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FARNEY et al.

(54) **GROUND COVERING SUPPORT STRUCTURE**

(76) Inventors: **Greg FARNEY**, Calgary (CA); **Mike MCGINLEY**, Calgary (CA); **Ian BARNETT**, Sundre (CA)

Correspondence Address:
BLAKE, CASSELS & GRAYDON LLP
BOX 25, COMMERCE COURT WEST, 199 BAY STREET, SUITE 2800
TORONTO, ON M5L 1A9 (CA)

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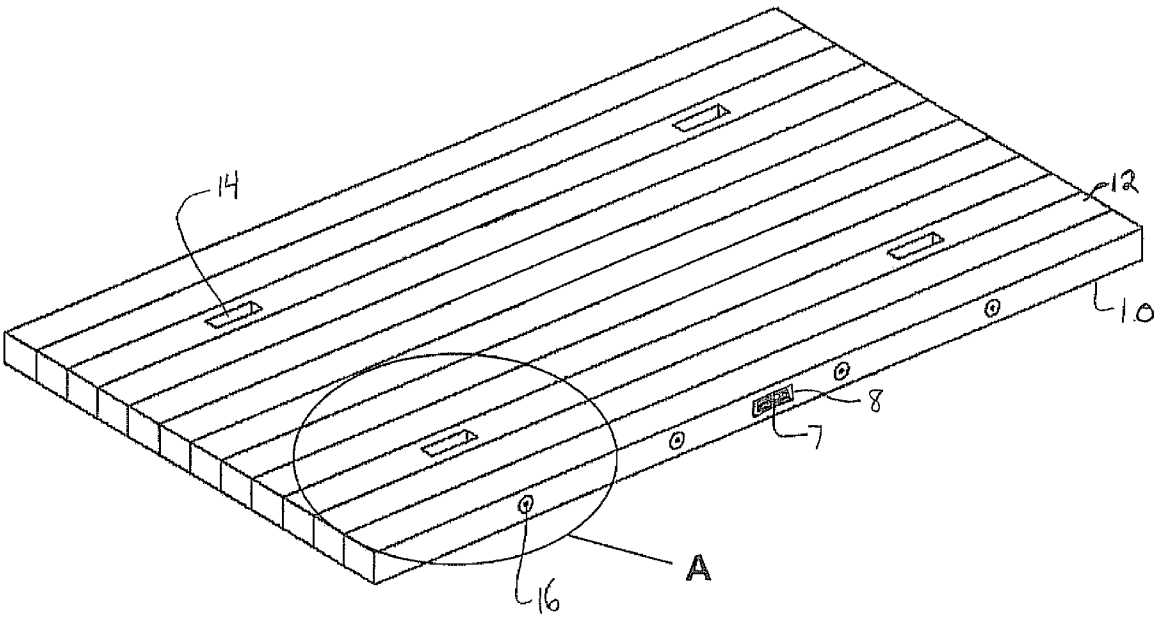
(57) **ABSTRACT**

A ground covering support structure is provided comprising a plurality of longitudinally aligned boards secured to one another using a plurality of transversely extending rods; and at least one aperture formed in the access mat, the at least one aperture being aligned with a corresponding one of the rods such that an exposed portion of the corresponding one of the rods passes through the aperture, each the at least one aperture containing a retractable lifting link, the retractable lifting link comprising a lifting eyelet and an elongated slot; wherein the rod passes through the elongate slot to restrict movement of the link through the aperture. The boards may advantageously be constructed using recycled beetle kill lumber or similar recycled materials.



