IRON PALLET, METHOD OF MANUFACTURING THE SAME, AND INTERMEDIATE SUPPORT FOR THE SAME

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ABSTRACT

The present invention relates to an iron pallet which is essentially used to conveniently, quickly and correctly handle articles or products when producing, transporting and keeping the articles or products, a method of manufacturing the same, and an intermediate support for the same. A coating layer is formed on an upper surface of an iron pallet which will come into contact with a product to be placed on the iron pallet, by processing a solid material at a high temperature using plasma, arc or flame to produce fine particles and by momentarily jetting the fine particles to the upper surface of the iron pallet such that fine particles are formed on the upper surface of the iron pallet. Therefore, fine depressions and prominences are created to prevent slip of the product placed on the pallet, and excellent corrosion resistance is rendered when compared to a conventional iron pallet.
**Figure 1**

![Diagram of a rectangular structure with labeled parts 1, 5, and 6.](image)

(a) ![Diagram showing a top view](image)

(b) ![Diagram showing a side view](image)

**Figure 2**

![Diagram of a structure with labeled parts 7 and 8.](image)

(a) ![Diagram showing a top view](image)

(b) ![Diagram showing a side view](image)
[Figure 12]

[Figure 13]
IRON PALLET, METHOD OF MANUFACTURING THE SAME, AND INTERMEDIATE SUPPORT FOR THE SAME

TECHNICAL FIELD

[0001] The present invention relates to an iron pallet which is essentially used to conveniently, quickly and correctly handle articles or products when producing, transporting and keeping the articles or products in an industrial field or in a distribution procedure, a method of manufacturing the same, and an intermediate support for the same.

BACKGROUND ART

[0002] So far, a pallet generally used for transporting and keeping products is manufactured by assembling timber having predetermined thickness or width in the shape of a lattice and driving fastening elements such as nails into the overlapped portions of the timber. The pallet manufactured in this way has a drawback in that it has a poor strength and a short lifetime. Specifically, when the pallet is used as a platform on which bricks, stones, etc. are stockd in the open air, the pallet is exposed to moisture or water. Therefore, moisture or water may soak into the timber to cause deformation of the timber, and the timber may be decomposed and gather mold, as a result of which an offensive odor can be produced and damage to the articles placed on the pallet can be caused. Further, when considering a situation that almost all of raw materials are imported, waste of foreign currency, unnecessary consumption of resources, and environmental pollution may result. Accordingly, in order to cope with the problems related with the decomposition and poor strength as disadvantages of the timber, a pallet made of synthetic resin (plastic) has been utilized.

[0003] However, while the pallet made of synthetic resin is suitable for mass production, exhibits an excellent strength and has an extended lifetime when compared to the conventional wooden pallet, since the entire pallet is integrally formed by injection molding, the pallet has a substantial weight. Due to this fact, disadvantages are caused in that loading efficiency is degraded to serve as a cause for increasing a physical distribution cost, and it is difficult to recycle the pallet made of synthetic resin whereby environmental issues may be raised.

[0004] Recently, in order to solve these problems, a pallet made of iron has been disclosed in the art. Nevertheless, since the iron pallet has a number of parts, a manufacturing cost increases and the automated mass production of the iron pallet is difficult. Also, after the iron pallet is used for extended periods, since screws or bolts used for assembling the iron pallet may be easily loosened by vibration, inconvenience can be caused while using the iron pallet, and the lifetime of the iron pallet can be shortened. Under these circumstances, while another iron pallet which is integrally formed including leg parts has been suggested in the art, an excessive equipment cost is required, and various problems are caused to conduct a proper function as a pallet in relation with weight, manufacturing cost and in-use convenience in use.

[0005] As an invention solving these problems, the present applicant has filed several patent applications, in an example of which a reinforcing hole is defined in an upper plate and leg members are coupled to the lower part of the upper plate. Notwithstanding, an iron pallet which has improved in-use convenience and a simple construction is still required in view of economic efficiency. In particular, needs exist for an iron pallet which can maintain an excellent strength and can be easily assembled while being composed of an upper plate, a lower plate and an intermediate member as main component elements.

[0006] Meanwhile, the upper surface of an iron pallet which comes into contact with products placed on the pallet is likely to be abraded or broken due to exposure to corrosion and physical and chemical damages, and the products are apt to slip on the upper surface of the iron pallet. As methods for solving this problem, a pigment such as epoxy and paint is simply applied, or a galvanized iron sheet is used for forming the iron pallet. However, even in these methods, the problems related with the slip of the products and corrosion of the iron pallet are not thoroughly solved, and the galvanized iron sheet has a drawback in that it is expensive.

[0007] In the particular case of a pallet used for curing cement products, while a pallet made of stainless steel can be advantageously used, because the cost of the pallet made of stainless steel is expensive over six to ten times the cost of a hot-rolled iron sheet, the pallet made of stainless steel cannot be adequately used. In the case of the pallet made of the hot-rolled iron sheet which is relatively cheap, because it is used in a manner such that finished cement products are loaded on the pallet and the pallet is moved by a conveyor, a bogie or a forklift into a steam curing room to cure the cement products under a high temperature, the surface of the pallet made of the hot-rolled iron sheet is likely to be corroded. Particularly, the corner portions of the pallet are exposed to frequent contact with foreign objects, they are corroded to an increased degree.

