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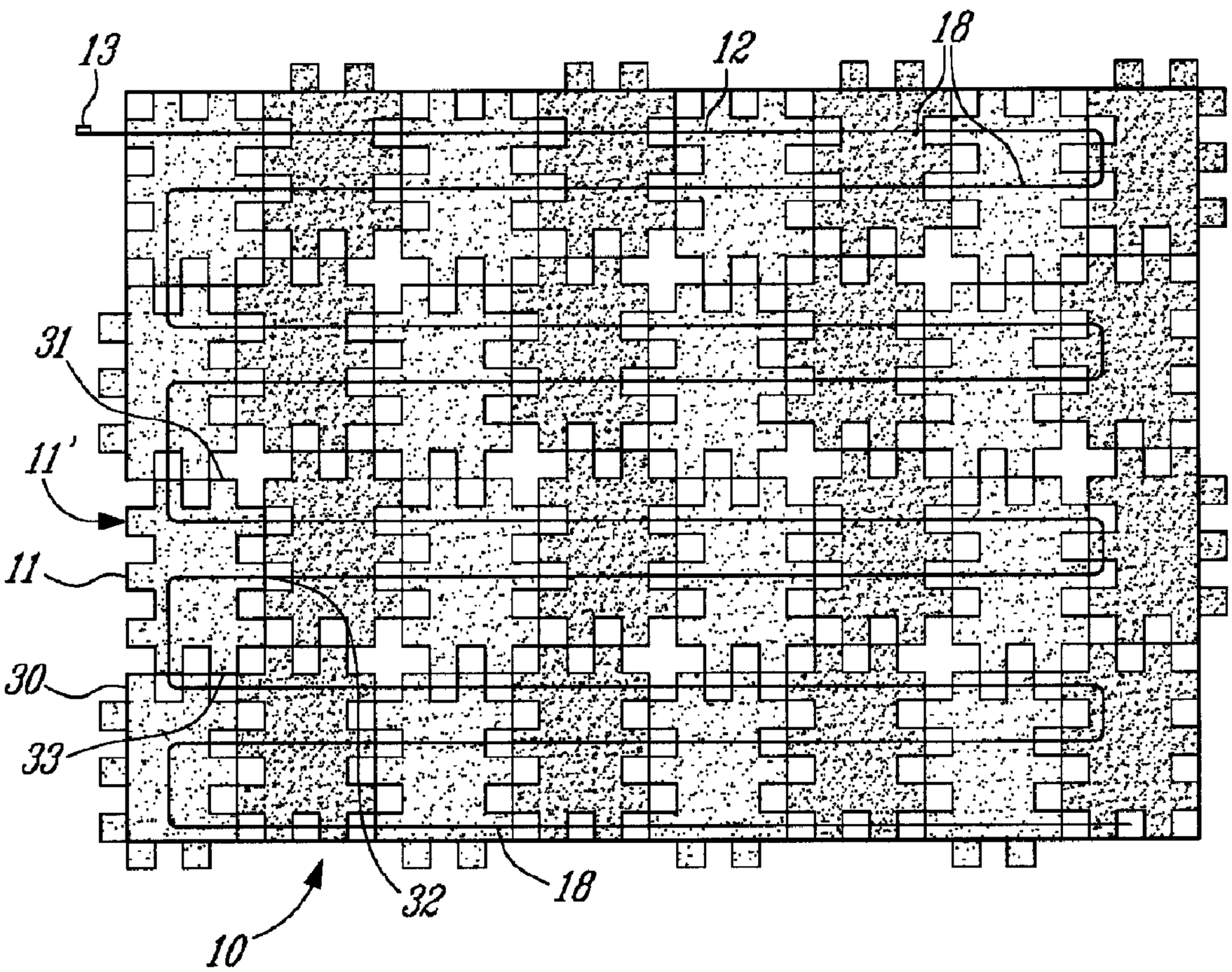
(54) Title: HEATING WIRE SUPPORT MESHING AND METHOD OF CONSTRUCTING A HEATED SURFACE WITH SAME



(57) Abrégé/Abstract:
A heating wire support meshing and a method of constructing a heated surface, particularly a floor surface therewith, is described. The heating wire support meshing comprises one or more mats formed by transversely spaced parallel rows of wire support bridge

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(57) Abrégé(suite)/Abstract(continued):
elements interconnected together at their crossings. The bridge elements have electric heating wire support slots to receive and guide one or more electric heating wires along one or more desired paths. Bottom support formations extend along a bottom planar surface of the mat. Top support formations lie in a top planar surface of the mat. The wire support slots are adapted to support the one or more electric heating wires spaced below the top support formations. The support meshing also acts as a reinforcement of a sub-floor on which the support meshing is installed.

ABSTRACT

A heating wire support meshing and a method of constructing a heated surface, particularly a floor surface therewith, is described. The heating wire support meshing comprises one or more mats formed by transversely spaced parallel rows of wire support bridge elements interconnected together at their crossings. The bridge elements have electric heating wire support slots to receive and guide one or more electric heating wires along one or more desired paths. Bottom support formations extend along a bottom planar surface of the mat. Top support formations lie in a top planar surface of the mat. The wire support slots are adapted to support the one or more electric heating wires spaced below the top support formations. The support meshing also acts as a reinforcement of a sub-floor on which the support meshing is installed.

HEATING WIRE SUPPORT MESHING AND METHOD OF CONSTRUCTING A HEATED SURFACE WITH SAME

TECHNICAL FIELD

The present invention relates to a heating wire support meshing and a method of constructing a heated surface, for example a floor surface, having one or more heating wires supported therein. Further, the heating wire support meshing of the present invention reinforces a sub-floor and permits the complete construction of a radiant floor including the application of a floor covering material in a single installation session.

BACKGROUND ART

Guide strips which are securable to a floor for attaching and supporting heating wire circuits on a sub floor structure are known. An example of such floor heating system is described in Applicant's U.S. Patent 7,250,570 issued July 31, 2007. With these systems the wire retaining strips are secured to the sub-floor surface which, if made of wood, is usually constituted by two layers of sheeting material, such as plywood sheeting, which are secured by means of screws to prevent movement of the sub-floor. The rigid sub-floor supports a cement slurry as well as the covering material thereover, usually ceramic tiles, and its rigidity is required to prevent the cement to crack or to cause the electric wires to break due to movement.

A disadvantage of these known systems is that there is a need to solidify the sub-flooring which is costly in material and installation time. There is also a further need to provide different trade people to complete the entire construction of the radiant heated floor. After the sub-floor is constructed by a carpenter, another tradesman

installs the heating cable guide strips onto the floor and then lays the heating wires onto the floor and attaches them to the guide strips. Another tradesman is then required to apply the cementitious slurry over the heating wire and the interval between the installation of the wire and the pouring of the slurry may take several days leaving the wires exposed to other tradesmen to walk and this often damages the wired circuits. It is common to cover the set dried cementitious slurry with ceramic tiles and a further tradesman is needed to install the tiles onto the set concrete floor. Accordingly, as can be seen, this installation is very time consuming and expensive and exposes the heating wires to damage.

