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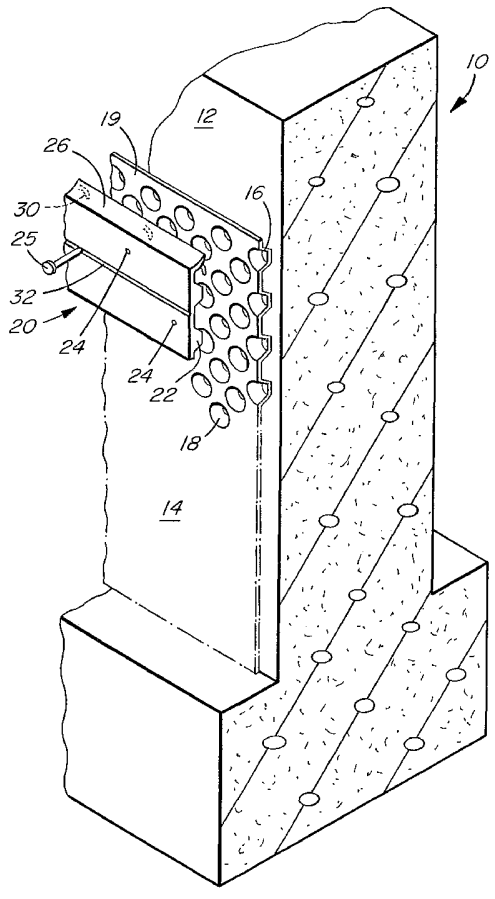
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(54) Title: FOUNDATION PROTECTOR SYSTEM



(57) Abstract: A foundation protection system for the exterior surface (12) of a foundation wall (10) has a membrane (14) of plastic material on the exterior surface (12) of the foundation wall (10), the membrane (14) having a marginal edge portion (19), and a securement strip (20) extending along the entire marginal edge portion (19) of the membrane (14). The membrane (14) and the securement strip (20) have interengaged projecting (22) and recessed (18) portions, with fasteners (25) penetrating through the securement strip (20) and the membrane (14) into the foundation wall (10) and thereby securing the securement strip (20) and the membrane (14) to the foundation wall (10). The securement strip (20) may have a flexible flange (26) in sealing contact with the foundation wall (10) upwardly beyond the marginal edge portion (19) of the membrane (14) along the entire length of the marginal edge portion (19) of the membrane (14). A slot-shaped recess (32) extends along the securement strip (20) for temporarily holding nails (25) or screws during installation.

WO 2004/106642 A1

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Description

FOUNDATION PROTECTOR SYSTEM

Technical Field

The present invention relates to surface coverings and is useful, more particularly, for foundation protection systems and for securement strips for use in such systems.

Background Art

For protecting a foundation wall against the effects of moisture, it is known to install against the exterior surface of the foundation wall a foundation protector sheet or membrane which is made of waterproof material and which is dimpled, so that the dimples of such sheet or membrane can be placed against the exterior surface of the foundation wall to allow moisture to seep downwardly through spaces between the dimples, between the protector sheet or membrane and the exterior surface of the foundation wall.

The dimples of the foundation protector sheet or membrane, which project from one side of the foundation protector sheet or membrane, form corresponding recesses in the opposite side of the foundation protector sheet or membrane.

During the installation of the foundation protector system, and after the foundation protector sheet or membrane has been installed on the foundation wall exterior surface, the foundation is backfilled and, consequently, soil is pressed against the outer surface of the protector sheet or membrane and into the recesses. When this occurs, and during subsequent subsidence of the ground around the foundation wall, this soil tends to drag the foundation protector sheet or membrane downwardly and away from the foundation exterior surface.

To counteract such displacement of the foundation protector sheet or membrane from its correct position on the foundation wall exterior surface, fasteners of various types have been previously employed. For example, in United States Patent Number 6,523,309, issued February 25, 2003 to Shane Finley, there is disclosed a fastening plate for securing a membrane to a substrate, the fastening plate being shaped to interengage recesses in the outer surface of a foundation protector membrane and to be secured to the substrate by a nail driven through the fastening plate and through the foundation protector or membrane into the substrate.

In use, a plurality of such fastening plates is required to be spaced apart along the foundation protector membrane.

However, it has been found, in practice, that the use of such fastening plates is unsatisfactory because the foundation protector membrane is dragged downwardly, in the above-described manner, and sags between the fastening plates. These prior fastening plates, therefore, do not effectively seal the entire edge of the foundation protector membrane and it is consequently necessary, in practice, to caulk the edge of the foundation protector membrane.

Therefore, the use of such spaced apart fastening plates requires some means other than the fastening plates themselves to close and seal the gaps between the surface of the substrate or foundation wall and the foundation protector membrane along the top of the foundation protector membrane.

Disclosure of Invention

According to the present invention, there is provided a securement strip for securing a marginal edge portion of a foundation protector sheet to a foundation wall, the foundation protector sheet having projections on one side thereof for abutment against the foundation wall and recesses on opposite sides thereof, with spaces between the projections, the securement strip comprising a first portion extending along the securement strip and

formed with protrusions for engagement in the recesses in the foundation protector sheet, and a second portion extending along the first portion, the second portion comprising a flexible flange extending at an angle from the first portion for flexed engagement with the foundation wall above the foundation protector sheet so as to close the spaces between the projections of the foundation protector sheet, the first portion being adapted to receive fasteners for fastening the securement strip and, therewith, the foundation protector sheet to the foundation wall.

When the securement strip according to the present invention is in use, the length of the securement strip is selected so that it is long enough to extend, by itself or together with one or more similar securement strips, along the entire length of the foundation protector sheet so as to ensure that the foundation protector sheet is supported along the entirety of the foundation protector sheet to prevent moisture and soil from entering between the top of the foundation protector sheet and the foundation wall.

In a preferred embodiment of the invention, a sealing strip, e.g. of foam material, is provided along the length of the flexible flange for sealing the latter to the foundation wall.

Also, a slot-shaped recess is formed along the securement strip for receiving and gripping the tips of nails or screws. This greatly facilitates the installation of the securement strip, since one or more nail or screw tips can be inserted into this recess before the securement strip is interengaged with the foundation protector sheet, thereby enabling the person carrying out the installation to employ both hands for gripping and positioning the securement strip and, if necessary, for simultaneously gripping and adjusting the upper edge of the foundation protector sheet. Also, the slot-shaped recess enables nails or screws to be employed at any position along the marginal edge portion of the waterproof sheet, and therefore avoids problems which would otherwise arise when, for example, a waterproof sheet of metric dimensions is attached to a building foundation of imperial dimensions, which may occur for example when the foundation protector is applied to wood or IF foundations.

The insertion of nails at any position along with the length of the securement strip is also particularly advantageous when the securement strip is installed around a corner of the foundation wall.

Also according to the present invention, there is provided surface covering on a substrate, comprising a membrane of plastic material, the membrane having a marginal edge portion, a securement member extending along the marginal edge portion of the membrane, the membrane and the support strip, in this case a securement member, having interengaged projecting and recessed portions, the support strip having a flexible marginal portion extending upwardly into sealing contact with the substrate beyond the marginal edge portion of the membrane along the entire length of the marginal edge portion of the membrane, and fasteners extending through the support strip and the membrane into the substrate and thereby securing the support strip and the membrane to the substrate.

Brief Description of the Drawings

The invention will be more readily understood from the following description of preferred embodiments thereof given, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 shows a broken-away view, in perspective, of a part of a foundation wall provided with a foundation protector system embodying the present invention;

Figure 1A shows a broken-away portion in perspective of a part of a securement strip forming a component of the system of Figure 1;

Figure 2 shows a view in front elevation of the foundation wall and the foundation protector system of Figure 1;

Figure 3 shows a view taken in vertical cross-section through the foundation wall and foundation protector system of Figure 1;

Figure 4 shows a broken-away view, in vertical cross-section, through parts of a foundation wall and a modification of the foundation protector system of Figure 1;

Figures 5, 6 and 7 show broken-away views, in vertical cross-section, through parts of modified foundation protector sheets;

Figure 8 shows a broken-away plan view of overlapping ends of a pair of securement strips;

Figures 9, 10 and 11 show broken-away views in perspective of interengageable portions of foundation protector sheets and securement strips;

Figure 12 shows a modified securement strip according to another embodiment of the present invention;

Figures 13, 14, and 15 show broken-away views in perspective of securement strips with various forms of protrusions and recesses in the first portion of the securement strip, according to other embodiments of the invention;

Figure 13A shows a broken-away view, in vertical cross-section, through parts of a foundation wall and a foundation protector system employing the securement strip of Figure 13;

Figures 17 and 18 show broken-away views in perspective of securement strips with protrusions and recesses in an opposing side of the securement strip according to other embodiments of the invention;

Figures 18, 19, and 20 show perspective views of angled securement strips according to other embodiments of the invention;

Figures 21 and 22 show broken-away views taken in side elevation of two forms of securement strips and foundation protector sheets.

