Oct. 29, 1968 Z. L. HENDERSON 3,407,714

APPARATUS FOR ANCHORING THE MARGIN OF SYNTHETIC TURF

Filed April 13, 1966 2 Sheets-Sheet 1

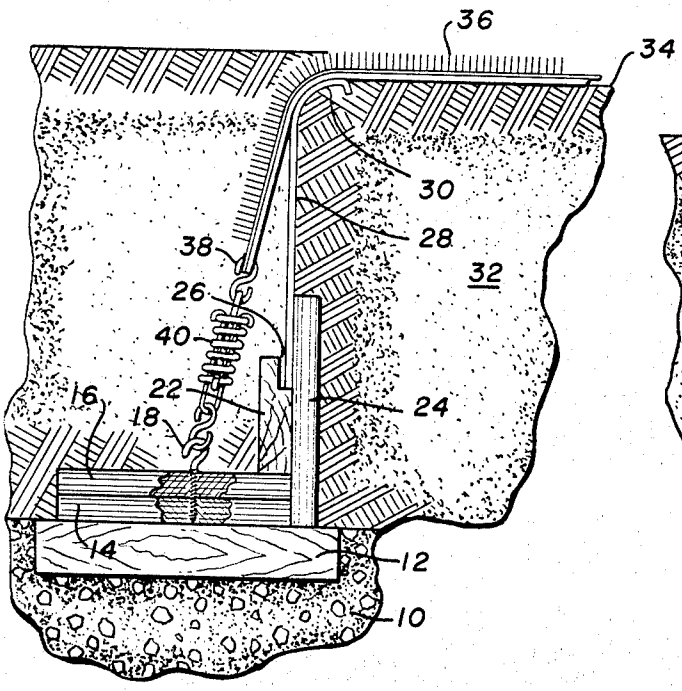


FIG. 1.

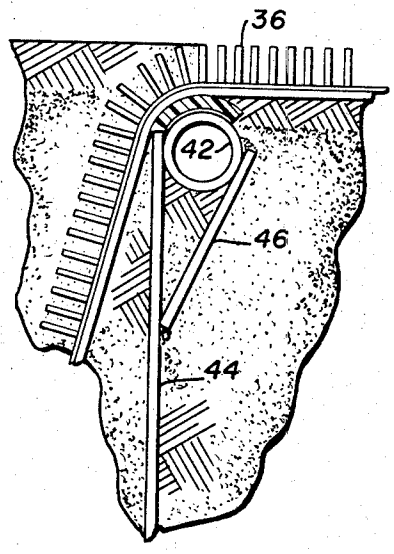


FIG. 2.

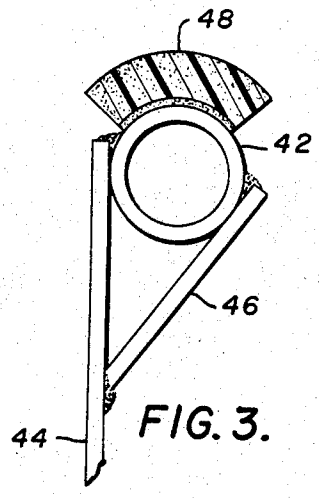


FIG. 3.

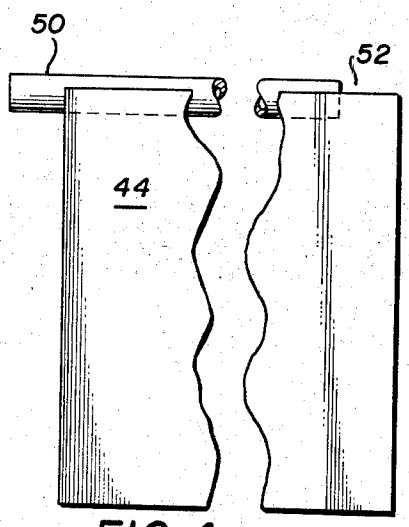


FIG. 4.

