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COPY

UNITED STATES DISTRICT COURT
CENTRAL DISTRICT OF CALIFORNIA

Neil Schultz. Plaintiff, vs. iGPS Company LLC and Schoeller Arca Systems, Inc., Defendants.	CASE NO. CV 09-6692-JFW (CWx) **Hon. John F. Walter** **SECOND AMENDED COMPLAINT FOR PATENT INFRINGEMENT** **DEMAND FOR JURY TRIAL**

This is an action for patent infringement under the United States patent laws, 35 U.S.C. § 271, et seq. This Court has subject matter jurisdiction over this action under 28 U.S.C. §§ 1331 and 1338. Pursuant to Fed. R. Civ. P. 15(a)(2), plaintiff Neil Schultz submits this Second Amended Complaint ("SAC") against Defendants iGPS Company LLC and Schoeller Arca Systems, Inc.

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PARTIES

1. Plaintiff Neil Schultz ("Schultz") is an individual residing in the State of New York.

2. Upon information and belief, defendant iGPS Company LLC ("iGPS") is a limited liability company organized and existing under the laws of the State of Delaware, with its principal place of business at 225 East Robinson Street, Suite 200, Orlando, Florida 32801.

3. Upon information and belief, defendant Schoeller Arca Systems, Inc. ("SAS") is a corporation organized and existing under the laws of the State of Delaware, with its principal place of business at 5202 Old Orchard Road, Skokie, Illinois, 60077.

JURISDICTION

4. This is an action for patent infringement under the United States patent laws, 35 U.S.C. § 271, et seq. This Court has subject matter jurisdiction over this action under 28 U.S.C. §§ 1331 and 1338.

5. Upon information and belief, SAS and iGPS have placed and continue to place infringing products (identified below) into the stream of commerce, and know or should know that such products are used throughout the United States, including in this district.

6. Upon information and belief, SAS and iGPS have committed acts of patent infringement in this Judicial District including, *inter alia*, contributing to the infringement by others in this Judicial District and/or inducing others to infringe in this district.

7. Upon information and belief, iGPS and SAS each are subject to the personal jurisdiction of this Court and are amendable to service of process pursuant to the California long-arm statute, Cal. Civ. Proc. Code § 413.10 and Fed. R. Civ. P. 4(e).

VENUE

8. Venue is proper in this Court pursuant to 28 U.S.C.§§ 1391(b) and (c), and § 1400(b).

FACTS

9. Schultz is the owner of all right, title, and interest in and to United States Patent No. 6,758,148 (the "'148 patent") entitled "Fire Blocking Method and Apparatus," which duly and legally issued on July 6, 2004. The '148 patent is presumed to be, and is, valid and enforceable. A copy of the '148 patent is attached hereto as Exhibit A.

10. Schultz is the owner of all right, title, and interest in and to United States Patent No. 6,745,703 (the "'703 patent") entitled "Composite Pallet Member," which duly and legally issued on June 8, 2004. The '703 patent is presumed to be, and is, valid and enforceable. A copy of the '703 patent is attached hereto as Exhibit B.

11. Upon information and belief, SAS makes and uses, and sells and offers to sell to iGPS, a plastic pallet characterized as being "fire retardant" and as having received certifications under FM Approvals 4996 and UL 2335 (file no. R25482) (the "iGPS pallet"). By way of a specification sheet available on its website (http://www.igps.net/pallet_specs.php) and attached hereto as Exhibit C, iGPS represents that the iGPS pallet has certain features and specifications.

12. Upon information and belief, iGPS operates a pallet rental service (described on its website, http://www.igps.net/advantage/palletPooling.php), whereby iGPS uses iGPS pallets, and actively induces others to use iGPS pallets owned by iGPS, including as follows: a customer of iGPS notifies iGPS of a required shipment; in response, iGPS issues ready-for-use iGPS pallets to the customer's facility in truckload quantities; the customer then palletizes its products onto iGPS pallets and ships the palletized products down the distributor network; distributors then receive the iGPS pallets and either store the products in warehouses or use the iGPS pallets to move the products to the retailer; once the iGPS pallets have been emptied of products, the distributor relocates the iGPS pallets to their distribution centers; iGPS pallets are accumulated at the distribution center and the distributor then returns the iGPS pallets to iGPS; and iGPS inspects the returned iGPS pallets and prepares them for reissue to another customer.

13. Upon information and belief, the iGPS pallet made, used, sold, and/or offered for sale by SAS and iGPS comprises at least one pallet member having external surfaces; and a flame retardant material affixed to said at least one pallet member so as to substantially cover all of said external surfaces of said pallet member, wherein said flame retardant material is composed of a nanocomposite comprised of a clay that includes a silicate derivative.

14. Upon information and belief, the iGPS pallet made, used, sold, and/or offered for sale by SAS and iGPS comprises at least one deck member having a first surface and a second surface; said deck member having a plurality of open spaces, said open spaces extending between said first and second surfaces; and a strengthening layer positioned against at least one of said first surface and said second surface, wherein said deck member is composed of a nanocomposite material comprising a polymer material integrated with a clay, said clay comprising between 0.1% and 20% by weight of said nanocomposite.

15. Upon information and belief, the iGPS pallet constitutes a material part of the inventions of the '148 patent and the '703 patent, and, upon information and belief, SAS and iGPS know the iGPS pallet to be especially made or especially adapted for use in an infringement of the '148 patent and the '703 patent, and not a staple article or commodity of commerce suitable for substantial noninfringing use.

16. Upon information and belief, SAS and iGPS became aware of the '148 patent and the '703 patent, and that these patents presented an infringement issue with respect to the iGPS pallet, at least as early as October 27, 2008.

COUNT 1: INFRINGEMENT OF THE '148 PATENT BY SAS

17. Schultz realleges and incorporates by reference the allegations set forth in paragraphs 1-16 above.

18. Upon information and belief, SAS has infringed, and currently is infringing,

one or more claims of the '148 patent by making, using, selling, and offering to sell the iGPS pallet, and by contributing to the infringing use of iGPS pallets by others and/or inducing others to use the iGPS pallet.

19. Upon information and belief, SAS's infringement of the '148 patent has been and continues to be willful.

20. Upon information and belief, SAS's infringement of the '148 patent will continue unless enjoined by this Court.

21. As a direct and proximate consequence of SAS's infringement of the '148 patent, Schultz has suffered and will continue to suffer irreparable injury and damages, in an amount to be determined at trial, for which Schultz is entitled to relief.

COUNT 2: INFRINGEMENT OF THE '703 PATENT BY SAS

22. Schultz realleges and incorporates by reference the allegations set forth in paragraphs 1-21 above.

23. Upon information and belief, SAS has infringed, and currently is infringing, one or more claims of the '703 patent by making, using, selling, and offering to sell the iGPS pallet, and by contributing to the infringing use of iGPS pallets by others and/or inducing others to use the iGPS pallet.

24. Upon information and belief, SAS's infringement of the '703 patent has been and continues to be willful.

25. Upon information and belief, SAS's infringement of the '703 patent will continue unless enjoined by this Court.

26. As a direct and proximate consequence of SAS's infringement of the '703 patent, Schultz has suffered and will continue to suffer irreparable injury and damages, in an amount to be determined at trial, for which Schultz is entitled to relief.

COUNT 3: INFRINGEMENT OF THE '148 PATENT BY iGPS

27. Schultz realleges and incorporates by reference the allegations set forth in

paragraphs 1-26 above.

28. Upon information and belief, iGPS has infringed, and currently is infringing, one or more claims of the '148 patent by using the iGPS pallet, and by contributing to the infringing use of iGPS pallets by others and/or inducing others to use the iGPS pallet.

29. Upon information and belief, iGPS's infringement of the '148 patent has been and continues to be willful.

30. Upon information and belief, iGPS's infringement of the '148 patent will continue unless enjoined by this Court.

31. As a direct and proximate consequence of iGPS's infringement of the '148 patent, Schultz has suffered and will continue to suffer irreparable injury and damages, in an amount to be determined at trial, for which Schultz is entitled to relief.

COUNT 4: INFRINGEMENT OF THE '703 PATENT BY iGPS

32. Schultz realleges and incorporates by reference the allegations set forth in paragraphs 1-31 above.

33. Upon information and belief, iGPS has infringed, and currently is infringing, one or more claims of the '703 patent by using the iGPS pallet, and by contributing to the infringing use of iGPS pallets by others and/or inducing others to use the iGPS pallet.

34. Upon information and belief, iGPS's infringement of the '703 patent has been and continues to be willful.

35. Upon information and belief, iGPS's infringement of the '703 patent will continue unless enjoined by this Court.

36. As a direct and proximate consequence of iGPS's infringement of the '703 patent, Schultz has suffered and will continue to suffer irreparable injury and damages, in an amount to be determined at trial, for which Schultz is entitled to relief.

PRAYER FOR RELIEF

A. Wherefore, Schultz requests entry of judgment and other relief in his favor and against SAS and iGPS as follows:

B. Enter judgment that SAS and iGPS have infringed the '148 patent;

C. Enter judgment that SAS and iGPS have infringed the '703 patent;

D. Enter a judgment that the '148 patent is valid and enforceable;

E. Enter a judgment that the '703 patent is valid and enforceable;

F. Enter a preliminary and permanent injunction, pursuant to 35 U.S.C. § 283, restraining and enjoining each of SAS and iGPS, and their respective officers, agents, servants, employees, attorneys, and any persons in active concert or participation with them who receive actual notice of the order by personal service or otherwise, from any further manufacture, use, sales, offers to sell, or importations of any and all iGPS pallets;

G. Award Schultz, pursuant to 35 U.S.C. § 284, damages to compensate him for SAS's and iGPS's infringement of the '148 patent and the '703 patent, in no event less than a reasonable royalty for the use made of the claimed inventions by SAS and iGPS;

H. Award Schultz, pursuant to 35 U.S.C. § 284, up to treble damages;

I. Award Schultz, pursuant to 35 U.S.C. § 284, pre-judgment and post-judgment interest and costs;

J. Award Schultz, pursuant to 35 U.S.C. § 285, his reasonable attorneys fees; and

K. Award Schultz such other and further relief as the Court may deem just, proper, and equitable.

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DEMAND FOR JURY TRIAL

Schultz respectfully demands a trial by jury on all claims and issues so triable.

Dated: December 23, 2009

GRAVES LAW OFFICE, P.C.

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Fredricka Ung
Elizabeth A. Culley

Attorneys for Plaintiff
NEIL SCHULTZ

PROOF OF SERVICE

I am over the age of eighteen years and not a party to this action. My business address is Graves Law Office, P.C., 12121 Wilshire Boulevard, Suite 775, Los Angeles, California 90025.

On December 23, 2009 I served the following document entitled

SECOND AMENDED COMPLAINT FOR PATENT INFRINGEMENT

on all interested parties to this action in the manner prescribed as follows:

See attached list.

___ **CM/ECF**: I electronically transmitted the above document to the Clerk's Office using the CM/ECF System for filing, which transmits a Notice of Electronic Filing to the CM/ECF registrants listed above.

__x__ **MAIL**: I placed true and correct copies of the document(s) in sealed envelope(s) addressed to the above addressee(s). I am readily familiar with Graves Law Office, P.C.'s practice for collecting and processing of correspondence for mailing with the United States Postal Service, said practice being that, in the ordinary course of business, correspondence with postage fully prepaid is deposited with the United States Postal Service the same day as it is placed for collection.

___ **FAX**: I caused the within document to be transmitted via facsimile transmission to the above addressee(s) at the above facsimile numbers before 5:00 p.m. on the above date.

___ **EMAIL**: I transmitted true copies of the within document (with exhibits) electronically by means of email to the above addressee(s) at the above email address(es).

___ **HAND**: I caused the within document to be hand-delivered to the above addressee(s) at the above address(es).

___ **FEDEX**: I caused the within document to be delivered by Federal Express addressee(s) at the above address(es).

I declare that I am employed by a member of the bar at whose direction such service was made.

Executed on December 23, 2009 at Los Angeles, California.

Hamid Baradaran

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PROOF OF SERVICE

EXHIBIT A

US006758148B2

(12) **United States Patent**
Torrey et al.

