US 20070056228A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2007/0056228 A1

Penland, SR. et al. (43) Pub. Date: Mar. 15, 2007

(54) INTERLOCKING LAMINATED SUPPORT MAT

(76) Inventors: **Joe E. Penland SR.**, Kountze, TX (US); **Jon C. Fuitak**, Cape Elizabeth, ME (US); **Shane M. McDougall**, Caribou, ME (US); **Albert P. Putnam III**, Winterport, ME (US)

Correspondence Address:
HOWREY LLP
C/O IP DOCKETING DEPARTMENT
2941 FAIRVIEW PARK DRIVE, SUITE 200
FALLS CHURCH, VA 22042-7195 (US)

(21) Appl. No.: **11/543,456**

(22) Filed: **Oct. 5, 2006**

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/011,724, filed on Dec. 14, 2004, now Pat. No. 7,137,226, which is a continuation-in-part of application No. 10/377,009, filed on Feb. 28, 2003, now Pat. No. 7,141,137.

(60) Provisional application No. 60/394,814, filed on Jul. 10, 2002.

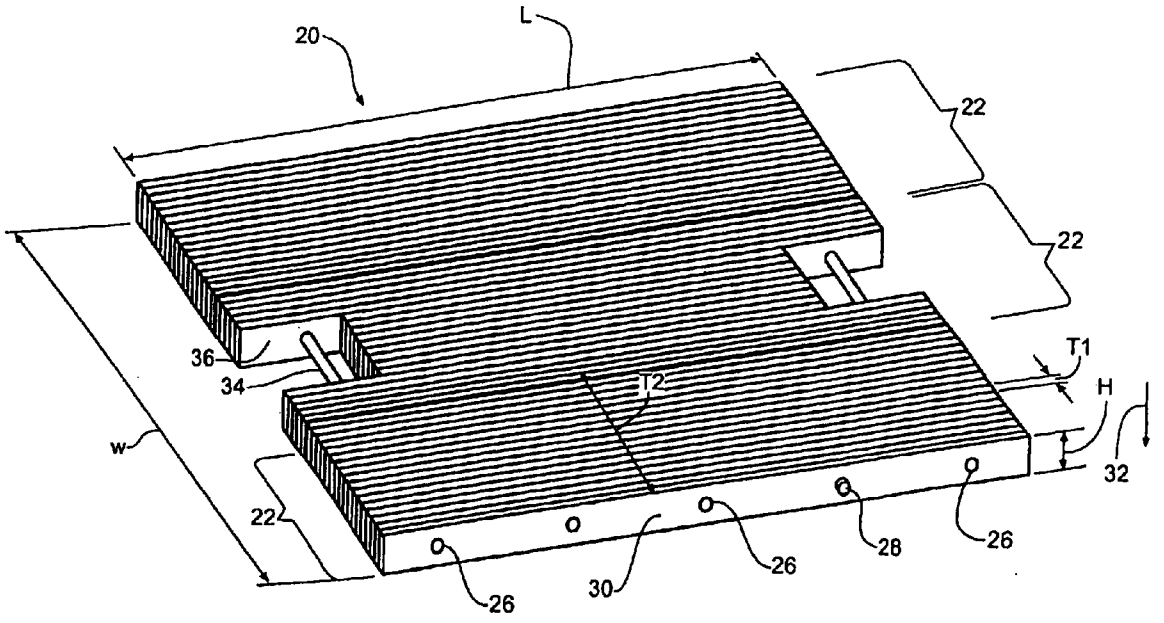
Publication Classification

(51) **Int. Cl.**
E04F 15/00 (2006.01)

(52) **U.S. Cl.** **52/177**

(57) **ABSTRACT**

A laminated one-ply support mat comprised of a plurality of individual wood hat includes means for transferring load and interlocking with an adjacent one-ply The laminated one-ply support mat may be suitable for the construction of ads, flooring, or platforms to support heavy equipment. The laminated one-ply ay include a non-laminated member fastened to each side to prevent damage to the laminated support mat. The laminated one-ply support may be comprised of a individual wood laminations fastened together by a plurality of nuts and bolts support mat to be disassembled and repair in the field.



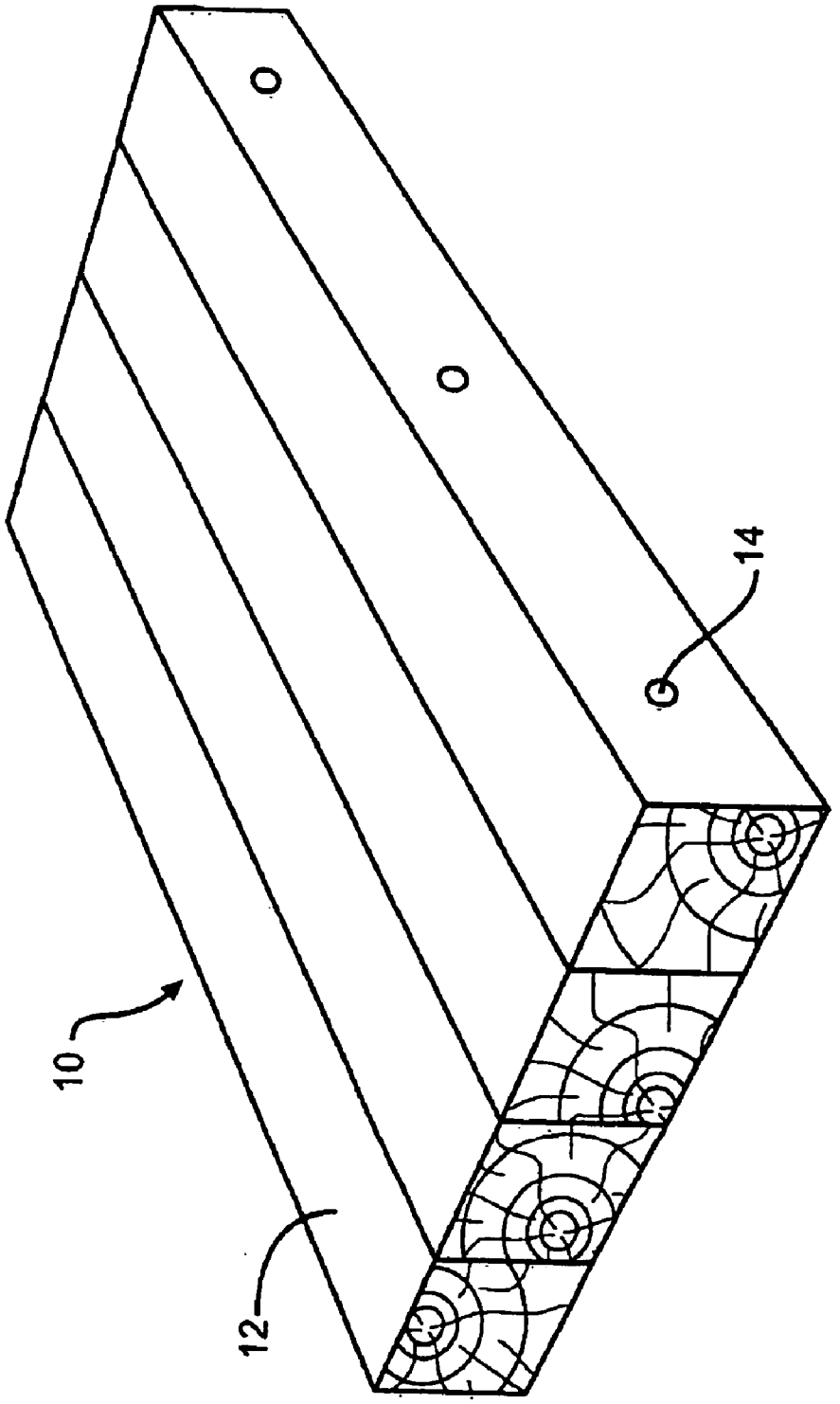


FIG. 1
(PRIOR ART)

