US 20100207009A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2010/0207009 A1**

(43) **Pub. Date: Aug. 19, 2010**

Nishijima

(54) **TEMPORARY POST JOINT, TEMPORARY STRUCTURE, AND METHOD FOR CONSTRUCTING SLABS OF FLOORS**

(76) Inventor: **Shigeyuki Nishijima**, Fukuoka-Shi (JP)

Correspondence Address:
WENDEROTH, LIND & PONACK, L.L.P.
1030 15th Street, N.W.,, Suite 400 East
Washington, DC 20005-1503 (US)

(21) Appl. No.: **12/668,746**

(22) PCT Filed: **Jun. 4, 2008**

(86) PCT No.: **PCT/JP2008/060283**

§ 371 (c)(1),
(2), (4) Date: **Mar. 15, 2010**

(30) **Foreign Application Priority Data**

Sep. 26, 2007 (JP) 2007-248562
Dec. 28, 2007 (JP) 2007-339779

Publication Classification

(51) **Int. Cl.**
E04G 11/48 (2006.01)

(52) **U.S. Cl.** **249/18**

(57) **ABSTRACT**

There is provided a temporary post joint for remarkably shortening the term of works while maintaining high flexibility of slab-designing. The temporary post joint is used in a temporary structure comprising a first temporary post (**2**), and a second temporary post (**5**) arranged in a higher floor. The temporary post joint comprises: a bottom face formed connectable to an upper end portion (**2***b*) of the first temporary post (**2**); and a top face formed connectable to a lower end portion (**5***a*) of the second temporary post (**5**). The temporary post joint connects the first and second temporary posts (**2** and **5**) in a vertical direction, and the temporary post joint is formed operable to engage with arranged reinforcing bars and is integrally held within a slab even after cast-in-place concrete contacting with the reinforcing bars has hardened and solidified. It is possible to harden and solidify cast-in-placed concrete of the higher and lower floors concurrently in parallel, thereby remarkably shortening term of works.

