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 (56) Documents Cited:
GB 1384872 A **GB 1071356 A**
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(54) Title of the Invention: **Protective groundsheet**
 Abstract Title: **Inflatable protective groundsheet and method of inhibiting ground frost**

(57) A protective groundsheet **10** comprises a flexible sheet-like body **11** provided with a plurality of internal air passages **14** extending substantially over the area of the body and with an inlet communicating with the passages **14** and connectible with a source of pressurised air, such as a pump. The body **11** is inflatable under feed of pressurised air via the inlet to the passages **14** and is provided on a side thereof intended in use to face the ground **G** with outlet perforations **19** allowing escape of air under pressure to combat or inhibit ground frost or icing. The groundsheet may comprise two sheets of flexible material connected together by seams **13** separating the passages. The seams maybe weld seams. Also disclosed is a method of inhibiting ground frost by use of the aforementioned groundsheet.

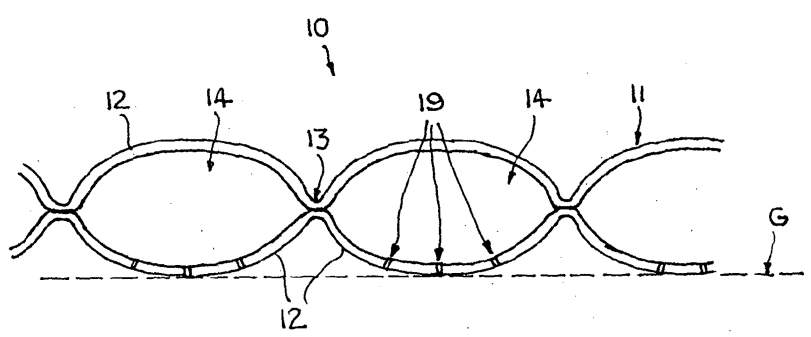


FIG. 2

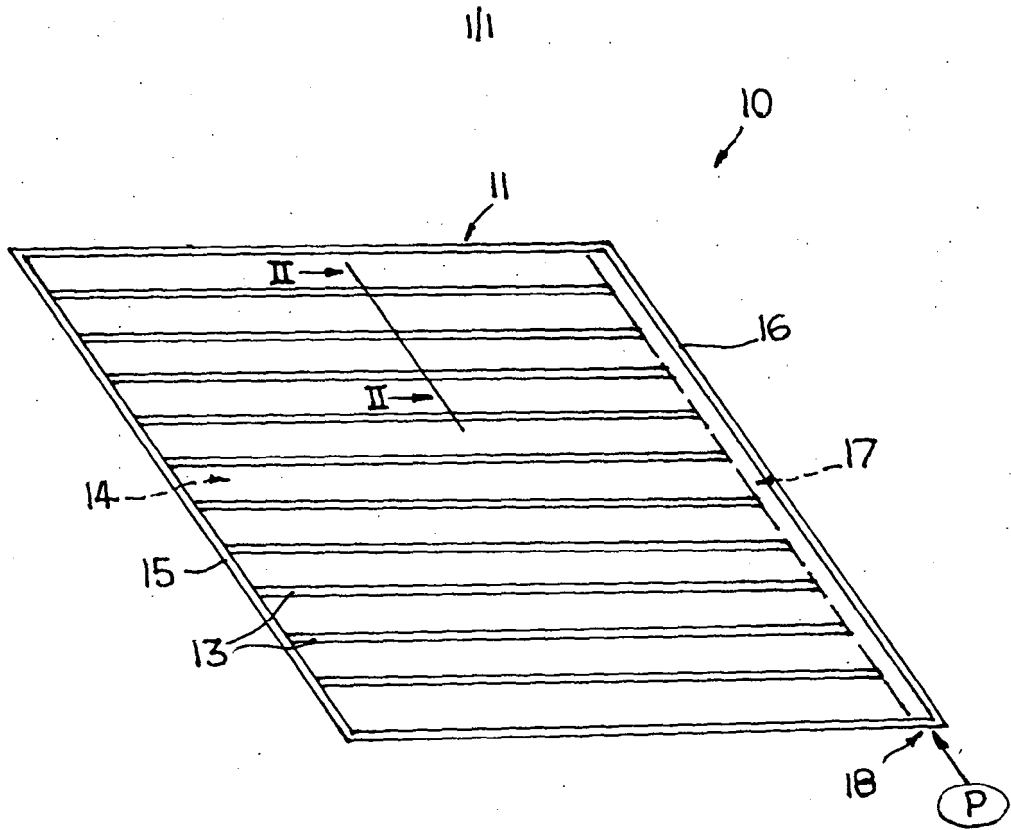


FIG. 1

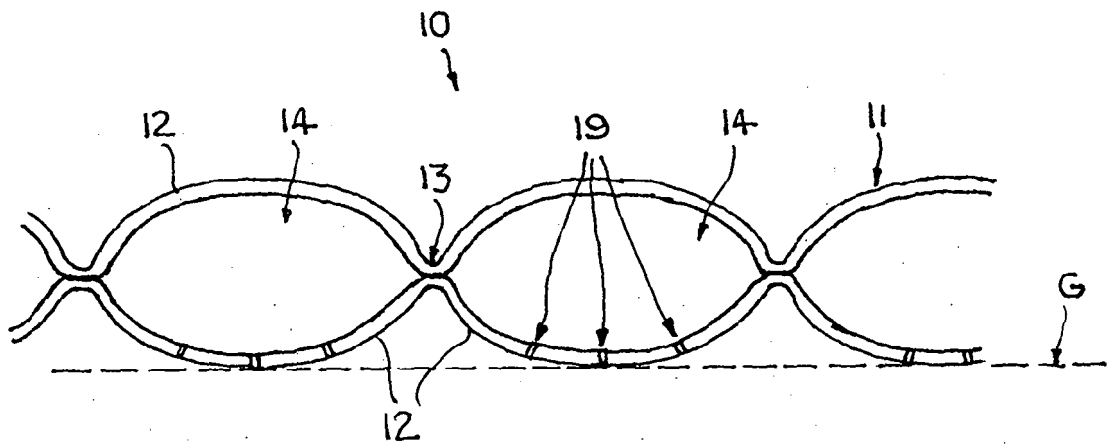


FIG. 2

PROTECTIVE GROUND SHEET

The present invention relates to a protective groundsheet, especially an inflatable groundsheet for pitches.

No artificial surface system has yet been provided or invented that has been able to take the place of natural grass or turf. Although many arena and sports venues do use artificial pitches when conditions necessitate it, it is generally recognised as preferable to use natural turf.

Damage to turf and grass is still therefore of major importance to groundkeepers and gardeners tasked with maintaining turf.

