

[TITLE OF DOCUMENT] SPECIFICATION

[TITLE OF THE INVENTION] GRATING, GRATING EQUIPPED WITH HANDLE,
AND GRATING PRODUCTION METHOD

[Technical Field]

[0001]

The present invention relates to a grating, a grating equipped with a handle, and a grating production method. In greater detail, the present invention relates to a grating formed by joining a plurality of main bars by joint units, which is reduced in weight for easier maintenance while strength against a load applied from above is secured, and improved in productivity by reducing the amount of labor in assembling at the time of production.

[Background Art]

[0002]

Gratings have been widely used in such a manner that, for example, a grating made of a metal is used as a cover of a ditch of a drainage formed in a road or a kitchen floor, and a grating made of a synthetic resin is used as a cover of a drainage part of a swimming pool or a bathroom. In particular, in consideration of safety and ease of maintenance, the latter grating is required to have necessary and sufficient bearing strength against a load applied from above mainly by a human

getting thereon, to comparatively lightweight. To put the gratings into production, ease of assembling at the time of production must also be considered to make the gratings advantageous to mass production.

[0003]

As an example of such gratings, the inventor of the present invention proposed a grating described in Patent Document 1. This grating was developed mainly for the purpose of reducing a worker's risk of falling by preventing a shoe sole of the worker in a kitchen, etc., from greatly slipping even if a load is applied in a longitudinal direction when the shoe sole comes into contact with wet upper surfaces of main bars of the grating, and has a structure with slip preventive members, and in addition, a joint structure joining the main bars of this grating is also characteristic.

[0004]

That is, as described in Fig. 3 and Fig. 4 and Paragraphs [0024], [0025], and [0026] of the specification of Patent Document 1, in a support leg wall of the main bar, a plurality of through holes are formed at even intervals in the longitudinal direction. In each of these through holes, a square-pipe-shaped guide pipe made of a metal and a round-rod-shaped joint bolt made of a metal and inserted through

the guide pipe are inserted. The guide pipe is made so as to just fit in the through hole, and is fixed in this state.

[0005]

Between the respective main bars, a cylindrical spacer made of a synthetic resin is disposed, and the guide pipe and the joint bolt are both inserted in each spacer. The guide pipe serves as a member to secure load bearing against a load applied from above. Almost no load acts on each joint bolt, and each joint bolt can bind the respective components by screwing a nut to each joint bolt projecting to the outside from each main bar disposed at one end portion and tightening the nut.

[Prior Art Document]

[Patent Document]

[0006]

[Patent Document 1] Japanese Published Unexamined Patent Application No. 2011-1801

[Summary of the Invention]

[Problem(s) to be Solved by the Invention]

[0007]

However, the above-described conventional grating has the following problems.

That is, as members to join the respective main bars,

not only joint bolts made of a metal but also guide pipes made of a metal to secure load bearing when receiving a load applied from above are provided. As described above, a load applied from above hardly acts on the joint bolts and the joint bolts function to bind the respective components, and strength against a load is secured by the guide pipes. Thus, the guide pipes are provided as components constituting the joint units, and accordingly, the weight of the whole grating is comparatively heavy, so that the grating is difficult to handle in terms of maintenance such as cleaning, and is disadvantageous.

[0008]

In addition, due to the guide pipe, the number of components constituting the joint unit increases, so that at the time of production, the number of assembling steps increases. Further, the joint bolt itself is a round rod body and freely rotates in a periaxial direction with respect to the through hole, so that to tighten a nut at an end portion, it is required that box wrenches are disposed at both ends of the joint bolt and tightening is performed while fixing the bolt head. Therefore, at the time of production, this work is troublesome and difficult, and there is room for an improvement in productivity at the time of production.

[0009]

The present invention was made in view of the above-described points, and an object thereof is to provide a grating, a grating equipped with a handle, and a grating production method, by which a grating formed by joining a plurality of main bars by joint units is reduced in weight for easier maintenance while strength against a load applied from above is secured, and improved in productivity by reducing the amount of labor in assembling at the time of production.

[Means for Solving the Problem(s)]

[0010]

(1) The present invention provides a grating including a plurality of main bars each having a plurality of insertion holes at required intervals in a longitudinal direction, and disposed at required intervals in parallel to each other at the same height, joint bolts that have rectangular sectional shapes long in one direction and are inserted in the insertion holes of the main bars in a state where the joint bolts are set so that their sectional shapes become vertically long so as not to rotate in periaxial directions, spacers in which the joint bolts are inserted and which are disposed between the main bars, and fixtures that are provided at one end or both ends of the joint bolts and fix the main bars to the joint bolts at required intervals.

[0011]

(2) The present invention provides the grating described in (1) above, in which each of the insertion holes is defined by four side portions, and among the respective side portions, a pair of shorter side portions vertically facing each other are provided straight and in parallel to each other so as to have lengths substantially equal to lengths of shorter side portions of the sectional shape of the joint bolt, to at an interval equal to lengths of longer side portions, and the other pair of longer side portions are formed to swell outward.

