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(54) **A cladding panel**

(57) A prefabricated reinforced brick panel (1) has a plurality of bricks (2) arranged in a spaced-apart array with mortar (7) between the bricks (2). The array comprises a number of superimposed rows (3) of bricks (2). The bricks (2) in each row (3) are staggered relative to the bricks (2) in each adjacent row (3) of bricks (2). Each brick (2) has a number of vertical through holes (8) extending

tending between a top (9) and a bottom face (10) of the brick (2). These through holes (8) are aligned in the array and vertical reinforcing bars (4) are inserted into the aligned holes (8) and extend between a top (5) and a bottom (6) of the panel (1). Two offset vertical reinforcing bars (4) pass through each brick (2). Transverse reinforcing bars (12) are mounted in the mortar (7) between rows (3) of bricks (2).

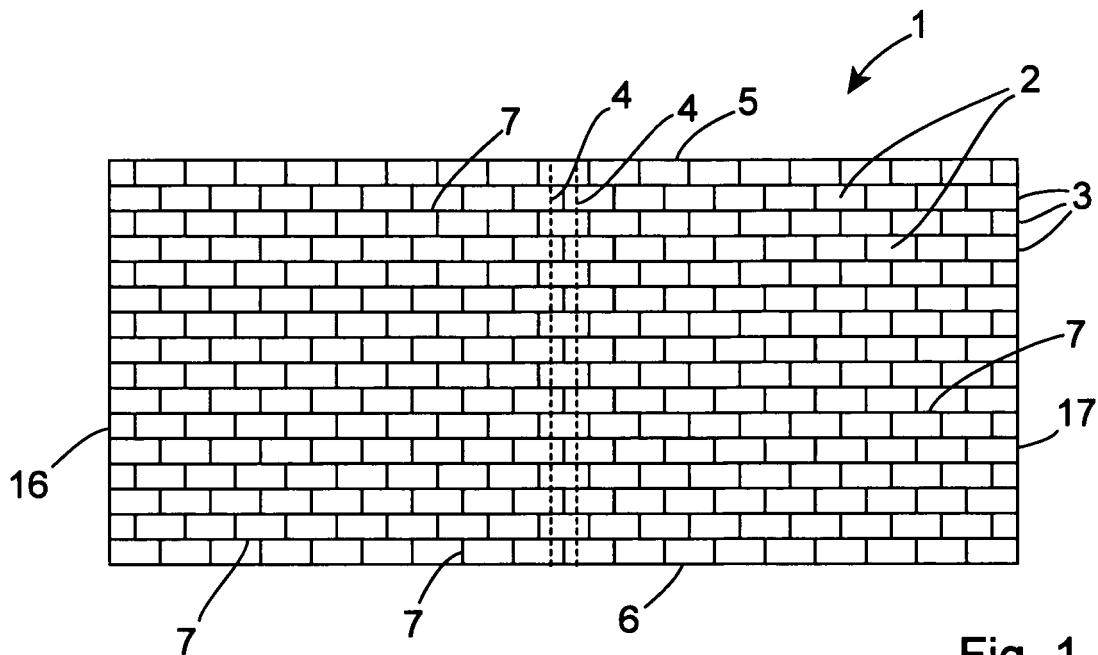


Fig. 1

Description**Field of the Invention**

[0001] This invention relates to cladding panels, and in particular to prefabricated reinforced masonry panels.

The Background Art

[0002] Examples of prefabricated reinforced masonry panels are to be found in Patent Specification Nos. GB 2,407,828, WO 03/104577, GB 1,219,587, GB 1,149,741 and GB 1,094,574. While a number of such cladding panels have been proposed previously, for one reason or another these have not proven entirely satisfactory and do not appear to have found widespread use.

[0003] The present invention is directed towards providing an improved cladding panel and method of manufacturing such cladding panels.

Summary of the Invention

[0004] According to the invention, there is provided a method for manufacturing a prefabricated reinforced masonry panel, including the steps:

laying a plurality of bricks face down on a horizontal support surface of a panel forming bed in a spaced-apart array leaving gaps between the bricks for reception of mortar,

said array comprising a number of juxtaposed rows of bricks,

the bricks in each row of bricks being staggered relative to the bricks in each adjacent row of bricks,

each brick having a plurality of spaced-apart through holes extending between a top and a bottom of the brick,

overlapping said holes in adjacent rows of bricks when forming said array,

inserting a number of spaced-apart outer vertical reinforcing bars through said overlapping holes in the bricks in alignment,

said outer vertical reinforcing bars extending between a top row of the bricks and a bottom row of the bricks in said array of bricks,

laying a first transverse reinforcing bar across said outer vertical reinforcing bars along at least one of the gaps between rows of bricks,

inserting a number of inner vertical reinforcing bars through said overlapping holes in the bricks in align-

ment,

said inner vertical reinforcing bars extending between the top row of bricks and the bottom row of bricks in said array of bricks and spaced above the outer vertical reinforcing bars on the bed,

preparing a liquid mortar and pouring said liquid mortar into the gaps between the bricks and through the holes in the bricks,

allowing the mortar to set to form the prefabricated reinforced masonry panel, and

removing the prefabricated reinforced masonry panel from the bed.

[0005] In one embodiment of the invention, the method includes laterally offsetting the inner and outer vertical reinforcing bars.

[0006] In another embodiment, the method includes inserting two vertical reinforcing bars through each brick.

[0007] In a preferred embodiment, the method includes inserting one outer vertical reinforcing bar and one inner vertical reinforcing bar through each brick.

[0008] In another embodiment, the method includes laying a second transverse reinforcing bar across said inner reinforcing bars along at least one of the gaps between rows of bricks prior to pouring the liquid mortar into the gaps between the bricks.

