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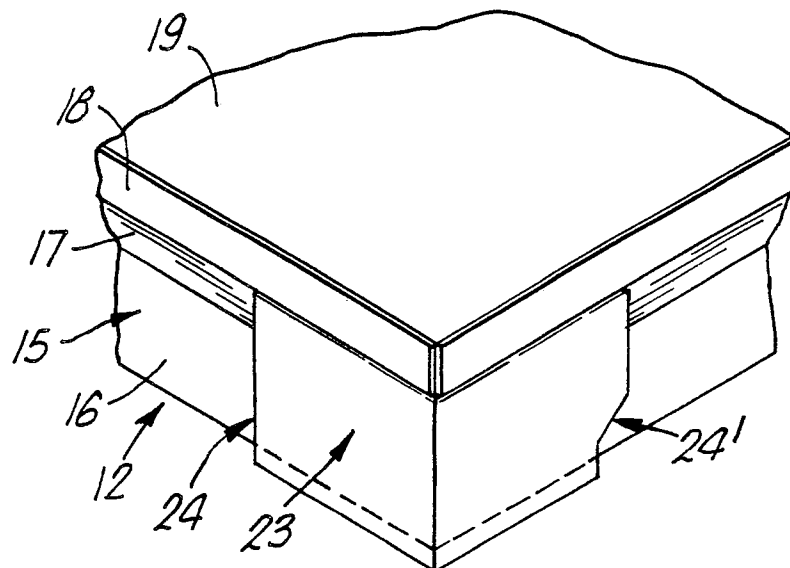
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54 Improvements in or relating to a suspended floor.

57 A suspended floor comprises a plurality of supports (1) to engage and support floor tiles (12). Each support (1) has a support positioned above an underlying surface. The support plate (8) has four upwardly directed lugs (9). On the exterior of the side walls (15) of the tiles (12) are brackets (23) or protrusions forming faces which face (24) away from the corners of the tile (12) and which engage the lugs (9).

**Fig.1.**



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## Improvements in or relating to a suspended floor

THE PRESENT INVENTION relates to a suspended floor.

It is becoming a more widespread practice to provide buildings, particularly office buildings, with a so-called suspended floor, especially where computer or similar equipment is to be utilised.

There are various types of suspended floor in use at the present time, and typically such a floor comprises a number of supports to be located on an oversite, or on a concrete floor, the supports supporting a number of square or rectangular floor tiles. The arrangement is such that a space is left between the floor tiles and the oversite or concrete floor, to accommodate wires, cables, and the like.

It is desirable for a suspended floor of this type to be substantially fireproof, and substantially smoke proof which means that the floor tiles utilised to make up the floor must abut tightly against each other.

Various of the prior proposed suspended floor suffer from disadvantages.

One type of prior proposed suspended floor utilises floor tiles which have a downwardly depending peripheral lip. The lips of the floor tiles are received within "V" shaped grooves in heads provided on the underlying supports. For various economic reasons the supports are usually fabricated of aluminium, since it is very expensive to fabricate supports of this type of steel.

Thus this prior proposed floor arrangement suffers from the disadvantage that the tiles cannot be stacked immediately above one another in alignment, since otherwise the depending lip may become caught on the edge of an underlying tile, but instead the tiles have to be stacked in a "skewed" or offset manner. When the tiles are transported, the tiles cannot be stacked compactly, and thus the tiles occupy a relatively large volume. Since the supports are made of aluminium, in the event of a fire arising, since aluminium melts at a relatively low temperature, the floor can collapse. Also, it has been found, in a floor of this type, that when the floor is subjected to shock or to a "rolling load" or certain other vibrations, the supports may fracture, thus again causing the floor to collapse.

One other type of prior proposed floor utilises supports which have a planar support plate provided with a plurality of apertures. Each floor tile has, at each corner, a depending peg, and when the floor tiles are mounted in position the pegs are inserted into the apertures in the supports. It is often difficult to align the pegs with the apertures.

The present invention seeks to provide improved suspended floor.

According to this invention there is provided a

suspended floor, said suspended floor comprising a plurality of supports and a plurality of tiles supported on the supports, each support comprising a support plate and means to locate the support plate above an underlying supporting surface, the support plate having four upwardly directed projections, means being provided, on each tile, on the exterior of the side walls of the tile in the region of each corner, defining faces facing away from the corner, said faces associated with any one corner of the tile being located to engage two of said projections on the support plate, when the corner of the tile is supported by the support plate.