(10) **Patent No.: US 6,758,148 B2**
(45) **Date of Patent: Jul. 6, 2004**

(54) **FIRE BLOCKING METHOD AND APPARATUS**

(75) Inventors: **Bruce Torrey**, Orlando, FL (US); **Neil Schultz**, Katonah, NY (US)

(73) Assignee: **Chep International, Inc.**, Orlando, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) bydays.days.

(21) Appl. No.: **10/045,696**

(22) Filed: **Oct. 26, 2001**

(65) **Prior Publication Data**

US 2003/0079660 A1 May 1, 2003

(51) **Int. Cl.**[7] **B65D 19/00**
(52) **U.S. Cl.** **108/51.11**; 108/57.25
(58) **Field of Search** 108/51.11, 901, 108/902, 57.25, 57.27, 57.28, 161

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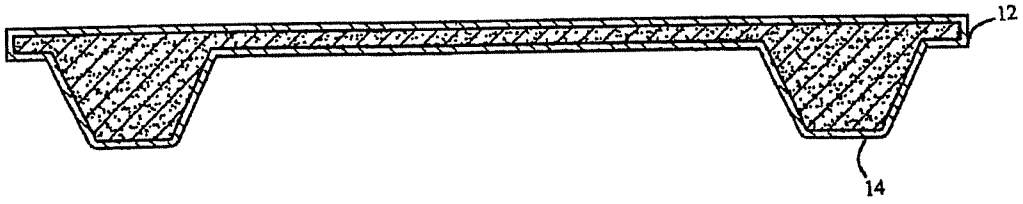
Primary Examiner—Jose V. Chen
(74) *Attorney, Agent, or Firm*—Akerman Senterfitt

(57) **ABSTRACT**

A pallet assembly includes at least one pallet member having external surfaces and a flame retardant material affixed to at least one pallet member so as to substantially cover all of the external surfaces of the pallet member. A pallet includes a container, tote bin, or any other suitable device used for the storage and transportation of items. In accordance with the invention, a method of fire blocking a pallet assembly includes the step of providing a pallet assembly that can include at least one pallet member having external surfaces. The method also can include affixing a flame retardant material to at least one pallet member so as to substantially cover all of the external surfaces of the pallet member.

21 Claims, 2 Drawing Sheets



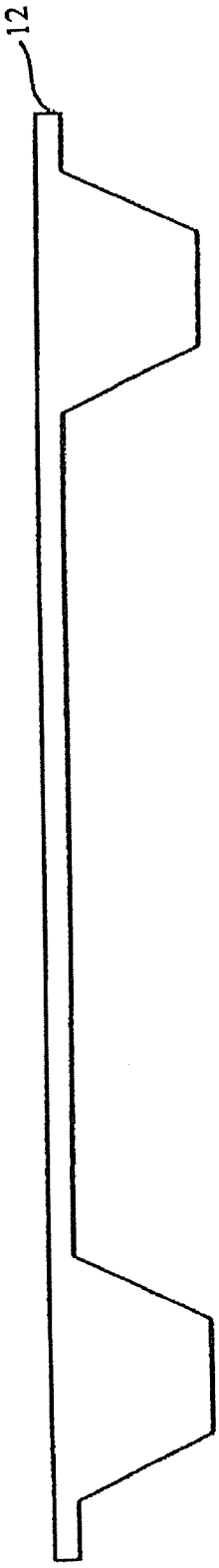


FIG. 1

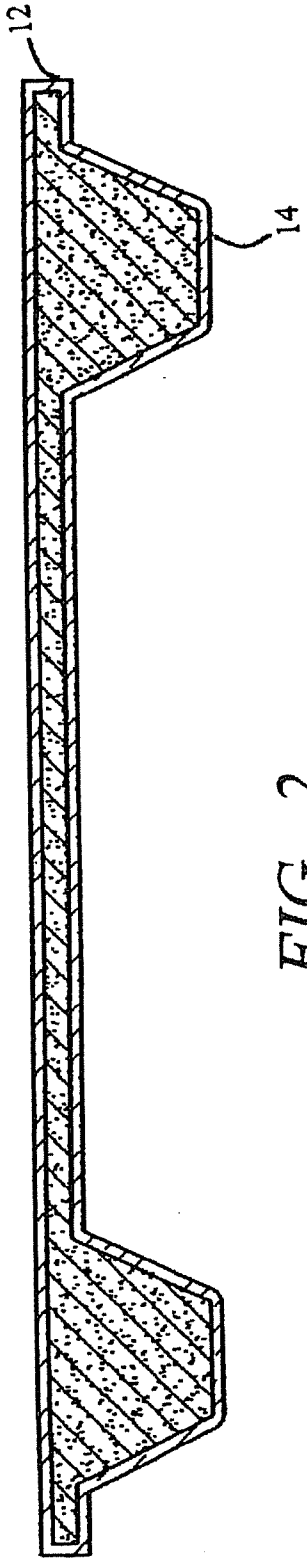


FIG. 2

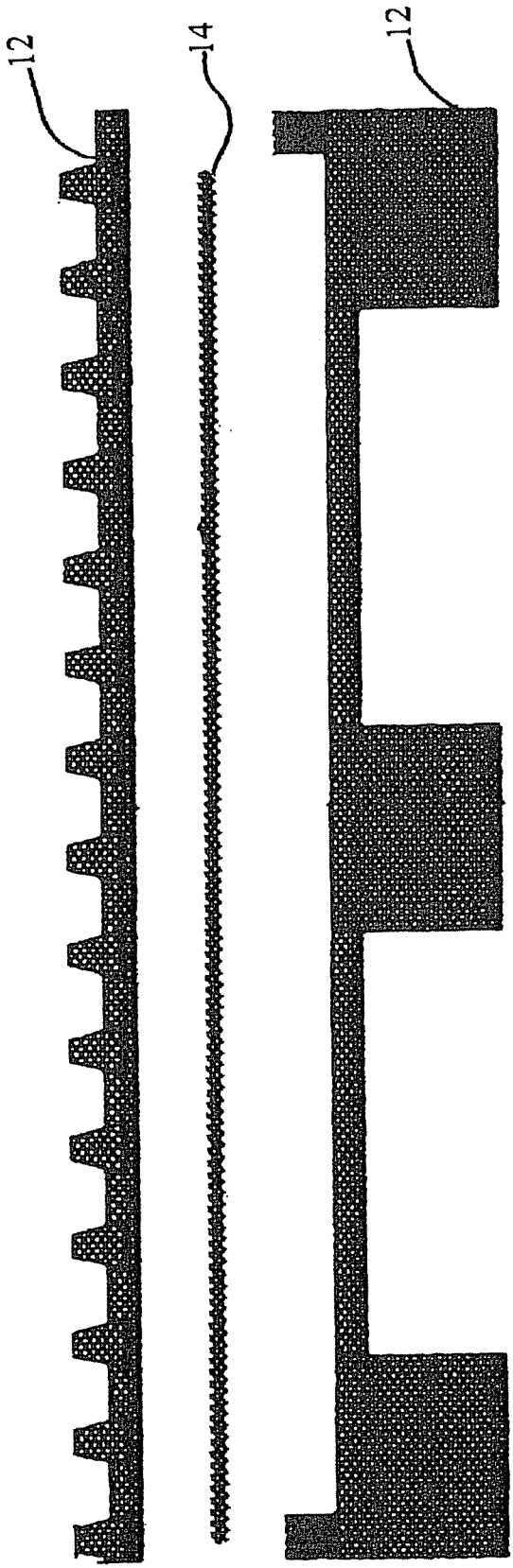


FIG. 3

FIRE BLOCKING METHOD AND APPARATUS

CROSS REFERENCE TO RELATED APPLICATIONS

(Not Applicable)

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

(Not Applicable)

BACKGROUND OF INVENTION

1. Technical Field

The present invention relates generally to fire blocking. More particularly, the invention relates to the fire blocking of pallets.

2. Description of the Related Art

Several approaches have been used to develop pallets with enhanced physical properties. Many of these approaches incorporate the use of various mixtures of compositions to enhance the physical properties of pallets. Specifically, these compositions attempt to increase flame resistance, durability, and strength of pallets. One type of composition that has been utilized includes nanocomposite technology. Nanocomposites utilize many different materials that are intermingled on a nanometer scale. The use of nanocomposites to develop high temperature compositions with enhanced thermal stability and performance characteristics is disclosed in U.S. Pat. No. 6,057,035 to Singh. The invention in Singh provides high-use temperature, lightweight polymer/inorganic nanocomposite materials utilizing techniques that enhance the thermal stability of the nanocomposite systems from their current limits of 100–150° C. to over 250° C. Additionally, much research has been focused on the development of flame retardant materials in combination with fabrics to provide flame retardant qualities. Combining flame retardant materials with fabric is generally known. For instance, U.S. Pat. No. 4,950,533 to McCullough, Jr. discloses fabrics comprising a blend of substantially permanently or irreversibly heat set, nonflammable, carbonaceous fibers with polymeric fibers. Considerable time and effort has been expended in commercial industry to develop nonflammable and flame retardant fabrics. In the area of pallet technology, the efforts have focused on increasing a pallet's ability to retard fire by the usage of methods involving the combinations of flame retardant materials in the composition of pallets, such as during the molding process. Additionally, the pallets in the prior art are monolithic in structure and incur difficulty when attempting to meet fire performance standards. Flame retardancy in the pallet industry is preferably measured according to the Underwriters' Laboratory UL-2335 and/or FMRC fire performance protocol. Other organizations, such as the Grocery Manufacturing Association (GMA) and OSHA impose size and other restrictions on pallets depending on its particular purpose. These standards set minimum requirements that ensure fire safety and performance in the pallet industry.

Unfortunately, past efforts conducted to develop pallets exhibiting superior flame resistance have been problematic. Difficulty has been encountered in attempting to qualify pallets under standard safety guidelines, such as UL-2335. The problem to be solved is in developing a warehouse material handling pallet that meets the endurance, dimensional, load bearing, and weight parameters outlined

by the Grocery Manufacturers Association (GMA) and OSHA ergonomic requirements while meeting the Factory Mutual Research Corporation and Underwriters Laboratories, Inc. Standard UL 2335 fire performance protocols. Consequently, there is a need for a pallet structure that meets the standards under these regulatory test concerning flame retardancy, while remaining cost efficient and effective for its particular purpose.

SUMMARY OF INVENTION

The present invention relates to an apparatus and method of fire blocking a pallet assembly that enhances the physical attributes of the pallet assembly while providing flame retardancy.

A pallet assembly according to the invention comprises at least one pallet member having external surfaces and a flame retardant material affixed to at least one pallet member so as to substantially cover all of the external surfaces of the pallet member. A pallet can include a container, tote bin, or any other suitable device used for the storage and transportation of items.

In accordance with the invention, a method of fire blocking a pallet assembly comprises the steps of providing a pallet assembly that can include at least one pallet member having external surfaces. The next step can include affixing a flame retardant material to at least one pallet member so as to substantially cover all of the external surfaces of the pallet member.

In this invention, a flame retardant material provides a covering to the pallet member and increases the fire performance of the pallet assembly. The flame retardant material utilized can increase the overall safety of the pallet assembly while providing enhanced physical durability. Flame retardant material suitable for use in this invention can include a flame retardant fabric. Affixing the flame retardant fabric to the pallet assembly provides resiliency to open flames. Open flames and other heat sources are common causes of pallet meltdown, thus creating dangerous fire hazards during storage and transportation. Affixing the flame retardant fabric to a pallet protects and prevents damage resulting from fire related occurrences and normal wear and tear. A blend of polymeric fibers can be included in the flame retardant fabric. The flame retardant fabric can be adapted to the dimensions of the pallet member. Adapting the flame retardant material to the dimensions of the particular pallet member can permit individual components of the pallet member to be fabricated. The flame retardant material also can include a flame retardant liquid. The flame retardant liquid can comprise an intumescent material. The intumescent material can be applied to a pallet member using a brush, roller or spray similar to application of ordinary paint. Required coating thickness depends on the substrate, severity of the heat exposure, and level of protection desired. The flame retardant material utilized also can include a flame retardant polymer such as polyetaraflouraethylene. Flame retardant synthetic fibers such as polyolefin fiber also can serve as the flame retardant material. Polyester and melamine fibers can also be utilized as the flame retardant material on the particular pallet member. Additionally, the application of flame retardant materials can provide aesthetic value to a pallet along with providing pallet assembly protection and flame retardancy.