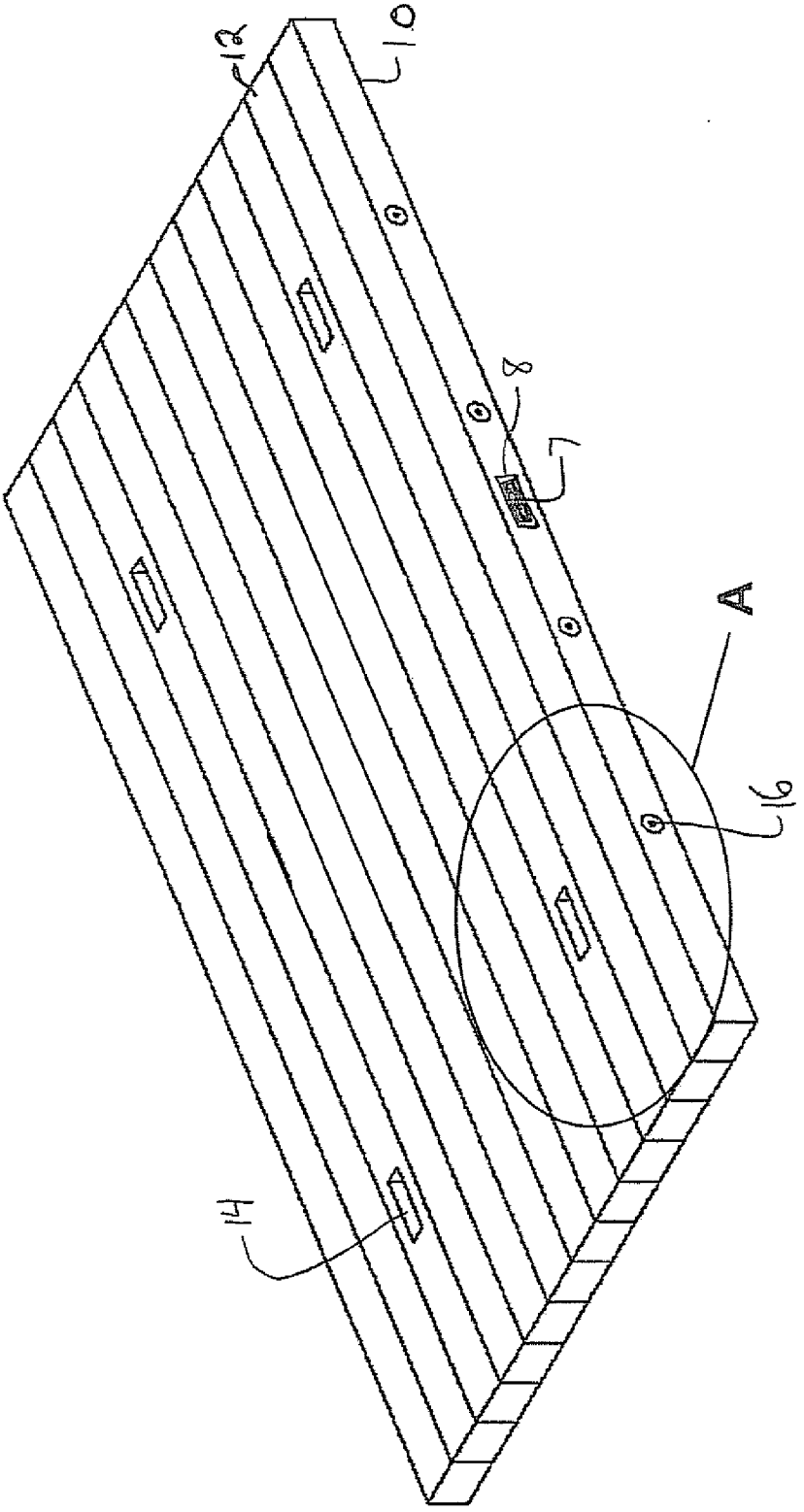


Figure 1

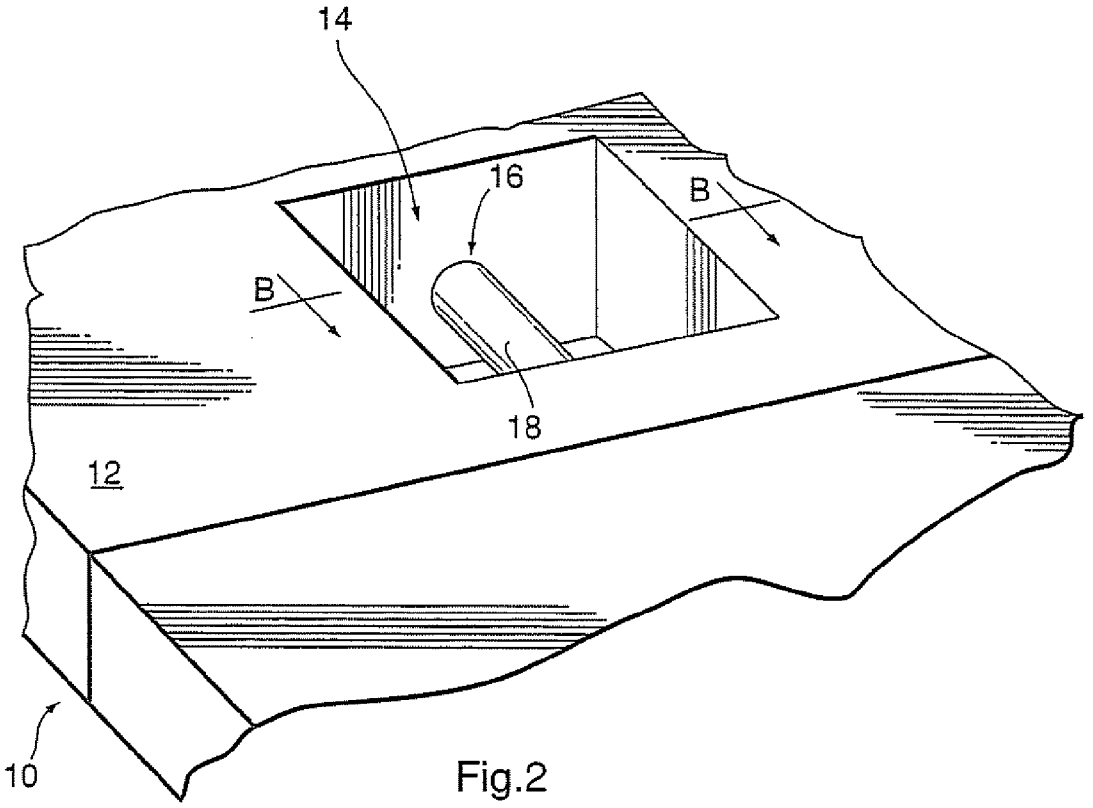


Fig.2

