

April 15, 1969

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GROUND COVERING CAPABLE FOR USE IN PLAYING TENNIS IN  
THE OPEN AIR OR UNDER COVER

3,438,312

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Fig. 1

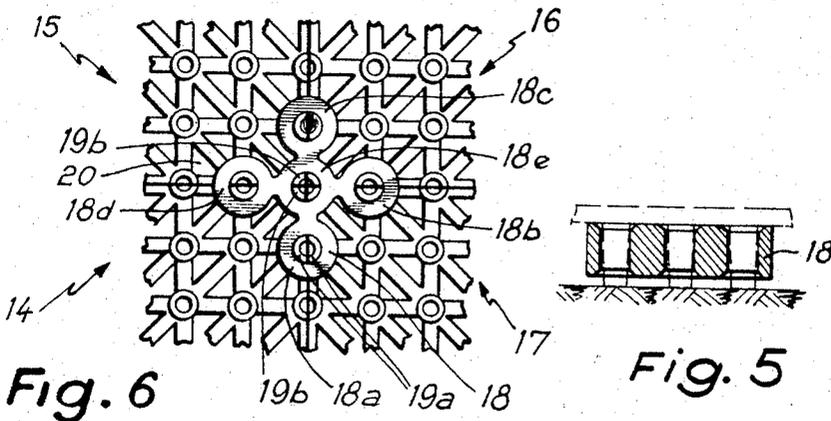
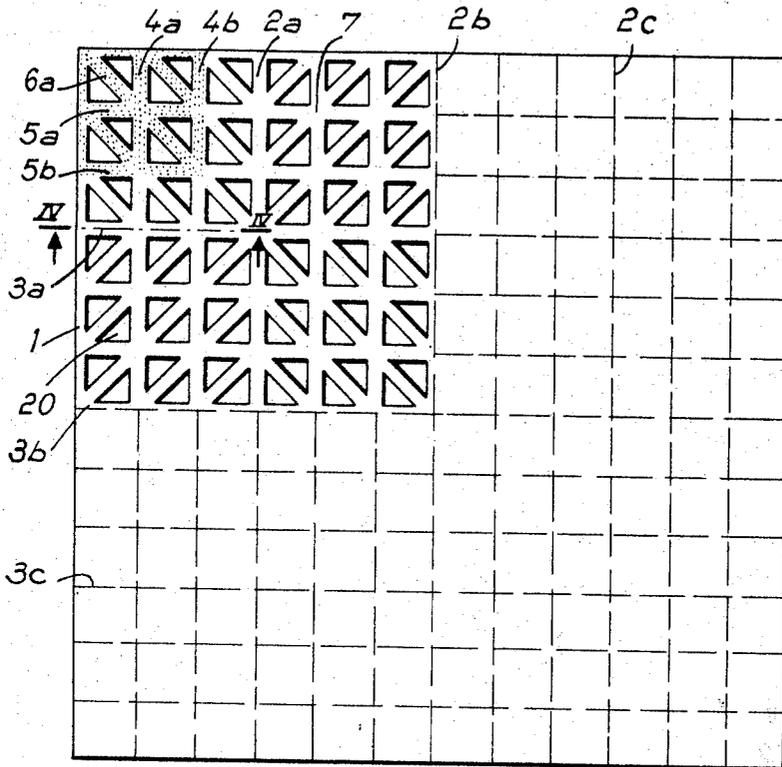