[0012]

In this case, a work of inserting the joint bolt into the through hole is easy. That is, as in the case of the present invention, in a case where the shape of the insertion hole is a so-called barrel shape, when the joint bolt having a rectangular sectional shape long in one direction is inserted in the through hole, almost no gap is left between a straight shorter side portion of the joint bolt and a straight shorter side portion of the insertion hole, however, a comparatively large gap is left between a straight longer side portion of the joint bolt and a longer side portion formed to swell outward of the insertion hole. It should be noted that the shape of the mouth portion of the insertion hole can be various polygonal

shapes, for example, a rectangular shape (including a square) in addition to a barrel shape and is not particularly limited as long as the joint bolt does not rotate in a periaxial direction when the joint bolt is inserted in the insertion hole. The "rectangular shape long in one direction" is a rectangular shape having four sides among which a pair of sides facing each other are longer than the other pair of sides.

[0013]

According to this, when inserting the joint bolt into the insertion hole, a worker has only to concentrate on fitting their shorter side portions to each other, and to begin with, the longer side portions hardly come into contact with each other due to the spaces, so that the joint bolt can be inserted with almost no problem even if the longer side portions are slightly loosely fitted to each other. In addition, after the insertion, the joint bolt does not rotate in the periaxial direction. That is, for example, the sectional shape of the joint bolt and the shape of the insertion hole are rectangular shapes having substantially the same size, and as compared with a case where almost no gaps are left between the respective side portions, in the grating according to the present invention, the tip portion of the joint bolt can be more easily fitted to the shape of the insertion hole and more easily inserted

in the insertion hole, and therefore, the labor in assembling at the time of production can be reduced and the productivity can be improved.

[0014]

(3) The present invention provides the grating described in (1) or (2) above, in which each of the main bars has a T-shaped or substantially T-shaped section consisting of a horizontal portion and a vertical portion, and the insertion holes are formed in the vertical portion.

[0015]

In this case, a gap between the main bars each having a T-shaped or substantially T-shaped section is formed between the horizontal portions of T shapes of main bars adjacent to each other. Therefore, a latching portion of a stem portion of a grating handle described later is easily latched from below to lower surface sides of portions of the main bars at positions sandwiching the gap. In addition, due to operation of the vertical portion of the T shape, the strength against a load applied from above increases, so that excellent functionality as a grating required to have durability against loads is obtained. It should be noted that the sectional shape of the main bars is not particularly limited, and various shapes may be adopted as long as their upper surfaces have excellent

usability and safety.

[0016]

(4) The present invention provides a grating equipped with a handle including the grating according to an invention described in any one of (1), (2), and (3) above, and a grating handle which includes a knob portion that has a required length and a width wider than a width of a gap between the main bars of the grating to which the grating handle is attached, and can be placed on upper surfaces of the main bars so as to be fitted in the gap, and a stem portion that is formed in a direction perpendicular to a longitudinal direction of the knob portion at a required position on a lower surface portion of the knob portion, and includes a neck portion with a diameter smaller than the width of the gap between the main bars, and a latching portion formed at a required angle with the knob portion in a periaxial direction of the neck portion at a tip end of the neck portion and having a length longer than the width of the gap between the main bars and a width narrower than the width of the gap, and is attached to the grating by being inserted into a gap between the main bars from above in a state where a direction of the latching portion of the stem portion is matched with a direction of the gap, rotated in the periaxial direction of the neck portion in a state where the neck portion is set

at a height of the gap to change the direction of the latching portion so that the length of the latching portion becomes longer than the width of the gap between the main bars in a width direction of the gap, and placed on upper surfaces of the main bars so that the knob portion is fitted in the gap and a movement in a rotating direction of the knob portion stops.

[0017]

Operation of the grating equipped with a handle is as follows in addition to the operation of the above-described grating.

When the grating handle of the grating equipped with a handle is inserted in a gap between the main bars (bar members) from above in a state where a direction of the latching portion of the stem portion is matched with the direction of the gap, and the neck portion is set at the height of the gap, since the neck portion has a diameter smaller than a width of the gap (interval between portions defining the gap of the main bars adjacent to each other), the grating handle can be rotated in the periaxial direction of the neck portion. It should be noted that the sectional shape of the neck portion is not particularly limited as long as the neck portion can rotate in the periaxial direction at a position corresponding to the gap, and may be, for example, oval or polygonal such as hexagonal

or octagonal other than the circular shape.

[0018]

Accordingly, the directions of the knob portion and the latching portion also change, and the length of the latching portion becomes longer than the width of the gap between the main bars in a width direction of the gap. Further, the grating handle is placed on upper surfaces of the main bars so that the knob portion is fitted slidably in the gap and the knob portion does not move in a rotating direction, and is attached to the grating.

[0019]

The grating handle can be easily removed from the grating in a procedure substantially reverse to the above-described attaching procedure, and the grating handle cannot be removed unless following the procedure, so that the grating handle rarely comes off naturally during normal use. Thus, in the grating equipped with a handle, in a case where the handle is broken or has a problem in movement and the handle needs to be replaced, the defective handle can be easily removed and a new non-defective handle can be easily attached, and therefore, the grating handle can be easily replaced.

[0020]

The above-described attachment of the grating handle

enables the grating handle to be attached to a gap between any adjacent main bars of the grating in a state where the grating handle is slidable along the gap. The grating handle is slidable when it is attached to the grating, so that the grating handle is advantageous since in a case where the grating handle is used in, for example, a bathroom, etc., even if a user's foot hits against the grating handle, the grating handle can escape in a sliding direction and rarely injures the user.