Figures 23a-g show plan views of securement strips having interconnecting formations.

Description of the Best Mode

Referring firstly to Figure 1 of the accompanying drawings, there is shown a foundation wall indicated generally by reference 10 having an exterior surface 12. A foundation protector sheet or membrane 14 is located on the exterior surface 12 of the foundation wall 10.

The foundation protector sheet 14 is a dimpled sheet formed at one side thereof with a plurality of protrusions 16, in the form of dimples of frusto-conical cross-sectional shape, which project towards and abut the exterior surface 12 of the foundation wall 10. Each of these protrusions 16 forms, at the opposite side of the foundation protector sheet 14, a corresponding frusto-conically shaped recess 18.

Along the entire length of a marginal edge portion 19 of the foundation protector sheet 14, which may e.g. be a horizontal marginal edge portion or a vertical marginal edge portion of the foundation protection sheet 14, there is provided at least one securement strip, indicated generally by reference numeral 20. The securement strip 20 is extruded from high density polyethylene, but may alternatively be made from low density polyethylene or partly propylene and any other suitable plastic material, and may be of any desired color. The securement strip 20 is formed, at an inner side thereof, with a plurality of protrusions 22 (Figure 1A). These protrusions 22 have a frusto-conical cross-sectional shape complementary to that of the recesses 18, and the protrusions 22 are spaced from one another in an array corresponding to that of the recesses 18 in such a

manner that the protrusions 22 on the securement strip 20 can engage in respective ones of the recesses 18 along a marginal edge portion 19 of the foundation protector sheet 14.

The securement strip 20 is formed with nail holes 24, which are distributed along the length of the securement strip 20. Nails 25 (Figure 2) can be driven through these nail holes 24 and through the foundation protector sheet 14 into the foundation wall 10 to fasten the securement strip 28, and therewith the marginal edge portion 19 of the foundation protector sheet 14, into position on the exterior surface 12 of the foundation wall 10. It used to be understood that, in some cases, the nails 25 may be replaced by screws (not shown).

The securement strip 20 includes, along its entire upper edge, a flexible flange 26 which is angled from the securement strip 20 towards the exterior surface 12 of the foundation wall 10. More particularly, as can be seen from Figure 2, the flexible flange 26 has an outer edge 28 which is pressed against the exterior surface 12 of the foundation wall 10 when the securement strip 20 is secured to the foundation wall 10 by the nails 25. The flexible flange 26 serves to seal the securement strip 20 to the exterior surface 12 of the foundation wall 10 and, thereby, to provide a seal, above the upper edge of the foundation protector sheet 14, to the exterior surface 12 so as to prevent moisture and contaminants from passing downwardly between the foundation protector sheet 14 and the exterior surface 12 through the gaps or spacings between the protrusions 16 of the foundation protector sheet 14.

The sealing of the flange 26 against the surface 12 may be enhanced, as illustrated in Figure 4, by the provision of a sealing strip 28 provided on the flexible flange 26 and extending along the entire length of the flexible flange 26. This sealing strip 28, which is preferably made of foam material, is compressed between the flexible flange 26 and the foundation wall exterior surface 12.

As shown in Figures 1, 2 and 4, the securement strip 20 is provided with a plurality of prongs 30, which are spaced apart along the flexible flange 26, at the side of the sealing

strip 20 facing the foundation wall 10. These prongs 30 extended downwardly from the flexible flange 26 and, during installation of the foundation protector system, can be hooked over the marginal edge portion 19 of the foundation protector step 14 so as to temporarily hold the protector strip 20 in position relative to the top of the foundation protector sheet 14 while the securement strip 20 and the foundation protector sheet 14 are manipulated into position on the foundation wall exterior surface 12.

The side of the securement strip 20 which faces away from the exterior surface 12 of the foundation wall 10 is formed, along the entire length of the securement strip 20, with a longitudinally extending, slot-shaped recess 32. This recess 32 is dimensioned to receive and grip the tips of nails, and thereby to temporarily retain the nails in position relative to the securement strip 20, during the installation of the foundation protector system. When the foundation protector sheet 14 and to the securement strip 20 have been properly positioned on the exterior surface 12 of the foundation wall 10, these nails can then be hammered through the securement strip 20 and the foundation protector sheet 14 into the foundation wall 10. The recess 32 thereby facilitates the installation of the foundation protector system by a person who can use both of his hands to grip and position the securement strip 28 and the top of the foundation protector sheet 14 without requiring that person to use one of his hands to hold the nails in position relative to the securement strip 20.

As shown in Figure 2, the protrusions 22 are solid. However, these solid protrusions may be replaced by hollow protrusions as shown in Figure 5, 6 and 7. The protrusion shown in Figure 5, and indicated generally by reference numeral 23 is a hollow protrusion having a cylindrical hollow interior 25 which opens at the side of the securement strip opposite from the protrusions 23, while Figure 6 shows a protrusion 27 having a cylindrical opening 29 open at opposite sides of the securement strip. In Figure 7, there is shown a protrusion 31 having a hollow interior space 33 which is open towards the foundation wall 10.

The securement strip 20 may, in practice, be one of a plurality of securement strips extending along the marginal edge portion of one or more foundation protector sheets. In that case, the securement strips may have overlapping end portions 35 and 37, as shown in Figure 8.

Since the purpose of the protrusions on the securement strip is to support the foundation protector sheet against downward displacement, the lower halves of the protrusions 22 may be omitted, as shown, for example, in Figure 9, in which protrusions modified in this manner are indicated by reference numerals 40, which are semi-cylindrical and which are shaped and dimensioned to interengage with cylindrical recesses 42 in the foundation protector sheet.

Figure 10 shows chevron-shaped protrusions 44 on the securement strip for engagement in upper portions of rectangular recesses 46 in the foundation protector sheet.

Figure 11 shows horizontally rectangular or bar-shaped protrusions 48 for engagement in corresponding recesses 50.

Figure 12 shows a modified securement strip, which is indicated generally by reference numeral 21, and which is similar to the securement strip 20 of Figures 1 to 4, except that in the case of the securement strip 21 the flexible flange 26 has been omitted. The securement strip 21 therefore, does not provide a seal between the marginal edge portion 19 and the foundation wall surface. For that purpose, caulking or some other sealing means may be employed. However, the securement strip 20A, by itself or in combination with one or more other securement strips (not shown) extends continuously along the marginal edge portion 19 and, therefore, supports and secures the marginal edge portion 19 relative to the foundation exterior surface 12 along the entirety of the marginal edge portion 19.

Figures 13 through 15 show different forms of the protrusions and recesses of the inner side of the securement strip according to other embodiments of the invention.

More particularly, Figure 13 shows frusto-conical recesses 60 in a securement strip 120 which engage complementary protrusions (not shown) on a foundation protector sheet 19a (Figure 13A) on a foundation 12a.

Figure 14 shows a securement strip 220 with elongate protrusions 62 and recesses 64 in the form of ribs having trapezoidal cross-sections. The protrusions 62 and recesses 64 inter-engage complementary protrusions and recesses (not shown) of a corresponding foundation protector sheet (not shown).

Figure 15 shows a securement strip 320 with protrusions 66 and recesses 68 in the form of ribs having square cross-sections. Again, these protrusions 66 and recesses 68 interengage complementary protrusions and recesses (not shown) in a corresponding foundation protector sheet (not shown).