SUMMARY OF THE INVENTION

It is a feature of the present invention to provide a heating wire support meshing and a method of constructing a heated surface utilizing the meshing and which substantially overcomes the above-mentioned disadvantages.

It is a further feature of the present invention to provide a heating wire support meshing which permits the installation of heating wire circuits thereinto and which protects the wires while supporting them throughout its length from a sub-floor surface.

Another feature of the present invention is to provide a heating wire support meshing on which a person can walk with the heating wire circuits installed therein while protecting the wire circuit.

Another feature of the present invention is to provide a heating wire support meshing which does not require reinforced sub-flooring for the construction of a ceramic tile radiant floor.

Another feature of the present invention is to provide a heating wire support meshing which can be cut to the contour of a surface area to be heated and which may be provided in roll form with the heating wires engaged therein.

Another feature of the present invention is to provide a method of constructing a radiant heating surface over a subsurface in a single operation including the installation of the support meshing and heating wire circuits, the application of a cementitious slurry and the application of a surface covering material such as ceramic tiles, etc. thereover and this construction being effected by a single trade person in a single installation session.

According to the above features, from a broad aspect, the present invention provides a heating wire support meshing comprises one or more mats formed by wire support means interconnected together at their crossings. The wire support means receive and guide an electric heating wire along one or more desired paths between a bottom planar surface and a top planar surface of the mat.

According to a further broad aspect of the present invention, there is provided a method of constructing a heated surface having one or more electric heating wires therein. The method comprises the steps of providing on a sub-surface a heating wire support mat having wire support means for receiving and guiding the one or more electric heating wires along one or more desired paths. The heating wire support mat has a bottom planar surface and a top planar surface. The wire support means is adapted to support the one or more electric heating wires below the top planar surface. The method further comprises applying a cementitious slurry over the wire support mat to embed the heating wire in the cementitious slurry. The method further comprises spreading the continuous slurry, using a cement spreading tool, over the wire support mat to cause the slurry

to project at a substantially predetermined height above the top planar surface while the spreading tool is guidingly supported over the top planar surface. The method further comprises applying a surface covering material on the cementitious surface.

According to a further broad aspect of the present invention the above-described method further comprises re-enforcing the sub-surface with the heating wire support mat to provide for the application of a ceramic covering material on the cementitious surface.

According to a further broad aspect of the present invention the above-described method further comprises effecting all of the steps in a continuous sequence.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the present invention will now be described with reference to the accompanying drawings in which:

FIG. 1 is a top view of a heating wire support meshing, constructed in accordance with the present invention and comprised of an assembly of small mats interconnected together and adapted to retain a heating wire captive therein;

FIG. 2 is a view similar to Figure 1 but showing mat sections of a square construction whereas in Figure 1 the mat sections are of rectangular construction;

FIG. 3 is an enlarged fragmented view illustrating the construction of the transversely spaced parallel rows of wire support bridge formations and their interconnections at their crossings as well as the construction of the attachment posts for securing two or more mat sections together;

FIG. 4 is an enlarged view of Figure 3 showing the construction of the post junction;

FIG. 5 is a view similar to Figure 3 but showing two mat sections interconnected together at their post junctions and the position of a heating wire retained in the vertical wire receiving slots formed in the support bridge formations;

FIG. 6 is a perspective view illustrating a wire retention means formed with the vertical wire receiving slot;

FIG. 7 is a fragmented section view showing how a radiant heating floor is constructed using the heating wire support meshing of the present invention.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawings and more particularly to Figure 1, there is shown generally at 10 a heating wire support meshing which is comprised of a plurality of mat sections 11 interconnected together as will be described later. A heating wire 12 is retained within the support meshing in an array to form a heating circuit. An end connector 13 is secured to a free end of the heating wire 12 which is enclosed within the meshing for coupling to a cold lead connector (not show), as is well known to a person skilled in the art, which leads to a thermostat which controls the feed of electric current to the heating wire 12.

As shown in Figure 1, the mat sections 11 are of substantially rectangular outline whereas in Figure 2 they are substantially of a square outline. The mat sections 11 are formed by transversely spaced parallel rows of wire support bridge formations interconnected at their junctions but this is not illustrated in Figures 1 and 2 for reason of clarity. The details of the construction of the support meshings 10 and 10', and more specifically of the mat sections 11, will now be described with reference to Figures 3 and 4.

Each of the mat sections 11 is formed by transversely spaced parallel rows, namely rows 14 and 14' of wire support bridge formations 15. The wire support bridge formations 15 are interconnected together at their crossings by a post junction 16 which is better illustrated in Figure 4. The wire support bridge formations 15 have wire support means in the form of a vertical wire receiving slot 17 for receiving and guiding an electric heating wire 12, shown in Figure 5, along one or more desired paths such as the paths 18 shown in Figure 1.

The mat sections 11 are further provided with bottom support formations constituted by flat bottom wall portions 19 of the wire support bridge formations 15 and the bottom face 20' of the attachment posts 20 as well as the bottom face 21' of the cup formations 21, the use of which will be described later. These bottom support formations 21 extend along a bottom planar surface of the mat sections.

Top support formations are constituted by the flat top wall 20'' of the posts 20 and the flat top surfaces 15' of the bridge formations 15. As can be seen in Figures 3 to 5, the bridge formations are provided with a flanged flat bottom surface 19 which lie in the bottom planar surface and to provide additional support on a sub-flooring. The top support formations lie in a top planar surface of the mat section.

The vertical wire receiving slot 17 in the bridge formations 15 have an open top end 22 to receive the wires therein and have a depth sufficient to retain the heating wire spaced below the top surface 15', herein intermediate the top and bottom planar surfaces, herein the top surface 15' of the bridge formations, and the bottom surface 19 thereof. The wire receiving slot 17 is also dimensioned for frictional engagement with the electric heating wire

positioned therein. The slot also has a concavely curved bottom edge 23 for smooth seating support of the heating wire. It also has substantially parallel side edges 24. Other mechanical wire retaining features such as undercuts, retaining slot with protrusions, etc., are envisaged for retaining the wire in the slot 17 and one of these is illustrated in Figure 6.

It is pointed out that the mat sections 11, and consequently the entire support meshing 10, is constructed of a suitable plastic material. Preferably the mat sections are injection molded.