[0009] In another embodiment, the method includes laying first and second transverse reinforcing bars in all the gaps between the rows of bricks.

[0010] In a further embodiment, each transverse reinforcing bar extends between opposite sides of the brick array.

[0011] In another embodiment, the reinforcing bars comprise rebar.

[0012] In a further embodiment, the method includes preparing a liquid mortar by mixing together a fine sand, cement and water.

[0013] In another embodiment, the method includes the step of arranging the bricks on the bed for forming an ope in the wall panel. The ope may be provided, for example, for reception of a window or door assembly.

[0014] In another embodiment, means is provided for sealing between a face of each brick and the bed.

[0015] In another embodiment, said sealing means extends into the gaps between the bricks.

[0016] In a further embodiment, the sealing means comprises resilient sealing elements mounted on the bed in the gaps between the bricks.

[0017] In another aspect, the invention provides a prefabricated reinforced masonry panel, including:

a plurality of bricks arranged in a spaced-apart array of bricks with mortar between the bricks,

said array comprising a number of superimposed rows of bricks,

the bricks in each row of bricks being staggered relative to the bricks in each adjacent row of bricks, 5

each brick having a plurality of through holes extending between a top and a bottom of the brick,

holes in each brick being in alignment with associated holes in vertically adjacent bricks, 10

a transverse reinforcing bar mounted between at least two adjacent rows of bricks, 15

a number of spaced-apart vertical reinforcing bars extending through aligned holes in the bricks between a top row of the bricks and a bottom row of the bricks in the brick array, 20

two vertical reinforcing bars extending through each full brick in the array.

[0018] In another embodiment, an outer vertical reinforcing bar and an inner vertical reinforcing bar extend through each brick, said outer vertical reinforcing bar and inner vertical reinforcing bar engaging holes in the brick spaced-apart at each side of a longitudinal axis of the brick. 25

[0019] In a further embodiment, the outer vertical reinforcing bar and the inner vertical reinforcing bar are laterally offset in each brick, engaging longitudinally spaced-apart holes in the brick. 30

[0020] In another embodiment, a pair of spaced-apart transverse reinforcing bars are mounted between at least two adjacent rows of brick. 35

[0021] In another embodiment, pairs of spaced-apart transverse reinforcing bars are mounted between all the rows of bricks.

[0022] In a further embodiment, the cladding panel has mounting means for attachment of the cladding panel to a support structure. Typically, the mounting means will be provided at a rear of the panel. The mounting means may be attached to the rear surface of the panel by any suitable fasteners. Alternatively, the mounting means may be embedded in the panel structure. In this construction, the mounting means may be engaged by the reinforcing bars passing through the cladding panel. 40 45

Brief Description of the Drawings

[0023] The invention will be more clearly understood by the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings, in which: 50

Fig. 1 is an elevational view of a cladding panel according to the invention;

Fig. 2 is a plan view of the cladding panel;

Fig. 3 is a detail end elevational view of the cladding panel;

Fig. 4 is a perspective view of the cladding panel;

Fig. 5 is an enlarged detail cut-away perspective view showing portion of the cladding panel;

Fig. 6 is an enlarged detail side sectional view taken along the line VI-VI of Fig. 2;

Fig. 7 is an elevational view of another cladding panel according to a second embodiment of the invention;

Fig. 8 is a plan view of another cladding panel according to a third embodiment of the invention;

Fig. 9 is a detail plan view showing a cladding panel assembly according to another embodiment of the invention;

Fig. 10 is an enlarged perspective view of a brick used in construction of the cladding panel; and

Figs. 11 to 16 show sequential stages in a method of manufacture of the cladding panels according to the invention.

Detailed Description of the Preferred Embodiments

[0024] Referring to the drawings and initially to Figs. 1 to 6 thereof, there is illustrated a cladding panel according to the invention, indicated generally by the reference numeral 1. The cladding panel 1 comprises a plurality of bricks 2 stacked in a number of rows 3. Vertical reinforcing bars 4 extend through the bricks 2 between a top 5 and a bottom 6 of the panel 1. Mortar 7 is provided between the bricks 2. Transverse reinforcing bars 12 are embedded in the mortar 7 between each row 3 of the bricks 2. 40

[0025] Referring to Fig. 10, the bricks 2 are conventional building bricks with a number of spaced-apart through holes 8 extending between a top face 9 and a bottom face 10 of each brick 2. Each brick 2 has a length L of 215mm, a width W of 105mm and a depth D of 65mm. Each hole 8 has a diameter of 20mm. As can be seen in the drawings, two rows of five spaced-apart holes 8 are provided. The vertical reinforcing bars 4 extend through the bricks 2 in each row of bricks between the top 5 and bottom 6 of the cladding panel 1, as can best be seen in Fig. 3. 50

[0026] It will be noted that all of the bricks 2 in the cladding panel 1 are engaged by the vertical reinforcing bars 4. Each full brick 2 is engaged by two of the vertical reinforcing bars 4. One of said two vertical reinforcing bars 4 engages in one of the holes 8 in the front row of holes 55

in the brick 2 and the other vertical reinforcing bar 4 engages in one of the holes 8 in the rear row of vertical holes 8 in the brick 2. Thus, effectively, a front row of spaced-apart vertical reinforcing bars 4 is provided, together with a rear row of spaced-apart vertical reinforcing bars 4 extending through the panel 1. Also, the two vertical reinforcing bars 4 which engage each brick 2 are offset being spaced-apart at opposite sides of a central longitudinal axis X of the brick 2 and are also laterally offset in each brick 2 engaging longitudinally spaced-apart holes 8 in the brick 2 as best seen in Fig 5.

As shown in Figs.1 and 4 the bricks 2 in each row 3 of bricks 2 are offset from the next adjacent row 3 of bricks 2 in similar fashion to a conventional brick wall construction.