Preferably the lower part of the side wall of each tile, at least in the region of the corner, is undercut so that said projections may be received in the undercut regions, so that two adjacent tiles may be located on the support plate, with the top parts of the side edges of the tiles abutting each other.

Conveniently each projection is adapted substantially to engage two adjacent side walls of a tile in the region of a corner of that tile.

Advantageously said means comprise a bracket mounted on the corner of the tile.

Preferably said bracket comprises two orthogonal arms, each arm lying adjacent the lower part of a respective side wall within the undercut region of the side wall.

Conveniently said faces facing away from the corner are substantially planar.

Alternatively said faces facing away from the corner are cranked. The cranked face may snugly abut the undercut side wall of a tile.

In another embodiment the means defining each face facing away from the corner of each tile comprises a pin or the like partly projecting from the side wall of the tile.

Preferably each projection on the support plate defines a vertical face facing inwardly towards the centre of the support plate. Each vertical face is positioned to engage a said face which faces away from a corner on each tile.

Preferably the projections comprise at least a terminal portion presenting an inclined face adapted to guide a tile into a seated position.

Conveniently each support plate is adjustably positionable above an underlying surface.

Advantageously each support plate is adjustably positionable by means of a screw jack.

Preferably said screw jack comprises a nut mounted on a threaded element, the threaded element being partially received within a tubular element, the nut engaging one end of the tubular element.

Conveniently each support is fabricated substantially of steel.

Preferably each tile comprises an outer casing formed of steel, and a central core formed of chipboard or the like.

According to another aspect of the invention there is provided an assembly comprising a tubular member connected to a plate, said tubular member receiving, in one end, a plug, said plug carrying a projection which is passed through an aperture in the plate and is deformed.

Preferably the projection is in the form of a rivet.

In order that the invention may be more readily understood, and so that further features thereof may be appreciated, the invention will now be described, by way of example, with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a support forming part of a floor in accordance with the invention, and a corner of a floor tile;

Figure 2 is a side elevational view, partly cut-away, of the support of Figure 1 with a modified floor tile engaged therewith;

Figure 3 is a side view of a modified support, illustrating two tiles mounted on the support;

Figure 4 is a top plan view of a support in accordance with the invention with one tile mounted thereon; and

Figure 5 is a sectional view through part of a modified embodiment of tile.

Referring initially to Figures 1 and 2 of the accompanying drawings a support 1, for a suspended floor in accordance with the invention, comprises a square or rectangular metallic base plate 2, provided with two anchoring holes 3, formed therein. A tubular spigot 4 extends upwardly from the centre of the plate, and is mounted in position on the plate by means of a plug 5 received as a friction fit within the bottom of the spigot, the plug having a projection, such as a cylindrical projection corresponding to a rivet, which is passed through an aperture in the plate 3 and is then deformed to secure the assembly together. The spigot may be secured to the plate in other ways, for example, by welding. However, it is preferred to use the rivetted plug 5. The plug 5 including a head portion which is a friction fit within the spigot. The plug has an integral rivet portion which passes through an aperture in the base plate 2 and is then deformed to hold the plug firmly on the base plate. The base plate and the spigot may thus be galvanised before assembly. Of course, if galvanised components are welded, the galvanising is destroyed, and the assembly then needs to be painted.

Resting on the top of the spigot is a nut 6 and,

passing through the threaded bore formed in the nut, into the spigot, is a threaded shaft 7. The upper end of the threaded shaft 7 is secured to a substantially square horizontal support plate 8. The plate 8 is thus supported on an adjustable screw jack. Each side wall of the plate 8 is provided, substantially at its mid-point, with a locating and engaging lug 9. Each lug 9 is a generally upstanding element having an initial portion 10 adjacent the plane of the plate 8 which extends vertically, and a terminal portion 11, spaced above the plane of the plate 8, which is inclined outwardly. The lugs 9 may be bent from a sheet of metal forming the plate 8, or the plate and lugs may be integrally cast.