[0008] Moreover, a conventional iron pallet comprises an upper plate, a lower plate and an intermediate plate. While these component elements are assembled with one another by means of screws, welding, riveting, etc., the assembling operations are proved labor and cost intensive, technical difficulties are accompanied with, defects are caused while using the pallet in situ after manufacture. That is to say, while the assembling using the screws provides a firm structure, the structure is likely to be adversely influenced by vibration, a labor cost is increased, and it is difficult to automatize the manufacturing procedure. In the case of assembling the pallet by welding, difficulties may be caused depending upon a working condition, and an initial equipment cost is excessively required when automatizing the manufacturing procedure. Even in the remaining method, satisfiable results cannot be obtained in terms of cost and quality.

DISCLOSURE

Technical Problem

[0009] Accordingly, the present invention has been made keeping in mind the above problems occurring in the prior art, and an object of the present invention is to provide an iron pallet which prevents slip of a product as occurred in the case of a conventional iron pallet, has excellent corrosion resistance when compared to the conventional iron pallet, and is coated on its side surface and upper and lower edges with a corrosion-resistant and abrasion-resistant material when being used for curing cement products, so that initial quality of the iron pallet can be maintained for extended periods and the iron pallet can be manufactured at a reasonable cost.
Another object of the present invention is to provide an iron pallet which can be easily assembled while maintaining the strength of a conventional iron pallet as it is.

A further object of the present invention is to provide an iron pallet which can be automatized in its manufacturing procedure to be quickly manufactured, has a light weight, can be conveniently assembled, and can be manufactured at a reasonable cost to accomplish competitiveness.

Yet another object of the present invention is to provide an iron pallet which is constructed in consideration of the fact that an intermediate support must have strength capable of standing the weight of a product placed on an upper plate and must be conveniently manufactured and that upper and lower plates must be quickly assembled with each other with sufficient strength at connection regions, and which has an intermediate support having a structure capable of standing the weight of a product placed on an upper plate and easily connecting upper and lower plates to each other with excellent strength.

Technical Solution

The present invention is directed for an iron pallet (1) characterized in that a coating layer (5) is formed on an upper surface of the iron pallet (1) which will come into contact with a product to be placed on the iron pallet (1), by processing a solid material at a high temperature using one of plasma, arc and flame to produce fine particles (6) and by momentarily jetting the fine particles (6) to the upper surface of the iron pallet (1) such that fine particles (6) are formed on the upper surface of the iron pallet (1).

Also, since an iron pallet (7) for curing a cement product is loaded at a high temperature in a manner such that the produced cement product is loaded on the iron pallet (7) and the iron pallet (7) is moved into a steam curing room by a conveyor a bogie or a fork lift to cure the cement product at the high temperature, the corner portions of the pallet (7) is likely to be severely corroded. In order to cope with this problem, the coating surface (8) of the iron pallet (7) for curing a cement product is formed at the corner portions of the iron pallet (7) which are most likely to be corroded. The coating surface (8) is formed on the iron pallet (7) to extend over a distance of no greater than 50 mm when measured from respective edges of the iron pallet (7). The fine particles (6) are primarily formed from one selected from a group consisting of zinc, stainless steel, alloy of zinc and aluminum, and alloy of zinc and stainless steel. Alternatively, the fine particles (6) are formed from a mixture of stone, sand and iron powder, or various ceramic particles.

Further, the present invention is directed for a method for forming a coating surface (5, 8) on an iron pallet (1, 7), comprising the steps of forming a material such as metal, nonmetal and ceramic into wire or powder using one of plasma, arc and flame; melting and momentarily jetting the wire or fine particles (6) comprising the powder to a surface of an iron plate using a thermal sprayer; sealing the surface of the iron plate to which the wire or fine particles are jetted, by applying liquid phase thermosetting resin such as epoxy resin, urethane resin and lacquer resin on the surface of the iron plate using a sprayer, a brush or a roll; and cutting the iron plate having undergone the jetting and sealing steps and fabricating a pallet (1, 7).

The present invention is illustrated in FIGS. 1(a), 1(b), 2(a) and 2(b). FIGS. 1(a) and 2(a) illustrate the iron pallet (1) and the iron pallet (7) for curing a cement product, respectively, which are entirely coated on their surfaces, and FIGS. 1(b) and 2(b) illustrate the iron pallet (1) and the iron pallet (7) for curing a cement product, respectively, which are partially coated on their surfaces.

The present invention is directed for an iron pallet (21) comprising an upper plate (22), a lower plate (23) and an intermediate member (24), wherein the intermediate member (24) has a substantially U-shaped cross-section, concaved reinforcing portions (29) are formed on respective walls of the intermediate member (24), and locking projections (28) for locking the upper plate (22) and the lower plate (23) are formed on upper and lower ends of the intermediate member (24) on which the concaved reinforcing portions (29) are not formed. The present invention is further directed for the iron pallet (21) wherein each locking projection (28) is divided into two parts which are bent in opposite directions.

