

Title of the Invention: Duct Reinforcing Fitting and Duct Reinforcing Method

Background of the Invention

Field of the Invention;

The present invention relates to a duct reinforcing fitting and a duct reinforcing method which reinforce a duct for sending air or the like whose temperature is regulated.

Description of the related art:

A plurality of ducts are provided on the inside of a structure, for example, inside of the ceiling of a building, so that an air-flow path can be formed, through which air or the like flows after its temperature is regulated. Such a duct is shaped like a box which is manufactured by cutting or bending a steel plate. When a duct is produced, for example, as shown in Fig. 16, both long-side edges of each wall plate 101 to 104 formed by working an steel plate are each folded to form a junction portion. Then, both short-side edges of each wall plate 101 to 104 are bent to form each bent portion 101A to 104A. Next, using the junction portion, each wall plate 101 to 104 is connected, and this connected part is double-seamed. Thus, the wall plates 101 to 104 make up a rectangular box body. Thereafter, a corner metal fitting 105 is attached to each corner part of each bent portion 101A to 104A to form a flange, thereby resulting in a duct

100. In the duct 100, in order to reinforce each wall plate 101 to 104, an L-shaped reinforcing material 110 (i.e., angle steel) may be respectively attached parallel to and a predetermined distance away from the bent portions 101A to 104A, over the full periphery of the duct 100 (e.g., refer to Japanese Patent Laid-Open No. 2004-3821 specification).

In a similar manner, ducts having various shapes are created, and such ducts are combined to form a passage for sending air or the like.

However, the above described duct 100 has the following problems. When each reinforcing material 110 is attached to the duct 100, as shown in Fig. 17, in each predetermined position 111 of the reinforcing material 110, it is joined by spot welding or riveting.

In the case of spot welding, the reinforcing material 110 is positioned on each wall plate 101 to 104, and in this state, the spot welding is conducted. This can increase the numbers of working processes and component parts when the duct 100 is manufactured. Besides, the reinforcing material 110 is an angle steel, and thus, the duct 100 can be heavier. In the case of the junction by means of riveting, as shown in Fig. 18A, the reinforcing material 110 is positioned on the wall plate 101. Next, as shown in Fig. 18B, the rivet 120 is driven into the reinforcing material 110 and the wall plate 101. Then, as shown in Fig. 18C, the tip of the rivet 120 is caulked.

Therefore, Fig. 19 shows a reinforced duct 100 capable of solving the above problems. In the duct 100 of Fig. 19, the wall plates 101 to 104 are provided with folded portions 101B to 104B, respectively. The folded portions 101B to 104B are formed parallel to the bent portions 101A to 104A of the wall plates 101 to 104, and further, in the middle of the wall plates 101 to 104, as well as in the same directions as the directions in which the bent portions 101A to 104A stand up, respectively. For example, Fig. 20 shows a sectional shape of the folded portion 101B formed in the wall plate 101. The folded portion 101B is shaped like a strip by folding a part of the wall plate 101 and is united with the wall plate 101. The folded portions 102B to 104B are also the same.

Each end part of the folded portions 101B to 104B is away at an angle of approximately 90° . Hence, for example, in order to connect inter-end parts formed between an end of the folded portion 101B of the wall plate 101 and its corresponding end of the folded portion 102B of the wall plate 102, an L-shaped connecting metal fitting 111 is attached to the end part of the folded portion 101B and the end part of the folded portion 102B. The connecting metal fitting 111 has, as shown in Fig. 21, a U-shape in section to cover the folded portions 101B and 102B. The connecting metal fitting 111 is attached to the folded portions 101B and 102B, and thereafter is subjected to spot welding, so that it is fixed

on the wall plates 101 and 102.

However, the above described reinforced duct 100 formed with the folded portions 101B to 104B has the following problems. The folded portions 101B to 104B are each shaped like a strip by folding a part of each wall plate 101 to 104, respectively. This requires, for example, dedicated machining equipment for forming the strip-shaped folded portions 101B while holding the wall plate 101. Such machining equipment itself is costly, and further, the duct 100 formed with the folded portions 101B to 104B using this machining equipment can be expensive.

Summary of the Invention

It is an object of the present invention to provide a duct reinforcing fitting and a duct reinforcing method which are capable of solving the above described problems, dispensing with dedicated machining equipment and reinforcing a duct.