[0021]

In the grating, a position to which the grating handle is attached and the number of grating handles to be attached can be set appropriately. By attaching the grating handle to the grating, a grating equipped with a handle is formed. The grating equipped with a handle is fitted to receiving brackets of a drainage ditch of, for example, a swimming pool or a bathroom, and used.

[0022]

In the above-described attached state of the grating handle, the latching portion of the stem portion positioned lower than the gap between the main bars cannot pass through the gap, so that the grating handle does not come off the grating, and is slidable along the gap on the upper surfaces of the main bars as described above. In a case where the grating equipped

with a handle is removed from the receiving brackets as in the case of cleaning the drainage ditch, etc., the grating equipped with a handle is removed as follows.

[0023]

First, when the grating handle is slid as described above, and the stem portion comes into contact with a joint unit joining the respective main bars, fingers are hooked on an end portion on the opposite side of the sliding direction of the knob portion, and pull up and hold this portion. It should be noted that the removal does not necessarily have to be performed as described above, and it is also possible that, for example, the grating handle is held so as not to slide by fingers of one hand, and is pulled up in the same manner by fingers of the other hand.

[0024]

Accordingly, the end portion of the grating handle on the side opposite to the pulled-up side of the knob portion comes into contact with the upper surfaces of the main bars, and the grating handle inclines by using this end portion as a fulcrum, and the stem portion also rises. In response to this rise, first, the neck portion of the stem portion passes through the gap. The latching portion is longer than the width of the gap between the main bars, and is latched on lower surfaces

of the portions defining the gap and cannot pass through the gap. Therefore, by holding and further pulling up the grating handle, the grating equipped with a handle is lifted up, and can be removed from the receiving brackets.

[0025]

(5) The present invention provides the grating equipped with a handle described in (4) above, in which the knob portion is formed so that an upper surface of the knob portion and upper surfaces of the main bars are flush or substantially flush with each other when the knob portion is placed on the upper surfaces of the main bars.

[0026]

In this case, when the grating handle is attached to the grating by placing the knob portion on upper surfaces of the main bars, the knob portion does not project from the upper surfaces of the main bars or the projecting amount is small. Therefore, in a case where the grating equipped with a handle is fitted to, for example, a drainage ditch of a bathroom and used, obstruction of the use as in the case where catching of a user's foot on the knob portion rarely occurs, and the grating equipped with a handle is easy to use and excellent in safety.

[0027]

(6) The present invention provides a grating production

method, including a step of inserting joint bolts having rectangular sectional shapes long in one direction into respective insertion holes of a main bar having a plurality of insertion holes at required intervals in a longitudinal direction so that the sectional shapes become vertically long and in a state where the joint bolts do not rotate in periaxial directions, a step of alternately repeatedly performing a work of fitting spacers onto the joint bolts and, subsequently, a work of fitting another main bar by fitting insertion holes to the joint bolts, and a step of fixing the main bars to the joint bolts by fixtures provided at one end or both ends of the joint bolts when a necessary number of the main bars are fitted to the joint bolts.

[0028]

With this production method, the joint bolt does not rotate in the periaxial direction when it is inserted in the insertion hole, so that particularly in a case where the fixture functions by being rotated like a nut, when the fixture is rotated, it is not necessary to intentionally stop rotation of the joint bolt, and therefore, the assembling work is easily performed.

[0029]

The spacers are fitted onto the joint bolts, so that in this state, when the respective main bars and the respective

spacers are integrated, the heights of the spacers become uniform along the longitudinal directions of the joint bolts, and particularly in a case where the spacers are cylindrical, the positions of the spacers in a lateral direction are also aligned.

[0030]

(Operation)

Operation of the grating according to the present invention is described.

The grating is assembled by fixing the respective main bars and spacers along the respective joint bolts in a state where the sectional shapes of the respective joint bolts are rectangular shapes vertically long (in the vertical direction). With this structure, the grating can be reduced in weight. That is, when the joint bolts have the same length and the same sectional area (that is, have the same weight), the strength against a load applied from above becomes higher than in the case where the joint bolts have square sectional shapes or rectangular sectional shapes horizontally long.

[0031]

Therefore, when the joint bolts having rectangular sectional shapes vertically long are provided with the same strength as joint bolts having square sectional shapes or rectangular sectional shapes horizontally long, in a case where

the joint bolts have similar shapes, the sectional shapes can be made smaller, so that the joint bolts can be reduced in weight while strength against a load applied from above is secured. Therefore, a grating including a plurality of joint bolts can be reduced in weight.

[0032]

The joint bolt does not rotate in the periaxial direction when it is inserted in the insertion hole, so that particularly in a case where the fixture functions by being rotated like a nut, when the fixture is rotated, it is not necessary to intentionally stop rotation of the joint bolt, and accordingly, the assembling work is easily performed.

[0033]

The spacers are structured so as to be fitted onto the joint bolts, so that in this state, when the respective main bars and the respective spacers are integrated, the heights of the spacers become substantially uniform along the longitudinal directions of the joint bolts, and particularly in a case where the spacers are cylindrical, positions of the spacers in the lateral direction are also aligned. Accordingly, the grating can be produced in an excellently united manner in terms of design.