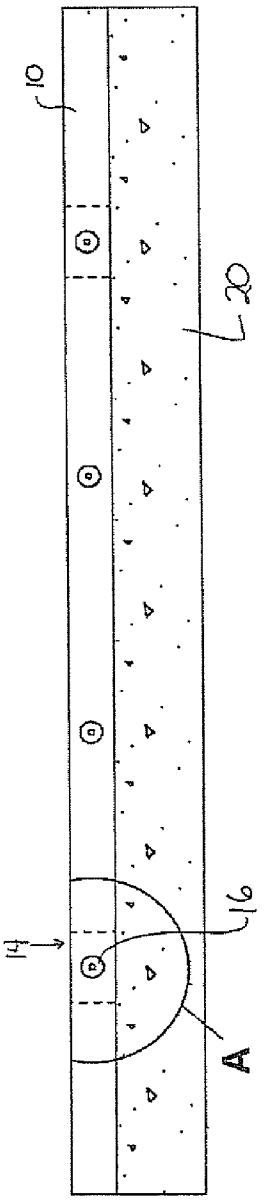


Figure 3

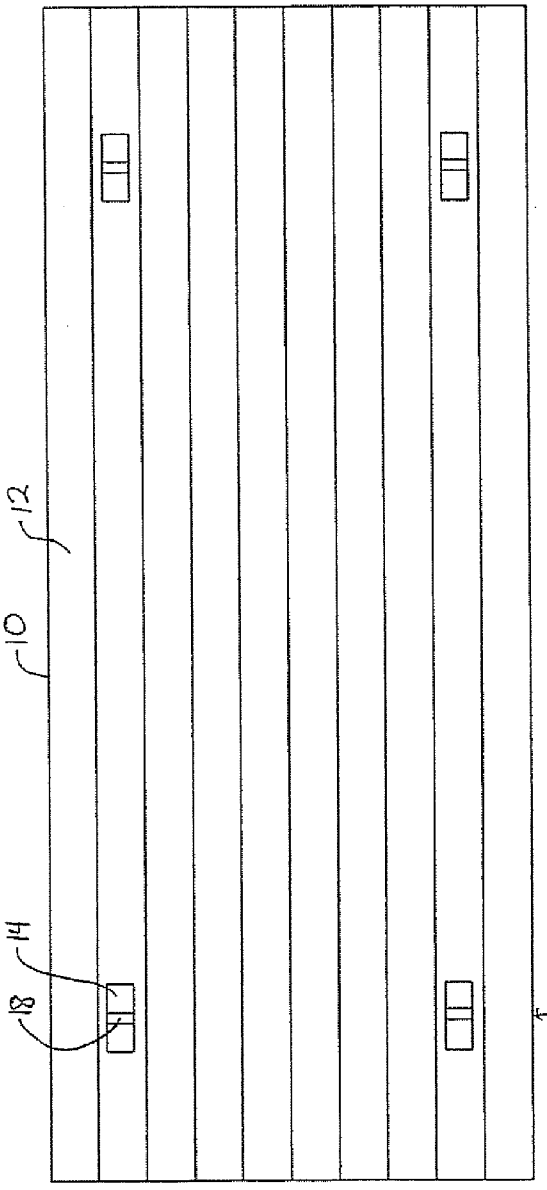
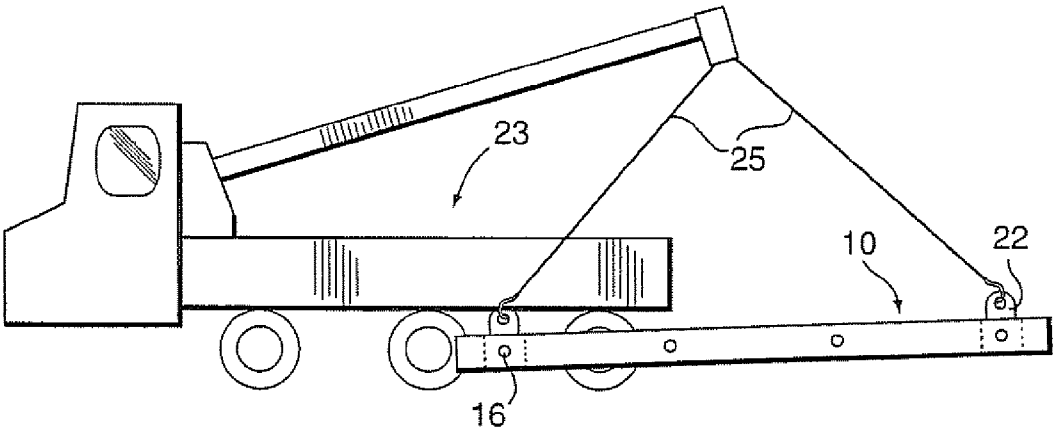


