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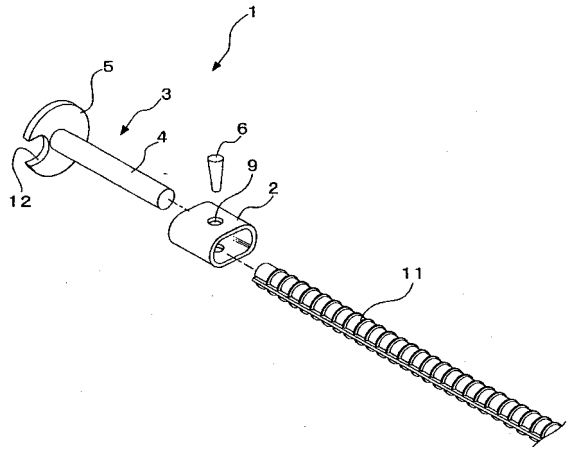
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(54) FIXING TOOL FOR REINFORCING ROD

(57) A reinforcing bar anchorage 1 in accordance with the present invention includes a sleeve 2 having an ellipsoidal cross-sectional shape, an anchoring member 3, and a wedge member 6. The anchoring member 3 includes a steel plate 5 having a substantially circular plate-like body and a connection rod 4 provided upright on the steel plate. The connection rod 4 is formed from a straight steel rod having a circular cross-section. The sleeve 2 is configured such that the connection rod 4 and the reinforcing bar 11 can be inserted thereinto while the connection rod 4 and the reinforcing bar 11 can be parallel to each other so as to overlap each other by a predetermined length. Wedge insertion holes 9, 9 are formed in the sleeve 2 between the reinforcing bar 11 and the connection rod 4 so as to be opposed to each other. A wedge member 6 is designed to be inserted into the wedge insertion holes 9, 9 for press-fitting.

FIG.3



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Description

TECHNICAL FIELD

[0001] The present invention relates to a reinforcing bar anchorage used in reinforced concrete structures (RC structures) and steel-reinforced concrete structures (SRC structures).

BACKGROUND ART

[0002] In RC structures and SRC structures, adhesion between reinforcing bars and concrete is ensured by embedding a predetermined length or more of the end portions of the reinforcing bars in the concrete, and the adhesion force along that length prevents the reinforcing bars from being pulled out of the concrete.

[0003] The embedment of end portions of reinforcing bars in concrete for preventing the reinforcing bars from being pulled out is called anchoring. When RC structures and SRC structures are designed and constructed, it is important to provide anchoring appropriate to the parts of the structures.

[0004] The anchoring of the end portions of reinforcing bars is achieved by providing an appropriate anchorage length. However, in areas such as beam-column joints, the end portions of reinforcing bars intersect one another in a complex manner, and these results in overcrowding of the reinforcing bars. Hence, the bar arrangement and concrete casting operations may not be easy to perform. In particular, when the bending moment required for a design is large, large-diameter reinforcing bars must be employed. With any increase in the anchorage length, the above tendency to overcrowd becomes apparent. In addition, since reinforcing bars having a large tensile strength need to be employed, it is difficult to bend the reinforcing bars themselves.

[0005] Therefore, a technique has been widely used in which an anchoring member is attached to the end portions of reinforcing bars in order to solve problems during bar arrangement or concrete casting caused by congestion of the reinforcing bars. Specifically, the problem of preventing the pulling out of the reinforcing bars is solved not by providing an appropriate anchorage length, but by the resistance to pulling out provided by the attached anchoring member.

[0006] As anchoring members to be used in the above technique, various structures and various shapes are known. For example, disk-shaped anchoring members friction-pressure-welded to reinforcing bars, anchoring members joined to reinforcing bars through a joint member, disk-shaped anchoring members screwed to reinforcing bars, and the like are known.

[0007]

[Patent Document 1] Japanese Patent Application Laid-Open No. 2004-84204

[Patent Document 2] Publication of Japanese Patent No. 3763877

DISCLOSURE OF THE INVENTION

PROBLEM TO BE SOLVED BY THE INVENTION

[0008] However, in conventional methods in which an anchoring member is screwed to a reinforcing bar or is joined to a reinforcing bar through a joint member, a problem exists in that the reinforcing bar must be threaded. In addition to this, a problem arises in that, when anchoring members are rotated during attachment at a worksite, the attachment operation may not be properly completed because the anchoring members interfere with reinforcing bars therearound. Furthermore, even when the attachment operation can be completed, another problem exists in that workability is poor. Moreover, another problem arises in that attachable positions for anchoring members are limited since, in the course of screwing them on, the anchoring members contact the end portions of the reinforcing bars.

[0009] The present invention has been made in view of the above circumstances, and it is an object of the invention to provide a reinforcing bar anchorage which provides excellent workability at a worksite and is applicable to any reinforcing bar without threading.

[0010] It is another object of the invention to provide a reinforcing bar anchorage having an anchoring member capable of being attached at any position on a reinforcing bar.

[0011] In order to achieve the above objects, a first aspect of the present invention provides a reinforcing bar anchorage including: an anchoring member including an anchoring portion and a connection rod extending from the anchoring portion; a sleeve which has an elliptical cross-sectional shape and allows the connection rod and a reinforcing bar to be connected to the connection rod to be inserted thereinto such that the connection rod and the reinforcing bar are arranged so as to overlap each other by a predetermined length, the sleeve having wall portions including a pair of opposing flat wall portions; and a wedge member which is to be inserted into wedge insertion holes formed in the respective opposing flat wall portions of the sleeve, and which is to be press-fitted between the connection rod and the reinforcing bar.

[0012] In the reinforcing bar anchorage according to the first aspect of the invention, the anchoring portion may be formed as a plate-like body, and a reinforcing bar insertion opening for allowing the reinforcing bar to pass therethrough may be formed in the plate-like body.

[0013] Moreover, in the reinforcing bar anchorage according to the first aspect of the invention, the anchoring portion may be formed as an annular-shaped body, and the reinforcing bar may be allowed to pass through a space surrounded by the annular-shaped body.

[0014] Furthermore, in the reinforcing bar anchorage according to the first aspect of the invention, the connection rod may include two connection rod bodies parallel

to each other, and the sleeve may be configured to allow the reinforcing bar and the two connection rod bodies to be inserted thereinto with the reinforcing bar sandwiched between the two connection rod bodies. In addition to this, two pairs of the wedge insertion holes may be provided at respective positions each of which is located between the reinforcing bar and one of the connection rod bodies and which are substantially symmetric with respect to an axis of the reinforcing bar.

[0015] A second aspect of the present invention provides a reinforcing bar anchorage including: an anchoring member including a sleeve having an ellipsoidal cross-sectional shape, the anchoring member having wall portions including a pair of opposing flat wall portions; an anchoring member-securing rod which is to be inserted, together with a reinforcing bar to which the anchoring member is to be secured, into the anchoring member such that the anchoring member-securing rod and the reinforcing bar are arranged so as to overlap each other by a predetermined length; and a wedge member which is to be inserted into wedge insertion holes formed in the respective opposing flat wall portions of the anchoring member, and which is to be press-fitted between the anchoring member-securing rod and the reinforcing bar.

[0016] In the reinforcing bar anchorage according to the second aspect of the invention, a flange-like protrusion may be provided on a periphery of the sleeve.

[0017] Moreover, in the reinforcing bar anchorage according to the second aspect of the invention, the anchoring member-securing rod may include two securing rod bodies, and the anchoring member may be configured to allow the reinforcing bar and the two securing rod bodies to be inserted thereinto with the reinforcing bar sandwiched between the two securing rod bodies. In addition to this, two pairs of the wedge insertion holes may be provided at respective positions each of which is located between the reinforcing bar and one of the securing rod bodies and which are substantially symmetric with respect to an axis of the reinforcing bar.

[0018] A third aspect of the present invention provides a reinforcing bar anchorage including: an anchoring member including an anchoring portion and a series connection rod extending from the anchoring portion; a sleeve having an ellipsoidal cross-sectional shape, the sleeve having wall portions including a pair of opposing flat wall portions; an anchoring member-securing rod which is to be inserted into the sleeve together with the series connection rod and a reinforcing bar to which the anchoring member is to be secured, the anchoring member-securing rod being arranged to be disposed on one side of the series connection rod and the reinforcing bar with the series connection rod and the reinforcing bar aligned on a straight line; and a wedge member which is to be inserted into wedge insertion holes formed in the respective opposing flat wall portions of the sleeve, and which is to be press-fitted between the anchoring member-securing rod and the series connection rod and between the anchoring member-securing rod and the reinforcing bar.

[0019] In the reinforcing bar anchorage according to the third aspect of the invention, the anchoring member-securing rod may include two rods provided on both sides of the reinforcing bar and the series connection rod so as to sandwich the reinforcing bar and the series connection rod therebetween.

[0020] Moreover, in the reinforcing bar anchorage according to the third aspect of the invention, the anchoring portion may be formed as a plate-like body, and a rod insertion opening for allowing the anchoring member-securing rod to pass therethrough may be formed in the plate-like body.

[0021] In the reinforcing bar anchorage according to the first aspect of the invention, the reinforcing bar is anchored in concrete by the anchoring member including the anchoring portion and the connection rod extending from the anchoring portion. In order to attach the anchoring member to the reinforcing bar, the connection rod of the anchoring member and the reinforcing bar are first inserted into the sleeve so as to be arranged with the connection rod and the reinforcing bar overlapping each other by a predetermined length. Next, the wedge member is inserted into the wedge insertion holes for press-fitting.

[0022] In this manner, the reinforcing bar is not required to be threaded, and labor involved in threading can be omitted.

[0023] Moreover, since the anchoring member need not be rotated when being attached to the reinforcing bar, the anchoring member is prevented from interfering with other reinforcing bars during the attachment operation. In addition to this, since the anchoring member can be firmly secured to the reinforcing bar simply by press-fitting the wedge member, the workability of the bar arrangement operation at a worksite is significantly improved.

[0024] The sleeve includes: a pair of semicylindrical wall portions which are arranged such that the curved inner surfaces thereof are opposed to each other; and a pair of flat wall portions each extending to the corresponding edges of the respective semicylindrical wall portions. The inner space of the sleeve includes: a reinforcing bar insertion space on the inner side of one of the semicylindrical wall portions; and a rod insertion space on the inner side of the other semicylindrical wall portion. The reinforcing bar is inserted into the reinforcing bar insertion space, and the connection rod is inserted into the rod insertion space. When the reinforcing bar and the connection rod are inserted into the sleeve, they are arranged in parallel to each other within the sleeve.

[0025] The wedge insertion holes are formed in the respective flat wall portions so as to be located between the reinforcing bar and the connection rod.

[0026] When the wedge member is driven into the space between the reinforcing bar and the connection rod, it bites into and engages both the reinforcing bar and the connection rod by taking the reaction force from the

semicylindrical wall portions of the sleeve.

[0027] As described above, a tapered portion of the wedge member bites into both the reinforcing bar and the connection rod. Which of the reinforcing bar and the connection rod is bitten into to a larger degree depends mainly on the difference in hardness between the two. If the tapered portion does not sufficiently bite into the reinforcing bar, the engaging force between the reinforcing bar and the wedge member will be insufficient.

[0028] Therefore, it is desirable that the connection rod have a hardness that is equivalent to or higher than that of the reinforcing bar so that the wedge member can bite into the reinforcing bar to the extent permitted by the design.

[0029] The anchoring portion may have any structure and any shape, so long as it has a desired anchorage strength. However, if the anchoring portion is formed as a plate-like body with a reinforcing bar insertion opening formed in it for allowing the reinforcing bar to pass therethrough, interference between the anchoring portion and the reinforcing bar can be prevented by the reinforcing bar insertion opening. Hence, the anchoring member can be attached at any position on the reinforcing bar.

[0030] Also in the configuration in which the anchoring portion is formed as an annular-shaped body and the reinforcing bar is passed through a space surrounded by the annular-shaped body, interference between the anchoring portion and the reinforcing bar can be prevented, as in the above case. Hence, the anchoring member can be attached at any position on the reinforcing bar.

[0031] The connection rod can be formed from, for example, a straight steel rod having a circular cross-section. The connection rod is not limited to being formed of a single body. For example, the connection rod may be formed of two connection rod bodies parallel to each other. In this case, the sleeve is configured such that the reinforcing bar and the two connection rod bodies can be inserted thereinto with the reinforcing bar sandwiched between the two connection rod bodies. In addition to this, two pairs of the wedge insertion holes are provided at respective positions each of which is located between the reinforcing bar and one of the connection rod bodies and which are substantially symmetric with respect to the axis of the reinforcing bar.

[0032] In this configuration, not only is the anchoring member more firmly secured to the reinforcing bar, but also the tensile force from the reinforcing bar is transmitted to the anchoring portion without being decentered since the securing structure of the anchoring member is symmetric with respect to the axis of the reinforcing bar. Hence, more stable anchoring is ensured.

[0033] In the reinforcing bar anchorage according to the second aspect of the invention, the reinforcing bar is anchored in concrete by the anchoring member including the sleeve having an ellipsoidal cross-sectional shape. In order to attach the anchoring member to the reinforcing bar, the anchoring member-securing rod and the reinforcing bar are inserted into the anchoring member so as to be arranged with the anchoring member-securing rod and the reinforcing bar overlapping each other by a predetermined length. Next, the wedge member is inserted into the wedge insertion holes for press-fitting.

[0034] In this manner, the reinforcing bar is not required to be machined, and conventionally required labor involved in threading the reinforcing bar can be omitted.

[0035] Moreover, since the anchoring member need not be rotated when being attached to the reinforcing bar, the anchoring member is prevented from interfering with other reinforcing bars during the attachment operation. Furthermore, since the anchoring member can be firmly secured to the reinforcing bar simply by press-fitting the wedge member, the workability of the bar arrangement operation at a worksite is significantly improved.

[0036] In contrast to the first aspect, in the second aspect, the sleeve serves as the anchoring member and acts against the tensile force of the reinforcing bar. The action and the configuration of other components of the sleeve are generally the same as those of the sleeve according to the first aspect, and therefore the description thereof is omitted. The description of the wedge member is also omitted.

[0037] Further, when the flange-like protrusion is provided on the periphery of the sleeve, a larger anchorage force can be ensured.