Fig. 6

Fig. 5

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Fig. 3

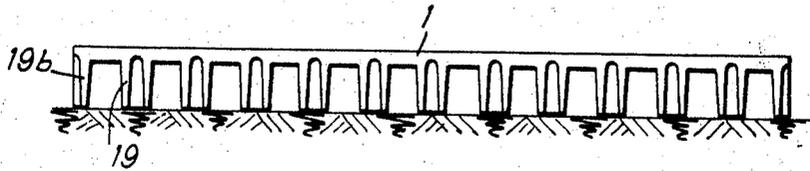


Fig. 2

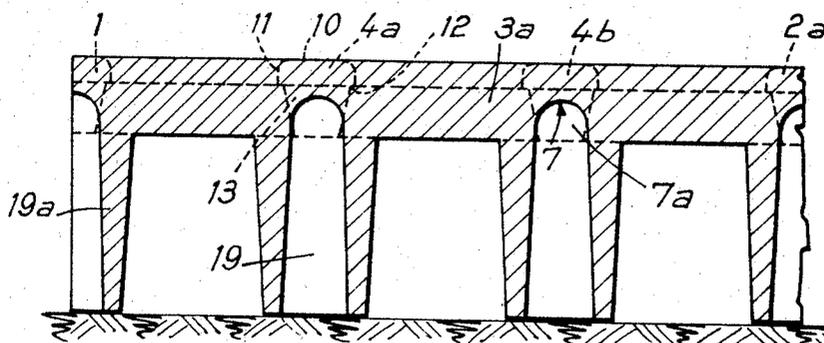
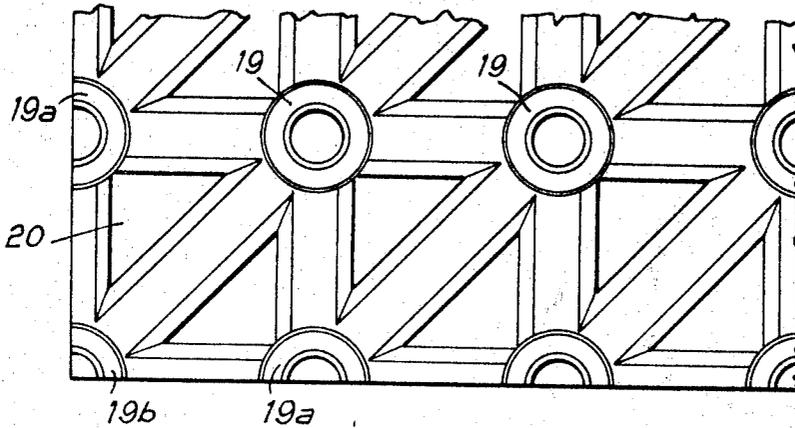


Fig. 4

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## GROUND COVERING CAPABLE FOR USE IN PLAYING TENNIS IN THE OPEN AIR OR UNDER COVER

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11 Claims

### ABSTRACT OF THE DISCLOSURE

A flexible and resilient ground covering for playing ball games such as tennis, in the open air or under cover. The covering may be made, for example, of a mouldable plastic material, composed of selectively coloured assembled members. The ground covering has an upper substantially smooth face which has over its whole extent regularly spaced openings. The openings pass through the covering and are defined by solid parts such that the surface occupied by the openings comprises between 25% and 55% of the total surface of the covering. The hubs formed by joints of the solid parts are extended perpendicularly to the lower face of the covering by support feet projecting therefrom.

The invention relates to a surface covering suitable, in particular, for use on a strong substructure, as an exposed covering which can be laid easily and speedily, is flexible and permeable, does not deteriorate, requires substantially no maintenance, and is suitable for playing tennis in the open air or under cover, as well as other ball games, but also suitable to be used for other purposes.

Special mixtures are already known for use in forming surfaces intended for particular uses, such for example, as tennis courts. These surfaces generally include a strong substructure which is covered with an impermeable layer of granular material held together with a binding agent. This layer must have flexible qualities; as well as qualities of resistance to use, permeability to rain water, a homogeneous nature which renders it rather difficult to determine the composition thereof, the laying being somewhat difficult to carry out satisfactorily and the price being somewhat high.

It has already been proposed to use for forming the covering layer a cover composed of wholly moulded members, subsequently assembled together. Apart from the fact that this covering has only been used under cover because of its impermeable nature and its tendency to retain water on the surface, it is not being used up to the present in the open air because of its inadequate qualities for resisting bad weather. If it is desired, in effect, to provide a covering capable of conforming perfectly and in all localities for the game of tennis and other ball games such as basketball, handball, etc., this covering must primarily neither collect together nor store on its surface water which it receives, and it must further have a structure such that it offers a sufficient flexibility to the feet of the players without giving rise to excessive rebound of the balls. It must have above all a structure of sufficient homogeneity such that the reaction of the covering to the impact of the ball is identical throughout and is substantially the same as the normal reaction of known coverings.