Figure 16 shows a securement strip 420 having slot-shaped recesses 70 that extend from the flange 74 to a bottom edge 76 of the strip 420. These slot-shaped recesses 70 make the securement strip 20 more flexible to facilitate coiling of the securement strip 420 for storage and transport or cutting to size.

Figure 17 shows a securement strip 20 having slot-shaped recesses 72 in one side of the strip 520 and protrusions 75 on the opposite side of the strip 520, the protrusions extending around the slots 72.

Figures 18 through 20 show angled securement strips 20 for use as corner pieces for securing foundation protector sheets around corners of foundation walls (not shown).

More particularly, in Figure 18 reference numeral 620 indicates generally a securement strip forming a corner piece for use with the strip 520 of Figure 17, and in Figure 19 reference numeral 720 indicates generally a securement strip forming a corner piece for use with the securement strip 420 of Figure 16, both for use at projecting corners of

foundation walls. In Figure 20, reference numeral 820 indicates generally a securement strip 820 in the form of a corner piece for use in corner recesses of foundation walls.

Figures 21 and 22 show other embodiments of the securement strip for securing other forms of foundation protector sheets to foundation walls.

More particularly, in Figure 21 reference numeral 920 indicates generally a foundation protector sheet having upper and lower portions indicated generally by reference numerals 80 and 82, respectively. The upper portion 80 has recesses 84 and 86 on opposite sides. The securement strip 20 has protrusions 88 complementary in shape to and interengageable with the recesses 84. The lower portion 82 has frusto-conically shaped protrusions, on one side thereof, for abutment against the foundation wall.

Figure 22 shows a securement strip with frusto-conically shaped protrusions 90 and recesses 92 that inter-engage a foundation protector sheet with complementary frusto-conically shaped protrusions 94 and corresponding recesses 96. In this embodiment the foundation protector sheet has a flat surface 98 that abuts a foundation wall.

The securement strips 120, 220, 320, 420, 520, 620, 720, 820, 920 and 1020 are each formed with an elongate projection in the form of a rib indicated by reference numerals 30a-30j, respectively, which extends horizontally along the side of the securement strip which, in use, faces the foundation wall. These ribs 30a-30j are of rectangular cross-section and in use are located immediately below flexible flanges 26a-26j, which correspond to the flexible flange 26 of Figures 1-4 and serve the same purpose, and above the interengaged protrusions and recesses of the securement strip and the foundation protector sheet.

In use, the ribs 30a-30j abut the foundation wall above the foundation protector sheet and serve as a stop to limit the extent to which the flexible flanges 26a-26j are deformed by the back fill.

Thus, as shown for example in Fig. 13A, which shows a broken-away view of the securement strip 120 supporting a foundation protector sheet 14a which corresponds to the sheet 14 of Figures 1-4, on a foundation wall 12a, the projection 30a extends above the foundation protector sheet 14a to the wall 12a and limits deformation of the securement strip, including the flexible flange 26a.

An elongate projection such as the ribs 30a-30j may be provided in place of the prongs 30 of Figures 1-4 and vice versa.

Still further embodiments of the securement strip of the invention indicated generally by reference numerals 23a - 23g in Figures 23a-g, which each show a like pair of the strips.

Figures 23a - f show like pairs of securement strips formed with end connector formations 100a-f, which are interengageable with end formations 101a-f of the respective like ones of the strips for connecting the pairs of strips together end-to-end.

Figure 23g shows a longitudinally projecting end portion 102 at one end of strip 23g for overlapping a like securement strip to connect the two strips 23g end-to-end.

As will be readily apparent to those skilled in the art, various modifications may be made in the above described embodiments of the present invention within the scope of the appended claims. For example, the protrusions may have various shapes other than those shown in the accompanying drawings and described above.

CLAIMS

1. A securement strip for securing an upper horizontal marginal edge portion 19 of a foundation protector sheet (14) to a foundation wall (10), the securement strip (20)comprising first and second portions extending along the securement strip (20), the first portion having support formations (22) for supporting inter-engagement with the foundation protector sheet (14), and being adapted to receive fasteners (25) for fastening the securement strip (20) and, therewith, the foundation protector sheet (14) to the foundation wall (10), characterized in that the second portion comprises a flexible flange (26) extending at an angle from the first portion for flexed engagement with the foundation wall (10) above the foundation protector sheet (14).

2. A securement strip as claimed in claim 1, characterized by a strip (28) of sealing material extending along the flexible flange (26) for sealingly contacting the foundation wall (10).

3. A securement strip as claimed in claim 2, characterized in that the sealing material comprises a foam material.

4. A securement strip as claimed in claim 1, characterized in that the formations (22) comprise substantially frusto-conically shaped protrusions.

5. A securement strip as claimed in claim 1, characterized in that the formations (62, 64, 66, 68, 75) are elongate.

6. A securement strip as claimed in claim 5, characterized in that the securement strip (620, 720, 820) is angled to form a corner piece for use at a corner of the foundation wall (10).

7. A securement strip as claimed in claim 5, characterized in that the formations (62, 64, 66, 68) are ribs.

8. A securement strip as claimed in claim 5, characterized in that the formations (66, 68) are of rectangular cross-section.

9. A securement strip as claimed in claim 5, characterized in that the formations (62, 64) are of trapezoidal cross-section.

10. A securement strip as claimed in claim 7, characterized in that the formations are protrusions (75) on one side of the first portion and extend around respective slots (72) in an opposite side of the first portion.

11. A securement strip as claimed in claim 5, characterized in that the formations are protrusions on one side of the first portion, the protrusions extending longitudinally of the securement strip (420), and slot-shaped recesses (70) in an opposite side of the first portion extend at right angles relative to the protrusions.

12. A securement strip as claimed in claim 5, characterized in that the formations (62, 66) are of solid cross-section.

13. A securement strip as claimed in claim 1, characterized in that the first portion of the foundation protector sheet (14) is formed with nail holes (24).

14. A securement strip as claimed in claim 1, characterized in that the first portion is formed with at least one slot-shaped recess (32) extending longitudinally of the securement strip (20), the slot-shaped recess (32) being dimensioned to receive and grip the tips of nails (25).

15. A securement strip as claimed in claim 1, characterized in that the flexible flange (26) further comprises retainer members (30) angled downwardly from an upper

edge of the flange for temporarily retaining the securement strip (20) on the foundation protector sheet (14) during installation.

16. A securement strip as claimed in claim 1, characterized by a stop (30a) in the form of a projection on the second portion below the flexible flange (26a) is provided for limiting deformation of the securement strip (120) when in use.

17. A securement strip as claimed in claim 1, characterized in that the securement strip is angled to form a corner piece for use at a corner of the foundation wall (10).

18. A securement strip as claimed in claim 1, characterized in that opposite ends of the securement strip (23a-23f) have end connector formations (100a-100f) interengageable with corresponding formations (101a-101f) of like securement strips (23a-23f) for connecting the strips end-to-end.

19. A securement strip as claimed in claim 1, characterized in that one end of the securement strip (23g) is formed with a longitudinally projecting portion (100g) for overlapping an adjacent like securement strip (23g).

20. A surface covering on a substrate, comprising a securement strip (20) as claimed in any one of claims 1 to 19, with a membrane (14) of plastic material, the membrane (14) having an upper marginal edge portion (19) and fasteners (25) extending through the securement strip (20) and the membrane (14) into the substrate (10) and thereby securing the securement strip (20) and the membrane (14) to the substrate (10), characterized in that the securement strip (20) extends along the upper marginal edge portion (19) of the membrane (14) and the flexible flange (26) extends upwardly into sealing contact with the substrate (10) beyond the upper marginal edge portion (19) of the membrane (14) along the entire length of the upper marginal edge portion (19) of the membrane (14).

21. A surface covering on a substrate as claimed in claim 20, characterized by a projection (30a) extending from the securement strip (120) to the substrate (10) as a stop for limiting deformation of the securement strip (120), the projection (30a) being located below the flexible flange (26a).