In order to solve the problems, a duct reinforcing fitting according to a first aspect of the present invention which is used for a duct formed by assembling wall plates, the wall plates each having a bent portion for flange formation at each end thereof, includes: a pair of attachment fittings each having a plate-like base portion the back surface of which comes into contact with the wall surface of the wall plate forming an interior wall surface of the duct, at least one plate-like standing wall portion protruding from the

front surface of the base portion, and a sandwiching portion formed in the base portion and sandwiching the bent portion of the wall plate together with the base portion; and a bar-like reinforcing fitting attached to the standing wall portion of each attachment fitting, wherein an arbitrary number of the attachment fittings are each provided in an arbitrary position in the longitudinal directions of the bent portion.

According to the first aspect of the present invention, the attachment fittings are attached to the bent portions for forming a flange of the duct, and using the attachment fittings, the reinforcing fitting is arranged in the bent portions of the duct.

A duct reinforcing fitting according to a second aspect of the present invention is provided wherein in the duct reinforcing fitting according to the first aspect: the duct includes a hook portion protruding from a plate surface of the wall plate and running along the bent portion of the wall plate so as to hook a corner metal fitting which forms a flange with the bent portion; and the base portion includes an engagement portion engaging with the hook portion of the wall plate.

A duct reinforcing fitting according to a third aspect of the present invention is provided wherein in the duct reinforcing fitting according to the first or second aspect, the reinforcing fitting has a T-shaped section when the base portion has the single standing wall portion.

A duct reinforcing method according to a fourth aspect of the present invention using the duct reinforcing fitting according to any one of the first to third aspects, includes the steps of: arranging each attachment fitting in the bent portions at both ends formed in the wall plate of the duct; and attaching the reinforcing fitting such that the attachment fittings are linked together.

A duct reinforcing method according to a fifth aspect of the present invention using the duct reinforcing fitting according to any one of the first to third aspects, includes the steps of: arranging each attachment fitting in the bent portions at both ends formed in the wall plate of the duct; and attaching the reinforcing fitting to the attachment fittings such that the attachment fittings are linked together.

According to the first aspect of the present invention, the reinforcing fitting is arranged via the attachment fittings in the bent portions of the duct. Therefore, the duct can be prevented from deforming and thus be reinforced. Further, according to this aspect, the attachment fitting is fixed on the duct so as to sandwich the bent portion formed in the wall plate, and the reinforcing fitting is fixed on the attachment fittings. This facilitates the attachment of the duct reinforcing fitting thereto. Still further, according to this aspect, the attachment fitting is fixed on the bent portion of the wall plate by holding the bent portion of the wall plate, and thereby, the duct reinforcing fitting

can be arranged in a duct already produced/installed. Besides, an arbitrary number of the attachment fittings can be provided in arbitrary positions in the longitudinal directions of the bent portion. This makes it possible to arrange a required number of such duct reinforcing fittings in necessary positions in accordance with the size, shape or the like of the duct, so that the duct can be suitably reinforced.

According to the second aspect of the present invention, the hook portion formed in the wall plate of the duct engages with the engagement portion formed in the base portion of the attachment fitting. Therefore, the attachment fitting can be fixed on the wall plate when it is attached to the wall plate, and hence, the duct reinforcing fitting can be securely attached thereto by extremely easy "one-touch" handling.

According to the third aspect of the present invention, the reinforcing fitting has a T-shaped section, thereby enhancing the strength of the reinforcing fitting.

According to the fourth aspect of the present invention, the reinforcing fitting is arranged along the wall plate of the duct, thereby reinforcing the wall plate. In other words, the moment of inertia of area of the duct becomes greater, and thus, the strength and rigidity of the duct also become greater.

According to the fifth aspect of the present invention, in the opening of the duct, the upper and lower wall plates

which face each other are provided with the reinforcing fitting which extends vertically between the end parts thereof. Therefore, the duct can be prevented from deforming and thus be reinforced.

Brief Description of Drawings

Fig. 1 is a perspective view showing a duct reinforcing fitting according to a first embodiment of the present invention.

Fig. 2 is a partly enlarged perspective view showing hook portions of a duct.

Fig. 3 is a partly enlarged perspective view showing a bent portion.

Fig. 4 is a perspective view of a reinforcing metal fitting.

Fig. 5 is a partly enlarged perspective view of an end part of the reinforcing metal fitting.

Fig. 6 is a front view of a metal plate for forming an attachment metal fitting.

Fig. 7 is a perspective view of the attachment metal fitting.