The present invention will be described below in detail with reference to the accompanying drawings. FIG. 3 is a perspective view of the iron pallet (21) formed with the locking projections (28) according to the present invention. FIG. 4 is a detailed view of the intermediate member (24) of the iron pallet (21) shown in FIG. 3. and FIG. 5 is a detailed view of another embodiment of the intermediate member (24) of the iron pallet (21) shown in FIG. 3. At this time, it is advantageous in the light of easy locking of the upper and lower plates (22 and 23) that the locking projections (28) are formed to have a semi-circular sectional shape.

By constructing the present invention as described above, due to the configuration of the U-shaped cross-section of the intermediate member (24) and the interaction of the concaved reinforcing portions (29) and the locking projections (28), an assembly type iron pallet (21) which has excellent strength and locking force can be manufactured.

A direction which the locking projections (28) face may be freely changed as occasion demands, and locking grooves which respectively correspond to the locking projections (28) are defined in the upper plate (22) and the lower plate (23) so that the upper and lower parts are symmetrically structured.

By forming the intermediate member (24) to have the U-shaped cross-section in the present invention, it is possible to effectively support the load applied downwards, and due to the presence of the concaved reinforcing portions (29), support strength can be further improved. By the locking projections (28), leftward and rightward vibration can be minimized.

The present invention is directed for an iron pallet (41) which has a press joint part. The present invention provides an iron pallet (41) comprising an upper plate (42) and a lower plate (43), wherein, after one end of the upper plate (42) is overlapped with the lower plate (43), a punch (12) serving as an upper mold is pressed into a through-hole of a lower
mold (13) by a press, whereby a press joint part (45) having a hole (44) is formed between the upper and lower plates (42 and 43).

[0024] Also, the present invention is directed for an iron pallet (41) which has a press joint part. In this iron pallet (41), a push pin (15) and a support spring (16) are installed below the lower mold (13), such that, after the punch (12) is introduced into the lower mold (13) and simultaneously perforates the upper and lower plates (42 and 43), torn portions of the upper and lower plates (42 and 43) are further bent outward by the push pin (15) biased by returning force of the spring (16).

[0025] Further, the present invention is directed for an iron pallet (41) which has a press joint part. In this iron pallet (41), an intermediate plate is intervened between the upper and lower plates (42 and 43), and the punch (12) serving as the upper mold is pressed into the through-hole of the lower mold (13) by the press, whereby press joint parts (45) are respectively formed between the upper plate (42) and the intermediate plate and between the intermediate plate and the lower plate (43).

[0026] The present invention is directed for an iron pallet (41) which has a press joint part. In this iron pallet (41), the lower mold (13) is constructed to be moved in a radial direction, and an annular spring (19) circumferentially surrounds the lower mold (13), such that the lower mold (13) can be moved radially outward when the punch (12) is lowered and can be moved radially inward to be returned to its original shape when the punch (12) is raised.

[0027] Moreover, the present invention is directed for an iron pallet (41) comprising an upper plate (42) and a lower plate (43), wherein, after one end of the upper plate (42) is overlapped with the lower plate (43), a punch (12) serving as an upper mold is pressed by a press into a concaved part of a lower mold (13) which is defined by a plurality of split movable dies assembled with another whereby a press joint part (46) is formed between the upper and lower plates (42 and 43), and wherein the lower mold (13) is constructed to be moved in a radial direction, and an annular spring (19) circumferentially surrounds the lower mold (13), such that the lower mold (13) can be moved radially outward when the punch (12) is lowered and can be moved radially inward to be returned to its original shape when the punch (12) is raised, whereby the press joint part (46) is bent outward while it is not perforated but undergoes drawing.

[0028] Specifically, the press joint part (46) is formed to have a configuration of a circle, a rectangle or a polygon.

[0029] The present invention is illustrated in FIGS. 6 through 11.

[0030] The present invention is directed for an iron pallet (61) characterized in that a surface of the iron pallet (61) is coated with a coating material, and the coating material is one selected from a group consisting of a yellow ochre constituent, a bentonite constituent, a zeolite constituent, a bioceramic constituent and a nano-sized silver constituent.

[0031] In particular, as shown in FIG. 12, the present invention is directed for an iron pallet (61) which is coated with a coating material and comprises a box-shaped pallet (65).

[0032] While the suitable grain size of yellow ochre constituent used in the present invention is 1,000–3,000 meshes, the iron pallet can be manufactured by adding in yellow ochre constituent of various grain sizes as occasion demands.

[0033] Also, zeolite and bentonite each having a grain size of 1,000–3,000 meshes are used to manufacture the iron pallet.

[0034] Further, the iron pallet (61) can be manufactured by adding in jade, germanium, elvan, bioceramic particles as ceramic beneficial to the human body, etc. or by adding in nano-sized silver particles.

