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(54) Tile covering formed of adjacent tiles, a tile fixation means and a tile.

(57) Tile covering comprising a number of adjacent tiles (1) being supported by tile supports (6) of elastic material which rest on a roof (4).

For fixing of the tiles (1) there are tile fixing means (8) with a circumferentially deformable peripheral element of elastic material which with its peripheral edge (13) cooperates in a clamping manner with an upright edge (7') of a tile fixing device accommodation chamber (7) in a tile. For this purpose, the peripheral element (9) cooperates on its inner side with adjacent rigid segments (10a, 10b, 10c, 10d) which are separated from each other and whose internal faces (19) form a tapering surface.

Pressing the segments (10a, 10b, 10c, 10d) outwards in order to deform the peripheral element (9), takes place with a disc shaped deformation element (11) having an external surface (18) tapering outwards. In the middle of the disc (11) is a bore (12) provided with screw thread (33) in which a shaft (14) provided with screw thread (13) and having a head (15) can move. When in use, the head (15) of the shaft (14) rests on the bottom (17a) of a tile recess (17) on the top side of the tiles (1). By means of a socket-head screw wrench which is placed in a socket (16) of the head (15) of the shaft, the disc (11) can be moved upwards, said upward movement being limited in each case by top faces (29) connected with the segments and, of course, by the clamping between the segments and the side wall (7) of the accommodation chamber (7). The tile fixing means accommodation chamber (7) can be located on the bottom side of the tile, but it can also be at distance from the bottom in a side wall (23) of the tile (1).

The invention also comprises a tile fixing means (8) such as that described above and a tile (1) provided with a tile fixing means accommodation chamber (7), and preferably a recess (17) for accommodating a head (15) of a shaft (14).

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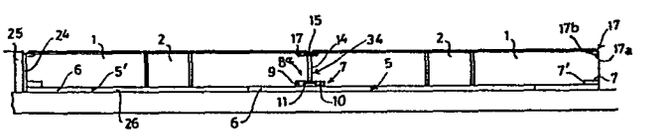

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Tile covering formed of adjacent tiles, a tile fixation means and a tile

The invention relates to a file covering formed by adjacent files preferably being supported by a tile support.

Such a tile covering used as a roof covering for forming a roof paving for flat roofs and the like, consisting of tiles placed on loose rubber or plastic tile supports, is known.

Though, through a suitable choice of the material for the tile supports, which hold the tiles at a distance from the roof, one can decrease noise nuisance when such roof surfaces are being walked or driven on and liquids can easily be channelled off, there is still often serious noise nuisance due to the fact that, during the acceleration of a car from the stationary position, the tiles are subjected to particularly great forces which lead to shifting of the tiles and cause a particularly great nuisance.

The object of the invention is therefore to eliminate this disadvantage by having the tiles cooperating with tile fixing means.

By using such tile fixing means, the roof covering forms a cohesive mass, in which the tiles are held united and during the acceleration of a car the shifting of the tiles is absorbed by the tile fixing devices.

Advantageously the file fixing means comprise a deformation element and a deformable peripheral element of flexible or elastic material which is made to cooperate with an upright wall part of a tile fixing means accommodation chamber of a tile.

With the use of such a tile fixing means, the peripheral element of flexible or elastic material can easily absorb the shock occuring during the acceleration of cars moving off, without the tiles being pressed against each other or shifted.

Through the use of a tile fixing device accommodation chamber and the tile fixing means, one can in a very simple manner, through deformation of the peripheral element of flexible or elastic material, press this peripheral element in a clamping manner and with an adjustable pre-tension against the upright wall parts of the tile fixing means accommodation chamber of a tile, which brings about the desired tile fixing in a very simple manner.

The tile fixing means advantageously comprise a peripheral element of elastic material comprising therein a rigid deformation element being vertically movable. For the vertical movement, the rigid deformation element is expediently connected to a shaft.

The tile fixing means may form an integral unit with a tile support.

The tile fixing means advantageously comprise a deformation element, which can be moved by means of a shaft for adjusting the desired position of the said deformation element for the tiles to cooperate in a clamping manner with the tile fixing means.

The invention also relates to a tile fixing means comprising at least one tile fixing element being deformable in circumference.

At last, the invention also relates to a tile provided with at least one tile fixing means accommodation chamber extending inwardly from the side wall.