The bridge formations 15 are also provided with passage formations 25 formed in their bottom edge to provide for the passage of a cementitious slurry thereunder, as will be described later. The transversely extending bridge formations 15 which extend in parallel and transverse relationship form large openings 26 in which a cementitious slurry can set. These openings 26 can be of varying sizes but it has been found that one square inch openings are adequate for the effective use of this product as well as supporting people walking thereon. As previously described, the mat sections 11 can be of square or rectangular cross-sections and they form interconnectable sections of convenient size, such as 17 inches by 17 inches, for packaging and manipulation during installation. The wire receiving slots are also dimensioned to frictionally engage the electric heating wire 12 therein. An alternative securing method for the wire, instead of frictional retention by pressure, is to position the wire receiving slots 17 of the bridge formations in offset alignment, as illustrated by the axes 27 and 27' in Figure 3. This offset between adjacent bridge formations 15 are approximately 1/16 of an inch to give the electric heating wire 12 a slight curvature

to provide for this retention along aligned wire receiving slots 17, as shown in Figure 5.

As shown in Figure 3, some of the post junctions 16 are attachment posts for securing two or more mat sections 11 together, as illustrated in Figures 1 and 2 to form the floor support meshing 10 or 10'. The mat section 11' as shown in Figure 1, has four parallel side edges, herein identified by reference numerals 30, 31, 32 and 33. The attachment posts along side edge 30 and side edge 33 are illustrated in Figure 3 to show the different configurations of the attachment posts. It is pointed out that the attachment post junctions along two adjacent ones of the side edges of the mat section, namely side edge 30 and 31, have male connecting pin formations 36 extending in a lower section thereof. The post junctions along the other two adjacent ones of the side edges, namely side edges 32 and 33, have cup formations 37. The cup formations 37 have an open top end or hole 38 configured to receive the pin formation 36 of another mat section in retention fit therein. Accordingly, the mat sections are interconnected together by these attachment posts and cups. It is further pointed out that the support meshing 10, as shown in Figure 1, can be constructed on a sub-floor surface by first interconnecting a plurality of mat sections 11 together and cutting these mat sections to the contour shape of the sub-floor area to be covered. However, because of the flexibility of the material, an entire support meshing 10 can be installed in a factory with the heating wire 12 assembled therein and retained by glue inserted in the vertical wire receiving slots 17, or at least some of them. Some of the attachment posts may also be interconnected together by glue or by snap fit retention whereby an entire assembled support meshing 10 can be assembled and cut to a desired length or contour of a surface

to be covered and then rolled to form a bundle for transportation.

Figure 6 illustrates a modification of the wire receiving slot 17 including a mechanical wire retention feature in the form of a protrusion 50 formed in each of the side edges 24 of the slot. The protrusions 50 are disposed in facial alignment to define therebetween a restricted throat opening 51 to retain the wire 12 captive thereunder on the curved bottom edges 23' of the wall side wall formation 52 which results due to the use of mold inserts (not shown) used to mold the protrusions 50. The restricted throat opening 51 is only slightly smaller than the diameter of the heating wire 12, i.e. a few millimeters, whereby not to damage the wire, but sufficient to maintain the wire captive thereunder. It is also pointed out that a single protrusion 50 may also be formed in only one of the side walls 52 and dimensioned to form an undercut thereunder to retain the wire. The restricted throat would then be formed between the single protrusion 50 and the opposed side wall 52.

Having thus described the heating wire support meshing 10 and mat sections 11, the method of constructing a heated surface having one or more heating wires therein will now be described with reference to Figures 1 and 6. As shown in Figure 1, a support meshing 10 is disposed on a sub-floor 43, as shown in Figure 6, which sub-floor 43 could be for example a single plywood sheet, a concrete floor or an acoustical mat with the heating wire 12 disposed into the support meshing 10 as shown in Figure 1. As previously described, because the heating wire 12 is retained below the top planar surface of the support meshing 10 and because of the close spacing of the transversely spaced parallel rows of wire support bridge formations, a person can walk on the support meshing disposed on a sub-floor. After the meshing

is installed on the sub-flooring, and it can also be retained thereon by glue at spaced apart contact locations, a cementitious slurry 40 is applied over the support mat, usually starting at a corner of the floor area being covered. The slurry has a liquidity sufficient to flow into all of the passages and areas between the transverse bridge formations to seal the support meshing and the heating wire into the slurry. The top surface of the cementitious slurry is applied pressure and leveled by the use of a cement spreading tool, such as a straight edge toothed trowel 42, which is displaced over the cementitious slurry, as shown by arrow 44, while being guidingly supported at the bottom edge 45 thereof, over the top surfaces of the bridge formations 15 and posts 20 lying in the top planar surface of the support meshing to form a ribbed cementitious surface 40' extending above the top surface 15' of the meshing.

Depending on the material to be applied over the surface, the cementitious surface can be spread flat and let to dry if, for example a carpet is to be installed onto the heated floor. On the other hand, and as is most frequent, ceramic tiles, such as the tile 41, can be immediately positioned over the wet ribbed cement surface 41' and will adhere thereto as the slurry sets. Accordingly, a tradesperson can, in one working session, construct the entire radiant floor. Because the tiles 41 are supported above the top support formations of the support meshing and the heating wire(s) is below the top surface, there is no fear of disturbing the electric heating wire(s). However, it is preferable not to walk on the freshly laid tiles 41 to let the tiles set as these tiles are usually spaced apart to form joints to receive a grout therein after the cement has set.

While the floor is being assembled the end connector or connectors 13 of the heating wire circuit or circuits are

connected to the cold lead or leads of the thermostat and embedded in the cement.

It is within the ambit of the present invention to cover any obvious modifications of the preferred embodiments described herein, provided such modifications fall within the scope of the appended claims.

CLAIMS:

1. A heating wire support meshing comprising one or more mats formed by wire support means interconnected together at their crossings, said wire support means receiving and guiding an electric heating wire along one or more desired paths between a bottom planar surface and a top planar surface of said mat.

2. A heating wire support meshing as claimed in claim 1, wherein said wire support means is constituted by transversely spaced parallel rows of wire support bridge formations, said bridge formations having said wire support means and wherein bottom support formations extend along said bottom planar surface of said mat, and top support formations lying in said top planar surface.

3. A heating wire support meshing as claimed in claim 2, wherein said mat is a plastic molded flexible mat.

4. A heating wire support meshing as claimed in claim 2, wherein said wire support means is constituted by a vertical wire receiving slot formed in each said support bridge formations, said wire receiving slot having an open top end.

5. A heating wire support meshing as claimed in claim 4, wherein at least some of said wire receiving slots of adjacent parallel wire support bridge formations are aligned in alternating offset relationship for frictional retention of a heating wire disposed therethrough.

6. A heating wire support meshing as claimed in claim 4, wherein said wire receiving slot has a protrusion in one or both side walls thereof to define a restricted throat opening in a top end portion of said slot whereby to maintain said electric heating wire captive thereunder.

