(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 219 865 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
02.08.2023 Bulletin 2023/31

(21) Application number: **22849010.8**

(22) Date of filing: **25.05.2022**

(51) International Patent Classification (IPC):
E04G 25/06 *(2006.01)* ***E04G 1/08*** *(2006.01)*
E04G 7/34 *(2006.01)* ***E04G 25/00*** *(2006.01)*

(52) Cooperative Patent Classification (CPC):
E04G 1/08; E04G 7/34; E04G 25/00; E04G 25/06

(86) International application number:
PCT/JP2022/021383

(87) International publication number:
WO 2023/007931 (02.02.2023 Gazette 2023/05)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(30) Priority: **28.07.2021 JP 2021123411**

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(54) ALUMINUM PIPE SUPPORT

(57) Problem to be solved

To provide an aluminum pipe support having lighter weight and higher rigidity compared to an iron pipe support.

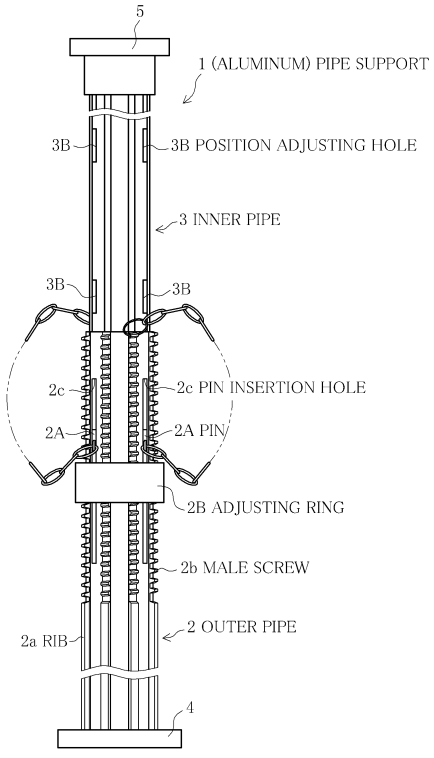
Solution

An aluminum pipe support 1 is configured with two pieces of pins 2A, an inner pipe 3 having an outer periphery formed in any one of a regular hexagonal shape, a regular octagonal shape, and a regular decagonal shape, and having, at a position not subjected to insertion of the pin 2A, a cross-sectional area of 1.96 times or larger than a cross-sectional area at a corresponding position of an inner pipe of a targeted-size iron pipe support, an outer pipe 2 having an inner shape allowing the inner pipe 3 to be inserted into, and having, at a position not subjected to the insertion of the pin 2A, a cross-sectional area of 1.35 times or larger than a cross-sectional area at a corresponding position of an outer pipe of the targeted-size iron pipe support. The upper limits of the cross-sectional areas of the inner pipe 3 and the outer pipe 2 are set so that the total weight of the inner pipe 3 and the outer pipe 2 is lighter than the total weight of the inner pipe and the outer pipe of the targeted-size iron pipe support.

Effects

The specified load bearing capacity is satisfied, and drastic reduction in weight and high rigidity are achieved.

【FIG.1】



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Description

Technical Field

[0001] The present invention relates to an aluminum pipe support which is made of aluminum and allows reduction in weight, and further which is adjustable in length and allows high rigidity as a whole.

Background Art

[0002] In constructing a concrete structure, concrete is placed in a form. At this time, for example, in placing a slab, a pipe support is used in order to support the form from a lower floor or from below.

[0003] The pipe support in prior art is schematically configured with two pipes so as to be adjustable in length. In the configuration allowing adjustment in length, adjusting holes facing each other in the diameter directions are formed at equal pitches in the axial direction, on the fitting portions of an outer pipe and an inner pipe, and an adjusting pin is inserted into the adjusting holes in order to fix the fitting position after the overall length of the pipe support is adjusted. The pipe support in prior art includes washers which are respectively brought into contact with an installation surface and a form surface, at the opposite end parts to the fitting portions of the outer pipe and the inner pipe.

[0004] Japanese Industrial Standards (JIS) and other standards define axial rigidity, pressure resistance and the like (hereinafter, these are collectively referred to as "specified load") of the pipe support having the configuration described above in prior art. In order to satisfy the specified load, suitable material, that is, heavy material such as steel pipe or iron is used. This requires a great deal of labor for transportation to the site in placing a form.

[0005] Patent Document 1 discloses that, in order to reduce such labor of a worker, the pipe support described above, in the prior art, has components at least including an outer pipe and an inner pipe made of aluminum alloy.

[0006] Specifically, Patent Document 1 discloses that the pipe support of an aluminum alloy single pipe has the both end parts in the longitudinal direction with an outer diameter smaller than its average outer diameter and a wall thickness larger than its average wall thickness, and the center part in the longitudinal direction with an outer diameter larger than its average outer diameter and a wall thickness smaller than its average wall thickness, and the outer diameter and the wall thickness are changed smoothly from the both end parts to the center part.

[0007] As disclosed in Patent Document 1, although the use of aluminum contributes to the reduction in weight, the change in material may lead to unusable state due to falling short of the specified load, and may further pose a risk of collapse of the placed concrete together with the form at the site.

[0008] Although, in Patent Document 1, the pipe support is configured with the aluminum single pipe as described above in order to achieve the reduction in weight, the configuration does not allow adjustment in length (height).

[0009] In terms of the issue described above, the length itself of the pipe support is adjustable in the case where various types of length of the aluminum alloy single pipes according to Patent Document 1 are prepared, as an example. In this case, a plurality of the single pipes are used in combination for length adjustment, each having the inner periphery formed with female screws screwing in mutually opposite directions at the upper end and the lower end, and connected, by screwing a bolt formed with male screws screwing in mutually opposite directions from the center in the axial direction, to the inner peripheries of the end parts where the single pipes are fitted to each other. There still exists the following issue.

[0010] In the case of the configuration in which the plurality of aluminum alloy single pipes (either round pipes or rectangular pipes) according to Patent Document 1 are connected in the axial direction, the bolt inserted for length adjustment may be deformed and buckled due to the vertical load concentratedly applied thereon, resulting in that the specified load may not be satisfied as a whole.