[0035] By coating the above-described yellow ochre constituent, bentonite constituent, zeolite constituent, bioceramic constituent, nano-sized silver constituent, etc. to the surface of the iron pallet, the iron pallet (61) according to the present invention which has undergone a coating process is manufactured. Here, the iron pallet (61) is manufactured to have a box-shaped configuration so that fruits or agricultural products can be stored in a low temperature warehouse while being placed on the iron pallet (61).

[0036] That is to say, it can be contemplated that a pallet can be integrally formed on the lower end of a box-shaped storing case as in the conventional art so as to allow the fork of a forklift to be inserted through the lower end of the box-shaped storing case.

[0037] Therefore, by storing fruits, etc. in the box-shaped iron pallet (65) according to the present invention which has undergone a coating process, excellent storing effect can be accomplished due to anions and far infrared rays emitted from a coated portion (66).

[0038] Also, the present invention is directed for a lower plate structure of an iron pallet. The iron pallet is characterized in that a lower plate (63) is installed under an upper plate, a locking lip (64) which project upward and then is bent is formed at one side end of the lower plate (63), and the upper plate is fitted and locked into a space delimited by the locking lip (64).

[0039] The present invention will be described below with reference to the accompanying drawings.

[0040] FIG. 13 is a perspective view illustrating a lower plate (63) of an iron pallet which is formed with a locking lip (64) according to the present invention, FIG. 14 is a perspective view illustrating the lower plate (63) shown in FIG. 13, in which an end portion of the locking lip (64) is folded, and FIG. 15 is a perspective view illustrating the lower plate (63) shown in FIG. 13, in which an end portion of the locking lip (64) is not folded.

[0041] An iron pallet is used in a manner such that it can be moved by a forklift, etc. while a product is loaded on the iron pallet. Since the iron pallet is moved along with the product, it should have a light weight in consideration of a distribution cost, etc., and above all, it must be manufactured so that labor and material costs are saved. From this viewpoint, in the present invention, the locking lip (64) which project upward and then is bent is formed at one side end of the lower plate (63) in a cutting and forming step so that the upper plate can be fitted and locked into the space delimited by the locking lip (64), thereby obviating the need for screws, bolts and nuts, as mechanical locking elements, or a welding process.

[0042] Preferably, the locking lip (64) is formed to have a U-shaped cross-section such that the upper plate which comprises a flat plate can be fitted into the locking lip (64) to allow the upper plate to be tightly coupled to the lower plate (63).

[0043] In the present invention, the lower plate (63) is formed to have a square wave-shaped cross-section in which prominences and depressions are alternately defined so that strength of the lower plate (63) can be increased. Hence, when forming the lower plate (63) using a forming machine to have the square wave-shaped cross-section, the locking lip (64) is also bent.
[0044] Further, when occasion demands, the end portion of the locking lip (64) can be folded as shown in FIG. 14 to increase strength and prevent a worker from being injured by the sharp edge of the locking lip (64).

[0045] In addition, the present invention is directed for an intermediate support (80) for an iron pallet. The intermediate support (80) intervened between and locked to upper and lower plates (81 and 82) of an iron pallet to support the upper and lower plates (81 and 82) is characterized in that the intermediate support (80) includes a front wall (83) which is formed with a concaved portion (86) and side walls (84) which are bent from both side ends of the front wall (83) and are formed with concaved portions (86), so that the intermediate support (80) has a substantially U-shaped cross-section, and the upper and lower ends of the front wall (83) and the side walls (84) are bent inward, so that the upper and lower plates (81 and 82) can be coupled to the intermediate support (80) over wide areas.

[0046] The coupling between the intermediate support (80) and the upper plate (81) and between the intermediate support (80) and the lower plate (82) is affected by welding.

[0047] Also, the intermediate support (80) is characterized in that the intermediate support (80) is formed by cutting a thin iron plate, bending both side portions of the cut thin iron plate to form a substantially U-shaped cross-section and bending inward both upper and lower end portions of the cut thin iron plate so that the upper and lower plates (81 and 82) can be coupled to the intermediate support (80) over surface areas which are more wide than the other portions of the intermediate support (80).

[0048] The present invention is illustrated in FIGS. 16 through 18.

[0049] While the intermediate support (80) installed between the upper plate (81) and the lower plate (82) of the iron pallet must be manufactured to have a simple construction so that the iron pallet has a light weight, the intermediate support (80) should have substantial strength. Also, the upper and lower plates (81 and 82) and the intermediate support (80) must be able to be quickly and firmly coupled with each other.

[0050] In the present invention, the upper and lower plates (81 and 82) and the intermediate support (80) are coupled with each other by welding, preferably, by spot welding. Therefore, the coupling region of the intermediate support (80) where the upper and lower plates (81 and 82) are coupled with the intermediate support (80) is formed to have an increased surface area. To this end, the upper and lower ends of the front wall (83) and both side walls (84) of the intermediate support (80) are bent inward at a right angle as shown in FIG. 16, and then, the bent portions (85) of the intermediate support (80) and the upper and lower plates (81 and 82) are coupled to each other by welding.