The tiles as used are preferably concrete tiles having a height being determined by the corner parts in the four corners and with a central part of the same height as the four corner parts, the bottom side of the tile being recessed.

Other measures which can advantageously be applied to a tile covering a tile fixing means and a tile according to the invention are described in the various sub-claims.

The invention will now be explained with reference to embodiments by means of the drawing, in which:
Fig. 1 shows a roof covering of tiles with tile fixing means according to the invention;
Fig. 2 shows a cross section of such a roof covering along the line II/II;
Fig. 3a shows a file fixing means in undeformed state together with parts of two adjacent tiles;
Fig. 3b shows the same tile fixing means as that shown in Fig. 3a, but in the expanded state;
Fig. 4 shows a top view of a tile fixing means according to Fig. 3a;
Fig. 5 shows a view of the bottom side of a tile used in a roof covering according to Fig. 1;
Fig. 6 shows a cross-section of a tile fixing means placed in a tile fixing means accommodation chamber of a tile being in the side wall of the tile at a distance from the bottom side.

Fig. 1 shows a roof covering consisting of concrete tiles 1 being supported by tile supports 6 of an elastic material such as synthetic or natural rubber. The tile supports are in turn carried by the top side of a roof 4 of a building (not illustrated).

In order to improve the drainage of rainwater from the top side of the tile, there are opposite each other in the side walls 23 of the tiles recesses 2 which together bound a passage 3 for allowing rainwater to pass to the bottom side of the tiles. Here, this rainwater can be channelled off via the space 26 being between the top side of the roof 4 and the bottom side of the tiles 1.

For a good cooperation of a tile support 6 and a tile 1, the tile is provided with a tile support accommodation chamber 5 whose upright wall 5' can cooperate with the circumferential edge 27 of the tile support 6.

Such a roof covering of tiles can be walked on very easily without noise nuisance, owing to the sound proofing effect of the tile supports 6.

Where, however, such a roof covering is used as a parking roof, a very great strain will be exerted on the tiles when a car drives away, as a result of which these tiles 1, having therebetween always slight clearances, are subjected a slight shift being accompanied by considerable noise nuisance.

In order to eliminate this disadvantage, it is proposed according to the invention, that adjacent tiles 1 should be mutually fixed by means of tile fixing devices 8.

Such a tile fixing device 8 comprises a closed ring 9 of elastic material such as natural or synthetic rubber. On the inside of the ring is an annular element made up of four separate rigid segments 10a, 10b, 10c, 10d. The segments are each provided with a flange 21, which is clamped in a circumferential groove 22 on the inside of the ring 9 of elastic material.

Between adjacent segments 10a, 10b, 10c, 10d extend the cuts through 20 being bounded by the side faces of the segments.

At their top side the segments 10a, 10b, 10c, 10d are provided with top faces 29 which extend to the centre point of the ring formed by the segments, leaving free a through-running opening 28.

Thus the top faces 29 of the segments 10a, 10b, 10c, 10d form one face with the flat top side of the ring 9.

The internal faces 19 of the adjacent segments 10a, 10b, 10c, 10d together form a tapering surface which extends in the direction of the flat top sides of the segments and whose diameter decreases in the direction of the top faces 29. Disposed in the internal space 30 formed by the tapering internal faces 19 of the segments 10a, 10b, 10c, 10d is a disc 11 provided with a tapering circumferential edge. After placing of the disc 11 in said internal space 30, the bottom face 31 of the disc 11 coincides with the bottom face 32 of the segments 10a, 10b, 10c, 10d, while the tapering circumferential edge is adapted to the tapering shape of the face 19.

The disc 11 is provided with a central bore 12, which has screw thread 33 disposed on a shaft 14 of a bolt with a head 15, in which a hexagon socket 16 is fitted.

The ring 9 with the segments 10a, 10b, 10c, 10d and disc 11 is accommodated in the fixing device accommodation chamber 7 of adjacent tiles which together bound a circumferential tile fixing means accommodation chamber.

The tiles are also provided on their top side with upper recesses 17, comprising an upright edge 17d and a bottom 17a, in which the recesses 17 of four adjacent tiles can accommodate the head 15 of

the bolt. Besides, through roundings 23 of the corners of the tiles a continuous chamber 34 is formed between the corners of four adjacent files 1 allowing passage of the shaft 14.