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Oct. 29, 1968 Z. L. HENDERSON 3,407,714

APPARATUS FOR ANCHORING THE MARGIN OF SYNTHETIC TURF

Filed April 13, 1966 2 Sheets-Sheet 2

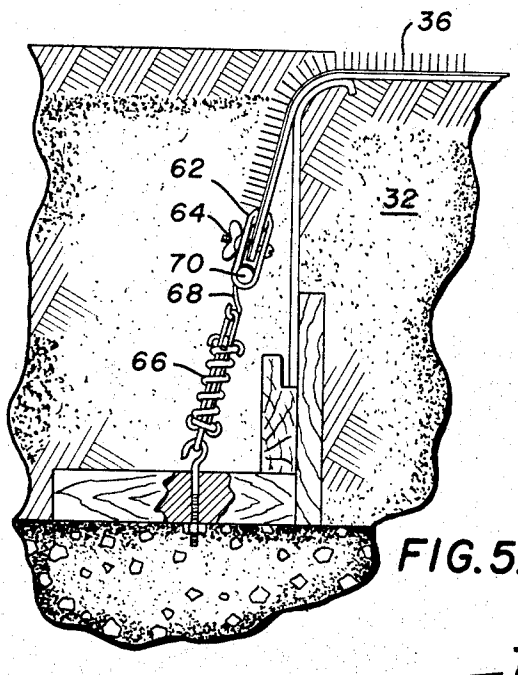


FIG. 5.

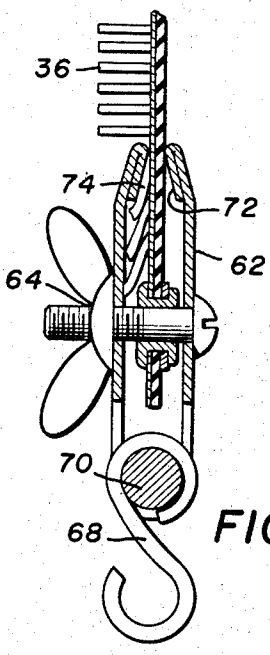


FIG. 7.

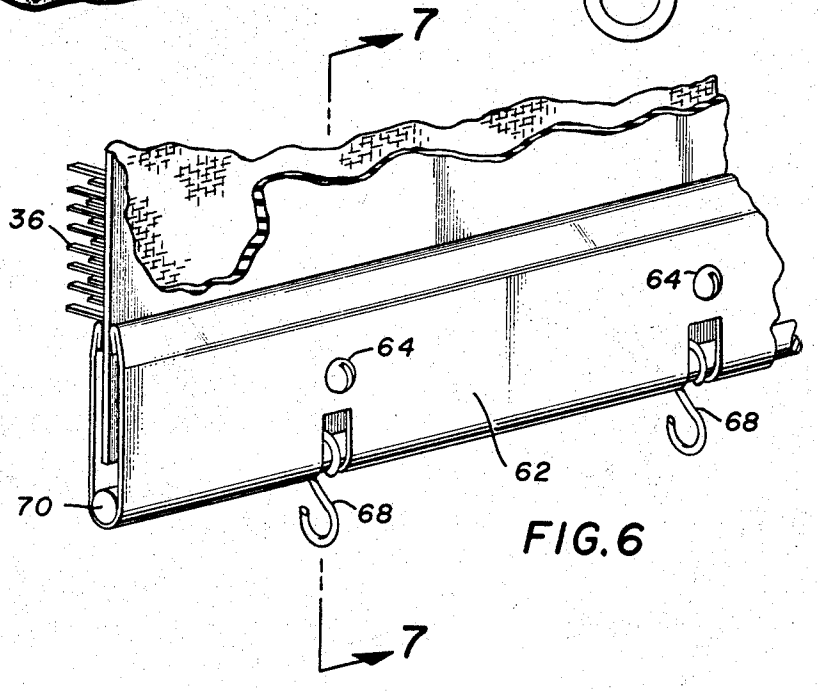


FIG. 6

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APPARATUS FOR ANCHORING THE MARGIN OF SYNTHETIC TURF

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4 Claims. (Cl. 94—7)

ABSTRACT OF THE DISCLOSURE

Apparatus for holding and tensioning an artificial turf wherein springs connected to the turf stretch the turf across the curved upper end of a support member, the upper end of the support member being positioned at or slightly below ground level.

The present invention relates to artificial recreational surfaces. More particularly, this invention relates to methods for anchoring the marginal edges of artificial turf on a dirt base to simulate natural grass. The invention also relates to structures employed to install artificial turf.

The newly accepted practice of conducting sporting events in enclosed areas shielded from sufficient sunlight to grow grass presents some unusual problems. Aside from the discovery and development of an artificial turf suitable for the ball-type sports, ancilliary problems are encountered with the installation of the turf and particularly where the installation is not permanent. Because of the substantial investment required to construct enclosed stadiums and arenas spacious enough to accommodate several thousand spectators, these facilities must be used for a variety of events. For some performances, a grass-like turf must be employed while other events must take place on a dirt base. Therefore, it is essential that installation of the artificial turf be removable and replacable to make these facilities adaptable for accommodating a variety of activities.

In the installation of artificial grass on areas such as baseball fields, tennis courts, football fields, golf greens and the like, it has been found that special precautions must be taken to insure that the marginal edge of the artificial turf is secured in such a manner that a ridge or valley is not apparent between the turf and the adjacent ground. Where permanent installations are permissible this problem is more readily solved than for removable installations which also require the removal of the support members that extend to near the surface. For example, there may be installations made in arenas or stadiums that also host events such as circuses, rodeos, horse races, horse shows, or polo matches. Obviously for these events the dirt must be worked to accommodate the particular activity. Consequently, the supporting structure used to anchor the artificial turf on these areas must be removable or submerged deep enough to permit discing or driving stakes into the dirt.

It is therefore a primary object of the present invention to provide a method for securing the marginal edges of artificial turf to a dirt base in a manner which permits removal and reinstallation of the turf. Another object is to provide a simple and economical method for anchoring the perimeter of large areas of artificial turf. Another object is to provide a method for installing artificial turf so that the turf forms a distinct sharp line with the adjacent earth without producing a ridge or valley. Another object is to provide apparatus which facilitates a submerged tie-down arrangement which is removable for securing under tension the perimeter of an artificial turf. Other objects and advantages will become apparent as the description develops hereinafter.

The foregoing objects of the present invention are

accomplished by digging a trench in a dirt base along the edge of an area to be covered with artificial turf; constructing a permanent foundation in the trench which supports a hook and an upright barrier plate having a curved edge at the ground level to support and contain the dirt packed against said member on the side to be covered with the artificial turf; drawing the edge of the turf over the curved support surface and down into the trench; and connecting the turf to the hook located in the bottom of the trench. The permanent foundation in the bottom of the trench is preferably constructed from a wood member submerged in a cement base. Other wood members which support the hook and the barrier plate are supported by the submerged wood member. Preferably these members should be cut from a wood such as redwood or cypress which will not deteriorate for long periods underground. The upright barrier member is preferably formed from a reinforced sheet metal which will not buckle out of alignment from the compressive forces exerted by the dirt packed against the plate during leveling of the dirt base prior to installation of the artificial turf. Alternatively, the barrier may be preformed from heavier gauge plating which does not require a reinforcement member. This type member suffers from at least two disadvantages however since heavy gauge steel is difficult to preform and backfilling dirt under the curved portion at the surface presents a problem. Where a reinforced plate is employed the pocket formed underneath the curvature is eliminated. Furthermore, the barrier plate can be constructed from a lighter gauge sheet metal which is easier to fabricate than the thicker plates.

Preliminary to securing the turf to the underground anchoring structure described above, the marginal edges of the turf must be prepared to receive an attachment member such as a S hook. The strength of the turf and the area covered is determinative of the retaining means required and the spacing thereof. If the artificial turf has sufficient tensile strength, a series of properly spaced grommets are adequate to withstand the forces imposed by the tie-down member. However, where the turf possessees a low degree of strength or is subjected to unusually large forces, the marginal edges may be enveloped in a metal bordering. The turf is then attached to the permanent member in the trench through a flexible connection and the trench is filled flush with the turf to present a smooth surface. A better understanding of the invention may be had with reference to the accompanying drawings, in which:

FIGURE 1 is an elevational view illustrating a preferred embodiment of the invention wherein the artificial turf is shown in its secured position;

FIGURE 2 is an elevational view of a barrier plate which is a preferred modification of the barrier plate shown in FIGURE 1. In this modification a circular member is fabricated to the vertical plate to obviate preforming the plate and to provide the necessary reinforcement. Also illustrated is the additional reinforcement support which fills in the area underneath the curved surface;

FIGURE 3 is a further view of the barrier plate of FIGURE 2 illustrating a resilient material bonded to the top surface of the circular member;

FIGURE 4 is a plan view of a longitudinal section of the barrier plate shown in FIGURE 2 illustrating the circular member extended at one edge and a void of the same length at the other edge to provide a coupling means for assembling sections of the barrier plates together;

FIGURE 5 is an elevation of the embodiment shown in FIGURE 1 except the use of a reinforced barrier plate and a metal marginal envelope are illustrated;

FIGURE 6 shows the turf clamped in a portion of the marginal reinforcement member and illustrates spaced

portions thereof removed to accommodate connecting members; and

FIGURE 7 is a cross-sectional view of FIGURE 6 taken at 7—7.