[0027] As best seen in Fig. 5, pairs of transverse reinforcing bars 12 are mounted between each row 3 of bricks 2 and extend between opposite ends 16, 17 of the wall panel 1, being embedded in the mortar 7. Such pairs of transverse reinforcing bars 12 may be provided between some or all of the rows 3 of bricks 2, as required.

[0028] Although not shown in the drawings, tie elements may be mounted on a rear face of the cladding panel 1 or embedded in the cladding panel 1 and projecting outwardly of the rear face of the cladding panel 1 for connection to a support structure on a building for mounting the cladding panel 1 on a building structure.

[0029] Referring now to Fig. 7, another prefabricated reinforced masonry panel according to a second embodiment of the invention is shown and indicated generally by the reference numeral 20. Parts similar to those described previously are assigned the same reference numerals. In this case, a number of openings 21 are provided in the wall panel 20 for reception of windows.

[0030] Referring now to Fig. 8, another prefabricated reinforced masonry panel is shown and indicated generally by the reference numeral 30. Parts similar to those described previously are assigned the same reference numerals. In this case, a pair of spaced-apart brick panels 1 are provided between which is sandwiched an intermediate layer 31. Said intermediate layer 31 may comprise insulation or alternatively it could comprise a reinforced concrete layer.

[0031] Referring to Fig. 9, there is shown another prefabricated reinforced masonry panel assembly, indicated generally by the reference numeral 40. Parts similar to those described previously are assigned the same reference numerals. In this case, the masonry panel 40 comprises an outer brick panel 1, an intermediate insulation panel 41 and an inner panel 42 of reinforced concrete material. The outer brick panel 1 and inner reinforced concrete panel 42 are tied together in any suitable fashion and the insulation material 41 mounted therebetween. Upright T-section posts 45 are associated with the panels 40. A laterally extending tongue 46 on the post 45 engages in an associated groove 47 formed at each end of the masonry panel 40. Thus, a masonry panel 40 can be mounted between a pair of the pillars 45 in con-

structing and supporting a wall formed of the panels 40.

[0032] Referring now in particular to Figs. 11 to 16, a method for manufacturing the prefabricated reinforced brick panels 1 will be described. A plurality of bricks 2 are laid face down on a horizontal support surface 50 of a panel forming bed 51 in a spaced-apart array leaving gaps 52 between the bricks 2 for reception of the mortar 7. Said array comprises a number of juxtaposed rows of bricks 2, the bricks 2 in each row of bricks being staggered relative to the bricks in each adjacent row of bricks 2. The through holes 8 in the bricks are overlapped in adjacent rows of bricks 2 when forming the array on the bed 51. Rubber spacer strips 53 are mounted in the gaps 52 between the bricks 2 on the bed 51 and seal between the bricks 2 and the bed 51. A number of spaced-apart outer vertical reinforcing bars 54 are inserted through the overlapping holes 8 in the bricks 2 between a top row of the bricks 2 and a bottom row of the bricks 2 in said array of bricks on the bed 51 (Fig.12). Next, a first transverse reinforcing bar 12 is laid across the outer reinforcing bars 54 (Fig. 13) along at least one of the gaps 52 between the rows of bricks 2. Then a number of inner vertical reinforcing bars 56 are inserted through the holes 8 in the bricks 2 to extend between the top row of bricks 2 and the bottom row of bricks 2 in the array of bricks mounted on the bed 51 (Fig.14). A second transverse reinforcing bar 12 is mounted on top of the inner reinforcing bars 56 (Fig. 15) in the gaps 52 between the rows of bricks 2. A liquid mortar is prepared from a mixture of special fine sand, cement and water. Further additives may also be included, for example an additive to improve flowability without segregation. The liquid mortar is poured into the gaps 52 filling the gaps 52 and the holes 8 in the bricks 2. The mortar 7 is allowed to set and then the prefabricated reinforced masonry panel 1 is removed from the bed 51.

[0033] The reinforcing bars preferably comprise rebar of suitable size. For example the vertical reinforcing bars 4,54,56 will typically be in the order of 8mm-10mm and the transverse reinforcing bars 12 may be in the order of 6mm. The transverse reinforcing bars 12 are provided in one or more courses, in some cases in every second course, and in some cases in every course.

[0034] The mortar should be free flowing to readily easily and quickly fill the gaps between the bricks and the holes in the bricks whilst at the same time avoiding segregation of the components.

[0035] In use, a number of the cladding panels 1 are mounted on an exterior of a building structure to provide a brick wall façade on the building structure. Any suitable mounting means may be provided for mounting the panels 1 and such mounting of cladding panels on support structures is well known in the art.

[0036] The invention is not limited to the embodiments hereinbefore described which may be varied in both construction and detail within the scope of the appended claims.

Claims

1. A method for manufacturing a prefabricated reinforced masonry panel, including the steps:

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laying a plurality of bricks face down on a horizontal support surface of a panel forming bed in a spaced-apart array leaving gaps between the bricks for reception of mortar,
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said array comprising a number of juxtaposed rows of bricks,
the bricks in each row of bricks being staggered relative to the bricks in each adjacent row of bricks,
each brick having a plurality of spaced-apart through holes extending between a top and a bottom of the brick,
overlapping said holes in adjacent rows of bricks when forming said array,
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inserting a number of spaced-apart outer vertical reinforcing bars through said overlapping holes in the bricks in alignment,
said outer vertical reinforcing bars extending between a top row of the bricks and a bottom row of the bricks in said array of bricks,
20
laying a first transverse reinforcing bar across said outer vertical reinforcing bars along at least one of the gaps between rows of bricks,
inserting a number of inner vertical reinforcing bars through said overlapping holes in the bricks in alignment,
25
said inner vertical reinforcing bars extending between the top row of bricks and the bottom row of bricks in said array of bricks and spaced above the outer vertical reinforcing bars on the bed,
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preparing a liquid mortar and pouring said liquid mortar into the gaps between the bricks and through the holes in the bricks,
allowing the mortar to set to form the prefabricated reinforced masonry panel, and
removing the prefabricated reinforced masonry panel from the bed.