[0011] To solve the above issue of Patent Document 1, the present patent applicants have supposed an aluminum pipe support in Patent Document 2. In Patent Document 2, the aluminum pipe support includes an aluminum outer pipe which has a pin insertion hole allowing a position fixing pin to be inserted into at one end in the axial direction, and an aluminum inner pipe which is configured to be inserted into the outer pipe and has a plurality of position adjusting holes formed at intervals in the axial direction so as to allow the pin to be inserted into. Each of the outer pipe and the inner pipe has a thickness of 1.5 to 4.5 mm at its thinnest portion. The inner diameter of the inner pipe is 1.5 to 2.5 times the inner diameter of the iron inner pipe satisfying the targeted specified load.

[0012] Patent Document 2 indicates, to exemplify the iron pipe support conforming to JIS, the pipe support which satisfies the specified (allowable) load of 9.8 kN (1000 kg) for use in an extended state to 19.6 kN (2000 kg) for use in a shortened state, includes an inner pipe having an outer diameter of 48.6 mm (a thickness of 2.5 mm and an 'inner diameter' of 43.6 mm) and an outer pipe having an outer diameter of 60.5 mm (a thickness of 2.3 mm and an 'inner diameter' of 55.9 mm), and has a weight of 15.7 kg, and discloses the aluminum pipe support configured with the inner pipe and the outer pipe satisfying the specified conditions described above.

[0013] In Patent Document 2, the inner pipe has an inner diameter of 65.4 mm which is 1.5 times the inner diameter (of 43.6 mm) of the inner pipe of the iron pipe support described above, and a thickness of 2.2 mm at the thinnest portion (an outer diameter of 69.8 mm). The outer pipe has an inner diameter of 70.0 mm, and a thickness of 2.2 mm at the thinnest portion (an outer diameter

of 74.4 mm).

[0014] A pipe support 1 having the configuration according to Patent Document 2 has a weight of 11.4 kg, which is lighter by approx. 4 kg compared to the iron pipe support having a weight of 15.7 kg, and satisfies the specified (allowable) load of 9.8 kN (1000 kg) for use in an extended state to 19.6 kN (2000 kg) for use in a shortened state. In other words, Patent Document 2 achieves the reduction in weight by approx. 25% compared to the iron pipe support.

[0015] The pipe support in Patent Document 2 is specialized in the reduction in weight while satisfying the specified load of the iron pipe support and, on the other hands, has a buckling resistance performance not exceeding the upper limit of the specified load of the iron pipe support.

Citation List

Patent Literature

[0016]

[Patent Document 1] Japanese Patent Application Laid-Open Publication No. H9-158500
[Patent Document 2] Japanese Patent Publication No. 6467393

Summary of Invention

Technical Problem

[0017] The problem to be solved is that although the aluminum pipe support according to Patent Document 2 is lighter in weight than the iron pipe support and satisfies the specified load of the iron pipe support of the same size, the aluminum pipe support has rigidity in quality lower than the specified load.

Solution to Problem

[0018] To solve the problem described above, in the present invention, an aluminum pipe support includes an aluminum outer pipe; an aluminum inner pipe configured to be inserted into the outer pipe; and a pin configured to be inserted and extracted through peripheral surfaces of the outer pipe and the inner pipe to fix positional adjustment conducted in terms of an overall height by an axial length of insertion of the inner pipe in the outer pipe. In the aluminum pipe support, two pieces of the pins are provided. The inner pipe has an outer periphery formed in any one of a regular hexagonal shape, a regular octagonal shape, and a regular decagonal shape, and has, at a position not subjected to insertion of the pin, a cross-sectional area of 1.96 times or larger than a cross-sectional area at a corresponding position of an inner pipe of a targeted-size iron pipe support. The outer pipe has an inner shape allowing the inner pipe to be inserted into, and has, at a position not subjected to the insertion of the pin, a cross-sectional area of 1.35 times or larger than a cross-sectional area at a corresponding position of an outer pipe of the targeted-size iron pipe support. The upper limits of the cross-sectional areas of the inner pipe and the outer pipe are set so that a total weight of the inner pipe and the outer pipe is lighter than a total weight of the inner pipe and the outer pipe of the targeted-size iron pipe support.

Advantageous Effects of Invention

[0019] The present invention satisfies the specified load of the targeted iron pipe support and achieves reduction in weight, and further achieves high rigidity exceeding the upper limit of the specified load of the targeted iron pipe support, through breaking down the fixed idea of considering that an aluminum product is low (poor) in rigidity.

[0020] Moreover, from the viewpoint of the specified load in JIS, in the case where the iron pipe support satisfying the specified load is used at the position where a load close to the upper limit is applied, an iron pipe support having a further larger specified (allowable) load, that is, a larger-size iron pipe support is used in consideration of safety, or alternatively an increased number of pipe supports per unit area are used. As a result, such increase in size or such increase in number leads to the increase in weight.

[0021] The aluminum pipe support according to the present invention achieves high rigidity, even while having a small rate in weight reduction to the total weight of the inner and outer pipes of the targeted iron pipe support. Accordingly, in the case described above, unlike the iron pipe support required to be larger in size, the aluminum pipe support according to the present invention may not be larger in size, or a smaller number of pipe supports per unit area compared to the number of iron pipe supports are required. As a result, in the entire site, the rate in weight reduction becomes large.

Brief Description of Drawings

[0022]

Fig. 1 is an external view schematically showing a configuration of an aluminum pipe support according to the present invention.
Fig. 2 is an exploded view of the aluminum pipe support according to the present invention.
Fig. 3 shows an inner pipe in the aluminum pipe support according to the present invention, specifically the upper view in Fig. 3 (a) and the front view in Fig. 3 (b).
Fig. 4 shows the inner pipe in the aluminum pipe support according to the present invention, specifically the cross-sectional view along an A-A line shown in Fig. 3 in Fig. 4 (a), and the cross-sectional

view along a B-B line shown in Fig. 2 in Fig. 4 (b).