Figure 4

Fig.5



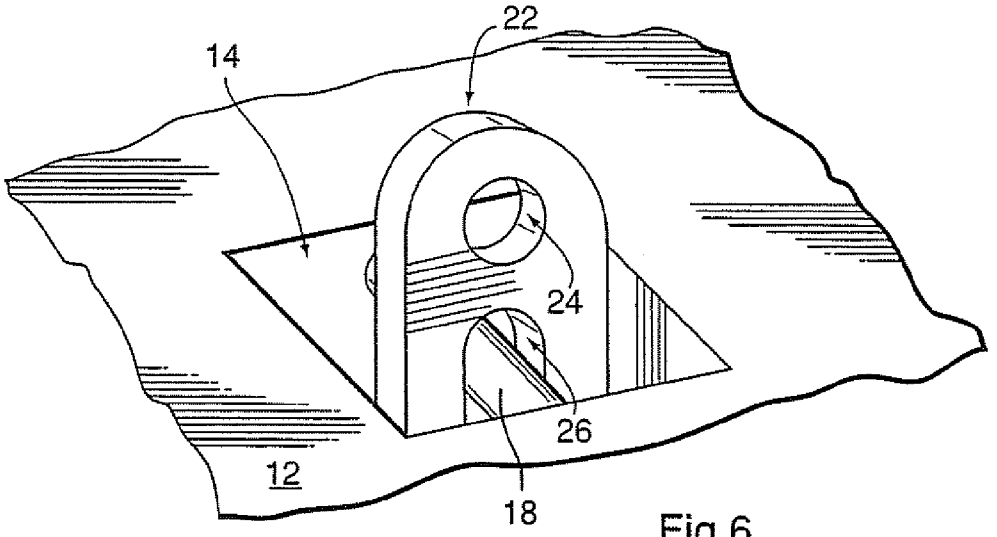


Fig.6

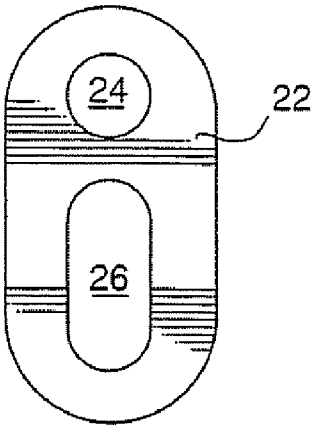


Fig.7

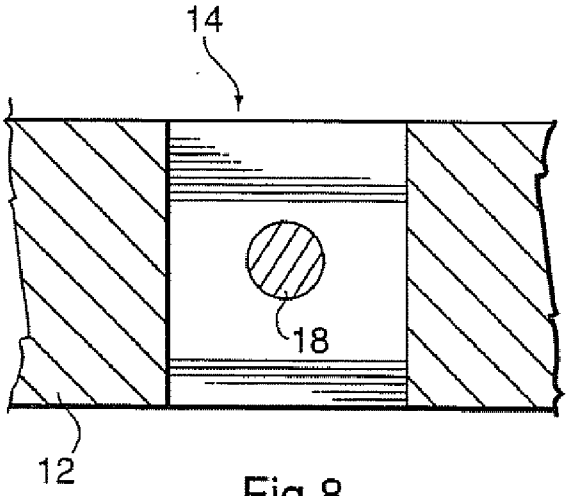


Fig.8

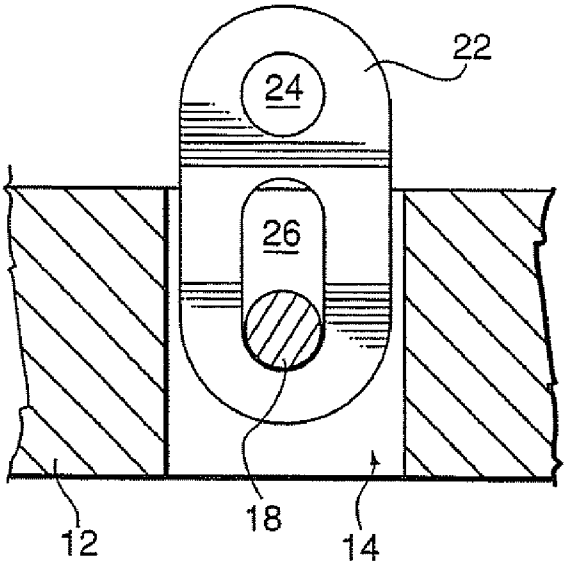


Fig.9

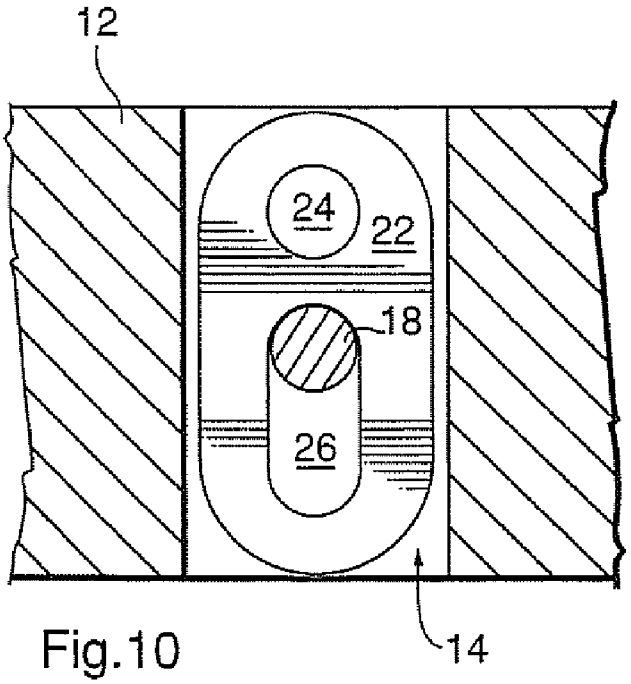


Fig.10

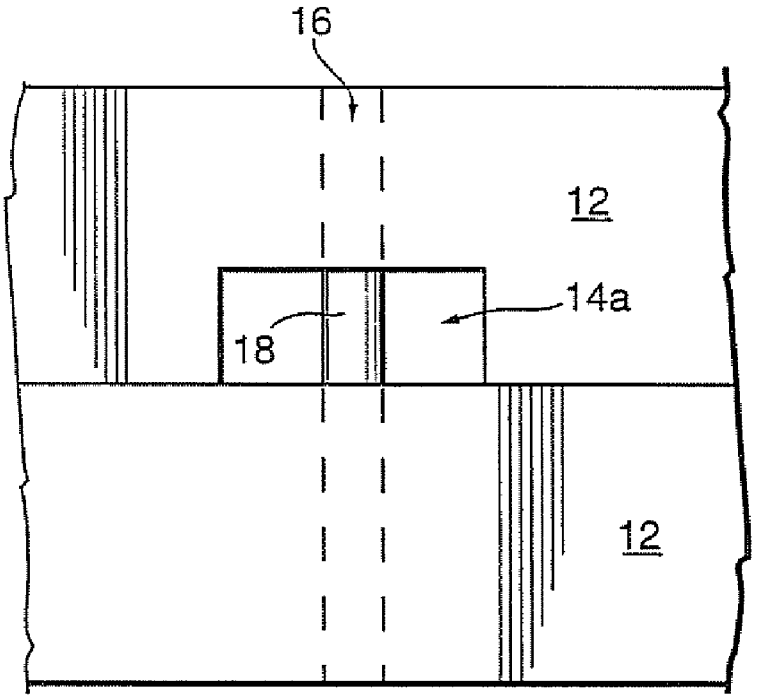


Fig.11

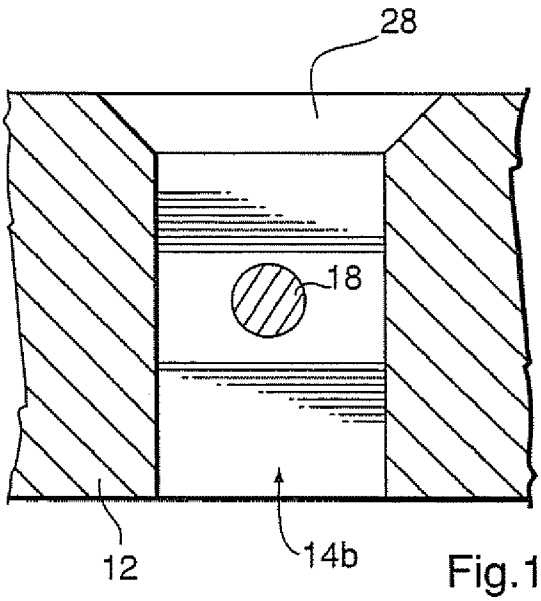


Fig.12

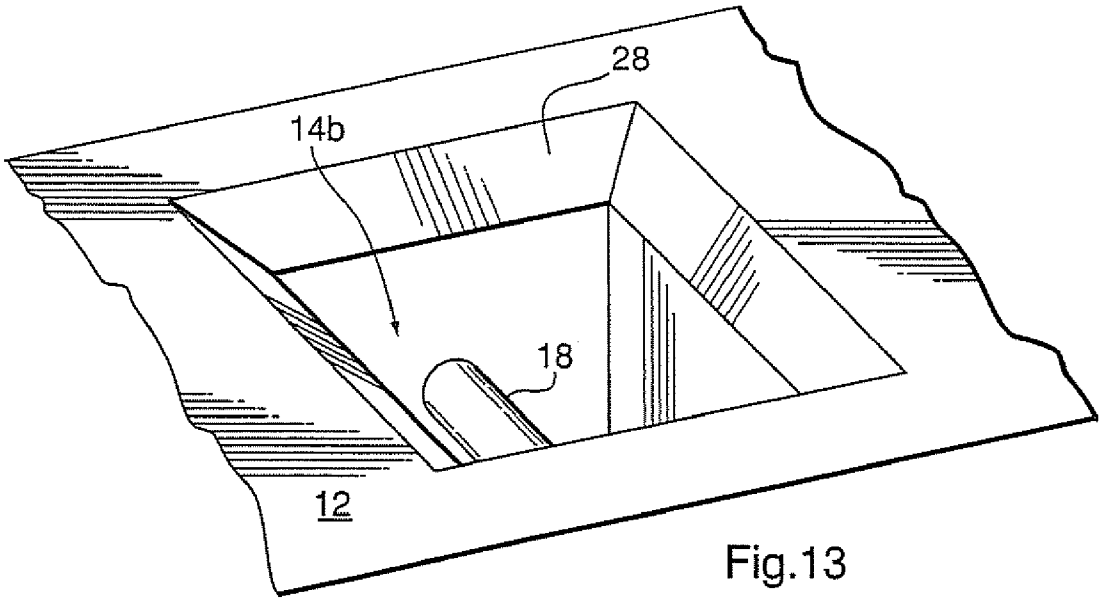


Fig.13

Fig.14

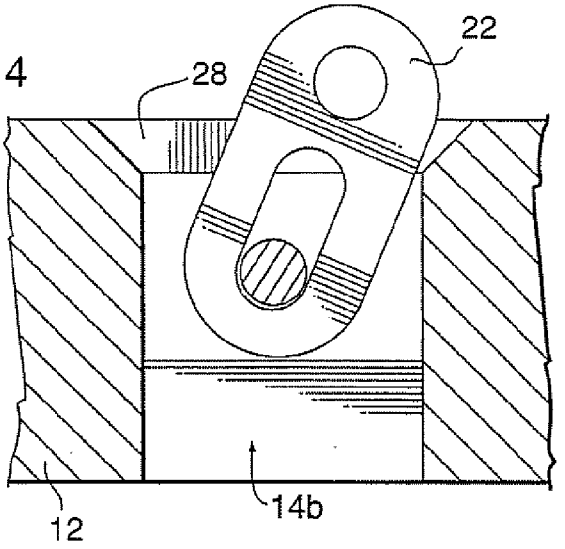


Fig.15

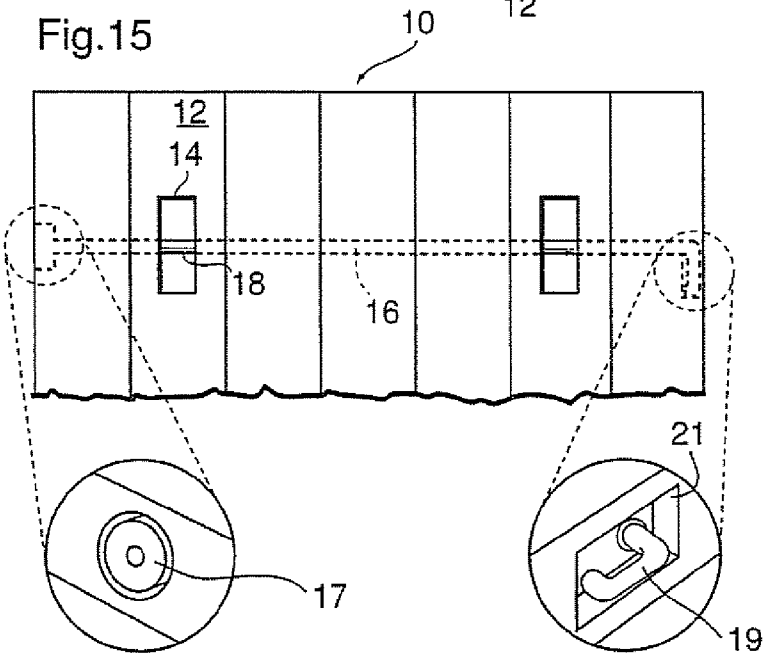
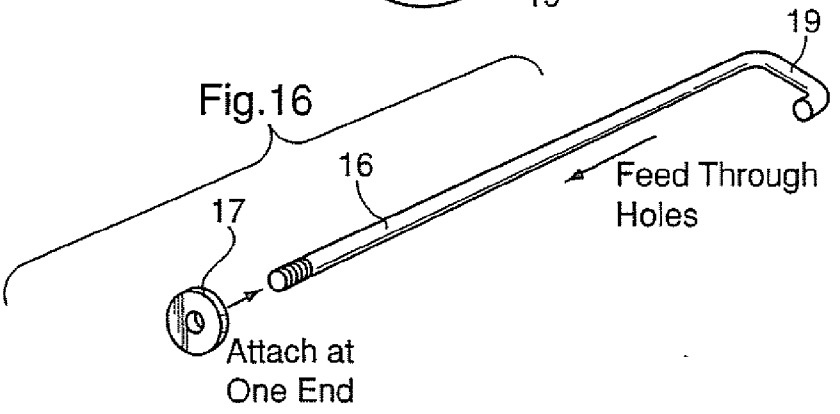


Fig.16



GROUND COVERING SUPPORT STRUCTURE

[0001] This application claims priority from U.S. Provisional Application No. 60/917,280 filed on May 10, 2007, the contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0002] The following relates generally to ground covering support structures and has particular utility in providing temporary roadways or around cover for large, outdoor work areas such as at a well site or a construction site.

BACKGROUND

[0003] In remote and unstable environments, a stable roadway (or any roadway) may not exist. Temporary roadways are sometimes assembled by aligning planks, boards or "mats" along a desired path. Such temporary roadways or otherwise ground covering support structures are commonly referred to as access rig or oilfield mats. The mats enable trucks and other equipment to drive over, store equipment on, or create camp sites on otherwise unstable land by providing a relatively level and stable surface.

[0004] Where many access mats are required to build a temporary roadway, it can be onerous to transport and assemble the mats into position. Some prior access mats such as those shown in U.S. Pat. Nos. 4,600,336 to Waller, Jr.; 5,713,695 to Rogers and U.S. Publication No. 2006/0034654 to Sanders; provide lifting points, however, these lifting points can either be difficult to access or may provide a trip hazard when protruding from the upper surface.

[0005] Where the lifting points are difficult to access, the loading/unloading, and moving of the mats can be hindered, and trip hazards can create unsafe working environments.

[0006] It is therefore an object of the following to obviate or mitigate the above-mentioned disadvantages.

