

[54] **PLASTIC NET DECK SURFACE AND DRAINAGE UNIT**

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[73] Assignee: **Conwed Corporation**, St. Paul, Minn.

[*] Notice: The portion of the term of this patent subsequent to May 5, 1990, has been disclaimed.

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[21] Appl. No.: **810,078**

[52] U.S. Cl. **94/33, 94/4, 94/7**

[51] Int. Cl. **E01c 11/24**

[58] Field of Search **94/4, 8, 33, 7, 5**

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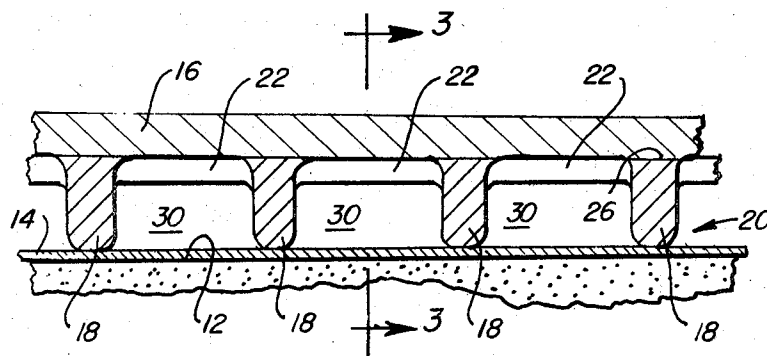
Primary Examiner—Jacob L. Nackenoff

Attorney, Agent, or Firm—Eyre, Mann & Lucas

[57] ABSTRACT

A net, preferably an extruded plastic net, is used to provide a raised surface and drainage means for a sloped deck such as a ball field, patio, and the like.

10 Claims, 14 Drawing Figures



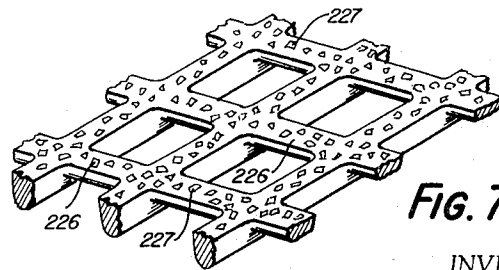
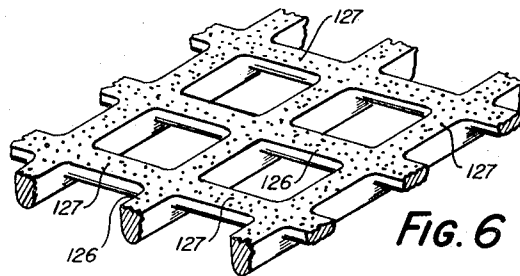
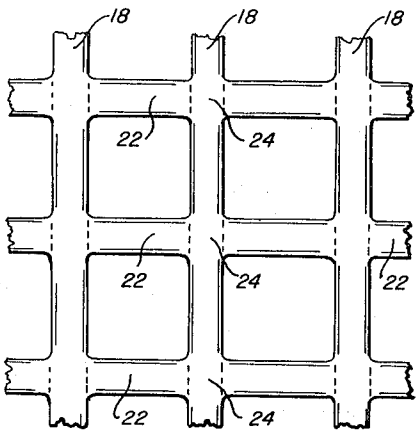
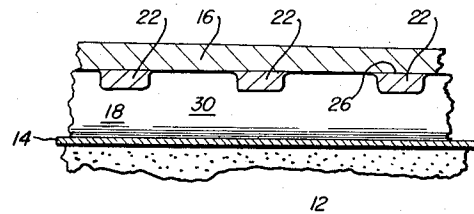
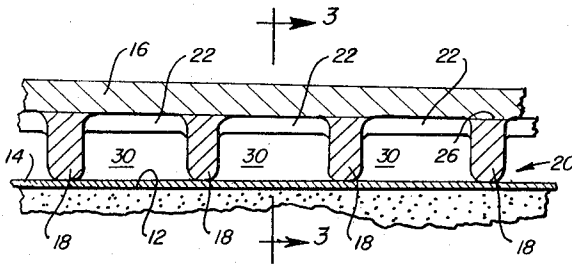
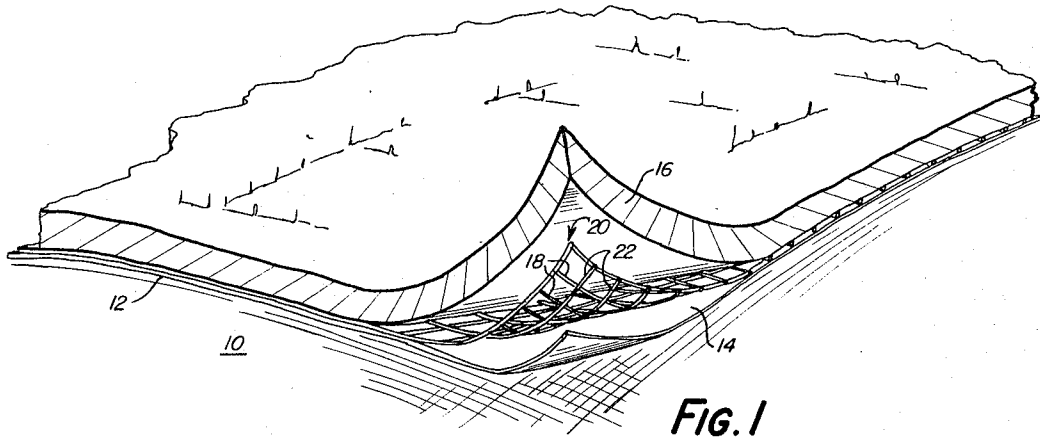