The entire support, as described, may be fabricated economically from steel, although it is to be appreciated that other materials may be utilised if desired. The advantages of a steel support are that the support will not melt under ordinary fire conditions, and will withstand rolling loads and shocks without breaking.

A floor tile 12, for use in conjunction with the support 1, is of generally square or rectangular configuration. The tile consists of a lower outer casing 13 formed of a folded sheet steel blank, comprising a rectangular base 14 having upstanding side walls 15, each side wall being of cranked configuration and thus having an initial vertical portion 16 which merges into an outwardly inclined portion 17, which terminates with a further vertical portion 18. The casing 13 thus effectively forms a shallow "tank" having four cranked side walls, the bottom of the "tank" being of lesser area than the top of the "tank". An element of chipboard or the like is machined to fit snugly within the casing 13. A steel upper sheet 19 may be adhered in position on top of the chipboard, thus effectively sealing the chipboard within the casing.

In a modified form of panel, as shown in Figure 2, the chipboard 20 has a greater thickness than the depth of the casing 13 and thus an upper cover 21 is provided which has a depending lips 22 which surrounds the portion of the chipboard which is proud of the casing.

It will be observed that each floor tile thus comprises an element of chipboard or the like which is substantially sealed within a casing formed of sheet steel or the like.

Mounted on the exterior of each corner of each tile is a locating bracket 23. Each locating bracket is mounted within the "undercut" portion of each side wall adjacent the corner, the bracket substantially filling this undercut portion, as can be seen from Figure 2. It will be appreciated that each bracket thus defines two faces 24 within the undercut region of each side wall, these faces actually

facing away from the adjacent corner of the tile on which the locating bracket is fitted. These faces are thus on the exterior of the side walls of the tiles. It will be seen that the locating bracket covers up the seam between the two side walls of the panel which have bent up from the initially flat blank.

The bracket 23 may be simply a "L" sectioned element of steel or plastic or the like comprising two arms which extend orthogonally to fill the undercut space adjacent the corner of a panel. If the bracket is of plastic it may have projections adapted to be received in recesses in the walls of the tile to retain the bracket in position. Alternatively the bracket may be adhered in position. It is to be appreciated that the bracket 23 may also incorporate a portion extending under the corner of the panel, in which case the bracket 23 may be held in position by means of a nail or screw passing through an aperture formed in the bracket and through a corresponding aperture formed in the base 14 of the casing 13 into the chipboard 20 within the tile.

The bracket 23 illustrated in Figure 1 illustrates two possible designs for the bracket. In the design shown to the left hand side of Figure 1, the bracket terminates with a vertical face 24, facing away from the adjacent corner, which is of planar configuration, whereas on the right hand side of the bracket the bracket ends with a face 24' which is of cranked configuration. The cranked configuration is selected so that the cranked face 24' will snugly abut the lug 9.

It is to be appreciated that a tile, in accordance with the invention, is to be mounted on the support as illustrated in Figure 1. Initially a first tile will be mounted on the support, by locating the support in position on an oversite or concrete floor, and lowering the tile downwardly. The lowermost corners of the faces 24 of the corner bracket 23 will be caused to engage with one or both of the inclined faces 11 on two adjacent upwardly extending lugs 9. As the tile is lowered further, the or each corner of the faces 24 will slide down the inclined faces 11, until the lowermost corners of the faces 24 are aligned with the vertical faces 10. The tile may then be lowered until the undersurface of the tile (or the undersurface of the bracket 23) contacts the support plate 8. It will be appreciated that, when the tile is in this condition, the vertical side faces of the upwardly extending lugs 9 substantially engage the portions 16 of the side walls of the tile, and also the faces 24 of the engaging bracket 23 engage the inwardly directed faces 10 of the lugs 9 formed on the support plate. It will thus be understood that the tile is securely retained in the desired position, and the corner of the tile will be located exactly at the centre of the support plate 8, as can be seen most clearly from Figure 4.

The lugs 9 are received within the undercut regions of the side walls of the tile, and thus do not prevent the top of another tile being tightly abutted against the first tile.

