July 8, 1952 J. C. LEEMHUIS 2,602,323

FLOOR STRUCTURE

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Fig. 1.

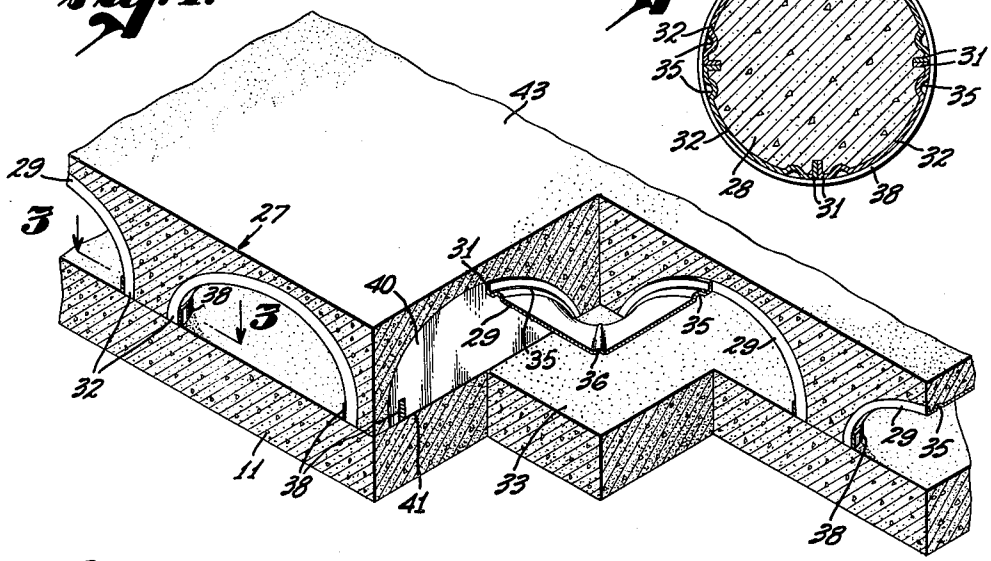
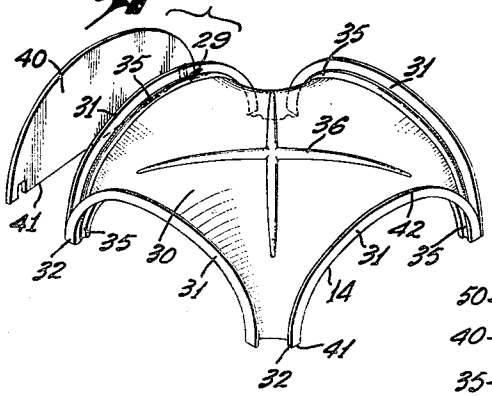


Fig. 3.

Fig. 2.



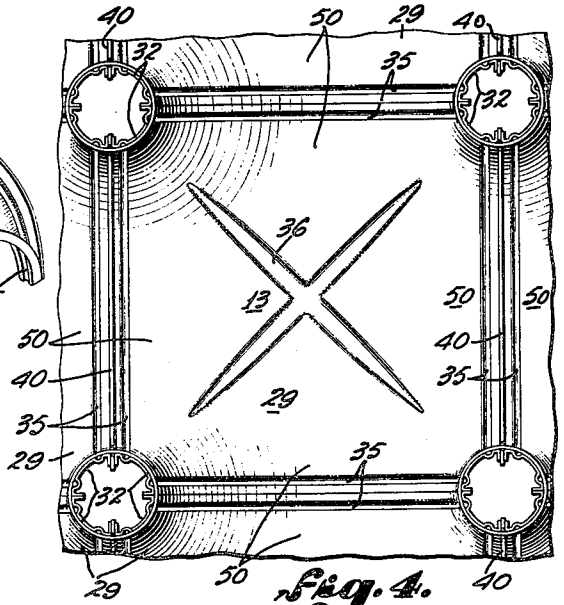


Fig. 4.

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FLOOR STRUCTURE

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5 Claims. (Cl. 72—66)

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This invention relates to a floor construction particularly adapted for use in radiant floor heating.

The invention is directed toward the provision of a new and improved floor construction preferably formed of cement poured over a suitable form made up of reinforcing stools or the like, said form comprising means for segregating or otherwise dividing off selected areas or channels forming passageways in nearly every direction under the floor for ventilation or heating purposes. Because it is contemplated that a maximum circulatory area be provided with minimum impediment of air flow, the structure envisages flow channels of maximum dimensions associated with supporting structure of improved design occupying a minimum of area and designed together with such passageways to allow dispersion of air rapidly and uniformly. Simple and effective provision is also made for appropriate bearing-wall supports and the like foundation reinforcements.