SUMMARY

[0007] In one aspect, there is provided a ground covering support structure comprising a plurality of longitudinally aligned boards secured to one another using, a plurality of transversely extending rods; and at least one aperture formed in the support structure, the at least one aperture being aligned with a corresponding one of the rods such that an exposed portion of the corresponding one of the rods passes through the aperture, each the at least one aperture containing a retractable lifting link, the retractable lifting link comprising a lifting eyelet and an elongated slot; wherein the rod passes through the elongate slot to restrict movement of the link through the aperture.

[0008] In another aspect, there is provided a ground covering support structure comprising a plurality of longitudinally aligned boards secured to one another using a plurality of transversely extending rods; and at least one aperture formed in the support structure, the at least one aperture being aligned with a corresponding one of the rods such that an exposed portion of the corresponding one of the rods passes through the aperture.

[0009] In yet another aspect, there is provided a ground covering support structure comprising at least one aperture formed therein, each the at least one aperture containing a retractable lifting link secured therein by a rod passing therethrough, the retractable lifting link comprising a lifting eyelet and an elongated slot; wherein the rod passes through the elongate slot to restrict movement of the link through the aperture.

[0010] In yet another aspect, there is provided a retractable lifting link to permit lifting a ground covering support structure, the lifting link comprising a lifting eyelet and an elongated slot to enable the lifting link to be secured within an aperture in the support structure by a rod passing therethrough such that movement of the lifting link through the aperture is restricted.

[0011] In yet another aspect, there is provided a ground covering support structure comprising at least one board constructed of a recycled material such as beetle kill lumber, plastic or rubber.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] An embodiment of the invention will now be described by way of example only with reference to the appended drawings wherein:

[0013] FIG. **1** is a perspective view of an access mat.

[0014] FIG. **2** is an enlarged perspective view of portion A shown in FIG. **1**.

[0015] FIG. **3** is an elevation view of the access mat of FIG. **1**.

[0016] FIG. **4** is a plan view of the access mat of FIG. **1**.

[0017] FIG. **5** is a pictorial view showing the unloading of the access mat of FIG. **1**.

[0018] FIG. **6** is an assembly view showing portion A of FIG. **1** with a lifting link.

[0019] FIG. **7** is a plan view of the lifting link of FIG. **6**.

[0020] FIG. **8** is a sectional view along the line B-B in FIG. **2**.

[0021] FIG. **9** is the sectional view of FIG. **8** assembled with the lifting link of FIG. **7** in one configuration.

[0022] FIG. **10** is the sectional view of FIG. **9** in another configuration.

[0023] FIG. **11** is a partial plan view of another embodiment.

[0024] FIG. **12** is a sectional view of portion A along line B-B in yet another embodiment.

[0025] FIG. **13** is a partial perspective view of the portion shown in FIG. **12**.

[0026] FIG. **14** is a sectional view of portion A along line B-B in yet another embodiment.

[0027] FIG. **15** is an enlarged portion of the plan view shown in FIG. **4**.

[0028] FIG. **16** is an exploded perspective view of a rod.

DETAILED DESCRIPTION OF THE DRAWINGS

[0029] Referring now to FIG. **1**, an access mat **10** is constructed from a series of longitudinally aligned boards **12** attached to each other. It will be appreciated that the access mat may be generally considered as a ground covering support structure that can be used to create temporary roadways as well as any outdoor work area such as at a well site or a construction site.

[0030] The boards **12** are preferably made from a recycled material such as beetle kill lumber e.g.—Douglas Fir or pine, which is relatively inexpensive and can be salvaged and reused for additional environmental benefits. It will be appreciated that recycled plastics or rubber materials can also be used, as well as new materials depending on the application

and/or expected environment. The boards **12** are attached by a series of transversely extending rods **16**. In the example shown in FIG. **1**, four rods **16** are used. Aligned with the endmost rods **16**, a series of apertures **14** are formed in selected boards **12**. In the arrangement shown in FIG. **1**, four apertures **14** are formed in the corner portions of the mat **10** such that the intersection of lines passing diagonally across the mat **10** is approximately in alignment with the centre of the mat **10**. Such an alignment is used to balance lifting loads as will be explained below. Preferably, the apertures **14** are symmetrically spaced as shown in FIG. **1**.

[0031] The apertures **14** may be cut or mortised through the middle portion of the boards **12** as shown in FIGS. **1**, **2** and **4** or may be cut or mortised as notches **14***a* along one edge of the board **12** as shown in FIG. **11**. The notches **14***a* simplify construction of the selected boards **12** by reducing the number of cuts made and/or simplifying the machinery required to create the apertures **14**. The apertures **14** may also comprise an inwardly and downwardly angled bevel **28** cut around the perimeter of the opening on the upper surface of the board **12** as shown in FIGS. **12** and **13** (referred to hereinafter as aperture **14***b*). A similar gouge or partial bevel along one edge of the aperture **14** may also be used.

[0032] When aligned, the boards **12** may be secured to each other along their respective lengths by drilling through the boards and embedding the rods **16**. As can be seen in FIGS. **15** and **16**, in one embodiment, the rods **16** are threaded at one end to accommodate a nut **17** and link (not shown) and are given a bent portion **19** at the other end. When assembled, the holes in the board **12** at one end can be countersunk to accommodate the nut **17** and a routered pocket **21** can be cut into the board **12** at the other end such that the bent portion **19** countersinks into the board **12** when the nut **17** is tightened on the rod **16**. The bent portion **19** enables the mat **10** to be assembled by tightening at only one end rather than having to tighten at both ends. Since it is preferable to countersink the nut **17**, only having to tighten one end increases the efficiency of the assembly process. It has been found that 1" rods and up to 1¼" holes provides an adequate fit between the boards **12** and the rod **16**.

[0033] The endmost rods **16** are aligned with the apertures **14** such that an exposed portion **18** of the respective rods **16** pass substantially through the centre of the aperture **14** as shown in FIGS. **2** and **4**. As can be seen in FIG. **3**, when assembled, the access mat **10** can provide a stable surface atop a region of underlying material **20** such as earth or stones. The mats **10** can be placed end to end to form a temporary roadway over such underlying material **20**.