FIG. 4

FIG. 6

FIG. 7

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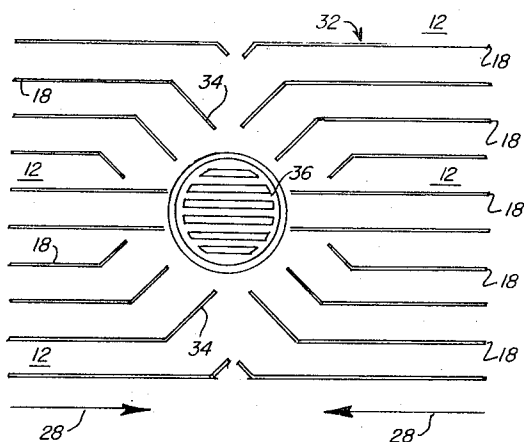


Fig. 5

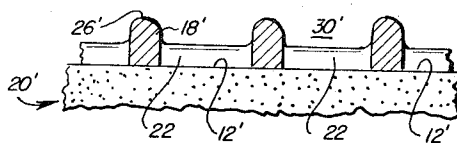


Fig. 8

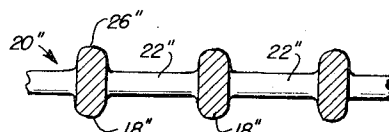


Fig. 9

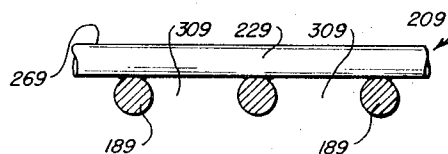


Fig. 9A

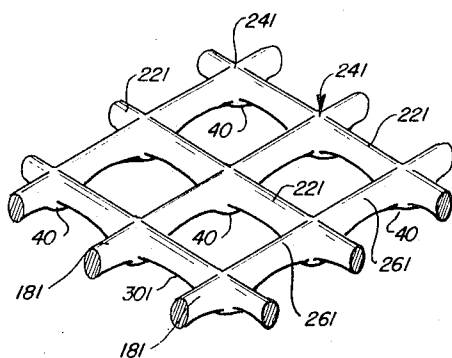


Fig. 10

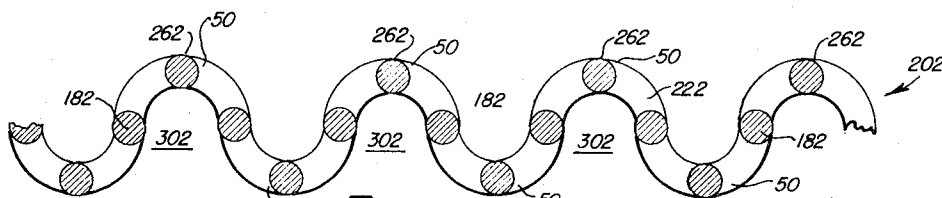


Fig. 11

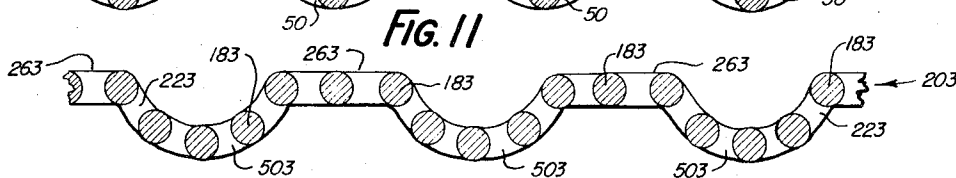


Fig. 12

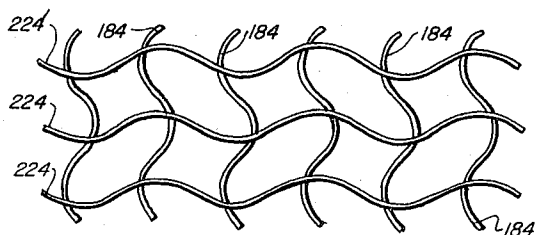


Fig. 13

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PLASTIC NET DECK SURFACE AND DRAINAGE UNIT

Increasing use is being made of artificial surfaces outdoors for tennis courts, baseball diamonds, and other like playing fields where water, from rain or otherwise, tends to make the natural surface of dirt, turf, and the like unplayable for considerable periods of time.

Similarly, artificial surfaces are being used around swimming pools both indoors and outdoors including such surfaces as the so-called "indoor-outdoor" carpeting which utilizes synthetic fibers.

In all of these and like applications there is a problem of such artificial surfaces retaining water when such surfaces are water penetrable as is commonly the case.

This invention is directed to an underlayment for such water penetrable artificial surfaces which serves to hold them away from the underlying deck in order to provide a drainage space for water beneath the outer walking or playing surface.

Another object of this invention is to provide a plastic net which can exhibit on its outer surface a suitable walking or playing surface without the additional need of the common synthetic turf, or other like synthetic surface.

These and other objects will become apparent to those skilled in the art from the following specification and drawings in which:

FIG. 1 shows the drainage net of the invention combined with an overlying sheet material,

FIG. 2 is a cross section through the assembly of FIG. 1,