In an embodiment of the present invention the flame retardant material can include a flame retardant metal. Stainless steel, copper, and aluminum are examples of metals that exhibit strong heat resistance while maintaining

malleability which allow these metals to be integrated into a pallet assembly. The flame retardant material also can utilize nanocomposite technology in covering a pallet assembly. Nancomposites utilize many different materials intermingled on a nanometer scale. Nanocomposites can be made from a variety of starting materials including, but not limited to gases, minerals, and plastics. Nanocomposite technology provides the benefit of increased physical properties. Nanocomposites can provide higher heat distortion temperatures, less shrinkage, less warping, electrical conductivity and better fire performance. The nanocomposites utilized in the flame retardant material can include an organic-inorganic complex of material. The flame retardant material can be composed of a nanocomposite material comprising a polymer material integrated with a clay between 0.1% and 20% by weight of the nanocomposite. The weight of the clay used in the nanocomposite comprising the flame retardant material also can include clay between 0.1% and 10% and clay between 10% and 20% by weight of the nanocomposite. The clay utilized can include a silicate or silicate derivative such as montmorillonite (alumino-silicate). Nanocomposite technology has demonstrated a significant reduction in heat release rates on the order of 50 to 75% while increasing stiffness, heat distortion temperatures, cold temperature impact and other barrier properties. Nanocomposites also can be utilized in conjunction with flame retardant resins. Flame retardant resins further enhance the fire resistance of pallets. Examples of fire performance enhancing resin technologies used are zirconia, boron oxides, polybenzoxazine, polymers and carbonsilicone resin additives.

The flame retardant material can be adhered to the pallet member utilizing a variety of processes well known within the industry. For example, in-mold processing, extrusion, co-extrusion, lamination, and autoclaving are available techniques that are suitable for adhering a flame retardant material to a pallet member. Application of flame retardant material to a pallet member is an effective mechanism for increasing the fire resistance of the pallet assembly and reducing accompanying safety hazards associated with low fire resistance, while also exceeding fire performance standards for pallets under Underwriters Laboratory UL 2335 protocol for pallets.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention may be better understood by referring to the following description taken in conjunction with the accompanying drawings, it being understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown.

FIG. **1** shoes a front view of a pallet member without a flame retardant material;

FIG. **2** shows a front view of a pallet member having a flame retardant material applied to pallet member; and

FIG. **3** shows a front view of a pallet member having a flame retardant material between surfaces of a pallet member.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention relates to an apparatus and method of fire blocking in a pallet assembly **10**. The fire blocking of a pallet member **12** enhances the physical attributes of the pallet assembly **10** while providing flame retardancy.

A pallet assembly **10**, according to the invention comprises at least one pallet member **12** having external surfaces

16 and a flame retardant material **14** affixed to at least one pallet member **12** so as to substantially cover all of the external surfaces **16** of the pallet member **12**. A pallet can include a container, tote bin, or any other suitable device used for the storage and transportation of items.

In accordance with the invention, a method of fire blocking a pallet assembly **10** comprises the steps of providing a pallet assembly **10** that can include at least one pallet member **12** having external surfaces **16**. The next step can include affixing a flame retardant material **14** to at least one pallet member **12** so as to substantially cover all of the external surfaces **16** of the pallet member **12**.

FIG. **1** and FIG. **2** depict an embodiment of the present invention having a flame retardant material **14** being utilized to cover a pallet member **12**. As shown in FIG. **2**, the flame retardant material **14** is used to cover the surface of the pallet member **12**. The type of flame retardant material **14** used in this embodiment is a flame retardant fabric **18**. The flame retardant fabric **18** provides a protective covering for the underlying pallet member **12**, as depicted in FIG. **2**. Application of the flame retardant fabric **18** includes the preparation of a suitable flame retardant fabric **18** to meet the physical dimensions of the pallet member **12** or entire pallet to be covered. The individual components of the pallet member **12** can be fabricated individually or as an entire unit. For example, a pallet member **12** that has a lower surface and an upper surface can be entirely fabricated by covering both the lower and upper surface of the pallet member **12**, as shown in FIG. **2**. Alternatively, the lower surface can be fabricated while leaving the upper surface exposed, or the upper surface can be fabricated while leaving the lower surface exposed. Dependent on the particular use of the pallet member **12**, it can be more suitable and economical to cover only one surface of a pallet member **12** with a flame retardant material **14**. For instance, in a warehouse facility where stacking of pallets can be limited to single layer stacking, and the most likely fire hazard is presented from the ground or other lower surface, one may elect only to cover the lower surface of the pallet member **12**. Flame retardant material used to cover a pallet member **12** can also include flame retardant resins within various components of the pallet member **12**. For example, the upper surface of the pallet member **12** can include a flame retardant resin while the remaining portions, such as the lower surface, can comprise other materials. Other suitable flame retardant material can include flame retardant fabrics, films and gaskets. Flame retardant material, such as intumescent films, coatings and foams can be placed between the upper surface and lower surface of a pallet member **12** to provide additional flame resistance, as depicted in FIG. **3**. Flame retardant material can also be placed to fill voids and spaces within the pallet member **12**. Processes such as blow molding, welding, and twin sheet thermoforming can be utilized to incorporate the flame retardant materials into the pallet member **12**.

Suitable types of flame retardant fabrics that can be utilized to cover a pallet member **12** can include fabrics comprising polymeric fibers and flame retardant polymers. A flame retardant polymer can include polytetrafluoroethylene. An example of a flame retardant polymeric fiber utilized can be a synthetic fiber. Synthetic fibers are engineered to transport and manage moisture, thermoregulate, stretch for comfort, provide personal safety, inhibit the growth of bacteria, and more. The weight of the flame retardant material **14** used can be an important factor to consider when designing a pallet assembly **10** to ensure meeting weight specifications for the particular pallet. As shown in FIG. **3**,

a flame retardant liquid **20** also can comprise the flame retardant material **14** used to cover the pallet member **12**. For instance, intumescent materials can be provided as the flame retardant material **14**. Covering a pallet member **12** utilizing the flame retardant liquid **20** can be applied with a brush, roller or spray similar to application of ordinary paint. The required coating thickness may depend on the substrate, severity of the heat exposure, and level of protection desired. For example, coating visually exposed pallet members **12** by spraying flame retardant intumescent paint directly to a pallet member **12** can be used where the pallet design calls for a thin, aesthetic, decorative look. The intumescent material **14** can be applied to a pallet member **12** and cause the surface to bubble to create a barrier between the fire and the treated material, thereby providing significant protection for the pallet member **12**.

In an embodiment of the present invention, the flame retardant material **14** can include a layer of metal as a suitable flame retardant material **44**. Stainless steel, copper, and aluminum are examples of metals that exhibit strong heat resistance while maintaining malleability which allow these metals to be integrated into a pallet assembly **10**. In some pallet designs it may be advantageous to use metal as the covering material in the pallet assembly **10** because of the intended use of the particular pallet. For instance, many wooden pallets often deteriorate and fall apart over time and require constant maintenance. Consequently, wood might not be optimally suited to transport highly flammable cargo. However, in some circumstances, metal as the flame retardant material **14** in a pallet assembly **10** may provide an adequate level of fire retardancy to enable a wood pallet to be used. The thickness of metal layers applied to the pallet member **12** can be adjusted to suit the specific needs of the pallet, along with consideration to transportation and storage concerns.

The present invention can include nanocomposite technology as a component of the flame retardant material **14** utilized in covering a pallet member **12**. Nanocomposites utilize many different materials intermingled on a nanometer scale. Nanocomposites can be made from a variety of starting materials including, but not limited to gases, minerals, and plastics. Nanocomposite technology provides the benefit of increased physical properties. Nanocomposites can provide higher heat distortion temperatures, less shrinkage, less warping, electrical conductivity and better fire performance. The nanocomposites utilized in the flame retardant material **14** can be incorporated into a variety of materials. Nanocomposites can comprise an organic-inorganic complex of material. The flame retardant material **14** can be composed of a nanocomposite material comprising a polymer material integrated with a clay between 0.1% and 20% by weight of the nanocomposite. The weight of the clay used in the nanocomposite comprising the flame retardant material **14** also can include clay between 0.1% and 10% and clay between 10% and 20% by weight of the nanocomposite. The clay utilized can include a silicate or silicate derivative such as montmorillonite (alumino-silicate). Nanocomposite technology has demonstrated a significant reduction in heat release rates on the order of 50 to 75% while increasing stiffness, heat distortion temperatures, cold temperature impact and other barrier properties. Nanocomposites also can be utilized in conjunction with flame retardant resins. Flame retardant resins further enhance the fire resistance of the pallets. Examples of fire performance enhancing resin technologies used are zirconia, boron oxides, polybenzoxazine, polymers and carbon-silicone resin additives.

The present invention can be useful in a protect various forms of the pallet assembly **10** that can include, but are not limited to warehouse pallets, totes, bins, and intermediate bulk containers. Additionally, the invention can be used in conjunction with a multitude of pallet designs of unlimited dimensions. The Grocery Manufacturing Association sets specific requirements for pallets that are used in the food and beverage industry. The Grocery Manufacturing Association (GMA) is one of the largest association of food, beverage and consumer product companies. The GMA assists in establishing food and nutritional policy throughout the country, which includes establishing pallet specifications. Pallet specifications as established by the Grocery Manufacturing Association require that a pallet be exactly 48"× 40"; have true 4-way entry; accommodate pallet racks; have a smooth, non-skid, top load bearing surface having at least 85% coverage and should be flat; a bottom loading surface and have cuts for pallet jack wheels from four sides; rackable from 48" and 40" dimension; must be recyclable; desired weight under 50 pounds; have a load capacity of 2,800 pounds; capable of bearing 2,800 pound loads safely in stacks of five loads high racking; and weather and moisture resistant. In an embodiment of the present invention featuring certain pallet designs, the pallets meet the Grocery Manufacturing Association requirements.

The flame retardant material **14** can be adhered to the pallet member **12** utilizing a variety of processes suitable in the industry. For example, in-mold processing, extrusion, co-extrusion, lamination, and autoclaving are available techniques that are suitable for adhering a flame retardant material **14** to a pallet member **12**. Application of flame retardant material **14** to a pallet member **12** is an effective mechanism in increasing the fire resistance of pallets and reducing accompanying safety hazards associated with low fire resistance, while also exceeding fire performance standards for pallets under Underwriters Laboratory UL 2335 protocol for pallets.

What is claimed is:

1. A method of fire retarding a pallet assembly, said method comprising the steps of:

providing a pallet assembly comprising at least one pallet member having external surfaces; and

affixing a flame retardant material to said at least one pallet member so as to substantially cover all of said external surfaces of said pallet member,

wherein said flame retardant material includes a flame retardant fabric comprising a blend of polymeric fibers.

2. The method according to claim **1**, wherein said affixing step further provides preparing said flame retardant fabric adapted to dimensions of said pallet member.

3. The method according to claim **1**, further comprising the step of fabricating the individual components of said pallet member with said flame retardant fabric.

4. A method of fire retarding a pallet assembly, said method comprising the steps of:

providing a pallet assembly comprising at least one pallet member having external surfaces; and

affixing a flame retardant liquid comprising an intumescent material to said at least one pallet member so as to substantially cover all of said external surfaces of said pallet member.

5. The method according to claim **4**, wherein said flame retardant liquid is applied to the external surfaces of the pallet member a form selected from the group consisting of an intumescent film, coating end foam.

6. The method according to claim **1**, wherein said flame retardant polymeric fibers comprise polytetrafluoroethylene.

7. A method of fire retarding a pallet assembly, said method comprising the steps of:

providing a pallet assembly comprising at least one pallet member having external surfaces; and

affixing a flame retardant material including a flame retardant metal to said at least one pallet member so as to substantially cover all of said external surfaces of said pallet member.