In particular, inclement weather, such as below zero, may have deleterious effects on grass or turf and additionally or also may make pitches unplayable. In the sporting field many times when such conditions are prevalent, a match or other fixture may need to be abandoned, cancelled or postponed, with consequent cost and other issues, due to frozen pitches.

Accordingly numerous solutions for protecting grass from inclement climates have been proposed including the following:

Australian patent application AU 760 239 (PETRIE et al) discloses a frost protection system for crops or plants and uses air blown through perforated pipes. The air creates turbulence around the plants to reduce frost damage. The air may be heated. The pipes are the same as those used for irrigation. A valve isolates the pipes from a water supply when a blower is running. The blower is protected from irrigation water by the valve.

United Kingdom patent application GB 1 086 434 (WILLEMSE) discloses a plurality of parallel transparent plastic tubes connected together in side-by-side relationship, an air supply tubular tube connected to the tubes and extending in a direction having at least a component perpendicular to the parallel tubes, this air supply tube being in connection with the interiors of the tubes, and an anchor tube adapted to be filled with water to hold down the cover on the ground or vegetation. Preferably, the anchor tubes are located within some of the parallel tubes. Warm air may be circulated through the appropriate tubes in

cold weather, and also the cover may be used, without being inflated, during good weather.

European patent EP 0 436 523 (HAKIM) discloses a coiling heat exchanger with mutually parallel flow ducts for the heat transfer medium, which are interconnected by elastic webs, to which filler is applied, which covers the flow ducts in particular in an even manner, and consists of flexible (elastic) material which does not impede the coiling, for covering a surface and/or for spanning hollows, in particular as a sport or recreation surface.