A metal or plastic ring 24 is expediently placed between the bottom 17a of the recesses 17 and the bottom side of head 15.

After laying of the tiles 1 on the roof, with the tiles being laid against the circumferential edges 25 of the roof, the tiles can still undergo slight shifts such as can be seen from the position shown in Fig. 3a, where one can see a clearance 13' between the circumferential edge 13 of the ring 9 and the upright edge 7' of the accommodation chamber 7.

By turning the head 15 with shaft 14, the disc 11 will, however, easily be moved upwards, thereby causing the segments 10a, 10b, 10c 10d to move outwards and thereby deform the ring 9, so that the edge 13 thereof engages in a clamping relationship the upright edge 7' of the chambers 7. Accordingly these tiles can only undergo a further displacement which is absorbed by the elastic material of the ring 9. This position is shown in Fig. 3b.

It has been found that thus the noise nuisance disappears entirely.

The segments 10a, 10b, 10c, 10d and the disc 11 advantageously consist of rigid plastic material such as polyvinyl chloride, polyolefins, such as polyethylene, nylon and the like, but other materials could also be used.

It is advisable to place a layer of elastic material 24 between the tile 1 and a circumferential edge 25 of the roof.

It is clear that by means of the shaft 14 with screw thread 13,

when the head 15 of the shaft is supported, the compression of the elastic material of ring 9 can be adjusted, in this case by adjusting the height of disc 11.

Fig. 5 shows a tile according to the invention from the bottom side with the fixing device accommodation chamber 7 being bound by the upright wall 7'.

Though in the figures the accommodation chambers 7 are circle-sector shaped and the circumferential element 9 is annular, it will be clear that other forms can also be used, provided that the circumference of the circumferential element 9 and the shape of the accommodation chambers 7 are adapted to each other. The corners 35 of the tile 1 can expediently be rounded off to form a passage 34 for passing the shaft 14 to the disc 11.

Fig. 6 shows another embodiment in which the fixing device accommodation chambers 7 are not located on the bottom side of the tile, but at a distance therefrom in the side walls 23.

Claims:

1. Tile covering formed by adjacent tiles (1) preferably being supported by a tile support (6), characterised in that the tiles cooperate with tile fixing means (8).

2. Tile covering according to claim 1, characterised in that the tile fixing means (8) comprise a deformation element (11) and a deformable peripheral element (9) of flexible or elastic material which is made to cooperate with an upright wall part (7') of a tile fixing means accommodation chamber (7) in a tile.

3. Tile covering according to claim 1 or 2, characterised in that the tile fixing means (8) consist of a peripheral element (9) of elastic or flexible material having disposed therein a displaceable deformation element (11) for the deformation of said peripheral element (9).

4. Tile covering according to claims 1 - 3, characterised in that the deformation element (11) cooperates with a shifting element (13, 14, 15) which can shift the deformation element (11) adjustably for deformation of the deformable peripheral element (9).

5. Tile covering according to claim 4, characterised in that the tile covering comprises at least one of the following measures:
a) the tile fixing devices (8) consist of an annular peripheral element (9) of elastic or flexible material which cooperate with segments (10a, 10b, 10c, 10d) of a rigid material and the segments (10a, 10b, 10c, 10d) cooperate with a deformation element (11);
b) the deformation element (11) cooperates with a shifting element (13, 14, 15) which shifts the deformation element (11);
c) the deformation element (11) is adjustable in height for the adjustable control of the compression of the elastic or flexible material

of the deformable peripheral element between the segments and an upright wall part (7') of a tile fixing means accommodation chamber (7);
d) the internal faces (19) of the segments (10a, 10b, 10c, 10d) form a tapering surface and the deformation element (11), being provided with a matching tapering circumferential edge (18), and being of a rigid material, via a central bore (12) provided with screw thread (33) engages a shaft (14) provided with screw thread (13) and with a head (15) being supported by a bottom (17a) of a top tile recess (17).

6. Tile fixing means comprising at least one tile fixing element being deformable in circumference.

7. Tile fixing means according to claim 6, characterised in that it comprises a circumferentially deformable peripheral element of flexible or elastic material, particularly of a natural or synthetic rubber.

