A system for the protection of airport runway light fixtures and markers is disposed at or near the edge of aircraft runways, taxiway and airport signs. The system includes a thin flexible mat having an axial opening proportioned to enable placement of a runway light fixture or marker there-through and peripherally disposed apertures within the mat. The system further includes several anchors for the mat, each of which comprises a planar head, and means for penetration and engagement of earth upon which the mat is positioned. The penetration and engagement elements of each anchor integrally and rigidly depend from a lower surface of the planar head at a central axis. A greatest transverse cross-section of the engagement element is proportioned for complemental insertion within the peripheral apertures of the convex mat. The planar heads of the anchors each engage the mat when the engagement means have fully penetrated the earth upon which the mat is to be secured. The upper surface of the planar head of each anchor preferably includes an axially disposed nut, Allen head screw or like proportioned for complemental engagement with the drive element of a power tool to effect rotation of the anchor into the earth.
PROTECTIVE SYSTEM FOR AIRPORT RUNWAY AND TAXIWAY LIGHT FIXTURES

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. application Ser. No. 10/369,494, filed Feb. 21, 2003, which is a continuation-in-part of U.S. application Ser. No. 10/029,923, filed Dec. 31, 2001, now U.S. Pat. No. 6,527,407 B2, which is a continuation of U.S. application Ser. No. 09/638,621, now abandoned, the contents of which are all incorporated herein by reference. This application also claims the benefit of International Application PCT/US02/41585, filed Dec. 26, 2002, the contents of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

[0002] Present day airports, of whatever size, make use of numerous, often hundreds, of light fixtures for purposes of illumination of the edge of the airport runway, taxiway and parking areas to thereby minimize the possibility that an aircraft will inadvertently travel off the edge thereof. Such airport light fixtures involve considerable cost, both by way of initial capital investment, accidental breakage and maintenance in that the state-of-the-art runway light fixture is designed to withstand intense vibration and high wind velocity encountered in take-off and landing operations of jet aircraft, as well as bad weather. Such fixtures must, as well, remain operable over a broad range of environmental factors including heat, humidity, erosion, dust, wind, vegetation and insects. Accordingly, each runway light fixture represents a significant, but risk prone, capital asset of the airport. In order to protect this asset and to ensure maximum functionality, extensive use of mowing and other equipment is made to trim and limit the growth of grass and vegetation thereabout. However, such equipment may itself cause damage to runway lights. In many areas, it is also necessary to employ plant poisons and pesticides to protect runway lights from insects and the ingrowth of vegetation. Accordingly, the maintenance of runway lights entails not only the cost labor associated with continual trimming of vegetation but, as well, the potentially hazardous use of herbicides and pesticides to protect the light from vegetation, insects, and other small animals which might otherwise damage the runway lighting.

[0003] The prior art has addressed the above problem through the suggestion of complicated and expensive light fixtures or light fixture protectors and, inter alia, is represented by U.S. Pat. No. 4,104,711 (1978) to Carter, entitled Airport Light Fixture; No. 5,122,798 (1992) to Kaolian, entitled Airport Ground Light Arrangement; No. 5,669,691 (1997) to Barlow, entitled Airport Runway or Taxiway Light Fixture; and No. 5,971,561 (1999) to Fitzwater, entitled Airport Field Light Protector.

[0004] All of the above solutions, while clearly useful in extending the life of airport runway light fixtures, provide no help in the above-described environmental problems associated with extensive groundwork and other maintenance directed to the vegetation which inevitably will try to envelop runway light fixtures. A recognition of such limitations in the prior art is reflected in Kaolian above which suggests the use of a semi-rigid disk shaped body formed of a weather-resistant material which comprises an integral part of the runway fixture per se. Therein, the disk requires excavation of earth and insertion of gravel under the disk. In other words, in systems such as Kaolian and Fitzwater above, a protective rigid or semi-rigid disk is essentially integrated as a part of the airport ground light unit. In such solutions, the outermost edge or periphery of such disk-like elements are susceptible to uplifting under the effect of jet blast, ambient wind, water, and the activity of insects and small animals even if the disk is positioned below ground level. Accordingly, none of the suggestions in the prior art which might, superficially, appear related to the present invention, are practical in terms of such long-term external effects thereupon. In addition, it is essential that any peripheral disk, skirt, or the like associated a runway light be as flat as possible to minimize interference with, or damage to, lower blades of landscaping equipment, the use of which would remain necessary with respect to airport maintenance beyond the periphery of any system for the protection of airport runway light fixtures. It is further noted that the use of gravel to suppress foliage about landing strips has given rise to its own problems; for example, jet blast is capable of dislodging and blowing gravel about a taxiway thereby creating a hazard to other aircraft and to personnel in the area.