It is therefore among the objects of this invention to provide a new and improved means for radiant floor heating, optionally by means of forced hot air, to form an air cushion under the floor surface having a minimum of obstruction to circulation, the latter being optionally and effectively regulated from selected points over the floor area.

It is another object of this invention to provide an improved floor construction of the desired character described requiring no additional ingredients or elements than those inherent in the raw material and which is fireproof, dampproof and dustproof.

Another further object of the invention is the provision of new and improved floor stools preformed and mutually inter-related with other like stools to produce a honeycomb of intercommunicating passageways with a minimum of flow obstruction in all given directions.

Another further object of the invention is to provide a novel floor construction associated with a novel and improved means of joining adjacent stools to one another for added strength and resilience or immobility.

Another further object of the invention is the provision of a new and improved reinforcing construction and reinforcing elements for a basic cement floor.

Another object of the invention is to provide a floor construction in which the maximum possible air space is obtained and in which the supporting means is a relatively small fraction of the obtained supported surface area.

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It is also among the objects of this invention to provide an economical readily mass-producible means for producing the desired effect.

It is, moreover, among the objects of the invention to provide for improvements over the prior art devices heretofore intended to accomplish generally similar purposes.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

It is contemplated that floors made in accordance with the present invention will be poured as a continuous slab of concrete or the like over stools and their associated parts, as hereinafter set forth, whereby a continuous floor composed of concrete having passageways formed thereunder will result.

In the drawings:

Figure 1 is a perspective view partially in section of a poured concrete floor formed over forming stools and other parts chosen as illustrative of this invention.

Figure 2 is a perspective view of a stool per se.

Figure 3 is a plan sectional view taken as on a line 3—3 of Figure 1.

Figure 4 is a bottom view of a portion of such floor as illustrated in Figure 1, the sub-floor being omitted.

Referring to the drawing, forms comprising stools 29, cf. Figure 2, preferably of sheet metal or like sheet material and formed with an upper convex surface 30 are directly laid upon the flat foundation 11 (Fig. 1), and the upper cement portion then poured as a single upper slab 27 over all of them. The stools thereby define a network of chambers and passages under the floor.

Said stools may have flanges 31 radially directed upwardly and outwardly and designed to abut one another around the outer ends of the archways 14. The ends 32 of each stool comprise legs corresponding to and adapted to accommodate pillar portions 28 of the floor. Said ends 32 are designed to rest upon the upper surface 33 of the slab 11.

Said reinforcing stool 29 may be provided with reinforcing beads 35 for increased strength and may also be formed with a central cross 36 likewise embossed therein for added strength in the central region of the stool.

In order more firmly to secure together the legs or ends 32 of each stool 29, bandlike annuli 38

likewise preferably formed of metal or optionally formed of other like materials including plastic or resilient members, are adapted to encircle the four-part pillar which is made up of four quarter-pillars at each corner of the stools (excepting, of course, that at the edges of the resultant floor or the corners thereof only one or two of said corner pillars occur). Said annuli retain the stools against relative lateral movement and serve to reinforce the bases of the pillars. Corresponding bands may be provided to encircle three, two or even one of said legs **32** along margins and corners of the floor as may be required.

The height of the passages under the floor may be increased or decreased to compensate for varying conditions and demands by increasing or decreasing the width of the annuli **38**.

Partitions **40** of generally semi-circular form but, like their corresponding archways, preferably having a straight bottom edge **41** resting flush on the surface **33** and extending vertically to the topmost edges **42** of the flanges **31**, are designed for disposition between said flanges **31** of adjacent stools in order to block off selected archways **14** and to provide inner directional channels for the flow of air where a duct-like passage is desired between a point of inlet or outlet for the honeycomb passageways under the floor as may be required, e. g., to avoid local areas of excessive heat or cold adjacent or remote from a hot air inlet or outlet point.

These partitions are made of a thin sheet material such as sheet iron, and they do not occupy any appreciable space as between the tiles when the latter are used. If desired, therefore, in the integral slab construction a continuous long strip of material of equal length to the desired passage may be placed as between adjacent rows of blocks or stools in lieu of the individual partition members **40**. The height of such continuous strips is preferably such as to cover the archways **14** from the upper surface **33** of the slab **11** but should fall somewhat short of the height of the upper surface **43** of the slab **27**.

The thickness of the partitions **40** will be of no importance where the stools are used as forms for the pouring of a single floor slab. Their height will be of importance only as it bears upon the question of slab joints or lines of separation. Where desired, especially though not necessarily for the latter purpose, heavy tar paper or other yieldable material, etc., may be substituted for sheet metal.