Fig. 5 shows an outer pipe in the aluminum pipe support according to the present invention.

Fig. 6 shows the outer pipe in the aluminum pipe support according to the present invention, specifically the view from an arrow C shown in Fig. 5 in Fig. 6 (a), and the cross-sectional view along a D-D line shown in Fig. 5 in Fig. 6 (b).

Description of Embodiments

[0023] The present invention aims to provide an aluminum pipe support configured to be lighter in weight than a targeted iron pipe support and to satisfy the specified load of the targeted iron pipe support, and further to have rigidity in quality equal to or more than the specified load. In the aluminum pipe support including an aluminum outer pipe, an aluminum inner pipe configured to be inserted into the outer pipe, and a pin configured to be inserted and extracted through the peripheral surfaces of the outer pipe and the inner pipe to fix positional adjustment conducted in terms of the overall height by the axial length of the insertion of the inner pipe in the outer pipe, two pieces of the pins are provided, and the inner pipe has an outer periphery formed in any one of a regular hexagonal shape, a regular octagonal shape, and a regular decagonal shape, and has, at a position not subjected to insertion of the pin, a cross-sectional area of 1.96 times or larger than a cross-sectional area at a corresponding position of an inner pipe of a targeted-size iron pipe support, while the outer pipe has an inner shape allowing the inner pipe to be inserted into, and has, at a position not subjected to the insertion of the pin, a cross-sectional area of 1.35 times or larger than a cross-sectional area at a corresponding position of an outer pipe of the targeted-size iron pipe support. The upper limits of the cross-sectional areas of the inner pipe and the outer pipe are set so that the total weight of the inner pipe and the outer pipe is lighter than the total weight of the inner pipe and the outer pipe of the targeted-size iron pipe support.

[0024] In a general pipe support made of either iron or aluminum, the inner pipe also referred to as an insertion pipe is to be inserted (fitted) into the outer pipe from above in the vertical direction. Accordingly, the inner pipe has a smaller outer diameter than the outer pipe, and thus tends to buckle at an upper part in the vertical direction when used.

[0025] In the present invention, the aluminum pipe support is configured with the inner pipe and the outer pipe made of aluminum, thus requiring sufficient consideration of not only the small outer diameter of the inner pipe but also the rigidity of the material. In Patent Document 2, the thickness of the inner pipe and the inner diameter of the inner pipe are specified based on the idea that, when the inner diameter of the inner pipe is set so as to exhibit the load bearing strength satisfying the specified load, the size of the outer pipe having a larger diameter than the inner pipe is set correspondingly.

[0026] In Patent Document 2, 'the smallest thicknesses' under the conditions are set in the range of 1.5 to 4.5 mm, and the inner diameter of the inner pipe is set in the range of 1.5 to 2.5 times the inner diameter of the inner pipe of the iron pipe support. When these specifications are satisfied while attaching importance to safety, the thicknesses 'other than' the smallest thicknesses actually do not contribute to the rigidity and are excessive, and thus shall be subjected to further reduction in weight.

[0027] The present invention focuses on the relation between a cross-sectional area (and an allowable load) and a total weight, on the basis of the results of the test of confirming the limit value at which buckling occurs over the specified load, instead of applying the configuration in which the smallest thickness of the inner pipe and the inner diameter of the inner pipe are specified in Patent Document 2.

[0028] Specifically, in the present invention, with respect to the cross-sectional areas of the inner pipe and the outer pipe, the inner pipe has, at a position not subjected to the insertion of the pin, a cross-sectional area of 1.96 times or larger than the cross-sectional area at the corresponding position of the inner pipe of the targeted-size iron pipe support, and the outer pipe has, at a position not subjected to the insertion of the pin, a cross-sectional area of 1.35 times or larger than the cross-sectional area at the corresponding position of the outer pipe of the targeted-size iron pipe support. The lower limits of the cross-sectional areas are set by attaching importance to the satisfaction of the load bearing capacity of the targeted-size iron pipe support when extended.

[0029] The specified load may be satisfied when the cross-sectional areas of the inner pipe and the outer pipe are larger than those of the targeted-size iron pipe support. On the other hands, the pipe support does not need to have excessively large outer diameters or external sizes (equivalent to those of the targeted-size iron pipe support), by attaching importance to the satisfaction of the specified load of the targeted-size iron pipe support and the reduction in total weight compared to the total weight of the targeted-size iron pipe support.

[0030] In the case of the inner pipe and the outer pipe having smaller cross-sectional areas than the conditions of the present invention described above, that is, the case where the inner pipe has, at a position not subjected to the insertion of the pin, a cross-sectional area smaller than 1.96 times the cross-sectional area at the corresponding position of the inner pipe of the targeted-size iron pipe support and the outer pipe has, at a position not subjected to the insertion of the pin, a cross-sectional area smaller than 1.35 times the cross-sectional area at the corresponding position of the outer pipe of the targeted-size iron pipe support, the pipe support is reduced in weight, but does not satisfy the specified load of the targeted-size iron pipe support.

[0031] As the cross-sectional area is larger, the rigidity can be further enhanced as described above. On the

other hands, as the total weight of the inner pipe and the outer pipe increases, the merit of being made of aluminum reduces. Accordingly, the respective upper limits of the cross-sectional areas of the inner pipe and the outer pipe are set so that the total weight thereof is lighter than the total weight of the inner pipe and the outer pipe of the targeted-size iron pipe support.

[0032] Two pieces of the pins are provided to be used. In the inner pipe having the outer periphery formed in any one of a regular hexagonal shape, a regular octagonal shape and a regular decagonal shape, position adjusting holes respectively corresponding to the pins are formed at the positions coming into close contact with or in the vicinities of the inner surfaces of the two sides opposed to each other of the inner periphery. The two pins are inserted into these position adjusting holes, respectively.