7. A heating wire support meshing as claimed in claim 4, wherein said wire receiving slot has a concavely curved bottom edge and substantially parallel side edges.

8. A heating wire support meshing as claimed in claim 3, wherein said wire support bridge formations are formed by vertical flat walls interconnected together at said crossings by a post junction, said bottom support formations being constituted by at least a flat wall portion of said vertical wall, and wherein passages are formed in said vertical wall for the passage of a cementitious slurry.

9. A heating wire support meshing as claimed in claim 8, wherein said post junction defines a support post having a flat bottom and top surface lying respectively in said bottom and top planar surfaces, said bottom surface also constituting said bottom support formations.

10. A heating wire support meshing as claimed in claim 8, wherein said top support formations is constituted by flat top surface sections of said wire support bridge formations and a flat top surface of said post junction.

11. A heating wire support meshing as claimed in claim 8, wherein some of said post junctions are attachment posts for securing two or more mat sections together in side-by-side relationship.

12. A heating wire support meshing as claimed in claim 11, wherein said mat section has parallel side edges, said attachment posts are defined by said post junctions along two adjacent ones of said parallel sides edges of said mat section having male connecting pin formation in a lower section thereof and said post junctions along the other two adjacent ones of said parallel side edges having cup formations having an open top end and configured to receive said pin formations of another mat section in retention therein.

13. A heating wire support meshing as claimed in claim 1, wherein said mat constitutes a reinforced sheeting for a sub-floor on which said mat is secured.

14. A heating wire support meshing as claimed in claim 3, wherein the electric heating wire is retained by glue in said wire support means, said flexible mat being a roll of flexible mat.

15. A heating wire support meshing as claimed in claim 4, wherein said wire receiving slots of said wire support bridge formations between two adjacent parallel rows are axially aligned with one another to retain a heating wire along a substantially straight parallel run, said wire being disposed in a serpentine path in said wire support meshing and defined by parallel runs spaced a predetermined distance apart as defined by selected ones of said parallel rows, said spaced apart runs of said heating wire being interconnected by an intermediate end portion of said heating wire between said spaced apart runs.

16. A method of constructing a heated surface having one or more electric heating wires therein, said method comprising the steps of:

i) providing on a sub-surface a heating wire support mat having wire support means for receiving and guiding said one or more electric heating wires along one or more desired paths, said heating wire support mat having a bottom planar surface and a top planar surface, said wire support means being adapted to support said one or more electric heating wires below said top planar surface;

ii) applying a cementitious slurry over said wire support mat to embed said heating wire in said cementitious slurry;

iii) spreading said cementitious slurry, using a cement spreading tool, over said wire support mat to cause said slurry to project at a substantially predetermined height above the top planar surface while said spreading tool is guidingly supported over said top planar surface; and

iv) applying a surface covering material on said cementitious surface.

17. A method as claimed in claim 16, wherein said step (i) further comprises reinforcing said sub-surface with said heating wire support mat to provide for the application of a ceramic covering material on the cementitious surface.

18. A method as claimed in claim 16, wherein said sub-surface is a flat floor surface and wherein a cold lead connector is secured to an end of said heating wire in said heating wire support mesh.

19. A method as claimed in claim 16, wherein said step (iv) comprises applying ceramic tiles on said cementitious surface while said slurry is wet whereby said ceramic tiles will adhere to said flat cementitious surface above said top planar surface.

20. A method as claimed in claim 16, wherein said steps (i) to (iv) are effected in a continuous sequence.

21. A method as claimed in claim 16, wherein said step (i) comprises the steps of interconnecting a plurality of heating wire support mats together in side-by-side relationship on said sub-floor surface, and positioning one or more of said heating wires in said mat to form one or more serpentitious wire heating circuits having an end connecting means, said end connecting means being disposed for connection to a cold lead connector.

22. A method as claimed in claim 16, wherein prior to step (i) there is provided the step of cutting said wire support mat to form a contour mat configured to a contour of a predetermined sub-surface or part thereof to be covered by said wire support mat.

23. A method as claimed in claim 22, wherein after said step of cutting there is provided securing in said contour mat said one or more of said heating wire by engaging said one or more heating wires to form one or more wire heating circuits, said contour mat being retained over said sub-surface.