[0051] As in a conventional structure, in the intermediate support (80) of the iron pallet according to the present invention, the front wall (83) and the side walls (84) are formed with the concaved portions (86) to be reinforced in their strength. One or more concaved portions (86) can be formed, and it is appropriate that the upper and lower plates (81 and 82) and the intermediate support (80) are coupled to each other on four points. Several intermediate supports (80) can be installed between the upper and lower plates (81 and 82) depending upon the weight of a product to be placed on the upper plate (81). The upper and lower plates (81 and 82) and the intermediate support (80) are formed of an iron plate. Further, in another embodiment of the present invention, the upper and lower plates (81 and 82) and the intermediate support (80) can be coupled to each other by means of bolts and nuts, etc., rather than by welding so that they can be disassembled from each other.

ADVANTAGEOUS EFFECTS

[0052] As described above, in the present invention, since fine particles are formed on the surface of a pallet, fine depressions and prominences are created to prevent slip of a product placed on the pallet, and it is possible to maintain excellent corrosion resistance when compared to a conventional iron pallet.

[0053] Also, in the present invention, because locking projections are projectedly formed to lock upper and lower plates, an assembling procedure can be easily implemented while maintaining the strength of the iron pallet as it is.

[0054] Further, in the present invention which is directed for an iron pallet assembled by pressing, the manufacturing procedure of the iron pallet can be automatized so that it is possible quickly manufacture the iron pallet, the iron pallet can have a light weight, and can be conveniently assembled to reduce a manufacturing cost.

[0055] Moreover, in the present invention, the surface of the iron pallet undergoes a coating treatment. A coating material includes one of a yellow ochre constituent, a bentonite constituent, a zeolite constituent, a bioceramic constituent and a nano-sized silver constituent. Due to this fact, since anions and far-infrared rays are generated and emitted on and from the surface of the pallet and it is possible to sterilize microorganisms, excellent effects can be obtained when using the pallet to keep agricultural products in a place.

[0056] Furthermore, an intermediate support for the pallet according to the present invention can sufficiently stand the weight of the products placed on an upper plate, and since the intermediate support has an increased surface area at a connection region where upper and lower plates are connected with each other and is welded to the upper and lower plates, the coupling operation can be quickly conducted with the connection region having excellent strength.

DESCRIPTION OF DRAWINGS

[0057] FIG. 1 is a perspective view of an iron pallet for transporting and keeping articles or products according to the present invention;

[0058] FIG. 2 is a perspective view illustrating an iron pallet for curing a cement product, on a surface of which a coating layer is formed;

[0059] FIG. 3 is a perspective view of an iron pallet formed with locking projections according to the present invention;

[0060] FIG. 4 is a detailed view of an intermediate member of the iron pallet shown in FIG. 3;

[0061] FIG. 5 is a detailed view of another embodiment of the intermediate member of the iron pallet shown in FIG. 3;

[0062] FIG. 6 is a perspective view of a pallet conventionally manufactured using screws;

[0063] FIG. 7 is a detailed view of an upper punch and a lower mold for manufacturing an iron pallet by performing pressing work according to the present invention;

[0064] FIG. 8 is a detailed view of a press joint part formed after performing pressing work as shown in FIG. 7;

[0065] FIG. 9 illustrates a workflow for forming a press joint part having no hole on an iron pallet by performing pressing work as shown in FIG. 7;
FIG. 10 illustrates press joint parts formed on an iron pallet by performing pressing work as shown in FIG. 7 and having no hole;

FIG. 11 is a plan view illustrating a state in which an annular spring is installed around a lower mold when performing pressing work as shown in FIG. 7;

FIG. 12 is a perspective view of a box-shaped iron pallet having undergone a coating process according to the present invention;

FIG. 13 is a perspective view illustrating a lower plate of an iron pallet which is formed with a locking lip according to the present invention;

FIG. 14 is a perspective view illustrating the lower plate shown in FIG. 13, in which an end portion of the locking lip is folded;

FIG. 15 is a perspective view illustrating the lower plate shown in FIG. 13, in which an end portion of the locking lip is not folded;

FIG. 16 is a detailed view of an intermediate support for an iron pallet according to the present invention;

FIG. 17 is an assembled view of an upper plate, a lower plate and an intermediate support according to the present invention which are shown in FIG. 16; and

FIG. 18 is a detailed view illustrating a state in which the upper plate, the lower plate and the intermediate support shown in FIG. 16 are assembled with one another.

BEST MODE

Embodiments of an iron pallet according to the present invention which is specially treated and has a corrosion and abrasion resistance will be concretely described below.

In a conventional method for painting a galvanized iron plate, zinc to be applied as an aqueous solution and paint are mixed with each other. However, in a novel method according to the present invention, a solid material is processed at a high temperature into the shape of fine particles, and the fine particles are momentarily attached to the surface of a metal plate.

Concretely describing this new surface treatment method, a material such as metal, nonmetal and ceramic is formed into wire or powder using plasma, arc or flame, and the wire or fine particles comprising the powder are melted and momentarily attached to the surface of an object at a high temperature using a thermal sprayer. Preferably, after shot blasting is implemented for the surface of the object, thermal spraying treatment is implemented. In this case, corrosion resistance maintaining periods for specified materials are as described below.