2. The method as claimed in claim 1, wherein the method includes laterally offsetting the inner and outer vertical reinforcing bars. 45
3. The method as claimed in any preceding claim, wherein the method includes inserting two vertical reinforcing bars through each brick. 50
4. The method as claimed in claim 3, wherein the method includes inserting one outer vertical reinforcing bar and one inner vertical reinforcing bar through each brick. 55
5. The method as claimed in any preceding claim, wherein the method includes laying a second trans-

verse reinforcing bar across said inner vertical reinforcing bars along at least one of the gaps between rows of bricks prior to pouring the liquid mortar into the gaps between the bricks.

6. The method as claimed in any preceding claim, wherein the method includes laying first and second transverse reinforcing bars in all the gaps between the rows of bricks.
7. The method as claimed in any preceding claim, wherein each transverse reinforcing bar extends between opposite sides of the brick array.
8. The method as claimed in any preceding claim, wherein the reinforcing bars comprise rebar.
9. The method as claimed in any preceding claim, wherein the method includes preparing a liquid mortar by mixing together a fine sand, cement and water.
10. The method as claimed in any preceding claim, wherein the method includes the step of arranging the bricks on the bed for forming an ope in the wall panel.
11. The method as claimed in any preceding claim, wherein the method includes providing means for sealing between a face of each brick and the bed.
12. The method as claimed in claim 11, wherein said sealing means extends into the gaps between the bricks.
13. The method as claimed in claim 11 or claim 12, wherein said sealing means comprises resilient sealing elements mounted on the bed in the gaps between the bricks.

14. A prefabricated reinforced masonry panel, including:
a plurality of bricks arranged in a spaced-apart array of bricks with mortar between the bricks, said array comprising a number of superimposed rows of bricks,
the bricks in each row of bricks being staggered relative to the bricks in each adjacent row of bricks,
each brick having a plurality of through holes extending between a top and a bottom of the brick,
holes in each brick being in alignment with associated holes in vertically adjacent bricks,
a transverse reinforcing bar mounted between at least two adjacent rows of bricks,
a number of spaced-apart vertical reinforcing bars extending through aligned holes in the bricks between a top row of the bricks and a

bottom row of the bricks in the brick array,
two vertical reinforcing bars extending through
each full brick in the array.

15. The prefabricated reinforced masonry panel as 5
claimed in claim 14, wherein an outer vertical rein-
forcing bar and an inner vertical reinforcing bar ex-
tend through each brick, said outer vertical reinforc-
ing bar and inner vertical reinforcing bar engaging
holes in the brick spaced-apart at either side of a 10
longitudinal axis of the brick.
16. The prefabricated reinforced masonry panel as
claimed in claim 14 or claim 15, wherein the outer 15
vertical reinforcing bar and the inner vertical reinforc-
ing bar are laterally offset in each brick, engaging
longitudinally spaced-apart holes in the brick.
17. The prefabricated reinforced masonry panel as
claimed in any of claims 14 to 16, wherein a pair of 20
spaced-apart transverse reinforcing bars are mount-
ed between at least two adjacent rows of brick.
18. The prefabricated reinforced masonry panel as
claimed in any of claims 14 to 17, wherein pairs of 25
spaced-apart transverse reinforcing bars are mount-
ed between all the rows of bricks.

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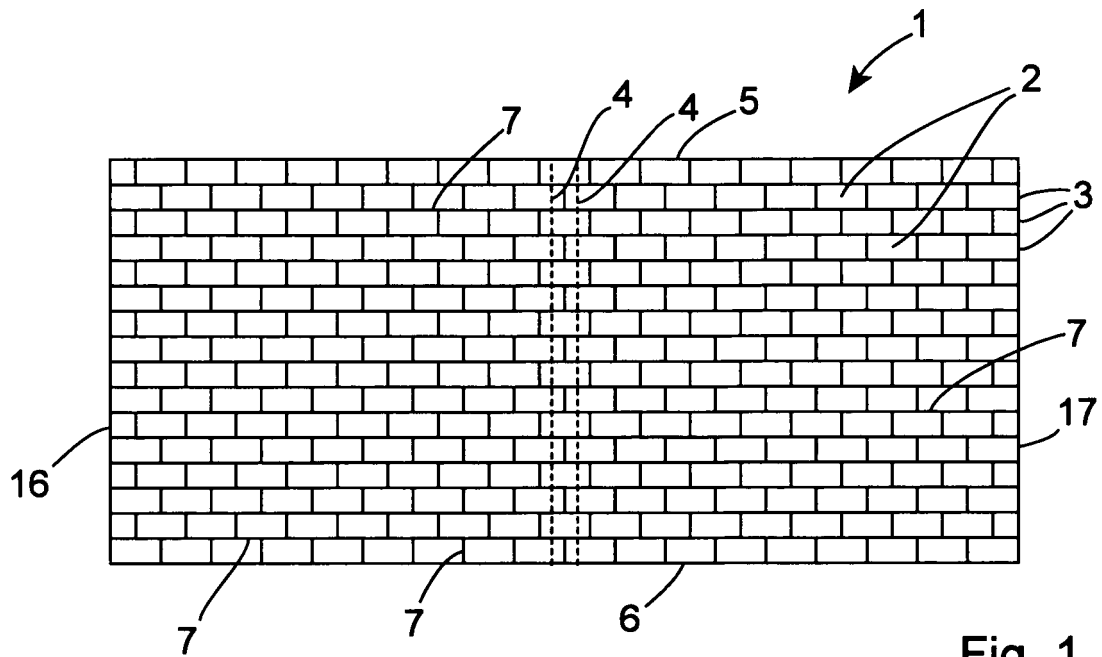