Referring to FIGURE 1 there is shown a preferred arrangement of the invention for securing the perimeter of an artificial turf which may be employed as a substitute for grass on an area where it would not be possible or practical to maintain natural turf. The structure shown is comprised of a cement bed 10 which is poured into the bottom of an excavation. Prior to the setting or hardening of the cement, a member 12, commonly referred to as a wood nailer, is permanently embedded in the cement. Two plywood members 14 and 16 are nailed to the nailer 12. These members are about ¾ inch thick to provide enough depth to receive a hook screw 18. The remaining super-structure consists of a 1 x 4 inch member 22 and 1 x 8 inch member 24 mounted on the nailer and plywood members. Member 22 is grooved at the edge adjacent to member 24. The slot 26 is sized to receive a plate 28 made from 16 gauge galvanized metal which is curved at 30 about a radius of 1⅝ inches. The plate 28 provides a barrier wall to retain the dirt or base composition 32 which is replaced to its normal level which is flush with the top surface of curved portion 30. It will be apparent that the curved portion 30 is quite essential to the proper installation of artificial turf. The surface thereof provides a firm support for the turf at its bending point to facilitate smooth and even installation. The radius of the curvature will vary with the thickness of the turf since the thicker turfs require a greater bending radius. It has been found that a turf having a backing thickness of ¼ inch drapes satisfactorily over a curvature having a radius from 1 to 2 inches.

After the retaining wall 28 has been erected and the base composition 32 has been replaced and throughly packed to a level flush with the top surface of the curved section 30, and artificial grass turf 36 is draped over the curved surface far enough for the peripheral edge to hang downwardly below the ground level when under tension. The marginal edge of the turf 36 is provided with grommets spaced approximately one foot apart to accommodate S-type hooks 38 which are connected to the turf and a draw bar 40. Another S-type hook 38 is employed to connect the draw bar and hook 18 together. A draw bar is preferred over a tension spring to protect against overcoming the strength possessed by a tension spring. The draw bar 40 should have sufficient length and strength to maintain the turf under tension to prevent wrinkling or bunching. Past experience has shown that a draw bar 2 to 3 inches long and having a spring rate of 35 lbs./in. performs well for most installations.

It will be apparent that the turf may be connected to the permanent foundation in several ways with a variety of connecting means. For example, additional S-hooks may be used to extend the length of the connecting means or other type connections may be substituted for the S-hooks. The principal consideration should be to provide a coupling means which is flexible and can be easily connected or unconnected, but possesses sufficient strength to impose a substantial amount of tension on the artificial turf 36.

In FIGURE 2 there is shown a modified embodiment of the plate 28 which illustrates a curved surface provided by a circular rod or tubular member 42. The rod is tack-welded to a vertical plate 44 at the top and is supported by a support member 46 which is tack-welded to the rod 42 and the vertical plate 44 to form a Y-shaped support for said rod. The construction illustrated in FIGURE 2 is highly preferable for two important reasons. It is most essential that the perimeter of artificial turf follow a guided line and that the surface between the turf and the adjacent ground be level. Both of these purposes are accomplished with the construction shown in FIGURE 2. The rod 42 has a curved surface to support the turf at its bending point and also provides the necessary reinforcement required to retain the dirt without buckling out of line. Furthermore, the rod can be used in straight lengths or can be bent to follow a curvilinear path depending upon the requirements. The reinforcement also permits the use of lighter weight metal plates and eliminates the necessity of bending the plate. Preferably an end portion of rod 42 is exposed as shown in FIGURE 4 to facilitate the assembly of several sections quickly. The exposed portion 50 slides into a cavity 52 of an adjacent plate. Another important aspect of the Y-shaped support is that the area below the rod 42 is enclosed. This is of particular importance since this area is difficult to refill and pack. Thus, the subsequent packing and settling of the soil causes valleys and ridges which would be obviously objectionable for surfaces such as baseball infields. In order to maintain a uniform degree of resilience, a layer of resilient material 48 such as polyurethane foam is bonded to the curved surface as shown in FIGURE 3. For example, without the cushion 48 a baseball or the like falling on the turf covering the metal member would bounce differently from other areas of the turf supported by a dirt base.