1. Corrosion resistance is maintained for about six years when plating melted zinc.

2. Corrosion resistance is maintained for about thirty years when thermally spraying alloy of zinc and aluminum.

In the case of using stone, sand and metal powder, advantageous effects are obtained in that a material cost can be saved and abrasion resistance can be improved.

Generally, if zinc is plated on an iron plate with an aim of improving corrosion resistance, a product can slip on the iron plate. However, in the present invention, due to the fact that fine particles (grains) of metal or nonmetal are formed on the surface of the iron plate by implementing a thermal spraying operation, or a material in which stone, sand and metal powder are mixed with one another is coated on the surface of the iron plate, slip of the product is prevented, and corrosion resistance is improved.

Here, plasma means vapor which is divided at a high temperature into electrons having negative charges and ions having positive charges. That is to say, the plasma means vapor which has a considerably high charge separation degree and contains an approximately same number of negative charges and positive charges to become neutral. When a temperature is gradually increased, almost all substances are converted from a solid state via a liquid state into a vapor state. At several tens of thousands °C., a vapor is divided into electrons and an atomic nucleus to be converted into a plasma state.

The plasma has a very high temperature when observed from a thermal point of view, is conductive when observed from an electrical point of view, allows a great current to pass through it, generates great electromagnetic force, emits light by itself, and contains therein a great amount radicals or ions which are very active when observed from a chemical point of view. Recently, the plasma has been widely used for production of energy, compounding and shaping of advanced materials, environmental processing, manufacture of information and communication devices, and so forth.

Describing the plasma used in the present invention, an arc which exits a negative electrode flows to the outside through a hole defined in a positive electrode. At this time, gas flows along the inner wall of a container and around the arc. Due to the presence of this gas flow, the outer wall of the arc is cooled to decrease heat loss in a sideward direction, and the electric conductivity of the outer part of the plasma is decreased so that a current can be concentrated further to the center part of the plasma.

The temperature at the center part of the plasma reaches about 20,000 °C., and therefore, it is possible to process a metal using plasma. Metals having high melting points, for example, such as tungsten, molybdenum, carbon, and so on, which cannot be welded or cut using gas flame in the conventional art, can be processed using the plasma. That is to say, plasma welding and plasma cutting belong to material processing at a high temperature. Plasma spraying as a method in which a high melting point metal is melted by plasma and is coated on the surface of a solid object to improve temperature resistance, corrosion resistance, abrasion resistance, etc. is used in the present invention. A gas stabilizing arc plasma torch which is currently used has several tens of mega watts of output capacity and can generate plasma through thermal ionization of an inert gas or a gas having high chemical reactivity. The generated plasma may have a temperature of up to 20,000K. A method for spraying a metal using arc or gas flame is also used in the same manner in the present invention. As an embodiment, a method for thermally spraying a material on a raw metal before a pallet is completely manufactured will be described below.

Described processes of the present invention, after a raw iron material having the shape of a coil is slit, a small-sized skelp is paid out and the surface of the skelp is heated. After the skelp is heated, foreign materials are removed from the surface of the skelp using shots or a steel brush, and an appropriate material is thermally sprayed onto the surface of the skelp. In the next step, the sprayed portion of the skelp is sealed by applying liquid phase thermosetting resin such as epoxy resin, urethane resin and lacquer resin on the upper and lower surfaces of the skelp using a sprayer, a brush or a roll.
Then, the resultant skelp is heated at a temperature of 130–200°C. This heating step can be omitted as the case may be. Thereupon, a semi-product is wounded again into the shape of a coil and then is formed by a forming machine. Then, this semi-product is mounted to a un-coiler, undergoes a roll forming process, is cut and is assembled to complete a pallet.

[0087] As another embodiment, a method for thermally spraying a material after a pallet is prepared will be described below. First, after a large-sized cold-rolled coil is slit, the slit coil is formed by a forming machine, is mounted to a un-coiler, and then undergoes a roll forming process. Then, the resultant coil is cut, and is assembled to complete a pallet. The completed pallet is heated to a temperature of 130–200°C, and foreign materials are removed from the surface of the heated pallet using shots or a steel brush. Next, an appropriate material is thermally sprayed onto the surface of the pallet, and the sprayed portion of the pallet is sealed by applying a liquid phase thermostetting resin such as epoxy resin, urethane resin and lacquer resin on the upper and lower surfaces of the pallet using a sprayer, a brush or a roll. Then, the pallet having undergone the sealing process is heated. This heating step can be omitted as the case may be. Through the above-described processes, a surface-treated iron pallet is completed. While conventional thermal spraying is implemented without pre-heating an object, in the present invention, the thermal spraying is implemented after pre-heating an object to a predetermined temperature.

[0088] Also, while the conventional sealing process is implemented without pre-heating an object, the present invention is particularly distinguished from the conventional art in that, after pre-heating and sealing of the coating layer, a re-heating process (while it can be omitted as the case may be) is implemented, whereby a sealing process is not simply implemented, but the surface coating layer is further reinforced. Above all, in the present invention, the sealing process is implemented to close air holes possibly existing on the surface for which the thermal spraying is implemented, and one coating layer is further formed after implementing the thermal spraying process for reinforcing the surface of the pallet. Therefore, the present invention is characterized in that two coating layers are formed on the surface of the pallet.

