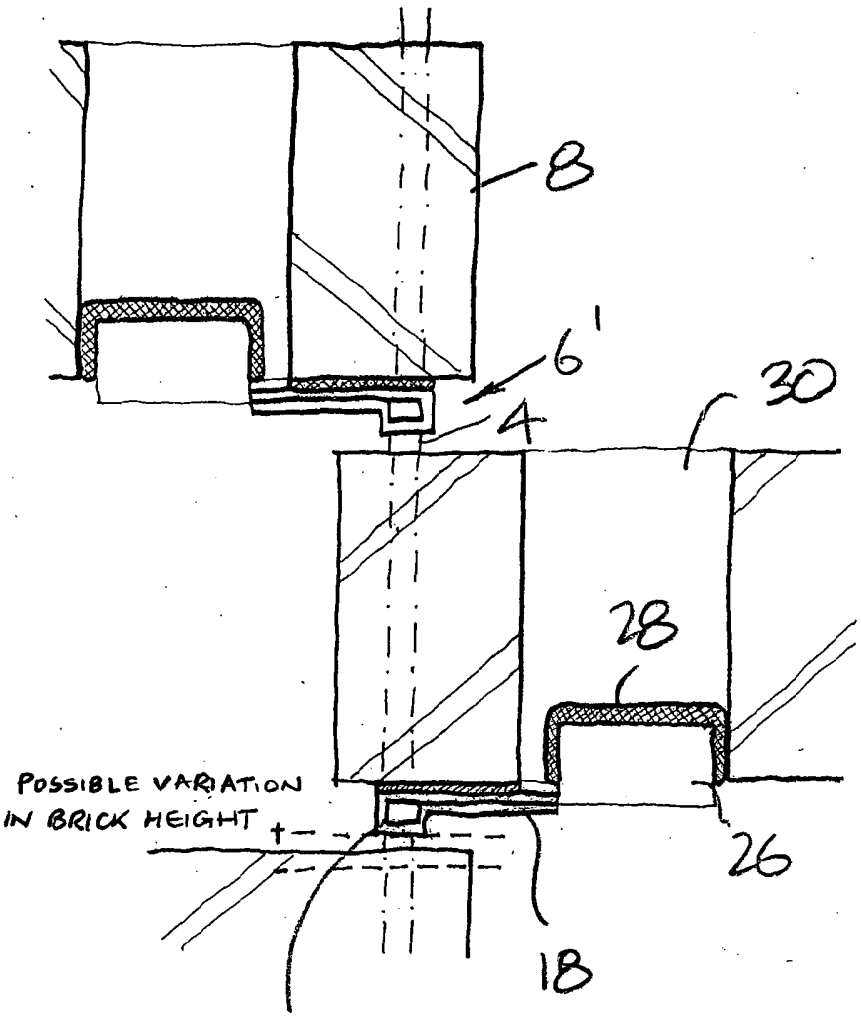
8
6'
4
30
28
POSSIBLE VARIATION
IN BRICK HEIGHT
26
18
20

FIG3

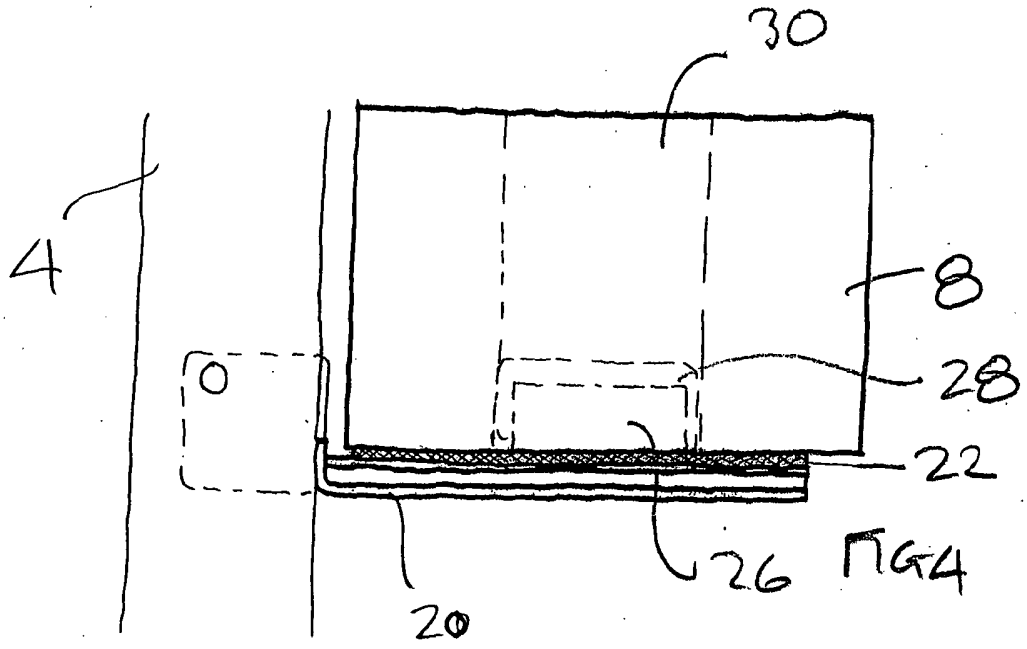
30
4
8
28
22
26
20

FIG4

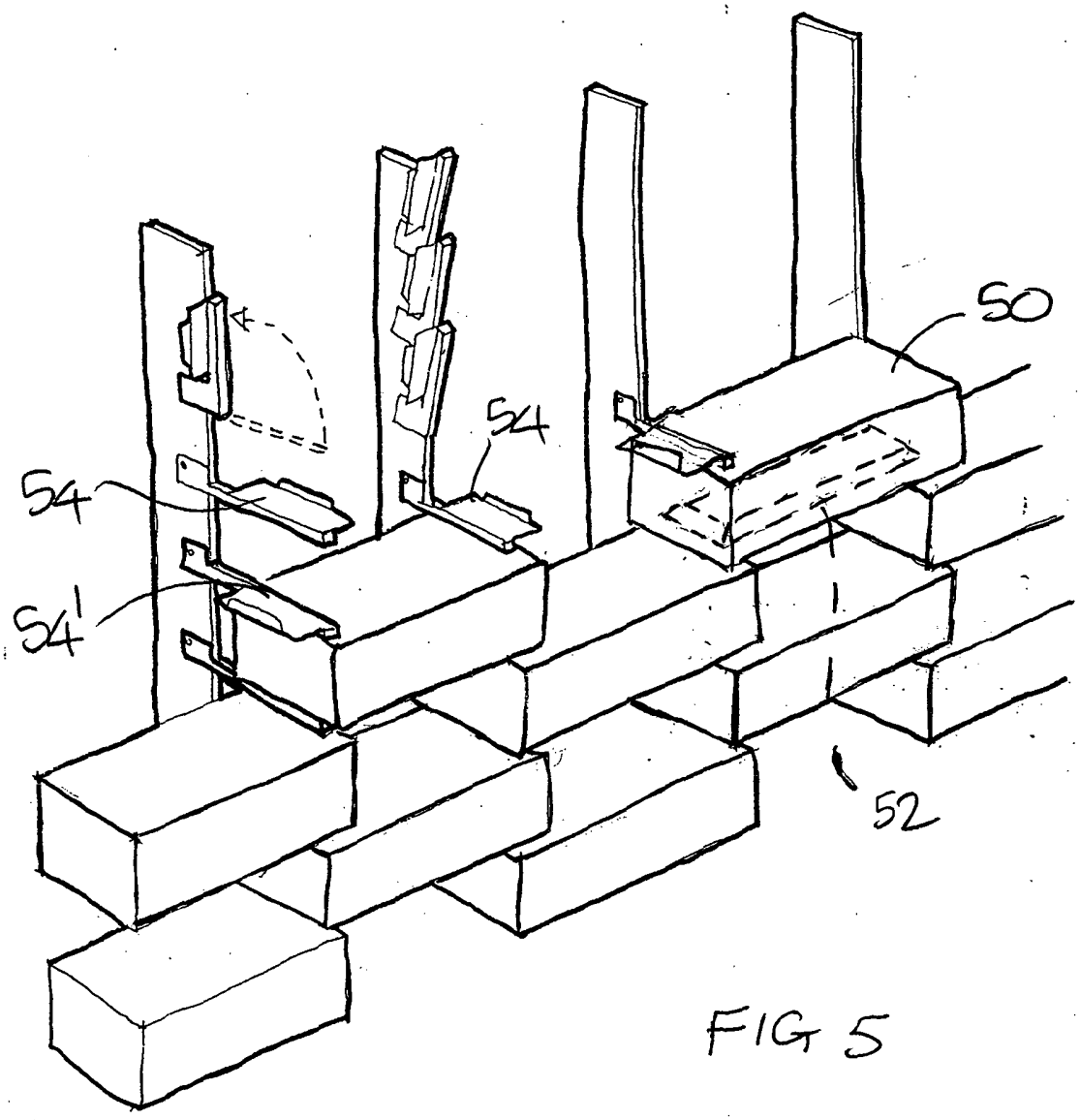

FIG 5

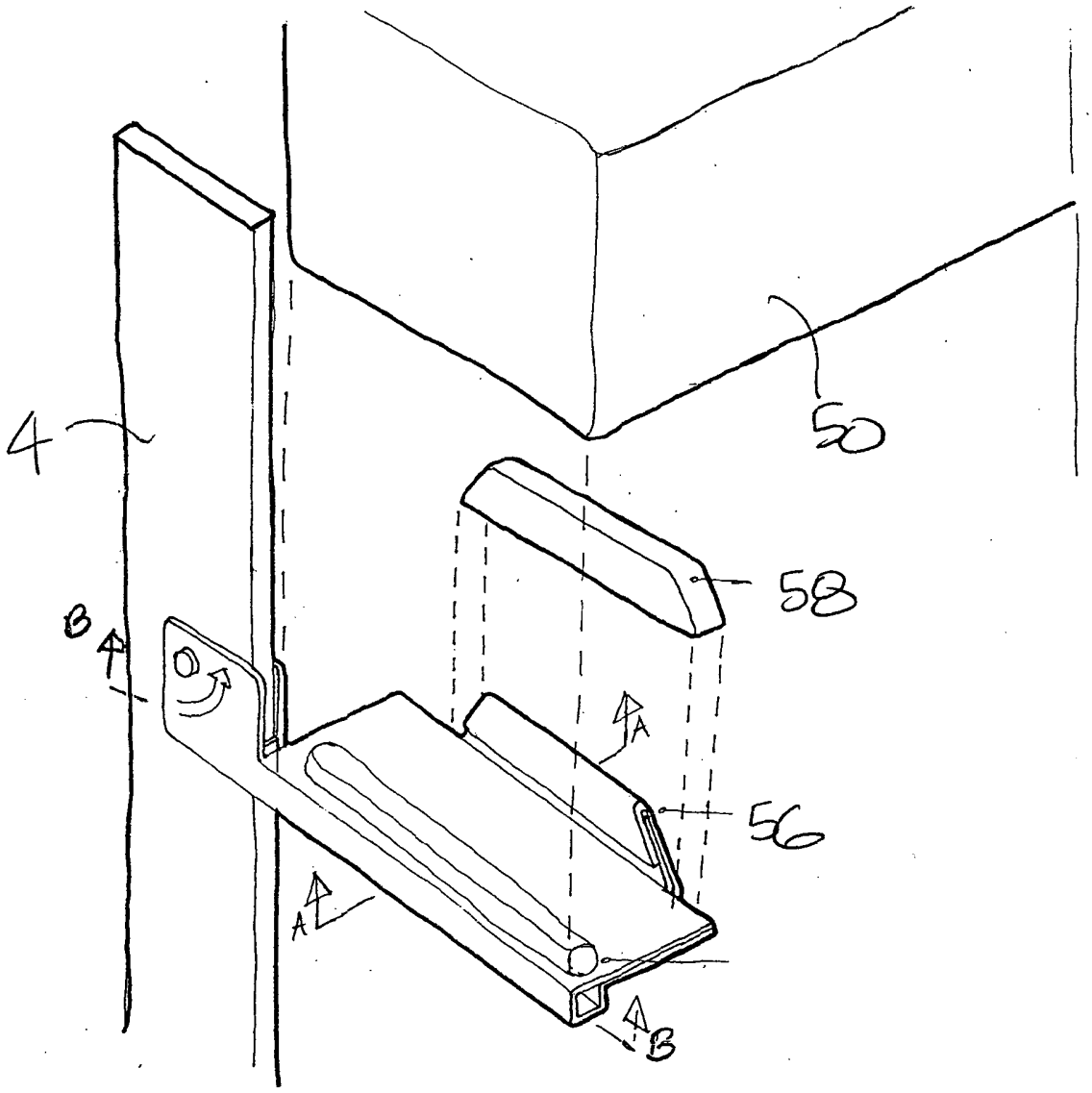

FIG6

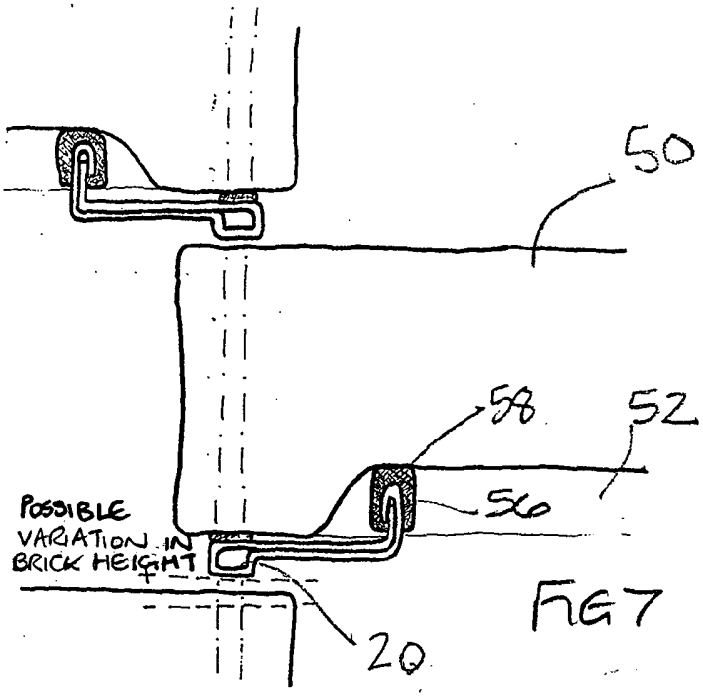

FIG 7