Referring now to Figure 3, initially it is to be noticed that the support 1' is of a slightly modified design in that the spigot 4' is provided with an external threaded region 7' which carries a nut 6', the nut engaging with the undersurface of a downwardly extending tubular portion 8' which extends down from the undersurface of the support plate. The portion 8' may be internally threaded to engage the threaded region 7' of the spigot 4'. Reinforcing webs 25 are provided to strengthen the device. Thus the support plate is still mounted on an adjustable screw jack arrangement. The upwardly extending lugs 9 present the vertical faces 10 and inclined faces 11 as illustrated in Figure 1, and these faces are illustrated as engaging the cranked end faces 24' of the brackets 23 provided on two adjacent tiles 12. It can be seen that the upper edges of the tiles are abutted and held firmly together, with each lug 9 effectively received in a cavity formed by the undercut lower regions of the adjacent side walls of the tiles.

Figure 4 serves to illustrate how the side walls 16 of the tile are substantially in engagement with the vertical side faces of the lugs 9, thus substantially preventing movement in the direction of the arrows 26, 27 and also illustrates how the end faces 24 of the engaging bracket 23 are in firm contact with the vertical faces 10 of the lugs 9, thus preventing movement in the direction of the arrows 28 and 29. It will thus be fully appreciated that the tile is securely locked in position and cannot move in any horizontal direction. Equally it will be understood that the tile must be in precisely the correct position relative to the support plate 8.

In assembling a floor in accordance with the invention, four supports are initially engaged with the four corners of a first tile, and the base plates 2 of the supports are secured to the underlying oversite or concrete floor using a suitable adhesive. By adjusting the nuts 6 of the screw jacks the tile supported by the four supports can be levelled. Subsequently a second tile has two corners thereof mounted on two of the supports, so that the further tile is immediately adjacent the first tile. Two additional supports are then connected to the remaining corners of that second tile, and, when correctly engaged with the tile, are adhered to the floor. Again this second tile may be levelled. Subsequent tiles are added in a corresponding manner. If necessary, when the floor has been created, selected tiles may be removed to enable the mounting plates 2 to be screwed or bolted to the oversite or concrete floor, by passing screws or bolts through the holes 3, but this may well prove not to be

necessary.

Whilst the invention has been described with reference to embodiments in which the means provided on the tiles defining the faces facing away from the adjacent corner on the exterior of the side walls of the tiles is in the form of a bracket, it is to be appreciated that alternative expedients may be adopted, and thus each side wall may, as illustrated in Figure 5, be provided with a projecting pin 26, adjacent the corner, part of the pin projecting into the under-cut portion of the side wall and thus presenting a region facing away from the corner to engage with an upstanding lug formed on the support plate. In a further alternative arrangement each side wall of a tile may be provided with a cut-out or recess adjacent the corner, the recess being dimensioned to engage with a lug 9, and one face of the recess defining the face which faces away from the corner which is to engage with the lug.

Whilst, for ease of manufacture, the undercut region is provided over the whole length of each side of each tile, since this provides reinforcing rigidity to the sides of the tile, the undercut region could be confined to regions adjacent the corners of the tile.

## Claims

1. A suspended floor, said suspended floor comprising a plurality of supports and a plurality of tiles supported on the supports, each support comprising a support plate and means to locate the support plate above an underlying supporting surface, the support plate having four upwardly directed projections, means being provided, on each tile, on the exterior of the side walls of the tile in the region of each corner, defining faces facing away from the corner, said faces associated with any one corner of the tile being located to engage two of said projections on the support plate, when the corner of tile is supported by the support plate.

2. A floor according to claim 1, wherein the lower part of the side wall of each tile, at least in the region of the corner, is undercut so that said projections may be received in the undercut regions, so that two adjacent tiles may be located on the support plate, with the top parts of the side edges of the tiles abutting each other.

3. A floor according to claim 1 or 2, wherein each projection is adapted substantially to engage two adjacent side walls of a tile in the region of a corner of that tile.

4. A floor according to claim 3, wherein said means comprise a bracket mounted on the corner of the tile.

5. A floor according to claim 4 as dependent upon claim 2, wherein said bracket comprises two orthogonal arms, each arm lying adjacent the lower part of a respective side wall within the undercut region of the side wall.

6. A floor according to any one of claims 3 to 5 wherein said faces facing away from the corner are substantially planar.

7. A floor according to any one of claims 3 to 5, wherein said faces facing away from the corner are cranked.

8. A floor according to claim 3, wherein the means defining each face facing away from the corner of each tile comprises a pin or the like partly projecting from the side wall of the tile.