[0089] The coating surface is formed on the corner portions of the iron pallet, which are most likely to occur, and it is proper to form the coating surface over a distance of 50 mm when measured from respective edges of the iron pallet.

[0090] The present invention directed for an iron pallet which is manufactured through pressing will be described by an embodiment.

[0091] First, describing a method for manufacturing a pallet through pressing with reference to FIG. 7, in the present invention, an iron plate having a thickness of 0.6 mm is generally used. An upper plate 42 and a lower plate 43 are overlapped with each other and are placed between a punch 12 serving as an upper mold and a lower mold 13. In this state, the punch 12 is moved downward. When the punch 12 is moved downward by a predetermined distance, the upper and lower plates 42 and 43 are simultaneously perforated, and a hole 44 is defined. Then, as the punch 12 is raised again, a push pin 15 is raised by the force of a spring 16 to outwardly bent the torn portion of the upper plate 42 which defines the hole 44.

[0092] The outward bending of the torn portion of the upper plate 42 which defines the hole 44 is effected due to configurations of the rounded portion of the punch 12, the rounded portion of a fixed die 17 of the lower mold 13, and the rounded portion of the push pin 15. In order to ensure precise working, it is preferred that the rounded portion of the corner portion of the punch 15 have a roundness of about 1.5 R, and the rounded portions of the corner portions of the punch 12 and the fixed die 17 have a roundness of about 1 R. When the push pin 15 is raised and lowered in correspondence with the operation of the punch 12, the movement of the push pin 15 is limited by a holder 18. This fact can be clearly understood from the drawing. It is appropriate that the upward and downward moving distance of the punch 12 and the push pin 15 serving as a moving die 20 is about 4 mm. When considering the fact that the push pin 15 projects by about 2 mm from the horizontal surface of the fixed die 17 when measured before working processes are started and the upward and downward moving distance of the push pin 15 is about 4 mm, the maximum lowered position of the push pin 15 corresponds to 2 mm below the horizontal surface of the fixed die 17. The press joint part formed as the final resultant product completed through these processes is shown in FIG. 8.

[0093] Another embodiment of an iron pallet which is manufactured through pressing according to the present invention will be described with reference to FIG. 9.

[0094] An upper plate 42 and a lower plate 43 are overlapped with each other and are placed between a punch 12 serving as an upper mold and a lower mold 13. In this state, as the punch 12 is moved downward, materials start to be drawn. Then, the materials are expanded outward to be joined with each other. Of course, this occurs due to the fact that an annular spring 19 surrounds the circumference of split molds so that the molds are moved radially outward when the punch 12 is lowered and are moved radially inward to be returned to their original positions when the punch 12 is raised.

[0095] If the punch 12 is raised, the split movable dies 20 repeat operation of returning to their original positions by the annular spring 19. If the thickness of the iron plate is substantial, the diameter of the punch 12 is decreased, and if the thickness of the iron plate is not substantial, the diameter of the punch 12 is increased.

[0096] FIG. 11 shows a state in which the movable die 20 of the lower mold 13 is divided into four split dies. The split movable dies 20 are assembled to form an annular configuration, and a concaved portion is defined on the lower surface of the split movable dies 20. The annular spring 19 is fixedly installed around the split movable dies 20 to fixedly hold the split movable dies 20. Therefore, the split movable dies 20 can be freely moved radially outward from the center point to be increased in their radius or can be freely moved radially inward toward the center point to be decreased in their radius. As occasion demands, the number of the split movable dies 20 of the lower mold 13 can be adjusted.

INDUSTRIAL APPLICABILITY

[0097] As is apparent from the above descriptions, the present invention provides an iron pallet which is convenient to use and has a simple construction. More particularly, the present invention provides an iron pallet which comprises an upper plate, a lower plate and an intermediate member and which can be easily assembled while maintaining sufficient strength.

[0098] Also, in the present invention, since fine particles are formed on the surface of a pallet, fine depressions and prominences are created to prevent slip of a product placed on
the pallet, and it is possible to maintain excellent corrosion resistance when compared to a conventional iron pallet.

Further, in the present invention which is directed for an iron pallet assembled by pressing, the manufacturing procedure of the iron pallet can be automatized so that it is possible quickly manufacture the iron pallet, the iron pallet can have a light weight, and can be conveniently assembled to reduce a manufacturing cost and improve economic efficiency.

1. An iron pallet characterized in that a coating layer is formed on an upper surface of the iron pallet which will come into contact with a product to be placed on the iron pallet, by processing a solid material at a high temperature using one of plasma, arc and flame to produce fine particles and by momentarily jetting the fine particles to the upper surface of the iron pallet such that fine particles are formed on the upper surface of the iron pallet.

2. The iron pallet according to claim 1, wherein the coating surface is formed over a distance of 50 mm when measured from respective edges of the iron pallet.