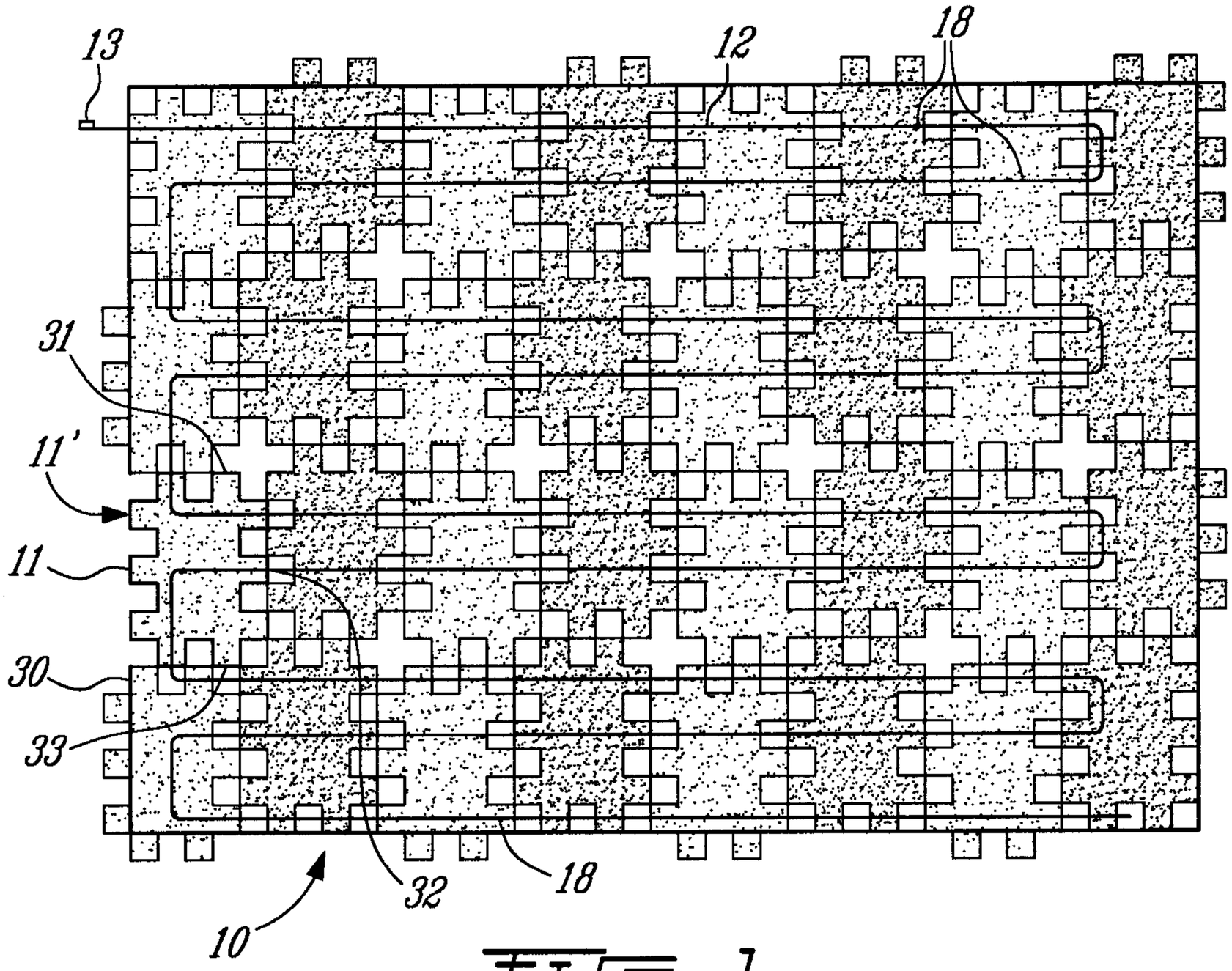

FIG_1

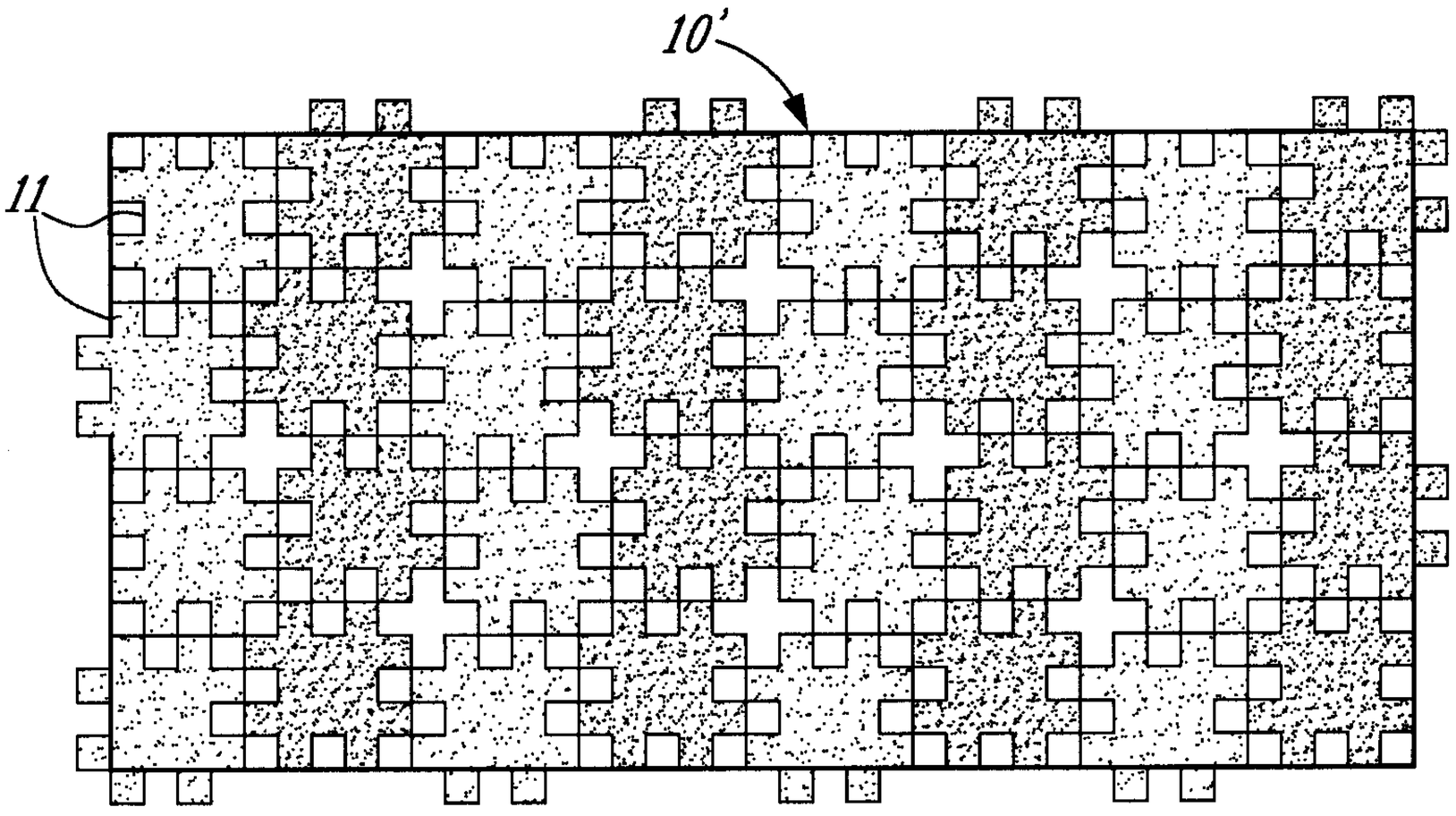

FIG_2

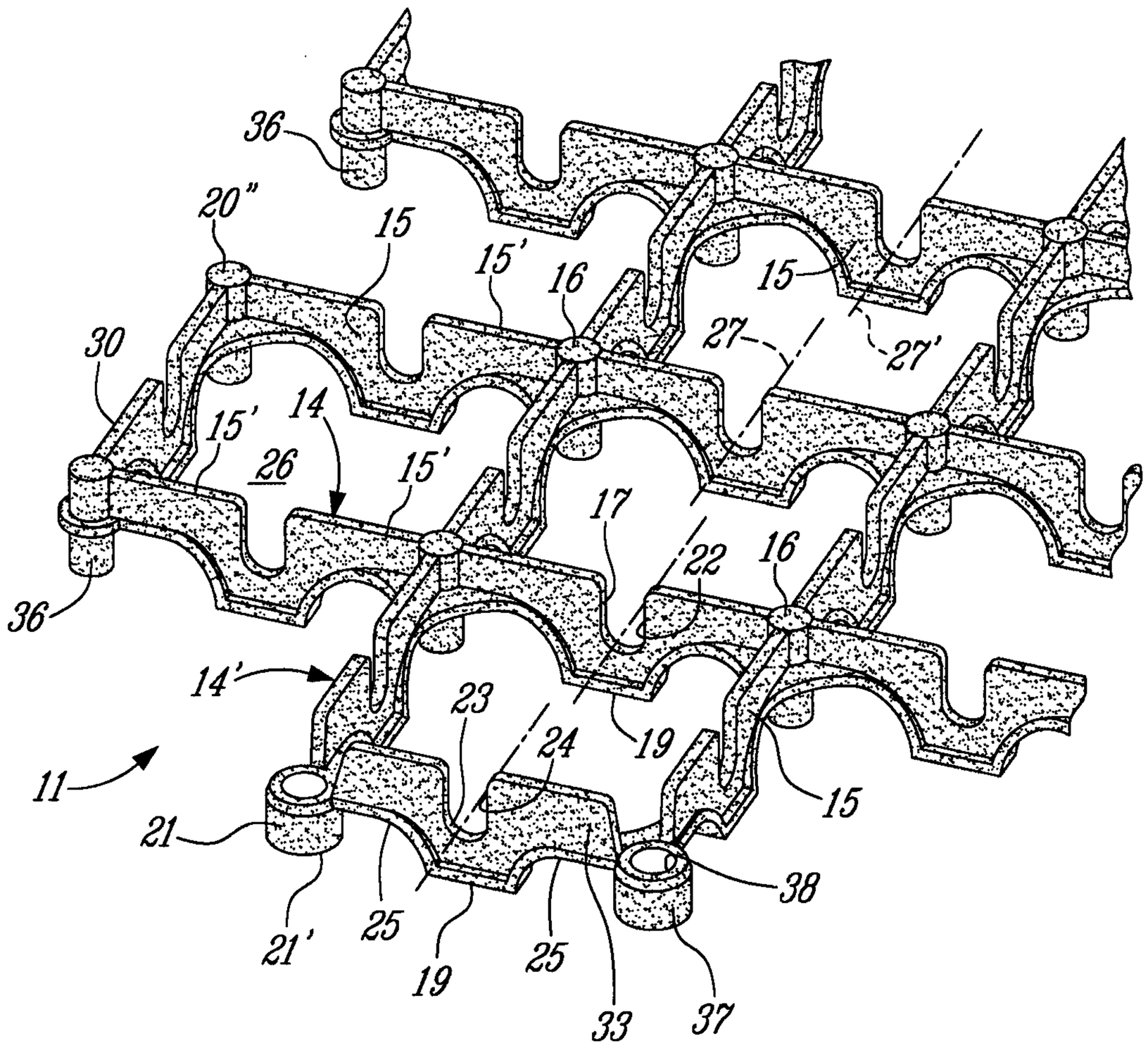
