

Description

DECK PLATE

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Technical Field

[0001] The present invention relates to a deck plate used for constructing a floor slab or a ceiling slab.

10 Background Art

[0002] In constructing a floor slab and a ceiling slab of a building structure, deck plates are widely used. The deck plate is installed such that the deck plate is made to extend between beams, and both end portions of the deck plate are fixed to upper surfaces of the beams. After the deck plate is fixed, concrete is placed on the deck plate and, then, the concrete solidifies so that a floor structural body or a ceiling structural body is constructed.

The deck plate is formed such that bending processing is performed on a metal plate by roll-forming or the like. Ribs are formed on the deck plate to enhance rigidity (For example, see Patent Literature 1).

20 Document List

Patent Literature

[0003]

Patent Literature 1: Japanese Patent Application Publication No. 2017-120014

25 Summary of Invention

Technical Problem

[0004] In the above-mentioned Patent Literature 1, each planar portion formed between ribs has flat projecting ridge portions each having an upper surface thereof projecting upward and hence, cross-sectional performance and buckling strength of the entire deck plate can be improved.

5 However, even when such projecting ridge portions are formed on the planar portion, there is a limitation in improvement of performance. Specifically, usually, a calculation for a deck plate is performed assuming that the deflection coefficient C used in a deflection calculation formula is 1.6. In the deck plate described in Patent Literature 1, the deflection coefficient C is only
10 improved to 1.33, so there is a demand for a greater improvement in cross-sectional performance. Further, forming a large number of projecting ridge portions to improve cross-sectional performance of a deck plate causes an increase in weight of the deck plate and hence, there is a demand for suppressing an increase in weight of the deck plate by forming only an
15 appropriate number of projecting ridge portions.

 The amount of deflection of the deck plate is calculated using second moment of area where the entire area of the deck plate in cross section is made effective. The deflection coefficient C is a correction coefficient in which an influence of a reduction in rigidity of the deck plate is estimated by taking into
20 account an effective area of the deck plate. As described above, usually, the deflection coefficient C of a deck plate is 1.6 (C=1.6).

 Assuming that the amount of deflection is δ , the deflection coefficient is C, a vertical load during construction is W, a span length is L, Young's modulus is E, and second moment of area where the entire area of the deck
25 plate in cross section is made effective is I, the calculation formula for the amount of deflection can be expressed as follows.

$$\delta=C\{5WL^4/(384EI)\}$$

[0005] The present invention has been made in view of the above-mentioned problems, and it is an object of the present invention to provide a deck plate which can suppress a large increase in weight while improving cross-sectional performance compared with a conventional deck plate.

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Solution to Problem

[0006] To solve the above-mentioned problems, the present invention is directed to a deck plate formed of a metal plate, and formed such that a surface portion and a rib are alternately formed in a continuous manner, the deck plate
10 being characterized in that a projecting ridge portion projecting toward one surface side is formed on the surface portion, and a ratio of a length of the surface portion excluding the projecting ridge portion in a width direction to a length of the surface portion in the width direction falls within a range of from 0.5 to 0.7.

15 [0007] It is also preferable that the surface portion and the rib be formed in a same number.

[0008] It is also preferable that the projecting ridge portions be formed in parallel in the width direction at a predetermined separation.

[0009] It is also preferable that a locking portion be formed on the surface
20 portion disposed on one end side in the width direction, and a receiving portion configured to receive the locking portion be formed on a rib disposed on another end side in the width direction.

[0010] It is also preferable that the length of the surface portion in the width direction be 180 to 220 mm.

25 [0011] It is also preferable that a width of the projecting ridge portion be 20 to 25 mm.

[0012] It is also preferable that a height of the projecting ridge portion be 4 to 8 mm.

[0013] It is also preferable that a separation between a center of the rib and a center of the projecting ridge portion disposed adjacent to the rib be 20 to 50 mm.

[0014] It is also preferable that a separation between centers of the projecting ridge portions disposed adjacent to each other be 30 to 60 mm.

[0015] It is also preferable that a bend radius of a curved portion of the projecting ridge portion be 3 to 5 mm, the projecting ridge portion being formed of a metal plate.

[0016] It is also preferable that three to five projecting ridge portions be formed per surface portion.

Effects of Invention

[0017] According to the present invention, a large increase in weight can be suppressed while cross-sectional performance of a deck plate is improved compared with a conventional deck plate.

Brief Description of Drawings

[0018]

[Fig. 1] A view showing deck plates according to a first embodiment installed between beams.

[Fig. 2] A perspective view of the deck plate of the first embodiment.

[Fig. 3] A cross-sectional view of the deck plate of the first embodiment.

[Fig. 4] An enlarged cross-sectional view of a projecting ridge portion in the first embodiment.

[Fig. 5] Fig. 5A is a graph of a first embodiment where the ratio of the length of a surface portion excluding the projecting ridge portions in a width direction to

the length of the surface portion in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 5B is a graph where the ratio of the length of the surface portion excluding the projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate is shown on the vertical axis. Fig. 5C is a graph which is obtained by combining the graph of Fig. 5A and the graph of Fig. 5B into one graph, and which shows a range of excellent cross-sectional performance.

[Fig. 6] Fig. 6A is a graph of a variant 1 of the first embodiment where the ratio of the length of the surface portion excluding projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and the rate of increase in effective second moment of area is shown on the vertical axis. Fig. 6B is a graph where the ratio of the length of the surface portion excluding the projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate is shown on the vertical axis. Fig. 6C is a graph which is obtained by combining the graph of Fig. 6A and the graph of Fig. 6B into one graph, and which shows a range of excellent cross-sectional performance.

[Fig. 7] Fig. 7A is a graph of a variant 2 of the first embodiment where the ratio of the length of the surface portion excluding projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 7B is a graph where the ratio of the

length of the surface portion excluding the projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate is shown on the vertical axis. Fig. 7C is a graph which is obtained by combining the graph of Fig. 7A and the graph of Fig. 7B into one graph, and which shows a range of excellent cross-sectional performance.

[Fig. 8] A cross-sectional view of a deck plate of a second embodiment.

[Fig. 9] An enlarged cross-sectional view of a projecting ridge portion in the second embodiment.

[Fig. 10] Fig. 10A is a graph of the second embodiment where the ratio of the length of a surface portion excluding projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 10B is a graph where the ratio of the length of the surface portion excluding the projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate is shown on the vertical axis. Fig. 10C is a graph which is obtained by combining the graph of Fig. 10A and the graph of Fig. 10B into one graph, and which shows a range of excellent cross-sectional performance.

[Fig. 11] Fig. 11A is a graph of a variant 1 of the second embodiment where the ratio of the length of the surface portion excluding projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 11B is a graph where the ratio of the

length of the surface portion excluding the projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate is shown on the vertical axis. Fig. 11C is a graph which is obtained by combining the graph of Fig. 11A and the graph of Fig. 11B into one graph, and which shows a range of excellent cross-sectional performance.

[Fig. 12] Fig. 12A is a graph of a variant 2 of the second embodiment where the ratio of the length of the surface portion excluding projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 12B is a graph where the ratio of the length of the surface portion excluding the projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate is shown on the vertical axis. Fig. 12C is a graph which is obtained by combining the graph of Fig. 12A and the graph of Fig. 12B into one graph, and which shows a range of excellent cross-sectional performance.

[Fig. 13] Fig. 13A is a graph of a variant 3 of the second embodiment where the ratio of the length of the surface portion excluding projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 13B is a graph where the ratio of the length of the surface portion excluding the projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective

second moment of area to the rate of increase in weight of the deck plate is shown on the vertical axis. Fig. 13C is a graph which is obtained by combining the graph of Fig. 13A and the graph of Fig. 13B into one graph, and which shows a range of excellent cross-sectional performance.

- 5 [Fig. 14] Fig. 14A is a graph of a variant 4 of the second embodiment where the ratio of the length of the surface portion excluding projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 14B is a graph where the ratio of the
- 10 length of the surface portion excluding the projecting ridge portions in the width direction to the length of the surface portion in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate is shown on the vertical axis. Fig. 14C is a graph which is obtained by combining
- 15 the graph of Fig. 14A and the graph of Fig. 14B into one graph, and which shows a range of excellent cross-sectional performance.

[Fig. 15] A view showing a deck plate installed between beams such that a surface of the deck plate on which ribs are formed is directed upward (toward concrete).

- 20 [Fig. 16] A view showing a deck plate installed between beams to extend over a plurality of spans.

Description of Embodiments

- [0019] Preferred embodiments of the present invention are described with
- 25 reference to drawings. The embodiments described hereinafter are merely for the sake of example, and various embodiments may be conceivable within the scope of the present invention.

[0020]

1. First embodiment

The configuration of a deck plate 10 according to a first embodiment will be described with reference to Fig. 1 to Fig. 4. Fig. 1 is a view showing deck plates installed between beams. Fig. 2 is a perspective view of the deck plate. Fig. 3 is a cross-sectional view of the deck plate. Fig. 4 is an enlarged cross-sectional view of a projecting ridge portion.