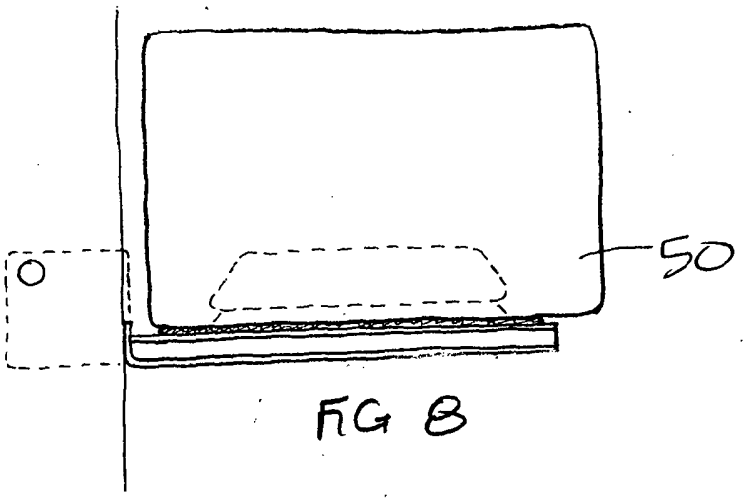

FIG 8

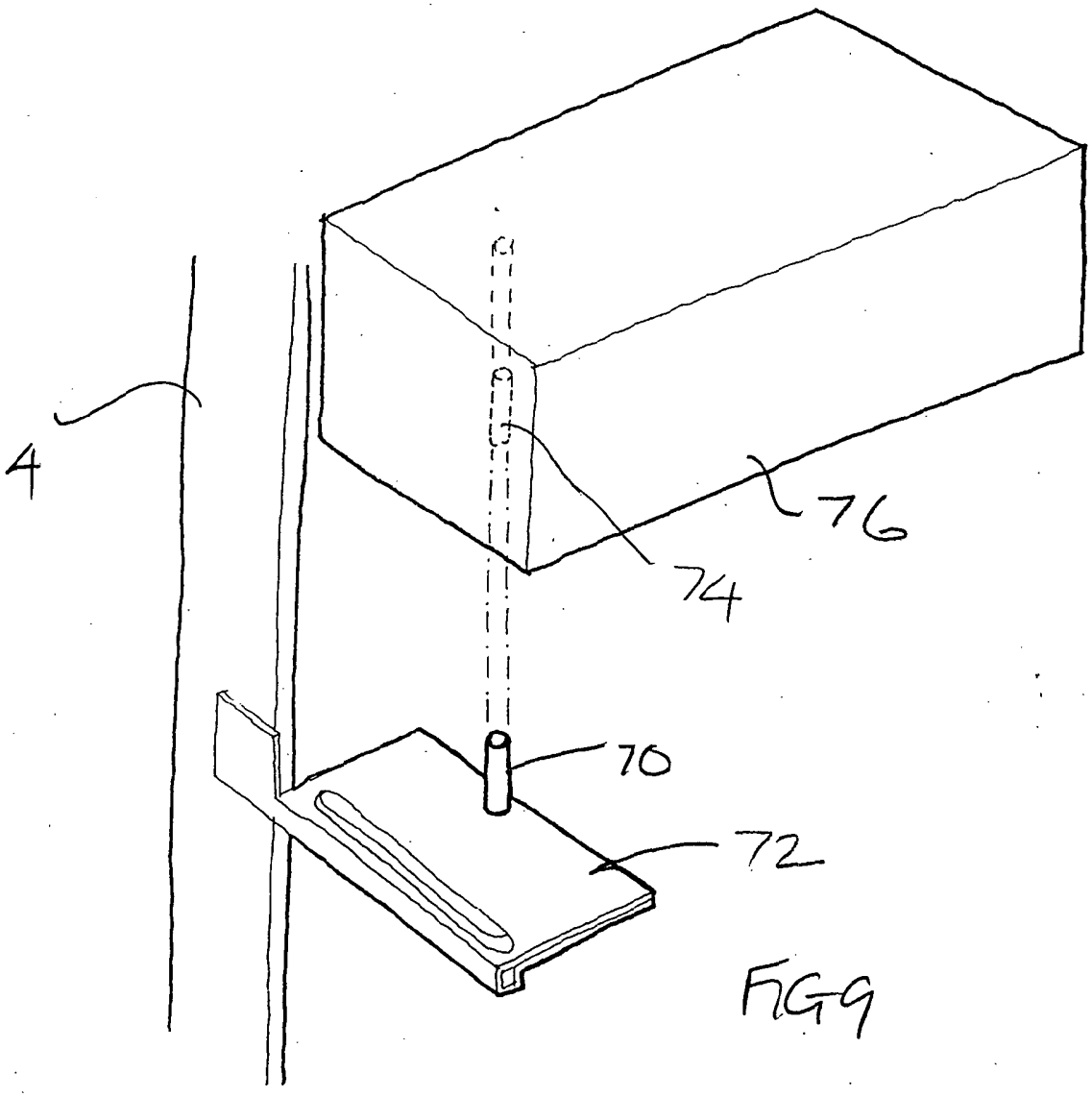

FIG 9

Brick Wall Structures

The present invention relates to brick wall structures and in particular, but not exclusively, to perforated brick wall structures.

It is sometimes desirable to provide a perforated brick wall, for example for ventilation, shading or screening purposes. In a traditional perforated brick wall structure, courses of bricks are laid one on top of the other, with a relatively small bearing area provided between bricks in adjacent courses. This relatively small area must receive mortar to bond the bricks together. The construction of such a structure is not only time consuming, requiring accurate positioning of bricks one relative to the other, but also leads to a relatively weak structure due to the relatively small area of bonding between the bricks. This in turn means that the size, particularly the vertical height, of such structures can be rather limited.