United States patent application US 5 120 158 (HUSU) discloses a method of removing moisture from a playing field having a surface layer and filter layer beneath the surface layer, the filter layer including at least two sloping pipes having perforations and defining first and second sections of a pipe network. The method comprises the steps of blowing air in a first direction through the first section for a first predetermined period to remove moisture from the surface layer, stopping the blowing in the first section for a second predetermined period sufficient to collect the removed moisture by accumulating it in the first section through the perforations thereof, blowing air in a first direction through the second section during the second predetermined period to remove moisture from the surface layer, causing the accumulated moisture in the first section to flow at an inclination in a direction opposite to the first direction for removal of the moisture from the playing field during the second determined period, and causing the accumulated moisture in the second section to flow at an inclination in a direction opposite to the first direction for removal of the moisture from the playing field during the first predetermined period.

French patent application FR 2 588 761 (DUPIUS) discloses a retractable thermal barrier consisting of an assembly of inflatable flexible tubes juxtaposed side-by-side and connected via at least one of their ends to a device for blowing in gas capable of inflating them, the tubes, once inflated, being capable of being coupled together along a wide longitudinal contact surface, whilst the thermal barrier may be retracted by deflation of the tubes which form it. The barrier serves for protection against freezing of ground surfaces (sports fields, etc.) or of plantations (vineyards, etc.) and in the production of insulating false ceilings (for greenhouses, swimming pools, etc.).

United Kingdom patent application GB 1 384 872 (WILLIAMS) discloses a flexible sheeting, preferably polyethylene, reinforced by elongate two-part stud and socket

fasteners which grip the sheet therebetween, the part including a bead extruded around a metal wire. The reinforcing wire may also be T-section. A-section clips which embrace the part and are provided with flexible loops to receive pegs for securing the sheeting in position or the flanges of the T-section tube may be cemented or nailed to a support. In a greenhouse longitudinal stiffeners are also provided and secure the sheeting to the tubular frame. The sheet is preferably two separate layers, the inner one of which is perforated, warm air being supplied from a fan heater via tube and outlets. The sheets may be used for covering cloches. They may also be used for covering sports grounds when they are supported in the centre by a hot air tube and pegged down at the edges.

There remains a need for a tailorable, resizable and readily available solution to sudden cold snaps or recurrent bad climates for a large variety of locations, especially to prevent grass or subsoil from freezing and being damaged by frost or ice as well as excessive rain or humidity.

According to a first aspect of the present invention there is provided a protective groundsheet comprising a flexible sheet-like body provided with a plurality of internal air passages extending substantially over the area of the body and with an air inlet communicating with the passages and connectible with a source of pressurised air, the body being inflatable under feed of pressurised air via the inlet to the passages and being provided on a side thereof intended in use to face the ground with outlet perforations allowing escape of air under pressure from the passages to combat or inhibit ground frost and icing.

Such a groundsheet may be laid over a pitch or other area of ground in adverse weather and air introduced into the passages such that the air when escaping via the perforations will cause the ground to defrost or be warmed to prevent the ground from becoming frozen, thus also preventing damage to grass. The groundsheet ideally provides a constant flow of air blowing onto the ground, which it also insulates, to defrost or prevent frost and ice occurring. The groundsheet can vary in size and may be able to be used for any application where the ground surface concerned needs protection from the elements, such as sports pitches or gardens.

If, when the groundsheet is in place, there is further fall of snow or rain or possibility of icing, the groundsheet presents an impermeable barrier and as such will screen the

ground. As the body is inflated with moving air, which optionally is heated, any snow or sleet falling on the sheet will melt. The body can be constructed and shaped so that any liquid will run off to sides. For that purpose, an intended upper side of the body is preferably developed, designed or configured to allow any water collecting thereon due to rainfall, for example, to be channelled off at its perimeters.

Additionally or alternatively, the groundsheet may be placed over, for example, a pitch for a period of time, providing a constant air outflow and preventing climatic conditions from impairing the state of the pitch. Added heating of the supplied air may be utilised in certain circumstances, such as when particularly cold.

It is also possible for a plurality of such groundsheets to be connected in a modular fashion, such as by inclusion of snap connections or screw connections that connect air passages in order to enable continuous air flow.