8. The method according to claim 7, wherein said flame retardant metal is selected from the group consisting Of stainless steel, copper and aluminum.

9. A method of fire retarding a pallet assembly, said method comprising the steps of:

providing a pallet assembly comprising at least one pallet member having external surfaces; and

affixing a flame retardant material composed of a nanocomposite comprised of a clay that includes a silicate derivative to said at least one pallet member so as to substantially cover all of said external surfaces of said pallet member.

10. A method of fire retarding a pallet assembly, said method comprising the steps of:

providing a pallet assembly comprising at least one a at member having external surfaces; and

affixing a flame retardant material composed of a nanocomposite comprising a polymer material integrated with a clay to said at least one pallet member so a to substantially cover all of said external surfaces of said pallet member, said clay comprising between 0.1% and 20% weight of said nanocomposite.

11. The method according to claim 10, wherein said clay comprises between 0.1% and 10% weight of said nanocomposite.

12. The method according to claim 10, wherein said clay comprises between 10% and 20% weight of said nanocomposite.

13. A pallet assembly comprising:

at least one pallet member having external surfaces; and

a flame retardant material affixed to said at least one pallet member so as to substantially cover all of said external surfaces of said pallet member

wherein said flame retardant material includes a flame retardant fabric comprising a blend of polymeric fibers.

14. A pallet assembly comprising:

at least one pallet member having external surfaces; and

a flame retardant material affixed to said at least one pallet member so as to substantially cover all of said external surfaces of said pallet member,

wherein said flame retardant material includes a flame retardant liquid comprising an intumescent material.

15. The pallet assembly of claim 13, wherein said flame retardant polymeric fibers comprise polytetrafluoroethylene.

16. A pallet assembly comprising:

at least one pallet member having external surfaces; and

a flame retardant material including a flame retardant metal affixed to said at least one pallet member so as to substantially cover all of said external surfaces of said pallet member.

17. The pallet assembly of claim 16, wherein said flame retardant metal is selected from the group consisting of stainless steel, copper and aluminum.

18. A pallet assembly comprising:

at least one pallet member having external surfaces; and

a flame retardant material affixed to said at least one pallet member so as to substantially cover all of said external surfaces of said pallet member,

wherein said flame retardant material is composed of a nanocomposite comprised of a clay that includes a silicate derivative.

19. A pallet assembly comprising:

at least one pallet member having external surfaces; and

a flame retardant material affixed to said at least one pallet member so as to substantially cover all of said external surfaces of said pallet member,

wherein said flame retardant material is composed of a nanocomposite material comprising a polymer material integrated with a clay, said clay comprising between 0.1% and 20% weight of said nanocomposite.

20. The pallet assembly of claim 19, wherein said clay comprises between 0.1% and 10% weight of said nanocomposite.

21. The pallet assembly of claim 19, wherein said clay comprises between 10% and 20% weight of said nanocomposite.

* * * * *

EXHIBIT B

US006745703B2

(12) **United States Patent**
Torrey et al.

(10) **Patent No.: US 6,745,703 B2**
(45) **Date of Patent: Jun. 8, 2004**

(54) **COMPOSITE PALLET MEMBER**

(75) Inventors: **Bruce Torrey**, Orlando, FL (US); **Neil Schultz**, Katonah, NY (US)

(73) Assignee: **Chep International, Inc.**, Orlando, FL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/045,695**

(22) Filed: **Oct. 26, 2001**

(65) **Prior Publication Data**

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(52) **U.S. Cl.** **108/51.11**; 108/57.25
(58) **Field of Search** 108/51.3, 51.11, 108/57.17, 57.19, 53.1, 57.25, 57.27, 57.29, 901, 902

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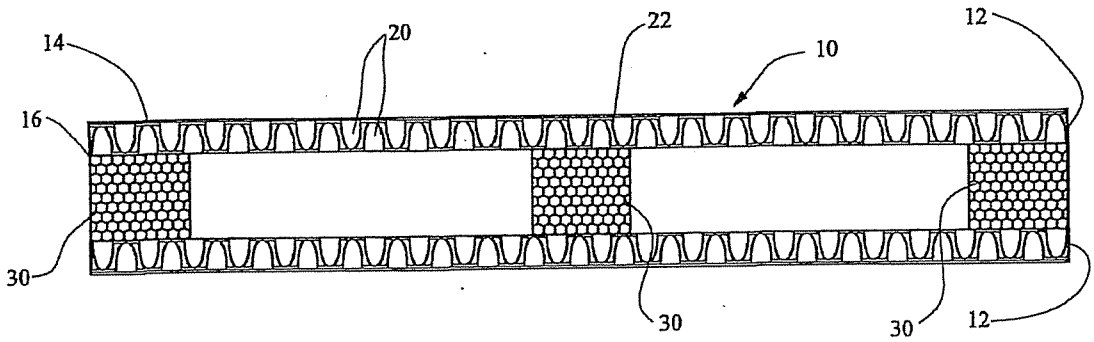
Primary Examiner—Jose V. Chen
(74) *Attorney, Agent, or Firm*—Akerman Senterfitt

(57) **ABSTRACT**

A composite pallet member that provides enhanced performance characteristics. A composite pallet member comprising at least one deck member having a first surface and a second surface. The deck member having a plurality of open spaces and a strengthening layer positioned against at least one of the first surface and the second surface.