[0038] Similarly to the connection rod, the anchoring member-securing rod can be formed from, for example, a straight steel rod having a circular cross-section. The anchoring member-securing rod is not limited to being formed of a single body. For example, the anchoring member-securing rod may be formed of two securing rod bodies. In this case, the anchoring member may be configured such that the reinforcing bar and the two securing rod bodies can be inserted thereinto with the reinforcing bar sandwiched between the two securing rod bodies. In addition, two pairs of the wedge insertion holes are provided at respective positions each of which is located between the reinforcing bar and one of the securing rod bodies and which are substantially symmetric with respect to the axis of the reinforcing bar.

[0039] In this configuration, not only is the anchoring member more firmly secured to the reinforcing bar, but also the tensile force from the reinforcing bar is transmitted to the anchoring member without being decentered since the securing structure of the anchoring member is symmetric with respect to the axis of the reinforcing bar. Hence, more stable anchoring is ensured.

[0040] In the reinforcing bar anchorage according to the third aspect of the invention, the reinforcing bar is anchored in concrete by an anchoring member including the anchoring portion and the series connection rod extending from the anchoring portion. The anchoring member is attached to the reinforcing bar in the following manner. The reinforcing bar, the series connection rod, and the anchoring member-securing rod are inserted into the sleeve such that the reinforcing bar and the series connection rod are aligned on the same straight line and that

the anchoring member-securing rod is disposed on one side of the reinforcing bar and the series connection rod. In this state, the wedge member is inserted into the wedge insertion holes for press-fitting.

In this manner, the reinforcing bar is not required to be machined, and conventionally required labor involved in threading the reinforcing bar can be omitted.

[0041] Moreover, since the anchoring member need not be rotated when being attached to the reinforcing bar, the anchoring member is prevented from interfering with other reinforcing bars during the attachment operation. Furthermore, since the anchoring member can be firmly secured to the reinforcing bar simply by press-fitting the wedge member, the workability of bar arrangement operation at a worksite is significantly improved.

[0042] The third aspect is different from the first aspect in that the series connection rod of the anchoring member and the reinforcing bar are aligned on the same straight line. However, the action and the configuration of other components of the sleeve, the wedge insertion holes, and the wedge member are generally the same as those of the first aspect, and therefore the description thereof is omitted.

BRIEF DESCRIPTION OF THE DRAWINGS

[0043]

Fig. 1 is a front view of a reinforcing bar anchorage according to a first embodiment.

Figs. 2(a) and 2(b) are sectional views of the reinforcing bar anchorage, Fig. 2(a) being a sectional view taken along line A-A, Fig. 2(b) being a sectional view taken along line B-B.

Fig. 3 is an exploded perspective view of the reinforcing bar anchorage.

Fig. 4 is a perspective view showing a state in which the assembly of the reinforcing bar anchorage is completed.

Fig. 5 is a diagram showing a state where the reinforcing bar anchorages according to the first embodiment are disposed in a staggered manner.

Fig. 6 is a diagram showing a state where the reinforcing bar anchorages according to the first embodiment are attached to respective reinforcing bars with end portions being irregularly positioned such that the anchoring portions of the reinforcing bar anchorages are aligned at the same height.

Figs. 7(a) and 7(b) are front views showing an anchoring member of a modification and an anchorage using the same.

Figs. 8(a) and 8(b) are perspective views showing an anchoring member of another modification and an anchorage using the same, respectively.

Fig. 9 is an exploded perspective view showing a reinforcing bar anchorage of another modification.

Figs. 10(a) and 10(b) are front views showing reinforcing bar anchorages of other modifications, respectively.

Fig. 11 is a front view showing a reinforcing bar anchorage of another modification.

Figs. 12(a) and 12(b) are sectional views of the modification shown in Fig. 11, Fig. 12(a) being a sectional view taken along line C-C, Fig. 12(b) being a sectional view taken along line D-D.

Figs. 13(a) and 13(b) are diagrams showing a reinforcing bar anchorage according to a second embodiment, Fig. 13(a) being a front view, Fig. 13(b) being a sectional view taken along line E-E.

Fig. 14 is a front view showing a reinforcing bar anchorage of a modification.

Figs. 15(a) and 15(b) are front views showing reinforcing bar anchorages of other modifications, respectively.

Fig. 16 is a front view showing a reinforcing bar anchorage of another modification.

Fig. 17 is a front view showing a reinforcing bar anchorage according to a third embodiment.

Figs. 18(a) and 18(b) are diagrams showing the reinforcing bar anchorage according to the third embodiment, Fig. 18(a) being a sectional view taken along line F-F, Fig. 18(b) being a sectional view taken along line G-G.

Fig. 19 is a front view showing a reinforcing bar anchorage of a modification.

Fig. 20 is a front view showing a reinforcing bar anchorage of another modification.

Figs. 21(a) and 21(b) are sectional views of the modification shown in Fig. 20, Fig. 21(a) being a sectional view taken along line H-H, Fig. 21(b) being a sectional view taken along line I-I.

Fig. 22 is a front view showing a reinforcing bar anchorage of another modification.

Figs. 23(a) and 23(b) are sectional views of the modification shown in Fig. 22, Fig. 23(a) being a sectional view taken along line J-J, Fig. 23(b) being a sectional view taken along line K-K.

Fig. 24 is a front view showing a reinforcing bar anchorage of another modification.

Fig. 25 is a front view showing a reinforcing bar anchorage of another modification.

DESCRIPTION OF REFERENCE NUMERALS

[0044]

1, 1a, 101, 121,	161 reinforcing bar anchorage
2, 102	sleeve
3, 3a, 73, 103	anchoring member
4	connection rod
5, 5a, 105	steel plate (plate, anchoring portion)
6	wedge member
9	wedge insertion hole
11	reinforcing bar
12, 112	reinforcing bar insertion opening
71	annular-shaped body (anchoring

	portion)
104	connection rod body
122	anchoring member
123, 162	anchoring member-securing rod
131	flange-like protrusion
133, 151	anchoring member
163	anchoring member
164	series connection rod
165	steel plate (plate, anchoring portion)
166	sleeve
193, 213	anchoring member
194, 214	steel plate (plate, anchoring portion)
195, 234	rod insertion opening
224, 234	steel plate (plate, anchoring portion)
225, 235	rod insertion opening

BEST MODE FOR CARRYING OUT THE INVENTION

[0045] Hereinafter, a reinforcing bar anchorage according to preferred embodiments of the present invention will be described with reference to the accompanying drawings. It should be noted that components and the like substantially identical to those of conventional technology will be designated by the same reference numerals, and a description thereof will be omitted.

(First Embodiment)

[0046] Fig. 1 is a front view showing a reinforcing bar anchorage according to a first embodiment. Figs. 2(a) and 2(b) are sectional views of the reinforcing bar anchorage, and Fig. 3 is an exploded perspective view of the reinforcing bar anchorage. As can be seen from these figures, the reinforcing bar anchorage 1 in accordance with the present embodiment includes a sleeve 2 having an ellipsoidal cross-sectional shape, an anchoring member 3, and a wedge member 6.

[0047] The anchoring member 3 includes a substantially circular steel plate 5 as a plate-like body and a connection rod 4 provided upright on the steel plate 5. The connection rod 4 is formed from a straight steel rod having a circular cross-section.

[0048] The sleeve 2 is configured such that the connection rod 4 and a reinforcing bar 11 can be inserted thereinto. Specifically, when inserted, the connection rod 4 and the reinforcing bar 11 can be arranged parallel to each other so as to overlap each other by a predetermined length. As can be clearly seen in Fig. 2(a), the sleeve 2 is composed of a pair of semicylindrical wall portions 7, 7 which are arranged so that the curved inner surfaces thereof are opposed to each other; and a pair of flat wall portions 8, 8 each extending to the corresponding edges of the respective semicylindrical wall portions 7, 7. Wedge insertion holes 9, 9 are formed in the pair of flat wall portions 8, 8, respectively, so as to be opposed to each other. The wedge insertion holes 9, 9 are aligned such that the axis line thereof is located between the reinforcing bar 11 and the connection rod 4 when these are inserted into the sleeve 2.

[0049] The wedge member 6 is designed to be inserted into the wedge insertion holes 9, 9 for press-fitting. When the wedge member 6 is press-fitted between the reinforcing bar 11 and the connection rod 4, it bites into and engages the reinforcing bar 11 and the connection rod 4 by taking the reaction force from the semicylindrical wall portions 7, 7 of the sleeve 2.

[0050] As described above, a tapered portion of the wedge member 6 bites into both the reinforcing bar 11 and the connection rod 4. Which of the reinforcing bar and the connection rod is bitten into to a larger degree depends mainly on the difference in hardness between the two. If the tapered portion does not sufficiently bite into the reinforcing bar 11, the engaging force between the reinforcing bar 11 and the wedge member 6 will be insufficient.

[0051] Therefore, it is desirable that the connection rod 4 have a hardness equivalent to or higher than that of the reinforcing bar 11, so that the wedge member 6 can bite into the reinforcing bar 11 to the extent permitted by the design.

[0052] As described above, the steel plate 5 of the anchoring member 3 is a substantially circular plate-like body. However, in the present embodiment, the steel plate 5 has a notch-like reinforcing bar insertion opening 12 formed therein, and the reinforcing bar 11 can be passed through the reinforcing bar insertion opening 12.

[0053] In order to attach the reinforcing bar anchorage 1 according to the present embodiment to the reinforcing bar 11, an end portion of the reinforcing bar 11 is first inserted into a first opening of the sleeve 2 and allowed to pass through the sleeve 2. Then, the connection rod 4 of the anchoring member 3 is inserted through a second opening of the sleeve 2 and allowed to pass through the sleeve 2.

[0054] Next, the anchoring member 3 and, if necessary, the sleeve 2 are slid relative to the reinforcing bar 11 such that the anchoring member 3, particularly the steel plate 5 thereof, is located at a desired position. At this time, since the reinforcing bar 11 is allowed to freely pass frontward and backward through the reinforcing bar insertion opening 12 of the steel plate 5, the anchoring member 3 can be displaced to any position relative to the reinforcing bar 11.

[0055] After completion of alignment of the anchoring member 3 as described above, the wedge member 6 is inserted into the wedge insertion holes 9, 9 for press-fitting. Any appropriate known wedge driver may be selected and used for press-fitting.

[0056] Fig. 4 is a diagram showing a state in which the wedge driving operation is finished and the attachment of the anchoring member 3 to the reinforcing bar 11 is completed.

[0057] As described above, with the reinforcing bar anchorage 1 according to the present embodiment, when the anchoring member 3 is attached to the reinforcing bar 11, the connection rod 4 of the anchoring member 3

and the reinforcing bar 11 are inserted into the sleeve 2 and are arranged so as to overlap each other by a predetermined length. In this state, the wedge member 6 is inserted into the wedge insertion holes 9, 9 for press-fitting. Hence, the anchoring member 3 can be firmly joined to the reinforcing bar 11 without machining the reinforcing bar 11. Therefore, conventionally required labor involved in threading the reinforcing bar can be omitted. In addition, since the anchoring member 3 can be firmly secured to the reinforcing bar 11 simply by press-fitting the wedge member 6, the operational advantage of significantly improving the workability of the bar arrangement operation at a worksite can be obtained.

[0058] Moreover, in the reinforcing bar anchorage 1 according to the present embodiment, since the anchoring member 3 need not be rotated when being attached to the reinforcing bar 11, the anchoring member 3 is prevented from interfering with other reinforcing bars during the attachment operation. This, along with simplification of the securing operation described above, allows a further improvement in the efficiency of the bar arrangement operation.

[0059] Furthermore, in the reinforcing bar anchorage 1 according to the present embodiment, interference between the steel plate 5 and the reinforcing bar 11 can be prevented by provision of the reinforcing bar insertion opening 12 formed in the steel plate 5 serving as an anchoring portion. Hence, the anchoring member 3 can be attached at any position on the reinforcing bar 11.

[0060] Fig. 5 shows a configuration in which the anchoring members 3 are secured in a staggered manner to a plurality of reinforcing bars 11, respectively, arranged at a predetermined pitch. In this configuration, interference between the anchoring members 3 can be prevented.

[0061] Fig. 6 shows a configuration used when the ends of a plurality of the reinforcing bars 11 arranged at a predetermined pitch are at irregular positions, respectively. In this case, the positions of the steel plates 5 serving as the anchoring portion are aligned by changing the securing position of each anchoring member 3 secured by the sleeve 2 and the wedge member 6 to the corresponding reinforcing bar 11. In this configuration, even when the ends of the reinforcing bars are arranged irregularly due to construction error during bar arrangement, the anchorage forces of the reinforcing bars 11 can be adjusted to a constant level by adjusting the attachment positions of the anchoring members 3.

[0062] In the present embodiment, the anchoring portion of the anchoring member is formed as a circular plate-like body. However, a plate-like body having any shape may be used, and the plate-like body can for example be formed as an ellipsoidal plate-like body, a rectangular plate-like body, a substantially rectangular plate-like body formed by chamfering or bending corners of a rectangular plate, or the like. In addition, the reinforcing bar insertion opening may be formed not only into a notch shape but also as a circular hole.

[0063] The anchoring portion is not limited to being formed as a plate-like body. The anchoring portion may have any shape and any structure, so long as it acts as an anchor in concrete.

[0064] Fig. 7(a) is a front view showing a state where an anchoring member of a modification is attached to the reinforcing bar 11. An anchoring member 61 shown in Fig. 7(a) includes an anchoring portion 62 bent into a semicircular shape and the connection rod 4 extending from the end portion of the anchoring portion 62. For example, the anchoring member 61 may be formed by bending a straight steel rod into a J-shape.

[0065] Also in this configuration, the anchoring member 61 can be attached at any position on the reinforcing bar 11 using the sleeve 2 and the wedge member 6. Further, although the attachment position is slightly limited in this case, the anchoring member 61 can be attached to the reinforcing bar 11 such that the anchoring portion 62 is positioned on a line extending from the reinforcing bar 11, as shown in Fig. 7(b). Such an attachment configuration enables more compact installation.

[0066] Fig. 8(a) shows an anchoring member of another modification, and Fig. 8(b) is a perspective view showing a state where the anchoring member of this modification is attached to the reinforcing bar 11. The anchoring member 73 shown in the figures includes: an annular-shaped body 71 bent into a rectangular frame shape and serving as the anchoring portion; and the connection rod 4 extending from the end portion of the annular body 71 in a direction perpendicular to a plane formed by the annular-shaped body 71. The anchoring member 73 is configured such that the reinforcing bar 11 can be inserted into a space 74 surrounded by the annular-shaped body 71.

[0067] For example, the anchoring member 73 can be formed by bending a straight steel rod into a rectangular frame shape.