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FIG_3

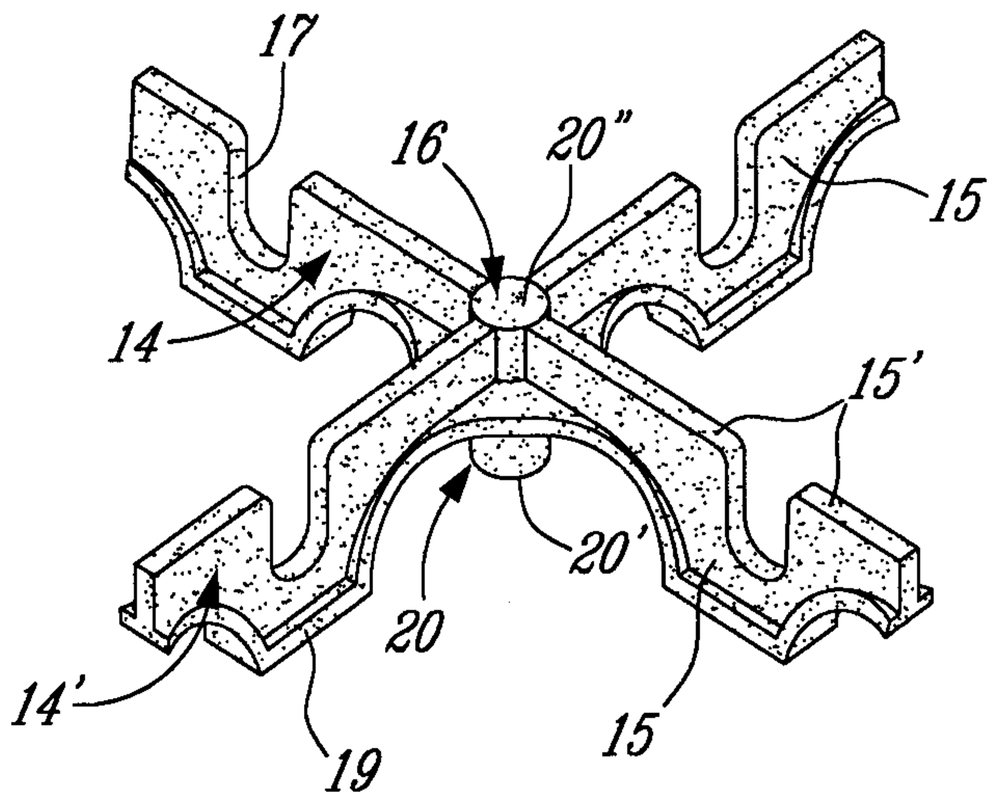
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FIG_4