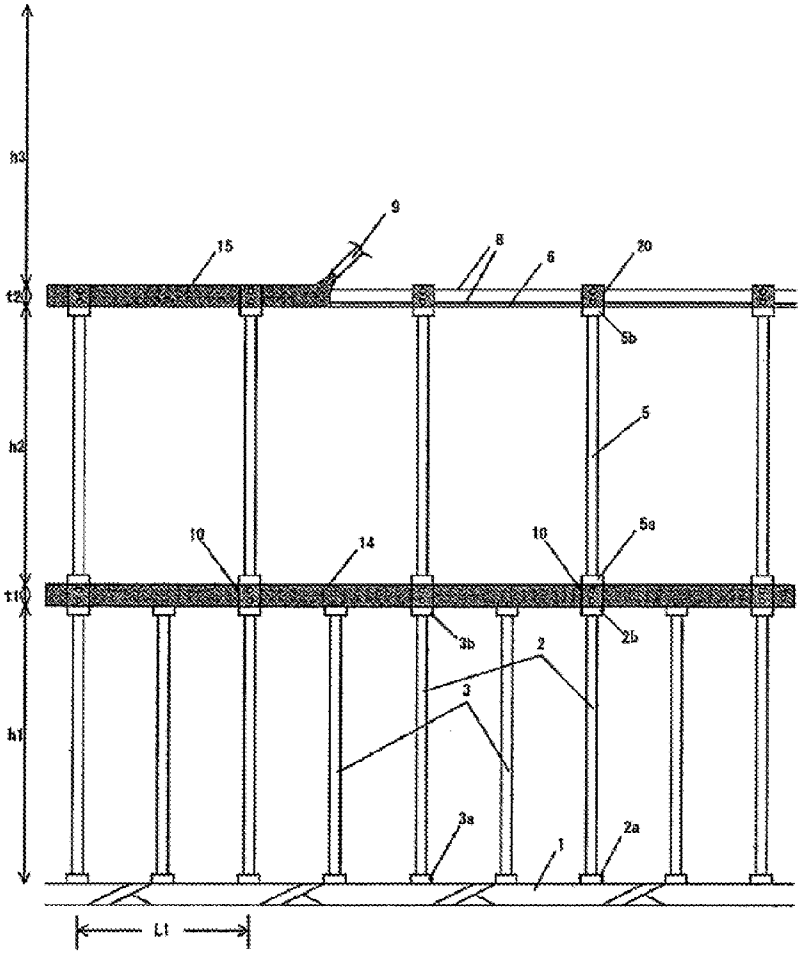


Fig. 1

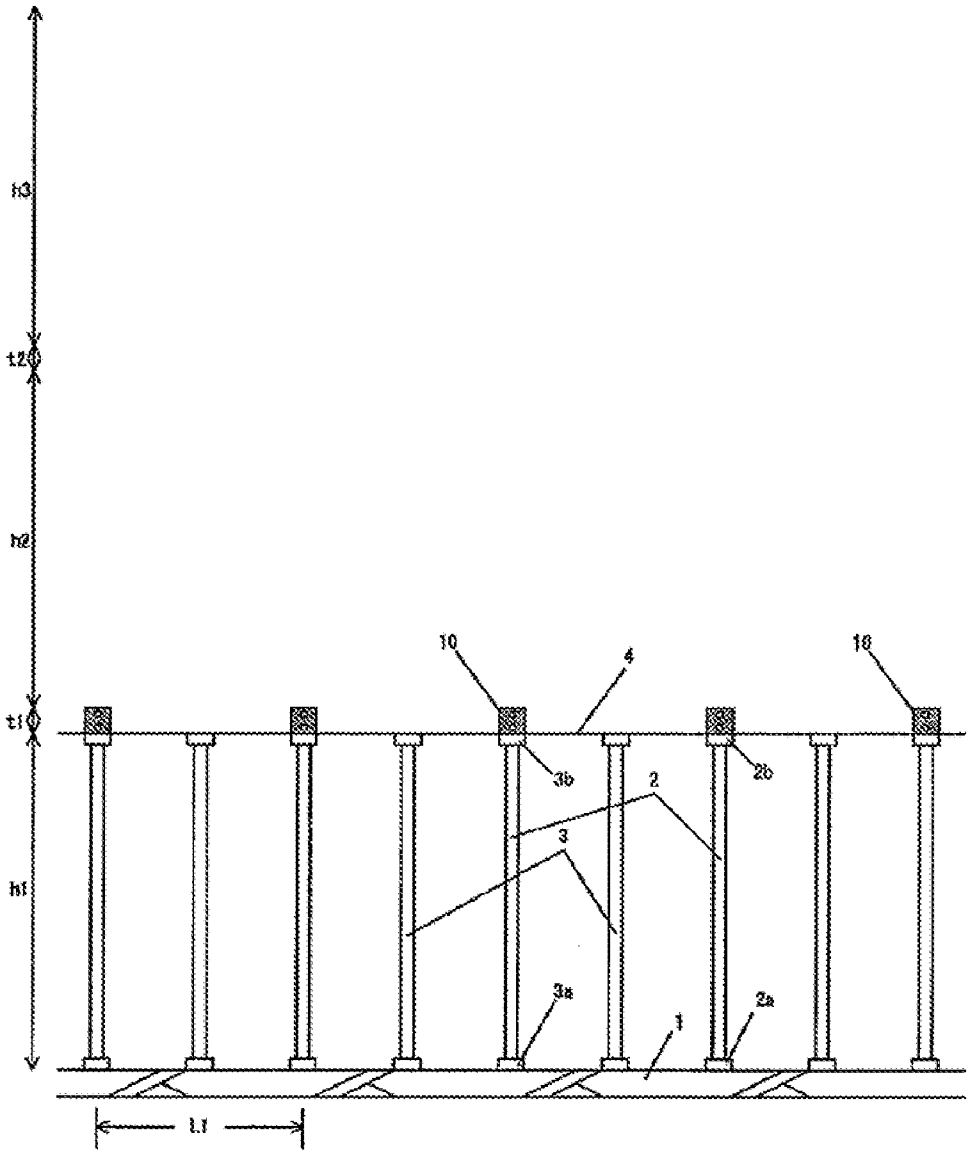