3. The iron pallet according to claim 1, wherein the fine particles are formed from one selected from a group consisting of zinc, stainless steel, alloy of zinc and aluminum, and alloy of zinc and stainless steel.

4. The iron pallet according to claim 1, wherein the fine particles comprise a mixture of stone, sand and iron powder.

5. A method for manufacturing an iron pallet, comprising the steps of:

forming a material such as metal, nonmetal and ceramic into wire or powder using one of plasma, arc and flame; and
melting and momentarily jetting the wire or fine particles having the shape of the powder to a surface of the iron pallet using a thermal sprayer; and
sealing the surface of the iron pallet to which the wire or fine particles are jetted, by applying liquid phase thermosetting resin such as epoxy resin, urethane resin and lacquer resin on the surface of the iron pallet using a sprayer, a brush or a roll.

6. A method for manufacturing an iron pallet, comprising the steps of:

forming a material such as metal, nonmetal and ceramic into wire or powder using one of plasma, arc and flame; and
melting and momentarily jetting the wire or fine particles having the shape of the powder to a surface of an iron plate using a thermal sprayer; and
sealing the surface of the iron plate to which the wire or fine particles are jetted, by applying liquid phase thermosetting resin such as epoxy resin, urethane resin and lacquer resin on the surface of the iron plate using a sprayer, a brush or a roll; and

cutting the iron plate having undergone the jetting and sealing steps and fabricating a pallet.

7. An iron pallet comprising an upper plate, a lower plate and an intermediate member, wherein the intermediate member has a substantially U-shaped cross-section, concaved reinforcing portions are formed on respective walls of the intermediate member, and locking projections for locking the upper and lower plates are formed on upper and lower ends of the intermediate member on which the concaved reinforcing portions are not formed.

8. The iron pallet according to claim 7, wherein each locking projection is divided into two parts which are bent in opposite directions.

9. An iron pallet comprising an upper plate and a lower plate, wherein, after one end of the upper plate is overlapped with the lower plate, a punch serving as an upper mold is pressed into a through-hole of a lower mold by a press, whereby a press joint part having a hole is formed between the upper and lower plates.

10. The iron pallet according to claim 9, wherein a push pin and a support spring are installed below the lower plate, such that, after the punch is introduced into the lower mold and simultaneously perforates the upper and lower plates, holes defining portions of the upper and lower plates are further bent outward by the push pin biased by returning force of the spring.

11. The iron pallet according to claim 9, wherein an intermediate plate is intervened between the upper and lower plates, and the punch serving as the upper mold is pressed into the through-hole of the lower mold by the press, whereby press joint parts are respectively formed between the upper and intermediate plates and between the intermediate and lower plates.

12. The iron pallet according to any one of claims 9 to 11, wherein the lower mold is constructed to be moved in a radial direction, and an annular spring circumferentially surrounds the lower mold, such that the lower mold can be moved radially outward when the punch is lowered and can be moved radially inward to be returned to its original shape when the punch is raised.

13. An iron pallet comprising an upper plate and a lower plate, wherein, after one end of the upper plate is overlapped with the lower plate, a punch serving as an upper mold is pressed by a press into a concaved part of a lower mold which is defined by a plurality of split movable dies assembled with one another, whereby a press joint part is formed between the upper and lower plates such that the press joint part is not perforated but undergoes drawing.

14. The iron pallet according to claim 13, wherein an intermediate plate is intervened between the upper and lower plates, and the press joint part is formed integrally with the upper plate, the intermediate plate and the lower plate by the punch serving as the upper mold and the lower mold.

15. The iron pallet according to claim 13 or 14, wherein the press joint part has a configuration of a circle, a rectangle or a polygon.

16. An iron pallet characterized in that a surface of the pallet is coated with a coating material, and the coating material is one selected from a group consisting of yellow ochre constituent, a bentonite constituent, a zeolite constituent, a biocermic constituent and a nano-sized silver constituent.

17. The iron pallet according to claim 16, wherein the pallet has a box-shaped configuration.

18. An iron pallet characterized in that a lower plate is installed under an upper plate, a locking lip which project upward and then is bent is formed at one side end of the lower plate, and the upper plate is fitted and locked into a space delimited by the locking lip.

19. An intermediate support intervened between and locked to upper and lower plates of an iron pallet to support the upper and lower plates, characterized in that the intermediate support includes a front wall which is formed with a concaved portion and side walls which are bent from both side ends of the front wall and are formed with concaved portions, so that the intermediate support has a substantially U-shaped cross-section, and the upper and lower ends of the front wall
and the side walls are bent inward, so that the upper and lower plates can be coupled to the intermediate support over wide areas.

20. The intermediate support according to claim 19, wherein the upper and lower plates are coupled to the intermediate support by welding.

21. The intermediate support according to claim 19, wherein the intermediate support is formed by cutting a thin iron plate, bending both side portions of the cut thin iron plate to define a substantially U-shaped cross-section and bending inward both upper and lower end portions of the cut thin iron plate so that the upper and lower plates can be coupled to the intermediate support over surface areas which are more wide than the other portions of the intermediate support.

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