

[DESCRIPTION]

[Title of Invention]

FIRE-RESISTANT COVERING MEMBER FOR PIPE INSERTION PART, FIRE-RESISTANT COVERING STRUCTURE, AND FIRE-RESISTANT COVERING METHOD

[Technical Field]

[0001]

The present invention relates to a fire-resistant covering member for a pipe insertion part, a fire-resistant covering structure, and a fire-resistant covering method that, in a pipe insertion part provided in the steel beam or the like, can fire-resistently cover the steel beam or the like.

[Background Art]

[0002]

Buildings of steel construction are required to ensure the performance of fire resistance hours defined by the Building Standards Act by applying fire-resistant covers onto columns, beams, supports, tubular column bodies, or the like that are primary structure parts of the buildings in order to prevent such a building from collapsing in case of a fire.

[0003]

For example, in conventional fire-resistant covering methods for steel beams applied to penetrating holes formed in webs of the steel beams, as illustrated in Fig. 3A and the like of Patent Literature 1, a fire-resistant material is wrapped around the internal core material made of a spiral duct or the like cut into a predetermined length, thereby a hollow sleeve member is manufactured, and the hollow sleeve member is installed in a pipe insertion part of a steel beam.

[Citation List]

[Patent Literature]

[0004]

Patent Literature 1: International Publication No. 2015/060389

[Summary of Invention]

[Technical Problem]

[0005]

However, the conventional hollow sleeve member described above is manufactured by wrapping a fire-resistant material around a hard internal core material made of a spiral duct or the like. Thus, there is a problem of the hollow sleeve members being significantly bulky in transportation from a manufacturing factory to a construction site or in conveyance within a construction site, and in addition, this is also a factor of increased transportation costs.

[0006]

Further, when the inner diameter of an actually drilled pipe insertion part of a steel beam is slightly smaller than a design dimension, a case arises where it is difficult to insert, into the pipe insertion part, a hollow sleeve member manufactured with an external dimension according to the design dimension.

[0007]

Accordingly, in view of the problems described above, the present invention intends to provide a fire-resistant covering member for a pipe insertion part, a fire-resistant covering structure, and a fire-resistant covering method that can fire-resistently cover a pipe insertion part more efficiently and effectively than those of the conventional art.

[Solution to Problem]

[0008]

Aspect 1 according to the present disclosure is a fire-resistant covering member for a pipe insertion part, in which the fire-resistant covering member includes: an annular fire-resistant covering material; and a welding part fixed by a welding pin from the outer face of the annular fire-resistant covering material and covering an end face of the annular fire-resistant covering material, and the welding pin can be welded to the welding part.

[0009]

Aspect 2 according to the present disclosure is the fire-resistant covering member for the pipe insertion part, in which the welding part is formed at each of both ends of a support plate formed in a substantially U-shape, and the support plate is extended between ends of the annular fire-resistant covering material on the inner face of the annular fire-resistant covering material.

[0010]

Aspect 3 according to the present disclosure is the fire-resistant covering member for the pipe insertion part, in which the welding pin includes a first welding pin, and the support plate is fixed by the first welding pin from the outer face of the annular fire-resistant covering material and electrically connected to a steel material via the first welding pin, the pipe insertion part being formed in the steel material.

[0011]

Aspect 4 and aspect 5 according to the present disclosure are the fire-resistant covering member for the pipe insertion part, in which the annular fire-resistant covering material has flexibility and is configured to be folded so as to close a hollow part defined by the annular fire-resistant covering material.

[0012]

Aspects 6 to 9 according to the present disclosure are the fire-resistant

covering member for the pipe insertion part, in which the welding pin includes a third welding pin, and the welding part is configured to be fixed by the third welding pin to a fire-resistant covering material covering a steel material around the pipe insertion part.

[0013]

Aspects 10 to 17 according to the present disclosure are the fire-resistant covering member for the pipe insertion part, in which the welding pin includes a second welding pin, and the annular fire-resistant covering material is configured to be fixed by the second welding pin to a steel material from inside of a hollow part defined by the annular fire-resistant covering material, the pipe insertion part being formed in the steel material.