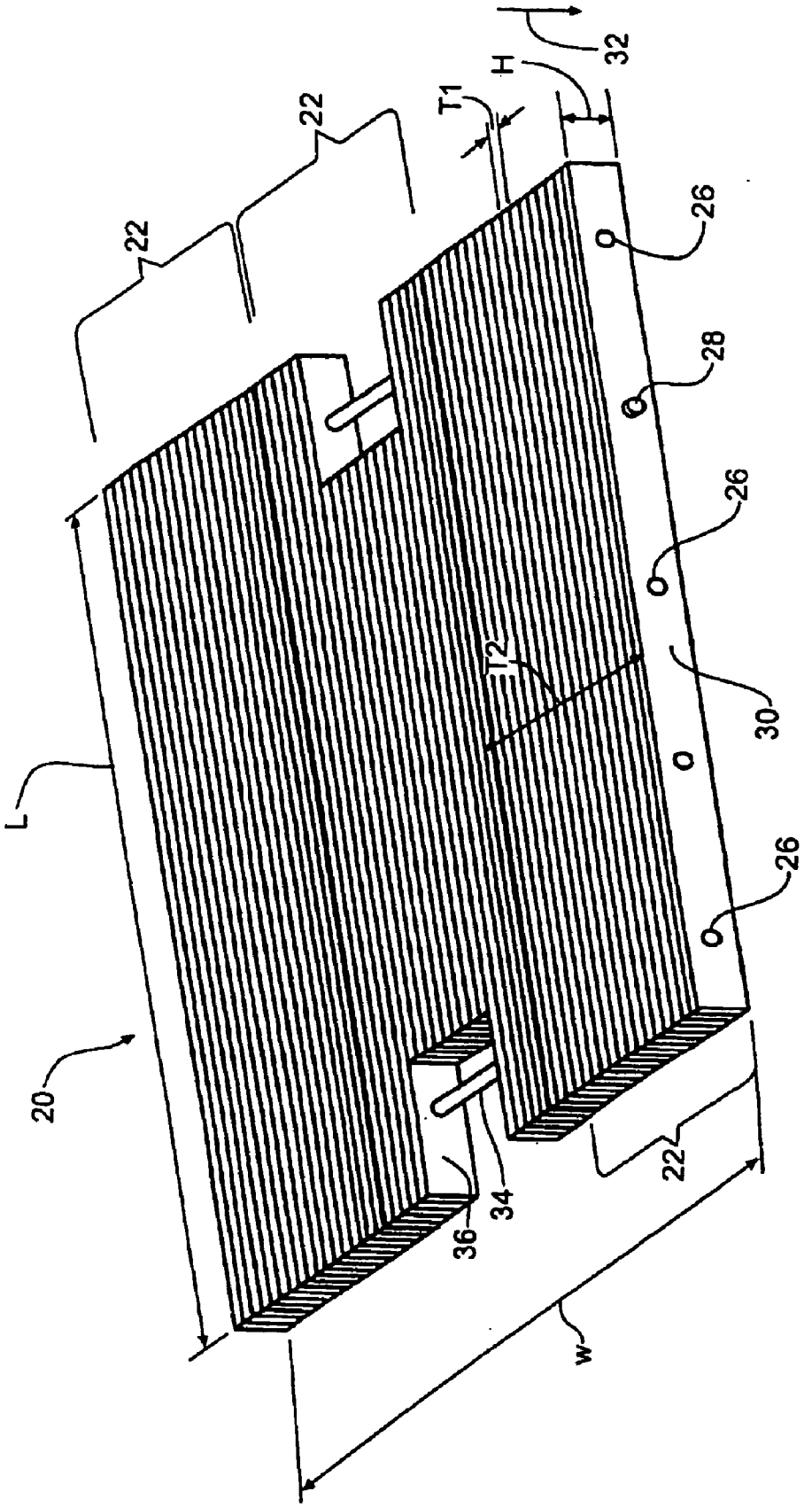


FIG. 2

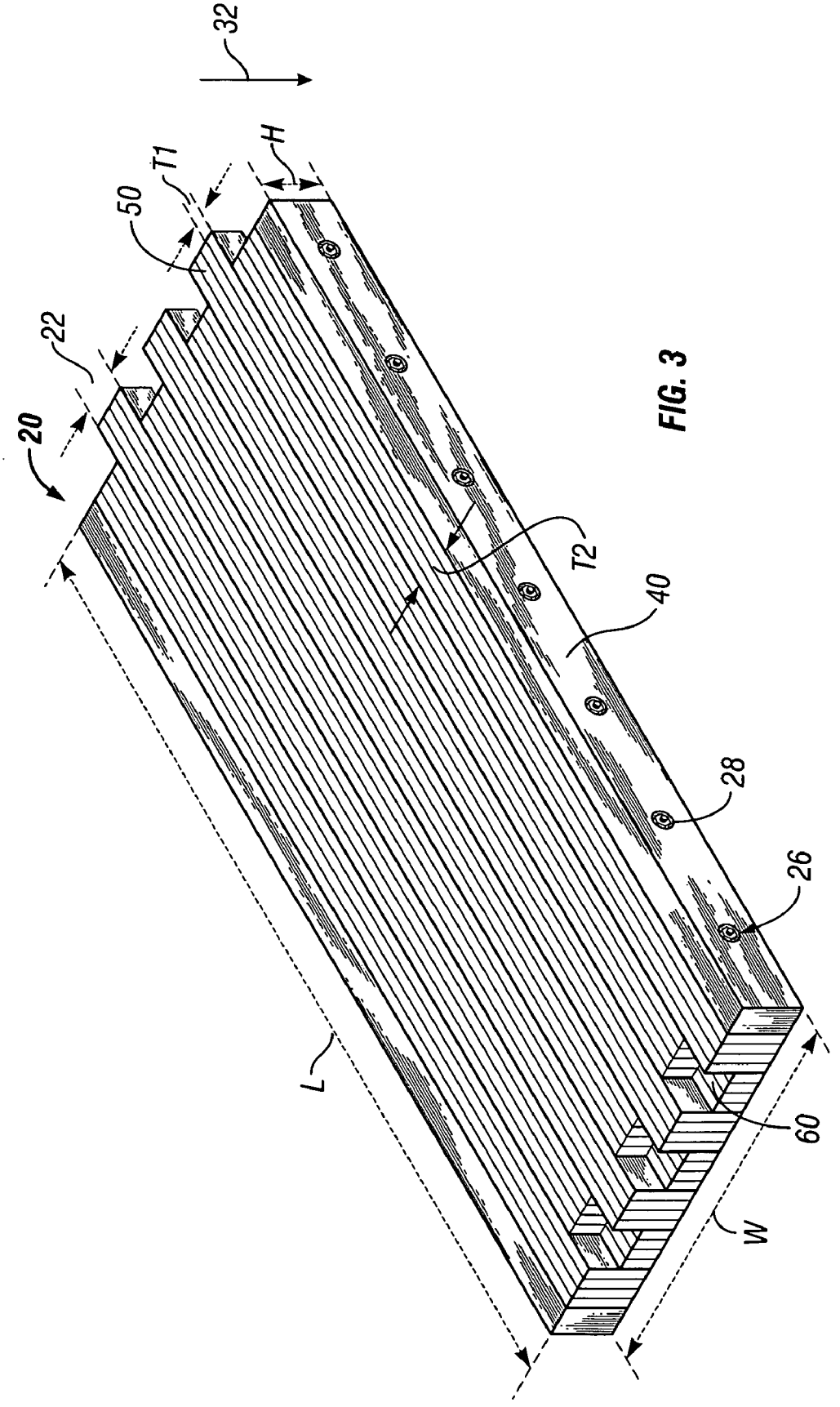


FIG. 3

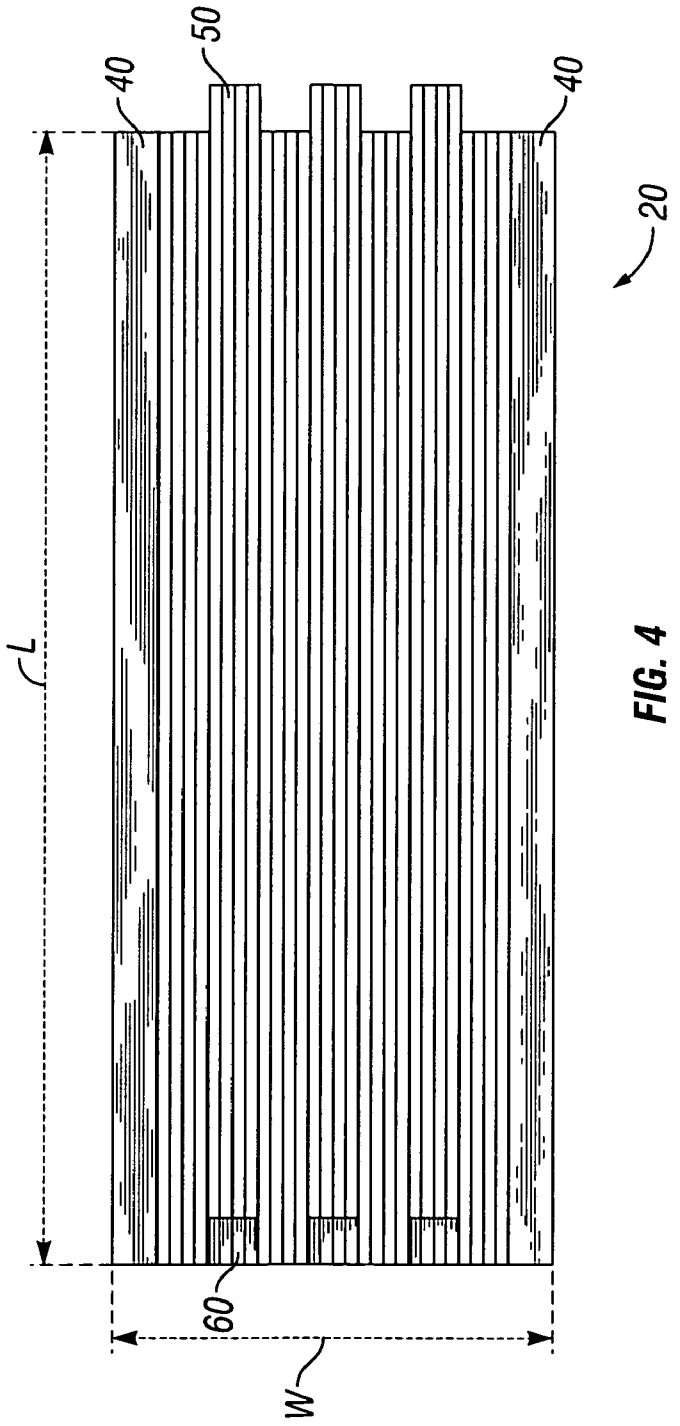


FIG. 4

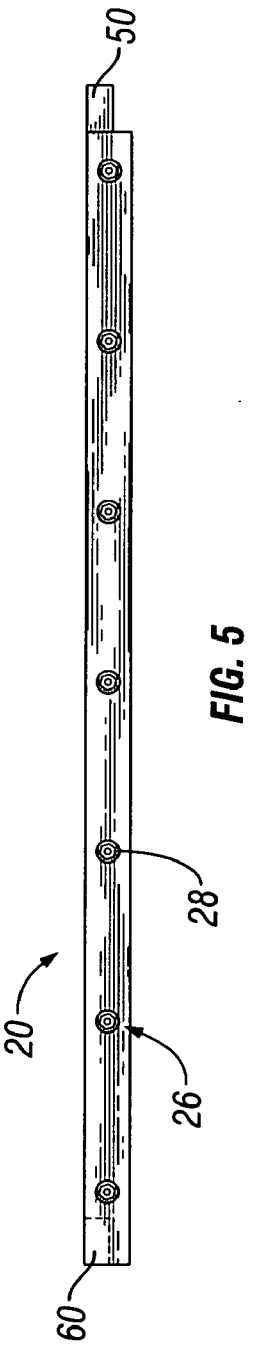
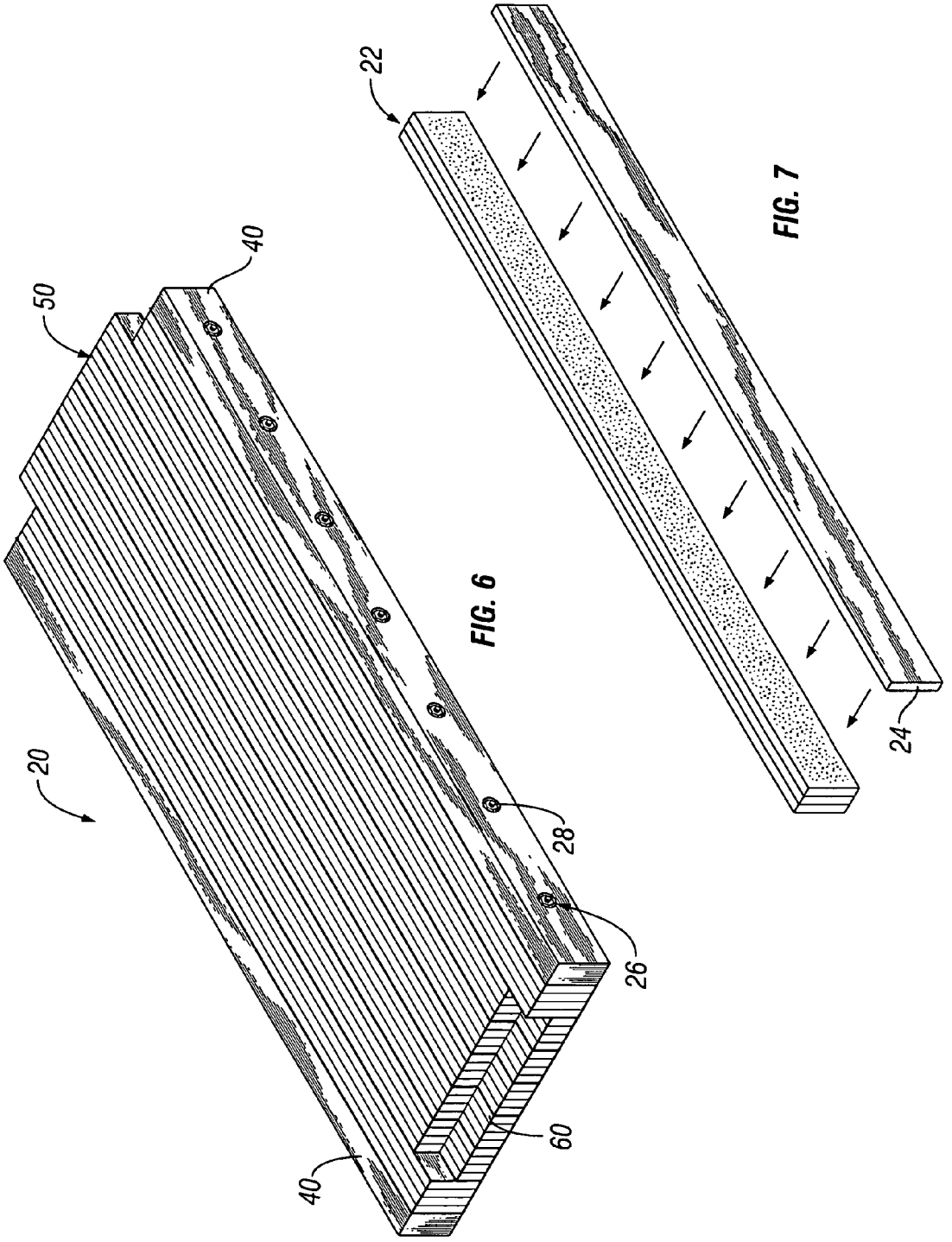


FIG. 5


22
24
FIG. 7
40
50
20
28
26
60
40
FIG. 6

INTERLOCKING LAMINATED SUPPORT MAT

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation-in-part of co-pending U.S. patent application Ser. No. 11/011,724, filed Dec. 14, 2004, entitled "Laminated Support Mat," which is a continuation-in-part application of U.S. patent application Ser. No. 10/377,099, filed Feb. 28, 2003, entitled "Method of Making Laminated Wood Beams With Varying Lamination Thickness Throughout the Thickness of the Beam," which claims priority to U.S. provisional application Ser. No. 60/394,814, filed Jul. 10, 2002, each of which is incorporated herein in its entirety by reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to an improved laminated one-ply support mat that may interlock with adjacent one-ply support mats to form a temporary road, platform, or flooring. The improved laminated one-ply support mat may be used as a support surface or pathway for heavy equipment to access remote areas to conduct construction, oil field exploration, and/or drilling operations. The improved laminated one-ply support mat has numerous applications in addition to be used in the oil and gas industry as would be appreciated by one of ordinary skill in the art having the benefit of this disclosure.

[0004] 2. Description of the Related Art

[0005] Oil field exploration and drilling operations are often undertaken in remote areas that do not have any established roads. Further, the terrain often includes swaps, marshlands, riverbeds, snow covered regions, areas having soft or sandy soil, or environmentally sensitive areas. These conditions often make it difficult to access with vehicles and equipment necessary for the exploration and drilling operations.