[0068] Also in this configuration, as in the embodiment described above, interference between the annular-shaped body 71 serving as the anchoring portion and the reinforcing bar 11 can be prevented, and therefore the anchoring member 73 can be attached at any position on the reinforcing bar 11.

[0069] In the embodiment shown in Figs. 1 to 6, the reinforcing bar insertion opening 12 for allowing the reinforcing bar to pass therethrough is provided in the plate 5. However, the reinforcing bar insertion opening may not be provided.

[0070] Fig. 9 is an exploded perspective view illustrating an anchorage 1a including: an anchoring member 3a in place of the anchoring member 3; the sleeve 2; and the wedge member 6. The anchoring member 3a includes: a circular steel plate 5a serving as the anchoring portion and not having the reinforcing bar insertion opening; and the connection rod 4 provided upright on the steel plate 5a.

[0071] Also in this modification, as in the embodiment described above, labor involved in threading the reinforc-

ing bar is omitted, and the operational advantage that the anchoring member 3a can be firmly joined to the reinforcing bar 11 can be obtained. Moreover, since the anchoring member 3a need not be rotated when being attached to the reinforcing bar 11, the operational advantage of preventing the anchoring member 3a from interfering with other reinforcing bars during attachment operation can be obtained. In addition, since the anchoring member 3a can be firmly secured to the reinforcing bar 11 simply by press-fitting the wedge member 6, the operational advantage of significantly improving the workability of the bar arrangement operation at a worksite can be obtained.

[0072] In the present embodiment, the reinforcing bar anchorage is composed of a single sleeve 2. However, in place of this configuration, the reinforcing bar anchorage may be composed of two sleeves 2, 2 arranged in series, the anchoring member 3, and the wedge member 6, 6 as shown in Fig. 10(a).

[0073] In this modification, the reinforcing bar 11 and the connection rod 4 of the anchoring member 3 are inserted into both the two sleeves 2, 2 arranged in series, and the wedge members 6, 6 are inserted, for press-fitting, into the wedge insertion holes 9, 9 formed in each of the sleeves 2, 2.

[0074] Moreover, a sleeve 91 shown in Fig. 10(b) may be used in place of the sleeve 2. In this case, two pairs of the wedge insertion holes 9, 9 are formed in the sleeve 91 so as to be parallel to the axis of the reinforcing bar 11. In this instance, two wedge members 6, 6 are inserted, for press-fitting, into the respective pairs of the wedge insertion holes 9, 9 formed in the sleeve 91.

[0075] In the present embodiment, the anchoring member 3 includes the substantially circular steel plate 5 serving as a plate-like body and the connection rod 4 provided upright on the steel plate 5. However, the connection rod is not necessarily composed of a single body.

[0076] Figs. 11 and 12 show such a modification. An anchoring member 103 shown in the figures includes: a connection rod including two connection rod bodies 104, 104 parallel to each other; and an ellipsoidal steel plate 105 serving as a plate-like body on which the connection rod bodies 104, 104 are provided upright.

[0077] A reinforcing bar anchorage 101 using the anchoring member 103 is provided with a sleeve 102 which allows the reinforcing bar 11 and the two connection rod bodies 104, 104 to pass therethrough with the reinforcing bar 11 sandwiched between the two connection rod bodies 104, 104. The sleeve 102 includes: a pair of semicylindrical wall portions 7, 7 which are arranged such that the curved inner surfaces thereof are opposed to each other; and a pair of flat wall portions 8a, 8a each extending to the corresponding edges of the respective semicylindrical wall portions 7, 7. Two pairs of wedge insertion holes 9, 9 are formed in the pair of flat wall portions 8a, 8a. Each pair of wedge insertion holes 9, 9 is formed at a position between the reinforcing bar 11 and one of the two connection rod bodies 104, 104, and the two pairs of wedge insertion holes 9, 9 are arranged substantially symmetrically with respect to the axis of the reinforcing bar 11.

[0078] In addition, the reinforcing bar anchorage 101 is provided with two wedge members 6, 6 which are to be inserted into the respective pairs of wedge insertion holes 9, 9 for press-fitting. When the wedge members 6, 6 are press-fitted between the reinforcing bar 11 and the respective connection rod bodies 104, 104, the wedge members 6, 6 bite into and engage with the reinforcing bar 11 and the respective connection rod bodies 104, 104 by taking the reaction force from the respective semicylindrical wall portions 7, 7 of the sleeve 102.

[0079] A circular hole-shaped reinforcing bar insertion opening 112 is formed in the steel plate 105 of the anchoring member 103, so that the reinforcing bar 11 can pass through the reinforcing bar insertion opening 112.

[0080] With the above configuration, operational advantages similar to those in the embodiment described above can also be obtained. In this configuration, the anchoring member 103 is more firmly secured to the reinforcing bar 11, and the tensile force from the reinforcing bar 11 is transmitted to the steel plate 105 serving as the anchoring portion without being decentered since the securing structure of the anchoring member 103 is symmetric with respect to the axis of the reinforcing bar 11. Hence, in addition to the above operational advantages, another remarkable operational advantage is obtained, i.e., more stable anchoring.

(Second Embodiment)

[0081] Next, a description will be given of a reinforcing bar anchorage according to a second embodiment. It should be noted that components and the like substantially identical to those of the first embodiment will be designated by the same reference numerals, and a description thereof will be omitted.

[0082] Figs. 13(a) and 13(b) are a front view and a sectional view, respectively, showing a reinforcing bar anchorage according to the present embodiment. As can be seen from these figures, the reinforcing bar anchorage 121 according to the present embodiment includes: an anchoring member 122 including a sleeve having an ellipsoidal cross-sectional shape; an anchoring member-securing rod 123 having a circular cross-section and formed from a straight steel rod; and a wedge member 6.

[0083] The anchoring member 122 is configured such that the anchoring member-securing rod 123 and the reinforcing bar 11 can be inserted thereinto so as to be parallel to each other with the anchoring member-securing rod 123 and the reinforcing bar 11 overlapping each other by a predetermined length. Similarly to the sleeve 2, the anchoring member 122 includes: a pair of semicylindrical wall portions 7, 7 which are arranged such that the curved inner surfaces thereof are opposed to each other; and a pair of flat wall portions 8, 8 each extending to the corresponding edges of the respective semicylin-

drical wall portions 7, 7. Each of the wedge insertion holes 9, 9 is formed in one of the pair of flat wall portions 8, 8. Specifically, the wedge insertion holes 9, 9 are formed at respective positions between the reinforcing bar 11 and the anchoring member-securing rod 123 so as to be opposed to each other.

[0084] The wedge member 6 is designed to be inserted into the wedge insertion holes 9, 9 for press-fitting. When the wedge member 6 is press-fitted between the reinforcing bar 11 and the anchoring member-securing rod 123, it bites into and engages the reinforcing bar 11 and the anchoring member-securing rod 123 by taking the reaction force from the semicylindrical wall portions 7, 7 of the anchoring member 122.

[0085] As described above, a tapered portion of the wedge member 6 bites into both the reinforcing bar 11 and the anchoring member-securing rod 123. Which of the reinforcing bar 11 and the anchoring member-securing rod 123 is bitten into to a larger degree depends mainly on the difference in hardness between the two. If the tapered portion does not sufficiently bite into the reinforcing bar 11, the engaging force between the reinforcing bar 11 and the wedge member 6 will be insufficient.

[0086] Therefore, it is desirable that the anchoring member-securing rod 123 have a hardness equivalent to or higher than that of the reinforcing bar 11, so that the wedge member 6 can bite into the reinforcing bar 11 sufficiently as much as allowable in design.

[0087] In contrast to the anchorage 1 of the first embodiment, in the reinforcing bar anchorage 121 according to the present embodiment, the anchoring member-securing rod 123 and the anchoring member 122 composed of a sleeve act as an anchor.

[0088] Therefore, the wall thickness of the anchoring member 122 is appropriately adjusted according to a required anchorage force when the anchoring member 122 is manufactured. Specifically, the greater the wall thickness, the larger the distance it will protrude beyond the peripheral surface of the reinforcing bar 11 and, correspondingly, the larger the anchorage force.

[0089] In order to attach the reinforcing bar anchorage 121 according to the present embodiment to the reinforcing bar 11, an end portion of the reinforcing bar 11 is first inserted through a first opening of the anchoring member 122 and allowed to pass through the anchoring member 122. Then, the anchoring member-securing rod 123 is inserted through the first opening or an opposite second opening of the anchoring member 122 and allowed to pass through the anchoring member 122.

[0090] Next, the anchoring member 122 is slid relative to the reinforcing bar 11 so as to be located at a desired position.

[0091] After completion of the alignment of the anchoring member 122, the wedge member 6 is inserted into the wedge insertion holes 9, 9 for press-fitting. An appropriate known wedge driver may be selected and used for press-fitting.

[0092] As described above, in the reinforcing bar anchorage 121 according to the present embodiment, the anchoring member 122 is attached to the reinforcing bar 11. In this case, the anchoring member-securing rod 123 and the reinforcing bar 11 are inserted into the anchoring member 122 so as to be arranged with the anchoring member-securing rod 123 and the reinforcing bar 11 overlapping each other by a predetermined length. In this state, the wedge member 6 is inserted into the wedge insertion holes 9, 9 for press-fitting. Hence, the anchoring member 122 can be firmly joined to the reinforcing bar 11 without machining the reinforcing bar. Therefore, conventionally required labor involved in threading the reinforcing bar can be omitted. In addition to this, since the anchoring member 122 can be firmly secured to the reinforcing bar 11 simply by press-fitting the wedge member 6, the operational advantage of significantly improving the workability of the bar arrangement operation at a worksite can be obtained.

[0093] Moreover, with the reinforcing bar anchorage 121 according to the present embodiment, since the anchoring member 122 need not be rotated when being attached to the reinforcing bar 11, the anchoring member 122 is prevented from interfering with other reinforcing bars during the attachment operation. This, along with simplification of the securing operation described above, allows a further improvement in the efficiency of the bar arrangement operation.

[0094] The present embodiment is configured such that a required anchorage force is provided by adjusting the wall thickness of the anchoring member 122. However, an anchoring member 133 shown in Fig. 14 may be used which includes: a sleeve 132 having the same configuration as that of the anchoring member 122; and a flange-like protrusion 131 provided on the periphery of the sleeve 132.

[0095] In this configuration, a large anchorage force can be ensured by combined anchorage from the sleeve 132 and from the flange-like protrusion 131. Moreover, a desired anchorage force can be ensured by changing the shape and dimensions of the flange-like protrusion 131, particularly the height of the protrusion from the sleeve 132.

[0096] In the present embodiment, the reinforcing bar anchorage is composed of the single anchoring member 122. However, in place of this configuration, two anchoring members 122, 122 arranged in series may be provided, as shown in Fig. 15(a). In this case, the reinforcing bar anchorage can be composed of the two anchoring members 122, 122, the anchoring member-securing rod 123, and two wedge members 6, 6.

[0097] In this modification, the reinforcing bar 11 and the anchoring member-securing rod 123 are inserted into both the two anchoring members 122, 122. Each of the wedge members 6, 6 is inserted, for press-fitting, into a pair of the wedge insertion holes 9, 9 formed in a respective one of the anchoring members 122, 122.

[0098] Moreover, an anchoring member 141 shown in Fig. 15(b) may be used in which two pairs of the wedge

insertion holes 9, 9 are formed so as to be parallel to the axis of the reinforcing bar 11. Two wedge members 6, 6 are inserted, for press-fitting, into the respective pairs of the wedge insertion holes 9, 9 formed in the anchoring member 141.

[0099] The reinforcing bar anchorage does not necessarily include a single anchoring member-securing rod. As shown in Fig. 16, two anchoring member-securing rods 123, 123 may be provided. In this case, the reinforcing bar anchorage can be composed of: the two anchoring member-securing rods 123, 123; an anchoring member 151 which is configured so as to allow the two anchoring member-securing rods 123, 123 and the reinforcing bar 11 to pass therethrough with the reinforcing bar 11 sandwiched between the two anchoring member-securing rods 123, 123; and the wedge members 6, 6. Two pairs of the wedge insertion holes 9, 9 are formed in the anchoring member 151. Each pair of the wedge insertion holes 9, 9 is formed at a position between the reinforcing bar 11 and one of the anchoring member-securing rods 123, 123, and the two pairs of the wedge insertion holes 9, 9 are arranged substantially symmetrically with respect to the axis of the reinforcing bar 11.

[0100] In this modification, the reinforcing bar 11 and the anchoring member-securing rods 123, 123 are inserted into the anchoring member 151 such that the reinforcing bar 11 is sandwiched between the anchoring member-securing rods 123, 123. Then, the two wedge members 6, 6 are inserted into the respective pairs of the wedge insertion holes 9, 9 for press-fitting.

[0101] In addition, a flange-like protrusion similar to that shown in Fig. 14 may be provided on the periphery of the anchoring member 151.

[0102] (Third Embodiment)

[0103] Fig. 17 is a front view showing a reinforcing bar anchorage according to the present embodiment, and Figs. 18(a) and 18(b) are sectional views thereof. As can be seen from these figures, the reinforcing bar anchorage 161 according to the present embodiment includes a sleeve 166 having an ellipsoidal cross-sectional shape, an anchoring member 163, two anchoring member-securing rods 162, 162, and the wedge members 6.

[0104] The anchoring member 163 includes a circular steel plate 165 serving as an anchoring portion and a series connection rod 164 provided upright on the steel plate 165. The series connection rod 164 is formed from a straight steel rod having a circular cross-section.

[0105] The sleeve 166 is configured so as to allow the series connection rod 164, the reinforcing bar 11, and the two anchoring member-securing rods 162, 162 to be inserted thereinto. The series connection rod 164 and the reinforcing bar 11 are arranged such that the axes thereof are aligned on the same straight line, and the two anchoring member-securing rods 162, 162 are arranged so as to sandwich the series connection rod 164 and the reinforcing bar 11 therebetween. As can be clearly seen in Fig. 18(a), the sleeve 166 includes: a pair of the semicylindrical wall portions 7, 7 which are arranged such that the curved inner surfaces thereof are opposed to each other; and a pair of the flat wall portions 8a, 8a each extending to the corresponding edges of the respective semicylindrical wall portions 7, 7.

[0106] The wedge insertion holes 9, 9 are formed in the pair of flat wall portions 8a, 8a. Specifically, the wedge insertion holes 9, 9 are formed at respective positions between the reinforcing bar 11 and the respective anchoring member-securing rods 162, 162 so as to be opposed to each other. Similarly, the wedge insertion holes 9, 9 are formed respective positions between the series connection rod 164 and the respective anchoring member-securing rods 162, 162 so as to be opposed to each other. The wedge insertion holes 9, 9 are formed on both sides of the axis of the reinforcing bar 11 so as to be symmetric with respect to that axis. Hence, four pairs of the wedge insertion holes 9, 9 are formed in the flat wall portions 8a, 8a.