Fig. 8 is a side view showing how to attach the attachment metal fitting to a wall plate.

Fig. 9 is a side view showing how to attach the attachment metal fitting thereto.

Fig. 10 is a side view showing how to attach the

reinforcing metal fitting thereto.

Fig. 11 is a perspective view showing a duct reinforcing fitting according to a second embodiment of the present invention.

Fig. 12 is a schematic front view showing that a plurality of duct reinforcing fittings are employed in the embodiments of the present invention.

Fig. 13 is a perspective view showing a variation of the attachment metal fitting in the embodiments of the present invention.

Fig. 14 is a plan view showing another example of the duct.

Fig. 15 is a perspective view of an attachment metal fitting employed for the duct of Fig. 14.

Fig. 16 is a perspective view of a conventional duct.

Fig. 17 is a perspective view showing the attachment of a reinforcing material to the conventional duct.

Fig. 18A is a sectional view showing a junction by means of a rivet before the rivet is driven. Fig. 18B is a sectional view showing the rivet is driven. Fig. 18C is a sectional view showing the rivet is caulked.

Fig. 19 is a perspective view of another conventional duct.

Fig. 20 is a sectional view showing a folded portion of the duct of Fig. 19.

Fig. 21 is a sectional view showing a connecting metal

fitting of the duct of Fig. 19.

Detailed Description of the Invention

Next, embodiments of the present invention will be described in detail with reference to the drawings.

(First Embodiment)

Fig. 1 shows a duct reinforcing fitting according to a first embodiment of the present invention. In Fig. 1, the duct reinforcing fitting of this embodiment is provided in a duct 100 having a length L1. In this figure, component elements are given the same reference characters and numerals as those of Fig. 16 described above, as long as the former are identical or are considered to be identical to the latter. Thus, their description is omitted.

The duct 100 suitable for this embodiment will be described before an explanation is given for this embodiment. The duct 100 employed in the first embodiment is provided with hook portions 101C to 104C. The hook portions 101C to 104C are formed in both end parts of wall plates 101 to 104 such that they protrude along bent portions 101A to 104A and near the bent portions 101A to 104A. The hook portions 101C to 104C are employed in forming the duct 100 with a flange and are used for positioning L-shaped corner metal fittings 105 or the like. For this purpose, for example, the hook portions 103C and 104C are formed, as shown in Fig. 2, in the wall plates 103 and 104 such that they protrude

toward the outside of the duct 100 and away from the bent portions 103A and 104A respectively by the distance equal to the thickness of the corner metal fitting 105. Using the protruding shape, the hook portions 103C and 104C suppress a move of the corner metal fitting 105 or hook the corner metal fitting 105. The hook portions 101C and 102C are also the same.

Further, in the duct 100, for example, the edge part of the bent portion 103A is bent, as shown in Fig. 3, in an L-shape to hold the corner metal fitting 105. Specifically, the bent portion 103A is formed by a bent part 103A₁ united with the wall plate 103, and a bent part 103A₂ united with the bent part 103A₁ and bent at substantially a right angle with respect to the bent part 103A₁. The bent part 103A₁ has a width L11 and the bent part 103A₂ has a width L12. The bent portions 101A, 102A and 104A are also the same as the bent portion 103A.

The duct reinforcing fitting of this embodiment employed for the above described duct 100 is a substitute for the L-shaped reinforcing material 110 of Fig. 16. This duct reinforcing fitting is formed by a reinforcing metal fitting 10 and attachment metal fittings 20.

The reinforcing metal fitting 10 of the duct reinforcing fitting has, as shown in Fig. 4, a long and narrow shape. The reinforcing metal fitting 10 has a length L2 substantially equal to the length L1 of the duct 100. As shown in Fig.

5, the reinforcing metal fitting 10 is produced by bending a long-and-narrow steel plate and has plate-like support portions 11 and a plate-like protrusion portion 12 formed between them. In the protrusion portion 12, screw holes for screwing 12₁ are formed at both-end parts thereof.

The reinforcing metal fitting 10 has a T-shaped section. Accordingly, the reinforcing metal fitting 10 will not be deformed even if pressure is applied thereto in a direction P1 which intersect the plate surface of the plate-like support portions 11 or in the direction opposite to the direction P1. In short, the T-shaped section contributes toward strengthening the reinforcing metal fitting 10. The wall plates 101 to 104 of the duct 100 are provided with at least one such reinforcing metal fitting 10. Further, the reinforcing metal fitting 10 may have an L-shaped section, and this reinforcing metal fitting 10 can also be employed for reinforcing the duct 100.