[0006] In order to reach these remote locations, temporary roads were often constructed out of solid sawn wood and wood boards. These prior art systems have typically taken the form of a series of wooden boards laid parallel to one another to form a layer. Multiple layers of such boards are formed by laying the individual boards perpendicular to the boards of the underlying layer. In the past, such board roads and pads have been constructed by hand by placing each individual board in position. Typically, a drilling site pad is constructed by manually laying one board at a time to form a layer of spaced, parallel boards of various lengths along the ground. A second layer of boards is then manually placed on top of the first layer with the boards of the second layer running perpendicular to the boards of the first layer. The boards of the second layer are typically nailed onto the underlying boards and retained in position. The nails however can lead to flat tires of equipment, which are often difficult to have repaired due to the remote location of the site. Often times it is necessary to overlay a third layer of parallel boards in a direction perpendicular to the boards of the underlying layer. Such a crisscrossing pattern of layered boards is continued until a pad of sufficient size and strength is formed.

[0007] After drilling operations are complete, the boards must be manually removed. These systems thus require large amounts of time and manual labor to install and remove. Additionally, individual boards are often damaged during removal such that they are unsuitable for reuse.

[0008] FIG. **1** shows a conventional temporary road panel, shown generally at **10**, formed by using a plurality of solid sawn timber elements **12**. Typically, four pieces of solid sawn timber **12** are used, each having a cross-sectional dimension ranging from about 8 inches times 8 inches to about 12 inches times 12 inches, with a length of 16 feet. The four pieces of timber **12** are usually bolted together using bolts **14** to form the temporary road panel **10** having an assembled dimension of 4 feet times 1 foot times 16 feet. Several panels can be placed side by side over existing ground to form a temporary roadway or to support cranes on a construction site. Ground conditions under the panels vary greatly and may include, for example, sand, clay, wetlands, and possibly a considerable amount of water. Another conventional wood mat utilizes smaller dimensional lumber and utilizes nails, carriage bolts, or steel rods as a fastening system. All of these systems have mechanical fastening systems to transfer stresses between components.

[0009] The hardwood panels are typically discarded at the end of the construction project, or they may be re-used if they are in relatively good condition. The longevity of the panels may be as little as six months to one year, depending on the length of the construction project and the environmental conditions to which the panels are subjected. The wood panels are typically untreated with preservative chemicals because of environmental concerns. Hardwoods are typically used because of their superior wear resistance to heavy truck and other construction equipment traffic. In addition to road panels and crane mats, other applications for the hardwood panels include decks over steel girders for temporary bridges, and soldier piles.