[0107] The wedge members 6 are designed so as to be inserted into the wedge insertion holes 9, 9 for press fitting. When the wedge members 6 are press-fitted between the reinforcing bar 11 and the respective anchoring member-securing rods 162, 162, the wedge members 6 bite into and engage the reinforcing bar 11 and the respective anchoring member-securing rods 162, 162 by taking the reaction force from the respective semicylindrical wall portions 7, 7 of the sleeve 166.

[0108] Similarly, when the wedge members 6 are press-fitted between the series connection rod 164 and the respective anchoring member-securing rods 162, 162, the wedge members 6 bite into and engage the series connection rod 164 and the respective anchoring member-securing rods 162, 162.

[0109] As described above, tapered portions of the wedge members 6 bite into both the reinforcing bar 11 and the respective anchoring member-securing rods 162, 162 or both the series connection rod 164 and the respective anchoring member-securing rods 162, 162. Which of the reinforcing bar 11 and the anchoring member-securing rod 162 or the series connection rod 164 and the anchoring member-securing rod 162 is bitten into to a larger degree depends mainly on the difference in hardness between the reinforcing bar 11 and the anchoring member-securing rod 162 or between the series connection rod 164 and the anchoring member-securing rod 162. If the tapered portions do not sufficiently bite into the reinforcing bar 11 or the series connection rod 164, the engaging force between the wedge member 6 and the reinforcing bar 11 or between the wedge member 6 and the series connection rod 164 will be insufficient.

[0110] Therefore, it is desirable that the anchoring member-securing rods 162 have a hardness equivalent to or higher than that of the reinforcing bar 11 or the series connection rod 164, so that the wedge member 6 can bite into the reinforcing bar 11 or the series connection rod 164 to the extent permitted by the design.

[0111] In order to attach the reinforcing bar anchorage 161 according to the present embodiment to the reinforc-

ing bar 11, an end portion of the reinforcing bar 11 is first inserted through a first opening of the sleeve 166. Then, the series connection rod 164 of the anchoring member 163 is inserted through an opposite second opening of the sleeve 166.

[0112] Before or after the above insertion operation, the anchoring member-securing rods 162, 162 are inserted into the sleeve 166 so as to sandwich the reinforcing bar 11 and the series connection rod 164 therebetween.

[0113] Next, the wedge members 6 are inserted into the respective wedge insertion holes 9, 9 for press-fitting. An appropriate known wedge driver may be selected and used for press-fitting.

[0114] As described above, in the reinforcing bar anchorage 161 according to the present embodiment, when the anchoring member 163 is attached to the reinforcing bar 11, the series connection rod 164 of the anchoring member 163 and the reinforcing bar 11 are inserted into the sleeve 166 such that the axis of the series connection rod 164 is aligned with the axis of the reinforcing bar 11. In addition to this, the anchoring member-securing rods 162, 162 are inserted into the sleeve 166 so as to sandwich the series connection rod 164 and the reinforcing bar 11 therebetween. In this state, the wedge members 6 are inserted into the respective pairs of the wedge insertion holes 9, 9 for press-fitting. Hence, the anchoring member 163 can be firmly joined to the reinforcing bar 11 without machining the reinforcing bar 11. Therefore, conventionally required labor involved in threading the reinforcing bar can be omitted. In addition to this, since the anchoring member 163 can be firmly secured to the reinforcing bar 11 simply by press-fitting the wedge members 6, the operational advantage of significantly improving the workability of the bar arrangement operation at a worksite can be obtained.

[0115] Moreover, in the reinforcing bar anchorage 161 according to the present embodiment, since the anchoring member 163 need not be rotated when being attached to the reinforcing bar 11, this can prevent the anchoring member 163 from interfering with other reinforcing bars during the attachment operation. This, along with simplification of the securing operation described above, allows a further improvement in the efficiency of the bar arrangement operation.

[0116] Furthermore, in the reinforcing bar anchorage 161 according to the present embodiment, the anchoring member-securing rods 162, 162 are configured so as to be capable of sandwiching the series connection rod 164 and the reinforcing bar 11 therebetween. Hence, the anchoring member 163 can be more firmly secured to the reinforcing bar 11, and the tensile force from the reinforcing bar 11 can be transmitted to the anchoring member 163 without being decentered since the anchoring member 163 can be attached symmetrically with respect to the axis of the reinforcing bar 11. Therefore, more stable anchoring can be achieved.

[0117] In the present embodiment, two anchoring member-securing rods are used so as to be capable of sandwiching the series connection rod 164 and the reinforcing bar 11 therebetween. However, the two anchoring member-securing rods of the invention are not necessarily provided. Only a single anchoring member-securing rod may be provided as shown in Fig. 19.

[0118] Also in such a configuration, the following operational advantages can be obtained as in the embodiments described above. For example, conventionally required labor involved in threading the reinforcing bar is omitted. The workability of bar arrangement operation at a workplace can be significantly improved. The bar arrangement operation can be carried out more efficiently since the anchoring member is prevented from interfering with other reinforcing bars during the attachment operation.

[0119] In the present embodiment, the circular steel plate 165 serves as the anchoring portion of the anchoring member in accordance with the present invention. However, a substantially circular steel plate 194 as shown in Figs. 20 and 21(b) may be used in place of the circular steel plate 165. The steel plate 194 has notch-shaped rod insertion openings 195, 195 formed at respective positions opposed to each other.

[0120] The rod insertion openings 195, 195 are configured to allow the respective anchoring member-securing rods 162, 162 to pass therethrough.

[0121] In this modification, an anchoring member 193 serving as the anchoring member in accordance with the invention includes the substantially circular steel plate 194 serving as the anchoring portion and the series connection rod 164 provided upright on the steel plate 194.

[0122] In this modification, interference between the steel plate 194 and each of the anchoring member-securing rods 162, 162 can be prevented by the rod insertion openings 195, 195 formed in the steel plate 194 serving as the anchoring portion. Hence, the limitation on the attachment positions of the anchoring member-securing rods 162, 162 is relaxed, whereby the workability is improved.

[0123] Moreover, circular hole-shaped rod insertion openings shown in Figs. 22 and 23(b) may be employed in place of the notch-shaped rod insertion openings 195, 195.

[0124] In the modification shown in these figures, an anchoring member 213 includes a substantially circular steel plate 214 serving as the anchoring portion and the series connection rod 164 provided upright on the steel plate 214. In this instance, circular hole-shaped rod insertion openings 215, 215 are formed in the substantially circular steel plate 214 and are provided on both sides of the position on which the series connection rod 164 is provided upright.

[0125] Each of the rod insertion openings 215, 215 is formed so as to allow a respective one of the anchoring member-securing rods 162, 162 to pass therethrough.

[0126] In this modification, interference between the steel plate 214 and each of the anchoring member-se-

curing rods 162, 162 can be prevented by the rod insertion openings 215, 215 formed in the steel plate 214 serving as the anchoring portion. Hence, the limitation on the attachment positions of the anchoring member-securing rods 162, 162 is relaxed, whereby the workability is improved.

[0127] In the modification shown in Fig. 19 among the modifications described above, a substantially circular steel plate 224 having a notch-shaped rod insertion opening 225 formed therein may be employed in place of the circular steel plate 165, as shown in Fig. 24. Similarly, as shown in Fig. 25, a substantially circular steel plate 234 may be employed which has a circular hole-like rod insertion opening 235 formed therein.

[0128] In these modifications, interference between the steel plate 224 and the anchoring member-securing rod 162 can be prevented by the rod insertion opening 225 formed in the steel plate 224 serving as the anchoring portion. Hence, the anchoring member 223 can be attached at any position on the reinforcing bar 11. Similarly, interference between the steel plate 234 and the anchoring member-securing rod 162 can be prevented by the rod insertion opening 235 formed in the steel plate 234 serving as the anchoring portion. Hence, the limitation on the attachment positions of the anchoring member-securing rod 162 is relaxed, whereby the workability is improved.

Claims

1. A reinforcing bar anchorage comprising:

an anchoring member including an anchoring portion and a connection rod extending from said anchoring portion;
a sleeve which has an elliptical cross-sectional shape and allows said connection rod and a reinforcing bar to be connected to said connection rod to be inserted thereinto such that the connection rod and the reinforcing bar are arranged so as to overlap each other by a predetermined length, the sleeve having wall portions including a pair of opposing flat wall portions; and
a wedge member which is to be inserted into wedge insertion holes formed in the respective opposing flat wall portions of said sleeve, and which is to be press-fitted between said connection rod and said reinforcing bar.

2. The reinforcing bar anchorage according to claim 1, wherein said anchoring portion is formed as a plate-like body, and a reinforcing bar insertion opening for allowing said reinforcing bar to pass therethrough is formed in said plate-like body.

3. The reinforcing bar anchorage according to claim 1, wherein said anchoring portion is formed as an annular-shaped body, and said reinforcing bar is allowed to pass through a space surrounded by said annular-shaped body.

4. The reinforcing bar anchorage according to claim 1, wherein: said connection rod includes two connection rod bodies parallel to each other; said sleeve is configured to allow said reinforcing bar and said two connection rod bodies to be inserted thereinto with said reinforcing bar sandwiched between said two connection rod bodies; and two pairs of said wedge insertion holes are provided at respective positions each of which is located between said reinforcing bar and one of said connection rod bodies and which are substantially symmetric with respect to an axis of said reinforcing bar.

5. A reinforcing bar anchorage comprising:

an anchoring member including a sleeve having an ellipsoidal cross-sectional shape, said anchoring member having wall portions including a pair of opposing flat wall portions;
an anchoring member-securing rod which is to be inserted, together with a reinforcing bar to which said anchoring member is to be secured, into said anchoring member such that the anchoring member-securing rod and the reinforcing bar are arranged so as to overlap each other by a predetermined length; and
a wedge member which is to be inserted into wedge insertion holes formed in the respective opposing flat wall portions of said anchoring member, and which is to be press-fitted between said anchoring member-securing rod and said reinforcing bar.

6. The reinforcing bar anchorage according to claim 5, wherein a flange-like protrusion is provided on a periphery of said sleeve.

7. The reinforcing bar anchorage according to claim 5, wherein: said anchoring member-securing rod includes two securing rod bodies; said anchoring member is configured to allow said reinforcing bar and said two securing rod bodies to be inserted thereinto with said reinforcing bar sandwiched between said two securing rod bodies; and two pairs of said wedge insertion holes are provided at respective positions each of which is located between said reinforcing bar and one of said securing rod bodies and which are substantially symmetric with respect to an axis of said reinforcing bar.

8. A reinforcing bar anchorage comprising:

an anchoring member including an anchoring portion and a series connection rod extending

from said anchoring portion;
a sleeve having an ellipsoidal cross-sectional shape, said sleeve having wall portions including a pair of opposing flat wall portions;
an anchoring member-securing rod which is to be inserted into said sleeve together with said series connection rod and a reinforcing bar to which said anchoring member is to be secured, said anchoring member-securing rod being arranged to be disposed on one side of said series connection rod and said reinforcing bar with said series connection rod and said reinforcing bar aligned on a straight line; and
a wedge member which is to be inserted into wedge insertion holes formed in the respective opposing flat wall portions of said sleeve, and which is to be press-fitted between said anchoring member-securing rod and said series connection rod and between said anchoring member-securing rod and said reinforcing bar.

9. The reinforcing bar anchorage according to claim 8, wherein said anchoring member-securing rod comprises two rods provided on both sides of said reinforcing bar and said series connection rod so as to sandwich said reinforcing bar and said series connection rod therebetween.

10. The reinforcing bar anchorage according to claim 8 or 9,
wherein said anchoring portion is formed as a plate-like body, and a rod insertion opening for allowing said anchoring member-securing rod to pass therethrough is formed in said plate-like body.

