The present invention relates to a composite deck plate integrated with a bar truss, the bar truss being coupled to cover an upper surface of a folding-type deck plate, and a method for manufacturing same. According to an embodiment of the present invention, a composite deck plate integrated with a bar truss comprises a trough-shaped deck plate and a bar truss. The trough-shaped deck plate includes: single units arranged transversely in repetition and each having an upper plate, side plates bent and extended downward at a slant from both cross-directional ends of the upper plate, and a lower plate bent horizontally from the cross-directional ends of the side plates; and a connecting part disposed at the free end of each of the lower plates. The bar truss includes: a pair of horizontally symmetrical bent bars, each being a continuously recurring unit module of a web bar, wherein each unit module includes left and right slopes separated from each other at mutually opposed slopes; a first bent portion connecting the upper ends of the left and right slopes; and a second bent portion at the lower ends of the left and right slopes, and bent in the form of a trough-shaped deck plate and coupled to cover the upper, side, and lower plates of the trough-shaped deck plate. An upper bar is coupled across the second bent portions, and a lower bar is coupled across the first connecting portions so that the web bar, the upper bar, and the lower bar are disposed on a common planar surface.
COMPOSITE DECK PLATE INTEGRATED WITH BAR TRUSS AND METHOD FOR MANUFACTURING THE SAME

The present invention relates to a composite deck plate integrated with a bar truss, the bar truss being coupled to cover an upper surface of a trapezoidal deck plate.

A steel frame structure or a steel framed reinforced concrete structure, which has excellent durability and aseismicity, is generally adopted for high-rise buildings, and so as to reduce the period of construction as well as the labor costs, further, deck plates are mainly used for slab systems in the high-rise buildings.

The deck plates are generally classified into a form deck plate and a structural deck plate. The form deck plate serves to resist the self-weight of fresh concrete before concrete curing and the load applied during construction, so that after the concrete curing the floor load is supported by the concrete slab. On the other hand, the structural steel deck plate serves to perform the functions of a tension bar, while supporting the load together with the concrete after the concrete curing. The structural steel deck plate provides the effects of the bar addition, thereby reducing the number of bars used and the thickness of concrete.

The structural steel deck plate has two kinds of deck plates, that is, a bar truss deck plate and a composite deck plate. The bar truss deck plate is manufactured by integrating a structural member which makes a portion of bar for a bottom plate to a form of a truss with a flat type form deck plate, so that erection load is supported by the bar
truss to reduce the thickness of the deck plate, and the shape of trough is removed on the deck plate to reduce the structural thickness of the bottom plate. Various bar truss deck plates have been developed in accordance with the shapes of the bar truss. Contrarily, the composite deck plate is developed by integrating a reinforced concrete structure with a deck plate, so that the deck plate serves as a structural member, while having a large contacted surface with the reinforced concrete through dovetail and embossing for enhancing the restriction effects.

In case of the bar truss deck plate, the rigidity of the flat deck plate is low, and a quantity of concrete on the tensile side is excessive to undesirably increase the self-weight of the concrete. In case of the deck plate to which a bent wire mesh is attached, the rigidity of the wire mesh is low, and since most of flexural rigidity is generated from the deck plate, the thickness of the deck plate is accordingly increased. Further, in case of the composite deck plate, local buckling easily occurs due to a low plate thickness and a high width-thickness ratio, thereby making it difficult to achieve the long span of the deck plate.

[Disclosure]

[Technical Problem]

Accordingly, the present invention has been made in view of the above-mentioned problems occurring in the prior art, and it is an object of the present invention to provide a composite deck plate integrated with a bar truss and a method for manufacturing the same, whereby the thickness of the deck plate is decreased, the self-weight of the deck plate is reduced through the decrease in quantity of concrete applied to the tensile sides of the lower portion thereof, and the flexural rigidity thereof is increased.
It is another object of the present invention to provide a composite deck plate integrated with a bar truss and a method for manufacturing the same that is capable of being automatically produced through the manufacturing of a triangulated bar truss.