[0033] In an example, the inner pipe has thickened portions which are formed at the portions not subjected to the insertion of the pins on the two sides opposed to each other on the inner surface of the inner pipe having the outer periphery formed in a regular hexagonal shape, a regular octagonal shape or a regular decagonal shape (the portions excluding the portions of the position adjusting holes), so as to be thickened in the range of 1.5 to 2.0 times the thickness of the inner pipe, continuously to the thickness of the inner pipe. If the thickened portions have a thickness smaller than 1.5 times the thickness of the inner pipe, the lower limit value of the cross-sectional area described above may not be satisfied, and accordingly the rigidity may be insufficient. If the thickened portions have a thickness larger than 2.0 times, the thickness may not contribute to the reduction in weight.

[0034] In the range along the axial direction where the position adjusting holes are provided, the thickened portions are not formed at the portions where the position adjusting holes are formed and allow the pins to be inserted into. In other words, the thickened portions are formed with the gaps corresponding to the height of the pins in the axial direction.

[0035] The arrangement of the thickened portions allows the thickened portions to surely support the pins subjected to pressure and load, prevents buckling caused by the portions in the inner pipe in an extended state having a smaller outer diameter than the outer pipe, and further allows the reduction in weight compared to the iron pipe support and achieves high rigidity exceeding the specified load of the iron pipe support of the same size.

[0036] As described above, in the prevent invention, two pieces of the pins are used, and the proper values of the cross-sectional areas of the aluminum inner and outer pipes are set through trial and error, resulting in that the pipe support is reduced in weight compared to the targeted iron pipe support, and the specified load is satisfied. Moreover, a pipe support having an excellent property of either light weight or high rigidity is properly used.

Embodiments

[0037] One embodiment according to the present invention will be described below with reference to Fig. 1 to Fig. 6. An aluminum pipe support 1 (hereinafter, referred to as a pipe support) configured to support a form for concrete placement in the present invention has major components of an outer pipe 2 and an inner pipe 3 made of aluminum, and two iron pines 2A, 2A.

[0038] In the present embodiment, the targeted-size iron pipe support has the following specifications.

Targeted-size iron pipe support: 3486 to 2121 mm
Outer pipe

Outer diameter: 60.5 mm
Thickness: 2.3 mm
Cross-sectional area: 420.2 mm^2

Inner pipe

Outer diameter: 48.6 mm
Thickness: 2.3 mm
Cross-sectional area: 334.0 mm^2

Total weight: 14.2 kg
Load bearing capacity: 14.7 kN (when extended to 3.4 m)

[0039] In the present embodiment, the outer pipe 2 has the inner periphery formed in, for example, a regular octagonal shape, and the outer periphery which is formed in the same regular octagonal shape as with the inner periphery and has, at the corner portions, ribs 2a protruding to the outward directions and extending in the axial direction. The outer pipe 2 has, on the peripheral surface in the end part in the axial direction on the ribs 2a where the inner pipe 3 is to be inserted into (hereinafter, the end part is referred to as the upper part of the outer pipe 2), a male screw 2b formed in a spiral concave shape (compared to the ribs 2a) as a whole.

[0040] The outer pipe 2 further has the pins 2A, 2A for position fixing with chains at two of the ribs 2a (the male screw 2b) different in position at the upper end part. The pins 2A, 2A are made of iron, and respectively have a thickness t of, for example, 4.5 mm.

[0041] The outer pipe 2 is formed with pin insertion holes 2c, 2c which penetrate from one-side outer periphery to another-side outer periphery and allow the pins 2A, 2A to be inserted into, at the positions which are close by the thicknesses of the outer pipe 2 and the inner pipe 3 to the center from the both ends in the orthogonal direction to the axial direction in the front view of the upper end part in the axial direction shown in Fig. 5, that is, in the width direction. In the present embodiment, the pin insertion holes 2c, 2c are formed to be opened wider by, for example, 0.4 mm compared to the thickness t of the pin 2A, in a length of, for example, 188 mm from the

positions lower by, for example, 50 mm from the upper end in the axial direction.

[0042] The outer pipe 2 according to the present embodiment has an outer diameter including the ribs 2a of, for example, 100 mm, and an outer diameter excluding the ribs 2a of, for example, 86.2 mm, a length in the axial direction of, for example, 1620 mm, and an inner periphery formed in, for example, a regular octagonal shape.

[0043] The outer pipe 2 has a thickness of, for example, 2.0 mm at the portion where none of the ribs 2a is provided and the position not subjected to the insertion of the pins 2A, 2A (the position where none of the pin insertion holes 2c, 2c is formed), and a cross-sectional area of 880 mm^2 including the ribs 2a. The cross-sectional area including the ribs 2a corresponds to approx. 2.10 times the cross-sectional area of the outer pipe of the targeted-size iron pipe support described above.

[0044] Moreover, the outer pipe 2 has, on the outer periphery, an adjusting ring 2B which is configured to screw with the male screw 2b so as to move and slightly adjust the pin 2A inserted in the pin insertion hole 2c and support the pins 2A, 2A. The adjusting ring 2B moves in a forward and backward threaded manner along the male screw 2b while supporting the pin 2A by the upper part, thereby making the pin 2A move in the pin insertion hole 2c in the axial direction so as to slightly adjust the overall length of the pipe support 1.

[0045] The inner pipe 3 is configured to be inserted into the outer pipe 2, and has an outer diameter of, for example, 79.7 mm, a thickness of, for example, 3.0 mm at the position where none of a thickened portion 3A to be described later is formed, a length in the axial direction of, for example, 2200 mm, and an outer periphery formed in, for example, a regular octagonal shape so as to allow the outer pipe 2 to be inserted into, in the present embodiment.

[0046] The inner pipe 3 has the thickened portions 3A which are formed on the two sides opposed to each other on the inner periphery so as to be thickened compared to the thickness of the inner pipe 3, continuously to the thickness of the inner pipe 3. In other words, in the present embodiment, the pin 2A inserted in a position adjusting hole 3B through the outer pipe 2 is supported by the thickened portion 3A.