These practical difficulties have prevented up to the present time the construction of a satisfactory covering for all the conditions of use referred to. In particular, numerous types of moulded covering, composed of assembled members, which are already known and intended

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for other use, (carrying vehicles, aircraft runways, floors of humid premises, etc.) are absolutely unserviceable for playing tennis. However, a satisfactory covering of this kind would give rise on already known superficial layers used for the construction of courts, to considerable advantages of which the most important would be the pre-fabrication in a factory, independence of atmospheric conditions, easy transport of members having dimensions and weight substantially reduced, easy and rapid laying at all seasons, lack of susceptibility to exterior agencies, substantially no maintenance, simple repair by replacement of several members and parts which have deteriorated, etc.

The invention has for its object to provide a covering satisfying the difficult conditions enumerated above and capable of being used equally well in the open air as under cover. One of the objects of the invention is also to provide a covering especially adapted for tennis and, similarly, other ball games such as: basketball, handball etc. . . . owing to its elasticity, flexibility, reaction to the impact of the ball, which is well controlled and as constant as possible, at all regions of the surface and also in all weather.

According to the invention, the covering has a smooth upper face which has over its entire extent regularly spaced openings of which the largest dimension is at least equal to a predetermined upper limit (15 mm. for tennis, 30 mm. for other ball games and other uses) and a smallest dimension at least equal to 3 mm., the said openings passing right through the covering and being defined by solid parts in such a manner that the surface occupied by the openings comprises between 25 and 55% of the total surface of the covering, the joints between the said solid parts being prolonged perpendicularly to the lower face of the covering by support feet extending perpendicularly thereto and intended to be supported at their free ends by a strong substructure.

This covering can be constituted by a single piece of large dimensions, which can be rolled up in order to facilitate transport. According to one particularly advantageous embodiment, the upper surface of the covering supported by the feet is composed of geometrically-shaped members, preferably square or rectangles, each member being traversed by spaced primary ribs, perpendicular to one another, the said primary ribs thus defining primary squares themselves traversed by secondary ribs, which are spaced regularly, mutually perpendicular, and parallel respectively to the sides of the primary squares, the said secondary ribs thus defining secondary squares themselves divided by a diagonal rib, the said diagonal ribs of the secondary squares, in the interior of a primary square, lying parallel to a common direction, whilst the directions of said diagonal ribs of two adjacent primary squares are orthogonal. The edge of each member has a width which is substantially half of that of the ribs.

The members of the covering arranged side-by-side are rigidly interconnected by assembly members, each of these connecting at least one foot support of a member to at least one foot support of another adjacent member.

Each assembly member has four peripheral sleeves arranged in the form of a cross and connected by a central sleeve, the height of these five sleeves being at the most equal to that of the foot supports, each of the four peripheral sleeves being intended to interlock securely two semi-foot supports of two adjacent members in order to assemble them and the central sleeve serving securely to interlock four quarter-foot supports on four adjacent members at a common corner.

The invention will be better understood and its secondary characteristics as well as its advantages will appear in the course of the description of one embodiment given only by way of example. Reference will be made to the accompanying drawings in which:

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FIGURE 1 is a plan view of a member of the covering according to the invention;

FIGURE 2 is a fragmentary inverted plan view to an enlarged scale of FIGURE 1;

FIGURE 3 is a view from the side of FIGURE 1;

FIGURE 4 is a partial view to an enlarged scale on section along line IV—IV of FIGURE 1;

FIGURE 5 is a view in elevation and in section of an assembly member;

FIGURE 6 is a view from below of four covering members interconnected by an assembly member.

FIGURE 1 shows a covering element of square form and of dimensions corresponding generally for example to a module of known plastics squares. It should be noted however that the invention is not limited to the form or dimensions of these members.

The latter are constituted, preferably, of a natural or synthetic-resin material, formed by any known manufacturing methods, for example by injection, and of which the nature and composition are determined for each covering member which has a desired flexibility taking into account the shape referred to hereafter.

There will be described in the following text an embodiment of the invention according to which the covering is made up of square members and rectangular members of elongate form and analogous to strips. However, the latter have not been illustrated in the accompanying drawings.