[0014]

Aspect 18 according to the present disclosure is a fire-resistant covering structure including: a fire-resistant covering member having an annular fire-resistant covering material inserted in and fixed to a pipe insertion part of a steel material; and a fire-resistant covering material covering a steel material around the annular fire-resistant covering material, in which the fire-resistant covering member has a welding part covering an end face of the annular fire-resistant covering material, and the fire-resistant covering material covering the steel material around the annular fire-resistant covering material is configured to be fixed to the welding part by a welding pin.

[0015]

Aspect 19 according to the present disclosure is a fire-resistant covering method including at least steps of: producing a fire-resistant covering member for a pipe insertion part by fixing a support plate to the inner face of an annular fire-

resistant covering material by a welding pin from the outer face of the annular fire-resistant covering material, the support plate having a substantially U-shape extending from one end face to the other end face of the annular fire-resistant covering material; and arranging the fire-resistant covering member for the pipe insertion part in the pipe insertion part formed in a steel material and electrically connecting the welding pin, which fixes the support plate, and the steel material to each other.

[0016]

Aspect 20 according to the present disclosure is the fire-resistant covering method including steps of: covering a steel material around the pipe insertion part with a fire-resistant covering material; and fixing the fire-resistant covering material covering the steel material around the pipe insertion part to a welding part present at an end of the support plate by using a welding pin.

[Advantageous Effects of Invention]

[0017]

According to the present invention, since the hard internal core material made of a spiral duct or the like is not used, the fire-resistant covering member for the pipe insertion part is not bulky unlike the conventional art, conveyance and attachment can be facilitated, and transportation costs can be reduced. In addition, even when the inner diameter dimension of a pipe insertion part of a steel beam has an error, the fire-resistant covering member can be easily installed.

[0018]

Further, the fire-resistant covering material covering a steel material around a pipe insertion part can be easily and reliably fixed to a welding part formed to a support plate by using a welding pin.

[Brief Description of Drawings]

[0019]

[Fig. 1]

Fig. 1 is a front view of a fire-resistant covering member of a pipe insertion part in an embodiment of the present invention.

[Fig. 2]

Fig. 2 is a sectional view of the fire-resistant covering member in the A-A cross section of Fig. 1.

[Fig. 3A]

Fig. 3A is a front view and a side view of a support plate in the embodiment of the present invention.

[Fig. 3B]

Fig. 3B is a perspective view illustrating another embodiment of a support plate in the embodiment of the present invention.

[Fig. 4]

Fig. 4 is an overall perspective view of the fire-resistant covering member installed in the pipe insertion part of a steel beam in the embodiment of the present invention.

[Fig. 5]

Fig. 5 is a front view of the fire-resistant covering member installed in the pipe insertion part of the steel beam at the part A of Fig. 4, and this front view is a diagram illustrating a fixing form of the fire-resistant covering member.

[Fig. 6A]

Fig. 6A is a front view of the fire-resistant covering member installed in the pipe insertion part of the steel beam at the part A of Fig. 4, and this front view is a

front view illustrating a state where the fire-resistant covering member has been fixed.

[Fig. 6B]

Fig. 6B is a C-C sectional view of Fig. 6A.

[Fig. 7]

Fig. 7 is a sectional view of the steel beam and the fire-resistant covering member in a B-B cross section of Fig. 5.

[Fig. 8]

Fig. 8 is front view illustrating a fixing form of the fire-resistant covering material around the pipe insertion part in the embodiment of the present invention.

[Fig. 9]

Fig. 9 is a sectional view of the steel beam, the fire-resistant covering material of the steel beam, and the fire-resistant covering member in a D-D cross section of Fig. 8.

[Fig. 10]

Fig. 10 is a front view illustrating a state where the fire-resistant covering member of the pipe insertion part has been folded in the embodiment of the present invention.

[Fig. 11]

Fig. 11 is a front view illustrating a fixing form of another embodiment of the fire-resistant covering material around the pipe insertion part in the part C of Fig. 4.

[Description of Embodiments]

[0020]

Embodiments of the present invention will be described below with reference to various drawings.

[0021]

Fig. 1 illustrates a front view of a fire-resistant covering member 10 of a pipe insertion part in the present embodiment, and Fig. 2 illustrates a sectional view of the fire-resistant covering member 10 in the A-A cross section of Fig. 1.