[0047] The inner pipe 3 has the position adjusting holes 3B, 3B which penetrate from one-side outer periphery to another-side outer periphery of the periphery so as to be bored at an interval on the thickened portions 3A, 3A in the axial direction, and has a cross-sectional area including the thickened portion 3A, 3A of 1036 mm^2. The cross-sectional area including the thickened portion 3A, 3A corresponds to approx. 3.10 times the cross-sectional area of the inner pipe of the targeted-size iron pipe support described above.

[0048] The reference numeral 4 is an outer pipe washer provided so as to be fitted inwardly to the end face opposite to the side with the rib 2a formed in the axial direction of the outer pipe 2. The reference numeral 5 is an inner pipe washer provided so as to be fitted outwardly to the end face opposite to the side subjected to the insertion in the outer pipe 2 in the axial direction of the inner pipe 3.

[0049] The results of a buckling test and the confirmation of weight with respect to the pipe support 1 having the configuration described above according to the present invention will be described below. In the buckling test based on assumption of the use in an extended state, the inner pipe inserted in the outer pipe installed on a flat place is left still for a predetermined period of time under the pressure vertically (downwardly in the axial direction) applied from the upper end of the inner pipe, and is observed to check the occurrence of buckling or the like, and repeatedly subjected to more pressure (in increments of 1t) after a predetermined period of time for observation until buckling occurs.

[0050] The pipe support 1 in Example 1 having the configuration described above is configured so as to realize 'high rigidity' with the total weight slightly lighter than that of the targeted-size iron pipe support described above. The pipe support 1 in Example 2 is configured so as to realize 'large reduction in weight' with the rigidity slightly higher than that of the targeted-size iron pipe support described above. The values enclosed in parentheses below indicate rates of change with respect to the targeted-size iron pipe support described above.

<Example 1> 3492 mm when extended to 2421 mm when shortened

Cross-sectional area of outer pipe: 880.0 mm^2 (approx. 2.41 times)
Cross-sectional area of inner pipe: 1036.0 mm^2 (approx. 3.25 times)
Total weight: 13.1 kg (approx. 0.94 times)
Load bearing capacity when extended: 35 kN (approx. 2.38 times)

<Example 2> 3492 mm when extended to 2421 mm when shortened

Cross-sectional area of outer pipe: 491.6 mm^2 (approx. 1.35 times)
Cross-sectional area of inner pipe: 624.5 mm^2 (approx. 1.96 times)
Total weight: 9.0 kg (approx. 0.64 times)
Load bearing capacity when extended: 15 kN (approx. 1.02 times)

[0051] According to the test, Example 1 is reduced in total weight by approx. 6% and has high rigidity with a load bearing capacity of 200% or more, and Example 2 is higher in load bearing capacity by approx. 2% and is drastically reduced in total weight by 30% or more.

[0052] Accordingly, the present invention allows more options of products depending on placing importance on high rigidity or light weight compared to the targeted-size

iron pipe support. In an example, in the former case, a smaller number of pipe supports per unit area are required, resulting in achieving the reduction of the number of pipe supports to be conveyed and the reduction of the positions of arrangement, while in the latter case, resulting in achieving the reduction of the labor of workers who convey those to the positions of arrangement.

Reference Signs List

[0053]