As shown in Fig. 1 to Fig. 3, the deck plates 10 form a formwork for concrete to be placed in constructing a floor structure (or a ceiling structure) of a building structure.

[0021]

<Configuration of deck plate>

As shown in Fig. 1, the deck plates 10 extend between beams 20 which are disposed on opposite sides. One end of each deck plate 10 is placed on one beam 20, and is fixed to the beam 20 by welding or the like. Another end of each deck plate 10 is placed on another beam 20, and is fixed to the beam 20 by welding or the like. To be more specific, each beam 20 is formed of an H-shaped steel, for example. Respective end portions of each deck plate 10 are placed on and fixed to flange portions of the H-shaped steel each forming the beam 20.

[0022] As shown in Fig. 2 and Fig. 3, the deck plate 10 is formed of a thin-plate-like steel plate on which surface treatment, such as galvanizing treatment, is performed. The deck plate 10 is manufactured such that a flat-plate-like steel plate, for example, is roll-formed by a roll forming machine. Bending processing is performed on the deck plate 10 at a plurality of places by the roll forming machine. It is preferable that the plate thickness of the deck plate 10 be

from 0.6 to 1.6 mm. In the present embodiment, the plate thickness of the deck plate 10 is set to 0.8 mm.

The deck plate 10 includes two ribs 1, 2, surface portions 3, projecting ridge portions 4, locking portions 5, and end closed portions 6.

5 [0023]

(Rib)

As shown in Fig. 3, the rib 1 is formed by performing bending processing on a steel plate. The rib 1 includes: a curved portion 11 which is bent on one surface side of the steel plate; a straight line portion 12 which is
10 continuously formed with the curved portion 11, the surface direction of the straight line portion 12 extending in the direction orthogonal to the surface portion 3; a folded-back portion 13 which is continuously formed with the straight line portion 12, and is bent plural times, thus being folded back; a
15 straight line portion 14 which is continuously formed with the folded-back portion 13, the surface direction of the straight line portion 14 extending along the straight line portion 12; and a curved portion 15 which is continuously formed with the straight line portion 14, and is bent toward the surface portion 3.

Each of the curved portion 11 and the curved portion 15 is formed
20 such that a bend radius R thereof is 4 to 10 mm, for example, approximately 6 mm. The reason is as follows. A bending processing can be relatively easily performed by roll-forming, and it is possible to prevent that the size of a recess formed between the curved portions 11, 15 becomes larger than necessary, thus causing waste of concrete.

25 The straight line portion 12 and the straight line portion 14 are formed such that a surface of the straight line portion 12 and a surface of the straight line portion 14 come into contact with each other, and the straight line

portion 12 and the straight line portion 14 are connected with each other by caulking processing or the like. With such a configuration, the straight line portion 12 and the straight line portion 14 are prevented from being separated from each other.

5 The folded-back portion 13 is formed into a substantially triangular shape in cross section. The folded-back portion 13 is folded back such that a starting point and an end point of the folded-back portion 13 are disposed adjacently to each other so as to cause the straight line portion 12 and the straight line portion 14 to come into contact with each other.

10 [0024] As shown in Fig. 3, the rib 2 is formed by performing bending processing on the steel plate. The rib 2 includes: a curved portion 21 which is bent on one surface side of the steel plate; a straight line portion 22 which is continuously formed with the curved portion 21, the surface direction of the straight line portion 22 extending in the direction orthogonal to the surface
15 portion 3; a folded-back portion 23 which is continuously formed with the straight line portion 22, and is bent plural times, thus being folded back; a straight line portion 24 which is continuously formed with the folded-back portion 23, the surface direction of the straight line portion 24 extending along the straight line portion 22; an inclined portion 25 which is continuously formed
20 with the straight line portion 24, and is inclined in an oblique direction toward the surface portion 3, the oblique direction being a direction separating from the straight line portion 22; a straight line portion 26 which is continuously formed with the inclined portion 25, the surface direction of the straight line portion 26 extending along the straight line portion 22; and a curved portion 27 which is
25 continuously formed with the straight line portion 26, and is bent toward the surface portion 3.

[0025] Each of the curved portion 21 and the curved portion 27 is formed such that a bend radius R thereof is 4 to 10 mm, for example, approximately 6 mm. The reason is as follows. A bending processing can be relatively easily performed by roll-forming, and it is possible to prevent that the size of a recess formed between the curved portions 21, 27 becomes larger than necessary, thus causing waste of concrete.

The straight line portion 22 and the straight line portion 24 are formed such that a surface of the straight line portion 22 and a surface of the straight line portion 24 come into contact with each other, and the straight line portion 22 and the straight line portion 24 are connected with each other by caulking processing or the like. With such a configuration, the straight line portion 22 and the straight line portion 24 are prevented from being separated from each other.

The folded-back portion 23 is formed into a substantially triangular shape in cross section. The folded-back portion 23 is folded back such that a starting point and an end point of the folded-back portion 23 are disposed adjacently to each other so as to cause the straight line portion 22 and the straight line portion 24 to come into contact with each other.

The inclined portion 25 is provided for forming a gap between the straight line portion 22 and the straight line portion 26. Due to the presence of this inclined portion 25, the gap formed between the straight line portion 22 and the straight line portion 26 can form a receiving portion 50 for a locking portion 5, and can accept the insertion of the locking portion 5.

[0026] Two ribs consisting of the rib 1 and the rib 2 are formed on the deck plate 10, and the rib 1 and the rib 2 are formed with a separation (a distance between the center of the rib 1 and the center of the rib 2) of 180 to 220 mm along the width direction (lateral direction) of the deck plate 10. Specifically,

the deck plate 10 is formed with a length L of 360 to 440 mm in the width direction of the deck plate 10. The rib 1 is formed such that a distance $L1$ from one end of the deck plate 10 in the width direction to the center of the rib 1 (a boundary surface where the straight line portion 12 and the straight line portion 14 come into contact with each other being assumed as the center of the rib 1) is 180 to 220 mm. Further, the rib 2 is formed such that a distance $L2$ from the center of the rib 1 to the center of the rib 2 (a boundary surface where the straight line portion 22 and the straight line portion 24 come into contact with each other being assumed as the center of the rib 2) is 180 to 220 mm. That is, the rib 1 is formed at a position in the vicinity of the center of the deck plate 10 in the width direction, and the rib 2 is formed at a position in the vicinity of the end portion of the deck plate 10 in the width direction. It is preferable that the distance $L1$ and the distance $L2$ be equal to each other. In the first embodiment, the deck plate 10 is formed such that $L1 = L2 = 200$ mm and $L = 400$ mm are established. That is, the length of each surface portion 3 in the width direction is 200 mm which is equal to $L1$, $L2$.

Each of the ribs 1, 2 is formed to extend along the length direction (longitudinal direction) of the deck plate 10. That is, the rib 1, 2 is continuously formed to extend from one end to another end along a direction along which the deck plate 10 extends between the beams 20.

It is preferable to form the rib 1, 2 such that a height from the lower end of the rib 1, 2 to the upper end (upper surface) of the surface portion 3 is 75 to 100 mm. In the first embodiment, the rib 1, 2 is formed such that a height $H1$ of the rib 1, 2 is 100 mm ($H1=100$ mm).

[0027]

(Surface portion)

As shown in Fig. 3, the surface portions 3 are, mainly, portions of the deck plate 10 where the ribs 1, 2 are not formed, and the surface portions 3 form surfaces which mainly receive a load of concrete to be placed on the deck plate 10. The surface portion 3 is formed next to the rib 1, 2 in the width direction of the deck plate 10. That is, in the deck plate 10, the ribs 1, 2 and the surface portions 3 are alternately formed. In the deck plate 10, the respective surface portions 3 are formed on the same plane.

In the first embodiment, two ribs 1, 2 and two surface portions 3 are formed. It is preferable to form the ribs and the surface portions in the same number. Particularly, it is preferable that one deck plate have one to three ribs and one to three surface portions.

[0028]

(Projecting ridge portion)

As shown in Fig. 3 and Fig. 4, the projecting ridge portions 4 are formed by performing bending processing on a steel plate. The projecting ridge portions 4 are formed on the surface portion 3 to project toward the surface side on which the rib 1, 2 is formed. With such a configuration, the surface portion 3 forms a surface where flat portions and valley portions (mountain portions when viewed from the opposite side) continue alternately.