[0010] Because the timber used to form the panel **10** is expensive, the panel **10** is very costly. Further, the roadway formed by the panels **10** is very costly because tens of thousands of the panels **10** may be needed for a single construction project. In addition, the solid sawn timber used to form the panel **10** is scarce because of the solid sawn timber must be extremely long, typically about sixteen feet in length. Further, each timber **12** is typically has an allowable design strength value within the range of from about 650 psi (pounds per square inch) to about 700 psi., thereby limiting the type and size of equipment which can be supported thereon.

[0011] In response to the large amounts of time and labor required to install and remove these temporary systems, a number of flooring systems in addition to the panel of FIG. **1** have been developed which utilize prefabricated mats or flooring units. These prefabricated units generally consist of multiple layers of boards, and are arranged and installed at the construction site to form the flooring system. A large number of patents have been issued disclosing multiple layered support mats that may be used to form a temporary road or flooring system. For example, U.S. Pat. No. 4,462,712 issued to Penland, Sr. and U.S. Pat. No. 5,822,944 also issued to Penland, Sr. disclose the use of a multiple layer mat used to create a temporary road or flooring system.

[0012] The multiple layer mats utilized by industry are typically constructed of solid sawn wood that is nailed together to form mat. The use of multiple layer mats has

been able to decrease the amount of labor and have been a benefit to the exploration and drilling for oil and gas, but some difficulties do exist in the construction of temporary roads and flooring. The use of nails to fasten the mat layers together may lead to flat tires on equipment used in these remote areas. This can be a difficult and frustrating problem because of the remote locations may make it difficult to have the tires repaired.

[0013] The weight of each individual multiple layer mat can also present a number of difficulties. The overall weight of the mat increases as each additional layer is added. Additionally, the addition of a layer increases the overall size of the mat. Increases in weight and size may increase both the transportation and the installation costs. For example, equipment is often used to transport mats from a storage location to a location to build a road. The mats may then be installed lengthening the road. As the road is built, the distance between the storage location and the end of the road increases causing the equipment to travel farther between trips. As the weight and size of the mats increases the same equipment can carry a smaller number of mats on each trip. Thus, larger mats require the equipment to make more trips to install the mat potentially increasing the cost to install the temporary road.

[0014] In an effort to reduce the overall weight of the mat, individual boards of each layer are often spaced apart. This space between individual boards can however be problematic. The equipment used in the exploration and/or drilling for gas and oil may use caterpillar tracks to move around on the temporary roads. Also equipment used in the winter may include spikes or tines for traction. The gaps between individual boards may allow the caterpillar tracks or spikes to pull up the top layer of boards from the multiple layer support mat. As a result, it is generally the industry practice to fasten a "sacrificial" layer of boards on top of the multiple layer support mats. The sacrificial layer of boards helps to prevent damage to the multiple layer support mats so the multiple layer mats may be reused. The installation and removal of the sacrificial layer of wood increases both the installation and material costs associated with the construction of temporary roads, flooring, and platforms.

[0015] The presence of a gap between the individual boards also allows for ice or mud to form between the boards when the multiple layer support mats are used in winter conditions. The ice may clench the bottom layer of the multiple layer mat causing the bottom layer to break off if the operator attempts to remove the map during the winter. If damaged, the mat can no longer be reused unless it is repaired. Because of the complex construction of the typical multiple layer mat, the damaged multiple layer mat must often be sent to a repair shop located offsite. Further, the damage done to the multiple layer mat often leaves fasteners such as nails at the work site, which may cause a flat tire to work equipment as discussed above.

[0016] The laminated support mat disclosed in U.S. patent application Ser. No. 11/011,724 overcomes a number of the above discussed problems. The support mat is a one ply support mat allowing it to be used during winter conditions as there are no layers that may be ripped off when an operator attempts to remove from frozen ground. Additionally, the support may is constructed of laminated beams fastened together without any gaps between the beams. Work equipment can also be driven on the laminated support mat without the fear of pulling off individual boards from the top layer. Although the laminated support mat is only a one-ply support mat, it is stronger than typical multilayer support mats because the individual wood laminations are vertically laminated together. The largest surfaces of the wood laminations are joined together creating a beam stronger than the individual boards of the multiple layer support mats. The one-ply laminated mat is not only stronger than a multiple layer mat, but it is also lighter than other conventional multiple layer support mats. This increase in strength and decrease in weight helps to reduce both the transportation and the installation costs.

[0017] The construction of the laminated support mat also facilitates repair in the field rather than sending the support mat to an offsite repair facility. In one embodiment, bolts and nuts fasten the laminated beams of the one-ply support mat together. If one beam is damaged, the support mat can be disassembled and a replacement beam can be used to reassemble the support mat. Typical multiple layer support mats used in the industry cannot be repaired in this fashion because layers may need to be removed to fix an underlying board. Further, the removal of the fasteners (i.e. nails) often may cause individual boards to crack or split.

[0018] As discussed above, support mats are often used to construct temporary roads or flooring. The multiple layer support mat often included interlocking structures to allow adjacent mats to be connected together. This is an important aspect due to the weight of the equipment used on the support mats. As the equipment moves between adjacent mats, the interlocking structure of multiple layer support mats transfers the load between the two mats at the interface. Adjacent support mats may move apart or buckle as heavy equipment moves between the mats if there is no load transferring structure between the adjacent mats. Thus, it would be beneficial to provide an interlocking configuration to permit one-ply laminated support mats to interlock.

[0019] Although the laminated support mats are generally stronger than multiple layer support mats, the laminated beams forming the outer, longitudinal edges are susceptible to damage if heavy equipment is driven over or along the edge of the support mat. The individual wood laminations may actually peel away or break off of the laminated support mats when heavy equipment is driven over an exposed edge. It would be beneficial to be able to use the lightweight laminated support mat, but prevent the edge of the lamination from peeling away from the support mat.

[0020] As discussed above, the laminated one-ply support mat may be comprised of multiple laminated beams fastened together by bolts and nuts. The laminated beams on the outer edge of the support mat may include counter sunk bores to house either the bolt head or the nut. The presence of the counter sunk bore may weaken the laminated beam compromising the strength of the laminated one-ply support mat. It would be beneficial to use a sheathing member that can be counter bored without weakening the support mat and also prevent the peeling of the laminated beam.

[0021] In light of the foregoing, it would be desirable to provide a one-ply laminated support mat that includes a load transfer structure that may engage an adjacent one-ply laminated support mat. It would also be desirable to provide a one-ply laminated support mat that includes a non-lami-

nated sheathing fastened to laminated beams located along the sides of the laminated one-ply support mat. The non-laminated sheathing may prevent peeling away of the laminated beams. Further, a counter sunk bore may be made into the non-laminated wooden sheathing without weakening the outer laminated beams of the one-ply laminated support mat.

[0022] The present invention is directed to overcoming, or at least reducing the effects of, one or more of the issues set forth above.