The instant structure may be economically produced from a large variety of materials, as will be readily apparent to one skilled in any of the arts of radiant heating, tile and cement construction.

The slab of the instant invention can be used as a finished floor surface or as a spacer between a base and upper floor finish, as desired. If so used the slab need not have a finished upper surface but may be roughly cast from the preferably thin and cement-like raw material.

In view of the relatively large passageways and the relatively small supporting columns resistance to air flow and forced air circulation for heating or cooling is reduced to a minimum. Control of flow is also possible, as heretofore stated, by the insertion of the partitions **40** or the like or from openings or registers adopted for use in forced air circulation. The passageways can also be used for sealed still air to act as an air cushion for insulation.

The pillars may be treated to prevent capillary action as by setting the stools **29** in tar initially spread over the surface **33**.

The passageways and pillars comprise a series of substantially circular columns spreading outwardly and upwardly to form and harmonize with the contours of the arches and concavities. The smooth rounded surface for unobstructed passages therein in all directions results in the formation substantially of a hot air cushion under the floor.

During installation the stools **29** are laid closely side by side on a hard level base so that the arches are mutually supporting when subjected to a vertical load.

Construction is preferably such that, by way of example, the aggregate area of contact between the bottom of the pillars and the base upon which they rest constitutes approximately five to ten per cent, preferably eight per cent, of the total floor area on the top surface **43** of the slab.

The resultant floor is dry and well ventilated and provides, if desired, a perfect base for subsequent floor finish such as a layer of cement, concrete, magnesite, composition, wood, etc., flooring. No cutting or waste of materials is called for.

For radiant heating the hot air may be forced down through apertures left in the slab **27**. Baffle plates used in conjunction with the partition **40** or their equivalent assist in directional flow and selective heating. Further circulation may be provided through openings in the floor surface at any point controlled by registers and the air may be drawn over the floor surface to a furnace for recirculation. The stools **29** may be laid without the use of mortar or bedding.

Reinforcing pillars and foundations for bearing walls may be provided by the omission of selective stools or rows or groups thereof. The arrangement thus defined may be separated and outlined by partitions or spacers and then poured solid.

This invention features the provision of an improved floor construction providing a maximum of air circulation beneath the floor surface with a minimum of obstructions, the structure being such that contact of the air flowing through the passageways with the columns assists in heating of the floor. Although it is herein contemplated that the slab **27** be made of a cement-like material and that the stools **29** be of metal, any other appropriate substitutes may be used, including plastics, fibrous material and the like. The slab **27** may be of any generally homogeneous material, and the stools **29** may be made of any sheet-like material of suitable strength.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent structures.

The invention having been herein described, what is claimed and sought to be secured by Letters Patent is:

1. A form adapted to receive cementitious material poured thereover, comprising a stool made of sheet material and having a square plan view, said stool having a dome-like center portion and extending downwardly at each corner of the square to form leg portions for the stool which terminate at a common horizontal plane, the edge portion of said material intermediate each

of said legs being formed as an archway giving access to the under portion of the stool, each leg portion of said sheet material curving downward to form at its lower extremity a quarter-cylinder lying on an arc centered on the corresponding corner of the square, thereby leaving a region which said cementitious material may fill above said leg portion down to said horizontal plane and thereby form, when hardened, a pillar at each corner of the stool.

2. A form according to claim 1, wherein each side edge of said stool forming said archways is turned upwardly to form a flange disposed substantially in the vertical plane of the corresponding archway.

3. A floor form comprising a plurality of stools of sheet material and having a square plan view, said stools being laid side by side and end to end on a horizontal plane to constitute a form over which cementitious material may be poured, the sheet material of each stool being curved downwardly to form a leg portion at each corner of the square thereby leaving intermediate said legs an archway on each side of the square, archways of contiguous stools thereby registering to form passageways interconnecting the region underneath said stools, the sheet forming said leg portions being curved downwardly to terminate at said horizontal plane in a quarter cylinder, whereby the common corner of four abutting squares is formed with a substantially circular pillar cavity into which the cementitious material may flow down to said horizontal plane and

when hardened constitute pillars at each of the corners of said stools to support a floor structure of said cementitious material.

4. A form according to claim 3, wherein the side edges of said stools curving to form said archways are bent upwardly into flanges superjacent the respective archways, said flanges being disposed in the substantially vertical plane of the archway, whereby the flanges of contiguous stools abut.

5. A form according to claim 3, including partitions disposed in vertical planes and intermediate registering archways of contiguous stools.

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