A plurality of projecting ridge portions 4 are formed in parallel along the width direction of the deck plate 10. For example, three projecting ridge portions 4 are formed per surface portion 3. In this embodiment, as shown in Fig. 3, the number and size of projecting ridge portions 4 are determined such that a ratio $r1$ of the length of a surface portion 3a of the deck plate 10 excluding the projecting ridge portions 4 in the width direction ($L4+L5+L6+L7$) to a length $L1$ of the surface portion 3a of the deck plate 10 in the width direction falls within a range of from 0.5 to 0.7. Also in a surface portion 3b of the deck plate

10, the number, width and depth of projecting ridge portions 4 are determined such that a ratio r_2 of the length of the surface portion 3b excluding the projecting ridge portions 4 in the width direction ($L_8+L_9+L_{10}+L_{11}$) to a length L_2 of the surface portion 3b in the width direction falls within a range of from 0.5 to 0.7. More specifically, although the number of projecting ridge portions 4 may vary depending on the width of each projecting ridge portion 4, it is preferable to suppress the number of projecting ridge portions 4 per surface portion 3 (3a, 3b) to three to five, for example. The projecting ridge portions 4 are formed to extend along the longitudinal direction of the deck plate 10.

[0029] As shown in Fig. 4, it is preferable to form each projecting ridge portion 4 such that a width B along the width direction of the deck plate 10 is 20 to 25 mm, and a height H2 (being a length from the lower surface of the surface portion 3 to the outer surface of a portion projecting the most from the side where the ribs 1, 2 are formed) is 4 to 8 mm. The projecting ridge portion 4 is formed such that a valley portion 41 formed at the center in the width direction has the largest depth, and the projecting ridge portion 4 includes inclined surfaces 42 extending from both sides of this valley portion 41 in the width direction and having the same inclination. It is preferable to form the projecting ridge portion 4 such that curved portions 43 (boundary portions each formed between the projecting ridge portion 4 and the surface portion 3, and the valley portion) formed by bending a metal plate have a bend radius R of 3 to 5 mm.

[0030] As shown in Fig. 3, it is preferable to form the projecting ridge portions 4 such that a distance L_4 from one end of the deck plate 10 to a projecting ridge portion 4a closest to the one end of the deck plate 10, of the projecting ridge portions 4 formed on the surface portion 3a disposed between one end of the deck plate 10 and the rib 1, is 17.5 to 35 mm. In the first embodiment, for example, when the number of projecting ridge portions 4 is set

to three, and the width B of each projecting ridge portion 4 is set to 25 mm, the projecting ridge portions 4 are formed such that the distance L4 is 32.5 mm. It is also preferable to form the projecting ridge portions 4 such that a distance L5 from the projecting ridge portion 4a to a projecting ridge portion 4b disposed adjacent to the projecting ridge portion 4a and a distance L6 from the projecting ridge portion 4b to a projecting ridge portion 4c disposed adjacent to the projecting ridge portion 4b are 10 to 35 mm. In the first embodiment, for example, when the number of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, the projecting ridge portions 4 are formed such that the distance L6 is 30 mm. It is also preferable to form the projecting ridge portions 4 such that a distance L7 from the projecting ridge portion 4c to the center of the rib 1 disposed adjacent to the projecting ridge portion 4c is 17.5 to 35 mm. In the first embodiment, for example, when the number of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, the projecting ridge portions 4 are formed such that the distance L7 is 32.5 mm. A separation between the rib 1, 2 and the projecting ridge portion 4 disposed adjacent to this rib 1, 2, and a separation between the projecting ridge portions 4 disposed adjacent to each other vary depending on the number of projecting ridge portions 4. However, it is preferable to set these separations to the same value as much as possible.

[0031] It is preferable to form the projecting ridge portions 4 such that a distance L8 from the center of the rib 1 to a projecting ridge portion 4d closest to the rib 1, of the projecting ridge portions 4 formed on the surface portion 3b disposed between the rib 1 and the rib 2, is set to 17.5 to 35 mm. In the first embodiment, for example, when the number of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, the projecting ridge portions 4 are formed such that the distance L8 is 32.5 mm. It is

also preferable to form the projecting ridge portions 4 such that a distance L9 from the projecting ridge portion 4d to a projecting ridge portion 4e disposed adjacent to the projecting ridge portion 4d and a distance L10 from the projecting ridge portion 4e to a projecting ridge portion 4f disposed adjacent to the projecting ridge portion 4e are 10 to 35 mm. In the first embodiment, for example, when the number of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, the projecting ridge portions 4 are formed such that the distance L10 is 30 mm. It is also preferable to form the projecting ridge portions 4 such that a distance L11 from the projecting ridge portion 4f to the center of the rib 2 disposed adjacent to the projecting ridge portion 4f is 17.5 to 35 mm. In the first embodiment, for example, when the number of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, the projecting ridge portions 4 are formed such that the distance L11 is 32.5 mm.

Accordingly, in the first embodiment, for example, when the number of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, a separation between the center of the rib 1 and the center of the projecting ridge portion 4c, 4d disposed adjacent to this rib 1 is 45 mm. Further, a separation between the centers of the projecting ridge portions 4 disposed adjacent to each other is 55 mm. In the first embodiment, it is preferable that the separation between the center of the rib 1 and the center of the projecting ridge portion 4c, 4d disposed adjacent to this rib 1 fall within a range of from 30 to 45 mm, and the separation between the centers of the projecting ridge portions 4 disposed adjacent to each other fall within a range of from 35 to 55 mm.

In the first embodiment, for example, when the number n of projecting ridge portions 4 is set to three, and the width B of each projecting

ridge portion 4 is set to 25 mm, the ratio r (r1, r2) of the length of one surface portion 3a, 3b excluding the projecting ridge portions 4 in the width direction to the length L1, L2 of the one surface portion 3a, 3b in the width direction is calculated by the following formula (1), formula (2).

5
$$r1=(L1-B \times n)/L1 \quad \dots (1)$$

$$r2=(L2-B \times n)/L2 \quad \dots (2)$$

Therefore, the ratio r (r1, r2) has the following value.

$$r1=(200-25 \times 3)/200=0.625$$

$$r2=(200-25 \times 3)/200=0.625$$

10 Accordingly, when the surface portion 3 has the above-mentioned width and each projecting ridge portion 4 has the above-mentioned width, to cause the ratio r to fall within a range of from 0.5 to 0.7, the number of projecting ridge portions 4 for one surface portion 3 is set to three or four.

[0032]

15 (Locking portion)

The locking portion 5 is formed at one end of the deck plate 10. The locking portion 5 is the end portion of a steel material which is bent from the surface portion 3a at substantially the right angle, and is formed to extend along the height direction of the ribs 1, 2. The height h of the locking portion 5 is 10 to 20 25 mm. In connecting the deck plates 10 with each other, the locking portion 5 of one deck plate 10 is inserted into the receiving portion 50 formed on the rib 2 of another deck plate 10. In connecting the deck plates 10 with each other, the deck plates 10 are made to overlap with each other such that a portion of the surface portion 3a of the deck plate 10 is placed on the upper surface of an 25 extending portion 8 to insert the locking portion 5 into the receiving portion 50, the extending portion 8 being formed continuously with the curved portion 27 of the rib 2, and extending along the surface portion 3a and the surface portion

3b. A distance L3 from the center of the rib 2 to the end portion of the extending portion 8 is 10 to 25 mm.

It is sufficient for the locking portion 5 to have a height which can be locked to the receiving portion 50 so that it is not always necessary that the height of the locking portion 5 falls within a range of from 10 to 25 mm. Alternatively, provided that placed concrete does not leak, without forming the locking portion 5, the surface portions may be made overlap with each other, joined with each other by welding, or connected with each other by fastening jigs, such as screws.

It is also sufficient for the receiving portion 50 to have a height which allows insertion of the locking portion 5 into the receiving portion 50 so that it is not always necessary that the height of the receiving portion 50 falls within a range of from 10 to 25 mm.

[0033]

(End closed portion)

As shown in Fig. 2, the end closed portions 6 are formed on both end portions of the deck plate 10 in the length direction (longitudinal direction). The end closed portions 6 are formed such that both end portions of the rib 1 and the rib 2 are compressed in the direction perpendicular to the surface of the deck plate 10. With the formation of the end closed portions 6, each of the rib 1 and the rib 2 is formed to have a cross section where the end closed portions 6 at both end portions of the rib 1, 2 are compressed, and other portions of the rib 1, 2 sandwiched between the end closed portions 6 are formed into a substantially triangular shape in cross section. As a result, both end portions of the rib 1 and the rib 2 have a height lower than other portions of the rib 1 and the rib 2 so that the deck plate 10 can be placed on upper surfaces of the flange portions of the beams 20. The end closed portion 6 is formed such that the

length of the end closed portion 6 along the extending direction of the rib 1 and the rib 2 is longer than the length of a portion of the end closed portion 6 placed on the upper surface of the flange portion of the beam 20.

[0034] As described above, the projecting ridge portions 4 are formed on the surface portion 3 of the deck plate 10 so that an effective cross-sectional area can be increased by the projecting ridge portions 4 at a position on the surface portion 3 away from the ribs 1, 2 and hence, cross-sectional performance of the deck plate 10 can be improved. Therefore, it is possible to increase the allowable span of the deck plate 10.

Further, cross-sectional performance is improved and hence, it is possible to reduce the weight of the deck plate 10 by reducing the plate thickness of the deck plate 10 compared with a conventional deck plate.