For preference, at least some of the passages are formed by a plurality of ducts individually connected with the inlet. In one embodiment at least some of the passages are formed by individual sections of a single duct connected with the inlet. Additionally or alternatively the ducts of the plurality or the sections of the single duct extend substantially parallelly to one another.

The inlet preferably communicates with the passages by way of a feed pipe.

With respect to construction, for preference the body comprises two sheets of flexible material connected together by seams, preferably weld seams, separating the passages.

The body can be provided with securing means, for example eyelets or ties, for use in securing the body to the ground or another such groundsheet. Thus, adjacent groundsheets may be fixed together by use of, for example, guy holes or eyelet holes and pegs as appropriate. In the alternative or in addition, connection can be by use of snap-fit connectors. Furthermore, an end of the body incorporating a connector to a feed pipe may be connected to an additional feed pipe or groundsheet by use of looped cables having a snap-fit lock or other closure mechanism. Typically, in order for the groundsheet to be attached to the ground use is made of pegs, typically having a T-shape, of metal or heavy-duty plastic with a screwthread to assist insertion into frozen ground.

The groundsheet preferably comprises pumping means connected with the inlet and operable to pump air under pressure into the inlet. Typically, air supply can be by way of a blower or pump. For preference, an air supply is provided with the groundsheet, although connecting means may be provided to enable connection of the pipe to an independent air supply.

For preference the groundsheet comprises a rotary storage member attached or attachable to the body and rotatable to roll up the body into a stored state and to unroll the body from that state.

According to a second aspect of the invention there is provided a method of combating or inhibiting ground frost and icing by a groundsheet as claimed in any one of the preceding claims, comprising the steps of spreading the sheet-like body over an area of ground to be protected with said side of the body facing the ground, feeding pressurised air via the inlet to the air passages to inflate the body and maintaining the feed of air so as to cause air to substantially continuously escape from the passages via the perforations and impinge as air jets on the ground.

The groundsheet is to incorporate a substantially constant flow of air. The pressure of the supplied air is sufficient to inflate the sheet above normal atmospheric pressure. The perforations may be positioned and sized to enable an even loss of air throughout the sheet and to give an even pressure within the air passages.

A preferred embodiment of the present invention will now be more particularly described by way of example with reference to the accompanying drawings, in which:

Fig. 1 is a schematic perspective view of a groundsheet embodying the invention and

Fig. 2 is a schematic cross-section, to enlarged scale, of a part of the groundsheet along the line II-II of Fig. 1.

Referring now to the drawings there is shown a groundsheet 10 for protection of the ground from, in particular, frost, the groundsheet comprising a flexible sheet-like body 11 substantially composed of two congruent sheets 12 of lightweight, flexible, tear-resistant

plastics material, elastomeric material, fibre-reinforced plastics or elastomeric material or other suitable flexible and non-permeable material. The body 11 is of generally rectangular form of, for example, 25 metres square; Fig. 1 shows merely an arbitrary size on a small scale to illustrate construction and format.

The sheets 12 are connected together at substantially uniform spacings by parallelly extending seams 13, preferably produced by thermal welding of the material - which in that case has to be a thermally weldable material - of the sheets, to form in the interior of the body a plurality of parallelly extending air passages occupying substantially the whole area of the body 11. The sheets 12 are also connected together at two mutually opposite edges of the body by seams 15 and 16 extending perpendicularly to the seams 13, the seam 15 preferably connecting with the seams 13 so as to close the air passages 14 at ends thereof adjoining that seam and the seam 16 being spaced from terminations of the seams 13 so as to form a transverse internal feed pipe 17 communicating with all the air passages 14. Provided at one end of the feed pipe 17 is an air inlet 18 connected or connectible with a pump P for supply of air under pressure.

The described formation of the air passages 14 by a plurality of ducts individually connected with the air inlet 18, such as by the feed pipe 17, is merely by way of example. The air passages could equally well be formed by, for example, individual sections of a single duct directly connected with the inlet. Various arrangements and ways of forming the air passages and providing communication with the inlet are possible by corresponding disposition of seams connecting the constituent sheets 12 of the body 11.