22. A surface covering on a substrate as claimed in claim 20, characterized in that the membrane (14) having an upper portion (80), and recesses comprising horizontal slots (84) in the upper portion, and a lower portion (82) with projections (85) on one side thereof for abutment against the substrate (10), the formations being protrusions comprising longitudinally extending ribs (88) on the securement strip (920) engaging in the slots (84) .

23. A surface covering on a substrate as claimed in claim 22, characterized in that the slots (84) and ribs (88) are of complementary square cross-sectional shapes.

24. A surface covering on a substrate as claimed in claim 22, characterized in that the slots (96) and ribs (90) are of complementary tapered cross-sectional shapes.

25. A surface covering on a substrate as claimed in claim 22, characterized in that the securement strip (420) is formed with vertical slots (70) in a side thereof opposite from the ribs.

26. A method of securing a foundation protector sheet to a foundation wall, comprising the steps of positioning the foundation protector sheet (14) against a surface (12) of the foundation wall (10), interengaging protrusions (22) and recesses (18) in an elongate securement strip (20) and in an upper marginal edge portion (19) of the foundation protector sheet (14), fastening the securement strip (20) to the foundation wall (10) to secure the upper marginal edge portion (19) of the foundation protector sheet (14) in position on the foundation wall (10) wherein the improvement comprises before fastening the securement strip (20) to the foundation wall (10) locating a sealing flange (26) extending along the

securement strip (20) in engagement with the foundation wall surface (12) above the upper marginal edge portion (19) of the foundation protector sheet (14).

27. A method of securing a foundation protector sheet as claimed in claim 26,wherein the improvement comprises interengaging a vertical end formation (100a-100g) of the securement strips(23a-23f) with a complementary end formation (101a-101g) of an adjacent like securement strips (23a-23f) to connect the strips end-to-end.