Fig. 1

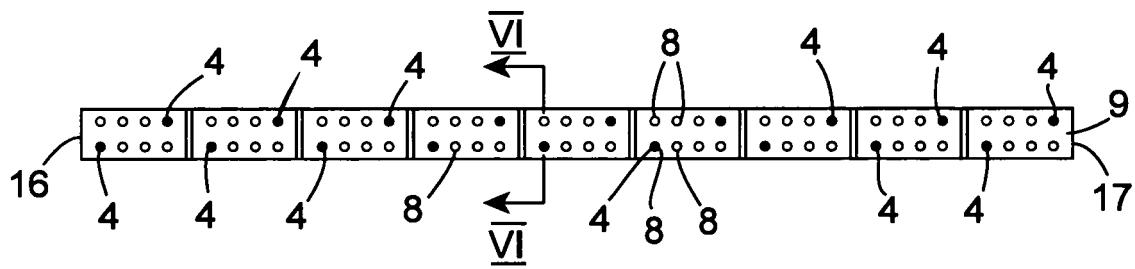


Fig. 2

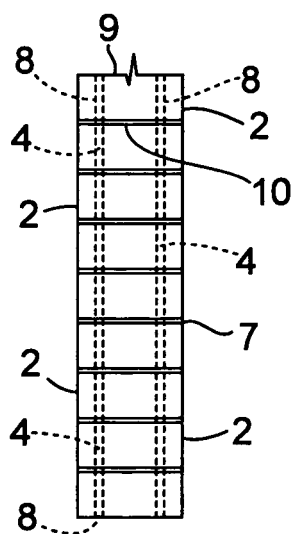


Fig. 3

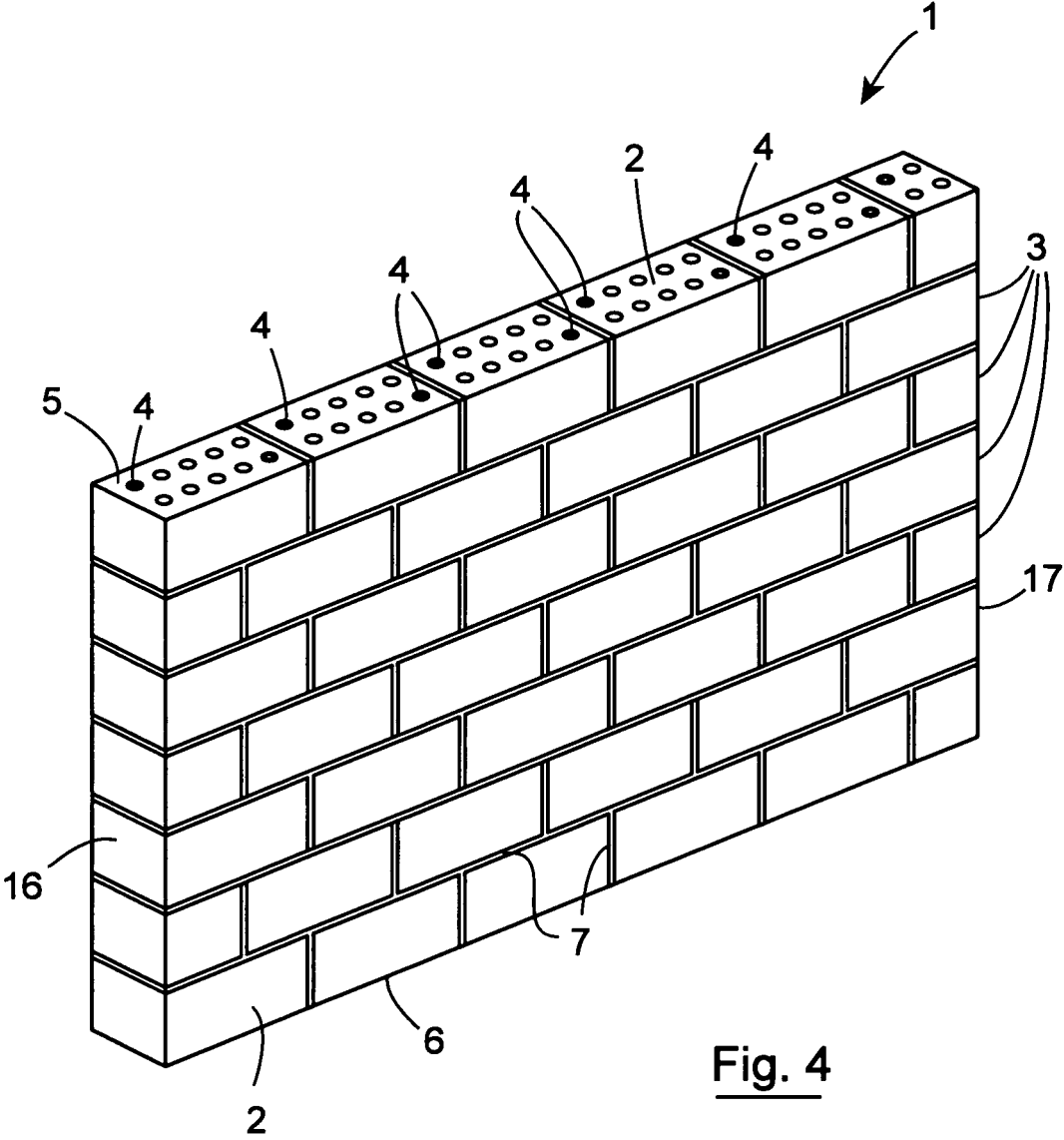