The flexible construction of the body 11, in particular from the flexible sheets 12, allows inflation of the body 11 under feed of pressurised air from the pump P to the air passages 12 via the inlet 18, in which case the air passages adopt a generally tubular form of approximately elliptical to circular cross-section.

The body 11 is provided at a side thereof intended in use to face the ground (indicated by G in Fig. 2), in particular in one of the sheets 12, with outlet perforations 19 allowing escape of air under pressure from the air passages. The perforations 19 are arranged in any desired pattern along the entire length of each air passage, preferably also transversely of each air passage, with the object of providing a relatively dense pattern of jets of escaping air over the whole area of the respective side - the underside in use - of

the body 11. The issuing jets are directed towards the ground to create a zone of air movement dispersing moisture and combating ground frost and icing of soil and soil cover such as grass. This can be promoted by heating the air at source, thus at or in the vicinity of the pump P.

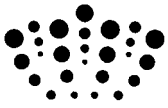
The groundsheet 10 can be provided with eyelets, ties or other securing means (not shown) to enable securing to the ground, such as by stakes, or to other such groundsheets.

When not in use, the groundsheet can be stored by being rolled up, for example, on a rotary storage member and, when needed unrolled from the member and spread over the area of the ground to be protected.

CLAIMS

1. A protective groundsheet comprising a flexible sheet-like body provided with a plurality of internal air passages extending substantially over the area of the body and with an air inlet communicating with the passages and connectible with a source of pressurised air, the body being inflatable under feed of pressurised air via the inlet to the passages and being provided on a side thereof intended in use to face the ground with outlet perforations allowing escape of air under pressure from the passages to combat or inhibit ground frost and icing.
2. A groundsheet according to claim 1, wherein at least some of the passages are formed by a plurality of ducts individually connected with the inlet.
3. A groundsheet according to claim 1 or claim 2, wherein at least some of the passages are formed by individual sections of a single duct connected with the inlet.
4. A groundsheet according to claim 1 or claim 2, wherein the ducts of the plurality of the sections of the single duct extend substantially parallelly to one another.
5. A groundsheet according to any one of the preceding claims, wherein the inlet communicates with the passages by way of a feed pipe.
6. A groundsheet according to any one of the preceding claims, wherein the body comprises two sheets of flexible material connected together by seams separating the passages.
7. A groundsheet according to claim 7, wherein the sheets are connected together by weld seams.
8. A groundsheet according to any one of the preceding claims, wherein the body is provided with securing means for use in securing the body to the ground or another such groundsheet.
9. A groundsheet according to claim 9, wherein the securing means comprise eyelets or ties.

10. A groundsheet according to any one of the preceding claims, comprising pumping means connected with the inlet and operable to pump air under pressure into the inlet.
11. A groundsheet according to any one of the preceding claims, comprising a rotary storage member attached or attachable to the body and rotatable to roll up the body into a stored state and to unroll the body from that state.
12. A method of combating or inhibiting ground frost and icing by a groundsheet as claimed in any one of the preceding claims, comprising the steps of spreading the sheet-like body over an area of ground to be protected with said side of the body facing the ground, feeding pressurised air via the inlet to the air passages to inflate the body and maintaining the feed of air so as to cause air to substantially continuously escape from the passages via the perforations and impinge as air jets on the ground.



Application No: GB1214524.9

Examiner: Bryony Barceló

Claims searched: 1-12

Date of search: 12 November 2012

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,Y	X: 1-5, 10, 12 Y: 6-9, 11	GB1384872 A Williams; see figure 6 and page 2 lines 6-15
Y	6-9	GB1071356 A Stone; see figures 1-3
Y	11	NL8300179 A Rensen; see abstract translation and figure 1
A	-	US3727345 A Smith; see figures 1-3
A	-	CN2616042 Y Xie Jingxun; see figures and abstract translation

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

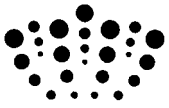
Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

Worldwide search of patent documents classified in the following areas of the IPC

A01G; A63C

The following online and other databases have been used in the preparation of this search report

WPI & EPODOC



International Classification:

Subclass	Subgroup	Valid From
A63C	0019/12	01/01/2006
A01G	0013/02	01/01/2006