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(54) **THERMAL HEATING BOARD**

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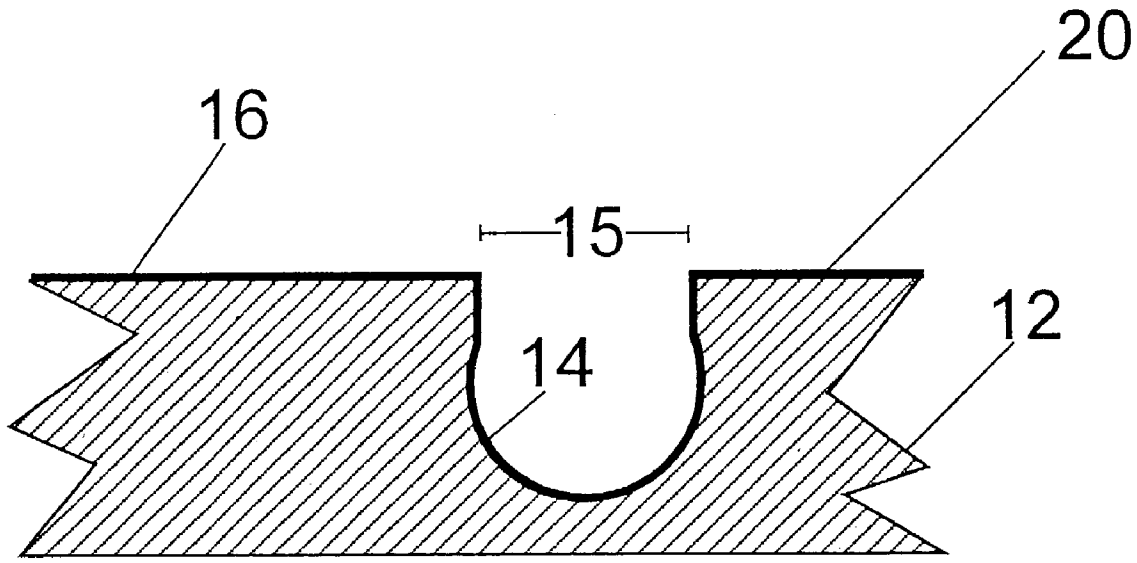
(57) **ABSTRACT**

An improved hydronic radiant heating system comprising a nonstructural board having a recess formed in one surface of said board, a pipe located within said recess, and, if desired, a film of metal covering said surface of said board and having a thickness proportional to the thermal properties of said board to provide desired overall thermal characteristics for said heating system.