Fig. 4

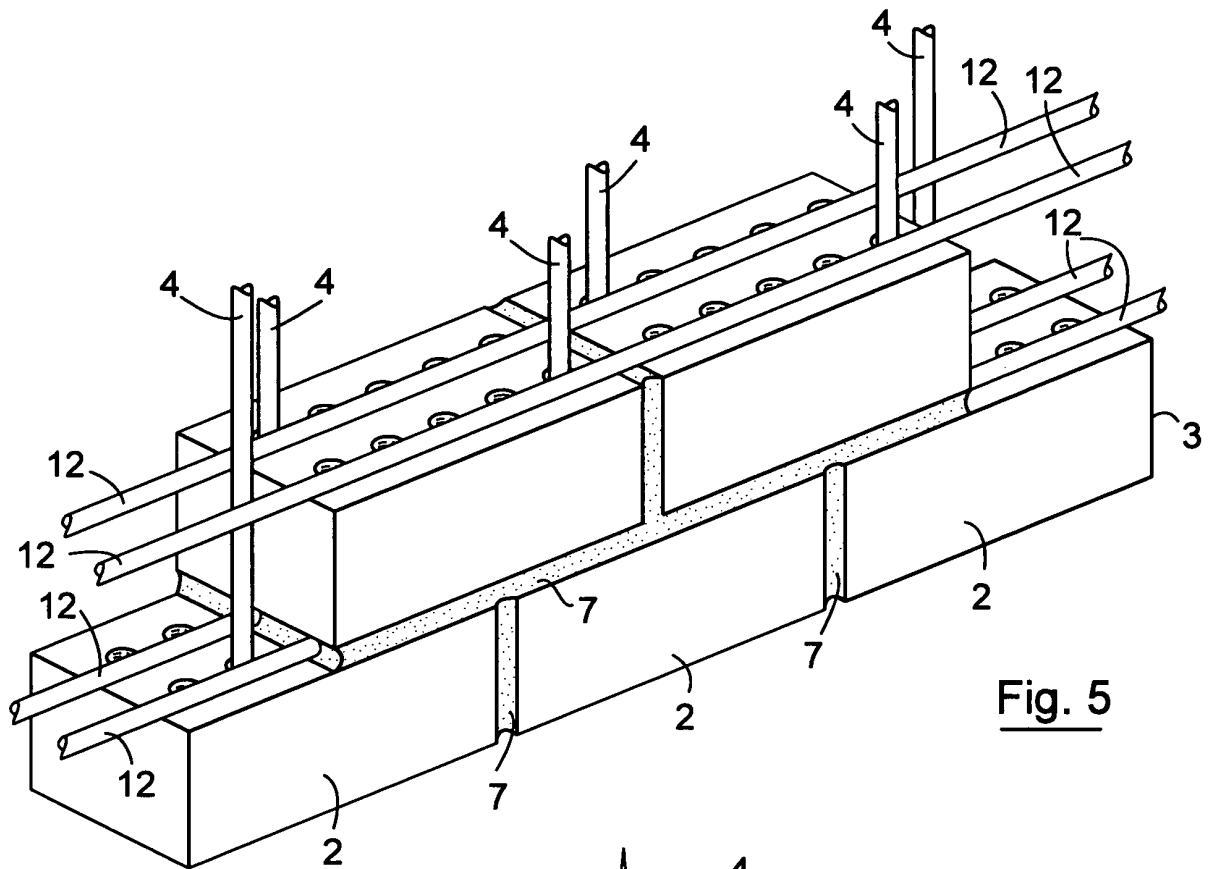


Fig. 5

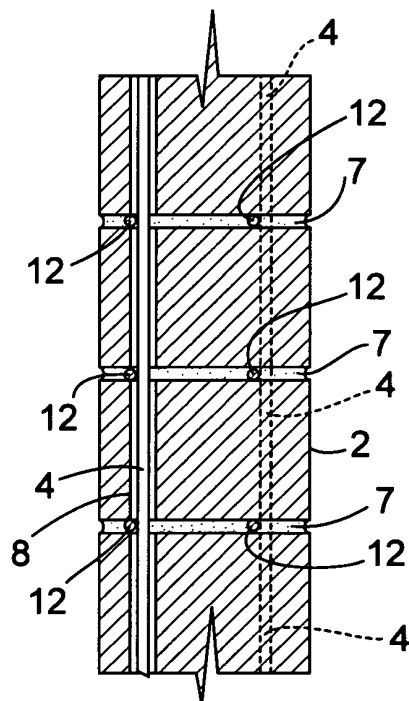


Fig. 6

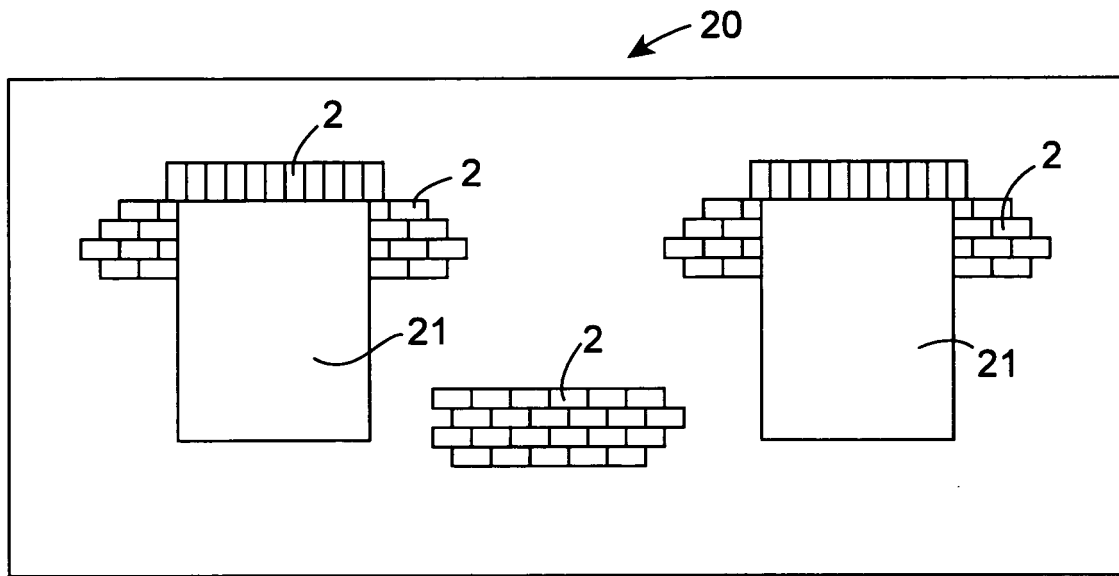