The present invention seeks to overcome or at least mitigate the above problems. From a first aspect the invention provides a brick wall structure comprising:

a series of vertically extending support columns;

a plurality of brick receiving brackets mounted to and projecting forwardly from said support columns in aligned rows; and

a plurality of bricks supported between respective pairs of brackets.

Therefore in contrast to existing walling systems, where the bricks are supported on one another, in accordance with the invention the bricks are supported on brackets supported by support columns. This provides for a greater integrity and strength in the structure and may allow significantly larger areas of brick work to be produced. By accurate positioning of the support brackets in the columns, an accurate course spacing can be achieved.

As will be appreciated by those skilled in the art, the term brick as used herein is not limited to its standard industry definition, e.g. with respect to the material and dimensions (size) of the brick. Instead, the term is intended to cover any block-like body of a suitable and desired size, including a traditional fired brick,

and also, for example, a cast block, a concrete block, natural stone, cast stone, terracotta, wood, and so on.

A brick wall structure in accordance with the invention can provide either a substantially continuous wall or a perforated wall. In a continuous wall, bricks in a given course are provided between every pair of adjacent columns. In a perforated wall structure, however, bricks in a given course are provided only between spaced apart pairs of support columns.

The brackets should be arranged accurately in position on the support columns so as to provided a constant spacing between the courses of bricks. In one embodiment, therefore, the brackets may be mounted fixedly to the support columns at a desired spacing. A potential disadvantage with such an arrangement is, however, that it may interfere with the laying of the bricks between vertically adjacent brackets. Accordingly, in preferred embodiments of the invention, the brackets are non-fixedly mounted to the support columns.

In a first embodiment, the brackets may be removably mounted to the support columns. For example, the brackets and columns may comprise inter-engaging mounting means, for example hooks and slots, the support column mounting means being provided at a desired spacing. With this arrangement, brackets may be mounted to the support columns only after an underlying course of bricks has been laid, making the positioning of the bricks easier. However, it has the disadvantage that the brackets must be installed *in situ*, which may be time consuming. In a further, preferred embodiment, therefore, the brackets are mounted to the support so as to be retractable to a non-supporting position.

In a particularly preferred embodiment, the brackets are pivotally mounted to the support columns so that they may be pivoted between a retracted position and a brick supporting position.

In a preferred embodiment, the bracket is generally L-shaped, with a brick being supported on the elongate limb of the bracket and a pivot being formed on the shorter limb of the bracket.

The brick supporting bracket is preferably provided with a laterally extending support surface for supporting the brick. A suitable bonding material, for example, mortar or a specialist brick adhesive can be placed between the support

surface and the brick. Alternatively, a suitable frictional material could be placed between the support surface and the brick. For example, the frictional material can be provided on (fixed to) the support surface such that there is a high friction coefficient between the brick and the frictional material, thereby maintaining the brick in position.

In a perforated wall structure, the brick supporting surface need extend laterally on just one side of the bracket, with an adjacent bracket on an adjacent column having its supporting surface extending laterally on the other side of that bracket such that the support surfaces extend towards one another to receive a brick there between. Thus in any one row of brackets, the supporting surfaces will extend in alternating lateral directions. Also, the supporting surfaces of vertically adjacent brackets on a given support column will also extend in alternating lateral directions.

In perforated wall systems, therefore, adjacent brackets in a given row may be mirror images of one another.

In a solid wall system, however, brick receiving surfaces may extend laterally on both sides of the bracket whereby each bracket will support adjacent ends of adjacent bricks.

It is preferred that the bracket further comprises means to locate the brick on the bracket. This will considerably facilitate the construction and avoid the need for accurate, unassisted positioning of the bricks on the brackets.

Preferably the brick locating means comprises a locator extending upwardly from the bracket for engagement in a recess or opening provided on the lower surface of a brick.

In a first embodiment, the upstanding formation may comprise a pin which is received in a bore or recess formed in the brick. The recess may be formed by drilling, for example.

In another embodiment, however, the locator may be configured to engage with a standard formation on the brick. For example, many moulded bricks are formed with a frog, i.e. a generally rectangular recess, in one surface of the brick and the locator may engage with the frog. Other, extruded bricks are formed with a plurality of through holes extending through the brick from the top to bottom surface of the brick. In such a brick the locator may be adapted to engage with that hole.

In the case of a frog-type brick, the locating formation may comprise an upstanding elongate flange which is configured to engage in the frog. In the case of a perforated brick, the locating formation may be formed as one or more upstanding solid or hollow posts for engaging in the through hole. The post may be polygonal, for example triangular or quadrilateral, in shape.

The locating member may be formed in any suitable manner, but for ease of manufacture, it may be formed as an upstanding edge of the bracket.

It will be understood that bricks will vary in size from brick to brick and batch to batch. Accordingly, in a preferred embodiment, a compliant element is arranged between the locating member and the brick. This will allow the brick to seat properly on the bracket.

The compliant material may be a relatively soft material such as a rubber or the like.