47 Claims, 6 Drawing Sheets



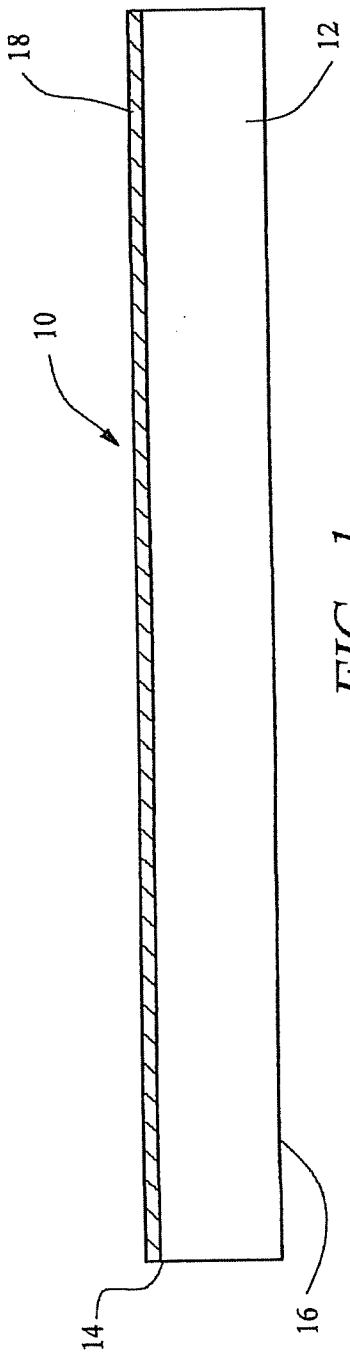


FIG. 1

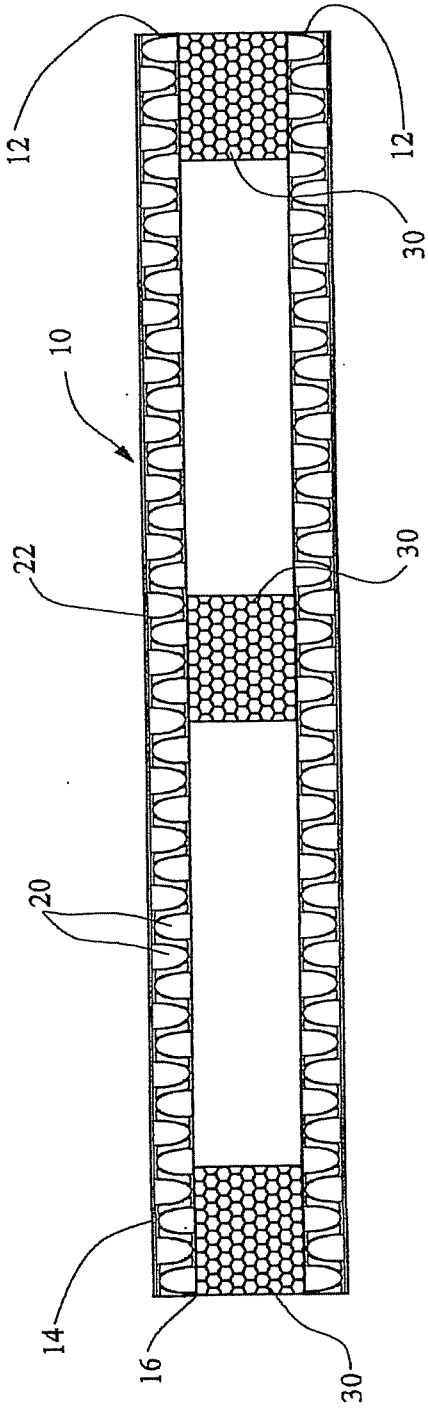


FIG. 2

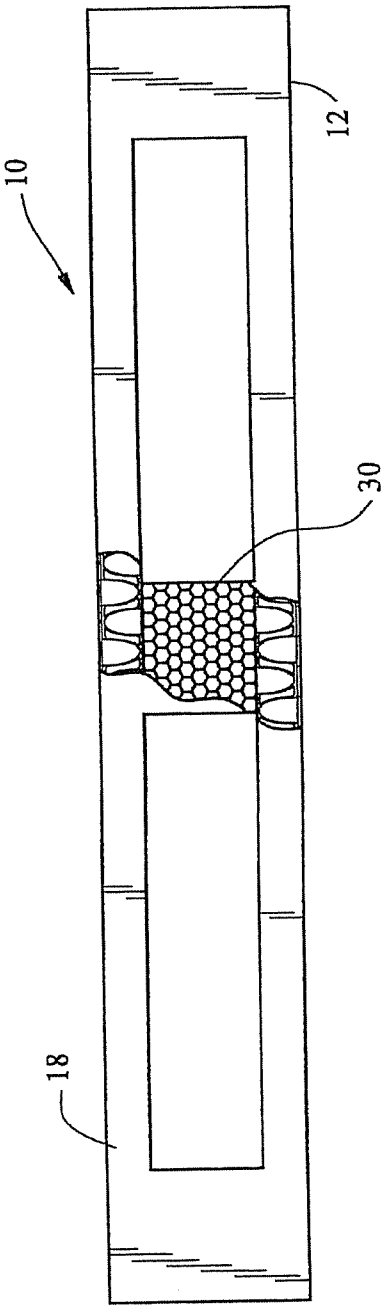


FIG. 3

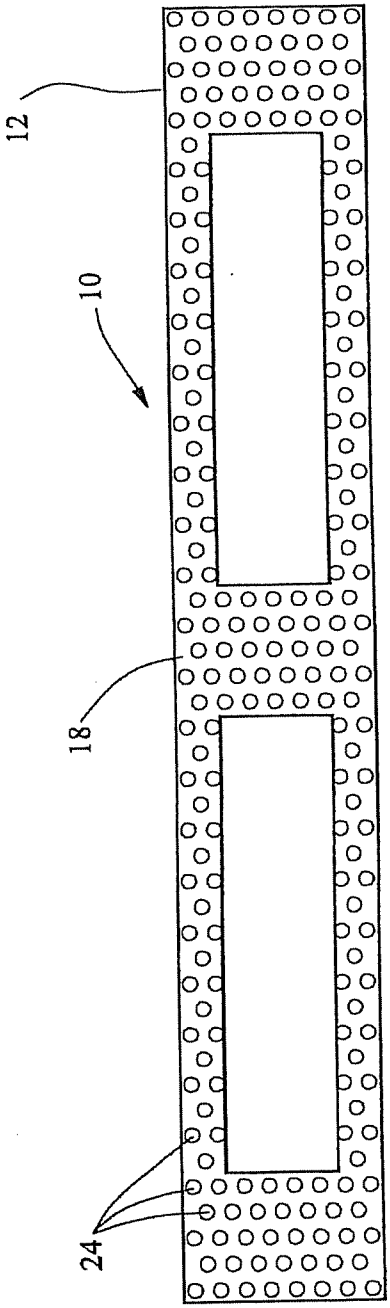


FIG. 4

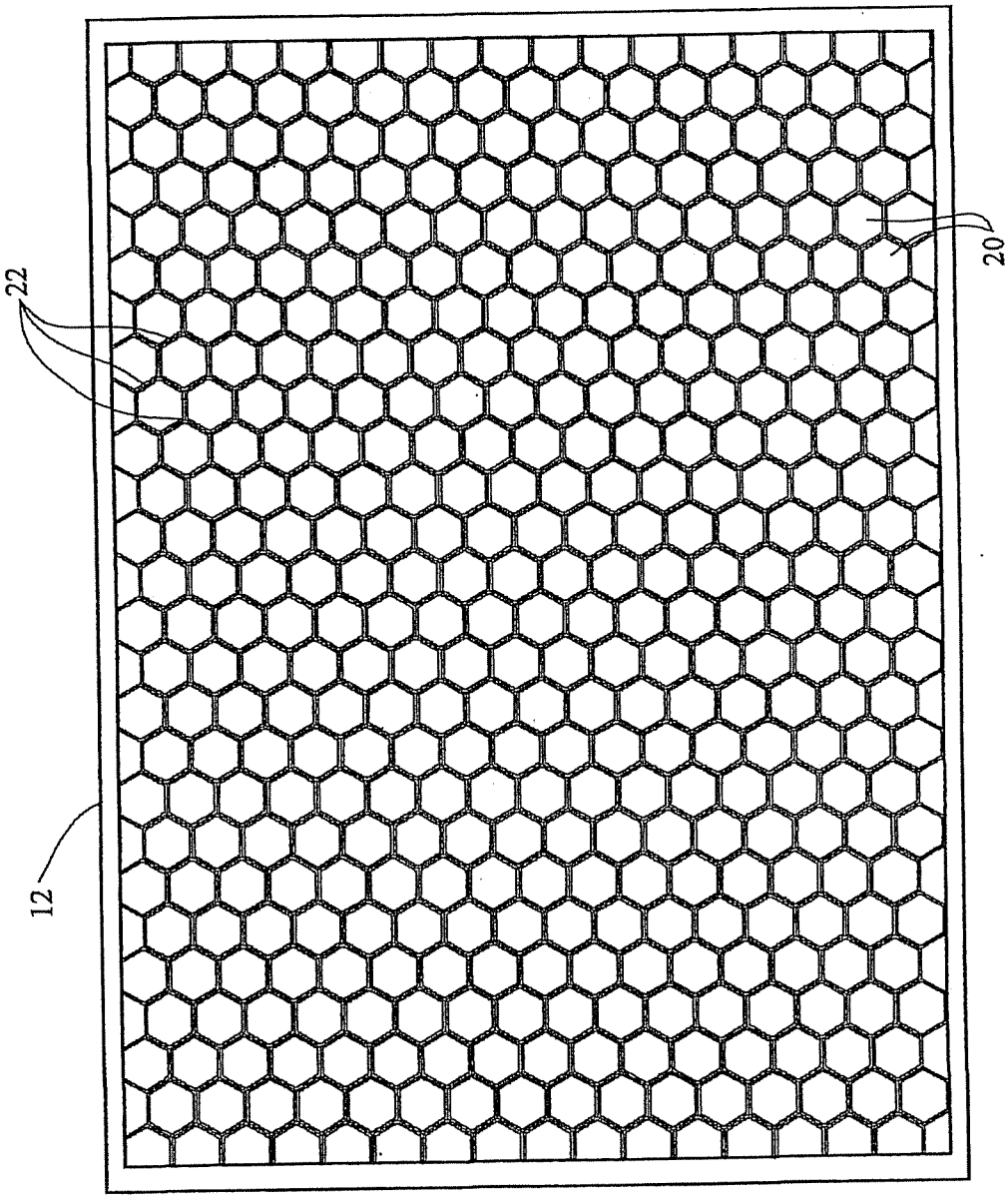


FIG. 5

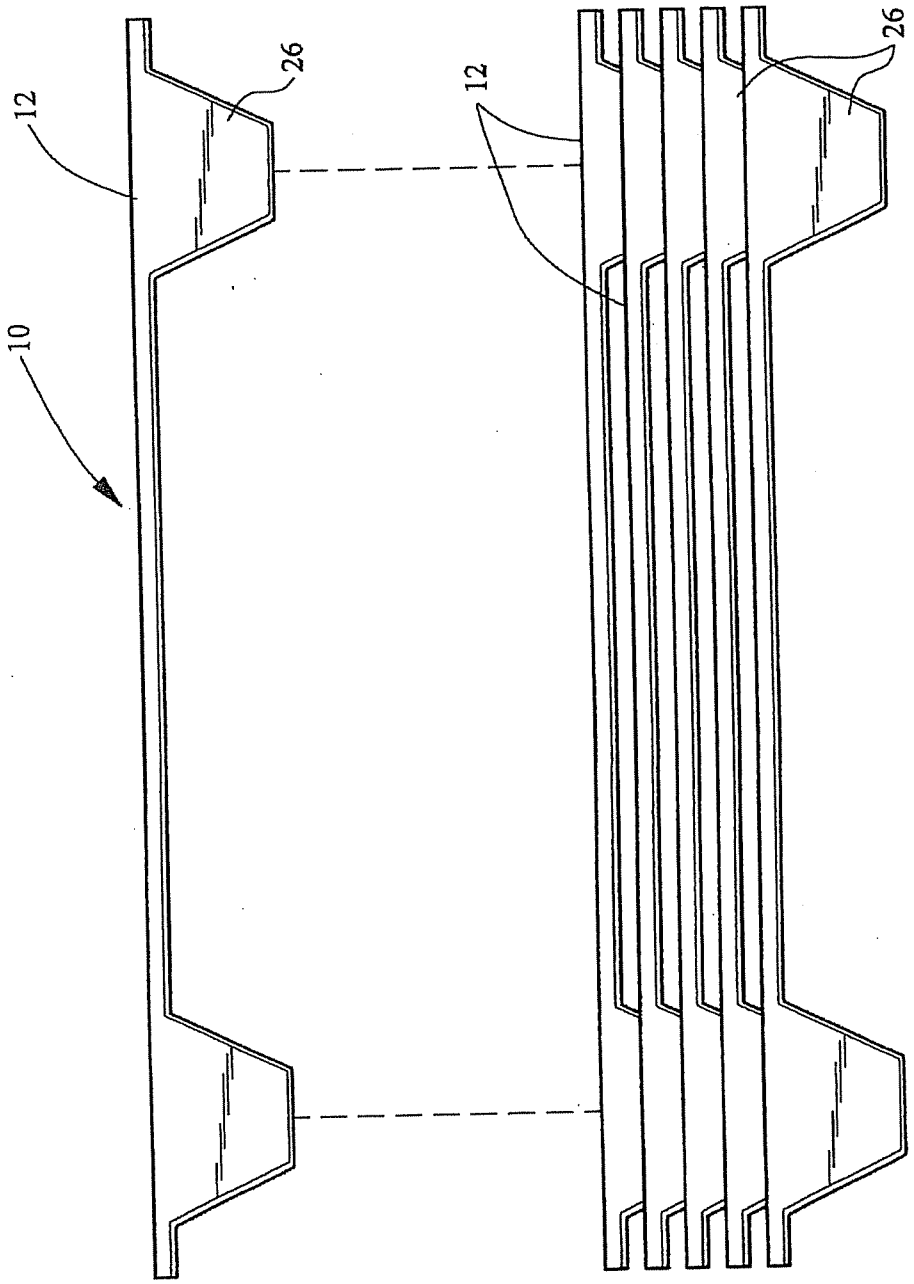


FIG. 6

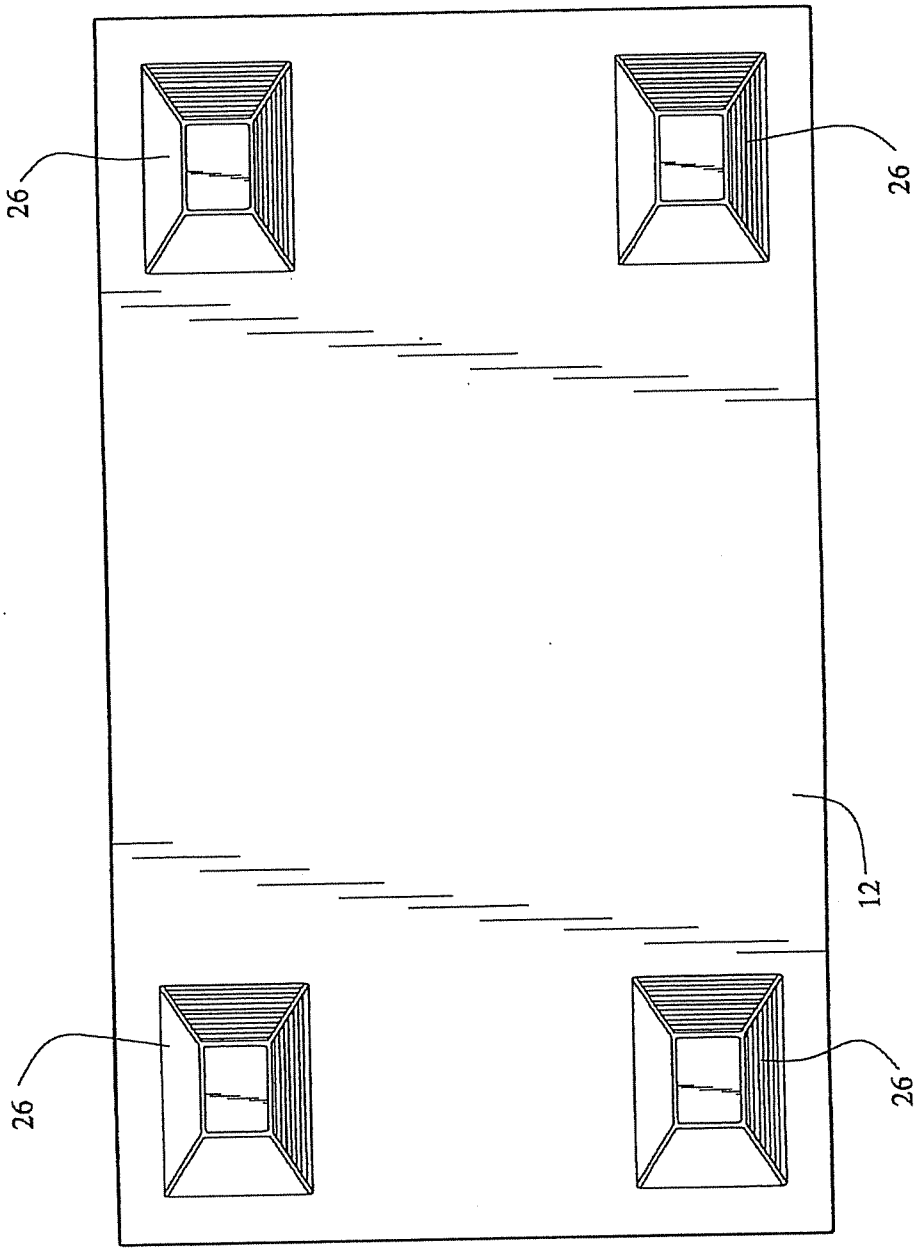


FIG. 7

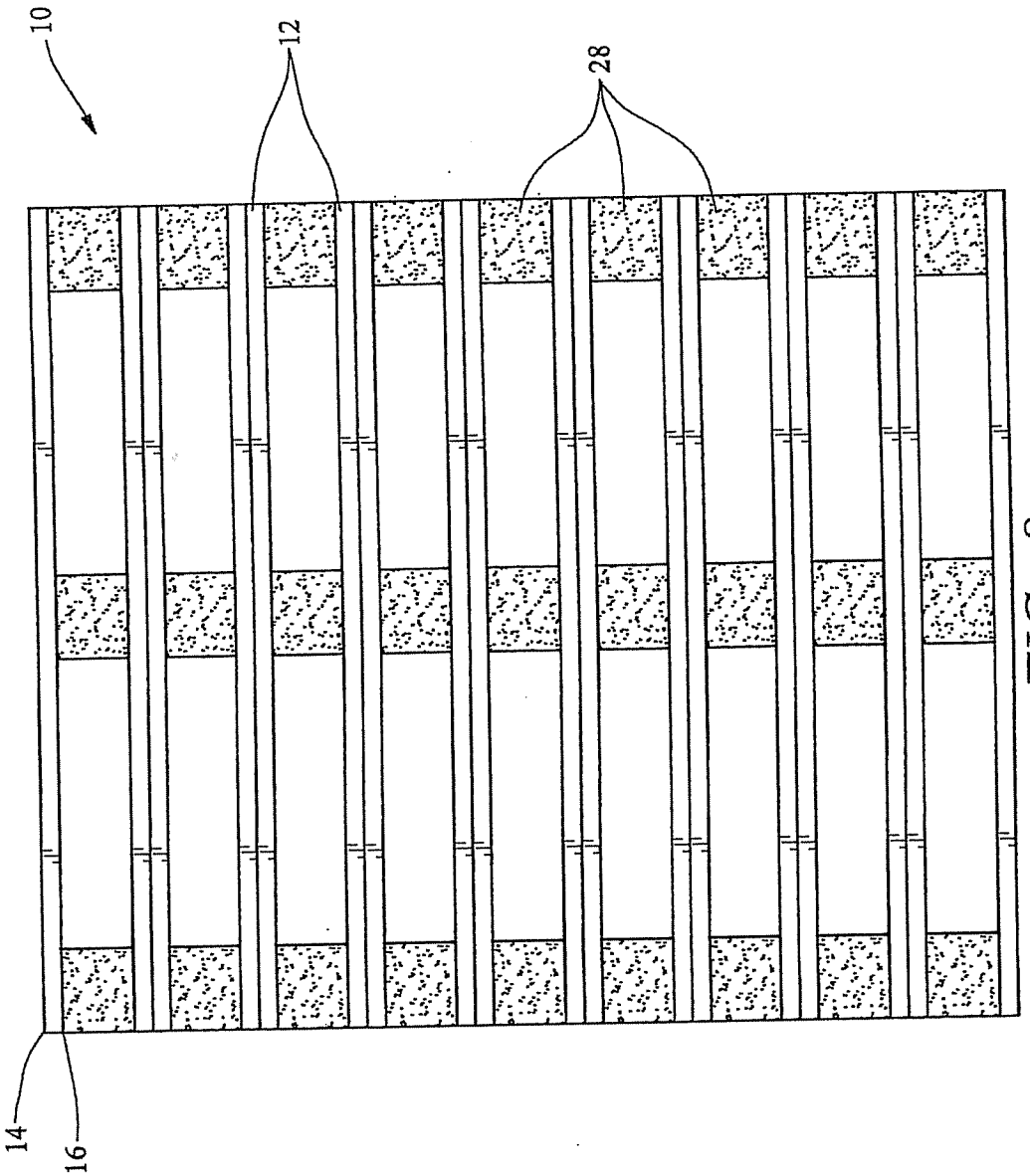


FIG. 8

COMPOSITE PALLET MEMBER

CROSS REFERENCE TO RELATED APPLICATIONS

(Not Applicable)

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

(Not Applicable)

BACKGROUND OF INVENTION

1. Technical Field

The present invention relates generally to a pallet member. More particularly, the invention relates to a composite pallet member with enhanced physical properties.

2. Description of the Related Art

Pallets are used to serve several purposes which range from the loading of equipment, or the stacking of food items for transportation and storage. Regardless of the purpose, a pallet must maintain durability to serve the particular purpose for which it is being used. The vast majority of pallets have been primarily constructed of materials such as wood and plastics. However, most pallets become damaged during transit over the passage of time. For example, many pallets constructed from wood either break or become detached. Additionally, pallets constructed from plastic are often extremely expensive and remain susceptible to deterioration with normal wear and tear. Also, wooden and plastic pallets pose fire hazards due to the high flammability of the materials.

UL 2335 "Classification of Warehouse Pallets" establishes minimum requirements that pallets used and stored in warehouses should adhere to in order to obtain reduced restrictions and improved fire retardancy. For example, obtaining a UL 2335 classification allows plastic pallets to use the same code rules as wood pallets, thereby eliminating several of the imposed restrictions associated with plastic pallets. A UL 2335 classification permits the use of wood and/or plastic pallets with the use of specifically defined restrictions. Wood pallets provide the basis for most all fire protection systems, although these types of pallets are recognized as being extra hazardous. Pallets which are not classified under UL 2335 are penalized significantly more than wood pallets. The associated penalties influence the use of pallets within certain aspects. For example, penalties can include restrictions on a pallets stacking height, corresponding sprinkler protection systems, and other forms of restrictions which can become very expensive. Pallets which are classified under UL 2335 are allowed the same protection systems afforded to ordinary wooden pallets. Consequently, it is desirable to design pallets that can be used to serve normal functions such as for packaging and transporting of goods, while also maintaining durability and exhibiting fire retardant qualities under UL 2335.

Currently, pallet compositions do not possess superior qualities in regards to durability, nor the ability to maintain sufficient fire performance. Although some pallets may provide a few of these qualities, none are optimally suited for multiple purposes. Attempts have been made to overcome present pallet technology. For example, U.S. Pat. No. 6,180,037 discloses a method and composition for manufacturing sheets having a highly inorganically filled matrix. The inorganic sheets may exhibit properties substantially similar to sheets presently made from traditional materials

like paper, cardboard, polystyrene, plastic, or metal. These inorganic sheets may prove to be beneficial in some instances, however many of the same concerns presented by lack of durability and strength are prevalent.

Nanocomposite technology refers to a relatively new class of plastics often derived from a highly defined form of bentonite that reacts with plastic resins. Nanocomposite polymers are prepared by fully dispersing or exfoliating intercalated clay platelets into a host polymer. U.S. Pat. No. 5,876,812 discloses nanocomposite polymer containers composed of a polymer material integrated with a plurality of nanosize particles of clay mineral which act to enhance the barrier properties of the container. The nanocomposite containers disclosed do not teach the use of additional substrate material to further reinforce the containers or pallets, nor the use of innovative design concepts to further structural integrity.

The prior art fails to address the need to have pallets and containers that improve the mechanical strength and durability of pallets and containers, while also providing increased thermal, barrier, and heat resistance properties, at economical prices.

SUMMARY OF INVENTION

The present invention relates to a composite pallet member that provides enhanced performance characteristics.

According to the invention, a composite pallet member can comprise a deck member having a first surface and a second surface. The deck member of the composite pallet member can include a plurality of open spaces located on the surface of the deck member. A strengthening layer can be positioned against at least one of the first surface and the second surface of the deck member. The plurality of open spaces and strengthening layer can provide enhanced strength. The plurality of open spaces can extend from the first surface toward the second surface. The plurality of open spaces also can extend from the second surface toward the first surface. Alternatively, the plurality of open spaces can extend from the first surface toward the second surface and also extend from the second surface toward the first surface. The open spaces can be arranged in a periodic relationship across the surface of the deck member and each open space can provide a closed end.