Fig. 7

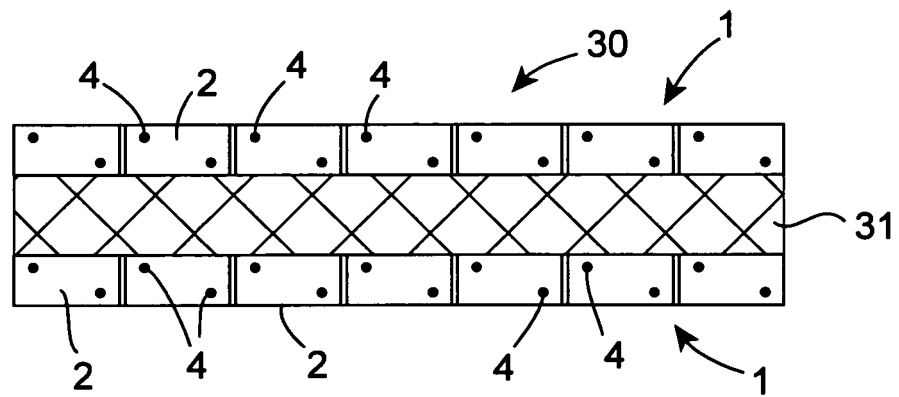
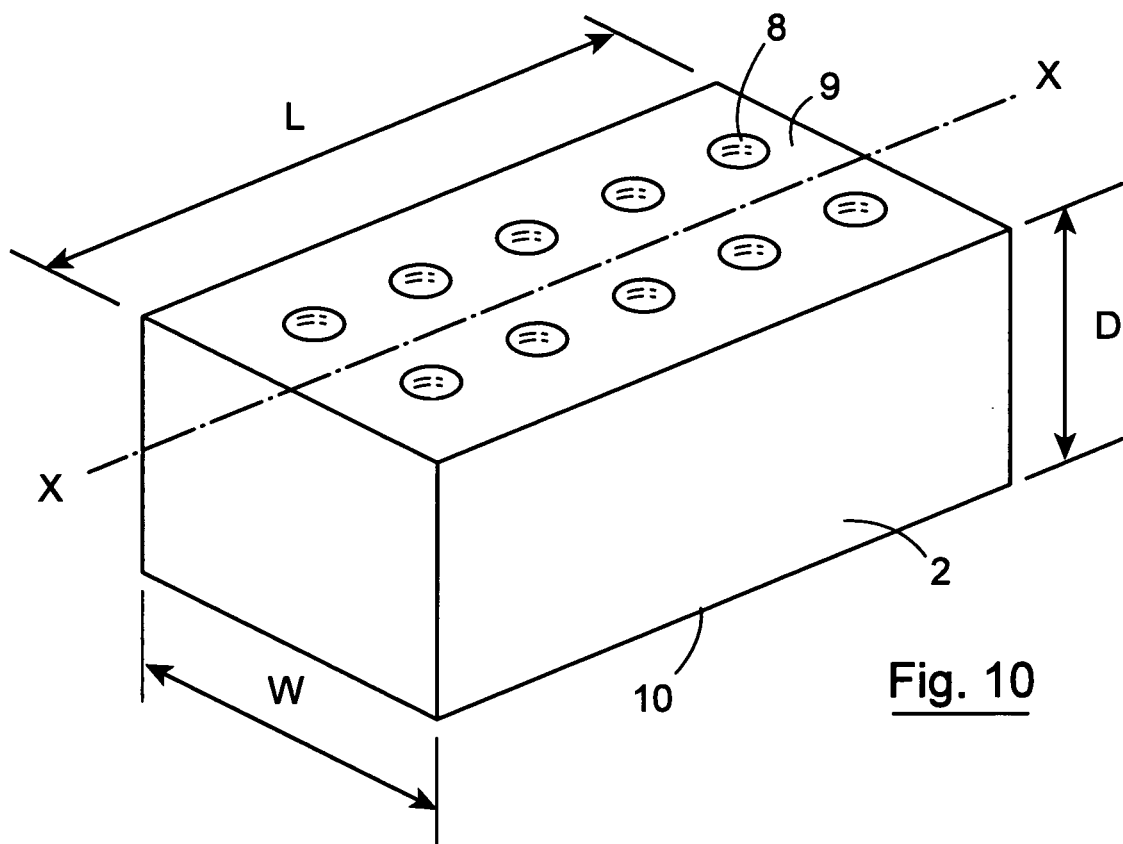
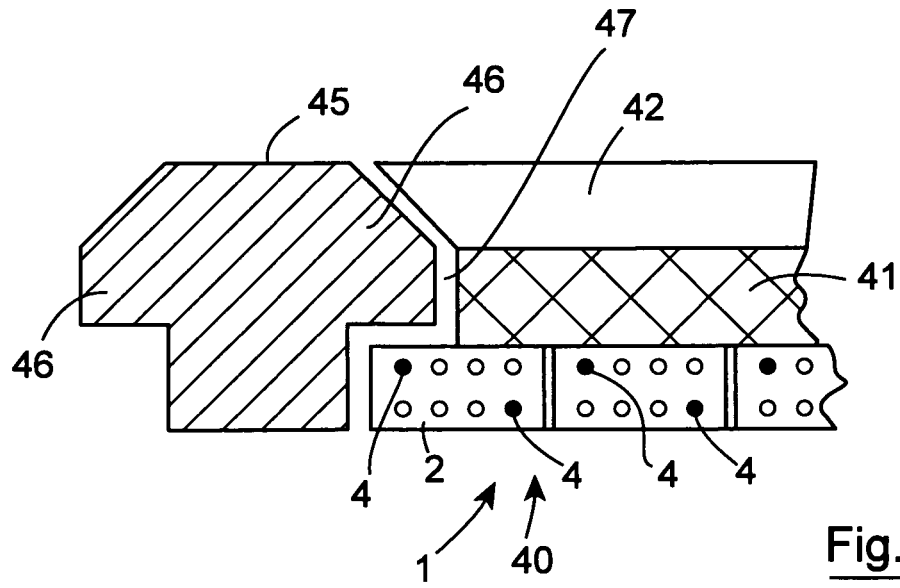