The attachment metal fittings 20 are used for supporting the reinforcing metal fitting 10, and an arbitrary number of attachment metal fittings 20 are each provided in an arbitrary position in the longitudinal directions of the bent portions 101A to 104A. In this embodiment, a description will be given mainly of the case where the bent portions 101A to 104A are provided at each middle part thereof with one such attachment metal fitting 20. The attachment metal fitting 20 is formed, as shown in Fig. 6, by bending a metal

plate 20₁ having an L-shape in plan view. The metal plate 20₁ is provided with parts to be bent (parts indicated by broken lines in the figure) which run substantially parallel to a long side 20₃ and a long side 20₄ up to an L-shaped corner 20₂ of the metal plate 20₁. Hence, the metal plate 20₁ is formed with a rectangular base portion 21, a standing wall portion 22 and a bent portion 23. The bent portion 23 is divided into three bent parts 23₁ to 23₃. The bent part 23₁ has a width L21, for example, substantially equal to the width L11 of the bent part 103A₁ of the bent portions 103A formed in the duct 100. The bent part 23₂ has a width L22, for example, substantially equal to the width L12 of the bent part 103A₂ of the bent portions 103A. The base portion 21 is formed with a long and narrow engagement portion 21₁ which sinks on the side of a front surface 20₁₁ of the metal plate 20₁ and rises on the side of a back surface 20₁₂ of the metal plate 20₁. The engagement portion 21₁ is away from the short side of the base portion 21 on the side of the bent portion 23 by the distance equal to the thickness of the corner metal fitting 105. Further, a screw hole 22₁ is formed in the standing wall portion 22.

In the L-shaped metal plate 20₁, as shown in Fig. 7, the standing wall portion 22 is bent toward the front surface 20₁₁ of the metal plate 20₁ such that the standing wall portion 22 and the base portion 21 form an L-shape. Then, the bent portion 23 is bent toward the back surface 20₁₂ of the metal

plate 20₁ such that the base portion 21 and the bent portion 23 form an L-shape. Further, the bent parts 23₂ and the bent part 23₃ are bent toward the back surface 20₁₂ of the metal plate 20₁ such that the bent parts 23₁, the bent parts 23₂ and the bent part 23₃ form a U-shape. On the boundary line between the base portion 21 and the standing wall portion 22, a rib 20₂₁ for reinforcement is formed at two places. The rib 20₂₁ protrudes from the corner formed by the base portion 21 and the standing wall portion 22. Hence, the standing wall portion 22 is configured so as not to be bent along the boundary line with respect to the base portion 21.

In this manner, the bent portion 23 is bent and shaped, and together with the base portion 21, forms a member which sandwiches and holds each of the bent portions 101A to 104A of the duct 100, or a sandwiching portion which sandwiches each of the bent portions 101A. The engagement portion 21₁ of the base portion 21 comes and fits into each of the hook portions 101C to 104C formed in the wall plates 101 to 104 respectively of the duct 100, or the engagement portion 21₁ of the base portion 21 engages with each of the hook portions 101C to 104C of the wall plates 101 to 104 respectively. Consequently, the attachment metal fitting 20 is fixed on each of the wall plates 101 to 104 with each of sandwiching the bent portions 101A to 104A respectively. At this time, for example, the metal plate 20₁ is bent such that the plate surface of the bent part 103A₁ of the bent portion 103A

intersects the plate surface of the standing wall portion 22 of the attachment metal fitting 20, and thereby, the standing wall portion 22 is formed in the base portion 21.

The duct reinforcing fitting of this embodiment has the above described structure. Next, a description will be given about a duct reinforcing method using this duct reinforcing fitting. The duct reinforcing fitting is arranged in the duct 100 as follows. The attachment metal fittings 20 of the duct reinforcing fitting are employed for attaching the reinforcing metal fitting 10 to the wall plates 101 to 104, and they are used in a set of two. As an example, the case where the duct reinforcing fitting is arranged in the wall plate 103 will below be described. A set of such attachment metal fittings 20 supports the single reinforcing metal fitting 10. As shown in Fig. 8, the bent portion 23 of the attachment metal fitting 20 is arranged such that the bent part 103A₂ of the bent portion 103A formed at an end of the wall plate 103 is tucked therein.