8. Tile fixing means according to claim 6 or 7, characterised in that the tile fixing means comprises a deformation element (11).

9. Tile fixing means according to claim 6 - 8, characterised in that the tile fixing means (8) comprises at least one of the following parts:
a) the deformation element (11) cooperates with a shifting element (13, 14, 15) shifting the deformation element (11);
b) the deformation element (11) is adjustable in height for the adjustable control of the compression of the elastic or flexible material of the tile fixing element (9) between the deformation element (11) and an accommodation chamber wall (7');
c) the tile fixing means (8) comprise an annular peripheral element (9) of elastic or flexible material which cooperates with segments (10a, 10b, 10c, 10d) of a rigid material and the segments (10a, 10b,

10c, 10d) cooperate with a deformation element (11);
d) the internal faces (19) of the segments (10a, 10b, 10c, 10d) form a tapering surface and the deformation element (11), being provided with a matching tapering circumferential edge (18) and being of a rigid material, via a central bore (12) provided with screw thread (33) cooperates with a shaft (14) provided with screw thread (13) and with a head (15) which can be supported by a bottom (17a) of a top tile recess (17).

10. Tile at least comprising a tile fixing means accommodation chamber (7) extending from a side wall (23) of the tile and preferably provided with a recess (17) on the top side to accommodate a head (15) of shaft (14), and/or rounded off corners of the tile.

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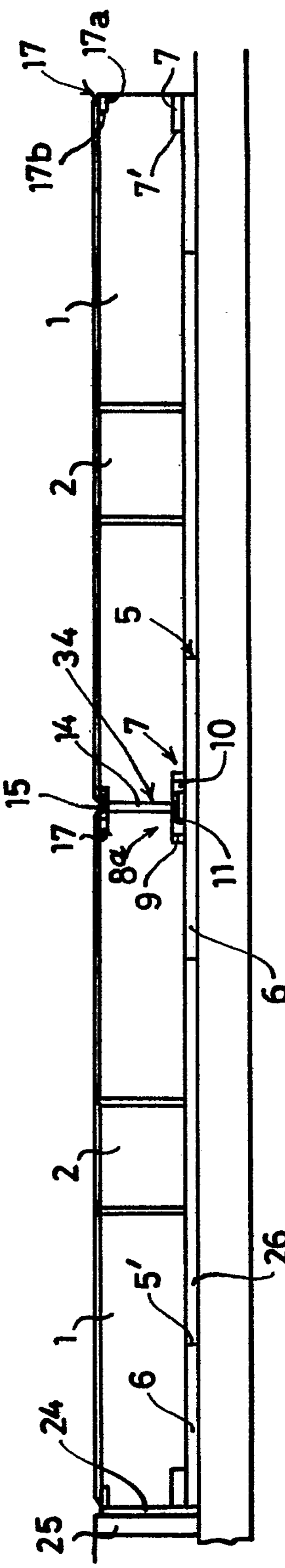

FIG: 2.