FIG. 3 is a cross section taken along the line 3—3 of FIG. 2,

FIG. 4 is a plan view of the drainage net of FIG. 2,

FIG. 5 shows one layout for the drainage net on a sloped deck,

FIGS. 6 and 7 are modifications of the drainage net of FIG. 2 showing a walking surface incorporated therein, and

FIGS. 8-13 show modifications of the drainage net of the invention.

FIG. 1 shows a deck 10 which has a sloped upper surface 12 and a covering waterproof sheet of polyethylene 14. As used throughout this application and in the claims the term "deck" means any substrate or surface upon which water may tend to stand or from which water tends to run off such as tamped earth, concrete, wooden platforms, and the like whether the same are used (either indoors or outdoors) for patios, around swimming pools, balconies, tennis courts, playing fields, basement recreation room floors, laundry room floors, and the like. Further, as used herein, reference to the upper sloped surface of the deck refers to the upper surface 12 of such a deck as above defined, or the upper surface of the covering waterproof sheet 14 if one is present, whichever is applicable in a particular instance. In all of such instances quick drainage of water from the upper surface 12 is desirable and, accordingly, the upper surface is sloped to suitable gutters or drains where the water is accumulated and conveyed away from the deck. In many of these applications the deck is covered with a water penetrable sheet material such as indoor-outdoor carpeting, perforated hardboard, perforated plywood, artificial turf, and the

like which tends to hold the water in its openings and interstices after a rain or after being hosed or otherwise supplied with water. Under such circumstances much of the water does not adequately drain from the surface 12 of the deck 10 and tends to lie stagnant making the surface unusable for walking or other like use.