Thereafter, the attachment metal fitting 20 is pushed toward the wall plate 103 or a direction P2, and thereby, as shown in Fig. 9, the bent portion 23 of the attachment metal fitting 20 sandwiches and holds the bent portion 103A formed in the wall plate 103 of the duct 100. Besides, the engagement portion 21₁ formed in the base portion 21 engages with the hook portion 103C formed in the wall plate 103, and the attachment metal fitting 20 is fixed on each of the

wall plates 101 to 104 with sandwiching each of the bent portions 101A to 104A respectively.

In the same manner, the attachment metal fitting 20 is attached to the bent portion 103A formed at the other end of the wall plate 103. Thereafter, as shown in Fig. 10, the protrusion portion 12 of the reinforcing metal fitting 10 is placed onto the standing wall portions 22 of the attachment metal fittings 20 attached at both ends of the wall plate 103. Hence, the reinforcing metal fitting 10 is attached to the attachment metal fittings 20. The screw holes 12₁ of the reinforcing metal fitting 10 are formed in the protrusion portion 12 so as to face the corresponding screw holes 22₁ formed in the respective standing wall portions 22 of the attachment metal fittings 20. The screw holes 12₁ and the screw holes 22₁ are screwed together to fix the reinforcing metal fitting 10 on the attachment metal fittings 20. Further, the reinforcing metal fitting 10 is fixed on the wall plate 103. In order to do this, for example, spot welding or riveting is conducted at places SP at even intervals on the support portions 11 of the reinforcing metal fitting 10.

Similarly, the duct reinforcing fitting of this embodiment is also arranged in each of the wall plates 101, 102 and 104.

The duct 100 provided with the duct reinforcing fitting of this embodiment has the following advantages. The moment of inertia of area of the duct 100 becomes greater, and thus,

the strength and rigidity of the duct 100 also become greater. Specifically, the duct reinforcing fitting is provided to reinforce the duct 100, thereby preventing a deformation or the like in the wall plates 101 to 104. Further, the duct reinforcing fitting of this embodiment is made up of the reinforcing metal fitting 10 and the attachment metal fittings 20, and these members are each formed by bending a metal plate. Hence, this duct reinforcing fitting is capable of dispensing with dedicated machining equipment and reinforcing the duct 100. According to this embodiment, the attachment metal fittings 20 can be attached to the bent portions 101A to 104A of the duct 100 simply by pushing the attachment metal fittings 20 against them or by easy "one-touch" handling, and the reinforcing metal fitting 10 can be fixed on the attachment metal fittings 20 only by pushing it onto them. Therefore, the duct reinforcing fitting can be extremely easily arranged. Still further, the duct reinforcing fitting can also be arranged in a duct already produced/installed.

(Second Embodiment)

In a second embodiment of the present invention, the reinforcing metal fitting 10 of the first embodiment is arranged in a position different from the first embodiment. In this embodiment, component elements are given the same reference characters and numerals as those of the above described first embodiment, as long as the former are identical or are considered to be identical to the latter. Thus, their

description is omitted. In this embodiment, as shown in Fig. 11, the attachment metal fittings 20 are arranged in the bent portion 101A of the wall plate 101 located in the upper face of the duct 100 and the bent portion 103A of the wall plate 103 located in the lower face thereof, respectively. Then, the reinforcing metal fitting 10 is attached to the attachment metal fittings 20 such that they are linked together. The attachment of the attachment metal fittings 20 is the same as the first embodiment.

Thereafter, the reinforcing metal fitting 10 is arranged between the attachment metal fitting 20 attached to the wall plate 101 and the attachment metal fitting 20 attached to the wall plate 103, and then, the reinforcing metal fitting 10 is fixed to each attachment metal fitting 20 by means of screwing.

According to the duct 100 provided with the duct reinforcing fitting of this embodiment, in the opening of the duct 100, the upper and lower wall plates 101 and 103 which face each other are provided with the reinforcing metal fitting 10 extending vertically between the end parts thereof. Therefore, the duct 100 can be prevented from deforming and thus be reinforced.