The projecting ridge portions 4 are formed such that the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction falls within a range of from 0.5 to 0.7. More specifically, by forming three to five projecting ridge portions 4 per surface portion 3, the whole surface portion 3 can become an effective cross section. Therefore, it is possible to manufacture the deck plate 10 having sufficient cross-sectional performance with only the small number of projecting ridge portions 4 and hence, a large increase in weight of the deck plate 10 can be suppressed. In addition to the above, even when the plate thickness of the deck plate 10 is reduced, there is no possibility that the surface portion 3 between the ribs 1, 2 deflects at the time of placing concrete.

[0035] By setting the above-mentioned ratio r to a value which falls within a range of from 0.5 to 0.7, the number of projecting ridge portions 4 per surface portion 3 can be suppressed to three to five. Therefore, there is no possibility of

a large increase in the amount of concrete which intrudes into recesses formed on the back side of the projecting ridge portions 4 so that it is possible to suppress a large increase in weight of a floor structure (or a ceiling structure) and a large increase in concrete material. Accordingly, it is also unnecessary to increase the plate thickness of the deck plate 10.

The locking portion 5 is formed at one end of the deck plate 10, and the receiving portion 50 is formed on the rib 2 disposed at a position in the vicinity of another end of the deck plate 10. Therefore, by only making one deck plate overlap with another deck plate so as to insert the locking portion 5 into the receiving portion 50, two deck plates 10 can be easily connected with each other and hence, workability can be improved.

Further, forming the projecting ridge portions 4 prevents a worker from easily slipping on the deck plate 10 during working on the deck plate 10 and hence, a working efficiency can be improved.

[0036]

<Improvement in cross-sectional performance of deck plate caused by formation of projecting ridge portions>

Next, the improvement in cross-sectional performance of the deck plate caused by the formation of the projecting ridge portions on the deck plate 10 according to the first embodiment will be described with reference to Fig. 5 to Fig. 7.

Fig. 5A is a graph where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 5B is a graph where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the

length of the surface portion 3 in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate 10 is shown on the vertical axis. Fig. 5C is a graph which is obtained by combining the graph of Fig. 5A and the graph of Fig. 5B into one graph, and which shows a range of excellent cross-sectional performance. The width of the projecting ridge portion is set to 25 mm, the height of the projecting ridge portion is set to 6 mm, and the bend radius R of the curved portion is set to 3 mm.

[0037] As shown in Fig. 5A, when the ratio r (the ratio r1 and the ratio r2 being the same value, thus being simply referred to as "ratio r" hereinafter) of the length of one surface portion 3 excluding the projecting ridge portions (L4+L5+L6+L7), (L8+L9+L10+L11) to the length L1, L2 of the one surface portion 3 of the deck plate 10 in the width direction is 0.9, the rate of increase in effective second moment of area does not even reach 1.3. Further, in the range of the ratio r from 0.7 to 1.0, as the number of projecting ridge portions 4 increases (as the ratio r decreases), the rate of increase in effective second moment of area sharply increases. When the ratio r is 0.3 to 0.7, the rate of increase in effective second moment of area is more than 1.6. However, when the ratio r is 0.3 to 0.5, the rate of increase in effective second moment of area is slightly lower than that when the ratio r is 0.5 to 0.7.

As shown in Fig. 5B, a comparison is made on the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate 10 caused by increasing the projecting ridge portion 4 (by decreasing the ratio r). Even in such a comparison, when the ratio r is in the vicinity of 0.6, the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate 10 reaches the highest numerical value, which is higher than 1.6, and even when the value for the

projecting ridge portions 4 is further increased (even when the ratio r is decreased), the ratio of the rate of increase in effective second moment of area to the rate of increase in weight gradually reduces. The reason is as follows. In the case where the number of projecting ridge portions 4 is small, even when the rate of increase in weight of the deck plate 10 is small, the rate of increase in effective second moment of area is small already, so a large increase is not observed. In the case where the number of projecting ridge portions 4 is large, the rate of increase in weight of the deck plate 10 is large and hence, an effect as great as an effect obtained when the ratio r is 0.6 cannot be obtained.

[0038] Therefore, it can be understood that, from viewpoints of improvement in cross-sectional performance, a reduction in weight of the deck plate, and economic efficiency, it is preferable to form the projecting ridge portions 4 on one surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, as seen in a section S in Fig. 5C and, especially, it is optimal to form the projecting ridge portions 4 such that the ratio r is in the vicinity of 0.6. The reason that the ratio r falling within a range of from 0.5 to 0.7 is optimal is as follows. Fig. 5B includes a range where the rate of increase in effective second moment of area is more than 1.6 and substantially constant, that is, the ratio r is equal to or less than 0.7 (ratio $r=0.7$ or less) at which the value of the rate of increase in effective second moment of area converges, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight has a value ranging from the maximum value to a value lower than the maximum value of the ratio by approximately 5%, and such a range is recognized as a range having favorable sectional efficiency.

In the case where the projecting ridge portions 4 are not formed, as described above, a calculation is performed assuming that the deflection coefficient C is 1.6. In the case where the projecting ridge portions 4 are formed

on the surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, compared with the case where the projecting ridge portions 4 are not formed, cross-sectional performance is remarkably improved, and effective second moment of area is increased by 1.6 or more times so that all area of the surface portion 3 can be considered as an effective cross section and hence, the deflection coefficient C becomes 1.0.

Further, with the formation of the projecting ridge portions 4 on one surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, when the plate thickness of the deck plate 10 is set to 0.8 mm, the yield point of a steel material is set to 235 N/mm², and a slab thickness is set to 150 mm, the allowable span of the deck plate 10 can be increased to 3860 mm (the case of including three projecting ridge portions) from 3300 mm (the case of including no projecting ridge portion).

[0039]

<Variant 1 of projecting ridge portion>

Next, a variant 1 of the projecting ridge portion in the first embodiment will be described.

Each projecting ridge portion 4 is not limited to have the above-mentioned width and height. For example, the width of each projecting ridge portion 4 may be set to 20 mm, and the height of each projecting ridge portion 4 may be set to 7 mm. In this case, Fig. 6A is a graph of the variant 1 where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 6B is a graph where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in

the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate 10 is shown on the vertical axis. Fig. 6C is a graph which is obtained by combining the graph of Fig. 6A and the graph of Fig. 6B into one graph, and which shows a range of excellent cross-sectional performance.

[0040] In comparison with the above-mentioned first embodiment, the width of each projecting ridge portion 4 is reduced by 5 mm, and the height of each projecting ridge portion 4 is increased by 1 mm. In this case, in the range where the ratio r of one surface portion 3 excluding the projecting ridge portions 4 to the one surface portion 3 is 0.7 to 1.0, as the number of projecting ridge portions 4 increases (the ratio r decreases), the rate of increase in effective second moment of area increases. However, even when the ratio r is reduced from a value in the vicinity of 0.7, the rate of increase in effective second moment of area is only slightly increased, so great effect is not observed. Whereas, with respect to the ratio of the rate of increase in effective second moment of area to the rate of increase in weight, as the number of projecting ridge portions 4 is increased (the ratio r is decreased), the weight of the deck plate 10 increases so that when the ratio r is in the vicinity of 0.7, the ratio reaches a value in the vicinity of 1.6, which is the highest numerical value, and even when the ratio r is reduced, the ratio of the rate of increase in effective second moment of area to the rate of increase in weight gradually reduces.

[0041] Therefore, also in the case of this projecting ridge portion 4, it can be understood that it is preferable to form the projecting ridge portions 4 on one surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, as seen in a section S in Fig. 6C, from viewpoints of improvement in cross-sectional performance, a reduction in weight of the deck plate, and economic efficiency.

In the case where the projecting ridge portions 4 are not formed, as described above, a calculation is performed assuming that the deflection coefficient C is 1.6. When the ratio r falls within a range of from 0.5 to 0.7, compared with the case where the projecting ridge portions 4 are not formed, cross-sectional performance is remarkably improved, and effective second moment of area is increased by 1.6 or more times so that all area of the surface portion 3 can be considered as an effective cross section and hence, the deflection coefficient C becomes 1.0.

Further, in the variant 1, for example, in the case where the number n of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 20 mm, when the ratio r (r1, r2) of the length of one surface portion 3a, 3b excluding the projecting ridge portions 4 in the width direction to the length L1, L2 of the one surface portion 3a, 3b in the width direction is calculated using the above-mentioned formula (1), formula (2), the following value can be obtained.

$$r1=(200-20\times3)/200=0.7$$

$$r2=(200-20\times3)/200=0.7$$

Accordingly, when each surface portion 3 has the width in the variant 1 and each projecting ridge portion 4 has the width in the variant 1, to cause the ratio r to fall within a range of from 0.5 to 0.7, the number of projecting ridge portions 4 for one surface portion 3 is set to three to five.