FIG.1

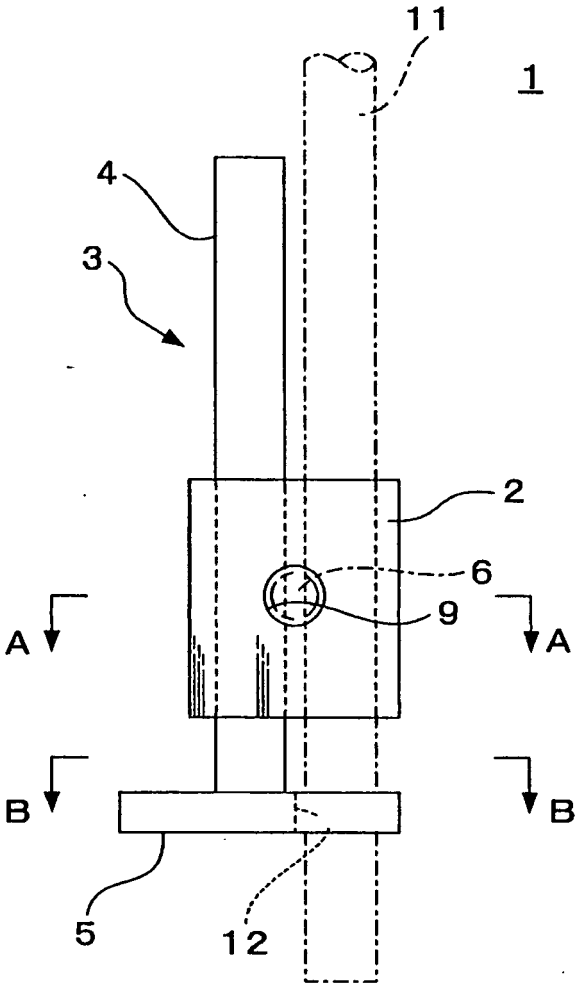


FIG.2A

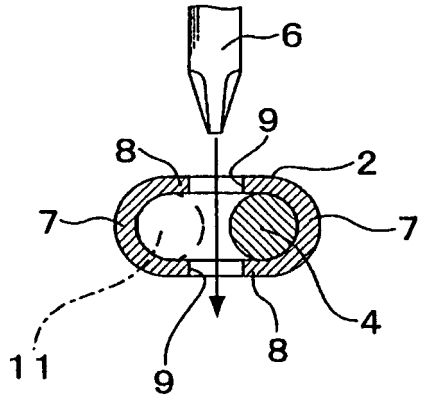


FIG.2B

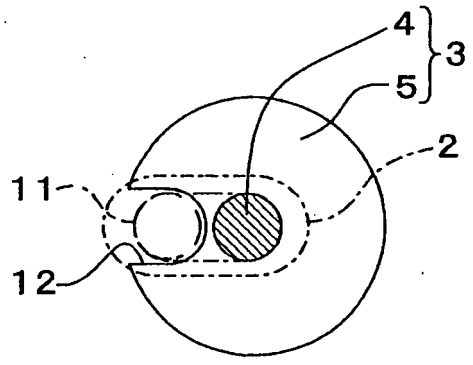


FIG.3

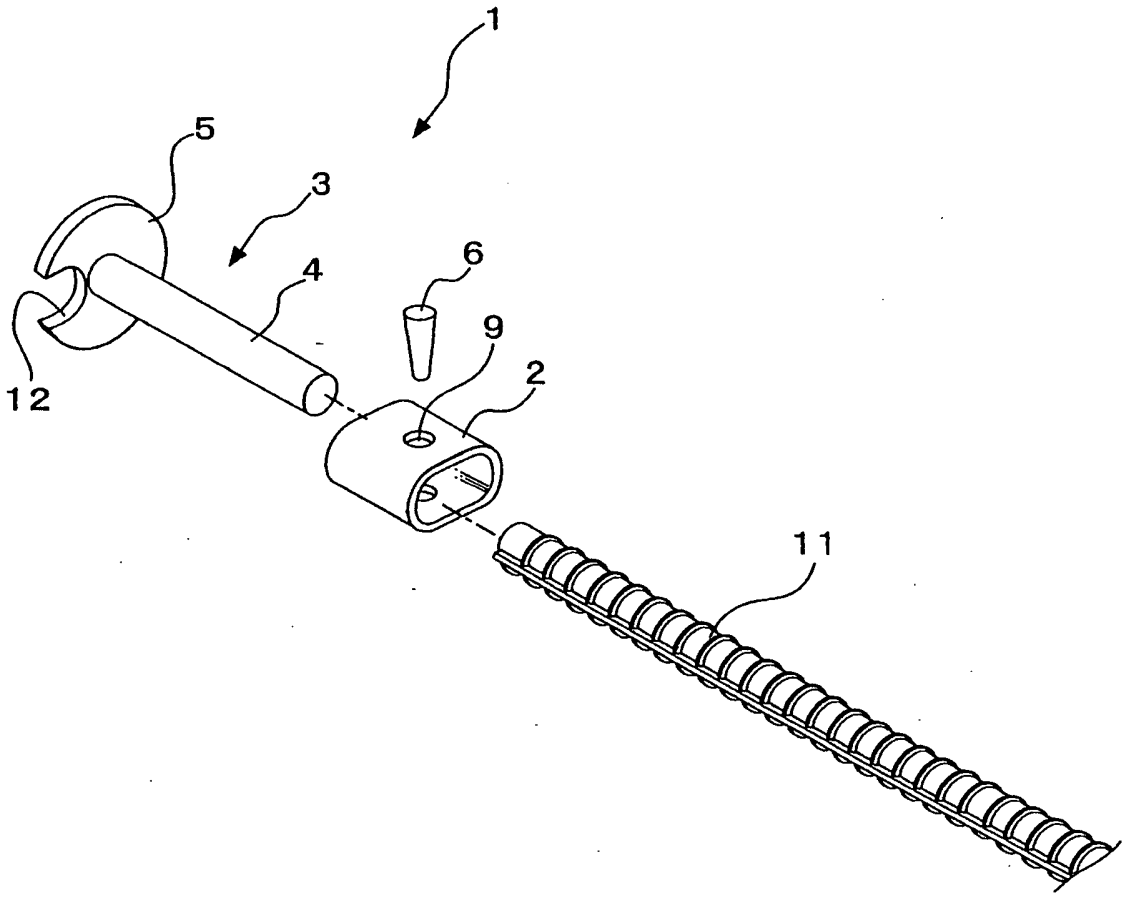


FIG.4

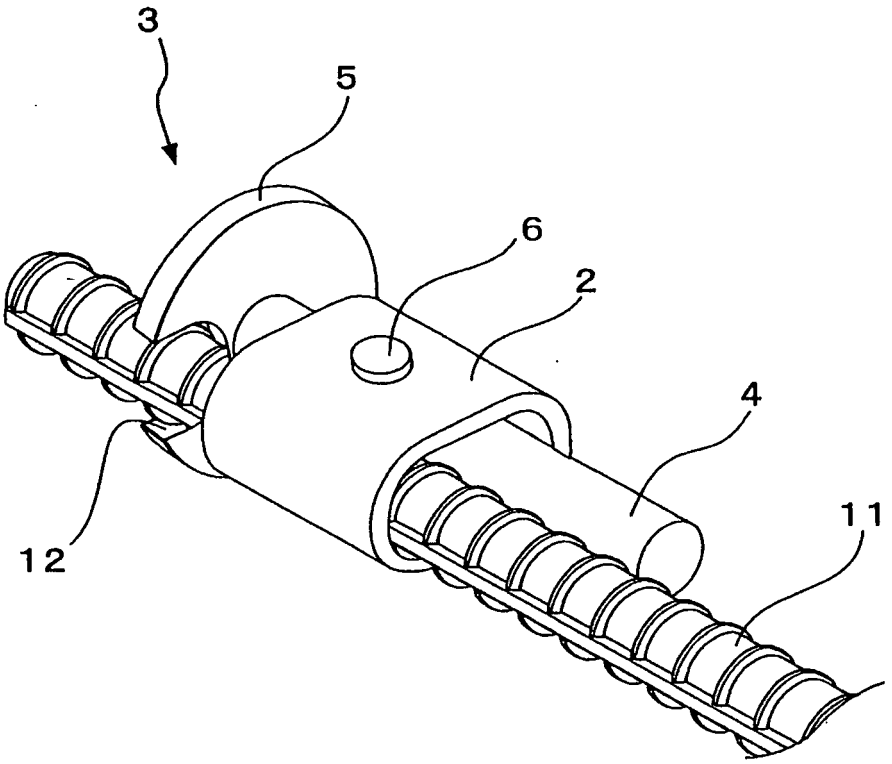


FIG.5

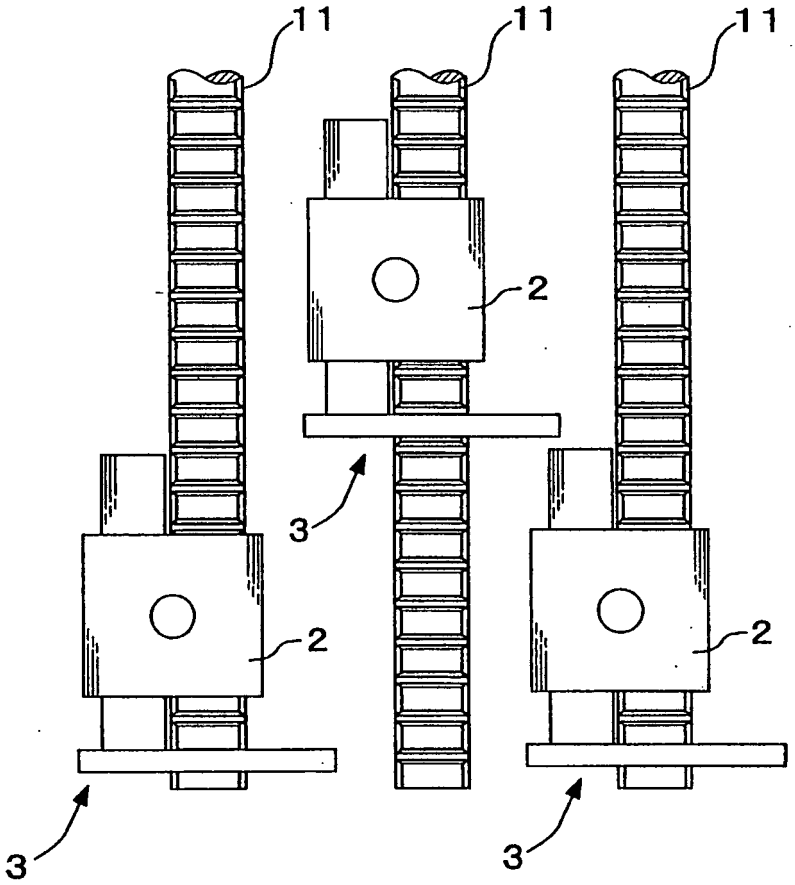


FIG.6

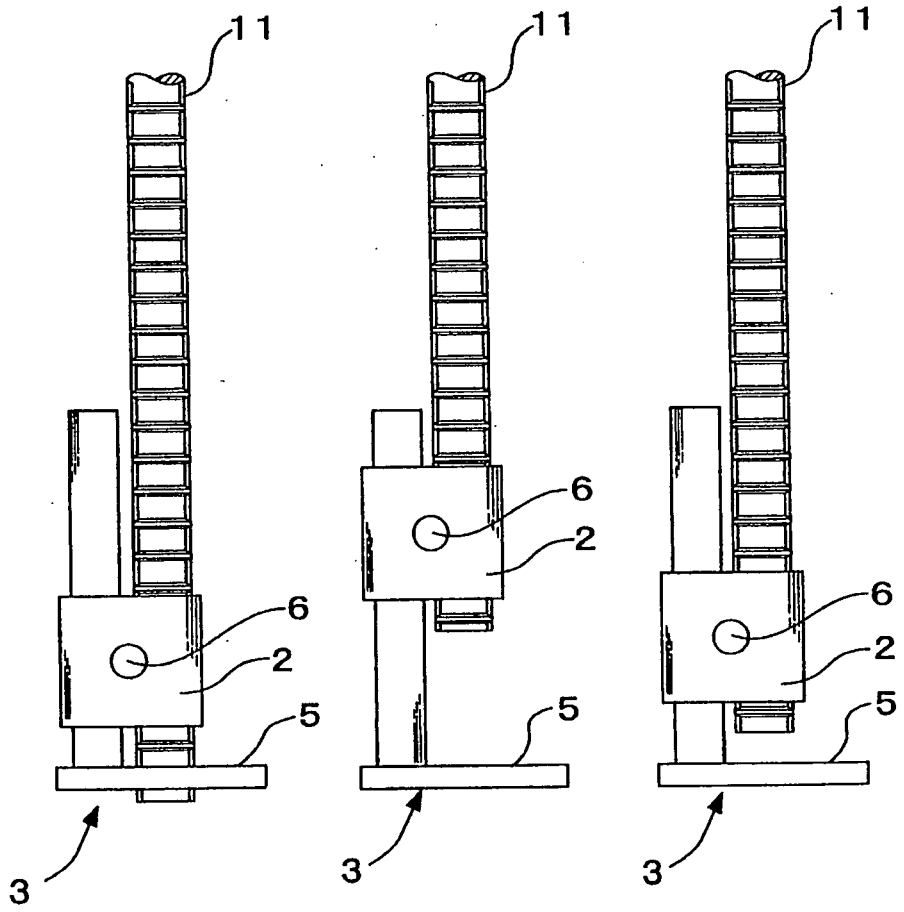


FIG.7A

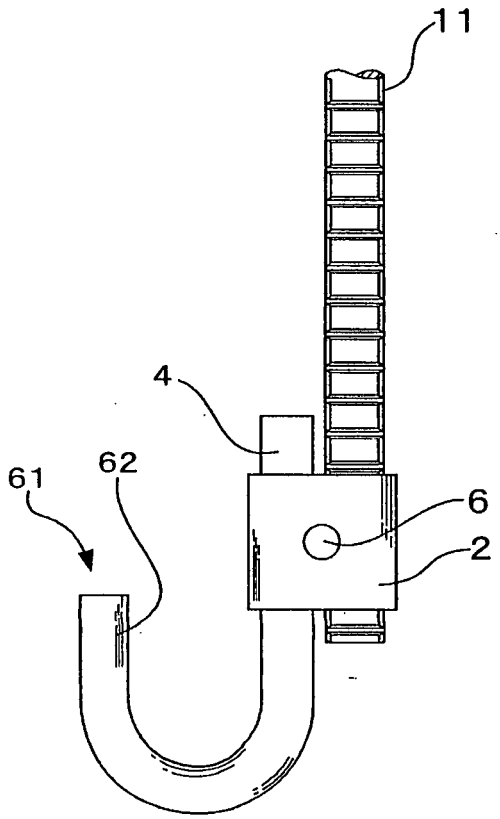


FIG.7B

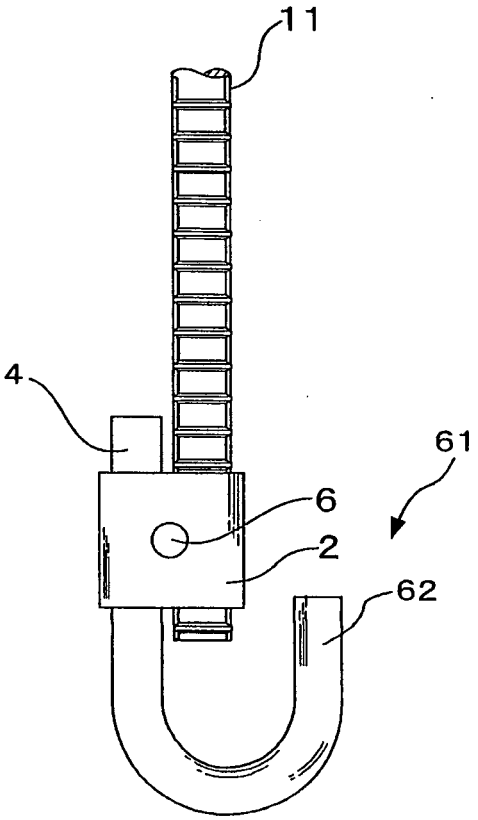


FIG.8A

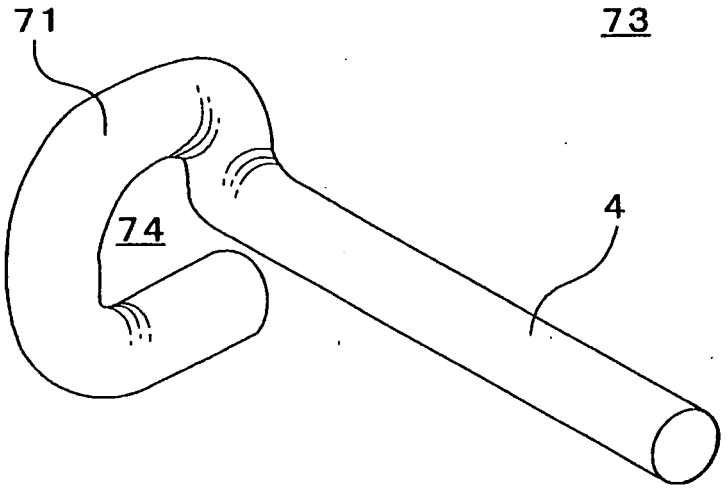


FIG.8B

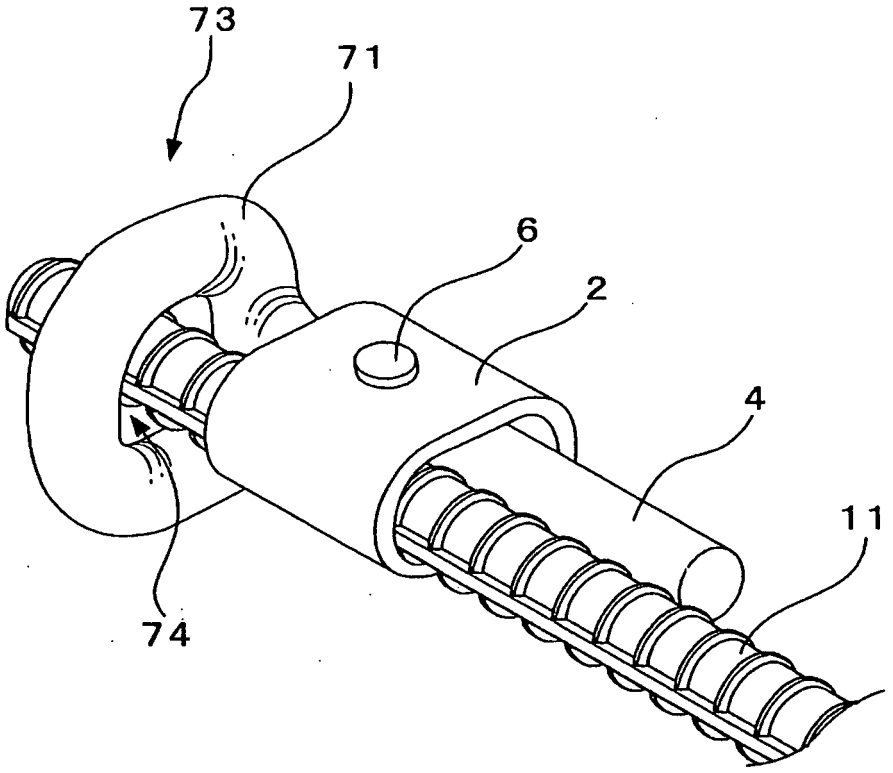


FIG.9

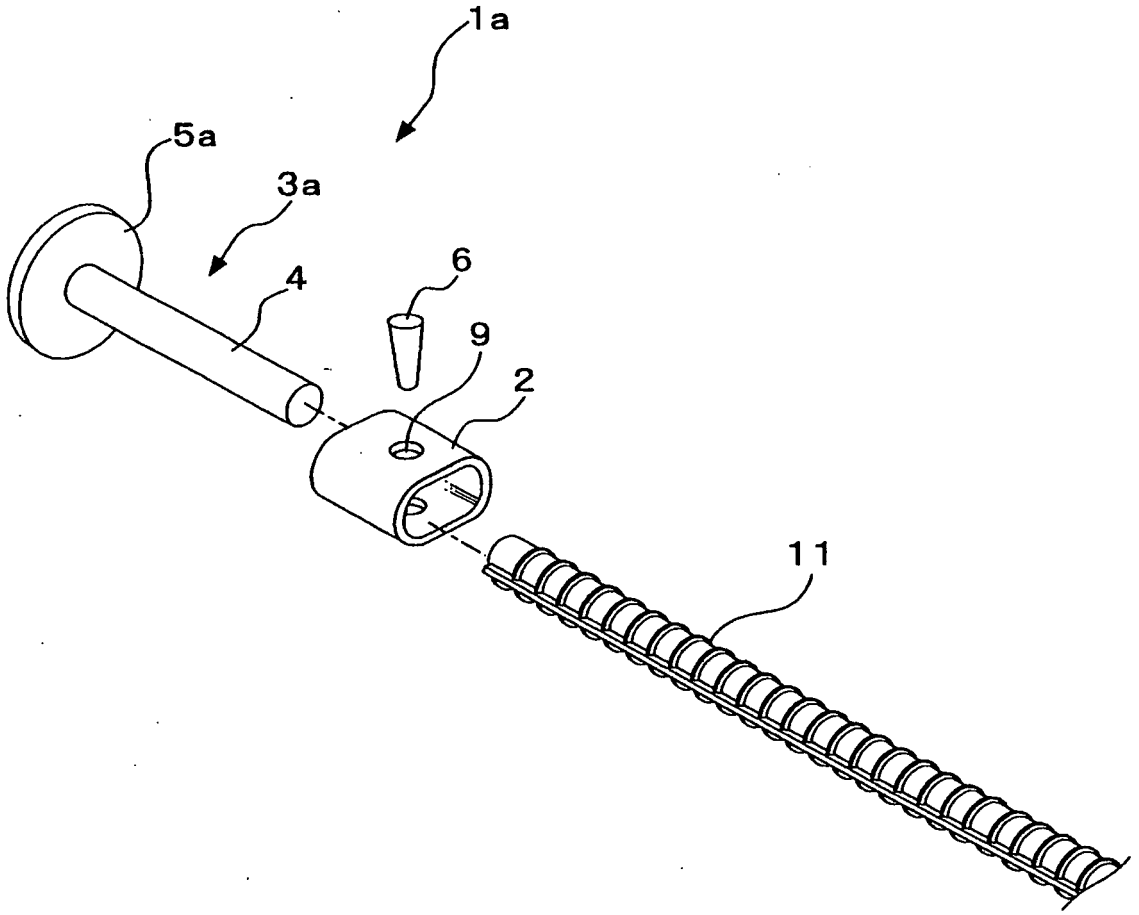


FIG.10A

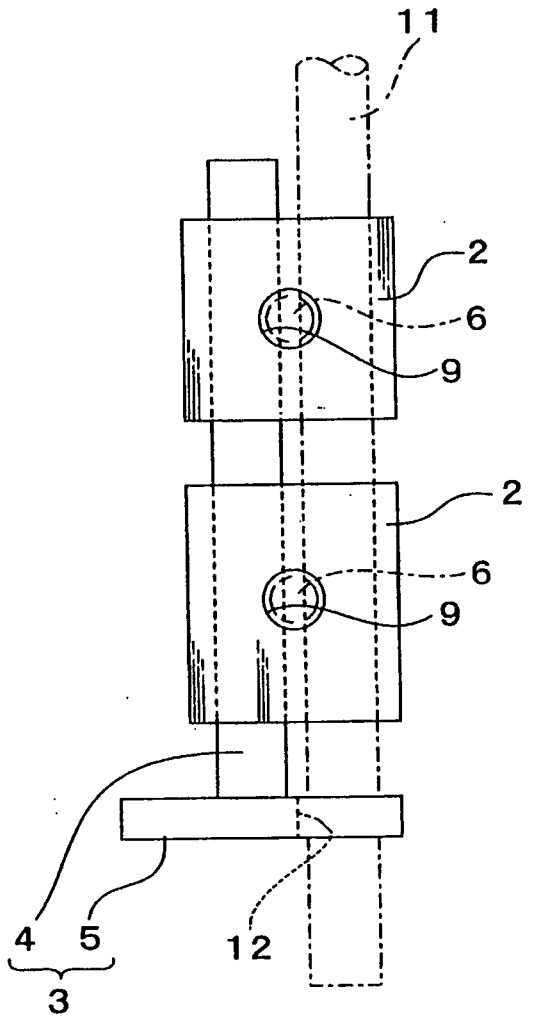


FIG.10B

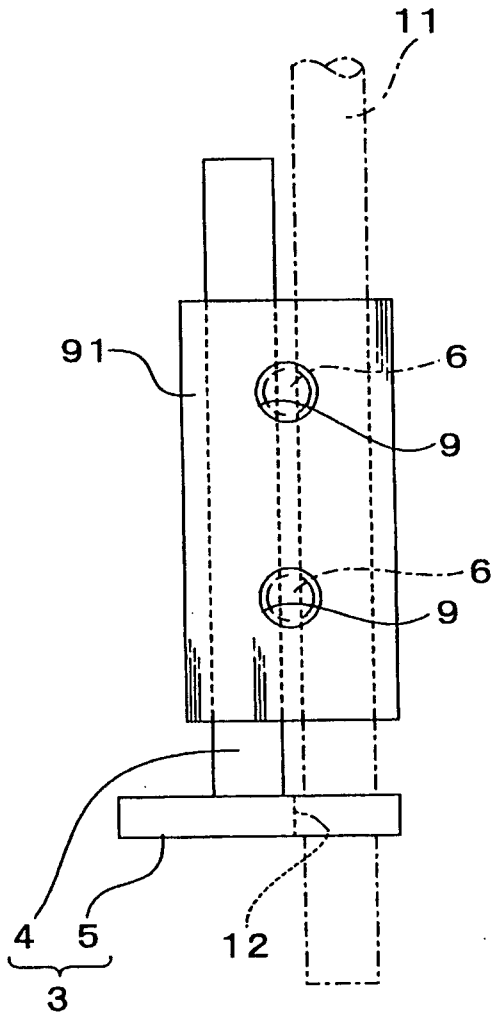


FIG.11

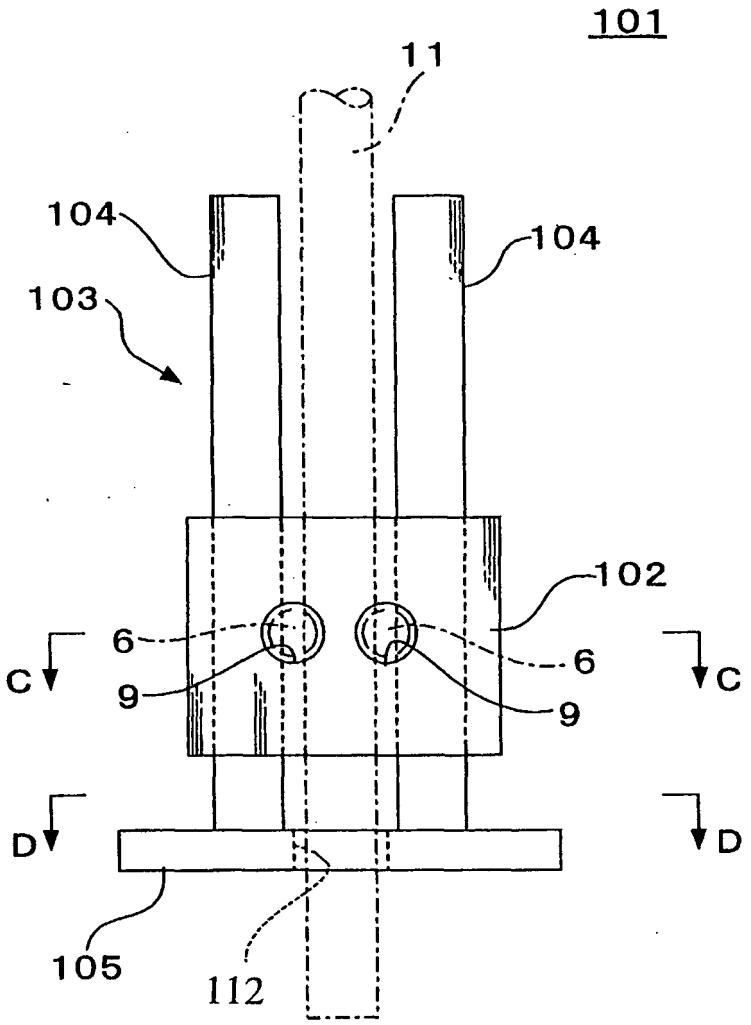


FIG.12A

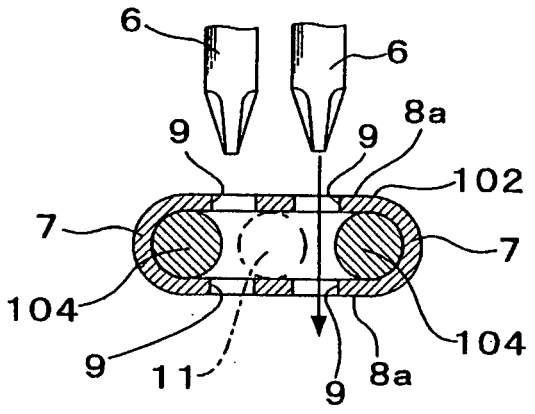


FIG.12B

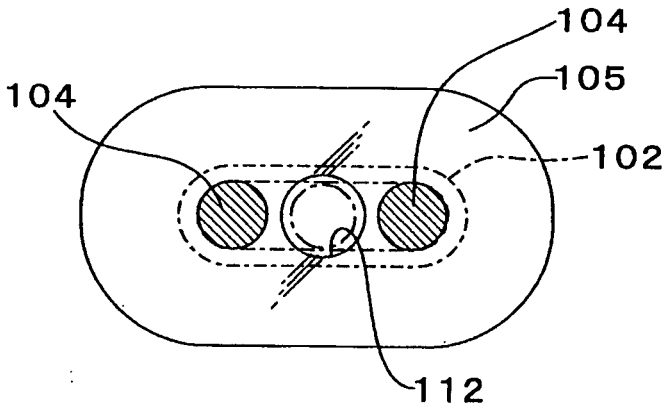


FIG.13A

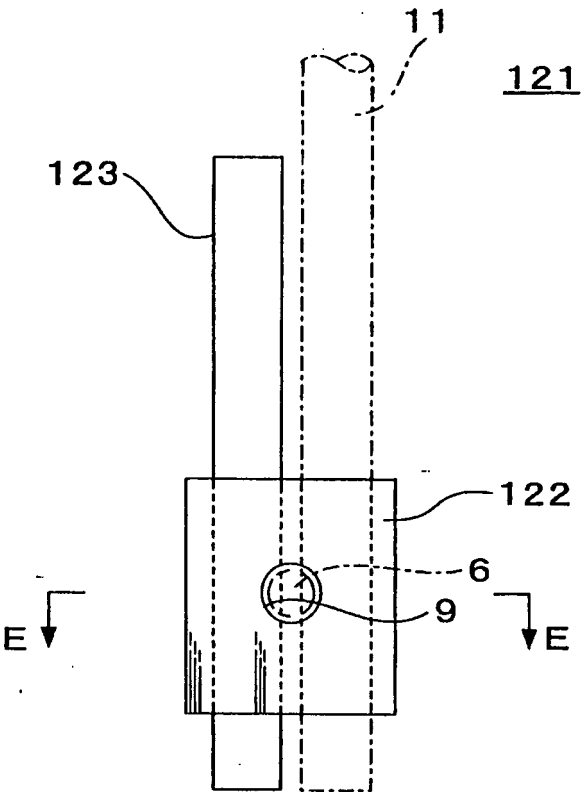