9. A floor according to any one of the preceding claims, wherein each projection on the support plate defines a vertical face facing inwardly towards the centre of the support plate.

10. A floor according to any one of the preceding claims, wherein the projections comprise at least a terminal portion presenting an inclined face adapted to guide a tile into a seated position.

11. A floor according to any one of the preceding claims, wherein each support plate is adjustably positionable above an underlying surface.

12. A floor according to claim 12, wherein each support plate is adjustably positionable by means of a screw jack.

13. A floor according to claim 12, wherein said screw jack comprises a nut mounted on a threaded element, the threaded element being partially received within a tubular element, the nut engaging one end of the tubular element.

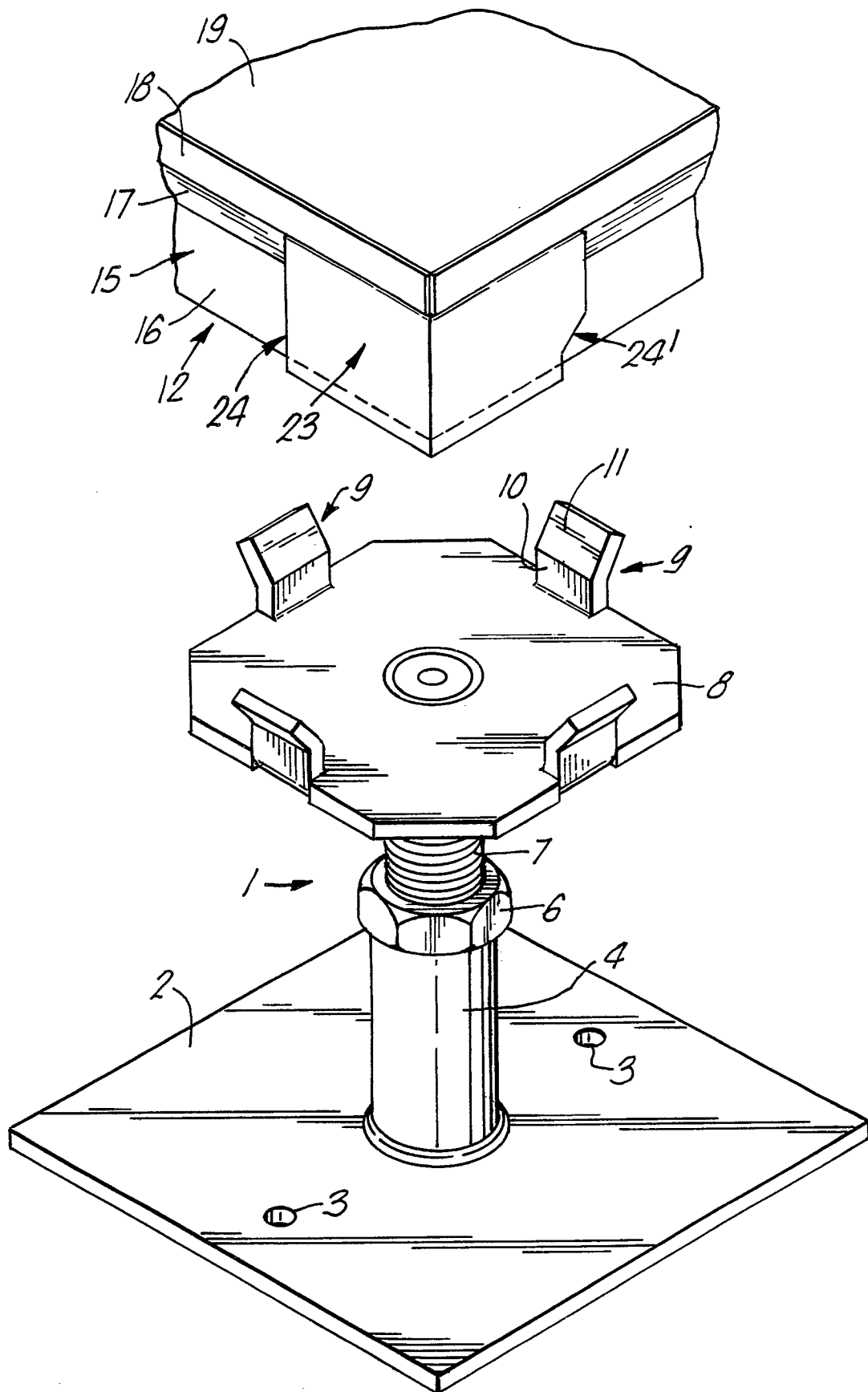
14. A floor according to any one of the preceding claims, wherein each support is fabricated substantially of steel.