[0034]

Thus, only by the joint bolts having rectangular sectional shapes vertically long, a load applied to the grating from above can be received and supported, so that a member to secure load bearing like a conventional square-pipe-shaped guide pipe is unnecessary, and accordingly, the grating can be reduced in weight. Further, the number of components is reduced, so that the amount of labor in assembling at the time of production is reduced, and accordingly, the productivity at the time of production can be improved.

[Effects of the Invention]

[0035]

The present invention can provide a grating, a grating equipped with a handle, and a grating production method, by which a grating formed by joining a plurality of main bars by joint units is reduced in weight for easier maintenance while strength against a load applied from above is secured, and improved in productivity by reducing the amount of labor in assembling at the time of production.

[Brief Description of the Drawings]

[0036]

Fig. 1 is an exploded perspective explanatory view showing an installation structure of a grating equipped with a handle according to the present invention.

Fig. 2 is a perspective view showing a state where the grating equipped with a handle is installed.

Fig. 3 is an explanatory front view showing a joint structure of main bars of a grating constituting the grating equipped with a handle.

Fig. 4 is an explanatory view showing a method of assembling by disassembling components constituting the joint structure of the main bars.

Fig. 5(a) is an explanatory side view showing a state where a joint bolt is inserted through an insertion hole of a main bar, and Fig. 5(b) is an explanatory side view showing a state where a washer is further fitted and a nut is tightened.

Fig. 6 is a perspective view of a grating handle.

Figs. 7 shows a procedure to attach the grating handle to a grating, and Fig. 7(a) is a partially sectional explanatory view showing a state where a stem portion is inserted in a gap between main bars and the handle is rotated 90 degrees around the stem portion, and Fig. 7(b) is a partially sectional explanatory view showing a state where the grating handle is dropped in and a knob portion is fitted in guide recessed portions of upper surfaces of the main bars.

[Fig. 8] Fig. 8 is a partially sectional explanatory view showing a state where one side of the knob portion of the grating

handle is pulled up so that the grating handle is inclined.

[Modes for Carrying Out the Invention]

[0037]

The present invention is described in detail based on an embodiment shown in the drawings.

(Grating G equipped with handle)

A grating G equipped with a handle according to the present invention includes a grating 2 formed by combining a plurality of main bars 20 and spacers 21, and a grating handle 1 attached to the grating 2 (refer to Fig. 1 and Fig. 3). Each main bar 20 is made of a synthetic resin, and particularly, an upper surface portion of a horizontal portion 201 of a T shape of the main bar 20 is formed by partially using a flexible material that hardly slips. It should be noted that it is also possible that the grating 2 is used solely without attaching the grating handle 1 thereto.

[0038]

(Grating 2)

Fig. 1 to Figs. 5 are referred to.

The grating 2 is constituted by joining a plurality of main bars 20 having T-shaped sections at required intervals via joint units (shown without symbols) each including spacers 21 having circular pipe shapes, a joint bolt 22, and nuts 24

as fixtures so that the main bars become parallel to each other and their heights become uniform. This joint structure is described in detail later.

[0039]

Each main bar 20 includes a horizontal portion 201 and a vertical portion 202, and between the horizontal portions 201 of the main bars 20 adjacent to each other, a gap 203 with a required width is formed across the entire length of the main bar 20. At both sides sandwiching the gap 203 in a width direction of upper surfaces of the horizontal portions 201 adjacent to each other, guide recessed portions 200 are formed across the entire length while portions at the central sections are left.

[0040]

Depths of the guide recessed portions 200 are set to be approximately 1/2 of a thickness of a contact portion 111 of a knob portion 11 of the grating handle 1 described later (refer to Fig. 3 and Fig. 7(b)). The widths of the guide recessed portions 200 are set so that a maximum width between the respective guide recessed portions 200 of the main bars 20 adjacent to each other positioned to sandwich the gap 203 becomes slightly larger than the width of the contact portion 111. When the contact portion 111 of the grating handle 1 is fitted to

the respective guide recessed portions 200, the grating handle 1 becomes slidable along the respective guide recessed portions 200 in this state, and cannot rotate in a rotating direction around a stem portion 12.

[0041]

Here, by mainly referring to Fig. 3, Fig. 4, and Figs. 5, joint units each including the above-described spacers 21, the joint bolt 22, and the nuts 24, and the joint structure of the respective main bars 20 by the joint units, are described in detail.

In the vertical portion 202 of the main bar 20, insertion holes 204 are formed at even intervals in a longitudinal direction. A mouth portion of the insertion hole 204 has a so-called barrel shape.

[0042]

That is, the insertion hole 204 is defined by four side portions, and a pair of shorter side portions 204a vertically facing each other of the four side portions are provided straight and in parallel to each other so as to have lengths substantially equal to the lengths of shorter side portions of the sectional shape of the joint bolt 22, and the other pair of longer side portions 204b curve so as to swell outward (refer to Fig. 5(a)). The shapes of the respective side portions 204b do not

necessarily have to curve, and the shapes of the side portions 204 are not particularly limited as long as spaces are formed between longer side portions 223 positioned at both lateral sides of a quadrangular bar portion 220 and the respective longer side portions 204b of the insertion hole 204. In addition, the shape of the insertion hole is not particularly limited, and may be a polygonal shape such as a hexagonal shape other than the barrel shape described above.