In the preferred embodiments, the compliant member may be constructed so as to engage over the locating means in a manner of a cap.

Whilst a complete brickwork structure has been described above, it will be appreciated that the invention also extends separately to various components of the structure. In particular, the combination of a support column and retractable support bracket considerably facilitates laying the bricks, so from a further aspect, the invention provides a brickwork support comprising a support column and a plurality of brick support brackets mounted thereto for movement between a retracted, non-supporting position and an extended supporting position. The bracket may have the preferred features described above.

In addition, it will be understood that the support columns may be preassembled into a grid structure off-site and transported to the intended installation site. This considerably facilitates the construction and installation of the support, so from a further aspect, there is provided a grid structure for supporting brickwork, such structure comprising a plurality of laterally spaced support columns joined together and a plurality of brick support brackets mounted to said columns in aligned rows.

The support columns may be made of any suitable material, but in a preferred embodiment they are formed from a metallic material, preferably a

corrosion resistant material such as stainless steel. The columns could, however, also be made from a non-metallic material for example a plastics material such as a fibre reinforced or other composite plastics material. The plastics material could be moulded or extruded, for example

Similarly, the brackets may be metallic made from stainless steel, for example. The brackets may be formed from a sheet material which is folded to the appropriate shape. Alternatively, however, the brackets could be cast, pressed or forged. The brackets could also, however, be made from a non-metallic material such as a plastics material such as a fibre reinforced or other composite plastics material. The bracket could then be moulded, for example injection moulded.

The invention will now be further described by way of example only with reference to the following drawings in which:

Figure 1 shows a first embodiment of the present invention;

Figure 2 shows an exploded detail of the system of Figure 1;

Figure 3 shows a section along line A-A of Figure 2;

Figure 4 shows a section along line B-B of Figure 2;

Figure 5 shows a second embodiment of the present invention;

Figure 6 shows an exploded detail of the system of Figure 5;

Figure 7 shows a view along line A-A of Figure 6;

Figure 8 shows a section view along line B-B of Figure 6; and

Figure 9 shows a third embodiment of the present invention.

With reference now to Figures 1 to 4, a first perforated brick wall structure 2 comprises a plurality of laterally spaced, vertically extending support columns 4, a plurality of brick receiving brackets 6, 6' mounted to the columns 4 and bricks 8 mounted between adjacent pairs of brackets 6, 6'.

As can be seen from Figure 1 and as will be described further below, the brackets 6, 6'. The brackets 6, 6' alternate along the length of each support column 4 and also in any given row across the columns 4.

Each support column 4 is formed in this embodiment from a flat post, for example made of stainless steel or some other material (metallic or non-metallic) giving the requisite strength and, if necessary corrosion resistant properties.

Typically the post will be 6 mm thick and 30 mm deep, although the dimensions will be chosen to suit the particular application.. Adjacent columns 4 are joined together by braces (not shown) at a desired spacing and such that the brackets 6, 6' are arranged in horizontally aligned rows.

As shown in Figures 2 to 4, each support bracket 6 is formed from a folded metal sheet, for example of stainless steel, and is generally L-shaped in section having a shorter limb 8 and longer limb 10. The shorter limb 8 of the bracket 6 is bifurcated so as to extend on both faces 12, 14 of the column 4. The bracket 6 is mounted to the column 4 by means of a hinge pin 16 extending through the column 4. This allows the support bracket 6 to pivot between a generally vertical retracted position and a general horizontal brick receiving position as illustrated in Figure 1.

Each bracket 6 further comprises a brick receiving surface 18 extending laterally on one side of a beam section 20. The beam section 20 gives rigidity to the bracket 6 while the surface 18 provides a sufficiently large surface to receive a portion of the brick and adhesive or mortar 22.

Upstanding from the edge 24 of the surface 18 is a triangular post 26. Although a triangular post is described, the post may have any polygonal shape, for example quadrilateral, pentagonal, hexagonal and so on. Fitted over the post 26 is a rubber or other compliant pad 28. As can be seen from Figures 3 and 4, the post and pad 28 engage within a hole 30 which is formed in the brick 8 during its manufacture.

The construction of the brick wall shown in Figure 1 will now be described. As a first step, the columns 4 with brackets 6, 6' are preassembled into a grid framework, possibly off site, and then positioned at the construction site. The brackets 6, 6' will initially be in their generally vertical, retracted position as shown in the upper part of Figure 1, with the brackets 6, 6' in the lowermost row being pivoted down to receive the first course of bricks 8. With this arrangement, the upper brackets 6, 6' will not interfere with proper placement of the bricks 8 on the horizontal brackets 6, 6'. As is apparent from Figure 1, in any particular horizontal row, the "left-hand" and "right-hand" brackets 6, 6' alternate such that in the locations where a brick 8 is to be mounted; the brick receiving surfaces 18 and locating posts 26 face one another. Adhesive or mortar 22 is then applied to the

brick receiving surfaces 18 of adjacent brackets 6, 6' and the brick 8 mounted to the brackets 6, 6' with the locating posts 26 of each brackets 6, 6' locating within a respective end hole 30 of the brick 8. The compliant cap 28 allows any variation between bricks sizes to be accounted for and provide a relatively close location, preventing excessive lateral or fore to aft movement of the brick 8 on the brackets 6,6'. Each end of the brick 8 slightly overhangs the beam 20 of the bracket 6, 6' such that the bracket 6, 6' cannot be seen projecting laterally of the brick 8.