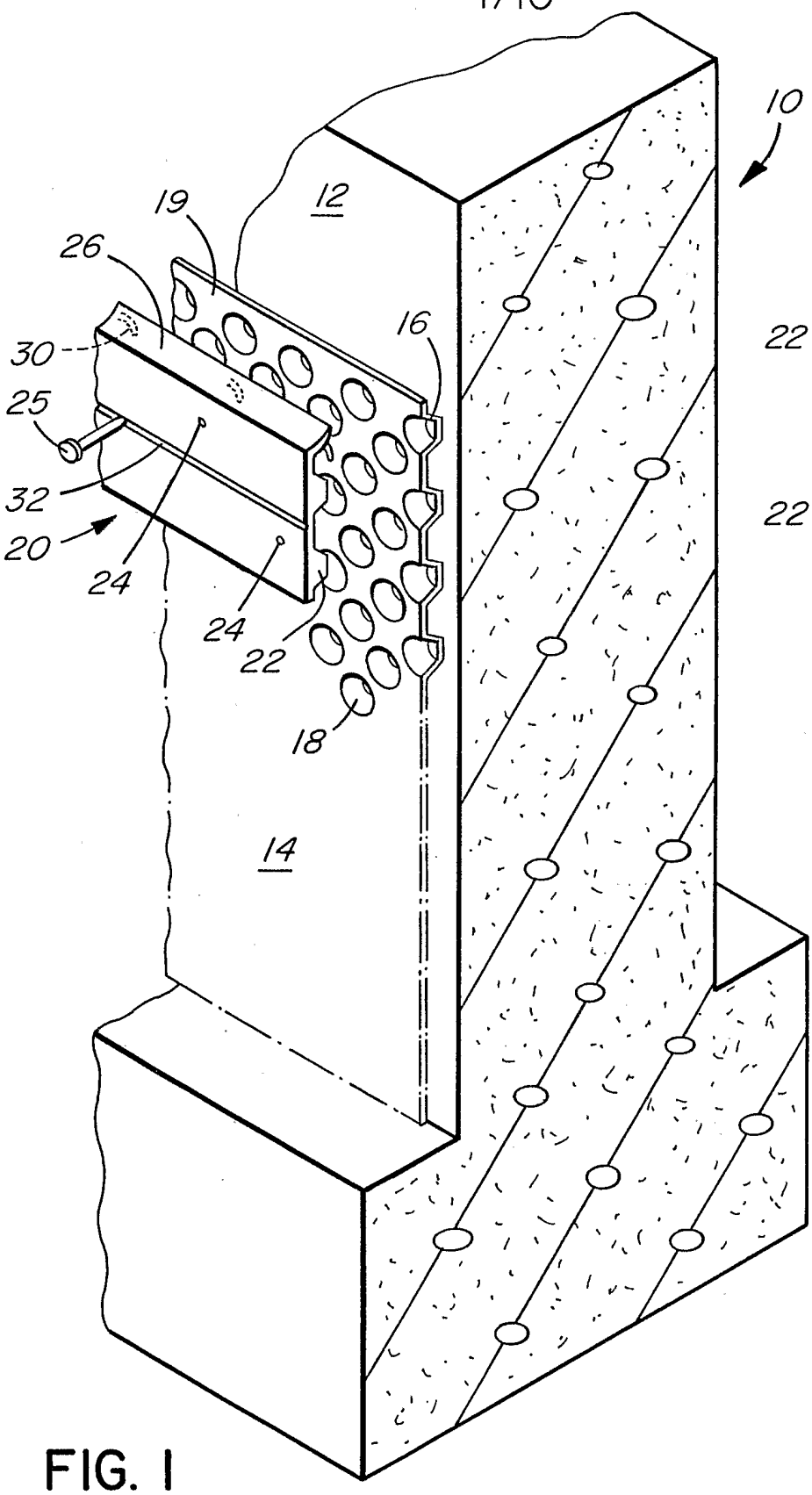


FIG. 1

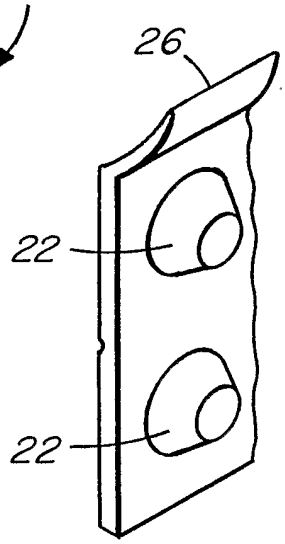


FIG. 1A

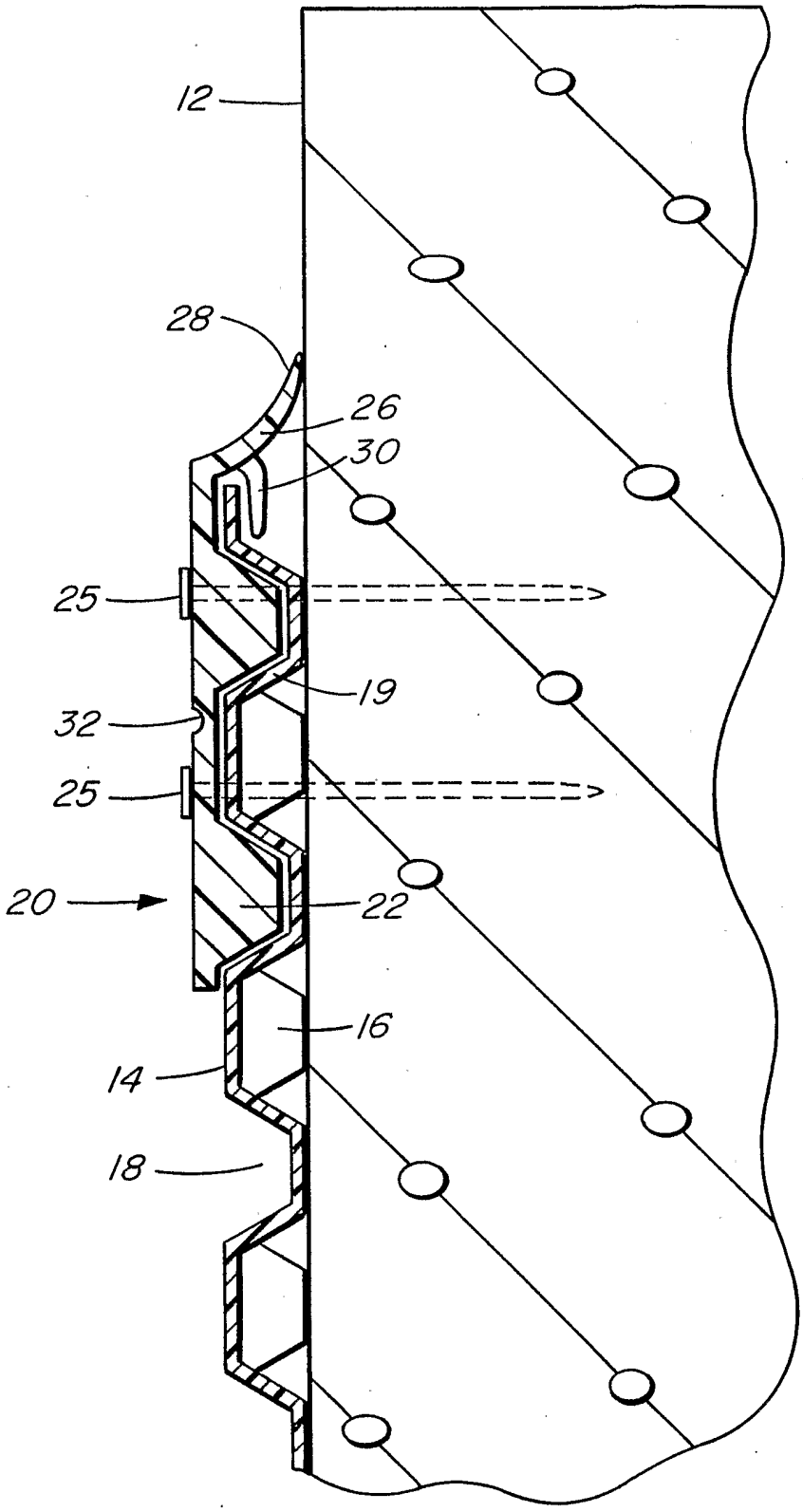


FIG. 2

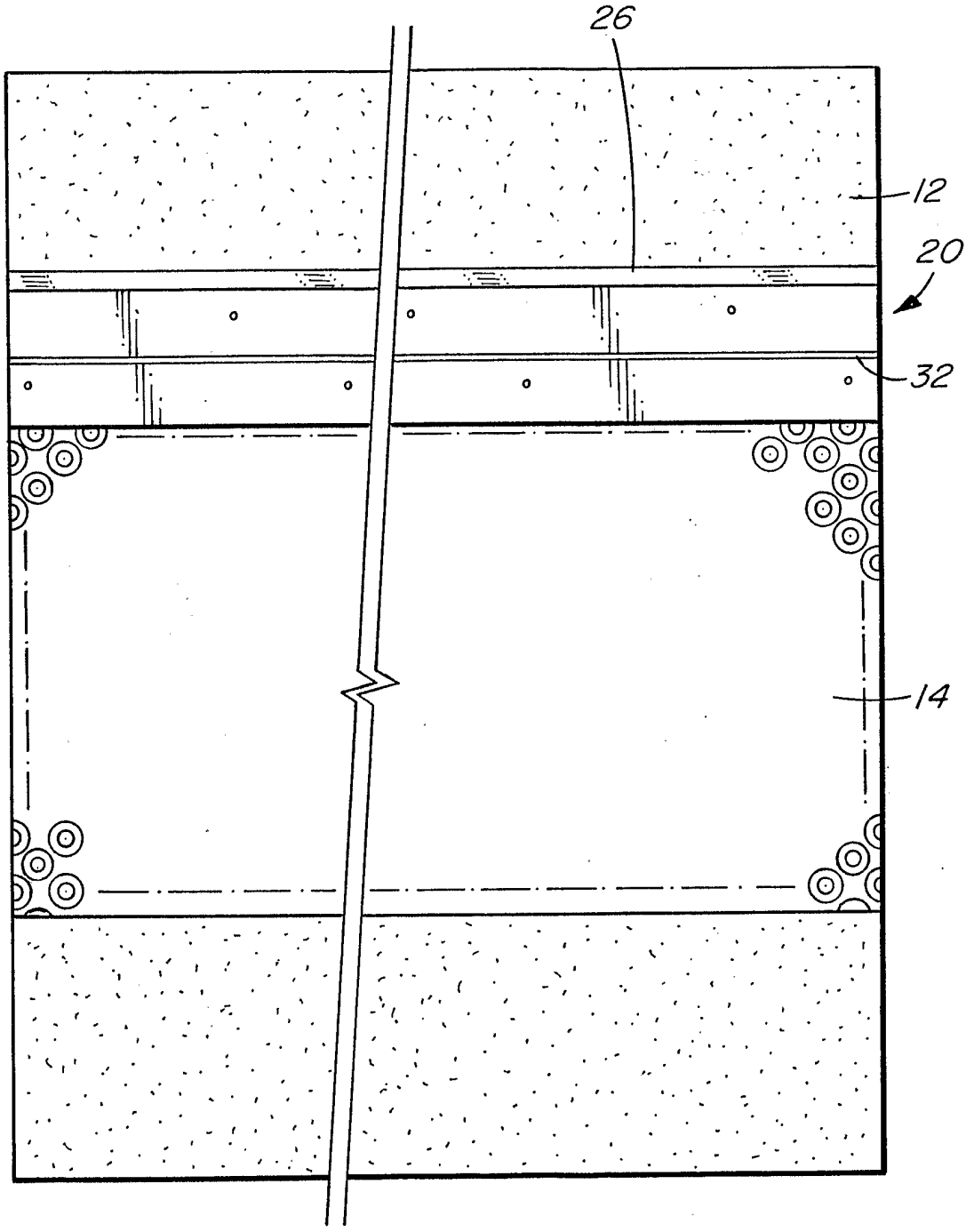


FIG. 3

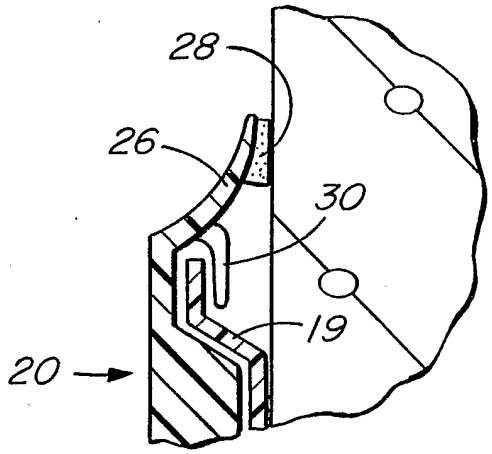


FIG. 4

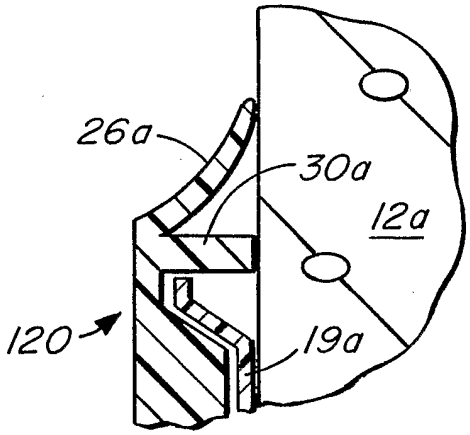


FIG. 13A

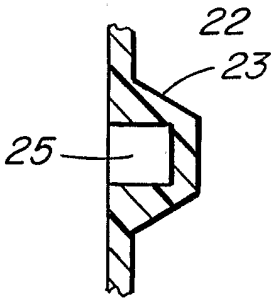


FIG. 5

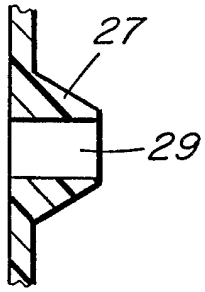


FIG. 6

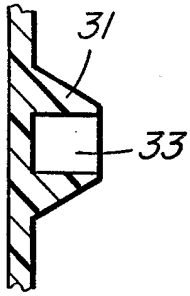


FIG. 7

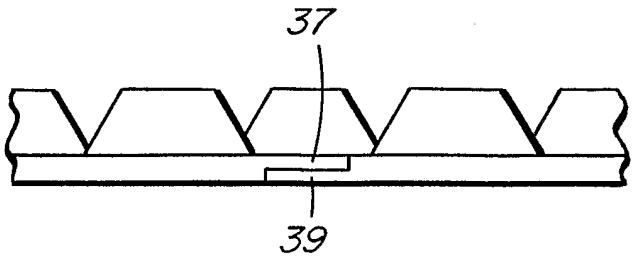


FIG. 8

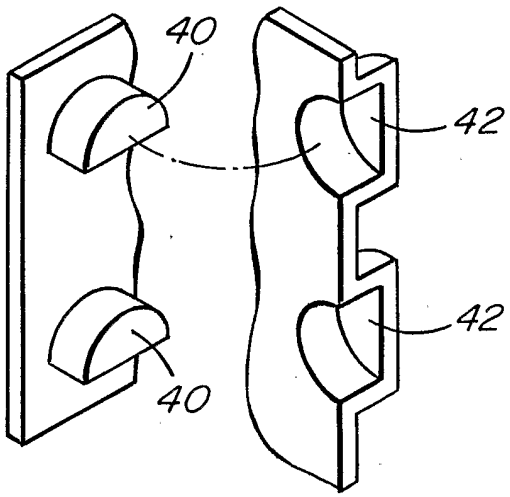


FIG. 9

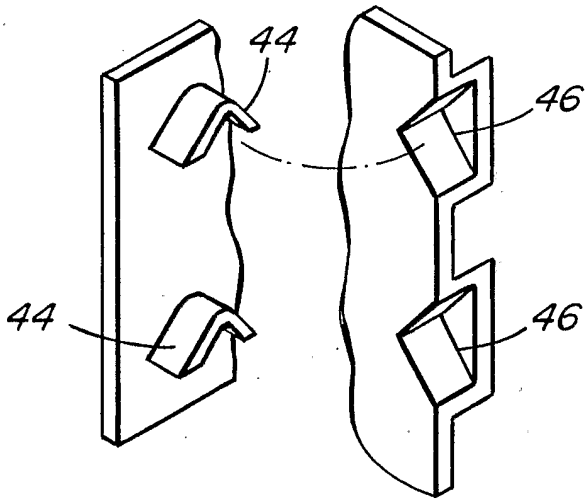


FIG. 10

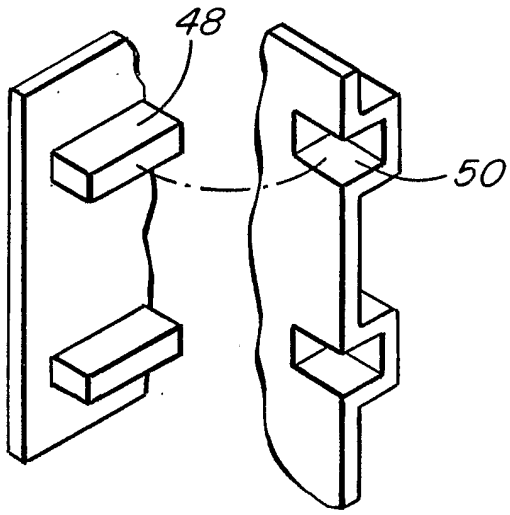


FIG. 11