[0022]

As illustrated in Fig. 1 and Fig. 2, the fire-resistant covering member 10 of the present embodiment has a fire-resistant covering material 11 formed of annularly connected flexible rock wool and a plurality of support plates 12 (12a, 12b, 12c, 12d) fixed by welding pins 13 from the outer face of the fire-resistant covering material 11 and extended between the ends of the fire-resistant covering material 11 on the inner face of the fire-resistant covering material 11. The support plates 12 (12a, 12b, 12c, 12d) are each formed in a substantially U-shape as illustrated in Fig. 3 and the like and include welding parts 121 (121a, 121b, 121c, 121d) covering the end faces of the fire-resistant covering material 11, and the welding parts 121 (121a, 121b, 121c, 121d) are characterized in that welding pins 13 (13a, 13b, 13c, 13d) can be welded thereto as illustrated in Fig. 8 and Fig. 9.

[0023]

In more detail, the fire-resistant covering material 11 of the annularly connected flexible rock wool is formed in a size in accordance with the inner diameter dimension of a pipe insertion part drilled in a steel beam. For example, the fire-resistant covering material 11 can be annularly formed by rolling a sheet of rock wool, which has been cut into a required dimension, into an annular shape, overlapping the ends thereof to each other, and fixing the overlapped portion to the support plate 12 described later by the welding pins 13 (first welding pin: a welding pin welded and fixed to a plate-like part 122 of the support plate 12).

[0024]

Further, a plurality of support plates 12 (12a, 12b, 12c, 12d) extended between the ends of the fire-resistant covering material 11 in the horizontal direction in Fig. 2 are disposed on the inner face of the annularly formed fire-resistant covering material 11, and four support plates 12 (12a, 12b, 12c, 12d) are disposed vertically and horizontally as illustrated in Fig. 1 in the present embodiment.

[0025]

As illustrated in Fig. 3A, the support plates 12 (12a, 12b, 12c, 12d) of the present embodiment each are a plate-like metallic member shaped in a substantially U-shape in the side view and having a length of 200 mm and a thickness of 0.8 mm. In more detail, the support plates 12 (12a, 12b, 12c, 12d) are each formed of a plate-like extending plate-like part 122 and welding parts 121 (121a, 121b, 121c, 121d) arranged at both ends in the extending direction of the plate-like part 122 and covering the end face of the fire-resistant covering material 11. Further, as illustrated in Fig. 2, the fire-resistant covering material 11 is arranged in the substantially U-shaped recess, three welding pins (first welding pins) 13 from the outer face of the fire-resistant covering material 11 is inserted thereinto, and thereby the fire-resistant covering material 11 is fixed to the support plate 12 (12a, 12b, 12c, 12d).

[0026]

As described above, since the annular fire-resistant covering material 11 has flexibility, the fire-resistant covering member 10 can be folded so as to close a hollow part 20, as illustrated in Fig. 10. Therefore, since the fire-resistant covering member 10 is not bulky unlike the conventional hollow sleeve material, the

transportation costs of the fire-resistant covering materials 11 can also be significantly reduced.

[0027]

Further, even when the inner diameter of the actually drilled pipe insertion part provided in the steel beam 100 is smaller than the design dimension, the fire-resistant covering member 10 can be easily attached to the pipe insertion part.

[0028]

Next, Fig. 4 illustrates an overall perspective view of the fire-resistant covering member 10 installed in the pipe insertion part of a steel beam 100, and Fig. 5 illustrates a front view of the fire-resistant covering member 10 installed in the pipe insertion part of the steel beam 100 at the part A of Fig. 4. Further, Fig. 6A and Fig. 6B illustrate the fixing form of the fire-resistant covering member 10 at the part A of Fig. 4. That is, the fire-resistant covering member 10 produced as described above is inserted in the pipe insertion part, and a welding pin 13 (second welding pin: a welding pin that is different from the welding pin welded to the support plate 12 and is welded and fixed to a web 101 of the steel beam 100) is inserted thereinto, as illustrated in Fig. 5. As illustrated in Fig. 6A and Fig. 6B, the welding pins (second welding pins) 13 are then welded and fixed to the web 101 of the steel beam 100. Accordingly, the fire-resistant covering member 10 that has been originally folded since insertion in the pipe insertion part can be firmly fixed in accordance with the shape of the pipe insertion part.