The bricks 8 in any one course can then be laid on the brackets 6, 6' of alternating pairs of support columns 4. When a first course of bricks 8 has been laid, the brackets 6, 6' in the next row can be folded down into a horizontal position to receive the next course of bricks 8. The spacing of the brackets 6, 6' on the columns 4 is chosen such than even with the largest dimensioned brick 8 there will still be enough space to receive the brick 8 between vertically adjacent brackets 6,6', without the lower surface of the beam 20 of the upper bracket 6, 6' contacting the upper surface of the brick 8, as shown in Figure 3. This course of bricks 8 is then laid in a similar manner to that described above.

This process can be continued over as many courses as desired.

A second embodiment of the invention is shown in Figures 5 to 8. This embodiment is similar in principle to that of the first embodiment but differs in detail. In particular, this embodiment is intended for use with bricks 50 having a frog 52 formed on one face.

In this embodiment, each bracket 54, 54' is provided with an upstanding flange 56 in place of the triangular post 26 of the first embodiment. The flange 54 tapers towards its upper edge so as to be received in the frog 52 of the brick 50. A compliant rubber or other pad 58 is fitted over the flange 56 in a similar manner to the cap 28, so as to accommodate variation in brick sizes.

The bricks of the second embodiment are laid in a similar manner to that of the first embodiment.

A yet further embodiment of the invention is disclosed in Figure 9. In this Figure, a locator in the form of a pin 70 extends upwardly from the mounting bracket 72 for engagement within a drilled or extruded hole 74 provided in the brick

76. This embodiment is more suitable for solid bricks rather than bricks with preformed frogs or through holes.

It will be understood that in all the embodiments, the locators 26, 54, 70 act substantially to locate the bricks 8 in position. Once the bricks 8 are attached to their support brackets, it will not be possible to disengage the locators 26,54, 70 in view of the overlying bricks 8 and brackets. Accordingly, even though each brick 8 is suspended clear of the next brick 8 by relatively small gap, the surrounding bricks 8 provide sufficient security to prevent bricks 8 coming free from the construction. It will also be appreciated that the construction speed is extremely fast and easy as there is no need to measure or level the bricks 8 during construction. The positioning and levelling of the bricks 8 is determined solely by the positioning of the support columns 4 and brackets 6, 6'. Moreover, since the bricks 8 are retained to the brackets 6, 6' by a relatively small area of adhesive or mortar 22, they can, if desired, be dismantled and reused if future access is required.

As disclosed above, the invention is applicable particularly to perforated brick structures. However, it could be adapted for substantially continuous wall structures by providing each brick support bracket with a second brick support surface adjacent to the first brick support surface. This will allow two bricks to be supported per support bracket. Such an arrangement may be advantageous in a ventilation system as there will still be a relatively small gap between the bricks.

It will be appreciated that the construction of the present invention has many applications, for example wind breaking for horticultural applications, visual screening, shading, highway noise reduction and visual screening, car park vented screening, landscaping or civil engineering, roof terrace screening and temporary structures.

It will also be understood that the present invention may be used to construct any size of wall - even one with just a single course of bricks.

Claims:

1. A brick wall structure comprising:

a series of vertically extending support columns;

a plurality of brick receiving brackets mounted to and projecting forwardly from said support columns in aligned rows; and

a plurality of bricks supported between respective pairs of brackets.

2. A brick wall structure as claimed in claim 1 wherein bricks in a given course are provided between every pair of adjacent columns.

3. A brick wall structure as claimed in claim 1 wherein bricks in a given course are provided only between spaced apart pairs of support columns.

4. A brick wall structure as claimed in any preceding claim wherein the brackets are mounted fixedly to the support columns.

5. A brick wall structure as claimed in claim 1, 2 or 3 wherein the brackets are non-fixedly mounted to the support columns.

6. A brick wall structure as claimed in claim 5 wherein the brackets are removably mounted to the support columns.

7. A brick wall structure as claimed in claim 6 wherein the brackets and columns comprise inter-engaging mounting means.

8. A brick wall structure as claimed in claim 1, 2 or 3 wherein the brackets are mounted to the support so as to be retractable to a non-supporting position.

9. A brick wall structure as claimed in claim 8 wherein the brackets are pivotally mounted to the support columns so that they may be pivoted between a retracted position and a brick supporting position.

10. A brick wall structure as claimed in claim 9 wherein the brackets are generally L-shaped, with a brick being supported on the elongate limb of the bracket and a pivot being formed on the shorter limb of the bracket.

11. A brick wall structure as claimed in any preceding claim wherein the brackets are each provided with a laterally extending support surface for supporting the brick.

12. A brick wall structure as claimed in claim 11 wherein the brick supporting surface extends laterally on just one side of the bracket.