SUMMARY OF THE INVENTION

[0023] The object of the present disclosure is to provide a one-ply laminated support mat that is able to engage an adjacent one-ply laminated support mat such that at the interface loads are transferred between the two support mats. In one embodiment a support mat having a first end and a second end is disclosed. The support mat is comprised of a plurality of beams fastened together, each of the beams being made of a plurality of individual wood laminations adhesively bonded together. The laminated beams may be comprised of a plurality of vertically oriented individual wood laminations having wide faces oriented parallel to a direction of a load applied to the support mat. Each of the beams may include outboard laminations, the wide faces of the outboard laminations defining a wide face of the beam. The support mat may include at least one load transfer tab that extends from the first end of the support mat and at least one load transfer slot in the second end of the support mat. The at least one load transfer slot may be aligned with the at least one load transfer tab that extends from the first end of the support mat.

[0024] The load transfer tab may be positioned in the load transfer slot in the second end of an adjacent support mat to interlock the two mats. The support mat may further include a first non-laminate member fastened to a first side of the support mat and a second non-laminate member fastened to a second side of the support mat. The first non-laminate and the second non-laminate members may be wooden members. A plurality of bolts and a plurality of nuts may be used to fasten the plurality of laminate beams, the first non-laminate member, and the second non-laminate member together. The first non-laminate and second non-laminate members may include a plurality of counter bores.

[0025] In one embodiment a mat unit to be interlocked with a plurality of other mat units to form a one-ply mat system is disclosed. The mat unit includes a plurality of longitudinal beams fastened together to form a one-ply mat unit having a first end and a second end. Each longitudinal beam is comprised of a plurality of vertically oriented longitudinal wood laminations vertically bonded together. The mat unit further includes at least one load transfer tab that extends from the first end and at least one load transfer slot in the second end that is aligned with the at least one load transfer tab. The at least one load transfer tab may be positioned within a load transfer slot of an adjacent one-ply mat unit to form an interlocked portion of a flooring system, platform, or roadway.

[0026] A first non-laminate member and a second non-laminate member may be fastened to the sides of the mat unit. The first and second non-laminate members may be wooden members. A plurality of bolts and a plurality of nuts may be used to fasten the mat unit together. The non-laminate members may include a plurality of counter bores to house the plurality of bolts and plurality of nuts.

[0027] The load transfer slot of the mat unit may be wider that the load transfer tab to facilitate insertion of the load transfer tab into a load transfer slot of an adjacent mat unit. The number and configuration of the load transfer structures may be varied to provide adjacent mats to interlock as would be appreciated by one of ordinary skill in the art. For example, the three load transfer tabs may extend from the first end of the mat unit and the second end may include three corresponding load transfer slots.

[0028] In one embodiment of the present disclosure, a plurality of longitudinal wood members are fastened together to form a one-ply support mat having a first end and a second end, wherein at least one load transfer tab extends from the first end and the second end includes at least one load transfer slot. The load transfer tab of a one-ply support mat may be positioned within the load transfer slot of an adjacent one-ply support mat to interlock the mats.

[0029] One embodiment of the present disclosure is a method of constructing a one-ply support mat. The method includes laminating a plurality of individual wood members to make a plurality of laminated beams having a first length and laminating a plurality of individual wood members to make a plurality of laminated beams having a second length, wherein the second length is longer than the first length. A portion of the ends of each of the laminated beams having the second length may be removed to form a load transfer structure. The one-ply support mat may be constructed by fastened together laminated beams of the first length alternated by laminated beams including the load transfer structure. A non-laminated sheathing may then be fastened to the outside of the one-ply support mat. The method may further include drilling a plurality of counter bores in the non-laminated sheathing and drilling a plurality of holes through the laminated beams. The method may further include inserting a plurality of fasteners through the plurality of counter bores and plurality of holes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] FIG. **1** is a side perspective view of a prior art road panel formed of solid sawn timber.

[0031] FIG. **2** is a side perspective view of one embodiment of a laminated support mat.

[0032] FIG. **3** is a side perspective view of one embodiment of a one-ply laminated support mat that includes load transfer tabs and load transfer slots.

[0033] FIG. **4** is a top view of the embodiment of FIG. **3** of a one-ply laminated support mat that includes load transfer tabs and load transfer slots.

[0034] FIG. **5** is a side view of the embodiment of FIG. **3** of a one-ply laminated support mat that includes load transfer tabs and load transfer slots.

[0035] FIG. **6** is a side perspective view of one embodiment of a one-ply laminated support mat that has one load transfer tab and one load transfer slot.

[0036] FIG. **7** is a side perspective view illustrating that the laminated beam is comprised of individual wood laminations.

[0037] While the invention is susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and will be described in detail herein. However, it should be understood that the invention is not intended to be limited to the particular forms disclosed. Rather, the intention is to cover all modifications, equivalents and alternatives falling within the spirit and scope of the invention as defined by the appended claims.

DESCRIPTION OF ILLUSTRATIVE EMBODIMENTS

[0038] Illustrative embodiments of the invention are described below as they might be employed in a laminated support mat. In the interest of clarity, not all features of an actual implementation are described in this specification. It will of course be appreciated that in the development of any such actual embodiment, numerous implementation-specific decisions must be made to achieve the developers' specific goals, such as compliance with system-related and business-related constraints, which will vary from one implementation to another. Moreover, it will be appreciated that such a development effort might be complex and time-consuming, but would nevertheless be a routine undertaking for those of ordinary skill in the art having the benefit of this disclosure.

[0039] Further aspects and advantages of the various embodiments of the invention will become apparent from consideration of the following description and drawings.

[0040] As shown in FIG. **2**, a laminated support mat, indicated generally at **20**, is comprised of a plurality of laminated beams **22**. Each beam **22** comprises a plurality of wooden members or individual wood laminations **24** (FIG. **7**). As used in the description of the invention, the term "mat" includes mats as well as panels. Optional apertures **26** can be formed through the support mat **20** for receiving fastening means **28**, as will be described herein.

[0041] The individual wood laminations **24** are preferably fabricated by structurally joining together arbitrary or different lengths or strips of wood material. Preferably, the arbitrary strips of wood material are disposed end-to-end and joined together, preferably by a jointing process, such as, for example, by finger jointing. It is to be understood that the strips can be continuous and full length. More preferably, the arbitrary strips of wood are strips of hardwood, such as oak, birch, or maple, although any desired hardwood can be used. Softwoods can also be used, but are not usually preferred. The strips of wood laminations **24** can be any length, such as a length within the range of from about 5 feet to about 16 feet. The strips of wood material can be joined together to define the individual wood laminations **24** of any desired length, such as individual wood laminations having a length of about 16 feet. It will be understood however, that the individual wood laminations **24** can be of any other desired length. Not all the wood laminations **24** need to be formed by joining together the strips, and the beam can be formed with some of the laminations formed by joined strips, and some of the wood laminations **24** being a continuous piece of full length. Preferably, at least 50 percent of the wood laminations are made of strips joined together.

[0042] The individual wood laminations **24** preferably have a height H within the range of from about 3 inches to about 6 inches. More preferably, the individual wood laminations **24** have a height H of about 5½ inches. The individual wood laminations **24** can have any desired thickness T**1**. Preferably, the individual wood laminations **24** have a thickness T**1** within the range of from about 0.50 inches to about 1.00 inches. A typical laminated beam **22** might contain 14 to 16 laminations and have a width T**2** of about 12 inches.