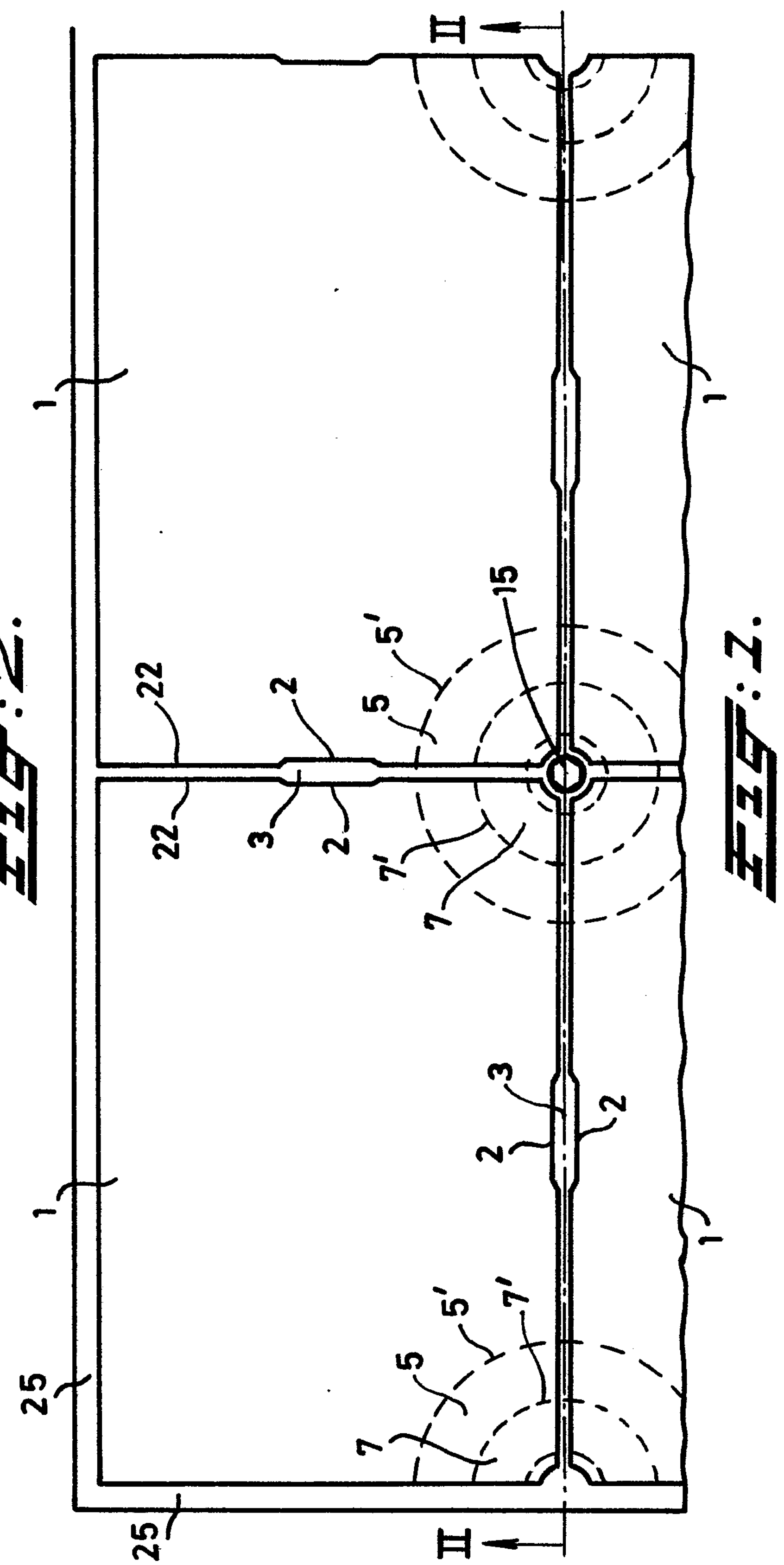

FIG: 1.

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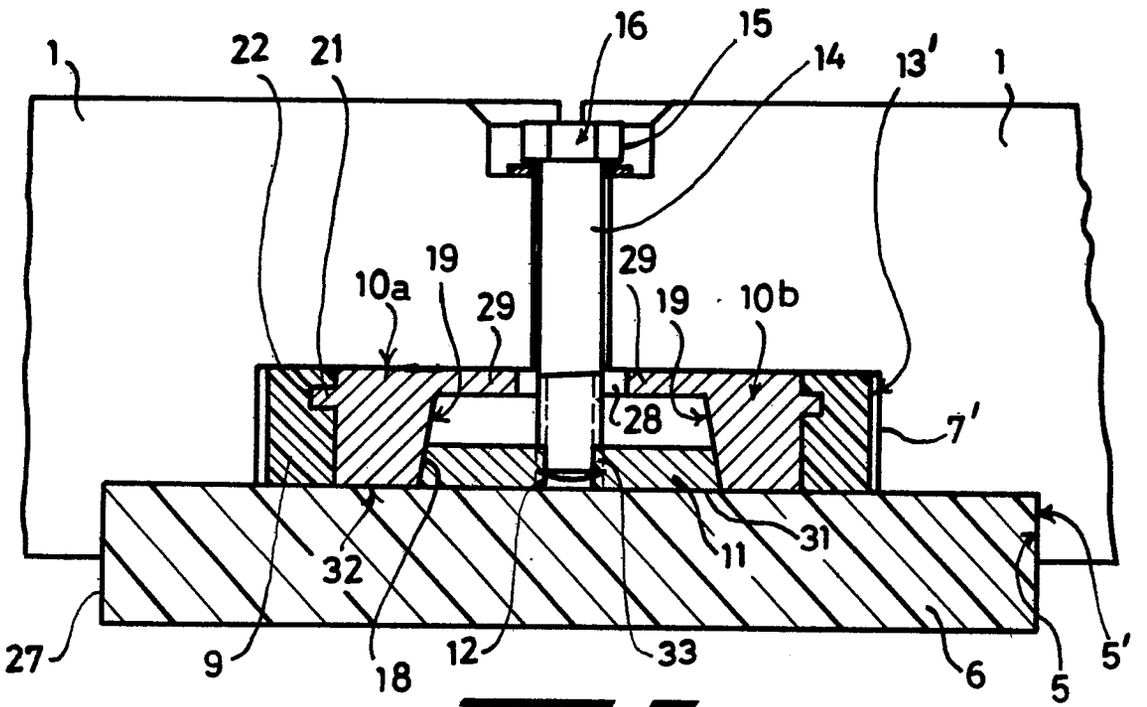