Several variations of the geometry of the open spaces may be incorporated into the composite pallet member. These differing variations in geometry can provide structural integrity and increased structural support. One embodiment of the invention can include a plurality of open spaces having a triangular geometry. In this embodiment, the plurality of open spaces are formed by three sidewalls arranged substantially in a triangular orientation. The space defined by the three sidewalls decreases in cross sectional area as the open spaces extend from the first surface toward the second surface. The space defined by the three sidewalls can decrease in cross sectional area as the open spaces extend from the second surface toward the first surface. The open spaces may vary in their positioning on the surface of the deck member depending on the particular pallet design. For example, in other embodiments of the invention the open spaces can be arranged in a honeycomb configuration or any other suitable configuration. The open spaces may be filled with foam, expanded metal, or a solid substrate. Additionally, the open spaces can be filled with intumescent paper, fiber sheets, coatings and fabrics. The filling of the open spaces provide additional reinforcement to the composite pallet member.

The deck member can be composed of a variety of materials such as wood, plastic, particle board and metal. The deck member also can be formed utilizing nanocomposite technology. Nancomposites utilize many different materials intermingled on a nanometer scale. Nanocomposites can be made from a variety of starting materials including, but not limited to gases, minerals, and plastics. Nanocomposite technology provides the benefit of increased physical properties. Nanocomposites can provide higher heat distortion temperatures, less shrinkage, less warping, electrical conductivity and better fire performance. The nanocomposites utilized in the composite pallet member can include an organic-inorganic complex of material. The deck member can be composed of a nanocomposite material comprising a polymer material integrated with a clay between 0.1% and 20% weight of the nanocomposite. The weight of the clay used in the nanocomposite comprising the deck member also can include clay between 0.1% and 10% and clay between 10% and 20% weight of the nanocomposite. The clay utilized can include a silicate or silicate derivative such as montmorillonite (alumino-silicate). Nanocomposite technology has demonstrated a significant reduction in heat release rates on the order of 50 to 75% while increasing stiffness, heat distortion temperatures, cold temperature impact and other barrier properties. Nanocomposites also can be utilized in conjunction with flame retardant resins. Flame retardant resins further enhance the fire resistance of pallets. Examples of fire performance enhancing resin technologies used are zirconia, boron oxides, polybenzoxazine, polymers and carbon-silicone resin additives.

The strengthening layer can be positioned against the surface of the deck member. The strengthening layer can be positioned to at least one of the first surface and the second surface of the deck member. The strengthening layer also can be positioned against both the first surface and second surface of the deck member in one embodiment. The deck member and strengthening layer provide the multiple layered pallet member with added durability and load support. The composite pallet member is resilient to normal wear and tear. Nanocomposite technology can be incorporated into the strengthening layer. The strengthening layer can be composed of a nanocomposite material comprising a polymer material integrated with a clay between 0.1% and 20% by weight of the nanocomposite. The weight of the clay used in the nanocomposite comprising the strengthening layer also can include clay between 0.1% and 10% and clay between 10% and 20% by weight of the nanocomposite. The strengthening layer also can be composed of materials such as wood, plastic, particle board, metal, or any other suitable material. The strengthening layer can be detachable or permanently attached to any surface of the deck member. For instance, the strengthening layer can be attached to the first surface of the deck member while no strengthening layer is attached to the second surface of the deck member. Conversely, a strengthening layer can be attached to the second surface of the deck member leaving the first surface without a strengthening layer. Additionally, a strengthening layer can be attached to the first surface of the deck member while a separate strengthening layer can be attached to the second surface of the deck member. The strengthening layer also can include a plurality of holes in its surface. The holes provide a mechanism that facilitates the release of fluids and gases from the surface of the deck member and strengthening layer.

The invention provides a composite pallet member where a plurality of legs can be mechanically integrated into the deck member. The legs also can be composed of a nanocomposite material comprising a polymer material integrated with a clay between 0.1% and 20% weight of the nanocomposite. The weight of the clay used in the nanocomposite comprising the legs also can include clay between 0.1% and 10% and clay between 10% and 20% weight of the nanocomposite. The composite pallet member also can include a plurality of deck members. The plurality of deck members provide additional support and structural integrity to the pallet member. In addition, the plurality of deck members also can include a plurality of open spaces which further compliment the particular design of the specific composite pallet member. The plurality of deck members also can be detachably coupled to form the shelving members. Shelving members can be adapted to provide additional storage space for the composite pallet member. The shelving members can be collapsible or foldable, which improves stacking and storage qualities as compared to traditional single layer pallets.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention may be better understood by referring to the following description taken in conjunction with the accompanying drawings, it being understood, however, that the invention is not limited to the precise arrangements and instrumentalities shown.