As shown in FIG. 1 applicant provides for drainage by means of a drainage net 20. As more specifically shown in FIG. 1, the upper surface 12 of the deck 10 is covered with a polyethylene sheet 14 which prevents water from soaking through and into the deck 10 when the deck is water absorptive as with tamped earth. Over the sheet 14 is placed the drainage net 20 of this invention, and over the drainage net 20 is placed the artificial surface 16 which may be, as indicated above, any one of a number of materials. While the polyethylene sheet 14 is shown in FIGS. 1, 2, and 3, it is to be understood that its use is not required in all instances since it merely serves to make the upper sloped surface of the deck 10 water impermeable.

The net 20 comprises at least two sets of strands 18 and 22. The net 20 is preferably an extruded plastic net of any one of a number of extrudable plastic materials well known to the extrusion art including particularly polypropylene. The net 20 is preferably of the type produced by the apparatus shown in the U.S. Pat. No. 3,252,181 in which the set of strands 18 can be extruded parallel to each other and can be extruded at substantially a right angle to the set of strands 22 which are also parallel to each other. By extrusion in this manner the number of strands, their dimension, and their relationships to each other may be controlled within relatively wide limits.

As shown in the drawings the extruded plastic net 20 has one set of parallel plastic strands 18 of greater height (see FIG. 2) than the crossing set of strands 22. As shown in FIG. 4, the intersections of the set of strands 18 and the set of strands 22 form joints 24 integral with the strands forming the joints and of the same material.

The net 20 has an upper surface 26 which as shown in FIGS. 1, 2, and 3 supports the covering sheet material 16 which is water penetrable. The strands 18 extend downwardly into contact with the polyethylene sheet 14, although, as indicated above, on some surfaces the polyethylene sheet 14 may be eliminated and the strands 18 may then bear directly upon the upper surface 12 of the deck 10.

As best shown in FIGS. 2 and 3 the set of strands 22 is not vertically as deep as the set of strands 18 and accordingly spaces 30 are provided beneath the plane of the upper surface 26 of the net through which spaces 30 water may run down the sloped upper surface 12 (or the polyethylene sheet 14 thereon) to suitable drains provided therefor. Accordingly, when water is supplied either by rain, by hosing, or by other means to the water penetrable surface 16 it will pass therethrough and downwardly into the spaces 30 where it will flow along the upper surface of the deck 10 to suitably located drains.

Sets of strands 18, which are parallel, are normally arranged parallel to the slope of the upper surface 12 of the deck 10 as shown schematically in FIG. 5. As shown in FIG. 5 in plan view the upper surface 12 of the deck 10 is sloped in the direction of the arrows 28 and the first section 32 of the net 20 is arranged with its strands 18 parallel to the direction of slope as indi-

cated by the arrows 28. However, as further shown in FIG. 5, there may be occasions when it is desirable to arrange the set of strands 18 of the net 20 at an angle to the slope. As shown at 34 there are sections of the net 20 having their strands 18 at a substantial angle to the direction of slope as indicated by the arrows 28. This angularity permits the water to be channeled toward a drain 36 from a much larger area of sloped surface 12. For ease of illustration the cross strands 22 of the net 20 are not shown in FIG. 5 and no covering sheet 16 is shown.

It has been found that while the strands 18 are quite dense the fact that the strands 22 bridge between the strands 18 provides some additional resiliency to the walking surface thus adding to the comfort of the net 20 as a walking and playing surface particularly when the same is used without the covering water penetrable sheet 16, although similar enhanced resiliency is also demonstrated when such covering 16 is utilized. It is theorized, but not known, that when the weight does not bear directly upon a strand 18 but between strands 18, the cross strands may bend downward, rocking the adjacent strands 18 and giving some cushioning effect.

While reference has been made above to the construction in which the net 20 has lying thereover a water penetrable sheet 16 such as, for example, an indoor-outdoor carpet, it is possible to treat the upper surface 26 of the net 20 (whether made up of the tops of one set of strands or a plurality of sets of strands) with a suitable friction surface so that the upper surface 26 of the net 20 may itself be used as the walking surface or playing surface for the area under consideration. As shown in FIG. 6 the upper surface 126 is provided with a friction producing material such as sand 127 indicated by the stippling in FIG. 6. The sand may be embedded in the upper surface 126 of the net by softening the net under heat and applying the sand with slight pressure while the upper surface 126 is so softened.