[0034] The apertures **14** can be sized such that the exposed portions **18** of the rods **16** provide a set of lifting points. For such an embodiment, the apertures **14** would be sized to accommodate an appropriately sized hook or other attachment mechanism.

[0035] In another embodiment illustrated pictorially in FIG. **5**, a transport vehicle **23** having a crane with lifting cables **25** (or other similar lifting apparatus) can rely on a series of retractable lifting links **22** that can be retrieved from the apertures **14** to hoist the access mat **10**. As can be seen in FIG. **6**, the links **22** can be attached to the mat **10** by inserting the rods **16** through an elongated slot **26** such that the link **22** pulls against the exposed portion **18** to thereby lift the mat **10**. The link **22** also provides a lifting eyelet **24** or other suitable aperture, hole or slot to accommodate the attachment of a hook or lifting mechanism. The link **22** is also shown in FIG. **7**. It can be seen by referring to FIGS. **7** through **10** that the elongated slot **26** permits the link **22** to be pulled out from the aperture **14** for lifting, and permits the link **22** to be hidden within the board **12** when not in use. In this way, when the access mat **10** is in situ, the link **22** does not create a trip hazard. However, the link **22** is readily accessible when the mat **10** is to be lifted and/or transported.

[0036] It can be appreciated that the apertures **14**, **14***a*, **14***b* can be sized to restrict pivotal movement of the links **22** about the rods **16** as shown best in FIGS. **9** and **10** or may be sized similar to the proportions shown in FIG. **6** to permit a predefined amount of pivotal movement as shown in FIG. **14**. In order to adjust the amount of pivotal movement permitted, the rods **16** can be realigned towards the upper surface of the mat **10** and the apertures **14***b* with bevel **2**S used to provide additional maneuverability. The pivotal rotation enables the link **22** to naturally align with the tension forces in the lifting cables **25** to reduce wear and stress on the boards **12** when the mat **10** is being lifted. A similar gouge or partial bevel may instead be provided along only one edge of the aperture **14** so as to provide better access to the link **22**.

[0037] As noted above, the access mat **10** can be constructed of a recycled product such as beetle kill lumber such as Douglas fir or pine that has been found to be capable of withstanding approximately 30,000 lbs or more. Other materials may instead be selected to accommodate different loads in different environments. The advantages of using beetle kill lumber or similar waste products is that the material may be relatively inexpensive to acquire and provides an environmental benefit. Where the access mats **10** are to be constructed for temporary use and discarded later, the use of a recycled cost effective material is also desirable.

[0038] As can be seen in FIG. **1**, a radio frequency identification (RFID) tag **7** can be embedded into the access mats **10** in a routered pocket **8** to enable the access mats **10** to be included in an inventory system (not shown). The RD tags **7** provide an owner and/or renter of the mats **10** with a unique identification serial number for each individual mat **10**. Where many mats **10** are being used and/or rented, this enables the tracking and reconciliation of the inventory. In this way, e.g., as mats **10** are unloaded off of the vehicle **23**, an REID reader (not shown) can record each mat **10** that is placed at that particular job site. Therefore, inventory associated with that job site can be recorded for later referral, billing, etc. As mats **10** are later loaded back onto the vehicle **23**, they can again be scanned or read to ensure that all mats **10** are accounted for. It will be appreciated that the RFID tags **7** can be active or passive and other tracking devices such as barcodes (not shown) could similarly be used. Although the REID tag **7** is shown as being embedded on the side of the mat **10**, it will be appreciated that it may be embedded on the top, bottom, end etc. Preferably, the RFID tags **7** are sealed in the pocket **8** using a suitable adhesive or epoxy for protection, waterproofing and to not degrade the signals.

[0039] To assemble the access mat **10**, each board **12** is drilled to accommodate the rods **16** whereby one hole is drilled in each board **12** for each rod **16**. A drilling station can be used with a drill press for each hole to ensure a consistent spacing between the holes. The holes for the appropriate board **12** are then counter sunk to accommodate the nuts **17** at one end of the mat and the board **12** for the other end of the mat **10** is routered to provide the appropriate number of pockets **21**. The appropriate selection of boards **12** are then cut or mortised to form a series of apertures **14**, which may be

notches **14***a* or complete passages and may include a bevel **28** or gouge for accessing the link **22**.

[0040] The boards **12** consequently comprise a series of holes of which one hole is aligned substantially centrally across each aperture **14** as shown in FIG. **2**. Also, as shown in FIGS. **15** and **16**, the appropriate board **12** includes countersunk holes and the appropriate board includes routered pockets **21** for containing the bent portions **19**. It will be appreciated that there may be any number of apertures **14** and any number of rods **16** with corresponding countersinks and pockets **21**. However, the symmetrical arrangement shown in FIG. **1** is preferred.

[0041] In each aperture **14**, a link **22** may then be placed with the lifting eyelets **24** facing up such that when the rods **16** are embedded or fed into the boards **12**, the exposed portions **18** of each pass through the respective elongated slots **26**. The rods **16** are fed through the boards **12** by inserting the threaded end into the pocketed board and then through the remaining board until it emerges at the other side of the mat **10** where the nut **17** is tightened thus countersinking the rod **16** at both ends. As the rods **16** are embedded, the boards **12** are preferably secured against each other longitudinally and a suitable adhesive may be used to strengthen the assembly if desired. When assembled, the boards **12** may be trimmed at each end to provide flush end faces to accommodate end-to-end alignment.

[0042] The mat **10** may be lifted onto the vehicle **23** as shown in FIG. **5**, by first retrieving each link **22** from the respective aperture **14** and attaching the corresponding lifting cable **25** using the exposed lifting eyelet **24** when in the position shown in FIG. **6**, FIG. **9** or FIG. **14**. The link **22** may be retrieved using a screwdriver, similar prying bar or even pulled out by the operator depending on the nature and size of the aperture **14**. For example, the aperture **14***b* having a bevel **28** or similar gouge along one side may better accommodate a prying bar or screwdriver by offering a clear angle towards the lifting eyelet **24**. In another example, the aperture **14** may be sized to provide enough peripheral room to enable the operator to grip the link **22**. It will be appreciated that the lifting eyelet **24** may be any suitable shape such as generally circular as shown, oval/elliptical etc.