[0005] It is, thereby, to be appreciated that prior art attempts to suppress the growth of foliage and to control other factors impacting upon airport ground lights have been relatively ineffective and, as well, have proven costly in terms of manpower, maintenance and particularly the replacement of lights and other components of such ground light systems when damage thereto occurs. The present invention thereby represents an effective alternative to such art as Kaolian and Fitzwater, referenced above.

SUMMARY OF THE INVENTION

[0006] This instant invention relates to a system for the protection of airport runway light fixtures, airport signs located on grass or earth, and markers disposed at or near the edge of aircraft runways and taxiways. The system more particularly includes a thin flexible mat having an axial opening proportioned to enable placement of a runway light fixture or marker threethrough; and a plurality of peripherally disposed apertures within said mat. The system further includes a plurality of anchors for said mat, each of which comprises a planar head, and means for penetration and engagement of earth upon which said mat is positioned. Said penetration and engagement means of each anchor integrally and rigidly depend from a lower surface of said planar head at a central axis thereof. Therein a greatest transverse cross-section of said engagement means is proportioned for complementary insertion within said peripheral apertures of the convex mat. Said planar heads of said anchors each engage said mat when said engagement means have fully penetrated the earth upon which the mat is to be secured. In a preferred embodiment, the upper surface of the planar head of each anchor comprises an axially disposed nut, Allen head screw or the like proportioned for complementary engagement with the drive element of a power too to effect rotation of the anchor into the earth.

[0007] In view of the above, it is an object of the present invention to provide an improved system for (i.e., the protection of airport runway light fixtures from airfield maintenance
equipment, this inclusive of a protective mat therefore and method of efficient securement thereof to the area surrounding such runway and taxiway light fixtures.

[0008] It is another object of the invention to provide an airport ground lighting system having improved means for the suppression of foliage and pests thereabout.

[0009] It is a further object to provide a system of the above type which will reduce mowing presently associated with runway lighting and lighting fixtures.

[0010] It is a further object to provide an airport ground light system protection for reduction of soil erosion in the area about the fixture.

[0011] It is a yet further object of the invention to provide a means for the protection of airport runway light fixtures not susceptible to uplift under the influence of jet or propeller airstream.

[0012] It is still another object to provide an improved system to enhance the visibility of runway ground lights.

[0013] It is a still further object of the invention to provide a system for the protection of airport runway lights which will reduce the cost of labor associated with the use of herbicides and pesticides about said lights and will reduce risks to workers otherwise required to walk onto or near the field for such tasks.

[0014] It is a yet further object to provide a system of the above type which is fully compatible with all sizes and weights of lawn maintenance equipment and which will pose no risk to such equipment or to an aircraft that may inadvertently travel over such a system.

[0015] It is a still further object of the invention to provide a system of the above type which will, through the use of conventional portable power tools, can be quickly installed or repositioned.

[0016] It is a further object to provide a system of the above type which is essentially immovable after it has been properly secured about a runway light fixture or airport sign and into the earth.

[0017] The above and yet other objects and advantages of the present invention will become apparent from the hereinafter set forth Brief Description of the Drawings, Detailed Description of the Invention and claims appended herewith.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] FIG. 1 is a perspective view of a single unit of the present inventive system after the same has been fully installed.

[0019] FIG. 2 is a bottom plan view of FIG. 1.

[0020] FIG. 3 is a side elevational view of the inventive system, showing the salt lip thereof.

[0021] FIG. 4 is a perspective view of an anchoring element employed with the present system.

[0022] FIGS. 5 and 6 are top schematic view showing potential travel paths of edges of airport lawn mowing equipment.

[0023] FIG. 7 is a top schematic view of an elliptical embodiment of the invention, also showing the travel paths of edges of airport mowing equipment.