1: (ALUMINUM) PIPE SUPPORT
2: OUTER PIPE

2a: RIB
2c: PIN INSERTION HOLE
2A: PIN

3: INNER PIPE

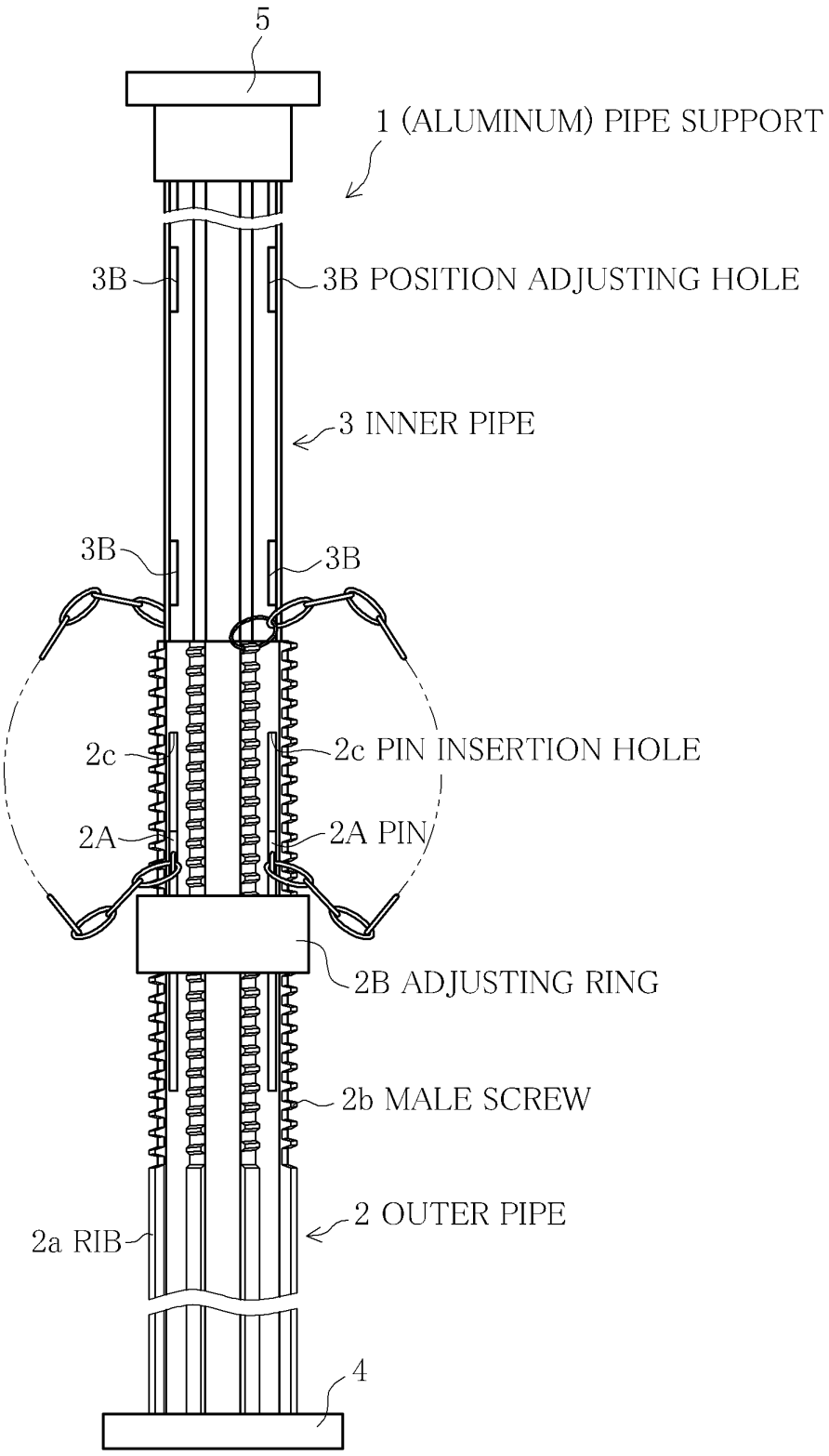
3A: THICKENED PORTION
3B: POSITION ADJUSTING HOLE

Claims

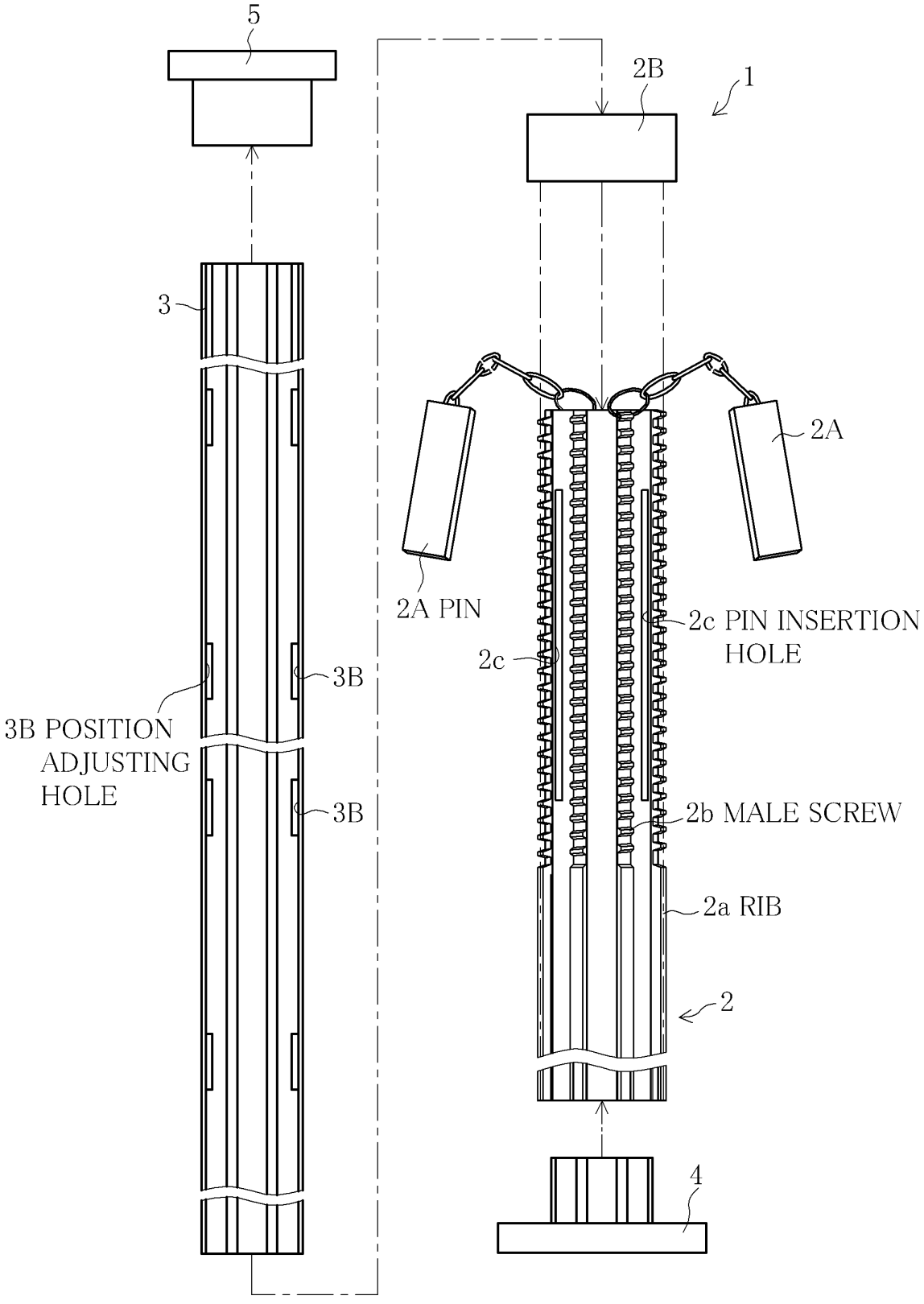
1. An aluminum pipe support configured to support a form for concrete placement, the aluminum pipe support comprising:

an aluminum outer pipe;
an aluminum inner pipe configured to be inserted into the outer pipe; and
a pin configured to be inserted and extracted through peripheral surfaces of the outer pipe and the inner pipe to fix positional adjustment conducted in terms of an overall height by an axial length of insertion of the inner pipe in the outer pipe, wherein,
two pieces of the pins are provided,
the inner pipe has an outer periphery formed in any one of a regular hexagonal shape, a regular octagonal shape, and a regular decagonal shape, and has, at a position not subjected to insertion of the pin, a cross-sectional area of 1.96 times or larger than a cross-sectional area at a corresponding position of an inner pipe of a targeted-size iron pipe support,
the outer pipe has an inner shape allowing the inner pipe to be inserted into, and has, at a position not subjected to the insertion of the pin, a cross-sectional area of 1.35 times or larger than a cross-sectional area at a corresponding position of an outer pipe of the targeted-size iron pipe support, and
upper limits of the cross-sectional areas of the inner pipe and the outer pipe are set so that a total weight of the inner pipe and the outer pipe is lighter than a total weight of the inner pipe and the outer pipe of the targeted-size iron pipe support.

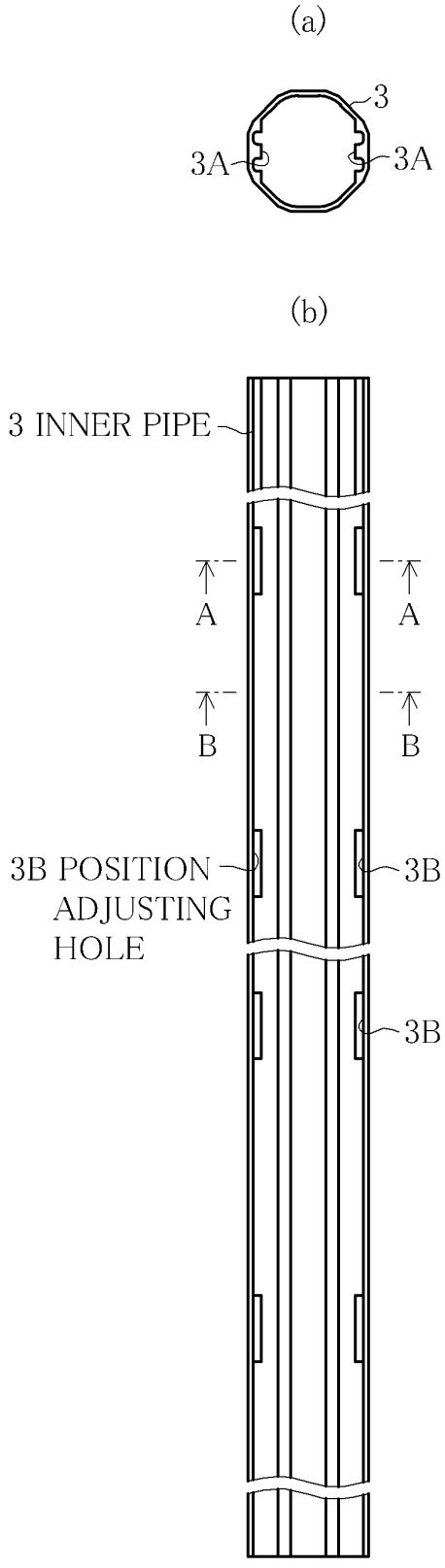
【FIG.1】


5
1 (ALUMINUM) PIPE SUPPORT
3B
3B POSITION ADJUSTING HOLE
3 INNER PIPE
3B
3B
2c
2c PIN INSERTION HOLE
2A
2A PIN
2B ADJUSTING RING
2b MALE SCREW
2a RIB
2 OUTER PIPE
4

【FIG.2】

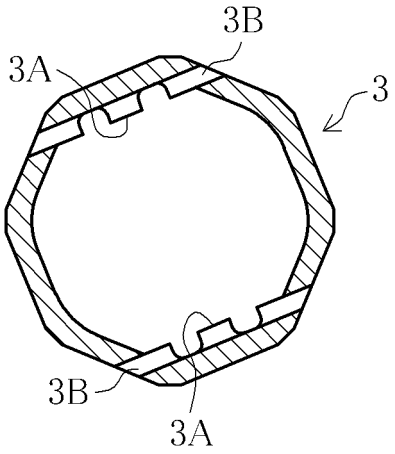

5
2B
1
3
2A
2A PIN
2c PIN INSERTION HOLE
2c
3B
3B POSITION ADJUSTING HOLE
3B
2b MALE SCREW
2a RIB
2
4

【FIG.3】

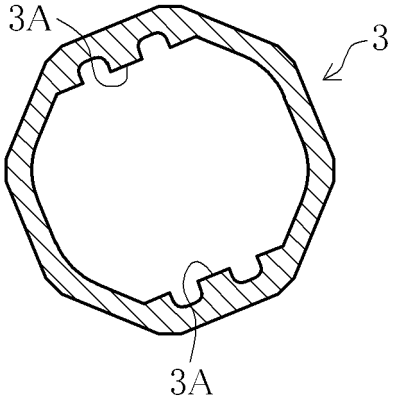


【FIG.4】

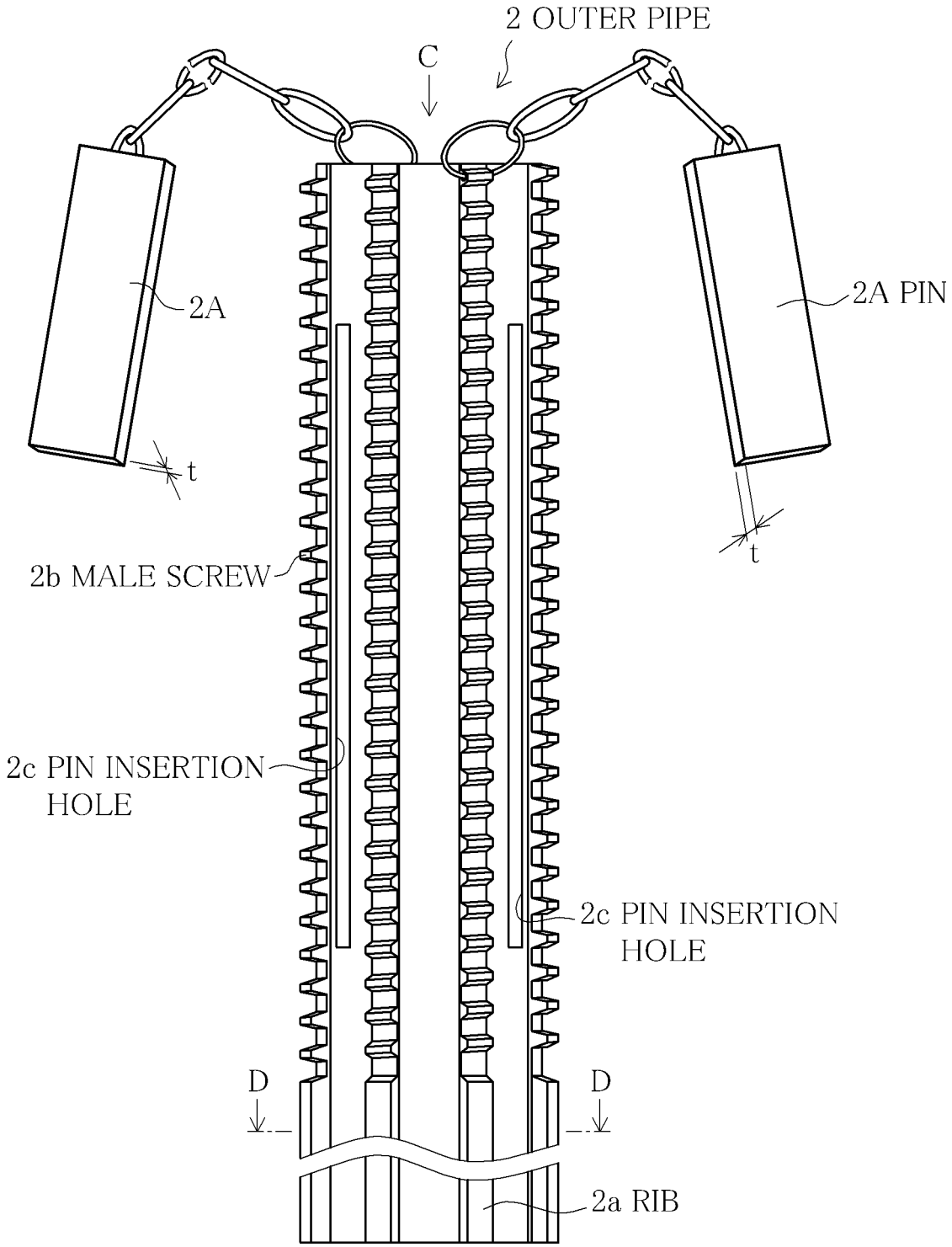
(a)



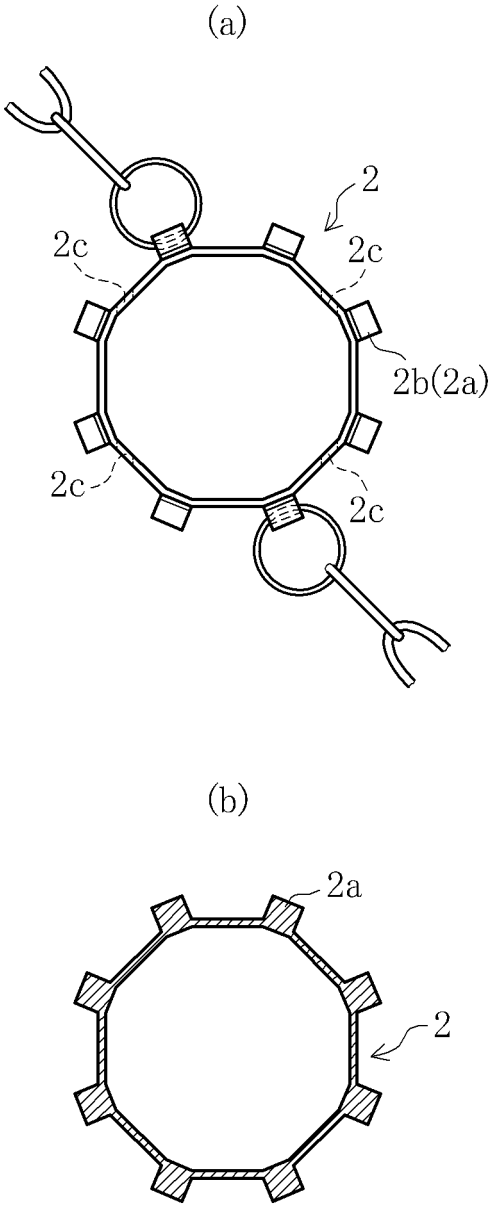
(b)



【FIG.5】


2 OUTER PIPE
C
2A
2A PIN
t
t
2b MALE SCREW
2c PIN INSERTION HOLE
2c PIN INSERTION HOLE
D
D
2a RIB

【FIG.6】



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2022/021383

A. CLASSIFICATION OF SUBJECT MATTER

E04G 25/06(2006.01)i; ***E04G 1/08***(2006.01)i; ***E04G 7/34***(2006.01)i; ***E04G 25/00***(2006.01)i
FI: E04G25/06 A; E04G1/08; E04G7/34 302A; E04G25/00 C

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E04G25/06; E04G1/08; E04G7/34; E04G25/00

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

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2022
Registered utility model specifications of Japan 1996-2022
Published registered utility model applications of Japan 1994-2022

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2018-71267 A (FORBUILD K.K.) 10 May 2018 (2018-05-10) paragraphs [0023]-[0036], fig. 1-4	1
A	JP 2016-176287 A (FORBUILD K.K.) 06 October 2016 (2016-10-06)	1
A	CD-ROM of the specification and drawings annexed to the request of Japanese Utility Model Application No. 54403/1993 (Laid-open No. 10532/1994) (NIPPON LIGHT METAL CO., LTD.) 10 February 1994 (1994-02-10)	1

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 July 2022	**02 August 2022**
Name and mailing address of the ISA/JP **Japan Patent Office (ISA/JP)** **3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915** **Japan**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/JP2022/021383

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 2018-71267 A	10 May 2018	(Family: none)	
JP 2016-176287 A	06 October 2016	(Family: none)	
JP 6-10532 U1	10 February 1994	(Family: none)	

Form PCT/ISA/210 (patent family annex) (January 2015)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP H9158500 A **[0016]**
- JP 6467393 B **[0016]**