[0043] A plurality of the individual wood laminations **24** are joined together to form the laminated beams **22**. Preferably, the individual wood laminations **24** are vertically oriented, having a wide face **30** oriented parallel to a direction of a load applied to the laminated beam **22**, with the load being indicated by arrow **32**.

[0044] The individual wood laminations **24** can be joined together into the beam **22** using any desired adhesive. Preferably, the individual wood laminations **24** are joined together with a waterproof adhesive, such as an adhesive that conforms to ASTM D2559-01. Preferably, the number of individual wood laminations **24** joined together to form the laminated beam **22** is a number within the range of from about 20 to about 30 laminations, although any number of individual wood laminations **24** can be used. More preferably, about 26 laminations are assembled together to form the laminated beam **22**.

[0045] The laminated beam **22** can have any desired width T**2**. Preferably, the laminated beam **22** has a width T**2** of about 12 inches. The laminated beams **22** can have any desired length L, such as, for example, a length L of about 12 feet. It will be understood however, that the laminated beams **22** can have any other desired length. As described regarding the individual wood laminations **24**, the laminated beams **22** preferably have a height H within the range of from about 3 inches to about 6 inches. More preferably, the laminated beams **22** have a height H of about 5½ inches.

[0046] A plurality of laminated beams **22** can be attached to one another by any suitable means to form the laminated support mat **20**. Preferably, the beams **22** are assembled together with a fastener, such as bolts **28** that extend through bolt apertures **26**. It will be understood that any other desired fastener can be used. Adhesive, binding wire, shear connections or brackets, all not shown, can also be used to connect the laminated beams **22** together into the mat **20**. These mechanical fastening systems allow stresses to be transferred between components. An adhesive can be used in conjunction with a mechanical fastening system. As shown in FIG. **2**, three laminated beams **22** are attached to one another to form the support mat **20**. The three laminated beams **22** further define a width W for the entire support mat **20**. It will be understood however, that any desired number of laminated beams **22** can be attached to one another to form the support mat **20**. Also, the laminated beams need not all be of the same width T**2**, but can be of different thicknesses.

[0047] If desired, the beams **22** can be provided with one or more lifting members **34** for the attachment of lifting cables, not shown. Optionally, the lifting members **34** are positioned within recesses **36**. The recesses are preferably formed at any location along an edge of the support mat **20**. Preferably, the recess **34** are formed at any location along the width W of the support mat **20**.

[0048] One advantage of the present invention is that the laminated beams **22** have an allowable design strength value

greater than about 3000 psi. Bending strength is measured, destructively, utilizing a 4-point bending test apparatus such as described in ASTM D198-00, with the wide face of the laminations parallel to the direction of applied load. Such a strength is superior to known sawn timber beams which typically have a strength value within the range of from about 650 psi to about 700 psi.

[0049] Another advantage of the present invention is that the support mat **20** has a smaller height H relative to known wood mats, such as the prior art mat **10** in FIG. **1**. The support mat **20** is thereby easier to move and to store, and requires a smaller amount of wood material, thereby efficiently using raw material resources and making the mat less costly.

[0050] Yet another advantage of the invention is that the mats **20** can be made with a tailor-made strength profile for particular strength applications. Further, raw material defects, such as knots, will be well distributed throughout the structure because each knot will have a thickness that is thicker than the width Ti of the laminations. This is relatively small in comparison with the thickness or width T**2** of the laminated beam **22**.

[0051] Another advantage of the present invention is that the support mat **20** has a weight that is within the range of from about 25 percent to about 60 percent lighter than prior art mats having the same surface area, such as, for example, the mat **10**. Preferably, the support mat **20** is about 50 percent of the weight of a prior art mat having the same surface area, such as, for example, the mat **10**.

[0052] Although the beams **22** are shown as having individual wood laminations **24** of a generally uniform thickness T**1**, it is to be understood that the beams **22** can be made of individual wood laminations **24** that vary in thickness across the width T**2** of the beam. Also, the beams **22** on the outer edges of the width W of the mat **20** need not be identical to the beam **22** in the central portion of the mat **20**.

[0053] In another variation of the invention some or all of the individual wood laminations **24** are reinforced with a reinforcement material to make them capable of withstanding greater loads. The reinforcement material can be any material suitable for improving the strength of the overall beam **22** and the mat **20**. For example, a layer of woven or nonwoven fiberglass strands can be applied between adjacent laminations **24**.

[0054] FIG. **3** shows one embodiment of the one-ply laminated mat **20** that includes three load transfer tabs **50** and three load transfer slots **60**. The number and configuration of the load transfer tabs and slots could be varied and still provide the same functionality as would be appreciated by one of ordinary skill in the art having the benefit of this disclosure. The load transfer tabs **50** may be positioned within the load transfer slots **60** of an adjacent one-ply laminated mat to form an interlocked roadway, flooring, or platform. The load transfer tab and load transfer slots prevent adjacent interlocked one-ply support mats from buckling as equipment moves across the interface. In one embodiment, the load transfer slot may be wider than the load transfer tab to facilitate insertion of the load transfer tab as the support mats are assembled to form a temporary structure. It is preferred that the one-ply laminated support mat be positioned such that the load transfer tab is adjacent to the ground when assembling a temporary structure.

[0055] The one-play laminated support mat of FIG. **3** includes a non-laminated wood member **40** fastened to each side of the support mat **20**. The non-laminated wood member **40** prevents the peeling or breaking off of laminated beam if heavy equipment moves over or near the edge of the support mat **20**. The non-laminated wood member includes a plurality of counter bores **26** to house the fasteners **28** used to fasten together the laminated beams **22** to form the support mat **20**.

[0056] FIG. **4** shows the top view of a one-ply laminated support mat **20** while FIG. **5** shows the side view. The width W of the support mat **20** can be increased or decreased by the number of laminated beams **22** used to comprise the support mat **20**. The height H and length L may be modified depending on the application as would be appreciated by one of ordinary skill in the art having the benefit of this disclosure. The smaller height of the one-ply mat in comparison to the multiple layer support mat may provide for a decrease in transportation costs to ship an order of one-ply support mats instead of the multiple layer support mats.

[0057] In one embodiment, two different lengths of laminated beams may be utilized to produce a one-ply laminated support mat **20**. For example in FIGS. **4** and **5**, the longer laminated beam may have a portion or slot **60** cut away from each end of the longer beam, wherein the portions are removed from opposed ends and opposite sides of the beam. The support mat can then be mated together with an adjacent mat so that its end is flush with the adjacent support mat. The removed portion **60** from the longer laminated beam of one support mat creates a load transfer slot **60** for accepting a load transfer tab **50** that extends from the other end of a longer laminated beam of the adjacent support mat **20**.

[0058] FIG. **6** shows an alternative embodiment of the load transfer tab **50** and load transfer slot **60** that may be used to interlock adjacent one-ply support mats **20**. FIG. **7** shows a laminated beam **22** that is comprised of individual wood laminations **24**. The number and size of individual wood laminations **24** may be varied to form laminated beams **22** of varying lengths and sizes as would be appreciated by one of ordinary skill in the art having the benefit of this disclosure. The laminated beams **22** may then be fastened together to form a one-ply support mat **20**.