[0024] FIG. 8 is a perspective view of a further embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0025] With the reference to the perspective view of FIG. 1, the present system is shown as it appears after the same has been fully installed about an airport runway light fixture. Therein may be seen a lighting fixture 10 of a type commonly used at airports. Such fixtures depend upwardly from a rigid conduit 12 which accommodates electrical cabling from a rigid concrete base 14 which is typically circular in structure and extends to periphery 16 shown in FIG. 1. Beneath the protective concrete structure 14 is earth 18 which will extend to the edge of the airport runway or taxiway 20. The invention includes a flexible partially convex mat 22 which includes an axial opening 24-proportioned to facilitate placement of the light fixture 10 therethrough.

[0026] As may be noted in the views of FIGS. 1 through 3, the mat comprises a central convex area 26 and an outer substantially flat annular area 28. Said inner area, which covers the protective base 14 surrounding fixture 10 will typically have a radius in the range of 8 to 16 inches, while annular area 28 will exhibit a radius in a range of 16 to 32 inches. The total radius of mat 22 would be about 24 inches. The elevation of convex central portion 26 relative to flat annular portion 28 (see FIG. 3) will typically be in a range of 1 to 3 inches depending upon the height of the protective base 14 surrounding fixture 10 and its cable support conduit 12.

[0027] As may be noted in FIG. 2, a plurality of apertures 30 are disposed about or near the periphery of mat 22, the purpose of which is to enable passage therethrough of a corresponding plurality of anchors 32 which (see also FIG. 4) which each include a planar head 34 and a typically spiral means 36 for the penetration and engagement of earth 18 upon which the mat 22 is to be positioned. As may be noted in FIG. 4, the engagement means is integrally and rigidly dependent from a lower surface of the planar head 34. Accordingly, mat apertures 30 are proportioned to slidably accommodate the greatest cross-section of the anchors 32 thereby facilitating complemental insertion of the spiral elements thereof through such apertures during the process of installation. This process, it is noted, is considerably facilitated through the provision, upon an upper surface of planar head 34, of a protruding element such as a hex or Allen head nut proportioned for complemental engagement with a drive head of a portable power tool to thereby effect rotation of such element and, thusly, of the entire anchor such that each anchor may be quickly inserted into the ground. Such insertion is also facilitated by providing a sharp tip 40 at the end of the spiral portion 36 of the anchor 32. It has been found that inexpensive readily available power tools such as a Makita or Black and Decker power drill. Anchor 32 may be easily inserted into earth having a wide range of soil types.

[0028] Through the use of an anchor consisting of a large diameter head, typically in a range of about 4 to about 8 inches, the present system, when properly installed, will
secure mat 22 such that it is immovable under any influence including water, weather, and jet blast. Therein erosion is most difficult and vegetation is unable to grow close enough to fixture 10 to impair the runway illumination function thereof.

[0029] Further, as may be noted with reference to FIGS. 5 and 6, the edges of mowing equipment of a type typically used at airports can safely pass over annular area 28 of the mat 22, this due to the minimal thickness of the mat which is in a range of 0.15 to 0.50 inches, but preferably 0.375 inches. In general, the mat is formed of an elastomeric material preferably a polymeric plastic such as an EPDM polypropylene terpolymer. The weight of a mat of the above dimensions made of such material would be about 28 pounds, with a density of 0.68 ounces/cu. inch. and tensile strength of about 650 pounds. Accordingly due to the thickness, strength and flexibility of mat 22, the present system will not interfere with the normal operation of airport mowing equipment. By the same token, there need not be a concern that the wheels or landing gear of an aircraft, which happens to pass beyond the edge of runway or taxiway 20, will be interfered with by either mat 22 or the planar heads 34 of the mat anchors 32.

[0030] With reference to FIG. 3, there is also shown a soft lip 44, the function of which is to contain salt which will melt snow or ice that may fall onto the mat.

[0031] It is to be appreciated that while the anchor shown in FIG. 4 comprises a spiral structure having a diameter of about two inches and a length of about one foot, that other securement means may be employed within the scope of the present invention as long as a planar head 34 is employed, this for the reasons set forth above.

[0032] In an alternate embodiment of the invention, shown in FIG. 7, there may be provided an elliptical mat 122 in lieu of the circular mat 22 above described. Typical dimensions thereof would be about 48 inches by 84 inches with a weight of about 50 pounds. Such an elliptical mat structure may be advantageously employed in a number of application where, for example, ground surface, visibility, or aesthetic considerations may dictate. For example, extending the length, in even a single axis, of the mat portion of the present system, will enhance ease of mowing and visibility of light fixture 10 from the aircraft runway 20, even if vegetation or foliage at the edge of the runway is not trimmed for a considerable period of time. Also, resistance to erosion of the earth surrounding lighting fixtures is increased through the use of the elliptical structure of mat 122. Such a structure, as is also noted in FIG. 7, is completely compatible with use with lawn mowing equipment and, in certain respects, is more suitable for such use in that the turning radii associated with mower travel along the edge of mat 122 is much than is the case of the turning radii associated with mower travel along or upon the periphery of circular mat 22. In FIGS. 5 to 7, the path of travel of the edge of the moving equipment is indicated by numbers 42 and 142.