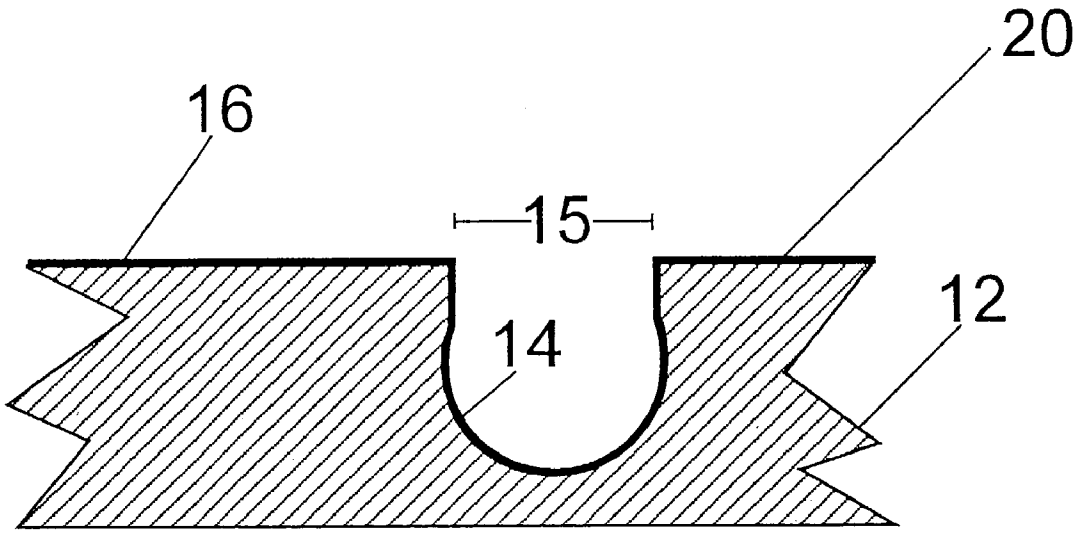


FIG. 1a

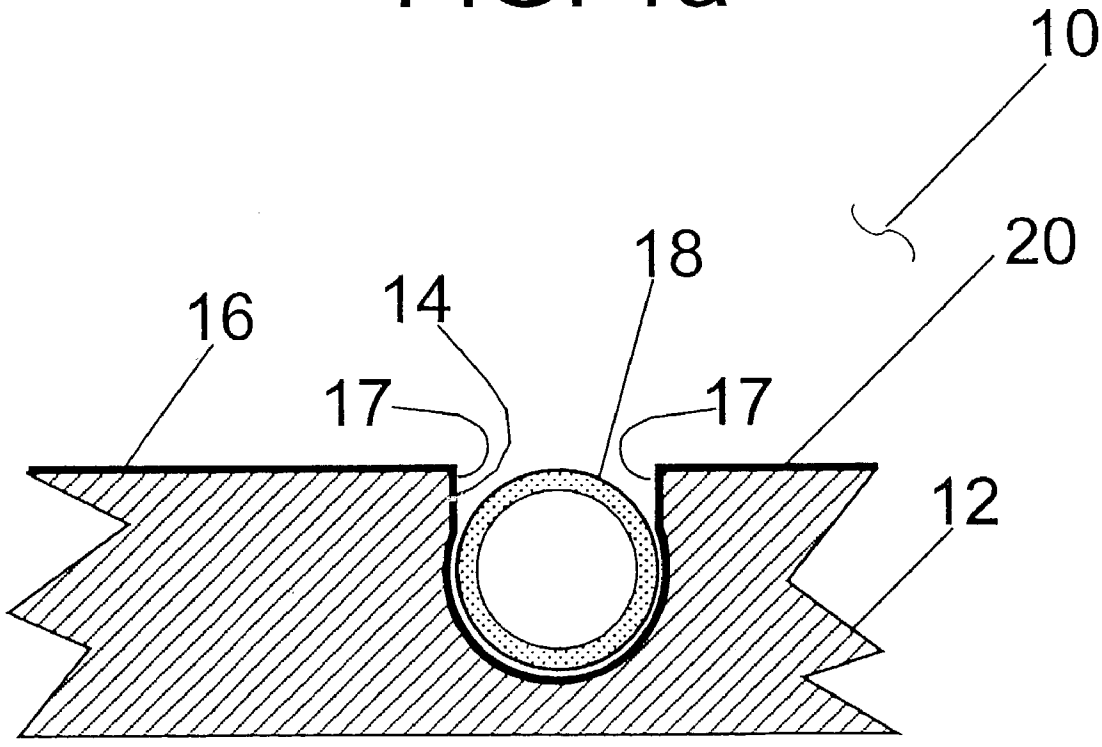


FIG. 1b

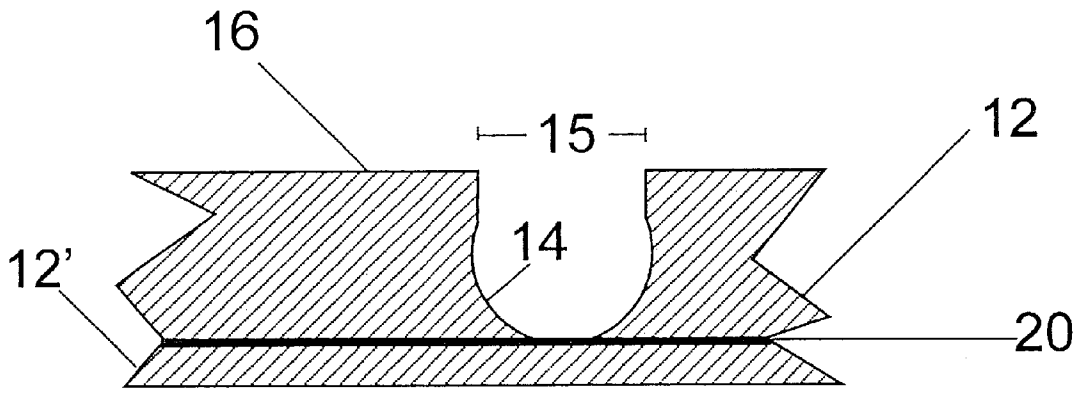


FIG. 2a

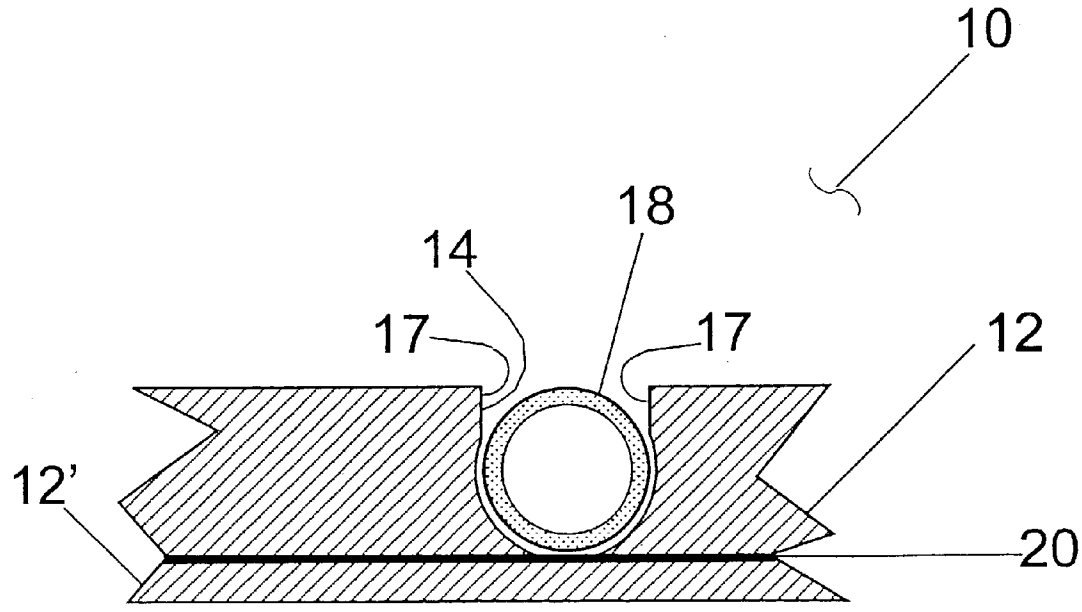


FIG. 2b

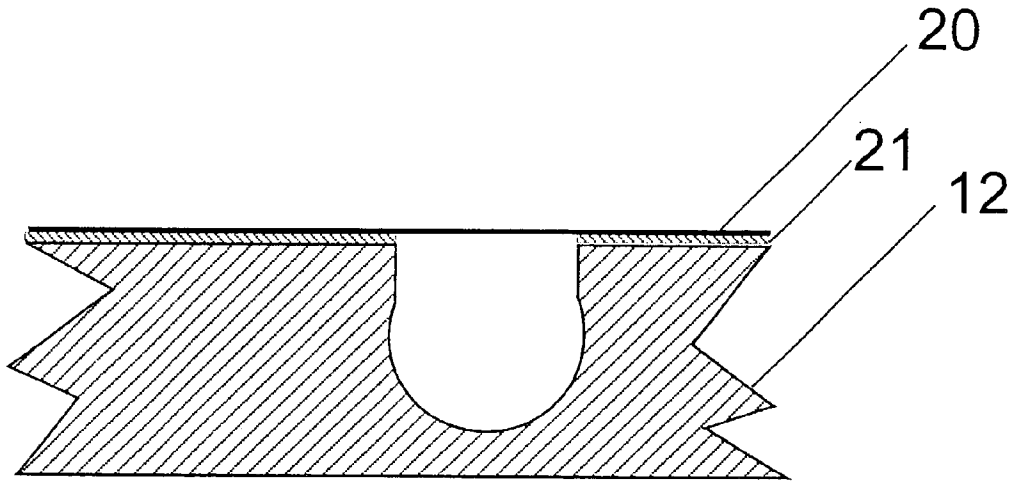