13. A brick wall structure as claimed in claim 12 wherein an adjacent bracket on an adjacent column has its supporting surface extending laterally on the other side of that bracket such that the support surfaces extend towards one another to receive a brick therebetween.

14. A brick wall structure as claimed in claim 11 wherein brick receiving surfaces extend laterally on both sides of each bracket.

15. A brick wall structure as claimed in any of claims 11 to 14 wherein a bonding or frictional material is placed between the support surface and the brick.

16. A brick wall structure as claimed in any preceding claim wherein each bracket further comprises means to locate the brick on the bracket.

17. A brick wall structure as claimed in claim 16 wherein the brick locating means comprises a locator extending upwardly from the bracket for engagement in a recess or opening provided on the lower surface of a brick.

18. A brick wall structure as claimed in claim 17 wherein the locator comprises a pin which is received in a bore or recess formed in the brick.

19. A brick wall structure as claimed in claim 17 wherein the locator is configured to engage with a frog or with a through hole extending through the brick from the top to bottom surface of the brick.

20. A brick wall structure as claimed in claim 19 wherein the locator comprises an upstanding elongate flange which is configured to engage in the frog.

21. A brick wall structure as claimed in claim 19 wherein the locator is formed as one or more upstanding solid or hollow posts for engaging in the through hole.

22. A brick wall structure as claimed in any of claims 16 to 21 further comprising a compliant element arranged between the locator and the brick.

23. A brick wall structure as claimed in claim 22 wherein the compliant member engages over the locating means in a manner of a cap.

24. A brickwork support comprising a support column and a plurality of brick support brackets mounted thereto for movement between a retracted non-supporting position and an extended supporting position.

25. A brickwork support as claimed in claim 24 wherein the brackets are pivotally mounted on the support column.

26. A brickwork support as claimed in claim 25 wherein the brackets are generally L-shaped, with a brick supporting surface provided on the elongate limb of the bracket and a pivot being formed on the shorter limb of the bracket.

27. A brickwork support as claimed in claim 26 the brackets are each provided with a laterally extending support surface for supporting the brick.

28. A brickwork support as claimed in claim 27 wherein the brick supporting surface extends laterally on just one side of the bracket.

29. A brickwork support as claimed in claim 28 wherein the brick supporting surfaces of adjacent brackets extend laterally in opposite directions.

30. A brickwork support as claimed in claim 26 wherein brick receiving surfaces extend laterally on both sides of each bracket.

31. A brickwork support as claimed in any of claims 24 to 30 wherein each bracket further comprises means to locate a brick on the bracket.

32. A brickwork support as claimed in claim 31 wherein the brick locating means comprises a locator extending upwardly from the bracket for engagement in a recess or opening provided on the lower surface of a brick.

33. A brickwork support as claimed in claim 32 wherein the locator comprises a pin.

34. A brickwork support as claimed in claim 32 wherein the locator comprises an upstanding elongate flange.

35. A brickwork support as claimed in claim 32 wherein the locator is formed as one or more upstanding solid or hollow posts.

36. A brickwork support as claimed in any of claims 31 to 35 further comprising a compliant element engaged over the locating means in a manner of a cap.

37. A grid structure for supporting brickwork comprising:
a plurality of laterally spaced support columns joined together; and
a plurality of brick support brackets mounted to said columns in aligned rows.

38. A grid structure as claimed in claim 37 comprising a plurality of brickwork supports as claimed in any of claims 24 to 36 joined together.

39. Apparatus as claimed in any preceding claim wherein the support column(s) are formed from a metallic material.

40. Apparatus as claimed in any of claims 1 to 38 wherein the columns are made from a non-metallic material for example a plastics material.

41. Apparatus as claimed in claims 40 wherein the plastics material is a fibre reinforced or other composite plastics material.

42. Apparatus as claimed in any preceding claim wherein the brackets are metallic.

43. Apparatus as claimed in claim 42 wherein the brackets are formed from a folded sheet material.

44. Apparatus as claimed in any of claims 1 to 41 wherein the brackets are made from a plastics material such as a fibre reinforced or other composite plastics material.

45. A brick wall structure substantially as hereinbefore described with reference to any one of the accompanying figures.

46. A brickwork support substantially as hereinbefore described with reference to any one of the accompanying figures.

47. A grid structure for supporting brickwork substantially as hereinbefore described with reference to any one of the accompanying figures.

Application No:	GB0818823.7	**Examiner:**	Helen Harrop
Claims searched:	1-23 & 39-44	**Date of search:**	12 March 2009

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X	X: 1, 5, 8-9, 11-12	US 3768798 A (DANKERT) See figures
A	-	DE 3121681 A1 (RAUSCH et al.) See figures and EPODOC & WPI abstract accession no 1982-B5623E [07]
A	-	JP 2006249722 A (TOYO KOGYO CO) See figures and EPODOC & WPI abstract accession no 2006-673704 [70]

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^{X} :

Worldwide search of patent documents classified in the following areas of the IPC

E04F; E04G; E04H

The following online and other databases have been used in the preparation of this search report

EPODOC & WPI

International Classification:

Subclass	Subgroup	Valid From
E04H	0017/14	01/01/2006