Alternatively, the upper surface 226 as shown in FIG. 7 may be provided with a pattern of embossing such as shown at 227 by means of a hot embossing roll or the like. The sand 127 and the embossing 227 of FIGS. 6 and 7 respectively can provide a friction surface for walking or other like use directly upon the upper surface of the net thus eliminating the need for the overlying water penetrable sheet 16. Ideally, such a friction surface is best provided when at least two sets of strands have their upper surfaces in a common plane to provide the upper surface 26 of the net as shown in FIGS. 2 and 3. In this way considerable area can be presented for walking while still providing considerable area for water to penetrate downwardly into the drainage spaces 30.

As shown in FIGS. 2 and 3 the upper surfaces of the strands 22 as well as the upper surfaces of the strands 18 lie in a common plane thus forming the upper surface 26 of the net 20. This provides for an excellent supporting surface for the overlying water penetrable sheet material 16 and eliminates any tendency for the same to sag down into the spaces between the set of strands 18. Such an arrangement also provides a better surface 26 upon which to walk directly without the need for a covering sheet 16. FIGS. 8 and 9, however, show variations of the net 20 in which the upper surface of the net does not have the sets of all strands co-

planar on the upper side. As shown in FIG. 8 a net 20' is illustrated having strands of one set 18' extending in one direction and strands 22' extending in the other direction, the strands 18' being higher than the strands 22'. In this instance the upper surface of the net 20' as indicated at 26' comprises only the upper surfaces of the strands 18'. Also, in this instance all of the strands 18' and 22' bear upon the underlying upper surface 12' of the deck. While this modification is not preferred due to the fact that the strands 22' will block water to the extent of their height, such an arrangement will permit drainage in the space 30' above the strands 22'.

FIG. 9 shows a net 20'' in which the cross strands 22'' are centrally located vertically with respect to the thickness of the higher strands 18''. This arrangement permits for adequate drainage, but like the modification of FIG. 8, does not provide as much support as the upper surface 26'' (26' in FIG. 8) of the net for supporting an overlying water penetrable sheet such as that shown at 16 in FIG. 1, or for providing a walking or playing surface. Accordingly, the construction of FIGS. 1, 2, 3, and 4 is preferred.

Another modification is shown in FIG. 9A in which the net 209 has one set of parallel plastic strands 189 and, lying thereabove, a crossing set of strands 229. This arrangement provides an upper surface 269 which may be used directly for walking or other like purpose or may be used to support the overlying water penetrable sheet 16. In this arrangement spaces 309 are provided beneath the plane of the surface 269 through which water may run off the sloped underlying surface. Again, while this modification (FIG. 9A) provides adequate drainage, it does not provide as much support for an overlying water penetrable sheet such as 16, or for providing a suitable walking or playing surface directly on the upper surface of the net.

FIG. 10 shows a modification in which the strands 181 and the strands 221 are substantially of the same thickness but in which the joints 241 formed integrally therewith have protruding on one side thereof projections or bumps 40. The projections or bumps 40 serve to raise the upper surface 261 of the net above the underlying slope to provide drainage space 301 for water. These projections 40 are readily provided during the extrusion of the net. The modification of FIG. 10 provides the least restriction to water flow of any of the modifications previously mentioned but cannot guide the runoff as can the nets 20, 20', 20'', or 209.

In FIG. 11 the net 202 is shown as comprising one set of parallel strands 182 and another set of strands 222 at substantially right angles thereto. Corrugations 50 are provided in the net 202 again to permit drainage in the space 302 beneath the upper surface 262 of the net. Such a corrugated net as shown at 202 also provides for enhanced resiliency when walking upon the upper surface 262 or a water penetrable sheet (such as sheet 16) lying thereupon.

A variation of the net of FIG. 11 is shown in FIG. 12 wherein a net 203 is shown having strands 183 in one direction and strands 223 in the other direction. In this instance the corrugations 503 are more widely spaced and are directed in only one direction as compared with the net of FIG. 11. The net 203 of FIG. 12 provides a more continuous upper surface 263 upon which to walk or upon which to place a water penetrable sheet such as shown at 16 in FIG. 1.

The corrugations of the nets of FIGS. 11 and 12 may readily be provided by molding or embossing the net after formation.