Fig: 3a.

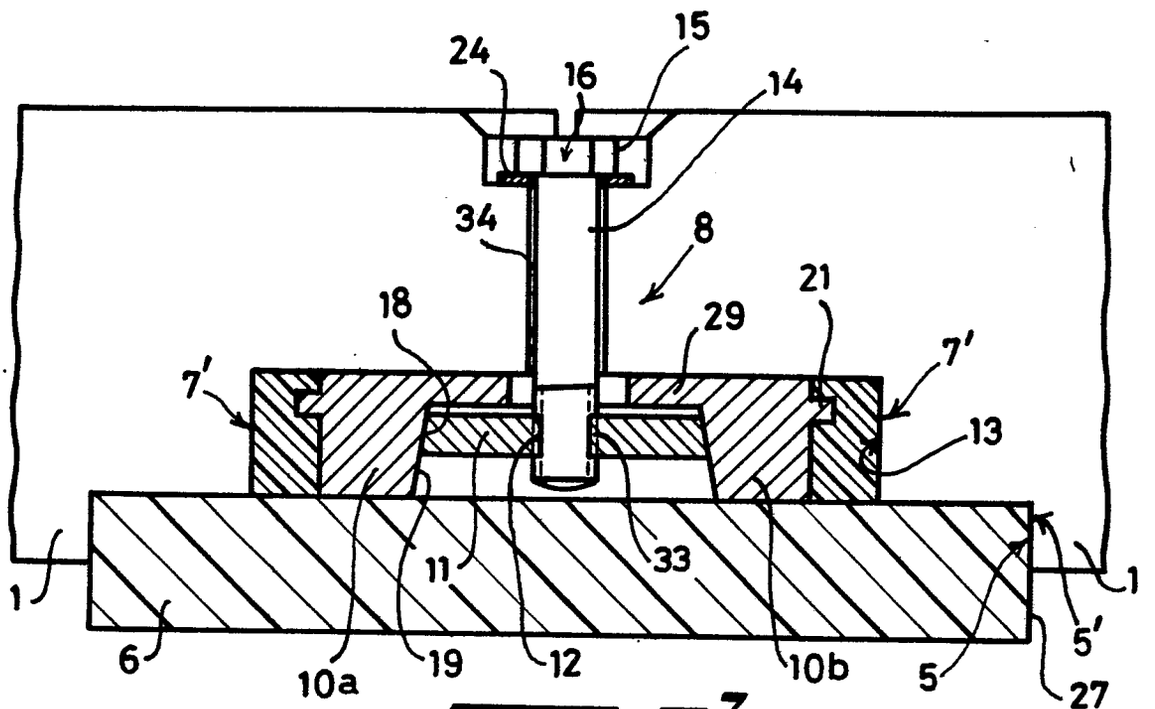

Fig: 3b.