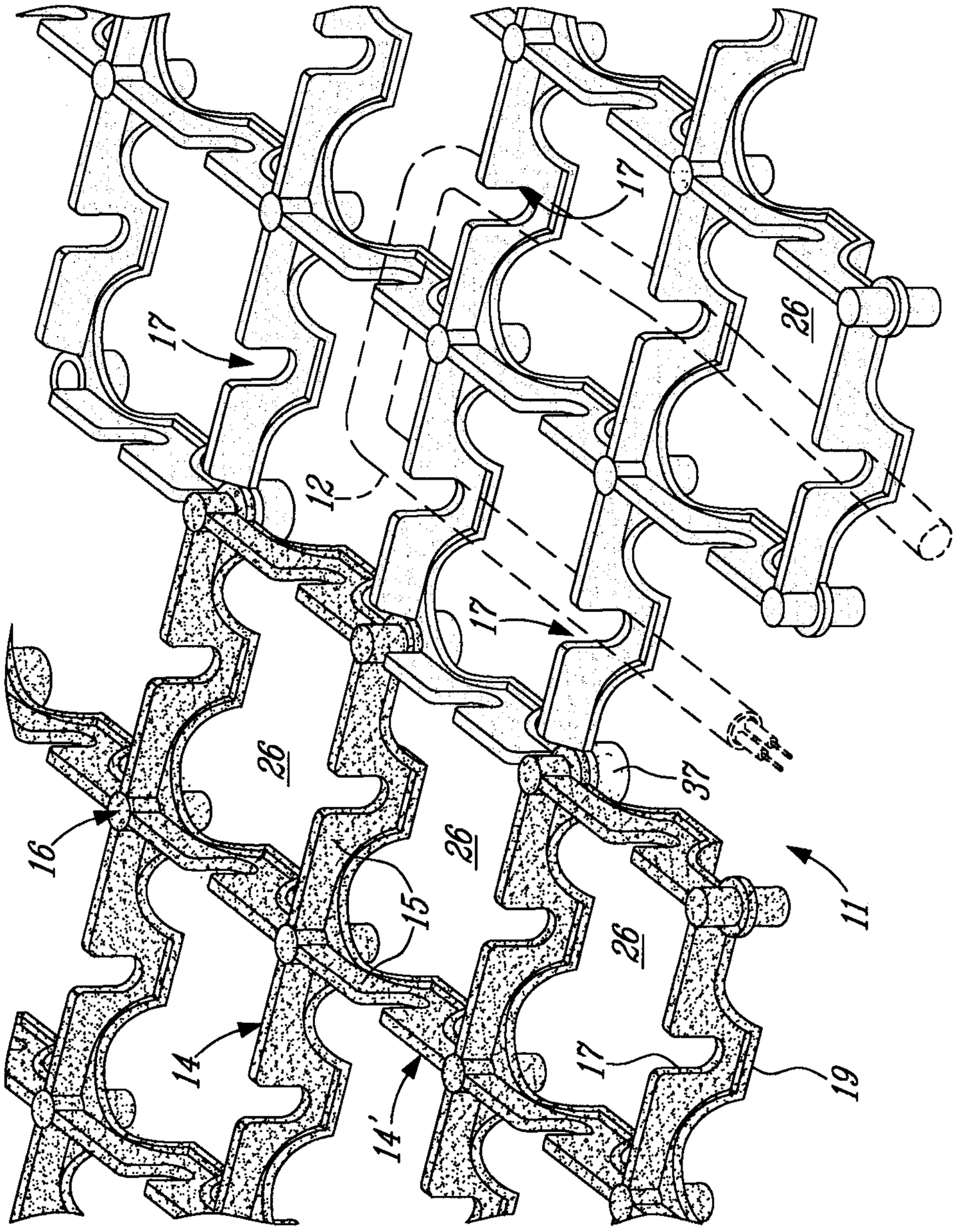


FIG-5

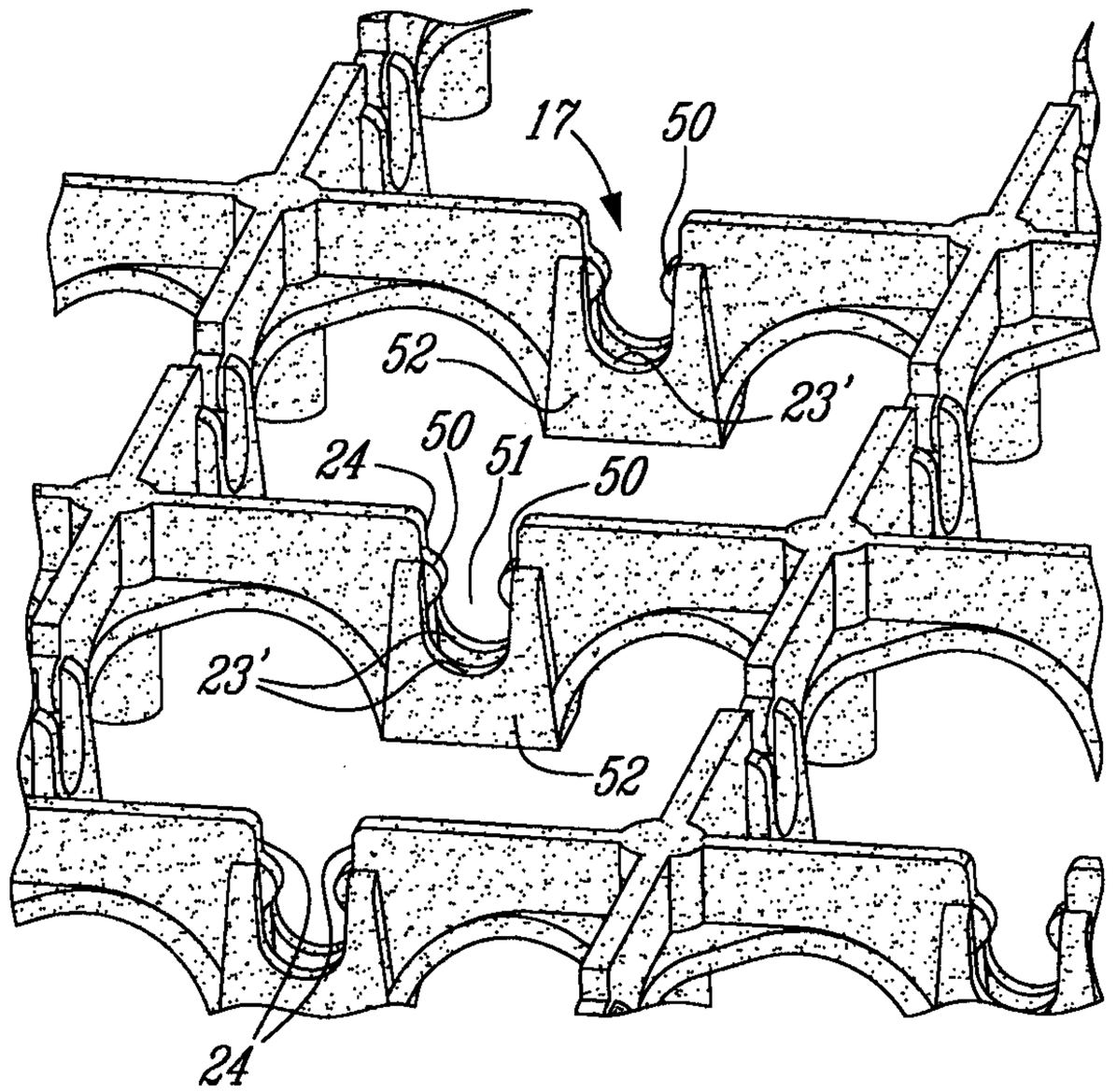


FIG. 6

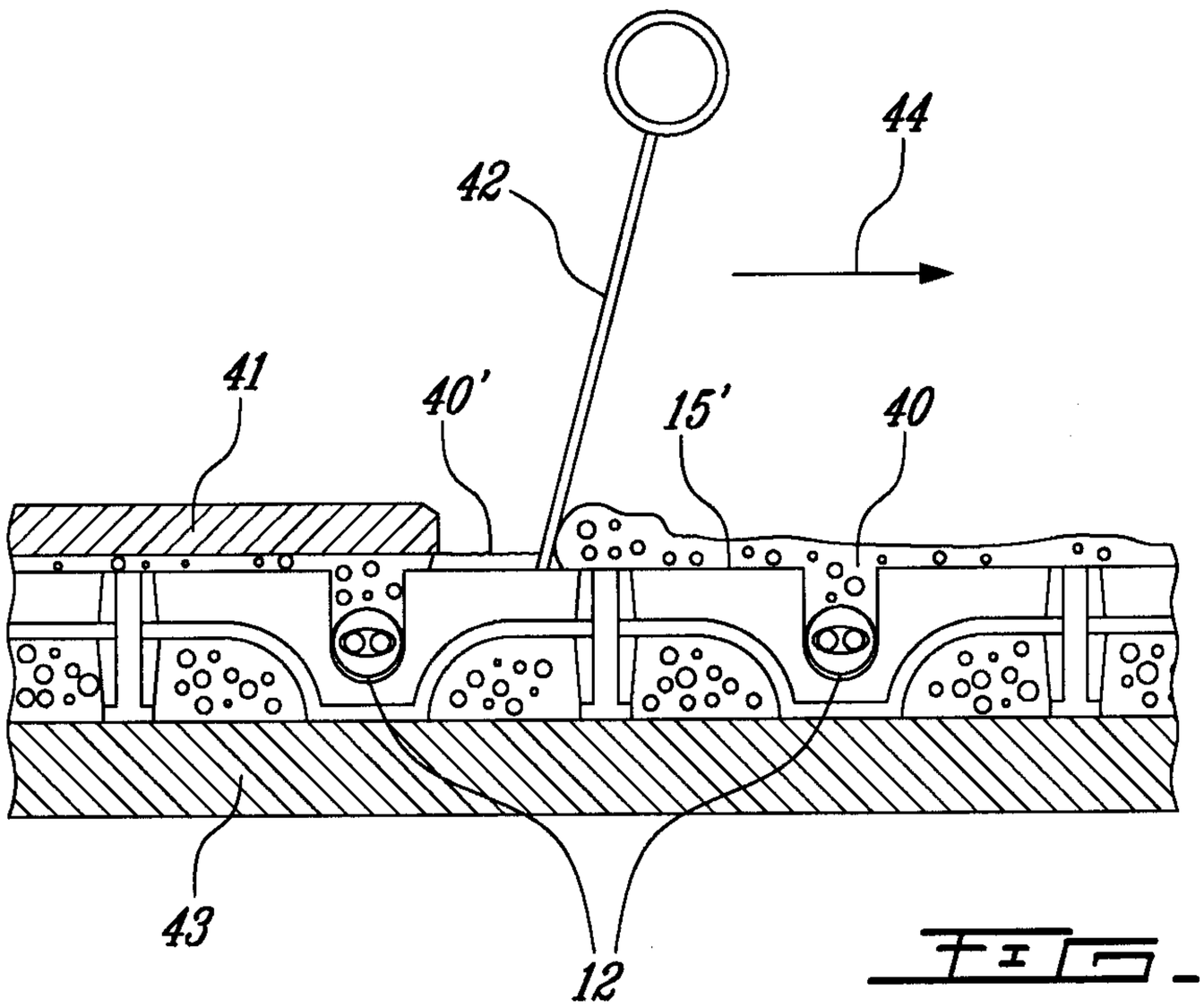