[0042]

<Variant 2 of projecting ridge portion>

Next, a variant 2 of the projecting ridge portion in the first embodiment will be described. For example, the width of each projecting ridge portion 4 may be set to 20 mm, and the height of each projecting ridge portion 4 may be set to 8 mm. In this case, Fig. 7A is a graph of the variant 2 where the

ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 7B is a graph where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate is shown on the vertical axis. Fig. 7C is a graph which is obtained by combining the graph of Fig. 7A and the graph of Fig. 7B into one graph, and which shows a range of excellent cross-sectional performance.

[0043] In comparison with the above-mentioned first embodiment, the width of each projecting ridge portion 4 is reduced by 5 mm, and the height of each projecting ridge portion 4 is increased by 2 mm. In this case, in the range where the ratio r of one surface portion 3 excluding the projecting ridge portions 4 to the one surface portion 3 is 0.7 to 1.0, as the number of projecting ridge portions 4 increases (the ratio r decreases), the rate of increase in effective second moment of area increases. However, even when the ratio r is reduced from a value in the vicinity of 0.7, the rate of increase in effective second moment of area is only slightly increased, so great effect is not observed. Whereas, with respect to the ratio of the rate of increase in effective second moment of area to the rate of increase in weight, as the number of projecting ridge portions 4 is increased (the ratio r is decreased), the weight of the deck plate 10 increases so that when the ratio r is in the vicinity of 0.7, the ratio reaches a value in the vicinity of 1.6, which is the highest numerical value, and even when the ratio r is reduced, the ratio of the rate of increase in effective second moment of area to the rate of increase in weight gradually reduces.

[0044] Therefore, also in the case of this projecting ridge portion 4, it can be understood that it is preferable to form the projecting ridge portions 4 on one surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, as seen in a section S in Fig. 7C, from viewpoints of improvement in cross-sectional performance, a reduction in weight of the deck plate, and economic efficiency.

In the case where the projecting ridge portions 4 are not formed, as described above, a calculation is performed assuming that the deflection coefficient C is 1.6. When the ratio r falls within a range of from 0.5 to 0.7, compared with the case where the projecting ridge portions 4 are not formed, cross-sectional performance is remarkably improved, and effective second moment of area is increased by 1.6 or more times so that all area of the surface portion 3 can be considered as an effective cross section and hence, the deflection coefficient C becomes 1.0.

Further, in the variant 2, for example, in the case where the number n of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 20 mm, when the ratio r (r_1 , r_2) of the length of one surface portion 3a, 3b excluding the projecting ridge portions 4 in the width direction to the length L_1 , L_2 of the one surface portion 3a, 3b in the width direction is calculated using the above-mentioned formula (1), formula (2), the following value can be obtained.

$$r_1 = (200 - 20 \times 3) / 200 = 0.7$$

$$r_2 = (200 - 20 \times 3) / 200 = 0.7$$

Accordingly, when each surface portion 3 has the width in the variant 2 and each projecting ridge portion 4 has the width in the variant 2, to cause the ratio r to fall within a range of from 0.5 to 0.7, the number of projecting ridge portions 4 for one surface portion 3 is set to three to five.

[0045]

2. Second embodiment

The configuration of a deck plate 100 according to a second embodiment will be described with reference to Fig. 8 and Fig. 9. The deck plate 100 according to the second embodiment is obtained by modifying the number of ribs 1, 2 and the height of the rib 1, 2 of the above-mentioned deck plate 10 according to the first embodiment so that the configuration of other portions in the second embodiment is substantially equal to the corresponding configuration in the first embodiment. Accordingly, hereinafter, components substantially equal to the corresponding components of the deck plate 10 according to the first embodiment are given the same symbols as the deck plate 10, and the description of such components is omitted.

[0046]

<Configuration of deck plate>

As shown in Fig. 8, the deck plate 100 includes three ribs 101a, 101b, 101c, surface portions 3, projecting ridge portions 4, the locking portion 5, and the end closed portions 6 (see Fig. 2). In the same manner as the deck plate 10 of the first embodiment, it is preferable that the plate thickness of the deck plate 100 be 0.6 to 1.6 mm. In the second embodiment, the plate thickness of the deck plate 10 is set to 0.8 mm.

[0047] Three ribs consisting of the rib 101a, the rib 101b, and the rib 101c are formed on the deck plate 100. In the same manner as the rib 10 of the first embodiment, each of the ribs 101a, 101b, 101c includes the curved portion 11, the straight line portion 12, the folded-back portion 13, the straight line portion 14, and the curved portion 15. The rib 101a and the rib 101b are formed with a separation (a distance between the center of the rib 101a and the center of the rib 101b) of 180 to 220 mm along the width direction (lateral direction) of the

deck plate 100, and the rib 101b and the rib 101c are formed with a separation (a distance between the center of the rib 101b and the center of the rib 101c) of 180 to 220 mm along the width direction (lateral direction) of the deck plate 100. Specifically, the deck plate 100 is formed with a length L of 540 to 660 mm in the width direction of the deck plate 100. The rib 101a is formed such that a distance La from one end of the deck plate 100 in the width direction to the center of the rib 101a (a boundary surface where the straight line portion 12 and the straight line portion 14 come into contact with each other being assumed as the center of the rib 101a) is 180 to 220 mm. The rib 101b is formed such that a distance Lb from the center of the rib 101a to the center of the rib 101b (a boundary surface where the straight line portion 12 and the straight line portion 14 come into contact with each other being assumed as the center of the rib 101b) is 180 to 220 mm. Further, the rib 101c is formed such that a distance Lc from the center of the rib 101b to the center of the rib 101c (a boundary surface where the straight line portion 12 and the straight line portion 14 come into contact with each other being assumed as the center of the rib 101c) is 180 to 220 mm. That is, the rib 101a is formed on one end side (the left side in Fig. 8) of the center of the deck plate 100 in the width direction, and the rib 101b and the rib 101c are formed on another end side (the right side in Fig. 8) of the center of the deck plate 100 in the width direction. It is preferable that the distances La, Lb, Lc be equal to each other. In the second embodiment, the deck plate 100 is formed such that $L_a = L_b = L_c = 210$ mm and $L = 630$ mm are established.

Further, in the second embodiment, the rib 101a, 101b, 101c is formed such that a height H3 from the lower end of the rib 101a, 101b, 101c to the upper end (upper surface) of the surface portion 3 is 75 mm ($H_3=75$ mm).

[0048] As shown in Fig. 8, the surface portions 3 are, mainly, portions of the deck plate 100 where the ribs 101a, 101b, 101c are not formed, and the surface

portions 3 form surfaces which mainly receive a load of concrete to be placed on the deck plate 100. The surface portion 3 is formed next to the rib 101a, 101b, 101c in the width direction of the deck plate 100. That is, in the deck plate 100, the ribs 101a, 101b, 101c and the surface portions 3 are alternately formed. In the deck plate 100, the respective surface portions 3 are formed on the same plane.

In the second embodiment, three ribs 101a, 101b, 101c and three surface portions 3 are formed. It is preferable to form the ribs and the surface portions in the same number.

[0049] As shown in Fig. 8 and Fig. 9, the projecting ridge portions 4 are formed by performing bending processing on a steel plate. The projecting ridge portions 4 are formed on the surface portion 3 to project toward the surface side on which the rib 101a, 101b, 101c is formed. With such a configuration, the surface portion 3 forms a surface where flat portions and valley portions (mountain portions when viewed from the opposite side) continue alternately.

A plurality of projecting ridge portions 4 are formed in parallel along the width direction of the deck plate 100. For example, three projecting ridge portions 4 are formed per surface portion 3. In this embodiment, as shown in Fig. 8, the number and size of the projecting ridge portions 4a, 4b, 4c are determined such that a ratio r_a of the length of the surface portion 3a of the deck plate 100 excluding the projecting ridge portions 4 in the width direction ($L_4+L_5+L_6+L_7$) to a length L_a of the surface portion 3a of the deck plate 100 in the width direction falls within a range of from 0.5 to 0.7. Also with respect to the surface portion 3b of the deck plate 100, the number, width and depth of projecting ridge portions 4d, 4e, 4f are determined such that a ratio r_b of the length of the surface portion 3b excluding the projecting ridge portions 4 in the width direction ($L_8+L_9+L_{10}+L_{11}$) to a length L_b of the surface portion 3b in the

width direction falls within a range of from 0.5 to 0.7. Also with respect to a surface portion 3c of the deck plate 100, the number, width and depth of projecting ridge portions 4g, 4h, 4i are determined such that a ratio r_c of the length of the surface portion 3c excluding the projecting ridge portions 4 in the width direction ($L_{12}+L_{13}+L_{14}+L_{15}$) to a length L_c of the surface portion 3c in the width direction falls within a range of from 0.5 to 0.7. More specifically, although the number of projecting ridge portions 4 may vary depending on the width of each projecting ridge portion 4, it is preferable to suppress the number of projecting ridge portions 4 per surface portion 3 (3a, 3b, 3c) to three to five, for example.