FIG. **1** shows a perspective view of a composite pallet member;

FIG. **2** shows a front view of an embodiment of a composite pallet member prior to addition of strengthening layer;

FIG. **3** shows a front view of an embodiment of a composite pallet member with attached strengthening layer;

FIG. **4** shows a front view of a composite pallet member with holes incorporated into the surface of strengthening layer;

FIG. **5** shows a front view of open spaces located on the surface of the deck member of the composite pallet member;

FIG. **6** shows a front view of a composite pallet member with nestable legs;

FIG. **7** shows a top view of a composite pallet member with nestable legs; and

FIG. **8** shows a front view of a composite pallet member with a plurality of deck members forming a shelving member.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention provides a composite pallet member **10** with enhanced physical properties. The invention provides a composite pallet member **10** comprised of various layers of material with fire retardant capabilities and increased durability against normal wear and tear.

FIG. **1** depicts an embodiment of the invention which provides a composite pallet member. The present invention comprises a deck member **12** having a first surface **14** and a second surface **16**. A strengthening layer **18** is positioned against at least one of the first surface **14** and the second surface **16** of the deck member **12**. As shown in FIG. **2**, the deck member **12** can include a plurality of open spaces **20** located on the surface of the deck member **12**. The combination of the strengthening layer **18** and the open spaces **20** provide the composite pallet member with a light weight and additional strength. The plurality of open spaces **20** provided by the deck member **12** can extend from the first surface **14**

toward the second surface **16**. The plurality of open spaces **20** also can extend from the second surface **16** toward the first surface **14**. The placement and orientation of the open spaces **20** located on the surface of the deck member **12** can vary depending on the particular design of the composite pallet member. For example, open spaces **20** also can be provided on the first surface **14** while none are provided on the second surface **16**. Alternatively, open spaces **20** can be provided on the second surface **16** and not be provided on the first surface **14**. The open spaces **20** also can be included on both the first surface **14** and second surface **16** of the deck member **12**. Regardless of the surface where the open spaces **20** are located, the open spaces **20** can extend toward the opposite surface. The open spaces **20** can be arranged in a periodic relationship across the surface of the deck member **12** and each open space **20** can provide a closed end. The closed end of the open spaces **20** provide additional stability within the particular pallet design constructed from the pallet member. The geometry of the open spaces **20** incorporated into the surface of the deck member **12** can include several variations. The geometric arrangement of the open spaces **20** across the deck member **12** supports the stability and strength of the design of the composite pallet member **10**.

The strengthening layer **18** can be positioned against the surface of the deck member **12**. As depicted in FIG. **2**, prior to the addition of the strengthening layer **18** the deck member **12** remains exposed to surface elements, which can contribute to normal wear and tear during usage. The strengthening layer **18** can be positioned to at least one of the first surface **14** and the second surface **16** of the deck member **12**. A strengthening layer **18** can be positioned against both the first surface **14** and the second surface **16** of the deck member **12** in one embodiment. The deck member **12** and strengthening layer **18** provide a multiple layered composite pallet member **10** with added durability and load support. As shown in FIG. **3**, the composite pallet member **10** has enhanced physical durability against deterioration by the addition of the strengthening layer **18**.

Nanocomposite technology can be incorporated into the strengthening layer **18**. The strengthening layer **18** can be composed of a nanocomposite material comprising a polymer material integrated with a clay between 0.1% and 20% by weight of the nanocomposite. The weight of the clay used in the nanocomposite comprising the strengthening layer **18** can include clay between 0.1% and 10% and clay between 10% and 20% by weight of the nanocomposite. The strengthening layer **18** also can be composed of materials such as wood, plastic, particle board, metal, or any other suitable material. The strengthening layer **18** can be detachable or permanently attached to any surface of the deck member **12**. For instance, a strengthening layer **18** can be attached to the first surface **14** of the deck member **12** while no strengthening layer **18** is attached to the second surface **16** of the deck member **12**. Conversely, a strengthening layer **18** can be attached to the second surface **16** of the deck member **12** leaving the first surface **14** without a strengthening layer **18**. Additionally, a strengthening layer **18** can be attached to the first surface **14** while a separate strengthening layer **18** can be attached to the second surface **16** of the deck member **12**. The strengthening layer **18** can also include a plurality of holes **24** in its surface, as shown in FIG. **4**. The plurality of holes **24** provide a mechanism that facilitates the release of fluids and gases from the surface of the deck member **12** and strengthening layer **18**.

The deck member **12** can include a plurality of open spaces **20** having a triangular geometry. In this embodiment, the plurality of the open spaces **20** are formed by three sidewalls arranged substantially in a triangular orientation. The space defined by the three sidewalls decreases in cross sectional area as the open spaces **20** extend from the first surface **14** toward the second surface **16**. Additionally, if open spaces **20** are located on the second surface **16**, the spaced defined by the three sidewalls decreases in cross sectional area as the open spaces **20** extend from the second surface **16** toward the first surface **14**. The positioning of the open spaces **20** on the surface of the deck member **12** may vary according to the particular pallet design constructed from the composite pallet member. The configuration of the open spaces **20** is not limited to any particular design and can be arranged in a suitable configuration based on the specific use and purpose of the composite pallet member **10**. One particular example of a suitable configuration includes a honeycomb configuration **22**, as illustrated in FIG. **5**. The configuration **22** of the open spaces provide the composite pallet member **10** with equalized load support across the surface of the deck member **12**. The configuration **22** of the open spaces also provides increased stability against horizontal and vertical forces that effectively minimize wear and tear on the composite pallet member **10**. Minimizing normal wear and tear extends the life of the composite pallet member **10**.

The open spaces **20** can be filled with foam, expanded metal, or a solid substrate. Additionally, the open spaces **20** can be filled with intumescent paper, fiber sheets, coatings and fabrics. The hollow shapes of the potential pallet designs allow the placement or encapsulation of various forms of sheet, fabric and coating materials into the pallet before complete assembly of the pallet. The open spaces **20** are not limited to a particular material for filling and can be filled with any suitable material. However, considerations related to fire safety should be taken under consideration during selection of an adequate material. The filling of the open spaces **20** provides additional reinforcement for the composite pallet member **10**.

The composite pallet member **10** can be utilized in forming a pallet. As illustrated in FIG. **2**, the pallet can be comprised using multiple composite pallet members adhered together with pallet material **30**. The pallet material **30** also can be used between the composite pallet members to separate pallet members **10** and provide structural support to the design of the pallet. Alternatively, the composite pallet member **26** can independently serve as a pallet, as shown in FIG. **1**. In this embodiment, the deck member **12** and strengthening layer **18** comprise the structure for the pallet design.

The deck member **12** can be composed of a variety of materials such as wood, plastic, particle board and metal. The deck member **12** is not limited to a particular type of material for construction, although attention to design structure and intended use should be factors to consider. The deck member **12** also can be formed utilizing nanocomposite technology. Composition of the composite pallet member **10** utilizing nanocomposite technology involves the intermingling of different materials on a nanometer scale. Nanocomposites can be made from a variety of materials including gases, minerals, and plastics. Although the composition of a nanocomposite is not limited to any particular type of material, it usually refers to the combination of plastics often derived from a highly refined form of bentonite that reacts with plastic resin. Nanocomposites are prepared by fully dispersing or exfoliating intercalated clay into a host polymer.

Nanocomposites exhibit structural, thermal, mechanical, and barrier properties. Nanocomposite technology provides

the benefit of increased physical properties. Nanocomposites can provide higher heat distortion temperatures, less shrinkage, less warping, electrical conductivity and better fire performance. The nanocomposites utilized in the composite pallet member **10** can include an organic-inorganic complex of material. The deck member **12** can be composed of a nanocomposite material comprising a polymer material integrated with a clay between 0.1% and 20% by weight of the nanocomposite. The weight of the clay used in the nanocomposite comprising the deck member **12** also can include clay between 0.1% and 10% and clay between 10% and 20% by weight of the nanocomposite. The clay utilized can include a silicate or silicate derivative such as Montmorillonite (alumino-silicate).

Montmorillonite can be employed in the preparation of polymer-clay nanocomposites. Montmorillonite provides performance advantages compared to traditional reinforcing agents for plastics. Montmorillonite can provide reinforcement to the pallet member and add to the overall strength of the pallet member. Other advantages of utilizing Montmorillonite includes providing lighter plastic parts with greater transparency. With Montmorillonite, the plastic will have increased barrier properties to moisture, solvents, chemical vapors, and gases. Montmorillonite leads to an improved permeation barrier. With Montmorillonite, the plastic will have increased dimensional stability at low reinforcement loading. The resulting plastic will have a higher heat distortion temperature. Only a few percent loading of Montmorillonite will increase the temperature at which the plastic will begin to soften. Pallet members **10** composed with Montmorillonite also provide increased durability in heat sensitive applications. The incorporation of Montmorillonite improves upon the ability to recycle pallet members **10**. Due to the colloidal nature, high surface area, and surface treatability of montmorillonite, it can serve as an active site to fix dyes into plastic.

Nanocomposite technology has demonstrated a significant reduction in heat release rates on the order of 50 to 75% while increasing stiffness, heat distortion temperatures, cold temperature impact and other barrier properties. Nanocomposites also can be utilized in conjunction with flame retardant resins. Flame retardant resins further enhance the fire resistance of pallet members **10**. Examples of fire performance enhancing resin technologies used are zirconia, boron oxides, polybenzoxazine, polymers and carbon-silicone resin additives. Nanocomposites offer a new flame-retardant approach. The improved flame retardancy shows a decrease in the peak heat release rate, decrease in smoke, and an increase in char formation. The nanocomposite particles are smaller than traditional reinforcing agents and provide a smooth surface.

An embodiment of the present invention, as illustrated in FIG. **6**, can include a composite pallet member **10** with a plurality of legs **26** mechanically integrated to the deck member **12**. The legs **26** can be composed of a nanocomposite material comprising a polymer material integrated with a clay between 0.1% and 20% by weight of the nanocomposite. The weight of the clay used in the nanocomposite comprising the legs **26** can include clay between 0.1% and 10% and clay between 10% and 20% by weight of the nanocomposite. The legs **26** can be integrated into the design of the pallet member **10** during the initial molding process. For example injection molding can be suited to form the legs **26**. Other processes suitable for forming the legs **26** include thermoforming, stamping, and extruding. The integration of legs **26** provide nesting ability and added structural support. For example, nesting ability allows pallet members to be stacked, which can be extremely beneficial during storage and transporting. As shown in FIG. **7**, the deck member **12** can include integrated leg **26** on the surface of the deck member. The first surface of the deck member can provide a first surface of the legs **26**. Additionally, the second surface of the deck member can provide a second surface of the legs **26**. The resulting legs **26** can extend from the first surface toward the second surface forming an opening on the surface. The opening allows the pallet members to be stacked. The geometry of the legs **26** can vary depending on the design of the particular legs. For example, a deck member can feature legs **26** in a pyramidal geometry. The addition of the strengthening layer can be included on the legs **26**. The strengthening layer can be positioned against at least one of the first surface and second surface of the deck member.

Another embodiment of the present invention illustrated in FIG. **8**, includes a composite pallet member **10** with a plurality of deck members **12**. The plurality of deck members **12** provide additional support and structural integrity to the pallet member. The plurality of deck members **12** also can be incorporated into the composite pallet member **10** to provide the pallet member with shelving members **28**. The plurality of deck members **12** can be detachably coupled to form the shelving members **28**. Shelving members **28** provide additional storage space for the composite pallet member **10**. A composite pallet member **10** with shelving members **28** can be useful in any industry that involves the need for storage or shelving capacity. For instance, in grocery stores the composite pallet member **10** can be used to store food and other related items in an efficient manner. Additionally, in warehouse facilities, the composite pallet member **10** can be used to store a multitude of items while providing the ability to be broken down into smaller units with collapsible shelving members **28**, or to be completely removed. The composite pallet member **10** also provides safety and fire security under storage conditions. The collapsible shelving members **28** provide the composite pallet member **10** the ability to be broken down into several individual units. The individual units can be utilized for material handling, display platforms or can be reassembled into other components to form larger pallet assemblies.

It will of course be understood that the invention is not limited to the specific details described herein, which are given by way of example only, and that various modifications and alterations are possible within the scope of the invention as defined in the appended claims. For example, the composite pallet member **10** can include variations in the number of deck members **12**, configurations of open spaces **20**, and placement of strengthening layer **18**, and remain within the scope of the invention.