[0029]

Further, Fig. 7 illustrates a B-B cross section of Fig. 5. As illustrated in Fig. 7, the fire-resistant covering member 10 is arranged in the pipe insertion part formed in the webs 101 of the steel beam 100, and thereby the welding pins (first welding

pins) 13, which fix the support plates 12 (12a, 12b, 12c, 12d), and the steel beam 100 are in contact with each other. In more detail, a single support plate 12 (12a, 12b, 12c, 12d) and the annular fire-resistant covering material 11 are fixed to each other by three welding pins 13. Further, the head of the welding pin 13 at the center position out of the three welding pins 13 is in contact with the web 101 of the steel beam 100. Accordingly, the steel beam 100 and the support plate 12 (12a, 12b, 12c, 12d) are electrically connected to each other.

[0030]

Next, Fig. 8 is a front view of the part C of Fig. 4 and illustrates a fixing form of a fire-resistant covering material (second fire-resistant covering material) 200 of the steel beam 100 around a pipe insertion part. Furthermore, Fig. 9 illustrates a sectional view of the steel beam 100, the fire-resistant covering material 200 of this steel beam 100, and the fire-resistant covering member 10 in the D-D cross section of Fig. 8. First, as illustrated in the part A of Fig. 4, the fire-resistant covering member 10 is installed in the pipe insertion part of the steel beam 100, and the steel beam 100 around the pipe insertion part is then covered with the fire-resistant covering material 200.

[0031]

Further, as illustrated in the part of B of Fig. 4, a cross-shaped cutout is provided in a portion that lies in the fire-resistant covering material 200 covering the steel beam 100 and corresponds to the hollow part 20 defined by the fire-resistant covering member 10, and the fire-resistant covering material 200 is cut out circularly in accordance with the hollow part 20 described above. Next, as illustrated in Fig. 8 and Fig. 9, each welding pin 13 (13a, 13b, 13c, 13d) (third welding pin: a welding pin that is different from the first welding pin and the second welding pin and is welded

and fixed to the welding part 121) is inserted into the fire-resistant covering material 200 and welded to the welding part 121 (121a, 121b, 121c, 121d) of each support plate 12 (12a, 12b, 12c, 12d), and thereby the fire-resistant covering material 200 is fixed. In such a way, since the steel beam 100 and the support plate 12 (12a, 12b, 12c, 12d) are electrically connected to each other as described above, the fire-resistant covering material 200, which covers the steel beam 100, and the fire-resistant covering member 10 can be firmly fixed to each other extremely easily and reliably.

[0032]

[Other embodiments]

Although one embodiment of the present invention has been described above, the present invention is not limited to the embodiment described above, and, for example, the following modifications are also possible.

[0033]

Although the fire-resistant covering member 10 described above includes four support plates 12 (12a, 12b, 12c, 12d), the support plates are not necessarily limited thereto, and the fire-resistant covering material 200 and the fire-resistant covering member 10 can be fixed to each other by three support plates 12 and three welding pins 13, as illustrated in Fig. 11. Naturally, the fire-resistant covering material 200 and the fire-resistant covering member 10 can also be fixed to each other by three or less or five or more support plates 12 and three or less or five or more welding pins 13.

[0034]

Further, the form of the support plate 12 is not limited to that illustrated in Fig. 3A. For example, as illustrated in Fig. 3B, the plate-like part 122 and the

welding part 121 of the support plate 12 can be configured separately and configured such that the plate-like part 122 is inserted into and fixed to an insertion part 1211 formed in the welding part 121.

[0035]

That is, with the configuration illustrated in Fig. 3B, it is only required to cut the plate-like part 122 in accordance with the length of the fire-resistant covering member 10, and the welding part 121 can be commonly used regardless of the length of the fire-resistant covering member 10. Therefore, the versatility of the support plate 12 can be improved, and the manufacturing costs can be reduced.

[0036]

Although the form in which the fire-resistant covering member 10 is installed in a pipe insertion part of the steel beam 100 has been described in the embodiments described above, the fire-resistant covering member 10 of the present invention is not necessarily limited to the use in the pipe insertion part of the steel beam 100 and can also be used in a pipe insertion part formed in other steel materials than the steel beam 100.

[0037]

Further, although dimensions (mm) are represented in Fig. 1 to Fig. 3A, these dimensions are mere examples and can be changed as appropriate in accordance with the size of the diameter of a pipe insertion part of the steel beam 100.

[0038]

Although the embodiments of the present invention have been described above based on the drawings, the specific configuration is not limited to these embodiments. The scope of the present invention is defined by the claims rather

than by the above description of the embodiments and includes all modifications within the meaning of equivalent and the scope of the claims. Further, the specific method or the like described in the above embodiments can be changed as far as the object of the present invention is achieved.

[List of Reference Symbols]

[0039]

10 fire-resistant covering member

11 fire-resistant covering material

12 (12a, 12b, 12c, 12d) support plate

13 (13a, 13b, 13c, 13d) welding pin

20 hollow part

100 steel beam

101 web

121 (121a, 121b, 121c, 121d) welding part

200 fire-resistant covering material for steel beam

[CLAIMS]

[Claim 1]

A fire-resistant covering member for a pipe insertion part, the fire-resistant covering member comprising:

an annular fire-resistant covering material; and

a welding part covering an end face of the annular fire-resistant covering material,

wherein the welding part is configured to be welded with a welding pin.

[Claim 2]

The fire-resistant covering member for the pipe insertion part according to claim 1,

wherein the welding part is formed at each of both ends of a support plate formed in a substantially U-shape, and

wherein the support plate is extended between ends of the annular fire-resistant covering material on the inner face of the annular fire-resistant covering material.

[Claim 3]

The fire-resistant covering member for the pipe insertion part according to claim 1 or 2,

wherein the welding pin includes a first welding pin, and

wherein the support plate is fixed by the first welding pin from the outer face of the annular fire-resistant covering material and electrically connected to a steel material via the first welding pin, the pipe insertion part being formed in the steel material.

[Claim 4]

The fire-resistant covering member for the pipe insertion part according to claim 1 or 2, wherein the annular fire-resistant covering material has flexibility and is configured to be folded so as to close a hollow part defined by the annular fire-resistant covering material.

[Claim 5]

The fire-resistant covering member for the pipe insertion part according to claim 1 or 2,

wherein the welding pin includes a third welding pin, and

wherein the welding part is configured to be fixed by the third welding pin to a fire-resistant covering material covering a steel material around the pipe insertion part.

[Claim 6]

The fire-resistant covering member for the pipe insertion part according to claim 1 or 2,

wherein the welding pin includes a second welding pin, and

wherein the annular fire-resistant covering material is configured to be fixed by the second welding pin to a steel material from inside of a hollow part defined by the annular fire-resistant covering material, the pipe insertion part being formed in the steel material.

[Claim 7]

A fire-resistant covering structure comprising:

a fire-resistant covering member comprising an annular fire-resistant covering material inserted in and fixed to a pipe insertion part of a steel material; and

a fire-resistant covering material covering a steel material around the

annular fire-resistant covering material,

wherein the fire-resistant covering member comprises a welding part covering an end face of the annular fire-resistant covering material, and

wherein the fire-resistant covering material covering the steel material around the annular fire-resistant covering material is configured to be fixed to the welding part by a welding pin.

[Claim 8]

A fire-resistant covering method comprising at least steps of:

producing a fire-resistant covering member for a pipe insertion part by fixing a support plate to the inner face of an annular fire-resistant covering material by a welding pin from the outer face of the annular fire-resistant covering material, the support plate having a substantially U-shape extending from one end face to the other end face of the annular fire-resistant covering material; and

arranging the fire-resistant covering member for the pipe insertion part in the pipe insertion part formed in a steel material and electrically connecting the welding pin, which fixes the support plate, and the steel material to each other.

[Claim 9]

The fire-resistant covering method according to claim 8 further comprising steps of:

covering a steel material around the pipe insertion part with a fire-resistant covering material; and

fixing the fire-resistant covering material covering the steel material around the pipe insertion part to a welding part present at an end of the support plate by using a welding pin.