It is still another object of the present invention to provide a composite deck plate integrated with a bar truss and a method for manufacturing the same that allows the bar truss to be brought into contact with the top and bottom planar surfaces of a trapezoidal deck plate, thereby increasing the structural stability thereof.

[Technical Solution]

To accomplish the above objects, according to a first aspect of the present invention, there is provided a composite deck plate integrated with a bar truss, the composite deck plate including: a trapezoidal deck plate having units arranged repeatedly in a transverse direction, each unit having an upper plate, side plates bent and extended downward at a slant from both ends of the upper plate in the width direction of the upper plate, and lower plates bent horizontally from the ends of the side plates in the width direction of the side plates, and connecting portions formed at the free ends of the lower plates; and the bar truss having upper bars, lower bars, and a plurality of web bars each having a pair of bent bars having an up and down symmetrical structure with respect to a horizontal line, one bent bar having unit modules continuously disposed repeatedly in left and right directions thereof, each unit module having left and right slopes spaced apart from each other in such a manner as to have inclinations opposite to each other, a first bent portion adapted to connect the top ends of the left and right slopes, and second bent portions
formed at the bottom ends of the left and right slopes, wherein the upper bars are coupled across the second bent portions of the web bars, and the lower bars are coupled across the first bent portions of the web bars, and in the state where the upper and lower bars are coupled to the web bars on the same plane, the coupled bars are bent to a shape of the trapezoidal deck plate in such a manner as to cover the upper plates, the side plates and the lower plates.

According to the present invention, preferably, the upper plates and the lower plates of the trapezoidal deck plate have reinforcement bent portions formed protrudedly therefrom in such a manner as to maintain a given distance from the bar truss.

To accomplish the above objects, according to a second aspect of the present invention, there is provided a method for manufacturing a composite deck plate integrated with a bar truss, the method including the steps of: molding a steel plate on which reinforcement bent portions are spaced apart from each other by a given distance to make a flat deck plate constituting a trapezoidal deck plate; making a planar bar truss having upper bars, lower bars, and a plurality of web bars each having a pair of bent bars having an up and down symmetrical structure with respect to a horizontal line, one bent bar having unit modules continuously disposed repeatedly in left and right directions thereof, each unit module having left and right slopes spaced apart from each other in such a manner as to have inclinations opposite to each other, a first bent portion adapted to connect the top ends of the left and right slopes, and second bent portions formed at the bottom ends of the left and right slopes, so that the upper bars are coupled across the second bent portions of the web bars, and the lower bars are coupled across the first bent
portions of the web bars, thereby locating the upper bars and
the lower bars are coupled to the web bars on the same plane;
disposing the planar bar truss over the flat deck plate and
welding the planar bar truss to the reinforcement bent
portions formed on the flat deck plate; and bending the flat
deck plate to which the planar bar truss is coupled.

[Advantageous Effects]

The composite deck plate integrated with a bar truss
according to the present invention provides the following
advantages:

First, the thickness of the deck plate is decreased, the
self-weight of the deck plate is reduced through the decrease
in quantity of concrete applied to the tensile sides of the
lower portion thereof, and the flexural rigidity thereof is
increased.

Second, the composite deck plate integrated with a bar
truss can be automatically produced through the manufacturing
of a triangulated bar truss.

Last, the composite deck plate integrated with a bar
truss allows the bar truss to be brought into contact with
the top and bottom planar surfaces of a trapezoidal deck
plate, thereby increasing the structural stability thereof.

[Description of Drawings]

FIG.1 is a plan view showing a composite deck plate
integrated with a bar truss according to the present
invention.

FIG.2 is a side view showing the composite deck plate
integrated with a bar truss according to the present
invention, which is observed in the direction of 'A' of FIG.1.

FIG.3 is a plan view showing the bar truss employed
according to the present invention.
FIG. 4 is a side view observed in the direction of 'B' of FIG. 3.

FIG. 5 is side view showing a method for manufacturing a composite deck plate integrated with a bar truss according to a preferred embodiment of the present invention.