Fig. 8



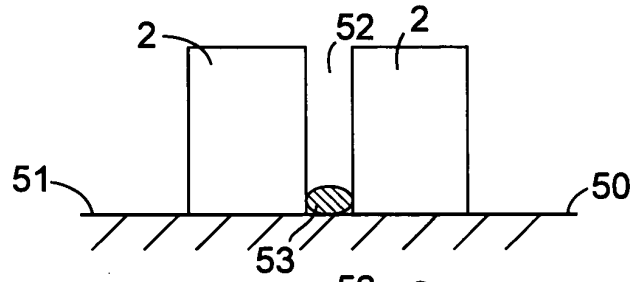


Fig. 11

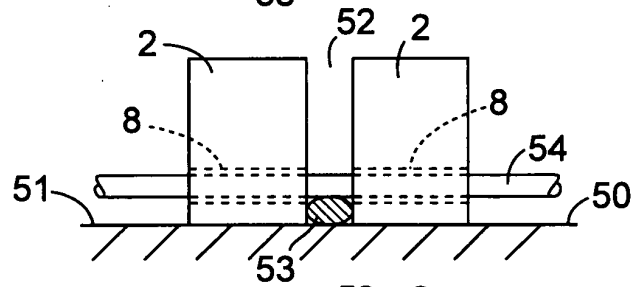


Fig. 12

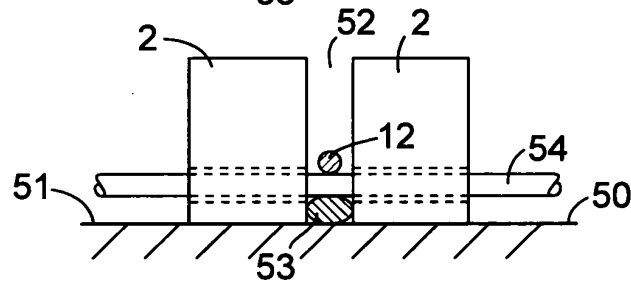


Fig. 13

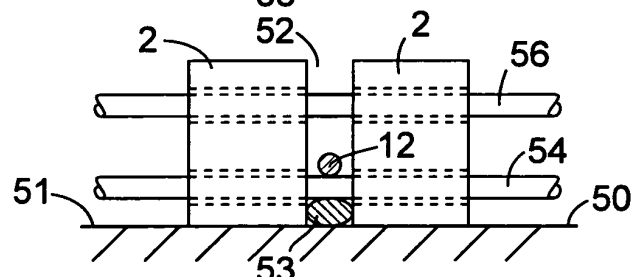


Fig. 14

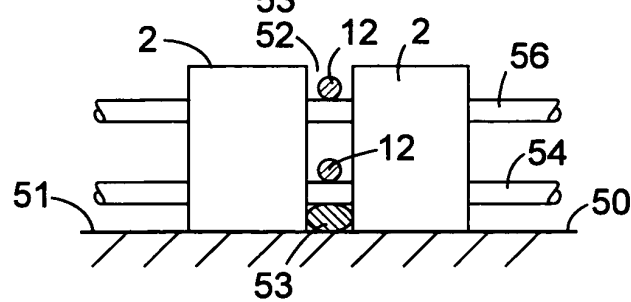


Fig. 15

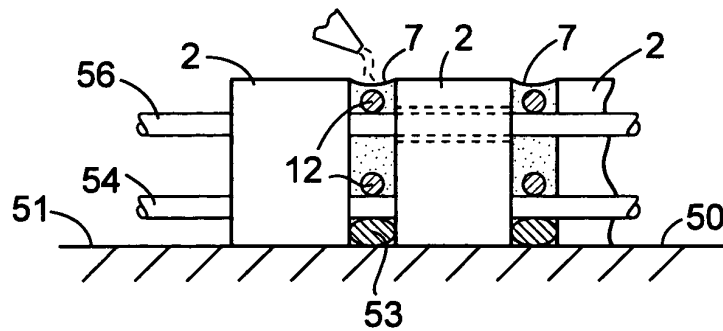


Fig. 16

REFERENCES CITED IN THE DESCRIPTION

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