15. A floor according to any one of the preceding claims, wherein each tile comprises an outer casing formed of steel, and a central core formed of chipboard or the like.

16. An assembly comprising a tubular member connected to a plate, said tubular member receiving, in one end, a plug, said plug comprising a projection which is passed through an aperture in the plate and is deformed.

17. An assembly according to claim 1, wherein said projection is in the form of a cylindrical rivet.

Fig.1.



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Fig.2.

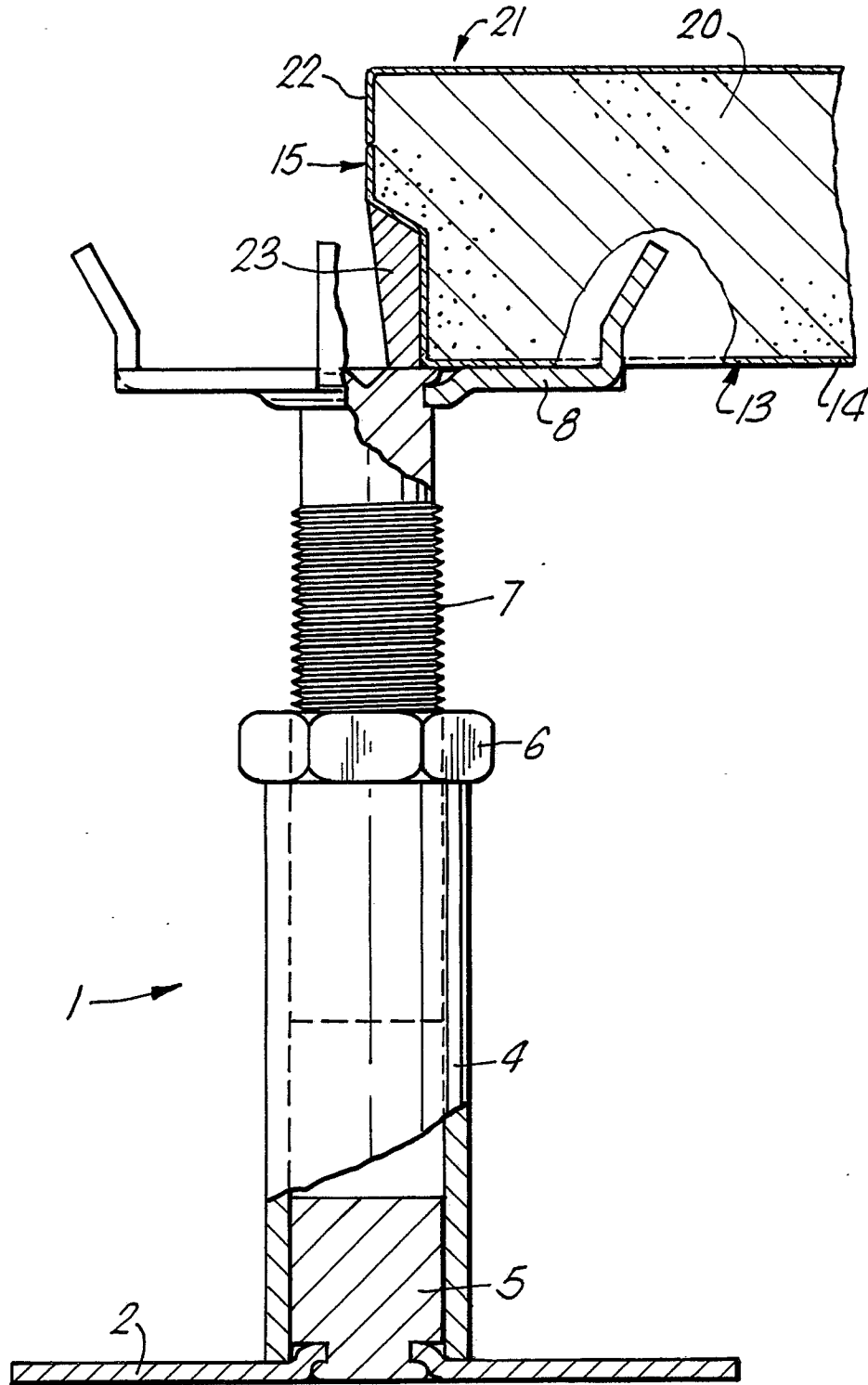


Fig. 3.