It should be noted that in FIGURE 1, the perimeter of the member is defined by a border 1, of narrow form, and identical on all four sides; an assembly of ribs 2a, 2b, 2c and 3a, 3b, 3c respectively parallel to two sides of the square and perpendicular to each other, divide the member into a plurality of primary squares of which the surface is, in this example  $\frac{1}{16}$  of the surface of the member; the width of the ribs 2a, 2b, 2c, 3a, 3b, 3c and is double the width of the edges 1. Each primary square is, in its turn, divided into secondary squares by a number of ribs 4a, 4b, 5a, 5b parallel to the preceding ones; each primary square contains 9 secondary squares. Each of the latter is traversed by a diagonal rib such as 6a. Within the interior of each primary square, the traversing diagonal ribs of the secondary squares are all parallel to one another, but between two primary adjacent squares, the diagonal ribs are orthogonal as can be seen in FIGURE 1. Seen from above, the covering appears as a plane surface having a plurality of openings 20 which are, in this example, right-angled isosceles triangles defined by ribs which with the exception of the edges of the member, are identical to one another, in width, in height and in cross-section; each place at which the various ribs meet each other constitutes a hub such as 7, from which there extends, perpendicular to the lower face of the hub, a support foot 19.

It will be seen that the openings are spaced very regularly over the surface of the covering. In this example, the total surface of the opening represents about 40% of the total surface of the covering.

FIGURE 4 clearly shows details of the support feet 19 which have a slightly truncated hollow cylindrical form, the external diameter tapering towards downwardly and the internal diameter tapering upwardly. It should be noted that the thickness of the wall of each support foot decreases in proportion to the distance from the ribs. In this example, the bore of each support foot is terminated by a recess, such as 7a, of substantially hemispherical form and provided in each hub such as 7, within the thickness of the ribs. This form is not essential and it may, in another embodiment meet the upper surface at each hub. The support feet are all identical to one another.

Each point at which the ribs meet the edges, at the sides of the member, constitutes a hub provided with a semi-foot support 19a, and each of the four corners of the member constitute a hub provided with a quarter of a support foot 19b as can be seen from FIGURE 2.

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It also can be seen in this figure, that the lower parts of the ribs are tapered. This feature is also shown in FIGURE 4 where the edge 1 and the ribs 4a, 4b and 2a have been shown in broken lines. Each rib includes, in section, a flattened top 10, rounded upper edges 11, vertical sides, extended, below a shoulder 12, by a trapezoidal portion 13 tapering downwardly. The flat top 10 can be made perfectly smooth but it can also be roughened or scored, as has been shown partially at the top left-hand corner of FIGURE 1.

As can be seen in FIGURE 3, the edges 1 are supported by the semi-foot supports 19a, and the quarter foot supports 19b in such a manner that it is possible to place side-by-side several members, thus forming at the junction lines a structure shown fully in FIGURE 6, in which the four members 14, 15, 16, 17 are interconnected. The latter are held in this position by assembly members 18.

Each assembly member (see FIGURE 6) is composed of four peripheral sleeves 18a, 18b, 18c, 18d, formed as a cross, interconnected by a central sleeve 18e. When the assembly member 18 is placed in position, each of the four peripheral sleeves 18a to 18d securely couple two semi-foot supports 19a connected to two adjacent members (14 and 17 for example) and the central sleeve 18e securely locks together the four quarter foot supports 19b at the common corner of the four elements 14 to 17. It is possible to see in FIGURE 5 that the height of an assembly member is less than that of the foot supports. The covering therefore rests always on the ground through the intermediary of these feet. The bores of the five sleeves 18a to 18e are slightly chamfered at each of their ends. This arrangement, as well as the slight concavity of the foot supports, considerably facilitates assembly.

It should be understood that the shape of the sleeves 18a to 18e is determined by that of the foot supports 19 and it follows, that if the latter are cylindrical as is the case in the drawings, the sleeves have a bore which is likewise cylindrical.

Moreover, the ends of the sleeves 18a to 18e of the assembly members can have grooves in which corresponding edges of the covering members may engage. This semi-encastre (i.e., set-in) arrangement allows the reinforcement of the junction by the corners of the four members mentioned above. The same assembly members can, moreover, be utilised for reinforcing a covering member which does not appear at any point on the surface where it will be accidentally damaged.

It will be clear from the above description that a covering according to the invention facilitates recovering of a surface of any dimensions. By associating, as is provided for, square members of a particular colour with bands or strips of another colour, it is possible to define particular points or to represent the contours of the ground as well as being possible to use these for the game of tennis.

Moreover, this covering offers the advantage of being instantly traversed by water which can flow through the space defined by the support feet between the covering itself and the supporting sub-structure.