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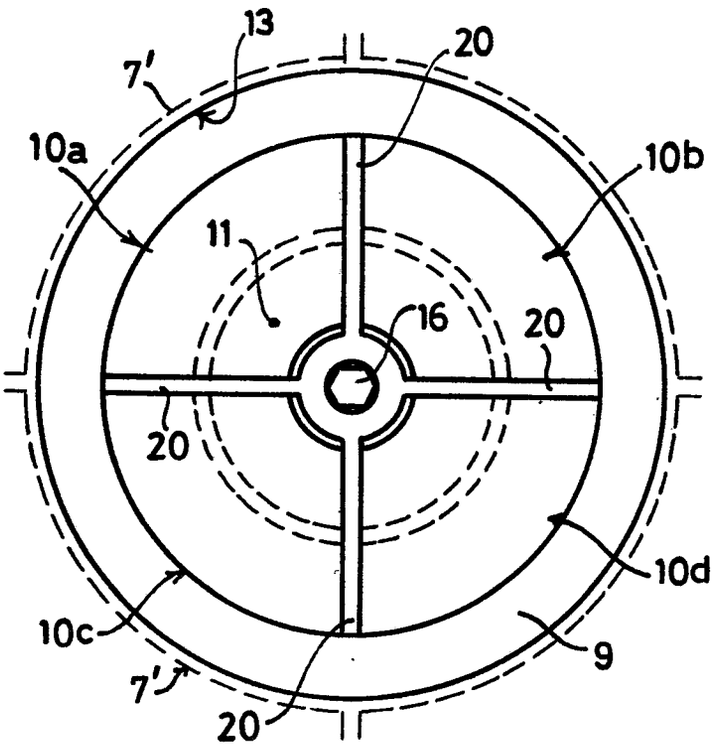

Fig: 4.

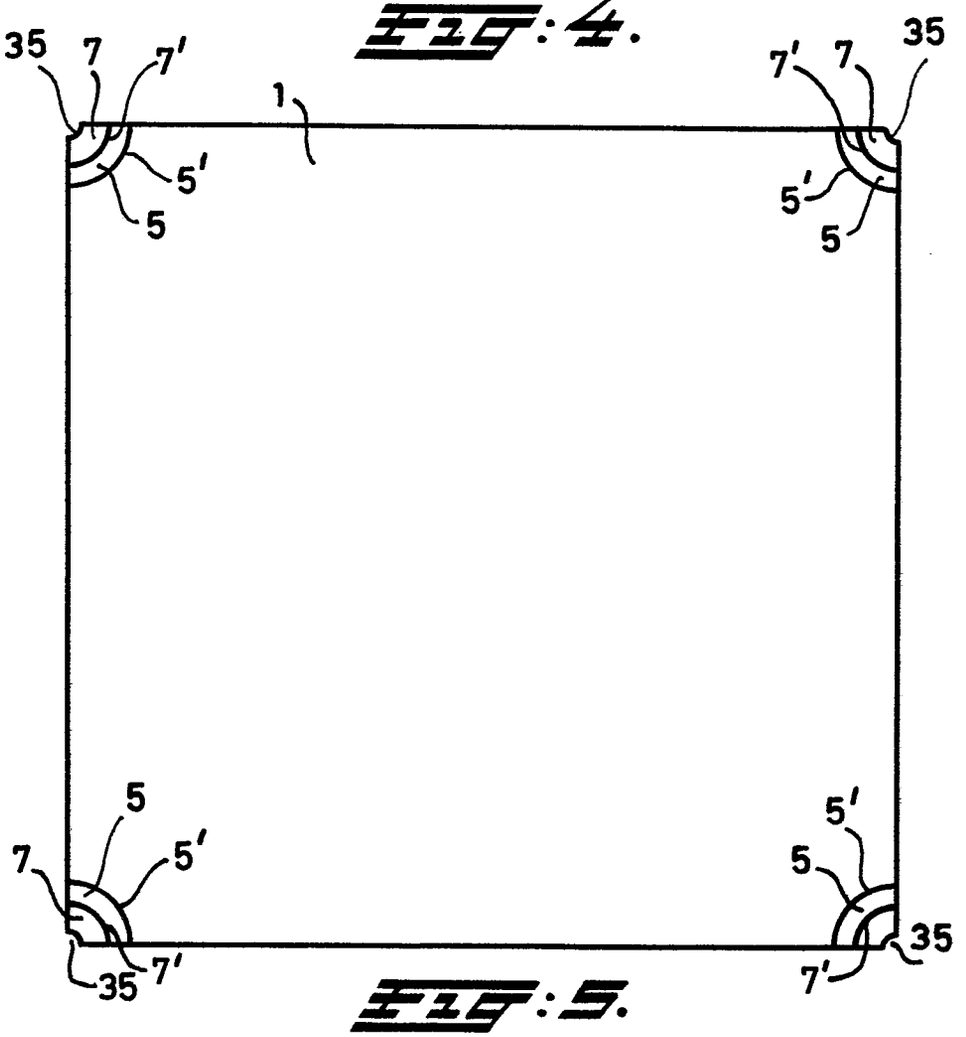

Fig: 5.