FIG.13B

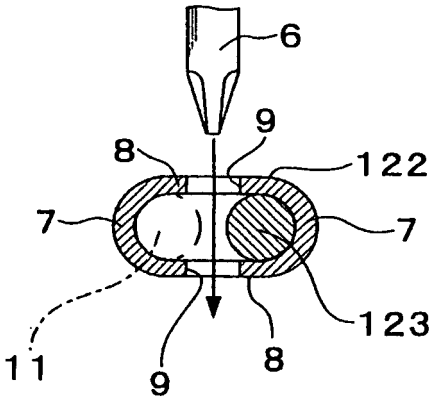


FIG.14

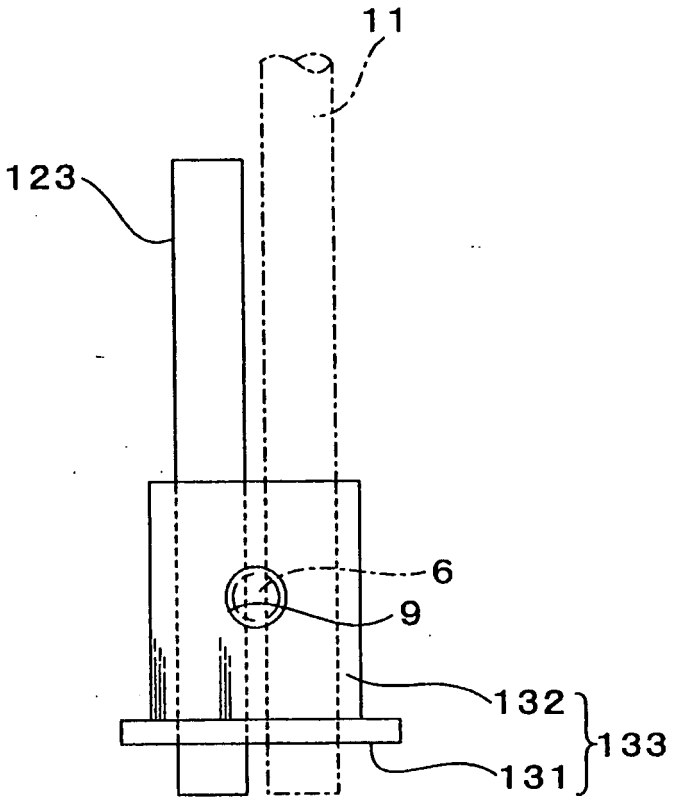


FIG.15A

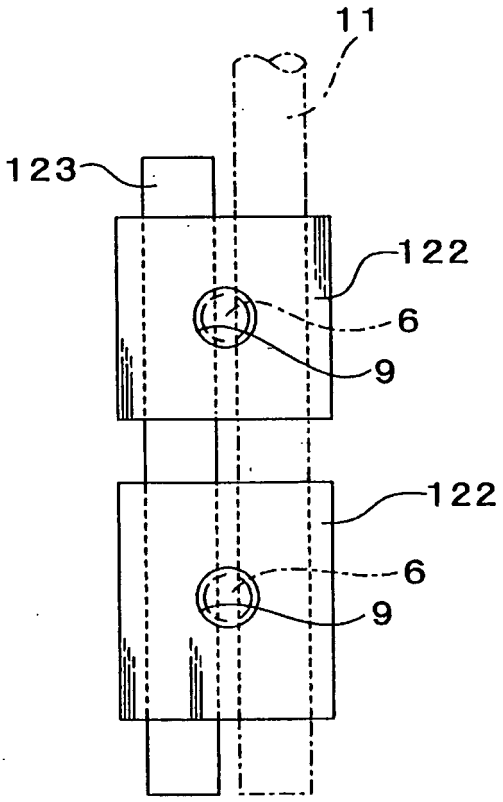


FIG.15B

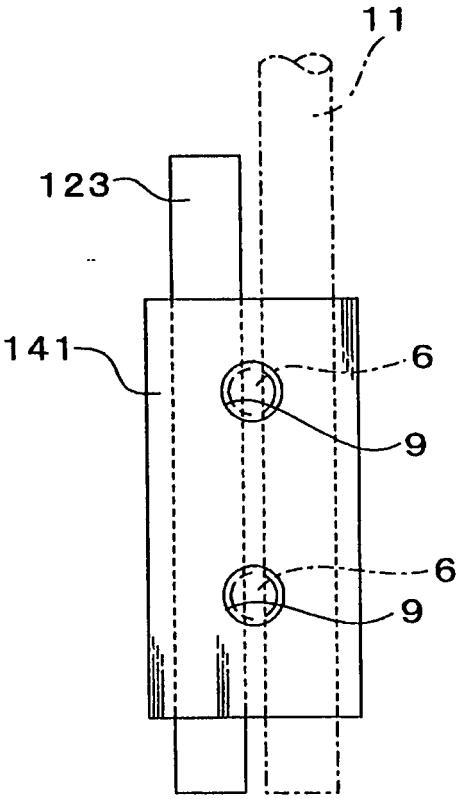


FIG.16

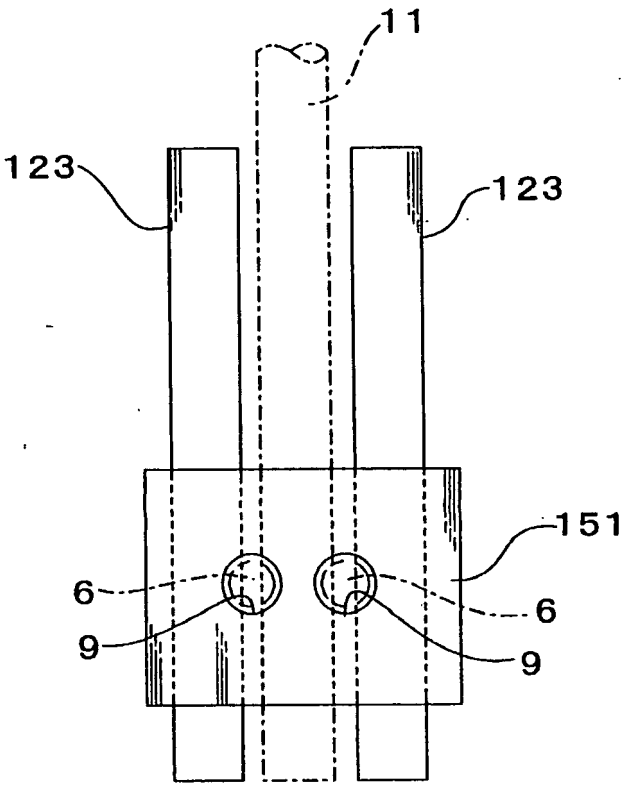


FIG.17

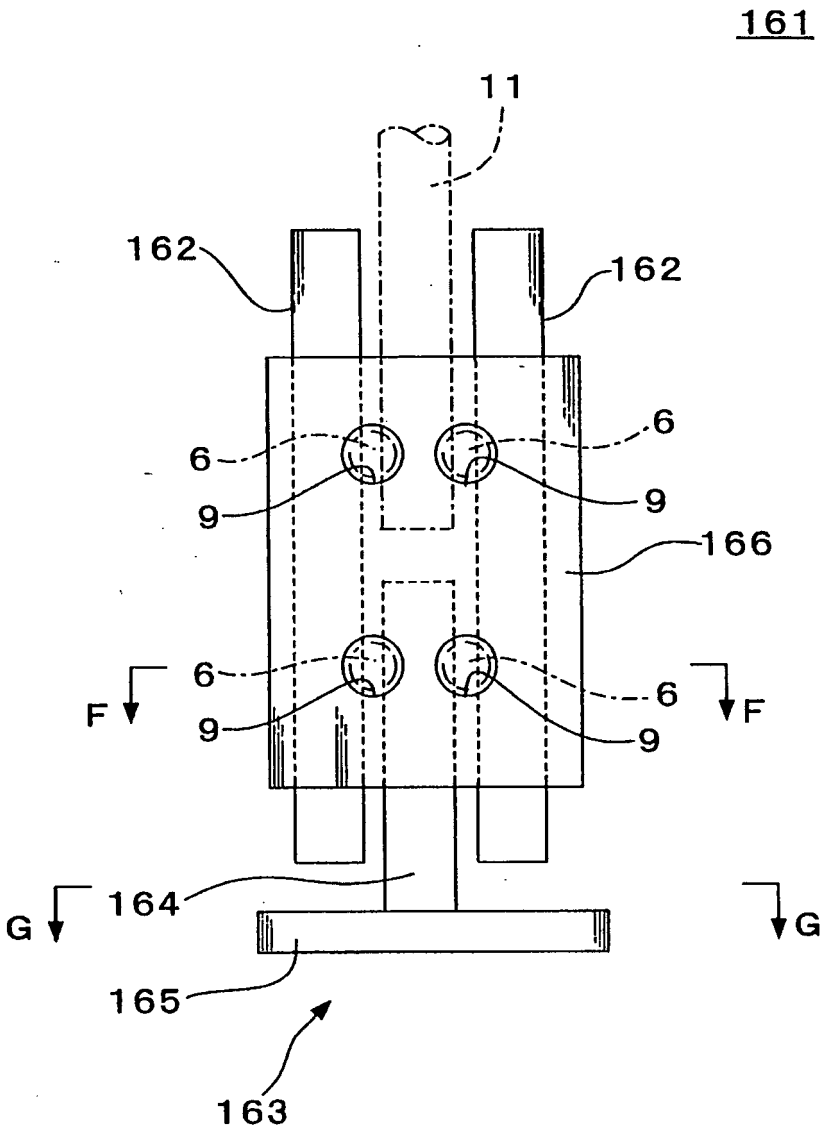


FIG.18A

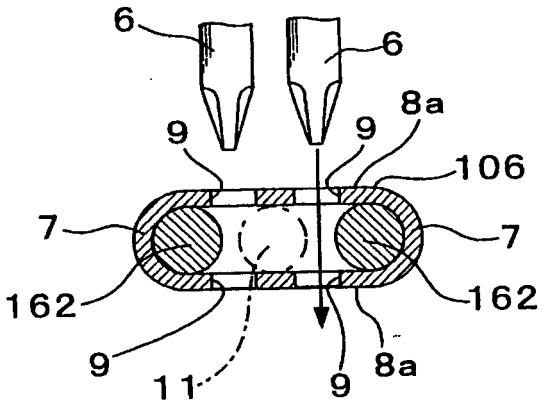


FIG.18B

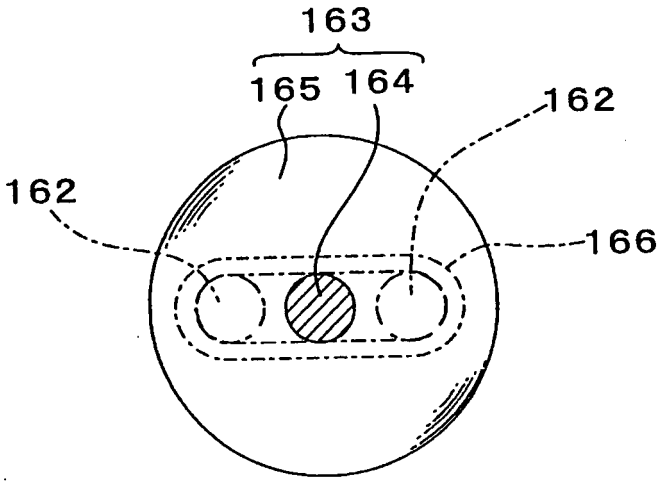


FIG.19

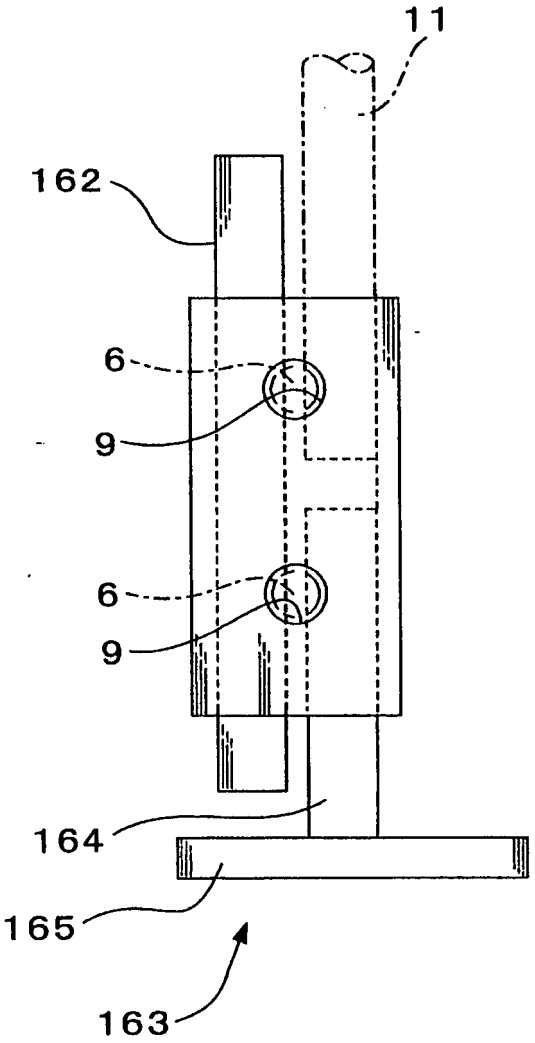


FIG.20

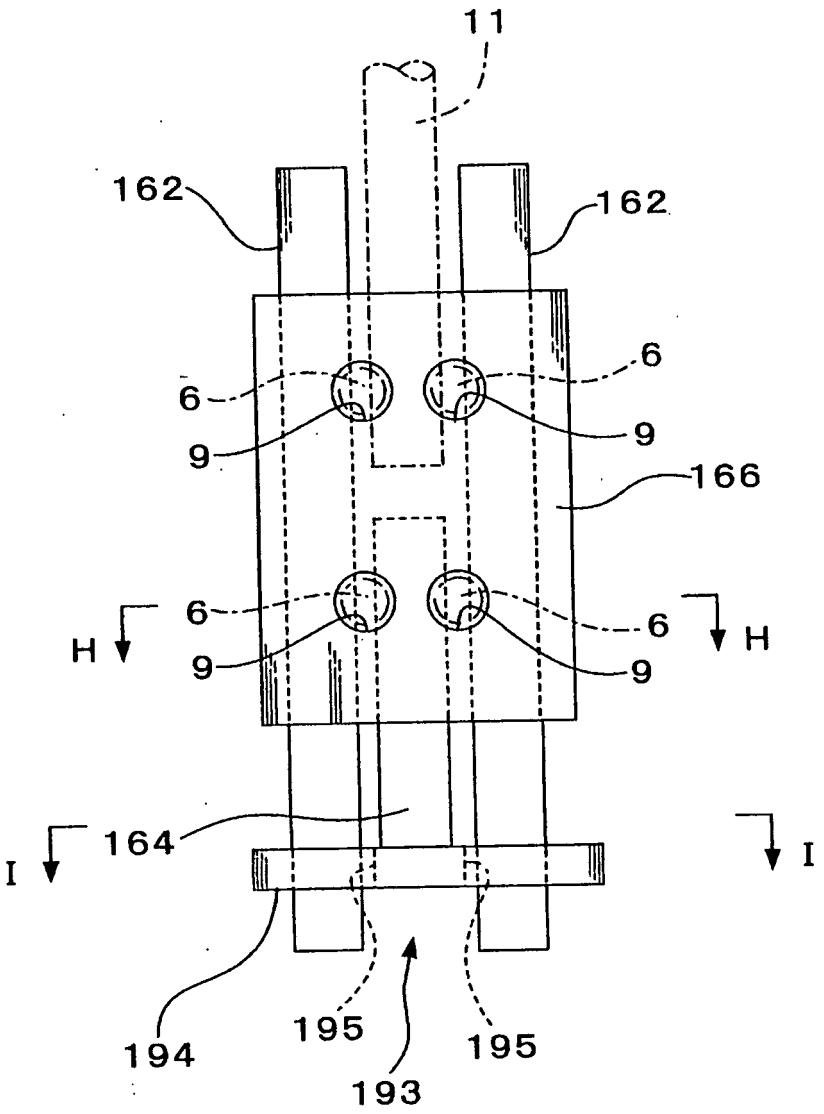


FIG.21A

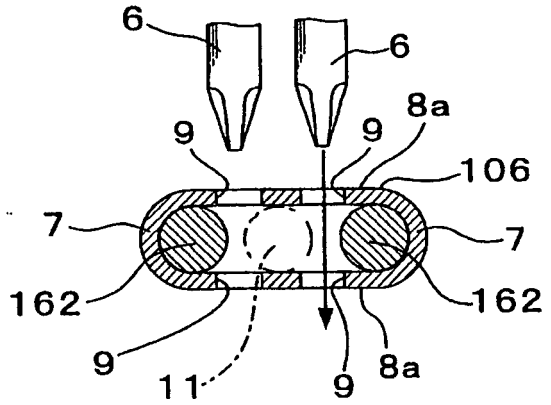


FIG.21B

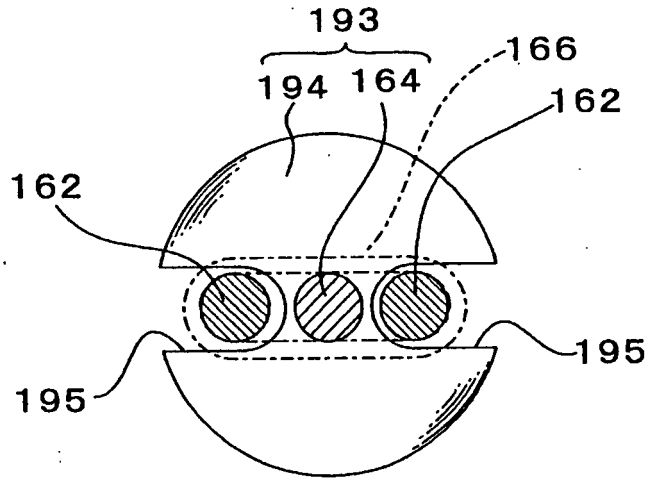


FIG.22

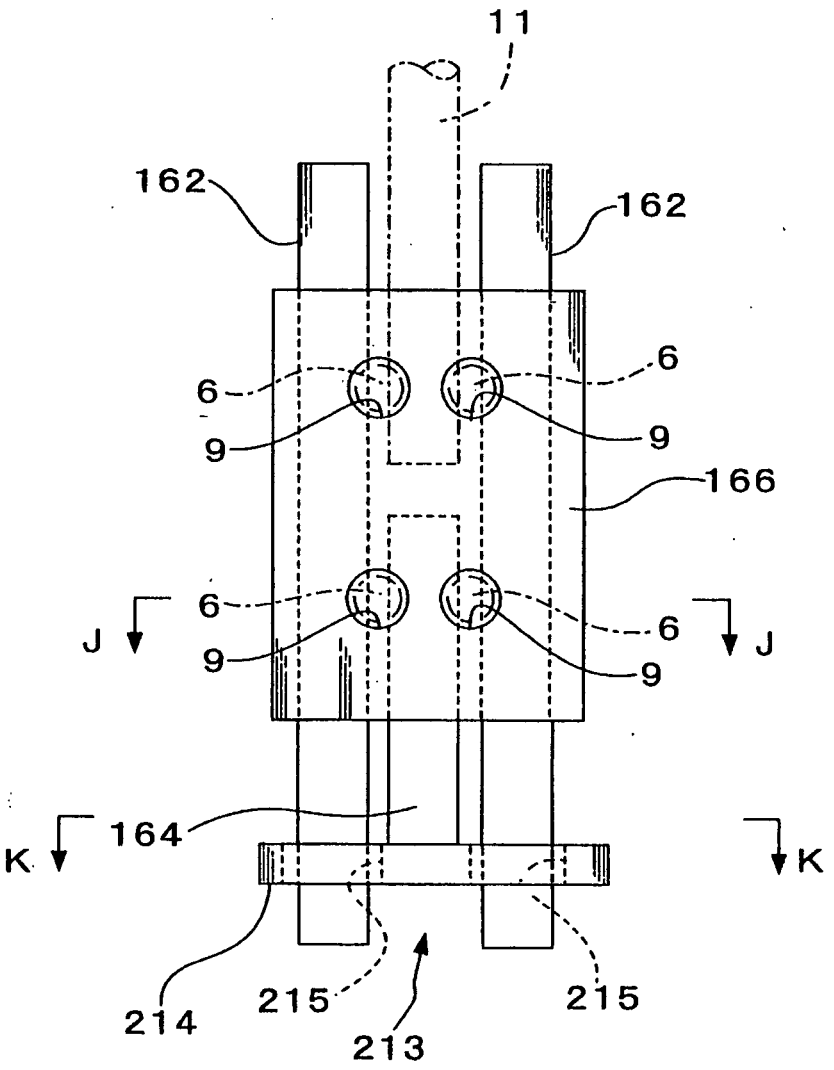


FIG.23A

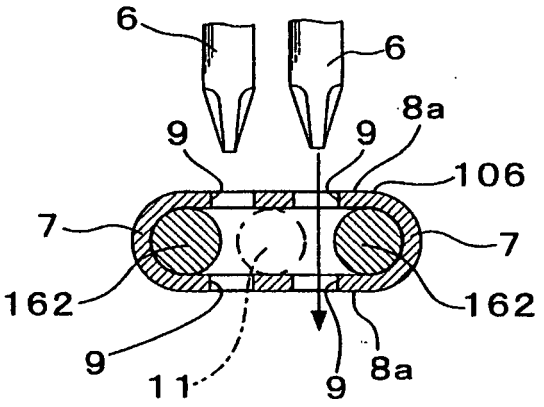


FIG.23B

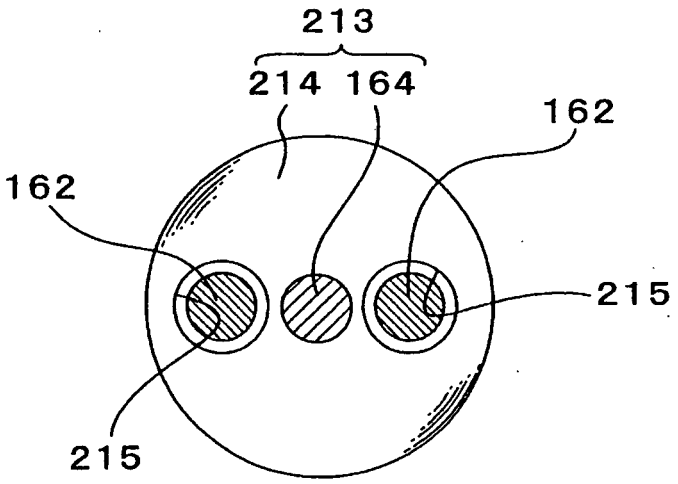


FIG.24

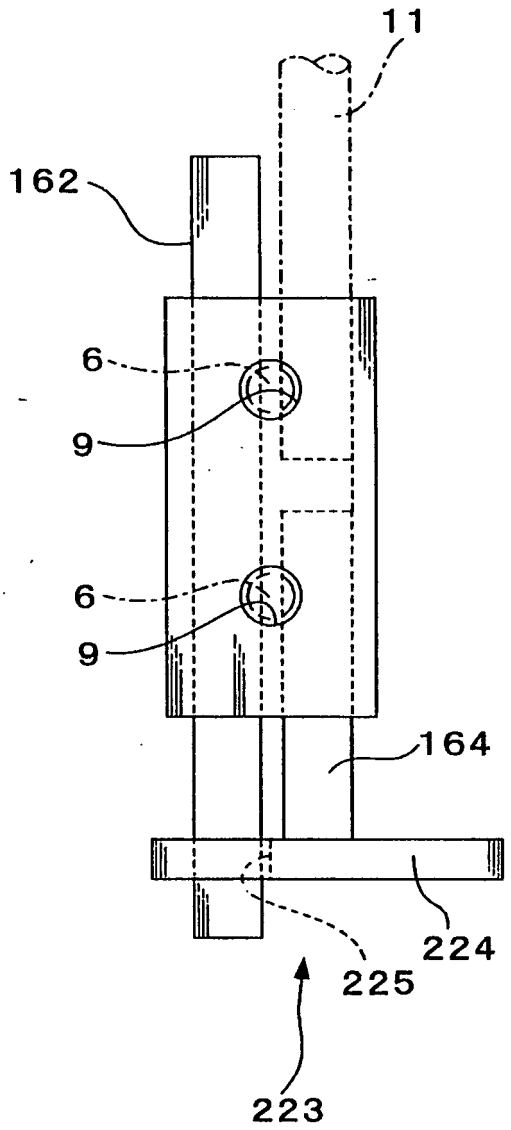
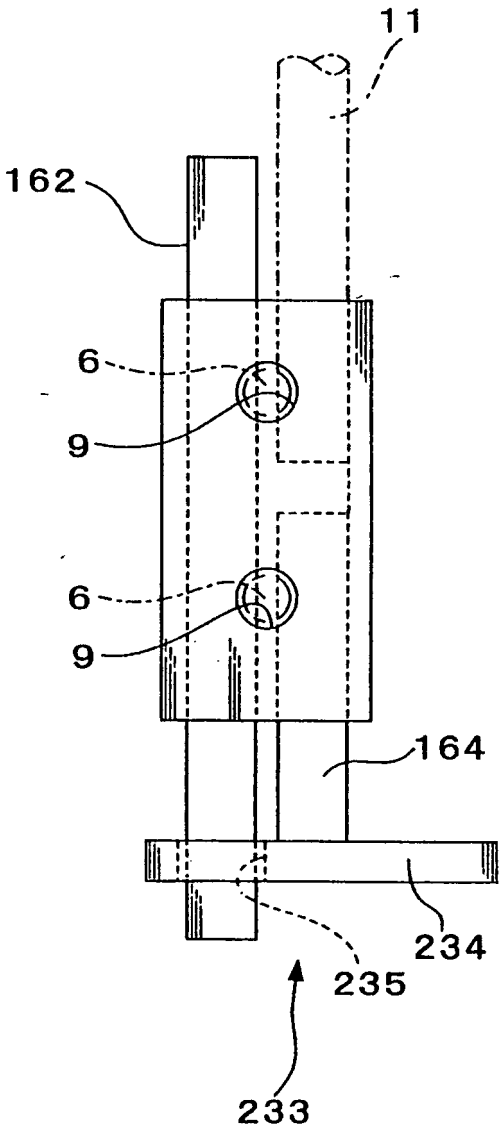


FIG.25



INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/001008