[0059] The construction of the one-ply support mat **20** provides that individual laminated beams **22** may be replaced in the field in the event a laminated beam is damaged. Replacement laminated beams **22** may be included with a shipment of one-ply support mats **20**. Additionally, replacement laminated beams **22** having a load transfer tab **50** and a load transfer slot **60** may also be provided.

[0060] Although various embodiments have been shown and described, the invention is not so limited and will be understood to include all such modifications and variations as would be apparent to one skilled in the art.

1. A support mat having a first end and a second end comprising:

a plurality of beams fastened together, each of the beams being made of a plurality of individual wood laminations adhesively bonded to each other;

wherein each of the laminated beams comprises a plurality of vertically oriented individual wood laminations, the plurality of individual wood laminations having wide faces oriented parallel to a direction of a load applied to the support mat, each beam having outboard laminations, the wide faces of the outboard laminations of each beam defining a wide face of the beam;

wherein the wide faces of adjacent beams touch each other;

at least one load transfer tab extends from the first end of the support mat; and

at least one load transfer slot in the second end of the support mat aligned with the at least one load transfer tab of the first end.

2. The support mat of claim 1, wherein the at least one load transfer tab may be positioned in a load transfer slot in the second end of an adjacent support mat to interlock the adjacent support mat.

3. The support mat of claim 1 further comprising a first non-laminate member fastened to a first longitudinal side of the support mat and a second non-laminate member fastened to a second longitudinal side of the support mat.

4. The support mat of claim 3, wherein a plurality of nut and bolt assemblies fasten the first non-laminate member, second non-laminate member, and the plurality of beams there between together to form a support mat.

5. The support mat of claim 4, wherein the plurality of nut and bolt assemblies are positioned within a plurality of counter sunk bores in the first non-laminate member and the second non-laminate member.

6. The support mat of claim 3, wherein the first non-laminate member and the second non-laminate member are wooden members.

7. A one-ply mat unit to be interlocked with a plurality of other mat units to form a mat support system, each mat unit comprising:

a plurality of longitudinal beams, the plurality of longitudinal beams fastened together to form a one-ply mat unit having a first end and a second end;

wherein each beam is comprised of a plurality of vertically oriented longitudinal wood laminates vertically bonded together;

at least one load transfer tab extending from the first end of the one-ply mat unit; and

at least one load transfer slot in the second end of the one-ply mat unit, the at least one load transfer slot aligned with the at least one load transfer tab of the first end, whereby the at least one load transfer tab may be positioned in at least one load transfer slot in a second end of an adjacent one-ply mat unit to form an interlocked portion of a mat support system.

8. The mat unit of claim 7 further comprising a first non-laminate member fastened to a first longitudinal side of the mat unit and a second non-laminate member fastened to a second longitudinal side of the mat unit.

9. The mat unit of claim 8, wherein a plurality of nut and bolt assemblies fasten together the first non-laminate member, second non-laminate member, and the plurality of longitudinal beams there between to form a one-ply mat unit.

10. The mat unit of claim 9, wherein the plurality of nut and bolt assemblies are positioned within a plurality of counter sunk bores in the first non-laminate member and the second non-laminate member.

11. The mat unit of claim 8, wherein the first non-laminate member and the second non-laminate member are wooden members.

12. The mat unit of claim 7, wherein the at least one load transfer slot is wider than the at least one load transfer tab.

13. The mat unit of claim 7 further comprising three load transfer tabs extending from the first end of the one-ply mat unit.

14. The mat unit of claim 13 further comprising three load transfer slots aligned with the three load transfer tabs extending from the first end, wherein the three load transfer tabs may be positioned within the three load transfer slots in a second end of an adjacent one-ply mat unit to form an interlocked portion of a mat support system.

15. The mat unit of claim 14, wherein each of the three load transfer slots is wider than each of the three load transfer tabs.

16. A support mat to be interlocked with a plurality of other substantially identical support mats comprising:

a plurality of vertically oriented longitudinal wooden members, the plurality of wood members vertically bonded together to form a support mat having a first end and a second end;

at least one load transfer tab extending from the first end of the support mat; and

at least one slot in the second end of the support mat, the at least one slot aligned with the at least one load transfer tab of the first end, whereby the at least one load transfer tab of one support mat may be positioned in the at least one slot in a second end of an adjacent support mat to interlock the support mat with the adjacent support mat.

17. A method of constructing a one-ply support mat, the method comprising:

laminating a plurality of individual wood members to make a plurality of laminated beams having a first length, the laminated beams having a first side and a second side;

laminating a plurality of individual wood members to make at least one laminated beam of a second length, the at least one laminated beam of the second length having a first end, a second end, a first side, a second side, a bottom surface, and a top surface;

removing a portion of material from the top surface of the first end of the at least one laminated beam of the second length, wherein the first end includes a load transfer structure;

removing a portion of material from the bottom surface of the second end of the at least one laminated beam of the second length, wherein the second end includes a load transfer structure; and

fastening together the at least one laminated beam of the second length between two laminated beams of the first length to form a one-ply support mat, wherein the laminated beams are vertically fastened together.

18. The method of claim 17, wherein the individual wood members are vertically laminated together to make a plurality of laminated beams having the first length and wherein the individual wood members are vertically laminated together to make at least one laminated beam of the second length.

19. The method of claim 18 further comprising fastening together a plurality of laminated beams of the first length, a plurality of laminated beams of the second length, a first non-laminated wooden member of the first length, and a second non-laminated wood member of the first length to form a support mat, wherein the first non-laminated wood member is adjacent to a first side of a laminated beam of the first length, the first side of a laminated beam of the second length is adjacent a second side of a laminated beam of the first length, the first side of a laminated beam of the first length is adjacent to the second side of a laminated beam of the second length, and the second non-laminated wood member is adjacent to the second side of a laminated beam of the first length.

20. The method of claim 19 further comprising drilling at least one first counter bore in the first non-laminate wood member, drilling at least one second counter bore in the second non-laminate wood member, and drilling at least one hole through the first and second sides of the plurality of laminated beams of the first length and the plurality of laminated beams of the second length.

21. The method of claim 20 further comprising positioning a nut in the at least one first counter bore and inserting a bolt through the at least one hole through the sides of the plurality of beams wherein a head of the bolt is positioned within the at least one second counter bore.

22. A laminated one-ply mat comprising:

a plurality of longitudinal beams, the plurality of longitudinal beams fastened together to form a one-ply mat unit having a first end and a second end;

wherein each beam is comprised of a plurality of vertically oriented longitudinal wood laminations vertically bonded together;

means for transferring load between a one-ply mat adjacent to the first end; and

means for transferring load between a one-ply mat adjacent to the second end.

23. The laminated one-ply mat of claim 22 further comprising a first non-laminate member fastened to a first side of the laminated one-ply mat and a second non-late member fastened to a second side of the laminated one-ply mat.

* * * * *