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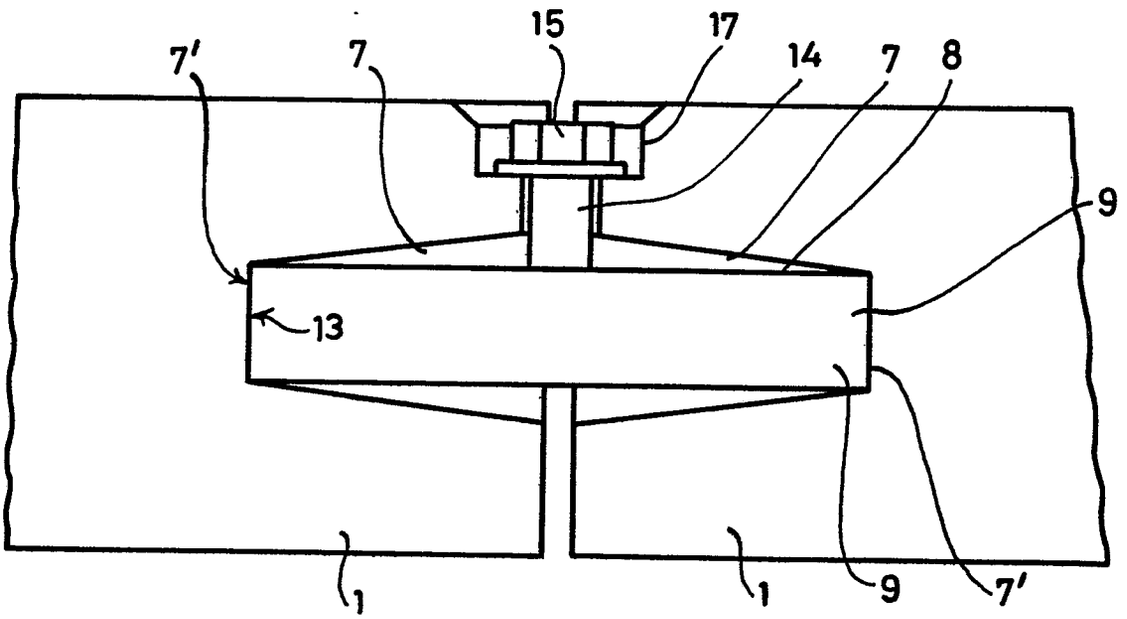

Fig:6.

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Application number

EP 85 20 0859

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
X	DE-A-3 220 368 (BRIDGESTONE) * Figures 1,7,13; page 10, paragraph 2; page 17, paragraph 2; page 18, paragraph 1; page 20, paragraph 3; page 21, paragraph 1 *	1	E 04 D 11/00 E 04 F 15/024 E 01 C 5/00
A		5,9,10	

A	DE-A-2 856 367 (P. ZOONTJENS BEHEER) * Figures *	1	

A	FR-A-2 549 870 (MEPLE) * Page 1, lines 4-25; figures *	1	
	---		TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	FR-A-2 428 716 (BRIDGESTONE) * Page 11, lines 17-42; page 12, lines 1-9; figures 2,3,9 *	1,2,7	
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A	FR-A-2 370 141 (VEB) * Page 2, lines 15-37; figures *	2,3,8	

A	DE-A-2 251 188 (RYSCHKA) * Page 2; page 3, paragraphs 1-2; figures 1-4 *	1,4,5, 9,10	
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	04-07-1986	CHESNEAUX J.C.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EUROPEAN SEARCH REPORT

0203226
Application number

EP 85 20 0859

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	FR-A-2 229 835 (COUWENBERGS) * Page 2, lines 8-23; page 4, lines 2-10; figures 1,7 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

The present search report has been drawn up for all claims

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