[0050] As shown in Fig. 9, it is preferable to form each projecting ridge portion 4 such that a width B along the width direction of the deck plate 100 is 25 mm, and a height H4 (being a length from the lower surface of the surface portion 3 to the outer surface of a portion projecting the most from the side where the ribs 101a, 101b, 101c are formed) is 6 mm. It is preferable to form the projecting ridge portion 4 such that the curved portions 43 (boundary portions each formed between the projecting ridge portion 4 and the surface portion 3, and the valley portion) formed by bending a metal plate have a bend radius R of 3 to 5 mm.

[0051] As shown in Fig. 8, when the number of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, the projecting ridge portions 4 are formed such that the distance L4 from one end of the deck plate 100 to the projecting ridge portion 4a closest to the one end of the deck plate 100, of the projecting ridge portions 4 formed on the surface portion 3a disposed between one end of the deck plate 100 and the rib 101a, is 37.5 mm. The projecting ridge portions 4 are formed such that the distance L5 from the projecting ridge portion 4a to the projecting ridge portion

4b disposed adjacent to the projecting ridge portion 4a and the distance L6 from the projecting ridge portion 4b to the projecting ridge portion 4c disposed adjacent to the projecting ridge portion 4b are 30 mm. Further, the projecting ridge portions 4 are formed such that the distance L7 from the projecting ridge portion 4c to the center of the rib 101a disposed adjacent to the projecting ridge portion 4c is 37.5 mm.

[0052] When the number of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, the projecting ridge portions 4 are formed such that the distance L8 from the center of the rib 101a to the projecting ridge portion 4d closest to the rib 101a, of the projecting ridge portions 4 formed on the surface portion 3b disposed between the rib 101a and the rib 101b, is 37.5 mm. The projecting ridge portions 4 are formed such that the distance L9 from the projecting ridge portion 4d to the projecting ridge portion 4e disposed adjacent to the projecting ridge portion 4d and the distance L10 from the projecting ridge portion 4e to the projecting ridge portion 4f disposed adjacent to the projecting ridge portion 4e are 30 mm. Further, the projecting ridge portions 4 are formed such that the distance L11 from the projecting ridge portion 4f to the center of the rib 101b disposed adjacent to the projecting ridge portion 4f is 37.5 mm.

[0053] When the number of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, the projecting ridge portions 4 are formed such that the distance L12 from the center of the rib 101c to a projecting ridge portion 4g closest to the rib 101c, of the projecting ridge portions 4 formed on the surface portion 3c disposed between the rib 101b and the rib 101c, is 37.5 mm. The projecting ridge portions 4 are formed such that the distance L13 from the projecting ridge portion 4g to a projecting ridge portion 4h disposed adjacent to the projecting ridge portion 4g and the distance

L14 from the projecting ridge portion 4h to a projecting ridge portion 4i disposed adjacent to the projecting ridge portion 4h are 30 mm. Further, the projecting ridge portions 4 are formed such that the distance L15 from the projecting ridge portion 4i to the center of the rib 101c disposed adjacent to the projecting ridge portion 4i is 37.5 mm.

[0054] Accordingly, in the second embodiment, for example, when the number of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, a separation between the center of the rib 101a and the center of the projecting ridge portion 4c, 4d disposed adjacent to this rib 101a, a separation between the center of the rib 101b and the center of the projecting ridge portion 4f, 4g disposed adjacent to this rib 101b, and a separation between the center of the rib 101c and the center of the projecting ridge portion 4i disposed adjacent to this rib 101c are 50 mm. Further, a separation between the centers of the projecting ridge portions 4 disposed adjacent to each other is 55 mm.

[0055] In the second embodiment, for example, when the number n of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, the ratio r (ra, rb, rc) of the length of one surface portion 3a, 3b, 3c excluding the projecting ridge portions 4 in the width direction to the length La, Lb, Lc of the one surface portion 3a, 3b, 3c in the width direction is calculated by the following formula (3), formula (4), formula (5).

$$ra=(La-B \times n)/La \quad \dots(3)$$

$$rb=(Lb-B \times n)/Lb \quad \dots(4)$$

$$rc=(Lc-B \times n)/Lc \quad \dots(5)$$

Therefore, the ratio r (ra, rb, rc) has the following value.

$$ra=(210-25 \times 3)/210=0.6428 \dots$$

$$rb=(210-25\times 3)/210=0.6428 \dots$$

$$rc=(210-25\times 3)/210=0.6428 \dots$$

Accordingly, when the surface portion 3 has the above-mentioned width and each projecting ridge portion 4 has the above-mentioned width, to
5 cause the ratio r to fall within a range of from 0.5 to 0.7, the number of projecting ridge portions 4 for one surface portion 3 is set to three or four.

[0056]

<Improvement in cross-sectional performance of deck plate caused by formation of projecting ridge portions>

10 Next, the improvement in cross-sectional performance of the deck plate caused by the formation of the projecting ridge portions on the deck plate 100 according to the second embodiment will be described with reference to Fig. 10 to Fig. 12. That is, the description will be made with respect to improvement in cross-sectional performance of the deck plate 100 caused by the formation of
15 the projecting ridge portions 4 on the deck plate 100 where three ribs 101a, 101b, 101c are formed, and the ribs 101a, 101b, 101c are formed to have the height H_3 of 75 mm.

[0057] Fig. 10A is a graph where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the
20 length of the surface portion 3 in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 10B is a graph where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal
25 axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate 100 is shown on the vertical axis. Fig. 10C is a graph which is obtained by combining the graph of Fig. 10A and

the graph of Fig. 10B into one graph, and which shows a range of excellent cross-sectional performance.

[0058] As shown in Fig. 10A, when the ratio r (the ratio r_a , the ratio r_b , and the ratio r_c being the same value, thus being simply referred to as "ratio r " hereinafter) of the length of one surface portion 3 excluding the projecting ridge portions ($L_4+L_5+L_6+L_7$), ($L_8+L_9+L_{10}+L_{11}$), ($L_{12}+L_{13}+L_{14}+L_{15}$) to the length L_a , L_b , L_c of the one surface portion 3 of the deck plate 100 in the width direction is 0.9, the rate of increase in effective second moment of area does not even reach 1.3. Further, in the range of the ratio r from 0.7 to 1.0, as the number of projecting ridge portions 4 increases (the ratio r decreases), the rate of increase in effective second moment of area sharply increases. When the ratio r is 0.3 to 0.7, the rate of increase in effective second moment of area is more than 1.6. However, when the ratio r is 0.3 to 0.5, the rate of increase in effective second moment of area is slightly lower than that when the ratio r is 0.5 to 0.7.

As shown in Fig. 10B, a comparison is made on the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate 10 caused by increasing the projecting ridge portion 4 (by decreasing the ratio r). Even in such a comparison, when the ratio r is in the vicinity of 0.6, the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate 10 reaches the highest numerical value, which is higher than 1.6, and even when the value for the projecting ridge portions 4 is further increased (even when the ratio r is decreased), the ratio of the rate of increase in effective second moment of area to the rate of increase in weight gradually reduces. The reason is as follows. In the case where the number of projecting ridge portions 4 is small, even when the rate of increase in weight of the deck plate 10 is small, the rate of increase in effective second moment of area is small already, so a large increase is not

observed. In the case where the number of projecting ridge portions 4 is large, the rate of increase in weight of the deck plate 100 is large and hence, an effect as great as an effect obtained when the ratio r is 0.6 cannot be obtained.

[0059] Therefore, it can be understood that, from viewpoints of improvement in cross-sectional performance, a reduction in weight of the deck plate, and economic efficiency, it is preferable to form the projecting ridge portions 4 on one surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, as seen in a section S in Fig. 10C and, especially, it is optimal to form the projecting ridge portions 4 such that the ratio r is in the vicinity of 0.6.

The reason that the ratio r falling within a range of from 0.5 to 0.7 is optimal is as follows. Fig. 10B includes a range where the rate of increase in effective second moment of area is more than 1.6 and substantially constant, that is, the ratio r is equal to or less than 0.7 (ratio $r=0.7$ or less) at which the value of the rate of increase in effective second moment of area converges, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight has a value ranging from the maximum value to a value lower than the maximum value of the ratio by approximately 5%, and such a range is recognized as a range having favorable sectional efficiency.

In the case where the projecting ridge portions 4 are not formed, as described above, a calculation is performed assuming that the deflection coefficient C is 1.6. In the case where the projecting ridge portions 4 are formed on the surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, compared with the case where the projecting ridge portions 4 are not formed, cross-sectional performance is remarkably improved, and effective second moment of area is increased by 1.6 or more times so that all area of the surface portion 3 can be considered as an effective cross section and hence, the deflection coefficient C becomes 1.0. Further, with the formation of the

projecting ridge portions 4 on one surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, when the plate thickness of the deck plate 10 is set to 0.8 mm, the yield point of a steel material is set to 235 N/mm², and a slab thickness is set to 150 mm, the allowable span of the deck plate 10 can be increased to 2780 mm (the case of including three projecting ridge portions) from 2530 mm (the case of including no projecting ridge portion).