FIG. 3a

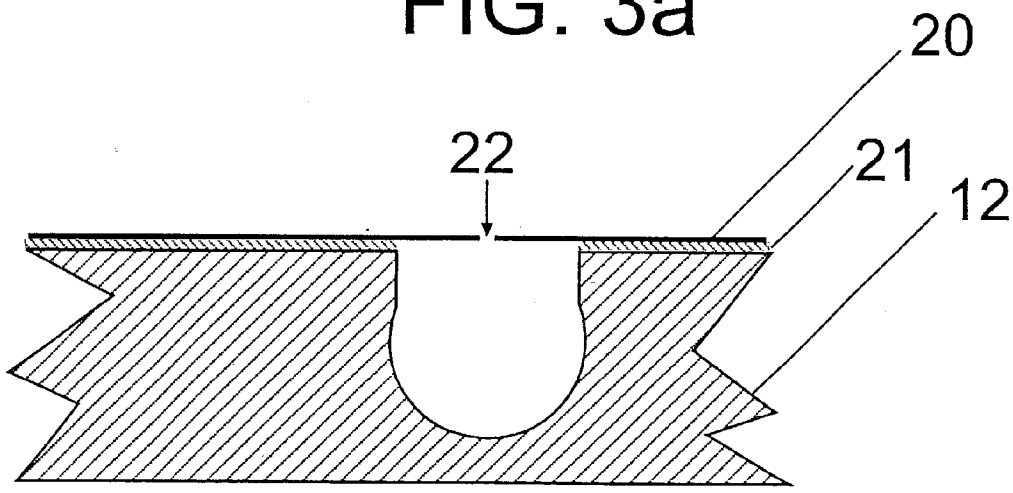


FIG. 3b

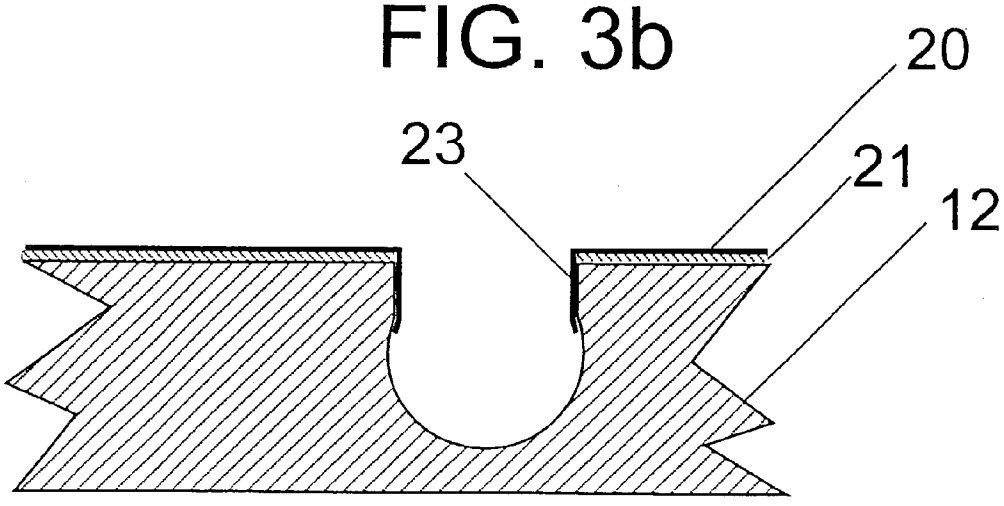


FIG. 3c

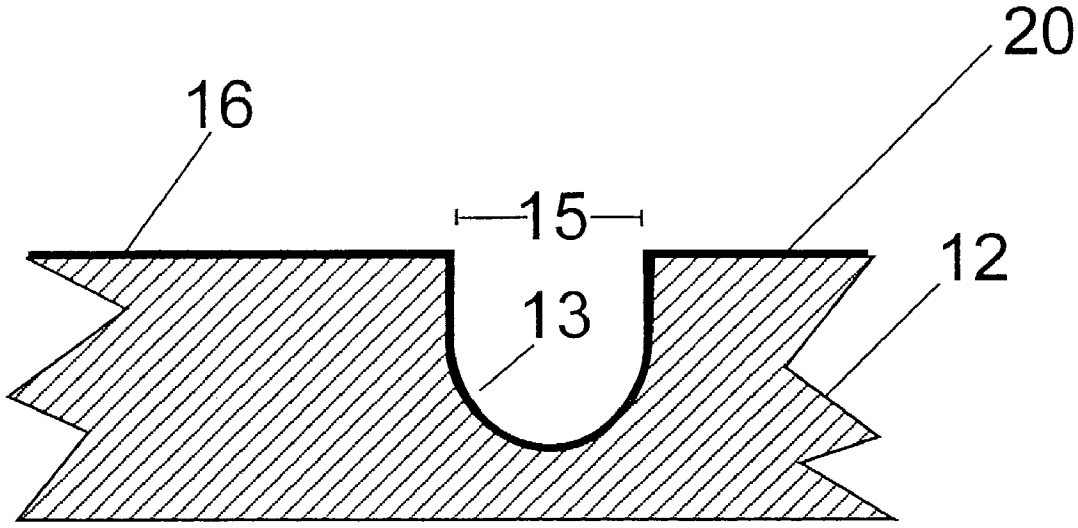


FIG. 4a

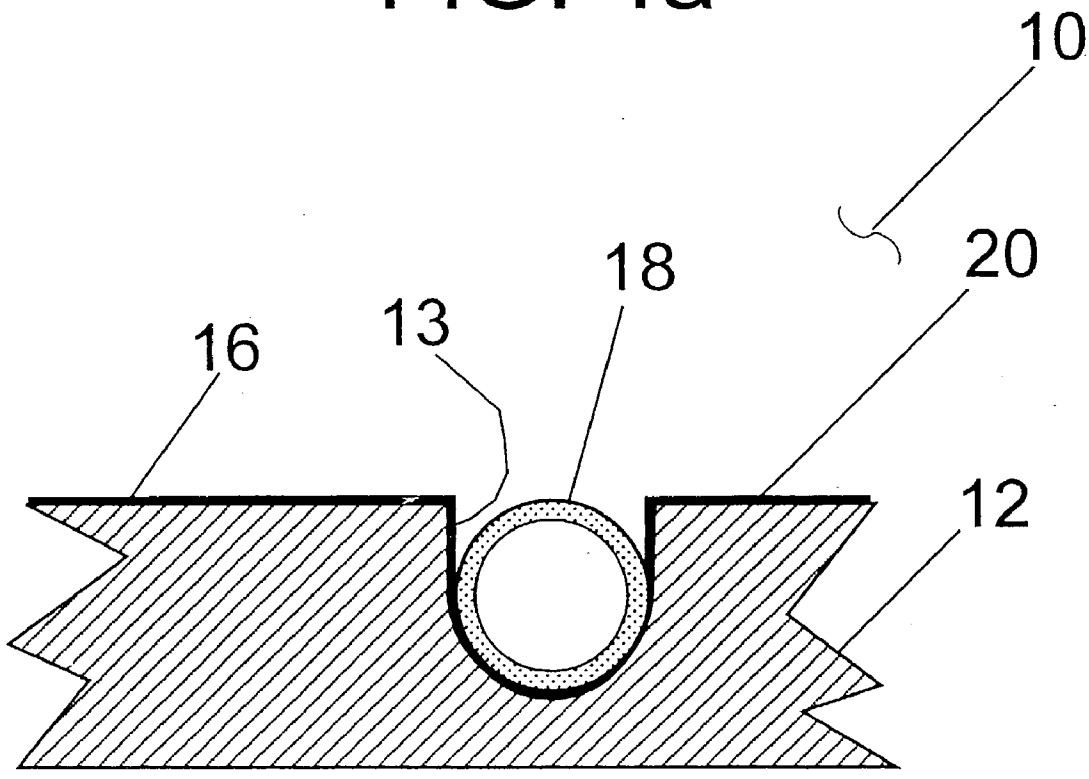


FIG. 4b

THERMAL HEATING BOARD

RELATED CASES

[0001] This invention is descnbed in my copending Provisional Patent Application Ser. 60/110,693, filed Dec. 3, 1998 and now expired and Utility Patent Application, Ser. No. 09/451,324, filed Nov. 30, 1999 and now.

FIELD OF INVENTION

[0002] This invention relates to construction material and is particularly directed to improved thermal heating modules for application of hydronic radiant heating in new and existing construction.