Hereinbefore, each embodiment of the present invention is described in detail. However, concrete configurations thereof are not limited to each embodiment. Therefore, unless changes and modifications in design depart from the scope

of the present invention, they should be construed as being included therein. For example, in each embodiment, the fixation of the reinforcing metal fitting 10 and the attachment metal fitting 20 is conducted by means of screwing. Instead of screwing, spot welding or the like can be utilized. Further, the case is described in which a single set of such attachment metal fittings 20 are arranged in a middle part of each of the bent portions 101A to 104A. However, a required number of such attachment metal fittings 20 and reinforcing metal fittings 10 (the duct reinforcing fittings) can be arranged in necessary positions in accordance with the size, shape or the like of the duct 100. This makes it possible to reinforce the duct 100 appropriately. For example, if the lateral width of the duct 100 is great, as shown in Fig. 12, two sets of such attachment metal fittings 20 and two such reinforcing metal fittings 10 may be provided such that the bent portions 101A and 103A are each divided into three parts in the lateral directions thereof. Therefore, the duct 100 having a great lateral width can be appropriately reinforced, thereby thinning the wall plates 101 to 104 of the duct 100.

Still further, the standing wall portion 22 is formed such that the plate surface of the bent part 103A₁ of the bent portion 103A intersects the plate surface of the standing wall portion 22 of the attachment metal fitting 20. However, as shown in Fig. 13, the standing wall portion 22 may be formed such that the plate surface of the bent part 103A₁

is parallel to the plate surface of the standing wall portion 22. Specifically, the standing wall portion 22 having a plate shape and standing up may be formed in the end part of the base portion 21 on the side opposite to the bent portion 23. This makes it possible to arrange the duct reinforcing fitting appropriately and flexibly in accordance with the shape or the like of the duct 100 or the reinforcing metal fitting 10.

Still further, in each embodiment, a straight duct whose axial line extends straight is provided, but another type of duct may also be used. For example, as shown in Fig. 14, an L-shaped duct can be employed. This duct shown in the figure is configured by connecting three duct bodies 121 to 123 while changing their connection directions (i.e., axial directions). In the same way as the first embodiment or the second embodiment, the duct reinforcing fitting is arranged in each of the duct bodies 121 to 123. In this case, the attachment metal fittings 20 having various sizes are employed in accordance with the shapes of the duct bodies 121 to 123. As shown in Fig. 15, a length L23 of the side of the base portion 21 located on the standing wall portion 22 side may be greater than a length L24 of the side opposite thereto, or conversely, the length L23 of the side on the standing wall portion 22 side may be smaller than the length L24 of the opposite side. In this manner, the present invention can also be applied to ducts other than a straight duct.

[Description of the Symbols]

10 ... reinforcing metal fitting (reinforcing fitting)
20 ... attachment metal fitting (attachment fitting)
 21 ... base portion
 22 ... standing wall portion
 23 ... bent portion
30 ... reinforcing metal fitting (reinforcing fitting)
 31 ... main body
 32, 33 ... flanges
40, 50 ... attachment metal fitting (attachment fitting)
100 ... duct
 101-104 ... wall plate
101A-104A ... bent portion

What is claimed is:

1. A duct reinforcing fitting which is used for a duct formed by assembling wall plates, the wall plates each having a bent portion for flange formation at each end thereof, comprising:

a pair of attachment fittings each having a plate-like base portion the back surface of which comes into contact with the wall surface of the wall plate forming an interior wall surface of the duct, at least one plate-like standing wall portion protruding from the front surface of the base portion, and a sandwiching portion formed in the base portion and sandwiching the bent portion of the wall plate together with the base portion; and

a bar-like reinforcing fitting attached to the standing wall portion of each attachment fitting,

wherein an arbitrary number of the attachment fittings are each provided in an arbitrary position in the longitudinal directions of the bent portion.

2. The duct reinforcing fitting according to claim 1, wherein:

the duct includes a hook portion protruding from a plate surface of the wall plate and running along the bent portion of the wall plate so as to hook a corner metal fitting which forms a flange with the bent portion; and

the base portion includes an engagement portion engaging

with the hook portion of the wall plate.

3. The duct reinforcing fitting according to claim 1 or 2, wherein the reinforcing fitting has a T-shaped section when the base portion has the single standing wall portion.

4. A duct reinforcing method using the duct reinforcing fitting according to any one of claims 1 to 3, including the steps of:

arranging each attachment fitting in the bent portions at both ends formed in the wall plate of the duct; and

attaching the reinforcing fitting such that the attachment fittings are linked together.

5. A duct reinforcing method using the duct reinforcing fitting according to any one of claims 1 to 3, including the steps of:

arranging the attachment fitting in the bent portion of the wall plate located in the upper face of the duct and the bent portion of the wall plate located in the lower face of the duct, respectively; and

attaching the reinforcing fitting to the attachment fittings such that the attachment fittings are linked together.