[0060]

<Variant 1 of projecting ridge portion>

Next, a variant 1 of the projecting ridge portion in the second embodiment will be described.

Each projecting ridge portion 4 of the deck plate 100, where three ribs 101a, 101b, 101c are formed, and the ribs 101a, 101b, 101c are formed to have the height H_3 of 75 mm, is not limited to have the above-mentioned width and height. For example, the width of the projecting ridge portion 4 may be set to 20 mm, and the height of the projecting ridge portion 4 may be set to 7 mm. In this case, Fig. 11A is a graph of the variant 1 where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 11B is a graph where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate 100 is shown on the vertical axis. Fig. 11C is a graph which is obtained by combining the graph of Fig. 11A and the graph of Fig. 11B into one graph, and which shows a range of excellent cross-sectional performance.

[0061] In comparison with the above-mentioned second embodiment, the width of each projecting ridge portion 4 is reduced by 5 mm, and the height H4 of each projecting ridge portion 4 is increased by 1 mm. In this case, in the range where the ratio r of one surface portion 3 excluding the projecting ridge portions 4 to the one surface portion 3 is 0.7 to 1.0, as the number of projecting ridge portions 4 increases (the ratio r decreases), the rate of increase in effective second moment of area increases. However, even when the ratio r is reduced from 0.7, the rate of increase in effective second moment of area gradually reduces, so great effect is not observed. Whereas, with respect to the ratio of the rate of increase in effective second moment of area to the rate of increase in weight, as the number of projecting ridge portions 4 is increased (the ratio r is decreased), the weight of the deck plate 10 increases so that when the ratio r is in the vicinity of 0.7, the ratio reaches a value in the vicinity of 1.6, which is the highest numerical value, and even when the ratio r is reduced, the ratio of the rate of increase in effective second moment of area to the rate of increase in weight gradually reduces.

[0062] Therefore, also in the case of this projecting ridge portion 4, it can be understood that it is preferable to form the projecting ridge portions 4 on one surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, as seen in a section S in Fig. 11C, from viewpoints of improvement in cross-sectional performance, a reduction in weight of the deck plate, and economic efficiency.

Further, in the variant 1, for example, in the case where the number n of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 20 mm, when the ratio r (r_a , r_b , r_c) of the length of one surface portion 3a, 3b, 3c excluding the projecting ridge portions 4 in the width direction to the length L_a , L_b , L_c of the one surface portion 3a, 3b, 3c in the

width direction is calculated using the above-mentioned formula (3), formula (4), formula (5), the following value can be obtained.

$$r_a = (210 - 20 \times 3) / 210 = 0.7142 \dots$$

$$r_b = (210 - 20 \times 3) / 210 = 0.7142 \dots$$

5 $r_c = (210 - 20 \times 3) / 210 = 0.7142 \dots$

Accordingly, when each surface portion 3 has the width in the variant 1 and each projecting ridge portion 4 has the width in the variant 1, to cause the ratio r to fall within a range of from 0.5 to 0.7, the number of projecting ridge portions 4 for one surface portion 3 is set to four or five.

10 [0063]

<Variant 2 of projecting ridge portion>

Next, a variant 2 of the projecting ridge portion in the second embodiment will be described.

Each projecting ridge portion 4 of the deck plate 100, where three ribs
15 101a, 101b, 101c are formed, and the ribs 101a, 101b, 101c are formed to have the height H_3 of 75 mm, may be formed such that, for example, the width of the projecting ridge portion 4 is set to 20 mm, and the height of the projecting ridge portion 4 is set to 8 mm. In this case, Fig. 12A is a graph of the variant 2 where the ratio r of the length of the surface portion 3 excluding the projecting ridge
20 portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 12B is a graph where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface
25 portion 3 in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate 100 is shown on the vertical axis. Fig. 12C is a graph

which is obtained by combining the graph of Fig. 12A and the graph of Fig. 12B into one graph, and which shows a range of excellent cross-sectional performance.

[0064] In comparison with the above-mentioned second embodiment of the present invention, the width of each projecting ridge portion 4 is reduced by 5 mm, and the height H4 of each projecting ridge portion 4 is increased by 2 mm. In this case, in the range where the ratio r of one surface portion 3 excluding the projecting ridge portions 4 to the one surface portion 3 is 0.7 to 1.0, as the number of projecting ridge portions 4 increases (the ratio r decreases), the rate of increase in effective second moment of area increases. However, even when the ratio r is reduced from a value in the vicinity of 0.7, the rate of increase in effective second moment of area gradually reduces, so great effect is not observed. Whereas, with respect to the ratio of the rate of increase in effective second moment of area to the rate of increase in weight, as the number of projecting ridge portions 4 is increased (the ratio r is decreased), the weight of the deck plate 10 increases so that when the ratio r is in the vicinity of 0.7, the ratio reaches a value in the vicinity of 1.6, which is the highest numerical value, and even when the ratio r is reduced, the ratio of the rate of increase in effective second moment of area to the rate of increase in weight gradually reduces.

[0065] Therefore, also in the case of this projecting ridge portion 4, it can be understood that it is preferable to form the projecting ridge portions 4 on one surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, as seen in a section S in Fig. 12C, from viewpoints of improvement in cross-sectional performance, a reduction in weight of the deck plate, and economic efficiency.

Further, in the variant 2, for example, in the case where the number n of projecting ridge portions 4 is set to three, and the width B of each projecting

ridge portion 4 is set to 20 mm, when the ratio r (r_a , r_b , r_c) of the length of one surface portion 3a, 3b, 3c excluding the projecting ridge portions 4 in the width direction to the length L_a , L_b , L_c of the one surface portion 3a, 3b, 3c in the width direction is calculated using the above-mentioned formula (3), formula (4), formula (5), the following value can be obtained.

$$r_a = (210 - 20 \times 3) / 210 = 0.7142 \dots$$

$$r_b = (210 - 20 \times 3) / 210 = 0.7142 \dots$$

$$r_c = (210 - 20 \times 3) / 210 = 0.7142 \dots$$

Accordingly, when each surface portion 3 has the width in the variant 2 and each projecting ridge portion 4 has the width in the variant 2, to cause the ratio r to fall within a range of from 0.5 to 0.7, the number of projecting ridge portions 4 for one surface portion 3 is set to four or five.

[0066]

<Variant 3 of projecting ridge portion>

Next, a variant 3 of the projecting ridge portion in the second embodiment will be described.

The deck plate 100, where three ribs 101a, 101b, 101c are formed, and the ribs 101a, 101b, 101c are formed to have the height H_3 of 75 mm, is not limited to have the above-mentioned plate thickness. For example, the plate thickness of the deck plate 100 may be set to 0.6 mm. In this case, Fig. 13A is a graph of the variant 3 where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal axis, and a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 13B is a graph where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal axis, and

the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate 100 is shown on the vertical axis. Fig. 13C is a graph which is obtained by combining the graph of Fig. 13A and the graph of Fig. 13B into one graph, and which shows a range of excellent cross-sectional performance.

[0067] In comparison with the above-mentioned second embodiment, the plate thickness is reduced by 0.2 mm. In this case, in the range where the ratio r of one surface portion 3 excluding the projecting ridge portions 4 to the one surface portion 3 is 0.7 to 1.0, as the number of projecting ridge portions 4 increases (the ratio r decreases), the rate of increase in effective second moment of area increases. However, even when the ratio r is reduced from 0.7, in the range of the ratio r from 0.6 to 0.7, the rate of increase in effective second moment of area only slightly increases, and even when the ratio r is reduced from 0.6, the rate of increase in effective second moment of area gradually reduces, so great effect is not observed. Whereas, with respect to the ratio of the rate of increase in effective second moment of area to the rate of increase in weight, as the number of projecting ridge portions 4 is increased (the ratio r is decreased), the weight of the deck plate 10 increases so that when the ratio r is in the vicinity of 0.6, the ratio reaches a value in the vicinity of 1.75, which is the highest numerical value, and even when the ratio r is reduced, the ratio of the rate of increase in effective second moment of area to the rate of increase in weight gradually reduces.

[0068] Therefore, also in the case of this projecting ridge portion 4, it can be understood that it is preferable to form the projecting ridge portions 4 on one surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, as seen in a section S in Fig. 13C, from viewpoints of improvement in cross-

sectional performance, a reduction in weight of the deck plate, and economic efficiency.

Further, in the variant 3, for example, in the case where the number n of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, when the ratio r (r_a , r_b , r_c) of the length of one surface portion 3a, 3b, 3c excluding the projecting ridge portions 4 in the width direction to the length L_a , L_b , L_c of the one surface portion 3a, 3b, 3c in the width direction is calculated using the above-mentioned formula (3), formula (4), formula (5), the following value can be obtained.

$$r_a = (210 - 25 \times 3) / 210 = 0.6428 \dots$$

$$r_b = (210 - 25 \times 3) / 210 = 0.6428 \dots$$

$$r_c = (210 - 25 \times 3) / 210 = 0.6428 \dots$$

Accordingly, when each surface portion 3 has the width in the variant 1 and each projecting ridge portion 4 has the width in the variant 1, to cause the ratio r to fall within a range of from 0.5 to 0.7, the number of projecting ridge portions 4 for one surface portion 3 is set to three or four.