[0033] It is further noted that mat 22 or 122 may be provided with holes for the accommodation of so-called snow poles 48 (set: FIG. 1) which are commonly used at airports in colder climates during much of the year.

[0034] With reference to FIG. 8, there is shown a further embodiment of the invention in which a mat 100 is entirely flat or co-planar, that is, does not include a convex axial portion. This embodiment is applicable where a runway light fixture 110 does not utilize a convex support or base. In said embodiment, slits 114 in the mat are used in lieu of axial opening 24 of mat 22, described above.

[0035] While there has been shown and described the preferred embodiment of the instant invention it is to be appreciated that the invention may be embodied otherwise than is herein specifically shown and described and that, within said embodiment, certain changes may be made in the form and arrangement of the parts without departing from the underlying ideas or principles of this invention as set forth in the claims appended herewith.

Having thus described our invention, what we claim as new, useful, and non-obvious and, accordingly, secure by Letters Patent of the United States is:

1. A system for the protection of airport runway lighting fixtures, the system comprising:

(a) a flexible convex mat including an axial opening proportioned to enable placement of a runway light fixture therethrough, and a plurality of peripherally located apertures;

(b) a plurality of anchors for said mat, each of said anchors comprising a planar head, and means for penetration and engagement of earth upon which said mat is to be positioned, said penetration and engagement means integrally and rigidly depend from a lower surface of said planar head at a center axis thereof, in which a greatest transverse cross-section of said penetration means is proportioned for complemental insertion through said peripheral apertures of said mat,

whereby said heads of said anchors each engage said mat when said penetration means have fully penetrated the earth upon which said mat is to be secured.

2. The system as recited in claim 1, in which an upper surface of said planar head of said anchor comprises an axially disposed element proportioned for complemental engagement with a drive head of a power tool to thereby effect rotation of said anchor into the earth.

3. The system as recited in claim 2, in which said penetration means of said anchor comprises an elongate spiral having a pointed tip thereof.

4. The system as recited in claim 3, in which said spiral of said anchor comprises a diameter of about two inches and a length of about one-foot.

5. The system as recited in claim 2, in which said planar head of said anchor defines a circle having a diameter in a range of about four to about eight inches.

6. The system as recited in claim 2, in which said mat defines a circle.

7. The system as recited in claim 2, in which said convex mat defines an ellipse.

8. The system as recited in claim 1, in which said mat comprises a convex inner region and an integral outer annular region which is substantially flat.

9. The system as recited in claim 2, in which said mat includes therein holes for the accommodation of snow poles.

10. The system as recited in claim 8, in which an upper surface of said planar head of said anchor comprises an axially disposed element proportioned for complemental
engagement with a drive means of a power tool to effect rotation of said anchor into the earth.

11. The system as recited in claim 10, in which said penetration means of said anchor comprises an elongate spiral having a pointed tip thereof.

12. The system as recited in claim 1, in which said planar head defines a circle having a diameter in a range of about 4 to about 8 inches.

13. The system as recited in claim 2, in which said mat comprises an inner convex region and an integral annular substantially flat outer region.

14. The system as recited in claim 8, in which an upper surface of said planar head of said anchor comprises an axially disposed element proportioned for complemental engagement with a drive means of power tool.

15. The system as recited in claim 1, in which said mat comprises a thickness of between about 0.15 and about 0.50 inches.

16. The system as recited in claim 15, in which said planar head defines a circle having a diameter in range of about 4 to about 8 inches.

17. The system as recited in claim 16, in which a radius of said mat comprises a radius in a range of about 18 to about 40 inches.

18. The system as recited in claim 2 in which said mat comprises a convex portion about said axial opening thereof.

19. The system as recited in claim 18, in which a vertical elevation of said convex portion of said mat comprises a range of between about one and about three inches above the earth.

20. The system as recited in claim 18, in which a vertical elevation of said mat defines a rectangle.