PRIOR ART

[0003] The concept of heating an area by heating the floor surface has been known since Roman times. In more recent times, such systems were formed by metal or plastic pipes embedded in concrete slabs or attached under a subfloor or sandwiched in between layers of flooring thereto by various means and by laying flooring or subflooring on top of these. More recently it has been proposed to have combinations of boards and pipes in various configurations installed either above or below a subfloor as well as integrated structural subfloor svstems with an integral metal plate However, these systems have been found to be relatively inefficient in transferring heat to desired area or have been too expensive to install or have been dimensionally too thick to be usefull in retrofit applications or have had sound transmission problems due to thermal contraction **1** and expansion of poorly connected component parts, or use uncommon building practices and sequencing of installation and have been somewhat useful to new construction. Also, inserting the pipe into the grooves of the prior art boards has been unsatisfactory. Frequently, the pipe would come loose and pop out of place, causing problems with laying overflooring and the like. Thus, none of the prior art thermal heating boards have been entirely satisfactory.

BRIEF SUMMARY AND OBJECTS OF INVENTION

[0004] These disadvantages of the prior art are overcome with the present invention and an improved hydronic radiant heating system is provided which is simple and inexpensive to install and which can be applied equally well to new or existing construction and to floors, walls or ceilings, while providing efficient heating to the desired area and ensuring that the pipes are retained within the system.

[0005] These advantages of the present invention are preferably attained by providing an improved hydronic radiant heating system comprising a non-structural board formed of thermally conductive material and having at least one undercut recess formed in the upper surface of said board, a pipe releasably ratained [located] within said undercut recess, and a film of metal covering the upper surface of said board.

[0006] Accordingly, it is an object of the present invention to provide an improved hydronic radiant heating system.

[0007] Another object of the present invention is to provide an improved hydronic radiant heating system which is simple and inexpensive to install.

[0008] An additional object of the present invention is to provide an improved hydronic radiant heating system which can be applied equally well to new or existing construction, while providing efficient heating to the desired area.

[0009] A further object of the present invention is to provide an improved hydronic radiant heating system comprising a simple board rather than a complex assembly of parts.

[0010] An additional object of the present invention is to provide an improved hydronic radiant heating system which can be applied to floors, walls and ceilings.

[0011] Another object of the present invention is to provide an improved hydronic radiant heating system comprising a board that lends itself to modules which can easily be laid out and installed.

[0012] An additional object of the present invention is to provide an improved hydronic radiant heatiing system that lends itself to mass production with associated cost savings.

[0013] A further object of the present invention is to provide an improved hydronic radiant heating system comprising a board having a thermally conductive coating whose thickness can be varied to compensate for the condutcivity of the board to achieve a desired overall thermal performance.

[0014] An additional object of the present invention is to provide an improved hydronic radiant heating system comprising a board having a groove with undercut grooves for releasably retaining a pipe within said groove.

[0015] A specific object of the present invention is to provide an improved hydronic radiant heating system comprising a nonstructural board formed of thermally conductive material having an undercut recess formed in one surface of said board and having a pipe releasably retained [located] within said recess.

[0016] Another specific object of the present invention is to provide an improved hydronic radiant heating system comprising a nonstructural board having an undercut recess formed in one surface of said board, a pipe releasably retained [located] within said recess, and a coat of thermally conductive material applied to said surface of said board having a thickness sufficient to compensate for the thermal characteristics of said board to provide desired overall thermal performance for said system.

[0017] These and other objects and features of the present invention will be apparent from the following detailed description, taken with reference to the figures of the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

[0018] **FIG. 1***a* is a vertical section through a floor heating system embodying the present invention;

[0019] **FIG. 1***b* is a view, similar to that of **FIG. 1***a*, showing a pipe inserted into the recess of the heating system of **FIG. 1**;

[0020] **FIG. 2***a* is a view, similar to that of **FIG. 1***a*, showing an alternative form of the floor heating system of **FIG. 1**;

[0021] **FIG. 2***b* is a view, similar to that of **FIG. 2***a*, showing a pipe inserted into the heating system of **FIG. 2***a*;