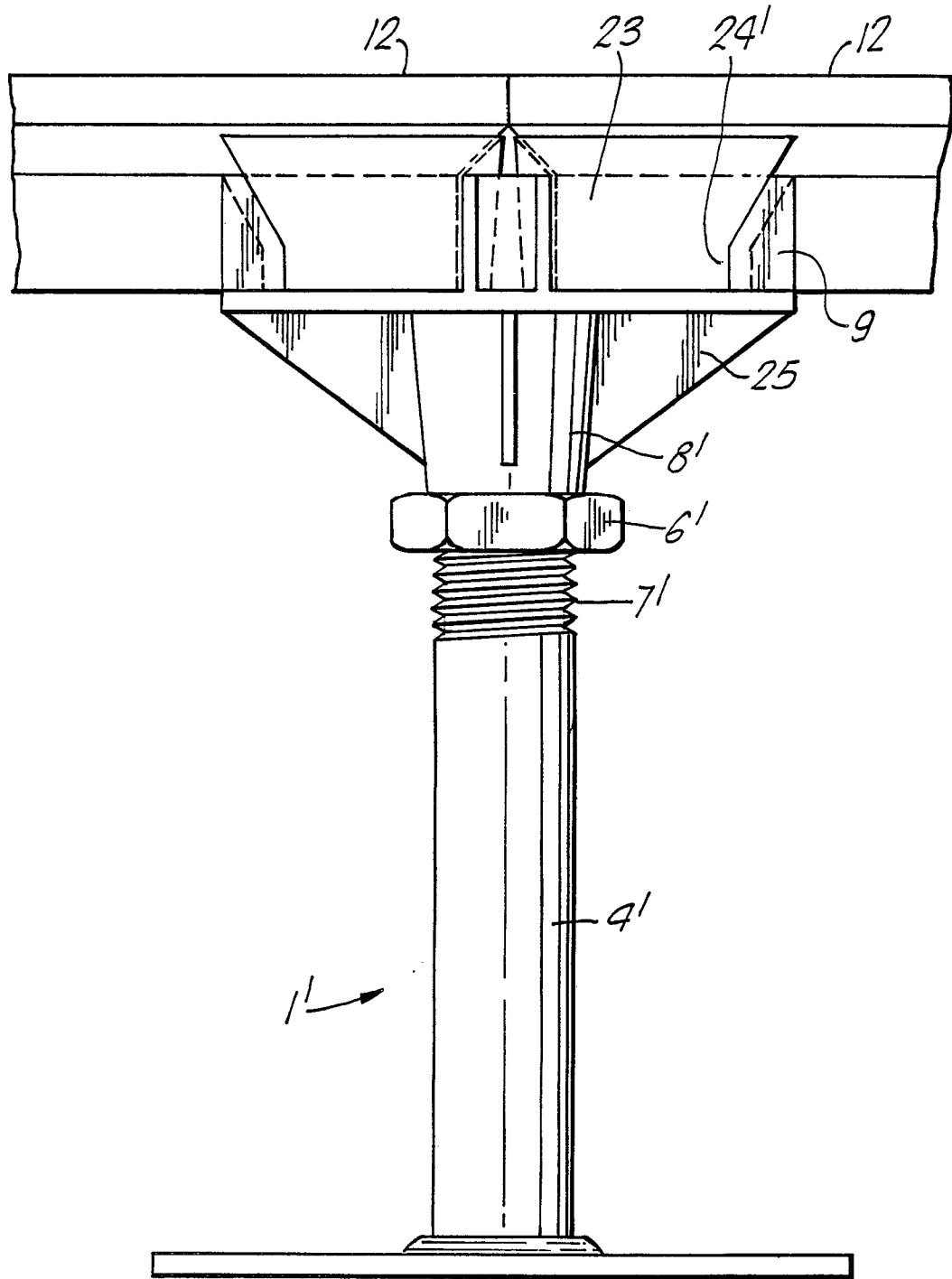




Fig. 4.