[0043]

To join the respective main bars 20, the joint bolts 22 are inserted in the respective insertion holes 204. The joint bolt 22 has a quadrangular bar portion 220 with a required length and threaded portions 221 provided at centers of both ends of the quadrangular bar portion 220. The quadrangular bar portion 220 has a rectangular sectional shape long in one direction, and shorter side portions 222 that are positioned one above the other during use have lengths to enable the shorter side portions 222 to be just fitted in the respective shorter side portions 204a of the insertion hole 204.

[0044]

The longer side portions 223 positioned at both lateral sides of the quadrangular bar portion 220 are straight, so that spaces 205 are formed between the longer side portions 223 and

the respective curved longer side portions 204b of the insertion hole 204. The joint bolt 22 is inserted so as to thread through the insertion holes 204 of a plurality (nine in the present embodiment) of main bars 20. Between the vertical portions 202 of the respective main bars 20, circular-pipe-shaped spacers 21 are disposed through the joint bolt 22 (refer to Fig. 3 and Fig. 4).

[0045]

It should be noted that the length of the quadrangular bar portion 220 of the joint bolt 22 is formed to be slightly shorter than a combined length of the thicknesses of the vertical portions 202 of all main bars 20 and the lengths of all spacers 21 when the joint bolt is inserted through the nine main bars 20 and eight spacers 21 as described above. The grating 2 is formed by integrating the respective main bars 20 and the respective spacers 21 by fitting washers 23 to the threaded portions 221 at both end portions of the joint bolts 22 inserted through the insertion holes 204 of the respective main bars 20 and further screwing and tightening the nuts 24.

[0046]

It should be noted that, when the joint bolt 22 is inserted in the spacer 21 at the time of assembling, an inner surface of the spacer 21 comes into contact with both corner side portions

224 on an upper portion side of the quadrangular bar portion 220 of the joint bolt 22 due to own weight of the spacer 21 and the spacer 21 is stabilized (refer to Fig. 5(a)). In this state, when the respective main bars 20 and the respective spacers 21 are integrated as described above, since the spacers 21 are cylindrical, the heights of the respective spacers 21 become uniform along the longitudinal direction of the joint bolt 22, and the positions in the lateral direction of the respective spacers 21 are also aligned.

[0047]

Here, a production method of the grating 2 according to the present embodiment is described. It should be noted that description of essential points of the production method is also given in the description of the structure above, and here, a flow of a series of steps is described.

[0048]

(1) The joint bolts 22 are respectively inserted into a plurality of insertion holes 204 of one main bar 20 in a state where the rectangular sectional shape of each quadrangular bar portion 220 becomes vertically long and each joint bolt 22 does not rotate in a periaxial direction. The longer side portions 223 positioned at both lateral sides of the quadrangular bar portion 220 are straight, and spaces 205 are formed between

the longer side portions 223 and the respective curved longer side portions 204b of the insertion hole 204. Therefore, a worker has only to concentrate on fitting the shorter side portions 204a and 222 to each other when inserting the joint bolt 22 into the insertion hole 204, and to begin with, the longer side portions 223 and 204b hardly come into contact with each other due to the spaces 205, so that the joint bolt can be inserted with almost no problem even if the longer side portions 223 are slightly loosely fitted.

[0049]

(2) A work of fitting spacers 21 onto the respective joint bolts by bringing the inner surface of each spacer 21 into contact with both corner side portions 224 on the upper portion side of the quadrangular bar portion 220 of each joint bolt 22, and, subsequently, a work of fitting another main bar 20 by fitting insertion holes 204 to the respective joint bolts 22, are alternately repeatedly performed.

[0050]

(3) When necessary numbers of main bars 20 and spacers 21 are fitted to the joint bolts 22, the respective main bars 20 are tightened in directions to approach each other at both end portions by washers 23 and nuts 24 provided at both ends of the quadrangular bar portion 220 of each joint bolt 22 and

fixed to the joint bolts 22, and accordingly, the respective main bars 20 and the respective spacers 21 are integrated. Accordingly, the grating 2 can be formed.

[0051]

The joint bolt 22 is not necessarily limited to a structure in which nuts 24 are screwed to both ends of the joint bolt 22 to tighten the main bars 20, and in any case, the joint bolt 22 cannot rotate in the periaxial direction, so that one end of the joint bolt 22 may be provided with a mere stopper for preventing coming off of the joint bolt 22 although this is not shown.

[0052]

(Grating handle 1)

Fig. 6 to Fig. 8 are referred to.

The grating handle 1 to be attached to the grating 2 includes a knob portion 11 that has a long thin straight shape and a required length, and a stem portion 12 formed at an intermediate portion in a longitudinal direction of a lower surface side of the knob portion 11 so as to extend downward in a direction perpendicular to the longitudinal direction of the knob portion 11. At a portion (border portion) at which the stem portion 12 is connected to the knob portion 11, a reinforcing portion 13 thickened for reinforcement is formed. The position at which

the stem portion 12 is provided is not limited to the intermediate portion in the longitudinal direction of the lower surface side of the knob portion 11, and may be shifted to both end sides in the longitudinal direction.