[0022] **FIG. 3***a* is a view, similar to that of **FIG. 1***a*, showing a layer of metal foil attached to the surface of a board similar to that of **FIG. 1***a*;

[0023] **FIG. 3***b* is a view, similar to that of **FIG. 3***a*, showing the metal foil having been slit;

[0024] **FIG. 3***c* is a view, similar to that of **FIG. 3***a*, showing the metal foil pressed into the recess of the board of **FIG. 3***a*;

[0025] **FIG. 4***a* is a view, similar to that of **FIG. 1**, showing an alternative form of the heating system of **FIG. 1**; and

[0026] **FIG. 4***b* is a view, similar to that of **FIG. 4***a*, showing a pipe installed in the heating system of **FIG. 4***a*.

DETAILED DESCRIPTION OF THE INVENTION

[0027] In the form of the present invention chosen for purposes of illustration in the drawing, **FIG. 1***a* shows a hydronic radiant heating system, indicated generally at **10**, comprising a supporting board **12** having a recess **14** formed in the upper surface **16** of the board **12** and having a pipe **18** located within the recess **14**, with a coat **20** of thermally conductive material, such as metal spray, metal foil or the like deposited on the upper surface **16** of the board **12**. As seen in **FIG. 1***b*, the recess **14** is undercut, providing an opening **15** with flanges **17** which overlie the pipe **18** after the pipe **18** has been inserted into the recess **14**. The pipe **18** sufficiently resilient to allow the pipe **18** to be inserted through the opening **15** and to snap back to overlie the pipe **18**, as seen in **FIG. 1***b*. This serves to releasably retain the pipe **18** and ensures that the pipe **18** cannot become dislodged or otherwise displaced. The supporting board **12** may be a wooden board or, if desired, may be plywood, fiberboard, recycled material or other suitable supporting material.

[0028] In use, the hydronic radiant heatng system **10** is applied over a suitable subfloor. over wall framing, under ceiling framing or over a concrete slab or over an existing floor, then the pipe **18** is forced into recess **14** so that flanges **17** overlie and releasably retain the pipe **18** and the finished floor, wall or ceiling goods are installed over the hydronic radiant heating system **10**. (In the case of its use for radiant hydronic ceiling heat the finished goods are installed below the board **12**) Heated water or the like is circulated through the pipe **18** and transfers heat by conductivity and radiation through the new floor to the desired area. The thermally conductive coat **20** can be varied to compensate for the varying conductive qualities of the supporting board **12**. Thus, the thickness of the thermally conductive coat **20** could vary proportionally to the thermal properties of the supporting boaard **12**. (More conductive board would have a thinner coating, while less conductive bboard would have a thicker coating.) The thermally conductive coat **20** may be applied to the upper surface **16** of the supporting board **12** by spraying or by applying one or more layers of metal foil or the like. Thus, the thickness of the coat **20** can be extremely thin, yet serves to effectively and efficiently transfer heat from the pipe **18** to the coat **20** and, hence, to the desired area.

[0029] **FIGS. 2***a* and **2***b* show an alternative form of the heating system of **FIG. 1***a* wherein two supporting boards **12** and **12'** are provided and the conductive coating **20** is applied between the boards **12** and **12'**. This would allow the components to be manufactured separately and, subsequently, to be laminated together at a convenient time and location.

[0030] **FIG. 3***a* shows the board **12** having a layer of metal foil **20** attached to the board **12** by suitable means, such as adhesive **21**, and overlying the recess **14**. Obviously, if desired, the metal layer **20** could be applied by plating or other well known means. After the metal layer **20** has been attached to the board **12**, the metal layer is slit, as seen at **22** in **FIG. 3***b*, and the portions of thematel layer **20** are then pressed into the recess **14**, as seen at **23** in **FIG. 3***c*. This provides a very simple and inexpensive means of manufacturing the board of **FIG. 1***a*.

[0031] **FIG. 4***a* shows an alternative form of the board **12** having the surface **13** of the recess **14** serrated or otherwise prepared to frictionally retain the pipe **18** when the pipe **18** is forcefully inserted into the recess **14**.

[0032] Obviously, numerous variations and modifications can be made without departing from the spirit of the present invention. Therefore, it should be clearly understood that the form of the present invention described above and shown in the accompanying drawing is illustrative only and is not intended to limit the scope of the present invention.