A. CLASSIFICATION OF SUBJECT MATTER
E04C5/18(2006.01)i, *E04G21/12*(2006.01)i

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)
E04C5/18, E04G21/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2007
Kokai Jitsuyo Shinan Koho 1971-2007 Toroku Jitsuyo Shinan Koho 1994-2007

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.
A	JP 2000-154613 A (Tokyotekko Co., Ltd.), 06 June, 2000 (06.06.00), Par. Nos. [0007] to [0008]; Figs. 1 to 3 (Family: none)	1-10
A	JP 2001-304210 A (Kabushiki Kaisha Sutekusu), 31 October, 2001 (31.10.01), Par. Nos. [0012] to [0013], [0017]; Figs. 6 to 9, 13 (Family: none)	1-10

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

* Special categories of cited documents:
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"O" document referring to an oral disclosure, use, exhibition or other means
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Date of the actual completion of the international search	Date of mailing of the international search report
20 November, 2007 (20.11.07)	04 December, 2007 (04.12.07)
Name and mailing address of the ISA/ Japanese Patent Office Facsimile No.	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2007/001008

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 117080/1985(Laid-open No. 23908/1987) (Okabe Co., Ltd.), 13 February, 1987 (13.02.87), Description, page 5, line 2 to page 8, line 5; Figs. 1 to 8 & US 4695178 A & GB 2178818 A	1-10
A	JP 55-21473 U (Sumitomo Metal Industries, Ltd.), 12 February, 1980 (12.02.80), Claims; drawings (Family: none)	3
A	JP 2-35153 A (Taisei Corp.), 05 February, 1990 (05.02.90), Fig. 1 (Family: none)	4,7,9

Form PCT/ISA/210 (continuation of second sheet) (April 2007)

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- JP 2004084204 A **[0007]**
- JP 3763877 B **[0007]**