[0053]

It should be noted that the longitudinal direction of the knob portion includes, in a case where the knob portion is long in one direction, in addition to a direction across the longer side, the same direction as a longitudinal direction of the main bars 20a and 20b described later when the knob portion is fitted in a gap 203 provided between the main bars 20a and 20b. In a case where the knob portion has a shape having vertical and horizontal lengths equal to each other in a planar view (for example, a cross shape, a square shape, or a circular shape), a direction across either the vertical side or the horizontal side (in the case of the cross shape or square shape) or an arbitral diametrical direction (in the case of the circular shape) may be defined as the longitudinal direction.

[0054]

The knob portion 11 includes a plate-shaped contact portion 111 having a long thin rectangular shape, and a fitting portion 112 that is formed integrally on a lower surface side of the contact portion 111, and has substantially the same length

as the contact portion 111 and has a substantially semicircular sectional shape (refer to Fig. 7(b)). The contact portion 111 has a width wider than a width of the gap 203 of the grating 2, and is slidably fitted in guide recessed portions 200 adjacent to each other.

[0055]

The fitting portion 112 is formed to have a width slightly narrower than the gap 203, and is fitted in the gap 203 so as to be slidable with respect to the gap 203 and not to rotate in a rotating direction around the stem portion 12. At both end portions in a longitudinal direction of the fitting portion 112, finger hook portions 113 and 113a are formed by notching the lower sides of both end portions obliquely.

[0056]

The stem portion 12 is provided with a neck portion 121 having a required length on a base portion side. The neck portion 121 has a round bar shape having a substantially circular section, and an outer diameter thereof is formed to be slightly smaller than the width of the gap 203 of the grating 2. Accordingly, by setting the neck portion 121 at the position of the gap 203, the neck portion 121 can rotate in a periaxial direction in this state.

[0057]

At a tip end of the neck portion 121, a latching portion 122 is provided. The latching portion 122 is structured by integrating rectangular parallelepiped blocks in a vertically two-tiered form, and a length of a lower block that serves as an actual latching part is set to be longer than an outer diameter of the neck portion 121, that is, longer than the width of the gap 203, and shorter than an interval between the vertical portions 202 of the main bars 20a and 20b adjacent to each other.

[0058]

Both end portions in a longitudinal direction of the lower block of the latching portion 122 are formed to project in the longitudinal direction by equal widths from the upper block having a length substantially equal to the outer diameter of the neck portion 121 so that the lower block becomes longer than the width of the gap 203. These portions (shown without symbols) projecting from the upper block are portions to be latched from below on lower surfaces of portions at positions sandwiching the gap 203 of the main bars 20a and 20b adjacent to each other. The gap 203 is also provided in the same manner between other main bars 20 and 20 adjacent to each other.

[0059]

The latching portion 122 is formed at an angle of 90 degrees with the knob portion 11 in the periaxial direction of the neck

portion 121. Further, the width of the latching portion 122 is set to be slightly narrower than the width of the gap 203 between the main bars 20a and 20b. Accordingly, the latching portion 122 can pass through the gap 203 by matching its longitudinal direction with the direction of the gap 203.

[0060]

It should be noted that the grating handle 1 is entirely made of a synthetic resin, however, the material is not particularly limited, and the grating handle 1 may be made of other materials such as a metal or ceramic. Alternatively, a plurality of materials such as a metal and a synthetic resin may be compounded and used to make the grating handle 1.

[0061]

The grating handle 1 is attached to the grating 2 as follows. Figs. 7 are mainly referred to.

[0062]

First, the direction of the latching portion 122 of the stem portion 12 of the grating handle 1 is matched with the direction of the gap 203 between the main bars, and then the latching portion 122 is inserted in the gap 203 from above (refer to Fig. 7(a)).

Next, the neck portion 121 of the stem portion 12 is set at the height of the gap 203, the grating handle 1 is rotated

in the periaxial direction of the neck portion 121 to change the direction of the latching portion 122 so that the length of the latching portion 122 becomes longer than the width of the gap 203 in the width direction of the gap 203 between the main bars 20a and 20b (refer to Fig. 7(a)).

[0063]

Then, the grating handle 1 is lowered and the contact portion 111 of the knob portion 11 is fitted in the respective guide recessed portions 200 of the main bars 20a and 20b, and at the same time, the fitting portion 112 of the knob portion 11 fits in the gap 203 between the main bars 20a and 20b (refer to Fig. 7(b)). Thus, the grating handle 1 can be easily attached to the grating 2.

[0064]

In this attached state, the grating handle 1 stops moving in the rotating direction of the knob portion 11 (does not rotate in the rotating direction), and is slidable along the guide recessed portions 200 and the gap 203.

[0065]

By attaching the grating handle 1 to the grating 2 in this manner, a grating G equipped with a handle is formed. It should be noted that the attaching position of the grating handle 1 is not particularly limited since the grating handle 1 is

slidable along the gap 203. It is also arbitrarily determined which gap 203 the grating handle 1 is fitted in between the main bars 20 among the plurality of gaps 203 in the width direction of the grating 2, and how many grating handles 1 are attached.

[0066]

(Operation)

Operation of the grating G equipped with a handle is described with reference to Fig. 1 to Fig. 8.