In some installations where the artificial turf has poor dimensional stability and the turf is to be subjected to large localized forces near the margins, the grommets may be torn from the edges of the turf. This problem can be overcome by reinforcing the margins of the turf with a clamp-type member as shown in FIGURE 5, 6 and 7. There is shown in FIGURE 5 an artificial turf 60 enveloped in a metal clamp 62 which is pressed tightly against the turf by a wing nut bolt 64 to distribute the forces exerted by the draw bar 66. A bar 70 is inserted in the root of the clamp 62 for connecting the S-hook 68. As shown in FIGURE 6, the edges of the clamp are cut out at spaced intervals to accommodate the hooks 68. The cut out portions may be stamped from the clamp which is preferably made from sheets of light-weight aluminum before it is bent around the bar 70 or if desirable can be cut out with the bar in place.

FIGURE 7 further illustrates in detail how the margin of artificial turf is reinforced. If desired, the wing-nut bolt 64 can be tightened until the walls 72 are drawn snugly against the turf 74. This will further distribute the load over the entire area enveloped by the clamp 62.

A typical installation made in accordance with the present invention comprises excavating approximately a 18″ x 18″ ditch with a conventional ditching machine. About 4 inches of cement is poured in the bottom of the ditch and a 2″ x 4″ member is embedded in the flowable cement transversely of the ditch at intervals approximately one foot apart. Since the 2″ x 4″ is used as a wood nailer to support other members, the top surface is not covered with the cement. Normally the super structure is comprised of two pieces of exterior treated plywood or boards approximately ¾″ thick and 10 inches wide which are nailed flat to the wood nailer. At the end of the wood nailer nearest the area to be covered with an artificial surface, an 8″ width of ¾″ exterior treated plywood is erected on edge. A 1″ x 4″ board supported at one edge by the double layer of plywood is nailed to the inside of the upright plywood board. The 1″ x 4″ board has a rectangular cut-away ¼″ x ½″ at the top edge adjacent to the upright board to accommodate a metal plate ⅛ inch thick and 12 inches wide. The metal plate is C-shaped at the upper edge which extends level with the ground surface. The dirt base is then built up flush with the top surface of the C-shaped member. This area is carefully filled to avoid subsequent settling which would produce an uneven surface. The upright plate or wall barrier may be temporarily braced if necessary prior to securing the artificial surface. A hook screw is secured in the plywood members in the bottom of the ditch approximately 3 inches from the base of the vertical structure. The margin of the artificial turf is provided with No. 3

tent grommets at 12 inch intervals. A die is used to cut the holes to accept the grommets which are inserted and swaged permanently in place. About 3 inches of the turf should be draped over the upright support member so that bending is accomplished easily. A 35 lb./in. draw bar spring about 3 inches long is suspended by S-hooks between a grommet in the turf and the respective screw hook to secure the turf firmly in place under tension. The ditch is filled to a level flush with the artificial turf to complete the installation. Subsequent removal and replacement of the turf can be readily accomplished by uncovering the flexible connection and removing the spring. The upright member is removed so that the dirt base can be plowed and disced to a depth of about eight inches.

It will be apparent that other materials may be used to construct the anchoring structure set forth herein and that other similar constructions may be built in accordance with the disclosure made without departing from the scope of the invention except as defined by the appended claims.

What is claimed is:

1. In an underground anchoring structure for securing the perimeter of artificial turf fabric which is employed as a substitute for natural grass turf, the structure comprising, in combination;

(a) a foundation,

(b) elongated upright members having curved upper edges supported by said foundation, said members enclosing an area,

(c) a filler in said enclosed area,

(d) an artificial turf fabric covering said enclosed area and extending over said curved upper edges, and

(e) spring means secured to the extending portions of said fabric at spaced intervals and anchored to said foundation to stretch said fabric over said curved upper edges.

2. The anchoring structure of claim **1** wherein the foundation is underground at least four inches.

3. The anchoring structure of claim **1** in which the spring means comprises a draw bar and at least two S-hooks.

4. The anchoring structure of claim **1** in which the curved upper edges are provided with a resilient material secured to the top thereof.

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