What is claimed:

1. A composite pallet member comprising:

at least one deck member having a first surface and a second surface;

said deck member having a plurality of open spaces, said open spaces extending between said first and second surfaces; and

a strengthening layer positioned against at least one of said first surface and said second surface,

wherein said deck member is composed of a nanocomposite material comprising a polymer material integrated with a clay, said clay comprising between 0.1% and 20% by weight of said nanocomposite.

2. The composite pallet member according to claim **1**, wherein a first set of said plurality of open spaces extend from openings in said first surface toward said second

surface and terminate in a closed end at said second surface, and a second set of said plurality of open spaces extend from openings in said second surface toward said first surface and terminate in a closed end at said first surface.

3. The composite pallet member according to claim 2, wherein said plurality of open spaces decrease in cross sectional area as said open spaces extend toward their respective closed ends.

4. The composite pallet member according to claim 1, wherein said plurality of open spaces are arranged in a honeycomb configuration.

5. The composite pallet member of claim 1, further comprising a strengthening layer positioned against said first surface and a strengthening layer positioned against said second surface.

6. The composite pallet member according to claim 1, wherein said deck member is composed of at least one material chosen from the group of materials consisting of wood, plastic, particle board and metal.

7. The composite pallet member according to claim 1, wherein said pallet member further comprises a plurality of deck members having a plurality of open spaces.

8. The composite pallet member according to claim 1, wherein said clay comprises between 0.1% and 10% by weight of said nanocomposite.

9. The composite pallet member according to claim 1, wherein said clay comprises between 10% and 20% by weight of said nanocomposite.

10. The composite pallet member according to claim 1, wherein said nanocomposite material comprises flame retardant resins.

11. The composite pallet member according to claim 1, wherein said nanocomposite material comprises a clay that includes a silicate derivative.

12. The composite pallet member according to claim 1, wherein said strengthening layer is composed of at least one material chosen from the group of materials consisting of wood, plastic, particle board and metal.

13. The composite pallet member according to claim 1, wherein said strengthening layer is composed of a nanocomposite material comprising a polymer material integrated with a clay, said clay comprising between 0.1% and 20% by weight of said nanocomposite.

14. The composite pallet member according to claim 13, wherein said strengthening layer clay comprises between 0.1% and 10% by weight of said nanocomposite.

15. The composite pallet member according to claim 13, wherein said strengthening layer clay comprises between 10% and 20% by weight of said nanocomposite.

16. The composite pallet member according to claim 1, wherein said strengthening layer is attached to at least one of said first surface and said second surface.

17. The composite pallet member according to claim 1, wherein said strengthening layer is detachably coupled to at least one of said first surface and said second surface.

18. The composite pallet member according to claim 1, wherein said strengthening layer includes a plurality of holes.

19. The composite pallet member according to claim 1, wherein said plurality of open spaces are filled with at least one filler selected from the group consisting of foam, expanded metal and solid substrate.

20. The composite pallet member according to claim 1, wherein said pallet member includes a plurality of mechanically integrated legs.

21. The composite pallet member according to claim 20, wherein said legs are composed of at least one material chosen from the group of materials consisting of wood, plastic, particle board and metal.

22. The composite pallet member of claim 20, wherein said legs are composed of a nanocomposite material comprising a polymer material integrated with a clay, said clay between 0.1% and 20% by weight of said nanocomposite.

23. The composite pallet member of claim 22, wherein said clay in said legs comprises between 0.1% and 10% by weight of said nanocomposite.

24. The composite pallet member of claim 22, wherein said clay in said legs comprises between 10% and 20% by weight of said nanocomposite.

25. The composite pallet member according to claim 1, wherein a plurality of deck members are attached to a surface of said deck member forming a shelving member.

26. The composite pallet member according to claim 25, wherein said plurality of deck members are detachably coupled to said deck member to form said shelving member.

27. The composite pallet member according to claim 25, wherein said plurality of deck members are collapsible.

28. The composite pallet member according to claim 1, wherein said strengthening layer completely closes said open spaces in said at least one surface.

29. The composite pallet member according to claim 28, wherein said strengthening layer completely closes said open spaces in both said first and second surfaces.

30. The composite pallet member according to claim 1, wherein said clay comprises montmorillonite.

31. A composite pallet member comprising:

at least one deck member having a first surface and a second surface;

said deck member having a plurality of open spaces in said first and second surfaces; and

a strengthening layer positioned against at least one of said first surface and said second surface, said strengthening layer at least partially closing at least some of said open spaces in said at least one surface,

wherein a first set of said plurality of open spaces extend from said first surface toward said second surface and terminate in a closed end at said second surface, and a second set of said plurality of open spaces extend from said second surface toward said first surface and terminate in a closed end at said first surface,

wherein said open spaces decrease in cross-sectional area as said open spaces extend toward their respective closed ends.

32. The composite pallet member according to claim 31, wherein said plurality of open spaces are arranged in a honeycomb configuration.

33. The composite pallet member of claim 31, further comprising a strengthening layer positioned against said first surface and a strengthening layer positioned against said second surface.

34. The composite pallet member according to claim 31, wherein said strengthening layer is attached to at least one of said first surface and said second surface.

35. The composite pallet member according to claim 31, wherein said strengthening layer is detachably coupled to at least one of said first surface and said second surface.

36. The composite pallet member according to claim 31, wherein said strengthening layer is composed of at least one material chosen from the group of materials consisting of wood, plastic, particle board and metal.

37. The composite pallet member according to claim 31, wherein said deck member is composed of at least one material chosen from the group of materials consisting of wood, plastic, particle board and metal.

38. The composite pallet member according to claim 31, wherein said pallet member further comprises a plurality of deck members having a plurality of open spaces.

39. The composite pallet member according to claim 31, wherein said strengthening layer includes a plurality of holes.

40. The composite pallet member according to claim 31, wherein said plurality of open spaces are filled with at least one filler selected from the group consisting of foam, expanded metal and solid substrate.

41. The composite pallet member according to claim 31, wherein said pallet member includes a plurality of mechanically integrated legs.

42. The composite pallet member according to claim 41, wherein said legs are composed of at least one material chosen from the group of materials consisting of wood, plastic, particle board and metal.

43. The composite pallet member according to claim 41, wherein a plurality of deck members are attached to a surface of said deck member forming a shelving member.

44. The composite pallet member according to claim 43, wherein said plurality of deck members are detachably coupled to said deck member to form said shelving member.

45. The composite pallet member according to claim 43, wherein said plurality of deck members are collapsible.

46. The composite pallet member according to claim 31, wherein said strengthening layer completely closes said open spaces in said at least one surface.

47. The composite pallet member according to claim 46, wherein said strengthening layer completely closes said open spaces in both said first and second surfaces.

* * * * *

EXHIBIT C

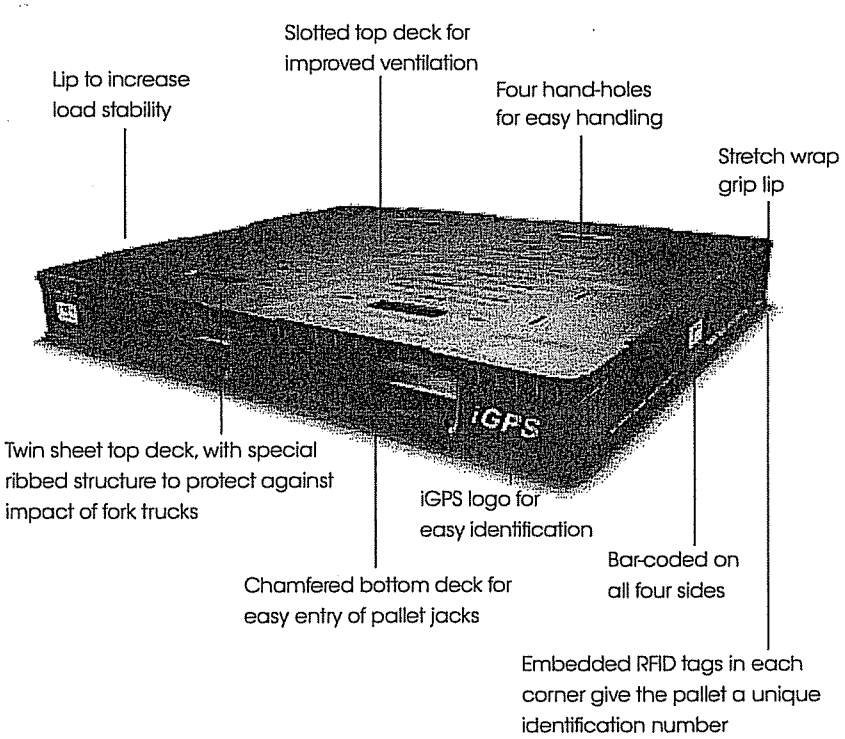
iGPS

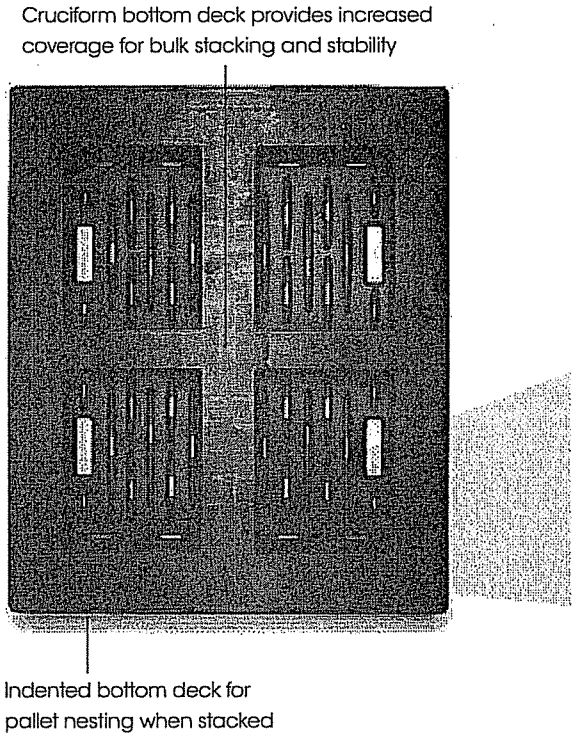
intelligent GLOBAL POOLING SYSTEMS

Pallet Features & Specifications

Quick Features

Consistent	Every iGPS plastic pallet has consistent 48" x 40" dimensions that meet or exceed all GMA standards.
Lightweight	Weighing 48.5 pounds each, iGPS pallets are 30% lighter than wood competitors.
Durable & Strong	iGPS plastic pallets are built with HDPE (high density polyethylene), ensuring long life. They are also edge-rackable, boasting a 2,800-pound load capacity and maintain standardized dimensions throughout their lifetime.
RFID/Bar-Coded	Unique identification number allows pallet to be associated with user internal LPN (license plate number).
Recyclable	Our plastic pallets are 100% recyclable and are never disposed of in a landfill.
Fire Performance	iGPS has the only commercially available pooled plastic pallet that is certified under UL 2335 (file no. R25482) and FM 4996 Approvals, and complies with NFPA-13.
Safe	No protruding nails or broken boards to injure employees or damage equipment or products.
Hygienic	iGPS pallets do not absorb liquids and are impervious to infestation and contamination.





Pallet Specifications

Dimensions	48" x 40" x 5.62"
Weight	48.5 lbs.
Load bearing capacity	Static load: 30,000 lbs. / Dynamic load: 5,000 lbs.
Edge-rackable load	2,800 lbs.
Top deck	• Twin sheet thermoformed, 1" thick • 100% coverage
Bottom deck	• Injection molded, 1" thick • 5 steel reinforcements • 57% coverage
Forklift opening long side	33" x 3.5"
Forklift opening short side	30" x 3.5"
RFID	4 identical generation 2 passive tags; 1 in each corner
Bar code/Alphanumeric identifier	1 on each side of the pallet
Temperature range	-20° F to 140° F
Burn index	Fire performance exceeds typical wooden pallets
Material	HDPE (high density polyethylene)

For more information about iGPS, please visit igps.net or call us at 800-884-0225.

REV 05/09

iGPS

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