The grating G equipped with a handle is fitted to receiving brackets 3 attached to a drainage ditch 4 of, for example, a swimming pool or a bathroom as shown in Fig. 1 and Fig. 2, and used. It should be noted that, in some cases, receiving parts are formed by directly machining the edges of the drainage ditch and the receiving brackets are not used. The grating G equipped with a handle is placed on receiving parts 30 provided to project inward at lower portions of the receiving brackets 3 being frame bodies that are rectangular in a planar view and buried in a floor surface, and fitted with a margin by providing slight clearances in the width direction. It should be noted that, in Fig. 8, for convenience of illustration, a clearance is provided between a lower end portion of the grating 2 and the receiving part 30, however, they are in contact with each other in actuality. Fig. 2 shows a state where two gratings G equipped

with handles are arranged in the longitudinal direction and set on the receiving brackets 3.

[0067]

The grating 2 is assembled by fixing the respective main bars 20 and the spacers 21 along the respective joint bolts 22 in a state where the sectional shapes of the quadrangular bar portions 220 of the respective joint bolts 22 become rectangular shapes vertically long. With this structure, the grating 2 can be reduced in weight. That is, when the joint bolts have the same length and same sectional area (that is, have the same weight), strength against a load applied from above is stronger than in the case where the sectional shapes are square shapes or rectangular shapes horizontally long.

[0068]

Therefore, in a case where strength of the joint bolt 22 having a rectangular sectional shape being vertically long in the present invention against a load applied from above is made equal to strength of a joint bolt having a square sectional shape or a rectangular sectional shape horizontally long, the sectional area can be made smaller, so that the joint bolt 22 can be further reduced in weight while strength against a load applied from above is secured. Therefore, by using the strength against a load applied from above as a standard, the grating

2 including a plurality of joint bolts 22 can be further reduced in weight.

[0069]

When the joint bolt 22 is inserted in the insertion hole 204, upper and lower side portions 222 are fitted to the side portions 204a of the insertion hole 204, so that the joint bolt 22 does not rotate in the periaxial direction. Therefore, in a case where the nut 24 is a fixture that functions when being rotated, when the nut 24 is rotated, it is not necessary to intentionally stop rotation of the joint bolt 22, so that the assembling work can be easily performed.

[0070]

Since the spacer 21 is structured so as to be fitted onto the joint bolt 22 by bringing the inner surface of the spacer 21 into contact with both corner side portions 224 on the upper portion side of the quadrangular bar portion 220 of the joint bolt 22, in this state, if the respective main bars 20 and the respective spacers 21 are integrated, the heights of the spacers 21 become uniform along the longitudinal direction of the joint bolt 22 as described above, and the positions in the lateral direction are also aligned. Accordingly, the grating G can be produced in an excellently united manner in terms of design.

[0071]

Thus, only by the joint bolts 22 in a state where each quadrangular bar portion 220 has a rectangular sectional shape vertically long, a load applied to the grating from above can be received and supported, so that a conventional member for securing load bearing like a square-pipe-shaped guide pipe is not necessary, and accordingly, the grating can be reduced in weight. Further, since the number of components is reduced, the amount of labor in assembling at the time of production is reduced, and accordingly, productivity at the time of production can be improved.

[0072]

By attaching the grating handle 1 to the grating 1 as described above, the grating handle 1 can be attached into the gap 203 between any main bars 20 adjacent to each other in a state where the grating handle 1 is slidable along the gap 203 and the guide recessed portions 200.

[0073]

The grating handle 1 is slidable when it is attached to the grating, so that the grating handle 1 is advantageous since in a case where the grating handle 1 is used in, for example, a bathroom, etc., even if a user's foot hits against the grating handle, the grating handle can escape in a sliding direction and rarely injures the user. Since the knob portion 11 projects

by only approximately 1/2 of the thickness of the contact portion 111 from the upper surface of the horizontal portion 201 of the main bar 20, essentially there are almost no catches, so that even if a foot hits against the grating handle 1, the foot is free from injury.

[0074]

In the attached state (the knob portion 11 and the gap 203 are parallel to each other) of the grating handle 1, the latching portion 122 of the stem portion 12 positioned lower than the gap 203 between the main bars 20a and 20b cannot pass through the gap 203, so that the grating handle 1 does not come off the grating 2, and is slidable along the gap 203 or the guide recessed portions 200 on upper surfaces of the main bars 20a and 20b as described above. In a case where the grating G equipped with a handle is removed from the receiving brackets 3 as in the case of cleaning the drainage ditch 4, etc., the grating G equipped with a handle is removed as follows.

[0075]

First, when the grating handle 1 is slid, and the stem portion 12 comes into contact with the spacer 21 of the joint unit joining the respective main bars 20, fingers are hooked on a finger hook portion 113a on an end portion at the side opposite to the sliding direction of the knob portion 11, and

pull up and hold the knob portion 11. Accordingly, an end portion of the grating handle 1 at the side opposite to the pulled-up side of the knob portion 11 comes into contact with the upper surfaces of the main bars 20a and 20b, and the grating handle 1 inclines by using this end portion as a fulcrum, and the stem portion 12 also rises (refer to Fig. 8).