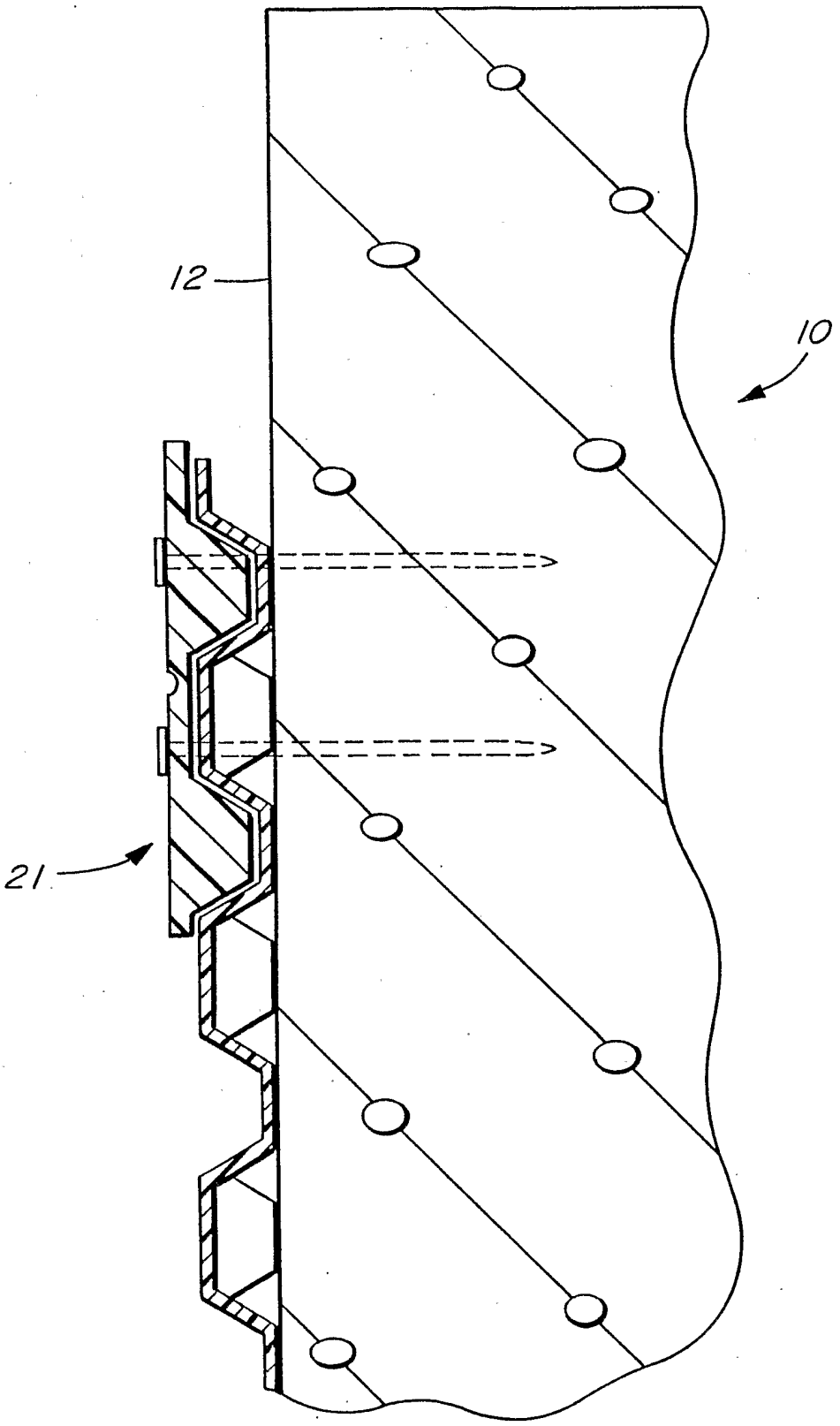


FIG. 12

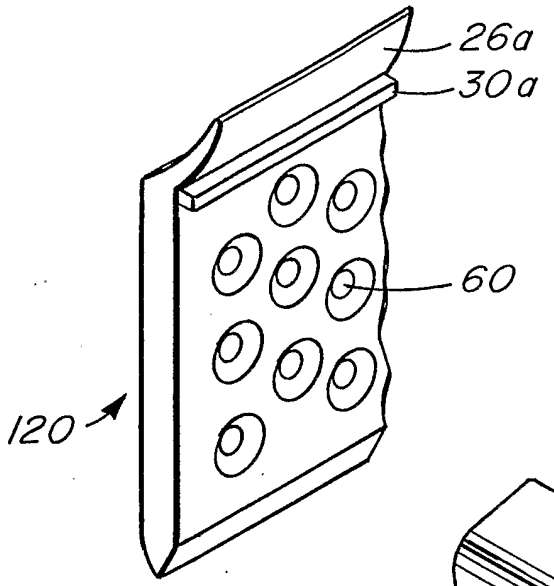


FIG. 13

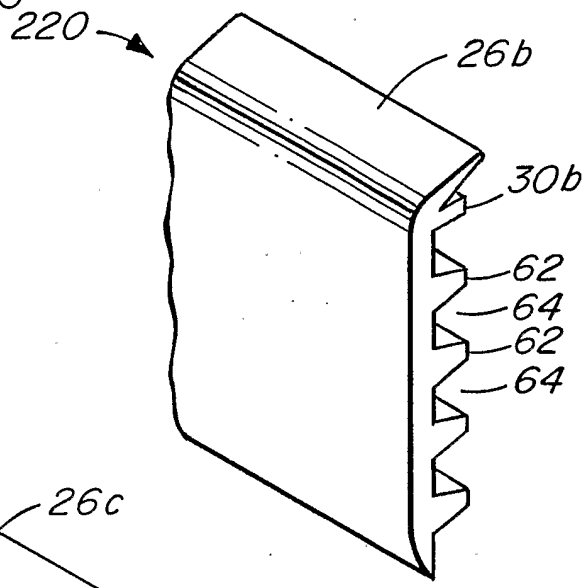


FIG. 14

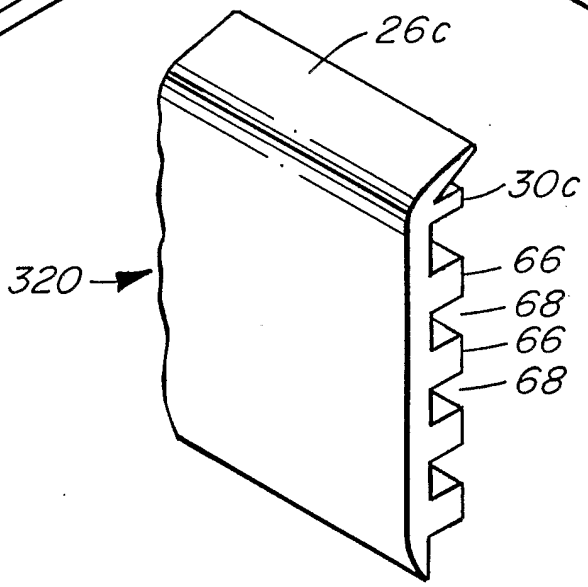


FIG. 15

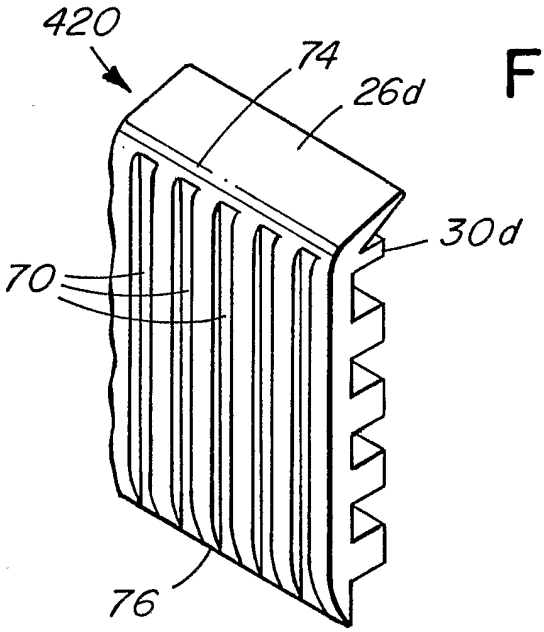


FIG. 16

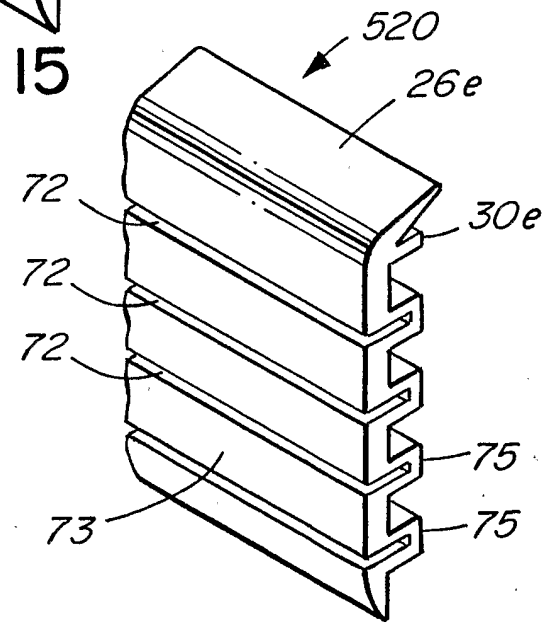


FIG. 17

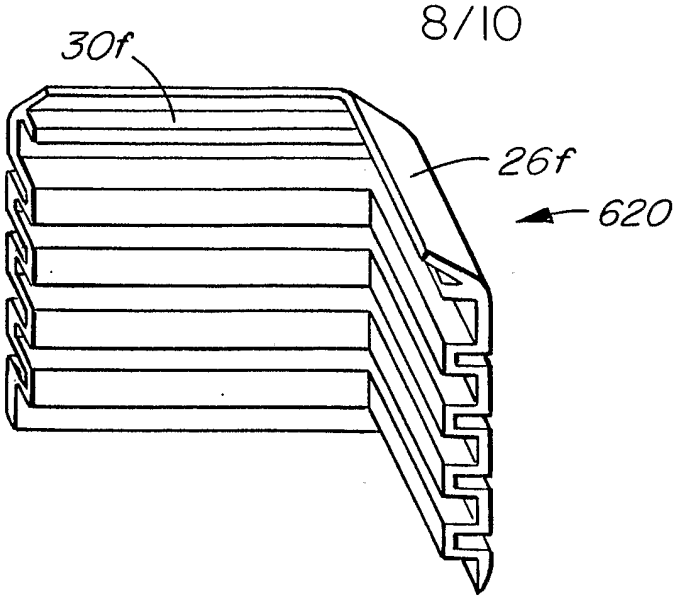


FIG. 18

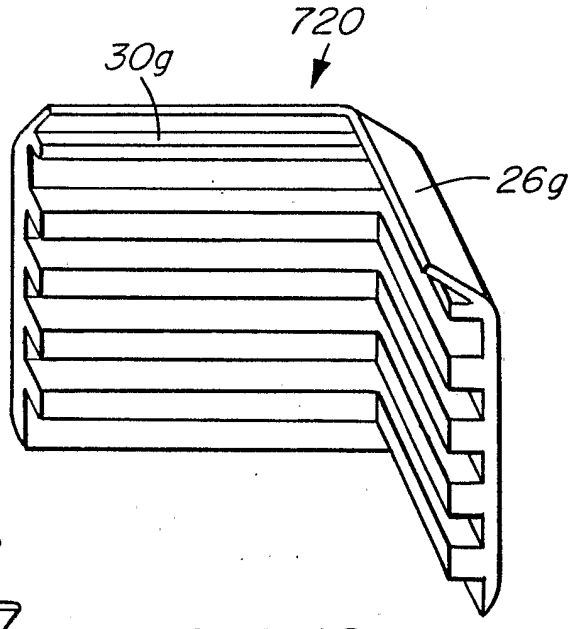


FIG. 19

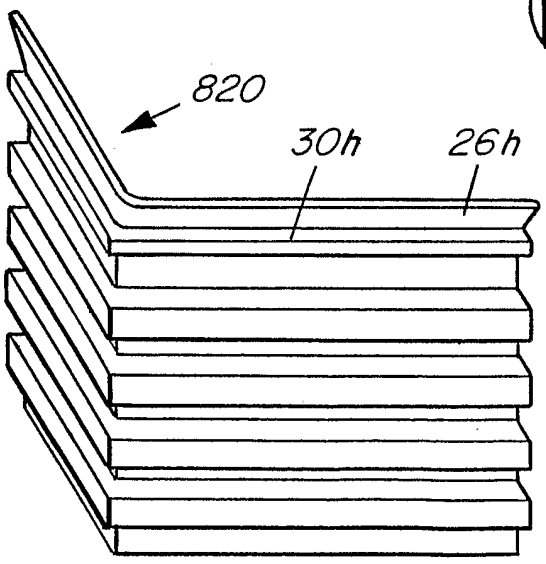


FIG. 20

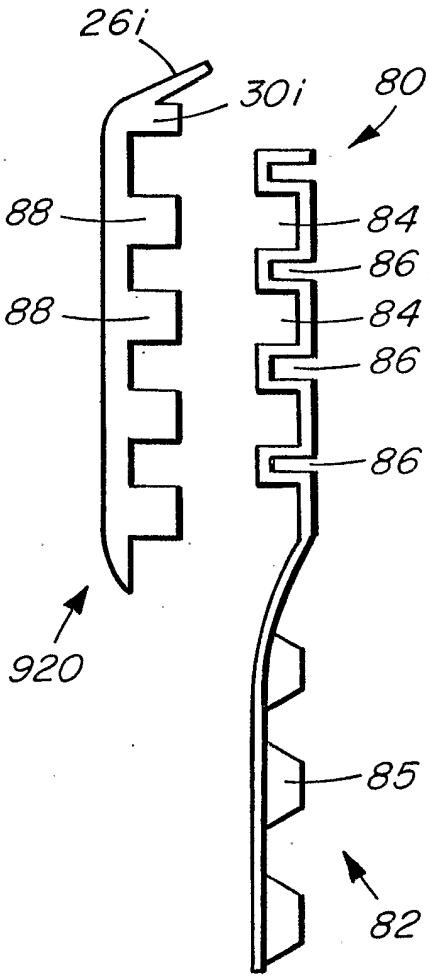

26i
30i
80
88
84
88
86
84
86
86
920
85
82

FIG. 21

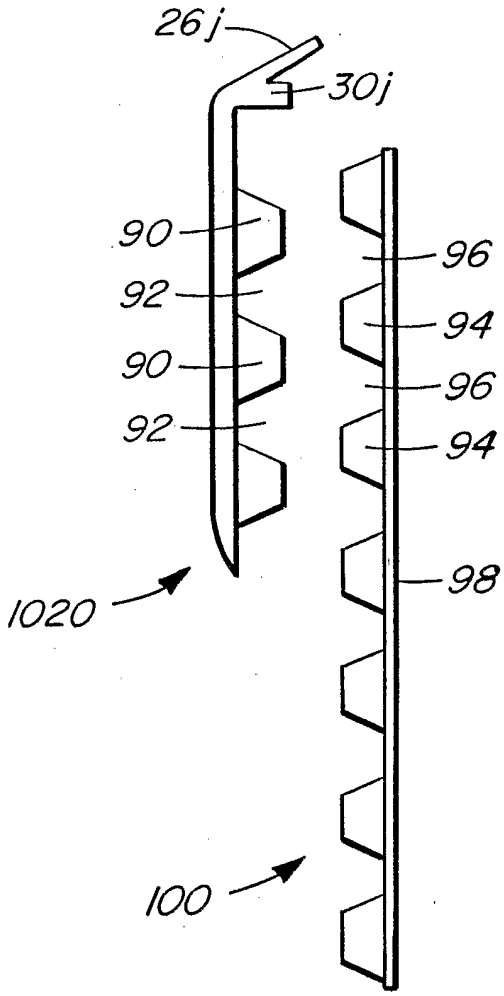

26j
30j
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94