It is also to be noted that the covering according to the invention is perfectly homogeneous at all places although it is constituted by an assembly of connected members, this guaranteeing uniform flexibility and an identical reaction at all places.

The support feet may, if it is required, be made more or less rigid or more or less flexible according to their height, the thickness of their walls and form of their ends. It will be seen that it is advantageous, in certain cases to cut notches in the lower ends of the support feet, to chamfer them or in contrast, to enlarge them at the base.

Moreover, with the purpose of providing for the most favourable flexibility for playing a game, it is sometimes advantageous to interpose between the support feet and the sub-structure, a vibration damping element of resilient material, this element being constituted either by ferrules encasing the free ends of the feet, or by a layer

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of flexible material deposited by projection, on the end of the said feet or on the sub-structure itself. In the latter case, the layer of flexible material may be formed by a binding material between the covering and the sub-structure and this plays at the same time, the roll of a sound-deadening layer.

The dimensions of the openings determines primarily the reaction of the covering when it is struck by the ball. The latter deforms, according to its size, over a surface of greater or smaller dimension. It will be understood therefore that the openings must be substantially smaller and more closely spaced than the ball will have at its smallest dimension. It has been determined, that for the game of tennis, the largest dimension of each opening must not exceed 15 millimetres and 30 millimetres for other ball games.

The form itself of the openings is not imposed by the invention and it is not necessary that the bounding lines should be of straight line form.

Furthermore, in order that flow of water through the covering should be possible, it is necessary that the dimensions of the openings should be such that the effects of capillarity and surface tension should not give rise in these openings to retention of water which will block them and prevent all vertical flow of water. It has been discovered that, in order to satisfy this condition, the smallest dimension of each openings should be at least equal to three millimetres.

It is evident that the covering according to the invention, which is particularly suitable for ball games and in particular tennis may, if it is desired, be used for other purposes (movement of people or vehicles, pavements . . . ).

We claim:

1. A ground covering for ball games such as tennis, made of a mouldable and flexible material, composed of a plurality of assembled members, said covering being characterized in that it has an upper substantially smooth face having regularly spaced openings, said openings having dimensions between 3 millimeters and 30 millimeters, said openings passing through said covering and being defined by solid parts such that the surface occupied by the openings being between 25% and 55% of the total surface of said covering, and support feet extending from the hubs formed by joints of the solid parts, said support feet being extended perpendicularly to the lower face of said covering, each of said members being of geometric shape having said openings defined by primary spaced, mutually perpendicular ribs, said primary ribs defining primary squares which are traversed by secondary ribs, said secondary ribs being regularly spaced, mutually perpendicular and parallel to the sides of the primary squares, said secondary ribs defining secondary squares each including a diagonal.

2. A covering according to claim 1, wherein the diagonals of said secondary squares are parallel to a common

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direction, and the directions of the diagonals of two adjacent primary squares being perpendicular.

3. A covering according to claim 2, characterized in that each covering member has an edge the width of which is substantially one half that of the ribs.

4. A covering according to claim 1, characterized in that the support feet are of hollow cylindrical form.

5. A covering according to claim 1, characterized in that the lower end of each of said support feet is notched.

6. A covering according to claim 1, characterized in that the lower ends of the support feet taper to a bevel.

7. A covering according to claim 1, characterized in that the lower ends of the support feet are enlarged.

8. A covering according to claim 2, characterized in that a dampening member constituted by a ferrule, extends from the free ends of the support feet.

9. A covering according to claim 2, characterized in that the support feet situated beneath the edge of the covering member are reduced to half longitudinally of the support feet and the support feet situated below the hubs of the ribs are reduced to a quarter longitudinally.

10. A covering according to claim 1, characterized in that the covering members disposed side-by-side are connected to each other by assembly members, each of said assembly members interconnecting at least one support foot of one member and at least one support foot of at least one adjacent member.

11. A covering according to claim 10, characterized in that each assembly member of the assembled members has four peripheral sleeves disposed in cross form and interconnected by a central sleeve, the height of the five sleeves being at most equal to that of the support feet, each of the four peripheral sleeves being intended to securely interlock two semi-support feet of two adjacent members to be assembled and the central sleeve being intended to securely interlock four quarter-support feet of four adjacent members having a common corner.

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94—3; 52—177, 584, 673;273—29;161—38, 48, 112