FIG. 6 is side view showing a method for manufacturing a composite deck plate integrated with a bar truss according to another preferred embodiment of the present invention.

[Best Mode for Invention]

Hereinafter, an explanation on a composite deck plate integrated with a bar truss and a method for manufacturing the same according to the present invention will be in detail given with reference to the attached drawings. The parts or components corresponding to each other in the drawings are indicated by corresponding reference numerals, and a detailed explanation on the known functions or configuration related thereto will be avoided for the brevity of the description.

FIG. 1 is a plan view showing a composite deck plate integrated with a bar truss according to the present invention, and FIG. 2 is a side view showing the composite deck plate integrated with a bar truss according to the present invention, which is observed in the direction of 'A' of FIG. 1.

Referring to FIGS. 1 and 2, a composite deck plate integrated with a bar truss according to the present invention includes a trapezoidal deck plate 10 and a bar truss 20 coupled to cover the trapezoidal deck plate 10.

The trapezoidal deck plate 10 includes units arranged repeatedly in a transverse direction thereof, each unit having an upper plate 11 having a generally trapezoidal section whose one side is open, side plates 12 bent and extended downward at a slant from both ends of the upper
plate 11 in the width direction of the upper plate 11, and lower plates 13 bent horizontally from the ends of the side plates 12 in the width direction of the side plates 12, and connecting portions 14a and 14b formed at the free ends of the lower plates 13 in such a manner as to continuously connect the neighboring trapezoidal deck plates 10 in their width direction.

That is, the units of the trapezoidal deck plate 10 define ribs each having a shape of a trapezoid whose bottom surface is open by means of the upper plate 11 and the side plates 12, and thus, the ribs are parallel to each other, while having the cross-sections connected to each other by means of the lower plates 13.

The upper plates 11, the side plates 12 and the lower plates 13 constituting the units of the trapezoidal deck plate 10 have well known embossing patterns or grooves formed thereon so as to improve the bond performance to slab concrete.

The upper plates 11 and the lower plates 13 have reinforcement bent portions 15 formed protrudedly therefrom in such a manner as to maintain a given distance from the bar truss 20, to prevent the damage caused by the direct welding to the deck plate 10, and to strengthen the rigidity of the deck plate 10 on which local buckling occurs due to a thin plate thickness and a high width-thickness ratio. The reinforcement bent portions 15 are molded together with the trapezoidal deck plate 10 when the trapezoidal deck plate 10 is bent.

The bar truss 20 includes upper bars 21, lower bars 22, and a plurality of web bars 23 spaced apart from each other by a given distance at a slant in the lengthwise directions of the upper bars 21 and the lower bars 22 in such a manner
as to connect the upper bars 21 and the lower bars 22, which has a shape similar to a warren truss.

According to the configuration of the bar truss 20, the upper bars 21 are disposed on the upper plates 11 of the trapezoidal deck plate 10, the web bars 23 on the side plates 12, and the lower bars 22 on the lower plates 13. That is, the bar truss 20 is coupled to the trapezoidal deck plate 10 in such a manner as to cover the upper plates 11, the side plates 12 and the lower plates 13.

The numbers of upper bars and lower bars disposed on each upper plate 11 and each lower plate 13 are two, but according to the present invention, they are not limited thereto and appropriately adjustable in accordance with the strength and rigidity of the trapezoidal deck plate 10.

According to the present invention, therefore, the lacking rigidity of the deck plate 10 on which local buckling occurs due to a low plate thickness and a high width-thickness ratio can be strengthened by means of the bar truss 20, so that the composite deck plate can achieve long span, without having the increment in the thickness of the trapezoidal deck plate 10. Further, the shape of the truss can be maintained to minimize the generation of the bending moments on nodal points.

FIG.3 is a plan view showing the bar truss employed according to the present invention, and FIG.4 is a side view observed in the direction of 'B' of FIG.3.