[0043] Once each link **22** has been retrieved and attached to the lifting cables **25**, the vehicle may then lift the mat **10** onto a flatbed or other surface for transport. When the cables **25** are detached, the links **22** simply slide into the apertures **14** leaving a substantially flush upper surface enabling several mats **10** to be stacked atop each other without becoming unstable. When unloading, a similar process can be followed.

[0044] It can therefore be seen that the link **22** can be hidden when not in use and readily retrieved for lifting and/or transportation. The link **22** does not present a trip hazard yet greatly aids in the handling of the access mats **10**. It will be appreciated that although preferably used with a set of corresponding links **22**, the access mats **10** as shown in FIGS. **1**, **3** and **4** may also be used without the links **22** if so desired. It will also be appreciated that the boards **12** may also be used with any suitable material that can withstand the anticipated weight of the machinery expected to cross the temporary pathway or roadway.

[0045] Although the invention has been described with reference to certain specific embodiments, various modifications thereof will be apparent to those skilled in the art without departing from the spirit and scope of the invention as outlined in the claims appended hereto.

1. A ground covering support structure comprising a plurality of longitudinally aligned boards secured to one another using a plurality of transversely extending rods; and at least one aperture formed in said access mat, said at least one aperture being aligned with a corresponding one of said rods such that an exposed portion of said corresponding one of said rods passes through said aperture, each said at least one aperture containing a retractable lifting link, said retractable lifting link comprising a lifting eyelet and an elongated slot; wherein said rod passes through said elongate slot to restrict movement of said link through said aperture.

2. The support structure according to claim **1**, said at least one aperture extending through a respective one of said boards.

3. The support structure according to claim **1**, said at least one aperture being cut as a notch along one side of a respective one of said boards such that one wall of said aperture is provided by an adjacent board.

4. The support structure according to claim **1**, said at least one aperture comprising a bevel along at least a portion of one edge.

5. The support structure according to claim **1**, said at least one aperture being sized substantially similar to said lifting link to restrict pivotal movement thereof.

6. The support structure according to claim **1**, said at least one aperture being longer in the longitudinal dimension of said board than the width of said link such that pivotal movement of said link is accommodated.

7. The support structure according to claim **6**, said at least one aperture comprising a bevel.

8. The support structure according to claim **1**, said at least one board being constructed of a recycled material such as beetle kill lumber, plastic or rubber.

9. The support structure according to claim **1** wherein said link is formed as an elongate member rounded at each end, said lifting eyelet being, formed at one end and said elongated slot being extending from the other end towards said eyelet.

10. The support structure according to claim **1** wherein said corresponding one of said rods passes through substantially the centre of said at least one aperture.

11. The support structure according to claim **1** wherein said rod is threaded at one end to accommodate a nut and is bent at another end to retain said rod.

12. The support structure according to claim **1** further comprising a radio frequency identification tag affixed thereto.

13. A ground covering support structure comprising a plurality of longitudinally aligned boards secured to one another using a plurality of transversely extending rods; and at least one aperture formed in said access mat, said at least one aperture being aligned with a corresponding one of said rods such that an exposed portion of said corresponding one of said rods passes through said aperture.

14. The support structure according to claim **13** wherein said corresponding one of said rods passes through substantially the centre of said at least one aperture.

15. The support structure according to claim **13**, said at least one aperture extending through a respective one of said boards.

16. The support structure according to claim **13**, said at least one aperture being cut as a notch along one side of a respective one of said boards such that one wall of said aperture is provided by an adjacent board.

17. The support structure according to claim **13**, said at least one aperture comprising a bevel along at least a portion of one edge.

18. The support structure according to claim **13**, said at least one aperture being sized substantially similar to said lifting link to restrict pivotal movement thereof.

19. The support structure according to claim **13**, said at least one aperture being longer in the longitudinal dimension of said board than the width of said link such that pivotal movement of said link is accommodated.

20. The support structure according to claim **19**, said at least one aperture comprising a bevel.

21. The support structure according to claim **13**, said at least one board being constructed of a recycled material such as beetle kill lumber, plastic or rubber.

22. The support structure according to claim **13** wherein said rod is threaded at one end to accommodate a nut and is bent at another end to retain said rod.

23. The support structure according to claim **13** further comprising a radio frequency identification tag affixed thereto.

24. A ground covering support structure comprising at least one aperture formed therein, each said at least one aperture containing a retractable lifting link secured therein by a rod passing therethrough, said retractable lifting link comprising a lifting eyelet and an elongated slot; wherein said rod passes through said elongate slot to restrict movement of said link through said aperture.

25. The support structure according to claim **24**, said at least one aperture extending through a respective one of said boards.

26. The support structure according to claim **24** wherein said link is formed as an elongate member rounded at each end, said lifting eyelet being formed at one end and said elongated slot being extending from the other end towards said eyelet.

27. The support structure according to claim **24**, said at least one aperture being cut as a notch along one side of a respective one of said boards such that one wall of said aperture is provided by an adjacent board.

28. The support structure according to claim **24**, said at least one aperture comprising a bevel along at least a portion of one edge.

29. The support structure according to claim **24**, said at least one aperture being sized substantially similar to said lifting link to restrict pivotal movement thereof.

30. The support structure according to claim **24**, said at least one aperture being longer in the longitudinal dimension of said board than the width of said link such that pivotal movement of said link is accommodated.

31. The support structure according to claim **30**, said at least one aperture comprising a bevel.

32. The support structure according to claim **24**, said at least one board being constructed of a recycled material such as beetle kill lumber, plastic or rubber.

33. The support structure according to claim **24** wherein said rod is threaded at one end to accommodate a nut and is bent at another end to retain said rod.

34. The support structure according to claim **24** further comprising a radio frequency identification tag affixed thereto.

35. A retractable lifting link to permit lifting a ground covering support structure, said lifting link comprising a lifting eyelet and an elongated slot to enable said lifting link to be secured within an aperture in said support structure by a rod passing therethrough such that movement of said lifting link through said aperture is restricted.

36. The lifting link according to claim **35** wherein said link is formed as an elongate member rounded at each end, said lifting eyelet being formed at one end and said elongated slot being extending from the other end towards said eyelet.

37. A ground covering support structure comprising at least one board constructed of a recycled material such as beetle kill lumber, plastic or rubber.

38. The support structure according to claim **37** further comprising a radio frequency identification tag affixed thereto.

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