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1020
100

FIG. 22

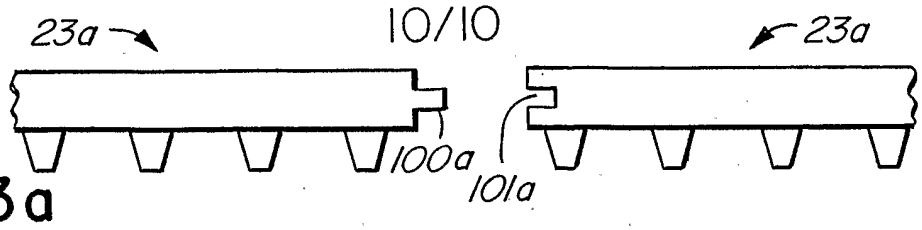


FIG. 23a

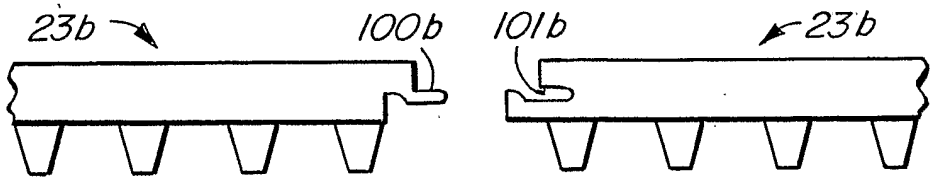


FIG. 23b

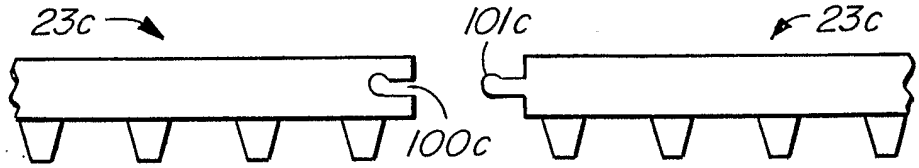


FIG. 23c

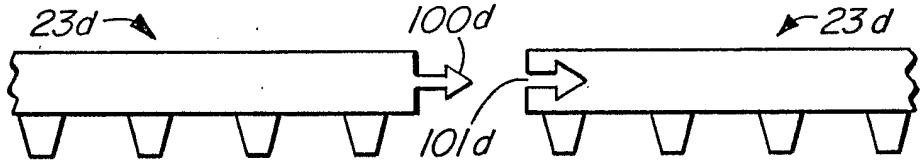


FIG. 23d

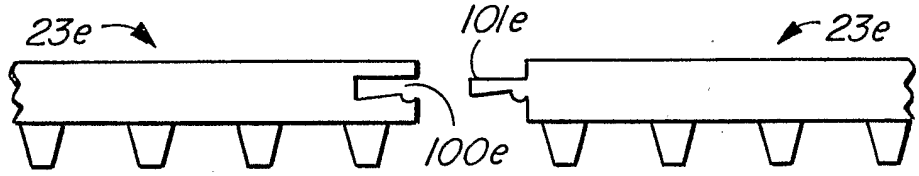


FIG. 23e

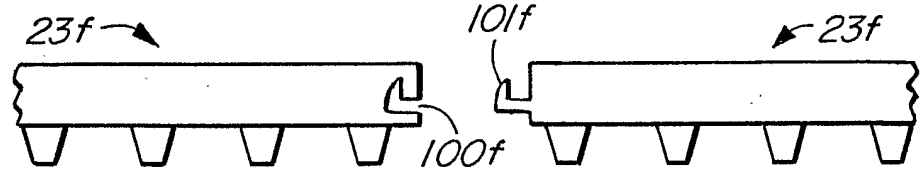


FIG. 23f

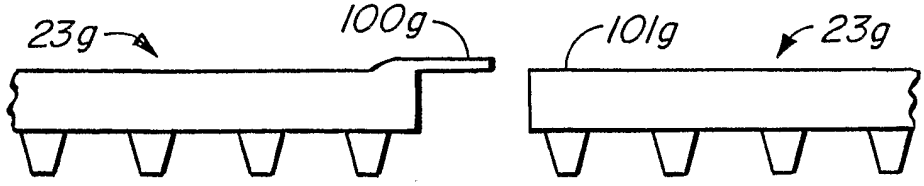


FIG. 23g

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA2004/000812

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E02D31/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 E02D E04D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 034 828 A (ROMA ROSEMEIER GMBH & CO KG) 2 September 1981 (1981-09-02) abstract; figure 2	1-10,12, 13, 16-21, 26,27
X	DE 33 02 244 A (ROMA ROSEMEIER GMBH & CO KG) 26 July 1984 (1984-07-26) abstract; figure 1	1,4,13, 16,20,21

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
7 October 2004	13/10/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	De Neef, K

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/CA2004/000812

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0034828 A	02-09-1981	DE 3006820 A1	29-10-1981
		AT 9028 T	15-09-1984
		EP 0034828 A1	02-09-1981
DE 3302244 A	26-07-1984	DE 3302244 A1	26-07-1984