[0076]

In response to this rise, first, the neck portion 121 of the stem portion 12 passes through the gap 203. The latching portion 122 is longer than the width of the gap 203 between the main bars 20a and 20b, so that the latching portion 122 is latched on lower surfaces of portions defining the gap 203, and cannot pass through the gap 203. Therefore, by holding and further pulling up the grating handle 1, the grating G equipped with a handle is lifted up and can be removed from the receiving brackets 3.

[0077]

When removing the grating handle 1 from the grating 2, the grating handle 1 can be easily removed in a procedure substantially reverse to the above-described attaching procedure, and the grating handle 1 cannot be removed unless following the procedure, so that the grating handle 1 rarely comes off naturally during normal use.

Thus, in the grating G equipped with a handle, in a case where the grating handle 1 is broken or has a problem in movement and the grating handle 1 needs to be replaced, the defective grating handle 1 can be easily removed and a new non-defective grating handle 1 can be easily attached, and therefore, the grating handle 1 can be easily replaced.

[0078]

The terms and wording used in this specification are only used to describe the present invention and involves no limitations, and are not intended to exclude terms and wording equivalent to features described herein and a part of the features. It is a matter of course that various modifications are possible within the scope of the technical idea of the present invention.

[Description of Symbols]

[0079]

G	Grating equipped with handle
1	Grating handle
11	Knob portion
12	Stem portion
121	Neck portion
122	Latching portion
13	Reinforcing portion

111 Contact portion
112 Fitting portion
113, 113a Finger hook portion
2 Grating
20, 20a, 20b Main bar
200 Guide recessed portion
201 Horizontal portion
202 Vertical portion
203 Gap
204 Insertion hole
204a Side portion
204b Side portion
205 Space
21 Spacer
22 Joint bolt
220 Quadrangular bar portion
221 Threaded portion
222 Shorter side portion
223 Longer side portion
224 Corner side portion
23 Washer
24 Nut
3 Receiving bracket

- 30 Receiving part
- 4 Drainage ditch

[TITLE OF DOCUMENT] WHAT IS CLAIMED IS:

[Claim 1]

A grating comprising:

a plurality of main bars each having a plurality of insertion holes at required intervals in a longitudinal direction, and disposed at required intervals in parallel to each other at the same height;

joint bolts that have rectangular sectional shapes long in one direction and are inserted in the insertion holes of the main bars in a state where the joint bolts are set so that their sectional shapes become vertically long so as not to rotate in periaxial directions;

spacers in which the joint bolts are inserted and which are disposed between the main bars; and

fixtures that are provided at one end or both ends of the joint bolts and fix the main bars to the joint bolts at required intervals.

[Claim 2]

The grating according to Claim 1, wherein

each of the insertion holes is defined by four side portions, and among the respective side portions, a pair of shorter side portions vertically facing each other are provided straight and in parallel to each other so as to have lengths substantially

equal to lengths of shorter side portions of the sectional shape of the joint bolt, to at an interval equal to lengths of longer side portions, and the other pair of longer side portions are formed to swell outward.

[Claim 3]

The grating according to Claim 1 or 2, wherein
each of the main bars has a T-shaped or substantially T-shaped section consisting of a horizontal portion and a vertical portion, and the insertion holes are formed in the vertical portion.

[Claim 4]

A grating equipped with a handle comprising:
the grating according to any one of Claims 1, 2, and 3;
and

a grating handle which includes a knob portion that has a required length and a width wider than a width of a gap between the main bars of the grating to which the grating handle is attached, and can be placed on upper surfaces of the main bars so as to be fitted in the gap, and a stem portion that is formed in a direction perpendicular to a longitudinal direction of the knob portion at a required position on a lower surface portion of the knob portion, and includes a neck portion with a diameter smaller than the width of the gap between the main bars, and

a latching portion formed at a required angle with the knob portion in a periaxial direction of the neck portion at a tip end of the neck portion and having a length longer than the width of the gap between the main bars and a width narrower than the width of the gap, and is attached to the grating by being inserted into a gap between the main bars from above in a state where a direction of the latching portion of the stem portion is matched with a direction of the gap, rotated in the periaxial direction of the neck portion in a state where the neck portion is set at a height of the gap to change the direction of the latching portion so that the length of the latching portion becomes longer than the width of the gap between the main bars in a width direction of the gap, and placed on upper surfaces of the main bars so that the knob portion is fitted in the gap and a movement in a rotating direction of the knob portion stops.

[Claim 5]

The grating equipped with a handle according to Claim 4, wherein

the knob portion is formed so that an upper surface of the knob portion and upper surfaces of the main bars are flush or substantially flush with each other when the knob portion is placed on the upper surfaces of the main bars.

[Claim 6]

A grating production method, comprising:

a step of inserting joint bolts having rectangular sectional shapes long in one direction into respective insertion holes of a main bar having a plurality of insertion holes at required intervals in a longitudinal direction so that the sectional shapes become vertically long and in a state where the joint bolts do not rotate in periaxial directions;

a step of alternately repeatedly performing a work of fitting spacers onto the joint bolts and, subsequently, a work of fitting another main bar by fitting insertion holes to the joint bolts; and

a step of fixing the main bars to the joint bolts by fixtures provided at one end or both ends of the joint bolts when a necessary number of the main bars are fitted to the joint bolts.