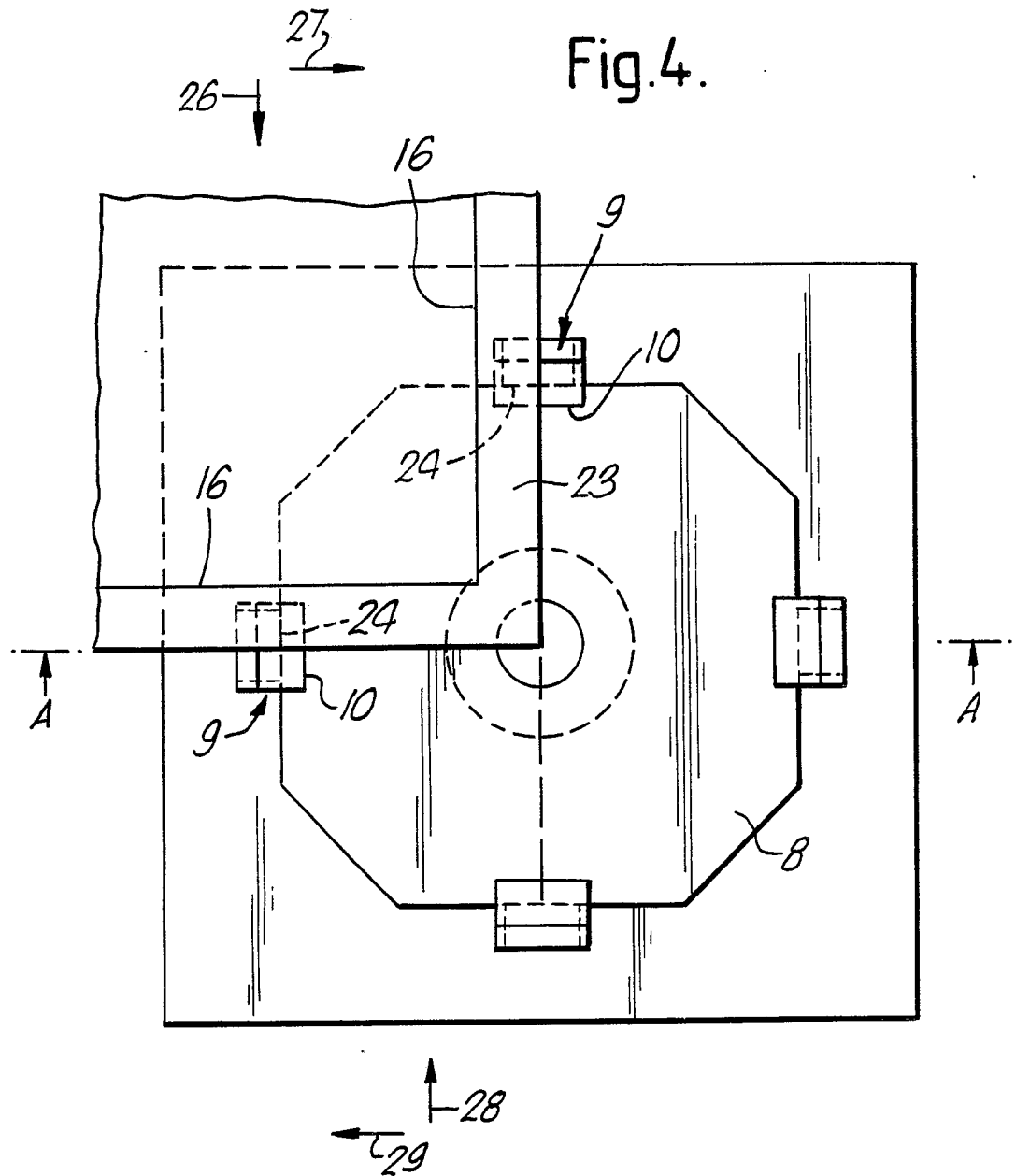


Fig. 5.