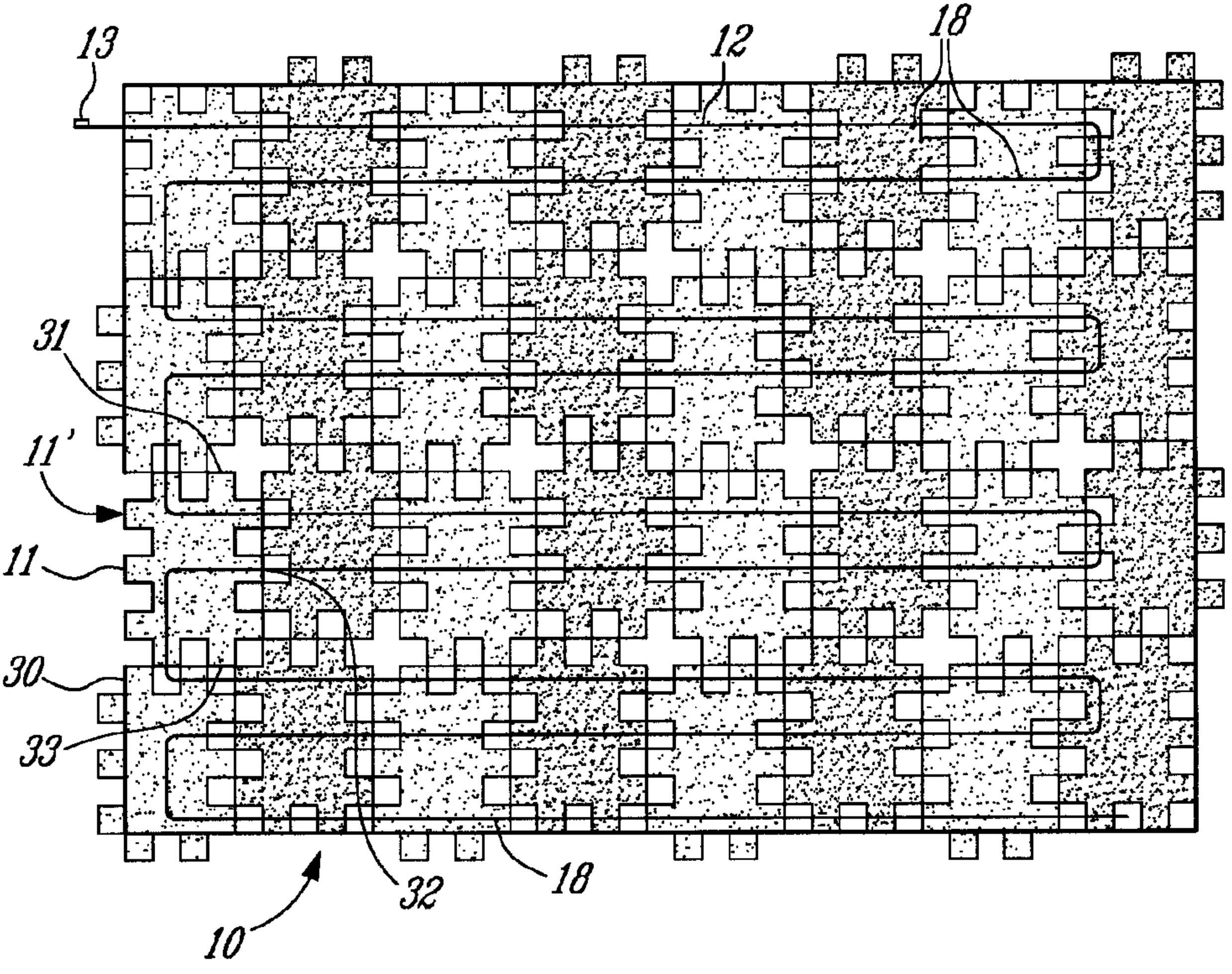


FIG. 7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