FIG. 13 shows a plan view of a variation of drainage net 204, which net has strands 184 running in one direction and strands 224 running in the other direction. The net 204 has its strands sinuous but parallel as contrasted to the net of FIG. 1 in which the parallel strands 18 and the parallel strands 22 are substantially straight. By means of the sinuous shape of the strands 184 and 224 of FIG. 13 the rate of flow of the water of the underlying sloped surface may be somewhat controlled to avoid great gushes and consequent erosion.

While the preferred net, as indicated above, is a plastic extruded net made in accordance with the disclosure in U.S. Pat. No. 3,252,181, other plastic extrusion means are known including the process and apparatus disclosed in U.S. Pat. No. 2,919,467, which produce a variation of the net in which the openings thereof are diamond-shaped or hexagonal rather than rectangular. Such net, having diamond-shaped or hexagonal-shaped or other shaped openings therethrough may also be used, it only being necessary that the strands are dimensioned and arranged in such fashion as to provide suitable drainage space beneath the upper surface thereof. Other means of producing the net can also be utilized including various weaves whereby the strands 18 are woven to the strands 20 provided, again, the strands are so dimensioned as to provide the requisite drainage spaces. However, weaving of strands of adequate strength to support the weight necessary in this application is generally difficult because of the thickness and stiffness of the strands. Additionally, while it is preferred that the entire net be of plastic material as indicated above, the strands 22 could be of wire or natural fibers embedded in the plastic strands 18.

I claim:

1. The combination comprising a deck, said deck having an upper sloped surface to permit runoff of water, a net over said deck, said net having an upper surface, said net including means extending into contact with said sloped upper surface of said deck for maintaining runoff space beneath the plane of the upper surface of said net, substantially all of the spaces within said net being open, and a water penetrable sheet material overlying said net.

2. The combination of claim 1 in which said water penetrable sheet is a carpet.

3. The combination of claim 1 in which said sheet material is secured to said net.

4. The combination comprising a deck, said deck having an upper sloped surface to permit runoff of water, a net over said deck, said net including a plurality

of sets of plastic strands, said sets of strands defining openings therebetween, substantially all of said openings being free of obstruction to the runoff of water, said net having an upper surface, said net including means extending into contact with said sloped surface of said deck for maintaining runoff space beneath the plane of the upper surface of said net, and a water penetrable sheet material overlying said net.

5. The combination of claim 4 in which said water penetrable sheet is a carpet.

6. The combination of claim 4 in which said sheet material is secured to said net.

7. The combination comprising a deck, said deck having an upper sloped surface to permit runoff of water, a net over said deck, said net having an upper surface, said net including a plurality of sets of strands, the strands of one of said nets being parallel plastic strands extending into contact with said sloped upper surface of said deck for maintaining runoff space beneath the plane of the upper surface of said net, the parallel strands of said one set being arranged generally downward of the slope of said sloped surface to provide with said surface channels for water runoff, substantially all of the spaces within said net being open, and the strands of another set being arranged at an angle to the strands of said one set and intersecting the strands thereof to maintain the strands of said one set in spaced parallel relationship.

8. The combination comprising a deck, said deck having an upper sloped surface to permit runoff of water, a net over said upper sloped surface, said net having a plurality of sets of plastic strands, the strands of one set intersecting the strands of another set to form joints at said intersections integral with the strands forming the joint, the upper surface of the strands of said one set and of the strands of said other set being substantially in a common plane, the lower surface of the strands of said one set being in engagement with said upper sloped surface of said deck and thereby supporting said net, the strands of said one set also being arranged generally downward of the slope of said deck to form with said deck channels for runoff of water, and the lower surface of the strands of said other set being spaced above said upper sloped surface of said deck whereby water may run off said upper sloped surface of said deck.

9. The combination of claim 8 in which the strands forming one of said sets are parallel.

10. The combination of claim 8 in which the strands of said one set intersect the strands of said other set at substantially a right angle.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,795,180 Dated March 5, 1974

Inventor(s) Ronald L. Larsen

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Under Notice:

"The portion of the term of this patent subsequent to May 5, 1990 has been disclaimed"

should read

--The portion of the term of this patent subsequent to January 5, 1990 has been disclaimed--

Signed and sealed this 2nd day of July 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents