

Oct. 18, 1960

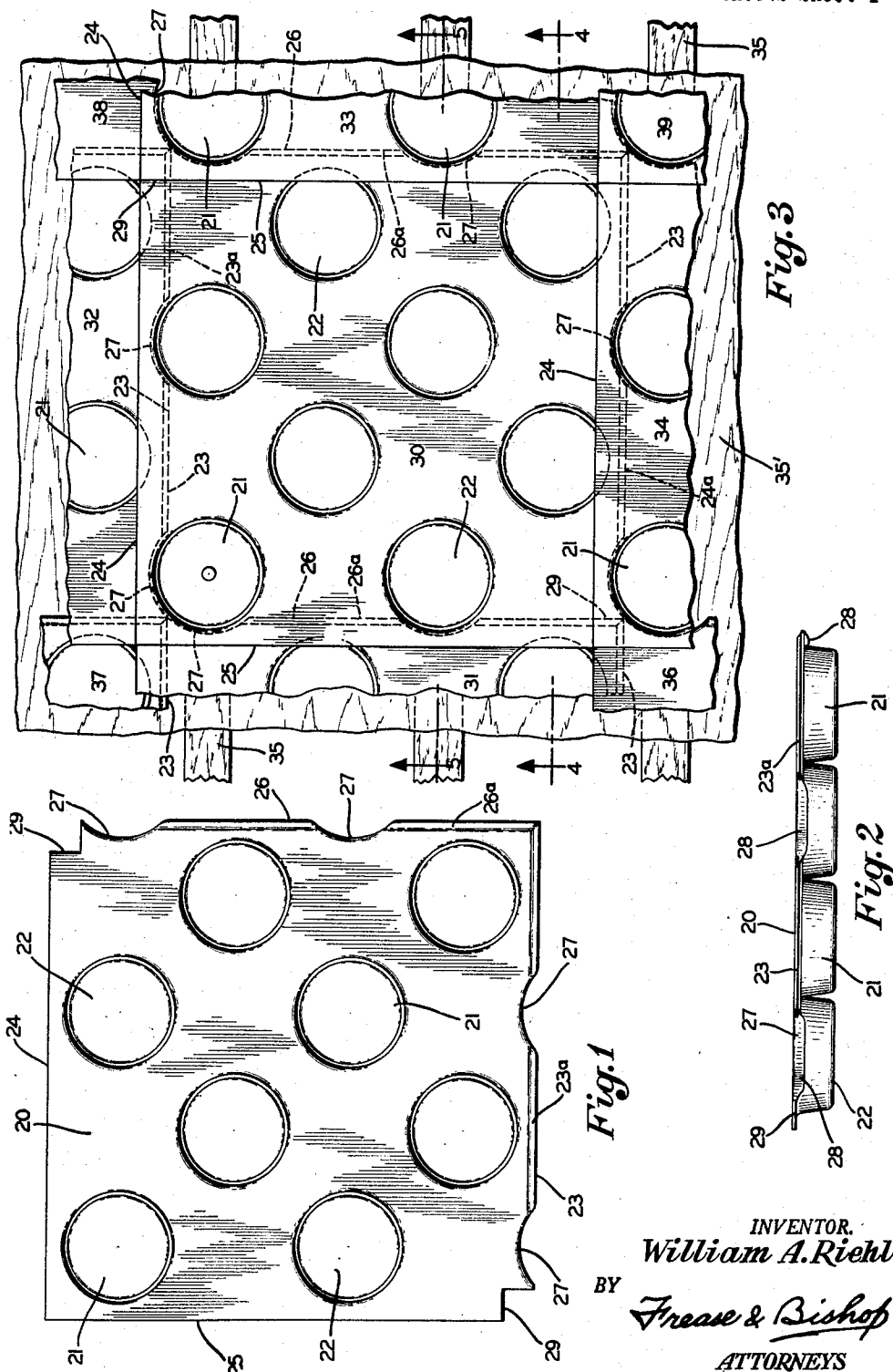
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2,956,785

HEATING PANEL CONSTRUCTION

Filed Oct. 4, 1957

4 Sheets-Sheet 1



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HEATING PANEL CONSTRUCTION

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4 Sheets-Sheet 2

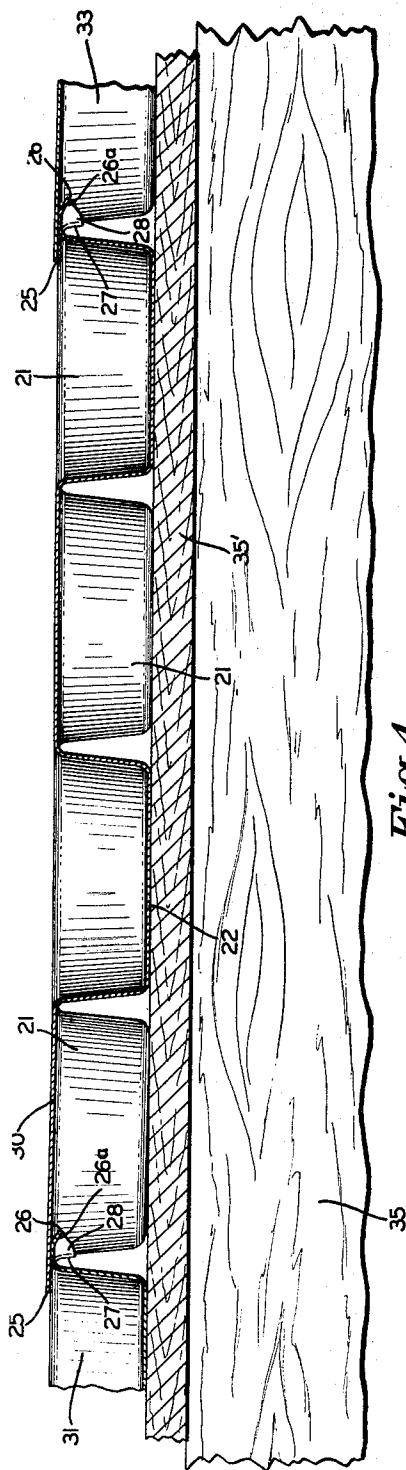


Fig. 4

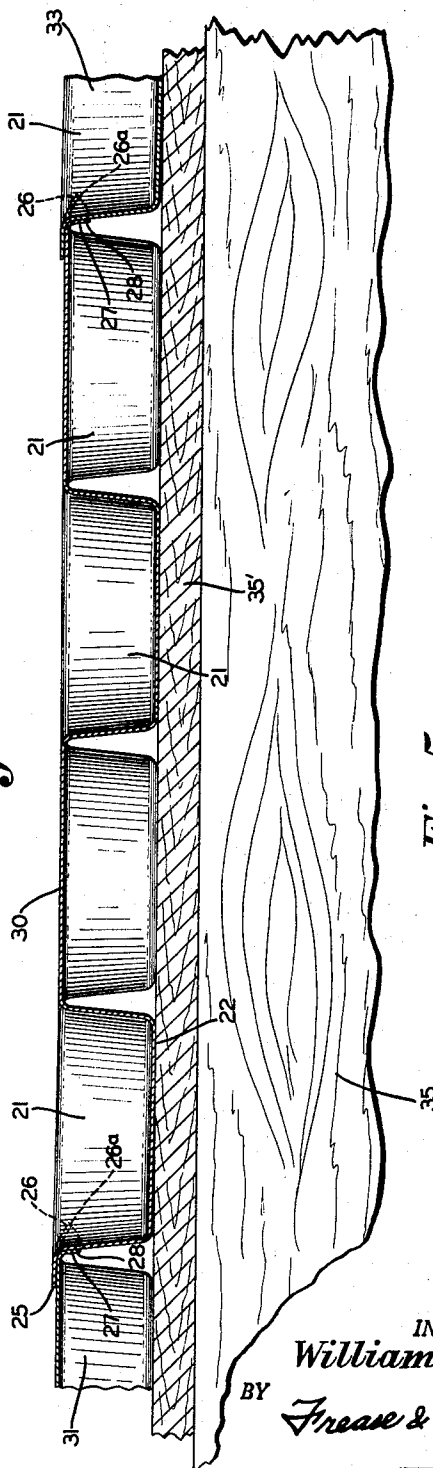


Fig. 5

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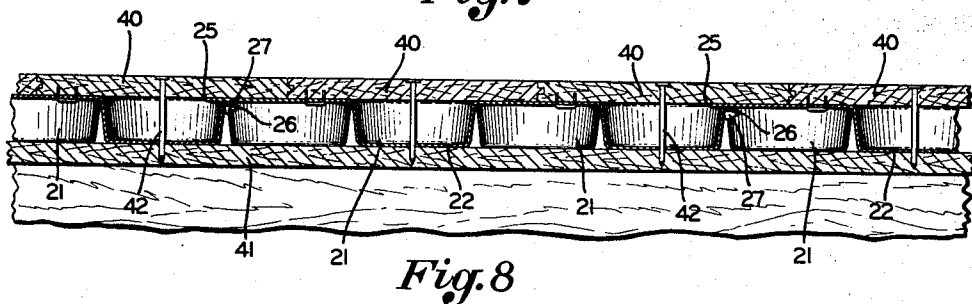
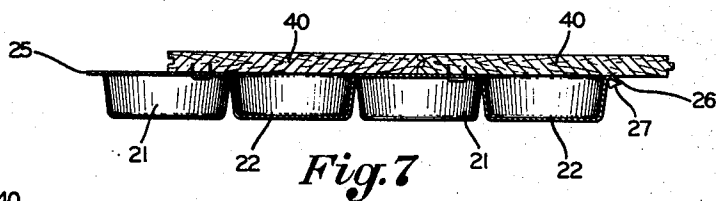
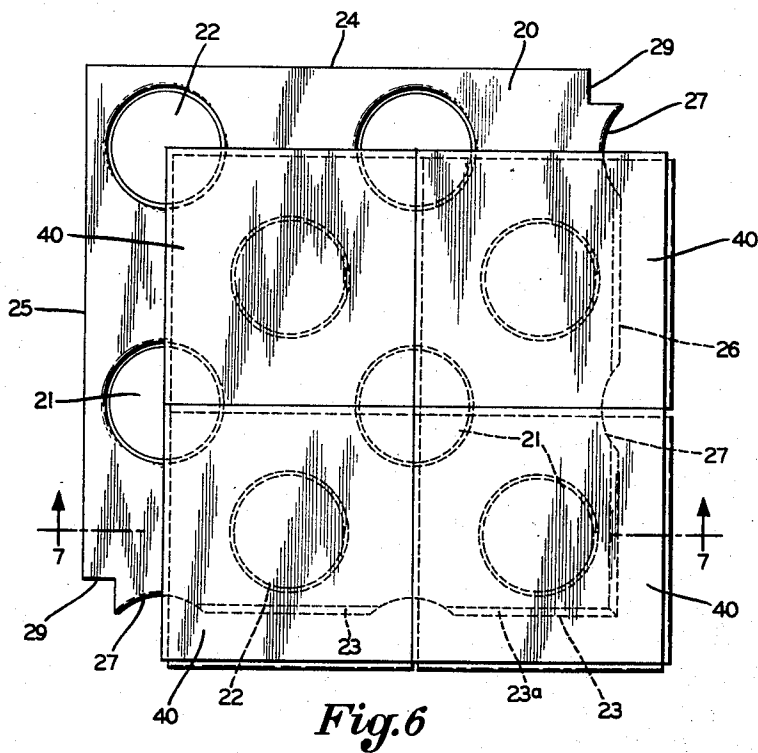
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4 Sheets-Sheet 3



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4 Sheets-Sheet 4

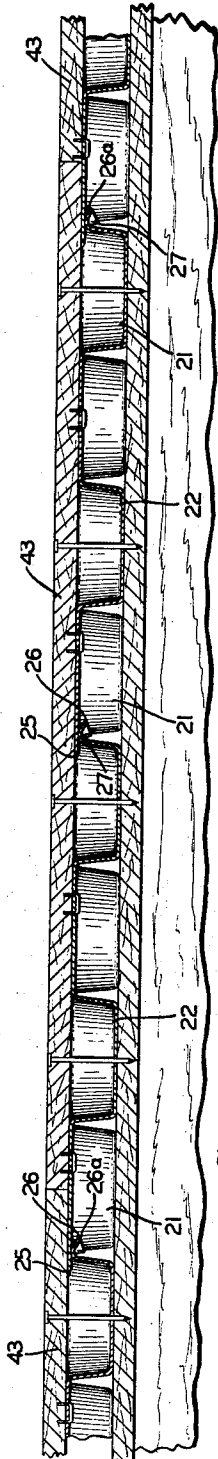


Fig. 10

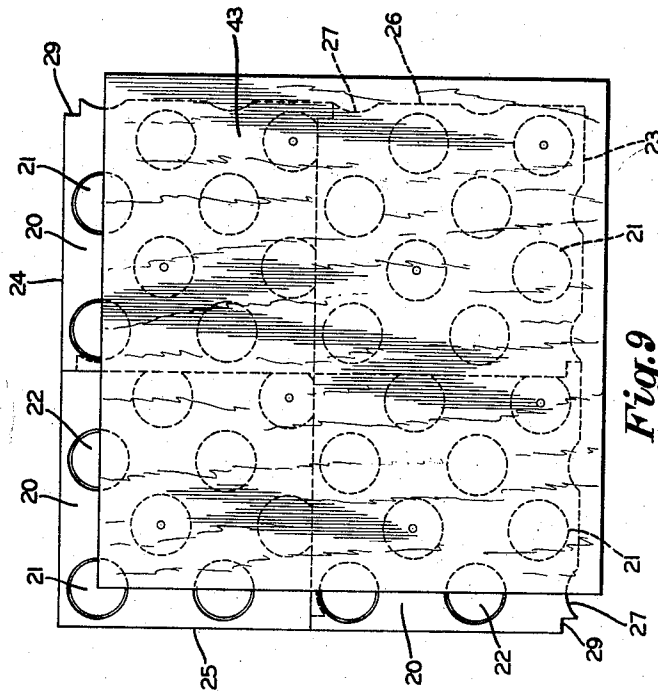


Fig. 9

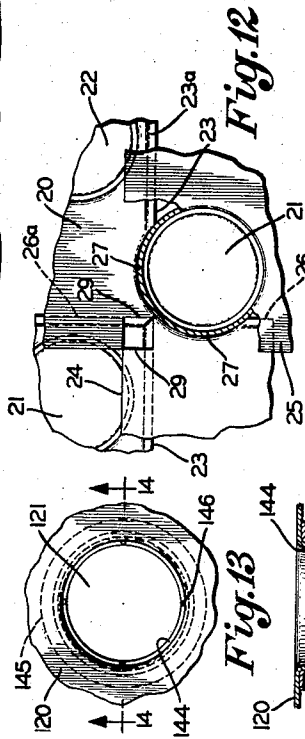


Fig. 12

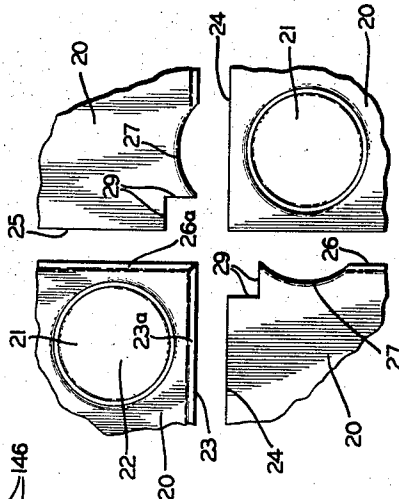


Fig. 11

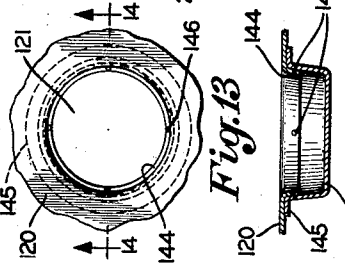


Fig. 13

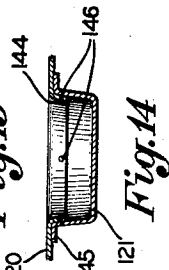


Fig. 14

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1

2,956,785

HEATING PANEL CONSTRUCTION

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Filed Oct. 4, 1957, Ser. No. 688,352

8 Claims. (Cl. 257—124)

My invention relates generally to a panel which may be used for heating or cooling, broadly being termed a heating panel construction and more specifically to a modular core construction used in forming preferably floor radiant heating panels. Furthermore my present invention is an improvement over the heating panel construction disclosed in my copending application, Serial No. 585,699, filed May 18, 1956, now abandoned.

The heating panel construction disclosed in my copending application, Serial No. 585,699, is comprised of spaced sheets structurally joined by a series of column means forming sinuous passages through the panels, so that these panels may be positioned in modular fashion to form the floor surface of a building structure and warm air may be circulated through the passages to radiant heat the rooms of the building structure above the floor surface. Although such a construction is satisfactory for its intended use, due to the high costs of transportation, it has been found that in some cases these transportation costs make the use of this prior heating panel construction prohibitive from the cost standpoint, particularly where it is necessary to ship the panels over long distances.

Thus it has become desirable to provide a way of furnishing a modular radiant heating floor panel that is of minimum weight and bulkiness so that the shipping costs thereof are minimized. It has been found that this problem can be solved by providing merely a core construction which can be installed at the building site, preferably on standard subflooring, and which will provide all of the other advantages of applicant's invention in heating panel construction as disclosed in said copending application Serial No. 585,699.

It is, therefore, a general object of the present invention to provide a heating panel construction which eliminates the foregoing problems.

It is a primary object of the present invention to provide a core construction for heating panels which provides spacer means between two sheets of flooring in a building structure so that when warm air is forced between the sheets of flooring they become radiant heating panels.

It is a further object of the present invention to provide a core construction for heating panels in which the cores are modular and cheaply fabricated from material such as relatively thin metal.

It is an additional object of the present invention to provide a core construction for heating panels in which the cores are formed in such a manner that a series of these cores must be properly assembled for providing an efficient heating panel and mistakes of assembly are virtually eliminated.

Also it is an object of the present invention to provide a core construction for heating panels in which a single core may be provided with a desired floor covering layer prefabricated thereon, or a series of these cores may be preassembled and provided with a single sheet of desired floor covering thereon, and in either case each assembled unit is a modular unit which may be shipped to the site

2

of a building structure and assembled on the conventional subflooring of the building structure to form radiant heating floor panels.

Finally it is an object of the present invention to provide a core construction for heating panels which may be fabricated and shipped at a minimum of cost.

These and other objects are accomplished by the parts, constructions, arrangements, combinations and subcombinations comprising the present invention, the nature of which is set forth in the following general statement, a preferred embodiment of which—illustrative of the best mode in which applicant has contemplated applying the principles—is set forth in the following description and illustrated in the accompanying drawings, and which is particularly and distinctly pointed out and set forth in the appended claims forming a part hereof.

In general terms the core construction for heating panels comprising the present invention may be stated as including sheet means extending in a first plane, with column means mounted on the sheet means and extending therefrom to a second plane spaced from the first plane, and with the column means being positioned so that sinuous air passages are formed in directions perpendicular to and between opposite side edges of the sheet means around the column means and between the first and second planes. Further the column means are preferably positioned so that straight diagonal passages are also formed between the planes. Finally the core construction may be provided with special configurations at the side edges thereof so that a series of these core constructions may be positioned with the side edges thereof adjoining and overlapped and the column means of one core construction will be properly positioned with respect to the column means of the other core constructions so that the sinuous and diagonal passages will be continued uniformly through the entire group of assembled core constructions.

Thus a series of the core constructions may be assembled between the subfloor of a building structure and a covering floor spaced above the subfloor, with the core construction providing a series of sinuous and preferably diagonal passages between the outer perimeter walls of the building structure so that warm air may be forced through these passages for providing a radiant heating panel to heat the rooms above the covering floor. Further, one or a series of these core constructions may be preassembled with preselected sections of the covering floor so that these preassembled units may be used to provide radiant heating for rooms in a similar manner.

By way of example, embodiments of the core construction for heating panels of the present invention are illustrated in the accompanying drawings forming a part hereof, wherein like numerals indicate similar parts throughout the several views, and in which:

Fig. 1 is a top plan view of a heating panel core formed according to the principles of the present invention;

Fig. 2, a side elevation of the heating panel core of Fig. 1;

Fig. 3, a fragmentary top plan view of the heating panel core of Fig. 1 assembled with a series of identical heating panel cores on the subfloor of a building structure;

Fig. 4, a fragmentary sectional view, part in elevation, looking in the direction of the arrows 4—4 in Fig. 3;

Fig. 5, a fragmentary sectional view, part in elevation, looking in the direction of the arrows 5—5 in Fig. 3;

Fig. 6, a top plan view showing the heating panel core of Fig. 1 preassembled with a series of floor-covering blocks;

Fig. 7, a sectional view, part in elevation, looking in the direction of the arrows 7—7 in Fig. 6;

3

Fig. 8, a fragmentary sectional view, part in elevation, similar to Fig. 7, but with the preassembled heating panel core of Fig. 6 assembled with other identical heating panel cores and structurally joined to the subfloor of a building structure;

Fig. 9, a top plan view of a series of the heating panel cores of Fig. 1 preassembled with a single floor-covering sheet to form a preassembled heating panel core unit;

Fig. 10, a view similar to Fig. 8, but showing the heating panel core unit of Fig. 9 assembled with other identical units and structurally joined to a subfloor of a building structure;

Fig. 11, a fragmentary top plan view showing the adjoining corners of a series of the heating panel cores of Fig. 1 in proper position ready to be assembled;

Fig. 12, a fragmentary top plan view similar to Fig. 11 but showing the corner sections of the heating panel cores properly assembled;

Fig. 13, a fragmentary top plan view illustrating a second embodiment of the core heating panel of Fig. 1; and

Fig. 14, a fragmentary sectional view, part in elevation, looking in the direction of the arrows 14—14 in Fig. 13.

The core construction for heating panels comprising the present invention includes a main sheet 20 extending in a given plane having a series of spaced preferably frusto-conical columns 21 extending therefrom and terminating at a second plane spaced from the first plane, so that the main sheet 20 forms connection means for the columns 21 retaining the columns in their spaced positions. Columns 21 are preferably hollow, having a larger diameter at their point of joinder to sheet 20 and tapering away from sheet 20 to a smaller diameter, with the closed bottoms 22 extending in the second plane spaced from the first or sheet plane.

Thus the cores may be formed of one-piece, relatively thin, sheet metal stampings in a so-called "muffin pan" style, with the columns 21 opening through sheet 20. For example, the cores may be stamped from 30 gauge rust-resistant steel.

For economy of manufacture, however, it may be desired to form the columns 21 separate from the sheet 20 and later secure the columns 21 to sheet 20 by conventional fastening means, such construction to be hereinafter more fully described.

The particular positioning and spacing of the columns 21 on the sheets 20 is of importance to provide the proper circulation of warm air through the heating panels which are ultimately to be formed using the core construction of the present invention, which warm air must circulate between sheet 20 and the plane of the column bottoms 22 and around the columns 21. In broad terms it can be stated that the columns 21 are positioned on the sheet 20 so that sinuous passages are formed between opposite sheet side edges and perpendicular to these sheet side edges.

That is to say, referring to Fig. 1, the passages formed between opposite sheet side edges 23 and 24, perpendicular to these side edges, are sinuous, so that the air cannot pass freely through a straight passage perpendicularly between these side edges but is caused to swirl and move in turbulence around columns 21. This is also true of the passages formed perpendicularly between the other opposite side edges 25 and 26. Still further it is preferred that the columns 21 are positioned to form straight diagonal air passages.

Stated in different terms, the columns 21 are preferably positioned equally spaced in lines extending perpendicularly between opposite side edges, with each line of columns being offset with respect to the side edges from the next adjacent lines preferably by one-half the spacing distance of the columns in any particular line. Thus taking any particular column 21, this column is equally spaced from the two nearest adjacent columns of the next adjacent line of columns.

4

Further, in order to provide the passages extending perpendicularly between the opposite side edges sinuous, a line drawn between the outer extremities of the columns in one line must be spaced from a line drawn between the extremities of the columns in the next line a lesser distance than the least distance between any given column in one line and its nearest adjacent columns in the next line. In this way, even though the lines of columns might be positioned so that straight line air passages of a given width are formed perpendicularly between opposite side edges, the widths of these straight line passages will not be as great as the shortest distance between the outer extremities of a column in one line and the outer extremities of the nearest adjacent columns in the next line.

Thus in actuality, even though straight line air passages of a given width are formed, the actual total passages in a direction perpendicular to the side edges of the sheet 20 alternately decrease and increase in width as the air is forced to pass beside a single column 21 and then between two of these columns. With this construction, therefore, the air will be forced to travel in a twisting or sinuous path thereby causing the necessary turbulence to circulate the air in all directions around columns.

Although it is preferred to space the columns 21 so that straight line diagonal air passages are formed, since the cores are modular, and all sinuous as well as diagonal passages will connect, it is seen that when a series of the cores are used in a building structure between a subfloor and covering floor, the diagonal passages will be of much greater length than the shorter sinuous passages. Due to this greater length of the diagonal passages, therefore, air will be provided at all points in the floor by being able to travel freely through the diagonal passages but will still be required to twist and turn and circulate by passing through the sinuous passages.

As shown in Fig. 2, it is preferred to position the line of columns 21 and to form the columns of dimensions so that the columns in one line, extending perpendicularly between opposite side edges, are equally spaced substantially the width of one column and have their largest diameter extremities in substantial alignment with the largest diameter extremities of the next adjacent line of columns, thereby forming the sinuous and diagonal passages. Further it is preferred to form the sheet 20 substantially square in configuration preferably with all of the columns spaced from the side edges thereof.

An example of a core that may be formed, having modular dimensions convenient for present building use, would be to form the sheet 20 seventeen inches square with the intentions of providing a one-half inch overlap on all side edges when a series of cores are assembled in a building structure. Further the columns can be formed having maximum diameters of four inches and being one and one-quarter inches deep, with the spacing between columns in any given row extending perpendicularly between either set of opposite side edges being four inches at the column maximum diameters.

Again referring to Fig. 1, arcuate cutouts 27 may be formed in the side edges 23 and 26 in alignment with alternate perpendicular rows of column 21. These cutouts 27 are spaced from the nearest column 21 in the perpendicularly extending line of columns the same distance as the columns in that line are spaced apart, so that the cutouts 27 provide positioning means between adjacent cores when these cores are assembled in a building structure for aligning the passages in directions parallel to the plane of main sheet 20 between the various adjacent panels, as will be hereinafter described.

Also it is preferred to provide a lip 28 on the cutouts 27 as shown in Fig. 2 and to provide slightly downwardly angled portions 23a and 26a on the edges 23 and 26 joining the cutouts 27 for a purpose to be hereinafter de-

5

scribed. Finally it is preferred to provide right angle cutouts 29 on opposite corners of the sheet 20 to prevent more than two sheets 20 overlapping at the corners thereof when the cores are assembled on a building structure subfloor as will also be hereinafter more clearly described.

The panel core construction comprising the present invention, as shown in Figs. 1 and 2 and described above, is shown in Fig. 3 assembled with a series of similar panel cores on a building structure subfloor. For convenience, the central core is indicated at 30 and the surrounding cores 31, 32, 33 and 34.

As shown in Figs. 3, 4 and 5, the edge 25 of core 30 overlaps the edge 26 of core 31 so that the arcuate cutouts 27 along edge 26 of core 31 receive a portion of the outer periphery of the columns 21 of core 30, thereby positively positioning cores 30 and 31 in proper alignment with the side edges 23 and 24 in exact alignment. Edge 24 of core 30 similarly overlaps edge 23 of core 32 so that again two of the columns 21 of core 30 are received in the arcuate cutouts 27 formed in the edge 23 of core 32.

Still further since cores 33 and 34 both overlap core 30, two of the columns 21 of each of these cores 33 and 34 are received in the cutouts 27 along the edges 23 and 26 of core 30, as shown. Also, all of this positioning is preferably done directly on the subfloor 35' of a building structure supported on the usual floor joists 35. Finally, as additional cores 36, 37, 38 and 39 are positioned in place with the cores 30, 31, 32, 33 and 34, they will be similarly received, either being overlapped by or overlapping the edges of their respective adjacent cores and with certain columns 21 being received in cutouts 27 depending on the particular positioning of any core with reference to the other cores.

This overlapping of adjacent edges of adjacent cores and the reception of certain columns 21 in the arcuate cutouts 27 is more clearly illustrated in Figs. 11 and 12, with Fig. 11 showing four of the panel cores approaching but just prior to complete overlapped assembly, and Fig. 12 showing the same four panel cores assembled with part of one of the sheets 20 broken away so that the reception of the one column 21 in the arcuate cutouts 27 can be more clearly seen. Further from Fig. 11, it is clear how the right-angle cutouts 29, formed in diagonally opposite corners of each panel core, limit the number of overlapped thicknesses of metal to two, even though four panel cores are joined at that point.

As shown in Fig. 11, at the point of joinder of these four panel cores, there are two full corners and two corners containing the right-angle cutouts 29, and this will always be the case when the panel cores are properly positioned. Thus when the four panel cores are brought together, as shown in Fig. 12, because two of the corners joined have the right-angle cutouts 29, only the two full corners overlap and thereby limit the overlapped thickness of metal to two thicknesses.

The purpose of providing the lips 28 on the cutouts 27 and the slightly downwardly angled portions 23a and 26a on the edges 23 and 26, joining the cutouts 27, as before described, is to insure that the edges 23 and 26 are overlapped by edges 24 and 25, respectively, of adjacent panel cores when the cores are positioned on the subfloor of a building structure, to thereby insure the proper assembly thereof. As can be seen, in order to make the respective columns 21 properly position with the cutouts 27 and lips 28, the core edges 23 and 26 must pass beneath the edges 24 and 25 of the adjacent cores, and the downwardly angled portions 23a and 26a on edges 23 and 26 between cutouts 27 will tend to make these edges 24 and 25 of the adjacent cores move above these edges 23 and 26 and the cutouts 27.

Thus when a series of the panel cores of Figs. 1 and 2 are positioned on the subfloor 35' of a building structure, as shown in Figs. 4 and 5, a substantially smooth surface

6

is formed by the sheets 20 so that it is merely necessary to add some form of finished floor covering on these floor panels to complete the construction. Further, the sinuous and diagonal air passages formed through each panel core are continued in the same pattern throughout the floor of the building structure resulting in a complete circulation of warm air throughout this floor.

The means for connecting the plenum of a forced air furnace to the assembled final floor heating panel and preferred means for exhausting this air from the final panel are illustrated in my copending patent application, Serial No. 585,699.

As shown in Figs. 6 and 7, the panel cores shown in Figs. 1 and 2 may be preassembled individually with desired forms of floor covering sheets. In Figs. 6 and 7, a panel core is assembled with four tongue and groove blocks of any desired hard wood or other floor covering material.

As shown in Fig. 6, if the panel cores are formed of the dimensions hereinbefore set forth, that is, sixteen inches square of effective floor area with a one-half inch overlapping on the side making the total panel core dimensions seventeen inches by seventeen inches, the wood blocks 40 would preferably be eight inches square, exclusive of tongue and groove, so that four of these blocks assembled also form a sixteen inch by sixteen inch effective floor area. Blocks 40 are, however, preferably assembled on the panel core inset from the side edges 24 and 25 and overhanging the side edges 23 and 26, with blocks 40 being secured to the panel core by any usual fastening means.

Thus as shown in Fig. 8, when the semi-fabricated panel core of Figs. 6 and 7 is installed on the subfloor 41 of a building structure, the side edges 24 and 25 of the core will overlap adjacent cores and the side edges 23 and 26 will be received under the side edges of adjacent cores in the manner hereinbefore described and shown in Fig. 3, but the blocks 40 will overlap the sheets 20 of the adjacent cores at the side edges 23 and 26 and be joined in tongue-in-groove fashion with the blocks 40 on these adjacent cores. Furthermore at edges 24 and 25, the blocks 40 from the adjacent cores will overlap the core of Fig. 6 and will be received in tongue-in-groove fashion in the blocks 40 of Fig. 6.

As shown in Fig. 8, therefore, the side edges 24 and 25 will telescope between the edge 26 of an adjacent core and the blocks 40 of that core with the reverse taking place at the side edge 26. All of the blocks 40 and cores may be secured to the sub-floor 41 after assembly by nails 42 received through blocks 40, through one of the bottoms 22 of the columns 21, and into the sub-floor 41.

As shown in Fig. 9, the panel cores may also be semi-fabricated into larger modular units made up of a series of these cores and a single sheet of covering flooring. As shown in Fig. 9, four of the panel cores are prefabricated with a sheet 43 of covering flooring with the sheet 43, similar to the assembled blocks 40 of Fig. 6, being inset at the core side edges 24 and 25 and overhanging at the core side edges 23 and 26.

As shown in Fig. 10, these semi-fabricated units may be assembled as before with the various panel cores overlapping in each single unit and also overlapping between units. That is to say the various side edges 24 and 25 are received telescoped between the side edges 23 and 26 and the edges of the covering sheet 43, with certain of the columns 21 being received in cutouts 27 properly positioning the various single panel cores throughout the building structure floor so that the air passages formed therethrough are always properly continuous and properly formed as hereinbefore described.

In both of the foregoing semi-fabricated units shown in Figs. 6, 7 and 8 and in Figs. 9 and 10, the slightly downwardly angled portions 23a and 26a on side edges 23 and 26 become of even increased importance for convenience of assembly of either type of these semi-fabri-

cated units with other similar prefabricated units on the subfloor of a building structure. As described in both cases and as shown in Figs. 8 and 10, when these semi-fabricated units are assembled with other similar units, certain of the core edges 24 and 25 must telescope between the covering blocks or covering sheets and other core side edges 23 and 26.

Thus with the downwardly angled portions 23a and 26a on these edges 23 and 26, this telescoping is easily accomplished. The core edges 24 and 25, which must be received between other core edges 23 and 26 and the covering blocks or sheets, will be easily guided into their proper telescoped position by these downwardly angled portions 23a and 26a.

A second embodiment of the heating panel core comprising the present invention is shown in Figs. 13 and 14, with the only difference being that the sheet 120 and the columns 121 are formed of separate pieces. As shown in Fig. 14, the sheet 120 is formed with openings at the locations of the column 121, with these openings having downwardly directed lips 144.

Further the columns 121 are formed with outwardly directed flanges 145 at the top edges thereof. Thus the columns 121 may be telescoped over the lips 144 on sheet 120 with the column flanges 145 abutting the undersurface of sheet 120, and the columns 121 may be secured to the lips 144 on the sheet 120 by means of welding, as shown at 146, or other fastening means.

Thus according to the principles of the present invention, the floor heating panel core shown in Figs. 1 and 2 may be cheaply fabricated from relatively thin metal, but since the columns 21 are preferably formed frusto-conical, the load supporting strength of this core will be relatively high and adequate for the usual building structure. Further, by providing these core units separate in modular form so that they can be assembled on a usual subflooring and covered with a usual covering flooring of a building structure, a floor radiant heating panel is provided at a relatively low cost, eliminating the need for factory assembling a complete radiant heating panel and incurring the excess shipping costs involved in shipping entire panel units to the site of the building structure.

Further because of the unique configuration of the panel core construction, that is, the provision of the cutouts 27 formed to receive the outer extremities of columns 21 of adjacent cores, the proper positioning of the cores in the building structures is insured and the proper spacing of the columns 21 in the finished over-all floor heating panel to provide proper radiant heating to the floor surface is insured. Also due to the provision of the corner cutouts 29, even though the panel cores may be overlapped during their assembly to insure proper assembly, an excessive thickness of metal is not provided at the core corners where four of these cores are joined, but rather merely the same double thickness of metal is provided which is present at all other joining edges of the core.

Finally, as described and illustrated, if it is desired, one or more of the panel cores comprising the present invention may be semi-fabricated with covering sheets of any form of floor covering desired, in which case these semi-fabricated units are also modular and may be shipped to the site of the building structure and assembled in place to form the radiant heating floor surface.

Although in the foregoing description the panel core construction has been illustrated for use between two layers of flooring and having warm air forced there-through for heating purposes, it should be understood that the principles of the present invention are not limited to this particular use of the construction but rather this is merely a preferred application. For instance, cool air could be forced through two surfaces separated by this core construction for cooling purposes, or the core construction may possibly be used for separating surfaces through which many types of fluids may be circulated

whether air or other than air and whether by forced circulation, gravity or otherwise.

Furthermore if it is desired, this core construction may be used between two layers of concrete rather than wood.

Finally if the embodiment of the core construction shown is used, that is having columns 21 which are hollow and open upwardly through the sheet 20, the covering layer of concrete, when in fluid state as poured, may enter the columns 21 completely filling these columns to thereby support the covering layer when solidified while still having the columns 21 formed.

In the foregoing description, certain terms have been used for brevity, clearness and understanding, but no unnecessary limitations are to be implied therefrom, because such words are used for descriptive purposes herein and are intended to be broadly construed.

Moreover, the embodiments of the improved construction illustrated and described herein are by way of example, and the scope of the present invention is not limited to the exact details of construction shown.

Having now described the invention, the construction, operation and use of preferred embodiments thereof, and the advantageous new and useful results obtained thereby, the new and useful construction and reasonable mechanical equivalents thereof obvious to those skilled in the art are set forth in the appended claims.

I claim:

1. Radiant heating panel core construction including a sheet extending in a first plane and having side edges, a series of spaced column means mounted on the sheet and extending therefrom to a second plane spaced from and parallel to the first plane, the column means being positioned so that sinuous passages are formed between opposite sheet side edges in a direction perpendicular to said side edges and around the column means between said planes, cutout positioning means formed in at least two adjoining side edges of the sheet, and the cutout positioning means being located with respect to the column means to be received partially around certain of the column means of adjacent panel cores for positively positioning the panel cores with the passages thereof aligned; whereby a series of the cores may be positioned in modular fashion between a building structure sub-floor and covering floor, and warm air forced through the sinuous passages to form a radiant heating floor surface.

2. Radiant heating panel core construction including a sheet extending in a first plane and having side edges, a series of spaced column means mounted on the sheet and extending therefrom to a second plane spaced from and parallel to the first plane, the column means being positioned equally spaced in parallel rows extending perpendicularly between opposite sheet side edges, any column means in one row being substantially equally spaced from the nearest adjacent column means of the nearest adjacent parallel rows, the parallel rows of column means being positioned with respect to each other so that all straight passages formed perpendicularly continuously between opposite sheet side edges are of a width less than said spacing between said any column means in one row and said nearest adjacent column means of the nearest adjacent parallel rows thereby forming sinuous passages in a direction perpendicular to said side edges and around the column means between said planes, cutout positioning means formed in at least two adjoining side edges of the sheet positioned in alignment with alternate parallel rows of the column means, and the cutout positioning means being formed to be received partially around certain of the column means of adjacent panel cores for positively positioning the panel cores with the passages thereof aligned; whereby a series of the cores may be positioned in modular fashion between a building structure sub-floor and covering floor, and warm air forced through the sinuous passages to form a radiant heating floor surface.

3. Radiant heating panel core construction including a sheet extending in a first plane and having side edges, a

series of spaced column means mounted on the sheet and extending therefrom to a second plane spaced from and parallel to the first plane, the column means being positioned so that sinuous passages are formed between opposite sheet side edges in a direction perpendicular to said side edges and around the column means between said planes, the column means being positioned equally spaced in parallel rows extending perpendicularly between opposite sheet edges, the column means in any one row being substantially equally spaced from the nearest adjacent column means of the nearest adjacent parallel rows, the parallel rows of column means being positioned with respect to each other so that all straight passages formed perpendicularly continuously between opposite sheet side edges are of a width less than said spacing between said any column means and said nearest adjacent column means of the nearest adjacent parallel rows thereby forming the sinuous passages, the positioning of the column means also forming straight diagonal passages beside the column means between said planes, cutout positioning means formed in at least two adjoining side edges of the sheet in alignment with alternate parallel rows of the column means, and the cutout positioning means being located with respect to the column means to be received partially around certain of the column means of adjacent panel cores with the adjacent side edges of said adjacent panel cores overlapping said at least two adjoining side edges of the sheet for positively positioning the panel cores with the passages thereof aligned; whereby a series of the cores may be positioned in modular fashion between a building structure sub-floor and covering floor, and warm air forced through the sinuous and diagonal passages to form a radiant heating floor surface.

4. The panel core construction as defined in claim 3 in which diagonally opposite corners of the sheet are formed with right angle cutouts having depths at least as great as the distance any side edges of adjacent core sheets would overlap any side edges of the sheet, to thereby insure a maximum of two sheet thicknesses overlapped at the corners of the sheets when the cores are positioned in modular fashion.

5. Radiant heating panel construction including a sheet extending in a first plane and having side edges, a series of spaced column means having widths and outer extremities mounted on the sheet and extending therefrom to a second plane spaced from and parallel to the first plane, the column means being positioned equally spaced one column means width in parallel rows extending perpendicularly between opposite sheet edges, the column means of one row being offset in a direction parallel to said rows a distance equal to substantially one column means width from the column means in the nearest adjacent parallel rows, the outer extremities of the column means in one row being substantially aligned in a direction parallel to said row with the outer extremities of the column means in the nearest adjacent parallel rows thereby forming sinuous passages between opposite sheet side edges in a direction perpendicular to said side edges and around the column means between said planes and also forming straight diagonal passages beside the column means between said planes, cutout positioning means formed in at least two adjoining side edges of the sheet in alignment with alternate parallel rows of the column means, the cutout positioning means being spaced from the nearest column means of said alternate parallel rows a distance equal to one width of the column means, and the cutout positioning means being formed for being received partially around certain of the column means of

adjacent panel cores for positively positioning the panel cores with the parallel rows of column means and the passages thereof aligned; whereby a series of the cores may be positioned in modular fashion between a building structure sub-floor and covering floor, and warm air forced through the sinuous and diagonal passages to form a radiant heating floor surface.

6. The panel core construction as defined in claim 5 in which the cutout positioning means are formed so that the adjacent side edges of adjacent panel core sheets overlap at least said two adjoining side edges of the sheet in which the cutout positioning means are formed; and in which diagonally opposite corners of the sheet are formed with right angle cutouts having depths at least as great as the distance any side edges of adjacent core sheets would overlap any side edges of the sheet, to thereby assure a maximum of two sheet thicknesses overlapped at the corners of the sheets when the cores are positioned in modular fashion.

7. Radiant heating panel construction including a series of spaced columns positioned with their axes extending between spaced parallel planes, connection means attached to the columns maintaining the columns positioned between said planes forming a panel core having side edges, the connection means positioning the columns so that sinuous passages are formed between opposite panel core side edges in a direction perpendicular to said side edges and around the column means between said planes, cutout positioning means formed by the connection means in at least two adjoining side edges of the panel core, and the cutout positioning means being located with respect to the column means to be received partially around certain of the column means of adjacent panel cores for positively positioning the panel cores with the passages thereof aligned; whereby a series of the cores may be positioned in modular fashion between a building structure sub-floor and covering floor, and warm air forced through the sinuous passages to form a radiant heating floor surface.

8. In a building structure, a sub-floor, a covering floor spaced above said sub-floor, a series of modular panel cores positioned between the covering floor and sub-floor throughout said floors for maintaining said covering floor spaced from said sub-floor, said panel cores having side edges and each including a series of spaced column means positioned so that sinuous passages are formed between the sub-floor and covering floor and around the column means in directions perpendicular to opposite core side edges, the panel cores being positioned with the sinuous passages connecting, cutout positioning means formed in at least two adjoining side edges of each of the panel cores, and the cutout positioning means of each panel core being located with respect to the column means of said core to be received partially around certain of the column means of other adjacent panel cores and positively positioning each of the panel cores with respect to each other with the passages thereof aligned; whereby warm air may be forced between the sub-floor and covering floor through the sinuous passages to form a radiant heating floor surface.

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