Fig. 2

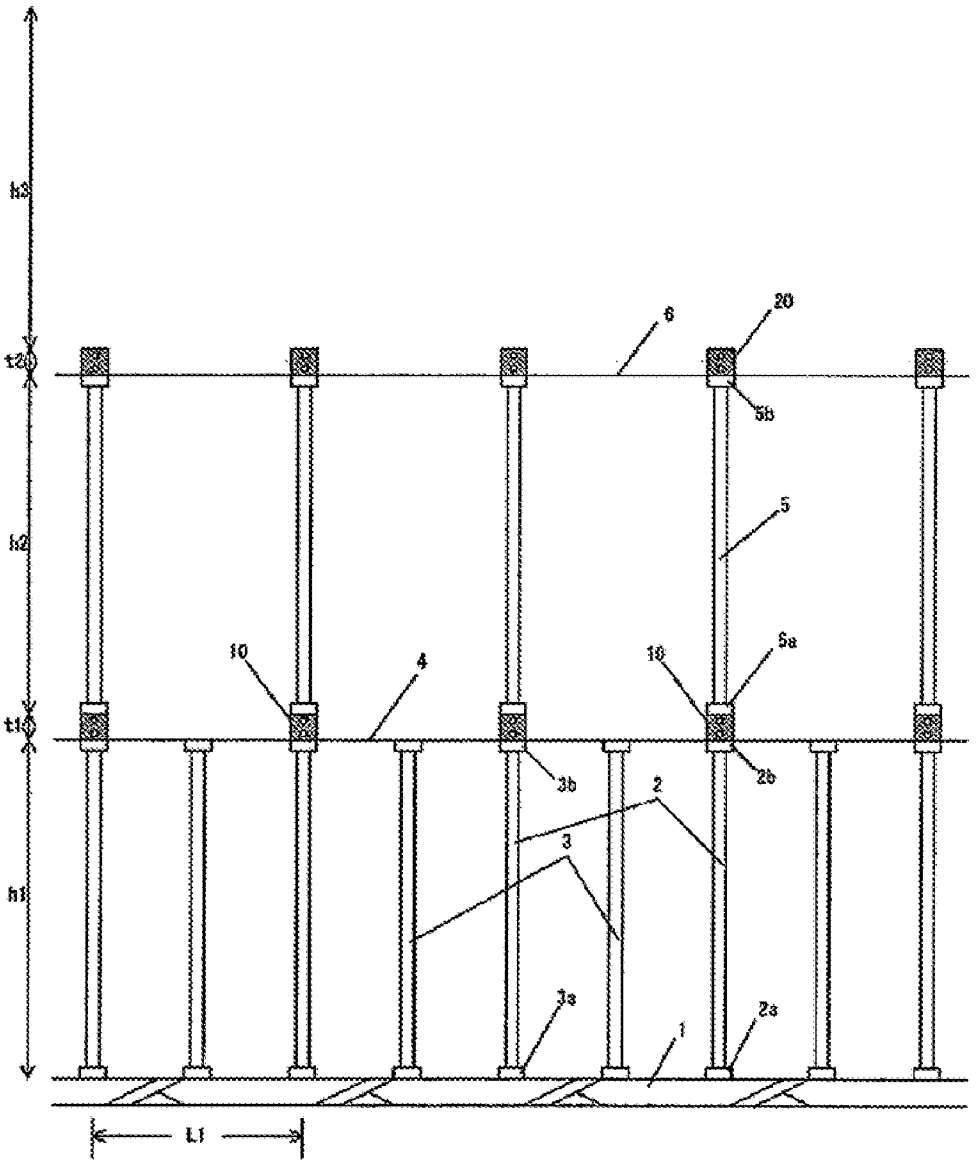


Fig. 3