Referring to FIGS.3 and 4, each of the web bars 23 constituting the bar truss 20 includes a pair of bent bars 23a and 23b having the width capable of covering one of the units of the trapezoidal deck plate 10 and the length corresponding to the length of the trapezoidal deck plate 10. The pair of bent bars 23a and 23b has an up and down
symmetrical structure with respect to a horizontal line. One bent bar (hereinafter, the bent bar 23a will be explained) has unit modules (each unit module is a portion indicated by a dotted line in FIG.3) continuously disposed repeatedly in left and right directions thereof, each unit module having left and right slopes 231 and 232 spaced apart from each other in such a manner as to have inclinations opposite to each other, a first bent portion 233 having a shape of a reverse U (or U) or a reverse triangle in such a manner as to connect the top ends of the left and right slopes 231 and 232, and second bent portions 234 having a shape of an L formed at the bottom ends of the left and right slopes 231 and 232. The first bent portion 233 and the second bent portions 234 are not limited to the shapes of reverse U (or U) or the reverse triangle and the shape of an L, and only if the left and right slopes 231 and 232 meet each other at a given angle, they may have any shapes.

The upper bars 21 are coupled across the second bent portions 234, and the lower bars 22 are coupled across the first bent portions 233. In the state where the upper bars 21 and the lower bars 22 are coupled to the web bars 23 on the same plane, the coupled bars are bent to correspond to the cross-sectional shape of the trapezoidal deck plate 10, thereby obtaining the bar truss 20 employed according to the present invention.

FIG.5 is side view showing a method for manufacturing a composite deck plate integrated with a bar truss according to a preferred embodiment of the present invention.

As shown in FIG.5, the composite deck plate integrated with a bar truss according to the present invention can be made by bending the trapezoidal deck plate 10 and the bar truss 20 at the same time.
That is, as shown in FIG.5 (a), a steel plate on which the reinforcement bent portions 15 are spaced apart from each other by a given distance is molded to make a flat deck plate 10a constituting the trapezoidal deck plate 10, and as shown in FIGS.3 and 4, one pair of bars are bent to prepare the web bars 23 to which the upper bars 21 and the lower bars 22 are welded. So as to distinguish the planar bar truss from the bent bar truss, in the figures, the bar truss on which the web bars 23, the upper bars 21 and the lower bars 22 are disposed on the same plane as each other is denoted by a reference numeral 20a.

Next, as shown in FIG.5 (b), the planar bar truss 20a is welded to the reinforcement bent portions 15.

After that, as shown in FIG.5 (c), the flat deck plate 10a to which the planar bar truss 20a is coupled is bent. That is, the flat deck plate 10a is pressurized in the direction of the arrows as shown in FIG.5 (b), and it is bent as shown in FIG.5 (c). As the bending operation is performed one time, accordingly, the trapezoidal deck plate 10 to which the bar truss 20 is coupled can be made to improve the productivity thereof.

FIG.6 is side view showing a method for manufacturing a composite deck plate integrated with a bar truss according to another preferred embodiment of the present invention.

As shown in FIGS.6, the bar truss 20 and the trapezoidal deck plate 10 are individually bent and then welded to each other. That is, as shown in FIG.6 (a), the planar bar truss is bent, and the steel plate is molded to make the trapezoidal deck plate 10. Next, as shown in FIG.6 (b), they are welded to each other.

While the present invention has been described with reference to the particular illustrative embodiments, it is
not to be restricted by the embodiments but only by the appended claims. It is to be appreciated that those skilled in the art can change or modify the embodiments without departing from the scope and spirit of the present invention.

5 [Industrial Applicability]

As mentioned above, according to the present invention, the thickness of the deck plate is decreased, the weight of the deck plate is reduced through the decrease in quantity of concrete applied to the tensile sides of the lower portion thereof, and the flexural rigidity thereof is increased. Further, the composite deck plate integrated with a bar truss can be automatically produced through the manufacturing of a triangulated bar truss. Additionally, the composite deck plate integrated with a bar truss allows the bar truss to be brought into contact with the top and bottom planar surfaces of the trapezoidal deck plate, thereby increasing the structural stability thereof.
[CLAIMS]

[Claim 1]

A composite deck plate integrated with a bar truss, comprising:

- a trapezoidal deck plate having units arranged repeatedly in a transverse direction, each unit having an upper plate, side plates bent and extended downward at a slant from both ends of the upper plate in the width direction of the upper plate, and lower plates bent horizontally from the ends of the side plates in the width direction of the side plates, and connecting portions formed at the free ends of the lower plates; and

- the bar truss having upper bars, lower bars, and a plurality of web bars each having a pair of bent bars having up and down symmetrical structures with respect to a horizontal line, one bent bar having unit modules continuously disposed repeatedly in left and right directions thereof, each unit module having left and right slopes spaced apart from each other in such a manner as to have inclinations opposite to each other, a first bent portion adapted to connect the top ends of the left and right slopes, and second bent portions formed at the bottom ends of the left and right slopes,

wherein the upper bars are coupled across the second bent portions of the web bars, and the lower bars are coupled across the first bent portions of the web bars, and in the state where the upper and lower bars are coupled to the web bars on the same plane, the coupled bars are bent to a shape of the trapezoidal deck plate in such a manner as to cover the upper plates, the side plates and the lower plates.

[Claim 2]
The composite deck plate integrated with a bar truss according to claim 1, wherein the upper plates and the lower plates of the trapezoidal deck plate have reinforcement bent portions formed protrudedly therefrom in such a manner as to maintain a given distance from the bar truss.

[Claim 3]

A method for manufacturing a composite deck plate integrated with a bar truss, the method comprising the steps of:

molding a steel plate on which reinforcement bent portions are spaced apart from each other by a given distance to make a flat deck plate constituting a trapezoidal deck plate;

making a planar bar truss having upper bars, lower bars, and a plurality of web bars each having a pair of bent bars having an up and down symmetrical structure with respect to a horizontal line, one bent bar having unit modules continuously disposed repeatedly in left and right directions thereof, each unit module having left and right slopes spaced apart from each other in such a manner as to have inclinations opposite to each other, a first bent portion adapted to connect the top ends of the left and right slopes, and second bent portions formed at the bottom ends of the left and right slopes, so that the upper bars are coupled across the second bent portions of the web bars, and the lower bars are coupled across the first bent portions of the web bars, thereby locating the upper bars and the lower bars are coupled to the web bars on the same plane;

disposing the planar bar truss over the flat deck plate and welding the planar bar truss to the reinforcement bent portions formed on the flat deck plate; and
bending the flat deck plate to which the planar bar truss is coupled.
**INTERNATIONAL SEARCH REPORT**

**International application No.**

**PCT/KR2010/003696**

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**A. CLASSIFICATION OF SUBJECT MATTER**

**E04B 5/40(2006.01)i, E04C 5/06(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

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**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

E04B 5/40; E04B 5/32; E04G 11/44

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Utility models and applications for Utility models: IPC as above

Japanese Utility models and applications for Utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPo internal) & Keywords: deck, plate, truss, unit

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**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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<td>KR 10-2009-0067038 A (KOREA INSTITUTE OF CONSTRUCTION TECHNOLOGY) 25 June 2009 See claim 1 and figures 1 to 3.</td>
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☑ Further documents are listed in the continuation of Box C.    ☒ See patent family annex.

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Special categories of cited documents:

A: Document defining the general state of the art which is not considered to be of particular relevance

E: Earlier application or patent but published on or after the international filing date

L: Document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O: Document referring to an oral disclosure, use, exhibition or other means

P: Document published prior to the international filing date but later than the priority date claimed

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X: Document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y: Document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

R: Document member of the same patent family

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**Date of the actual completion of the international search**

**25 MARCH 2011 (25.03.2011)**

**Date of mailing of the international search report**

**28 MARCH 2011 (28.03.2011)**

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**Name and mailing address of the ISA/KR**

Korean Intellectual Property Office
Government Complex-Daejeon, 339 Soeun-ro, Daejeon, 302-701, Republic of Korea

**Facsimile No.** 82-42-472-7140

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**Authorized officer**

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**Telephone No.**
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