What is claimed is:

1. A hydronic radiant heating system comprising:

a nonstructural supporting board mountable on a subfloor having at least one undercut recess formed in one surface of said supporting board, and

a pipe releasably retained [located] within said recess.

2. The heating system of claim 1 wherein:

said supporting board is formed of thermally conductive material.

3. The heating system of claim 1 wherein:

said supporting board is formed of a wood.

4. The heating system of claim 1 wherein:

said supporting board is formed of plywood.

5. The heating system of claim 1 wherein:

said supporting board is formed of fiberboard.

6. The heating system of claim 1 wherein:

said supporting board is formed of metal.

7. The heating system of claim 1 wherein:

said supporting board is formed of recycled material.

8 The heating system of claim 1 wherein:

said recess is formed in the upper surface of said supporting board.

9. The heating system of claim 1 further comprising:

a coat of thermally conductive material applied to said surface of said supporting board.

10 The heating system of claim 8 wherein:

said thermally conductive coat is formed by spraying molten metal onto said surface.

11. The heating system of claim 1 wherein:

said thermally-conductive coat is formed by applying at least one ply of metal foil to said surface.

12. The heating system of claim 1 wherein:

said member is applied of a subfloor.

13. The heating system of claim 1 wherein:

said member is applied to an existing floor.

14. The heating system of claim 1 wherein:

said member is applied to a wall.

15. The heating system of claim 1 wherein:

said member is applied to a ceiling.

16. The heating system of claim 1 wherein:

the thickness of said thermally-conductive coat is varied in pro-portion to the thermal properties of said supporting board.

16. The heating system of claim 1 wherein:

a pair of supporting members are provided, an upper one formed with a recess and the other having no recess.

17. The heating system of claim 16 further comprising:

a layer of thermally conductive material interposed between said board.

18. The heating system of claim 1 further comprising:

a layer of metal applied to overlie said recess,

said metal layer being subsequently slit loingitudinally of said recess and having the adjacent portions of said metal layer pressed into said recess.

19. The heating system of claim 1 further comprising:

said recess extending completely through said board,

a second board underlying said recessed board, and

a layer of metal foil interposed between said boards.

20. A hydronic radiant heating system comprising:

a nonstructural supporting board mountable on a subfloor having at least one recess formed in one surface of said supporting board, and

a pipe frictionally retained within said recess.

21. The heating system of claim 20 wherein:

said supporting board is formed of thermally conductive material.

22. The heating system of claim 20 wherein:

said supporting board is formed of a wood.

23. The heating system of claim 20 wherein:

said supporting board is formed of plywood.

24. The heating system of claim 20 wherein:

said supporting board is formed of fiberboard.

25. The heating system of claim 20 wherein:

said supporting board is formed of recycled material.

26 The heating system of claim 20 wherein:

said recess is formed in the upper surface of said supporting board.

27. The heating system of claim 20 further comprising:

a coat of thermally conductive material applied to said surface of said supporting board.

28. The heating system of claim 27 wherein:

said thermally conductive coat is formed by spraying molten metal onto said surface.

29. The heating system of claim 20 wherein:

said thermally-conductive coat is formed by applying at least one ply of metal foil to said surface.

30. The heating system of claim 1 wherein:

said member is applied of a subfloor.

31. The heating system of claim 20 wherein:

said member is applied to an existing floor.

32. The heating system of claim 20 wherein:

said member is applied to a wall.

33. The heating system of claim 20 wherein:

said member is applied to a ceiling.

34. The heating system of claim 20 wherein:

the thickness of said thermally-conductive coat is varied in pro-portion to the thermal properties of said supporting board.

34. The heating system of claim 20 wherein:

a pair of supporting members are provided, an upper one formed with a recess and the other having no recess.

35. The heating system of claim 34 further comprising:

a layer of thermally conductive material interposed between said board.

36. The heating system of claim 20 further comprising:

a layer of metal applied to overlie said recess,

said metal layer being subsequently slit loingitudinally of said recess and having the adjacent portions of said metal layer pressed into said recess.

37. The heating system of claim 20 further comprising:

said recess extending completely through said board,

a second board underlying said recessed board, and

a layer of metal foil interposed between said boards.

* * * * *