[0069]

<Variant 4 of projecting ridge portion>

Next, a variant 4 of the projecting ridge portion in the second embodiment will be described.

The deck plate 100, where three ribs 101a, 101b, 101c are formed, and the ribs 101a, 101b, 101c are formed to have the height H_3 of 75 mm, is not limited to have the above-mentioned plate thickness. For example, the plate thickness of the deck plate 100 may be set to 1.2 mm. In this case, Fig. 14A is a graph of the variant 4 where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal axis, and

a rate of increase in effective second moment of area is shown on the vertical axis. Fig. 14B is a graph where the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction is shown on the horizontal axis, and the ratio of the rate of increase in effective second moment of area to the rate of increase in weight of the deck plate 100 is shown on the vertical axis. Fig. 14C is a graph which is obtained by combining the graph of Fig. 14A and the graph of Fig. 14B into one graph, and which shows a range of excellent cross-sectional performance.

[0070] In comparison with the above-mentioned second embodiment, the plate thickness is increased by 0.4 mm. In this case, in the range where the ratio r of one surface portion 3 excluding the projecting ridge portions 4 to the one surface portion 3 is 0.7 to 1.0, as the number of projecting ridge portions 4 increases (the ratio r decreases), the rate of increase in effective second moment of area increases. However, even when the ratio r is reduced from 0.7, the rate of increase in effective second moment of area gradually reduces, so great effect is not observed. Whereas, with respect to the ratio of the rate of increase in effective second moment of area to the rate of increase in weight, as the number of projecting ridge portions 4 is increased (the ratio r is decreased), the weight of the deck plate 10 increases so that when the ratio r is in the vicinity of 0.7, the ratio reaches a value in the vicinity of 1.45, which is the highest numerical value, and even when the ratio r is reduced, the ratio of the rate of increase in effective second moment of area to the rate of increase in weight gradually reduces.

[0071] Therefore, also in the case of this projecting ridge portion 4, it can be understood that it is preferable to form the projecting ridge portions 4 on one surface portion 3 such that the ratio r falls within a range of from 0.5 to 0.7, as seen in a section S in Fig. 14C, from viewpoints of improvement in cross-

sectional performance, a reduction in weight of the deck plate, and economic efficiency.

Further, in the variant 4, for example, in the case where the number n of projecting ridge portions 4 is set to three, and the width B of each projecting ridge portion 4 is set to 25 mm, when the ratio r (r_a , r_b , r_c) of the length of one surface portion 3a, 3b, 3c excluding the projecting ridge portions 4 in the width direction to the length L_a , L_b , L_c of the one surface portion 3a, 3b, 3c in the width direction is calculated using the above-mentioned formula (3), formula (4), formula (5), the following value can be obtained.

$$r_a = (210 - 25 \times 3) / 210 = 0.6428 \dots$$

$$r_b = (210 - 25 \times 3) / 210 = 0.6428 \dots$$

$$r_c = (210 - 25 \times 3) / 210 = 0.6428 \dots$$

Accordingly, when each surface portion 3 has the width in the variant 1 and each projecting ridge portion 4 has the width in the variant 1, to cause the ratio r to fall within a range of from 0.5 to 0.7, the number of projecting ridge portions 4 for one surface portion 3 is set to three or four.

[0072] As described above, also in the deck plate 100 according to the second embodiment of the present invention, in the same manner as the above-mentioned deck plate 10 according to the first embodiment of the present invention, the projecting ridge portions 4 are formed such that the ratio r of the length of the surface portion 3 excluding the projecting ridge portions 4 in the width direction to the length of the surface portion 3 in the width direction falls within a range of from 0.5 to 0.7. Accordingly, a large increase in weight can be suppressed while cross-sectional performance is improved.

[0073]

<Others>

It is noted that the present invention is not limited to the above-mentioned embodiments. For example, the folded-back portions 13, 23 are not limited to have a substantially triangular shape. Provided that the folded-back portions 13, 23 are folded back such that the straight line portion 12 and the straight line portion 14 come into contact with each other, and the straight line portion 22 and the straight line portion 24 come into contact with each other, the folded shape of the folded-back portions 13, 23 may be freely modified.

The projecting ridge portions 4 may be formed to project in any direction from the surface portion 3.

The deck plate 10, 100 is not limited to a steel plate. Provided that a metal plate has predetermined cross-sectional performance, the metal plate may be made of any material.

When the deck plate 10, 100 is used not only as a formwork in placing concrete, but also as a portion of a floor structure (or a ceiling structure), after the concrete is solidified, the deck plate 10, 100 forms an integral body with the concrete so that rigidity of the floor structure (or the ceiling structure) can be increased.

Further, the deck plate 10, 100 is not limited to the case of constructing a building having a steel structure, and may be used as a formwork in the case of constructing a building having a reinforced concrete structure, or as a formwork in manufacturing a precast concrete.

[0074] As shown in Fig. 15, in causing the deck plate 10 (or the deck plate 100) to extend between the beams 20, the deck plate 10 (or the deck plate 100) may be placed such that a surface of the deck plate 10 (100) on which the ribs 1, 2 (or the ribs 101a, 101b, 101c) are formed is directed upward (toward concrete) to cause the ribs 1, 2 (101a, 101b, 101c) to be engaged with concrete to be placed on the deck plate 10 (100). In this case, after concrete is solidified, the ribs 1, 2

(101a, 101b, 101c) can be deeply inserted into concrete. Therefore, the concrete and the deck plate 10 (100) are formed into an integral body, thus forming a steel concrete composite structure and hence, rigidity of a floor structure (or a ceiling structure) can be also increased.

5 Reinforcing bars may be arranged in concrete to be placed on the deck plate 10 (100). In this case, rigidity of a floor structure (or a ceiling structure) can be further increased.

 When the deck plate 10 (100) is placed such that the surface of the deck plate 10 (100) on which the ribs 1, 2 (101a, 101b, 101c) are formed is
10 directed upward (toward concrete), the ribs 1, 2 (101a, 101b, 101c) do not project downward from the deck plate 10 (100) placed between the beams 20. Therefore, as shown in Fig. 16, when the entire length of one deck plate 10 (100) is increased, it is possible to place one deck plate 10 (100) such that the one deck plate 10 (100) extends between three or more beams 20 (a plurality of spans).

15 Further, when a plurality of deck plates 10 (100) are caused to extend between the beams 20, a portion of the surface portion 3 including the locking portion 5 may be cut out corresponding to the distance of the deck plate in the width direction, and this deck plate 10 (100) may be used as an adjusting plate (accessary) for adjusting an end width.

20

List of Reference Signs

[0075]

1 rib

2 rib

25 3 surface portion

4 projecting ridge portion

5 locking portion

- 6 end closed portion
- 10 deck plate
- 43 curved portion
- 50 receiving portion
- 5 100 deck plate
- 101a rib
- 101b rib
- 101c rib

Claims

1. A deck plate formed of a metal plate, and formed such that a surface portion and a rib are alternately formed in a continuous manner, the
5 deck plate being characterized in that

a projecting ridge portion projecting toward one surface side is formed on the surface portion, and

a ratio of a length of the surface portion excluding the projecting ridge portion in a width direction to a length of the surface portion in the width
10 direction falls within a range of from 0.5 to 0.7.

2. The deck plate according to claim 1 characterized in that the surface portion and the rib are formed in a same number.

15 3. The deck plate according to claim 1 or claim 2 characterized in that the projecting ridge portions are formed in parallel in the width direction at a predetermined separation.

4. The deck plate according to any one of claims 1 to 3 characterized
20 in that

a locking portion is formed on the surface portion disposed on one end side in the width direction, and

a receiving portion configured to receive the locking portion is formed on a rib disposed on another end side in the width direction.

25

5. The deck plate according to any one of claims 1 to 4 characterized in that the length of the surface portion in the width direction is 180 to 220 mm.

6. The deck plate according to any one of claims 1 to 5 characterized in that a width of the projecting ridge portion is 20 to 25 mm.

5 7. The deck plate according to any one of claims 1 to 6 characterized in that a height of the projecting ridge portion is 4 to 8 mm.

8. The deck plate according to any one of claims 1 to 7 characterized in that a separation between a center of the rib and a center of the projecting
10 ridge portion disposed adjacent to the rib is 20 to 50 mm.

9. The deck plate according to any one of claims 1 to 8 characterized in that a separation between centers of the projecting ridge portions disposed adjacent to each other is 30 to 60 mm.
15

10. The deck plate according to any one of claims 1 to 9 characterized in that a bend radius of a curved portion of the projecting ridge portion is 3 to 5 mm, the projecting ridge portion being formed of a metal plate.

20 11. The deck plate according to any one of claims 1 to 10 characterized in that three to five projecting ridge portions are formed per surface portion.