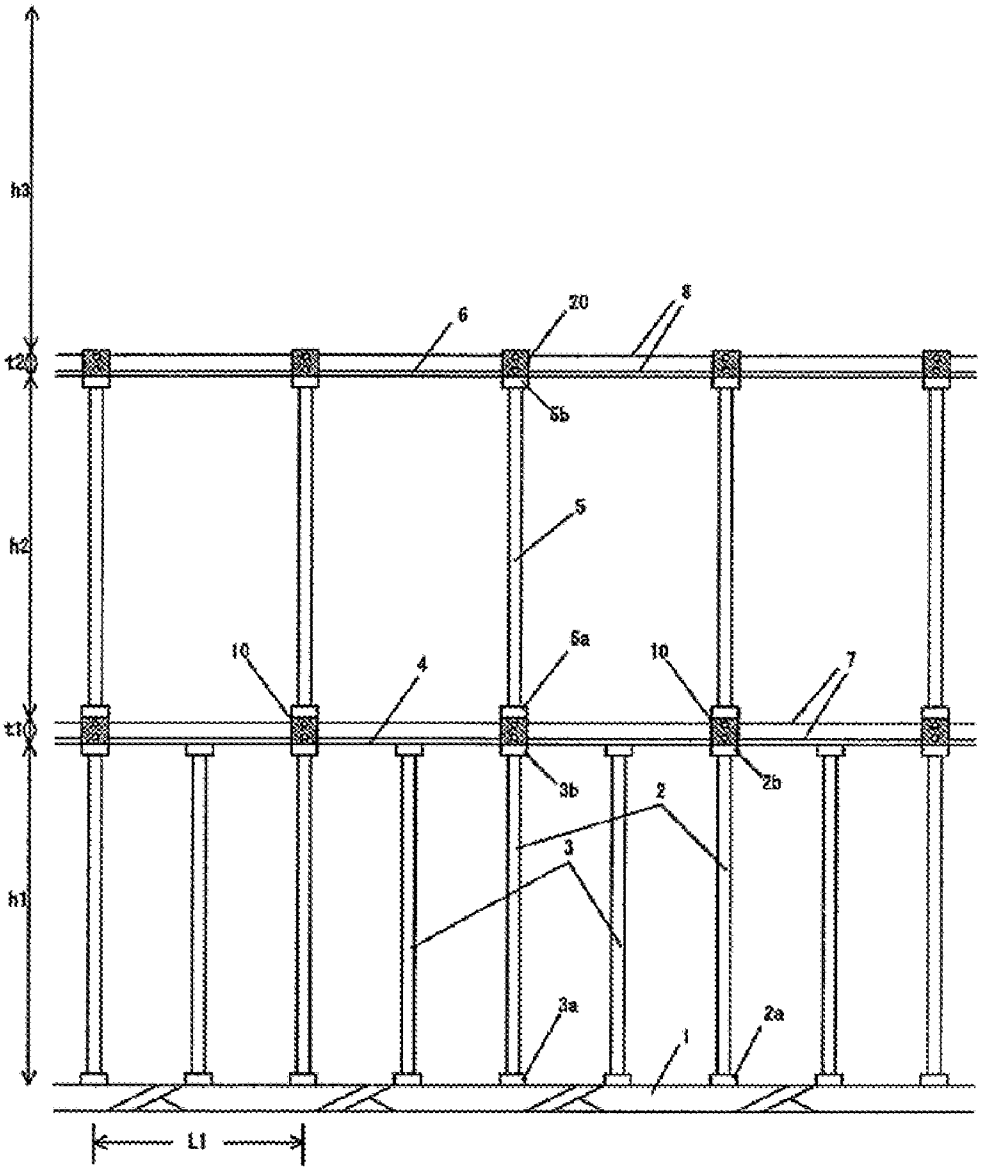


Fig. 4

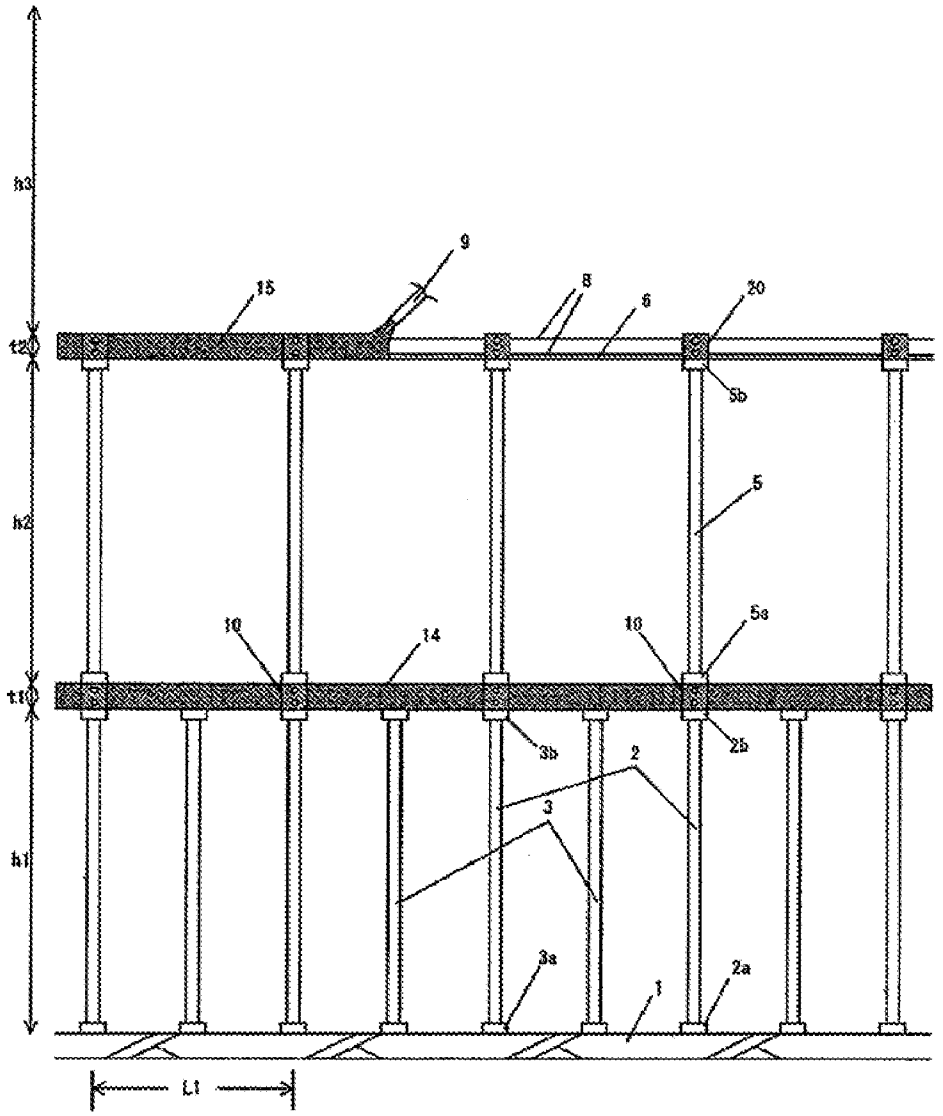


Fig. 5

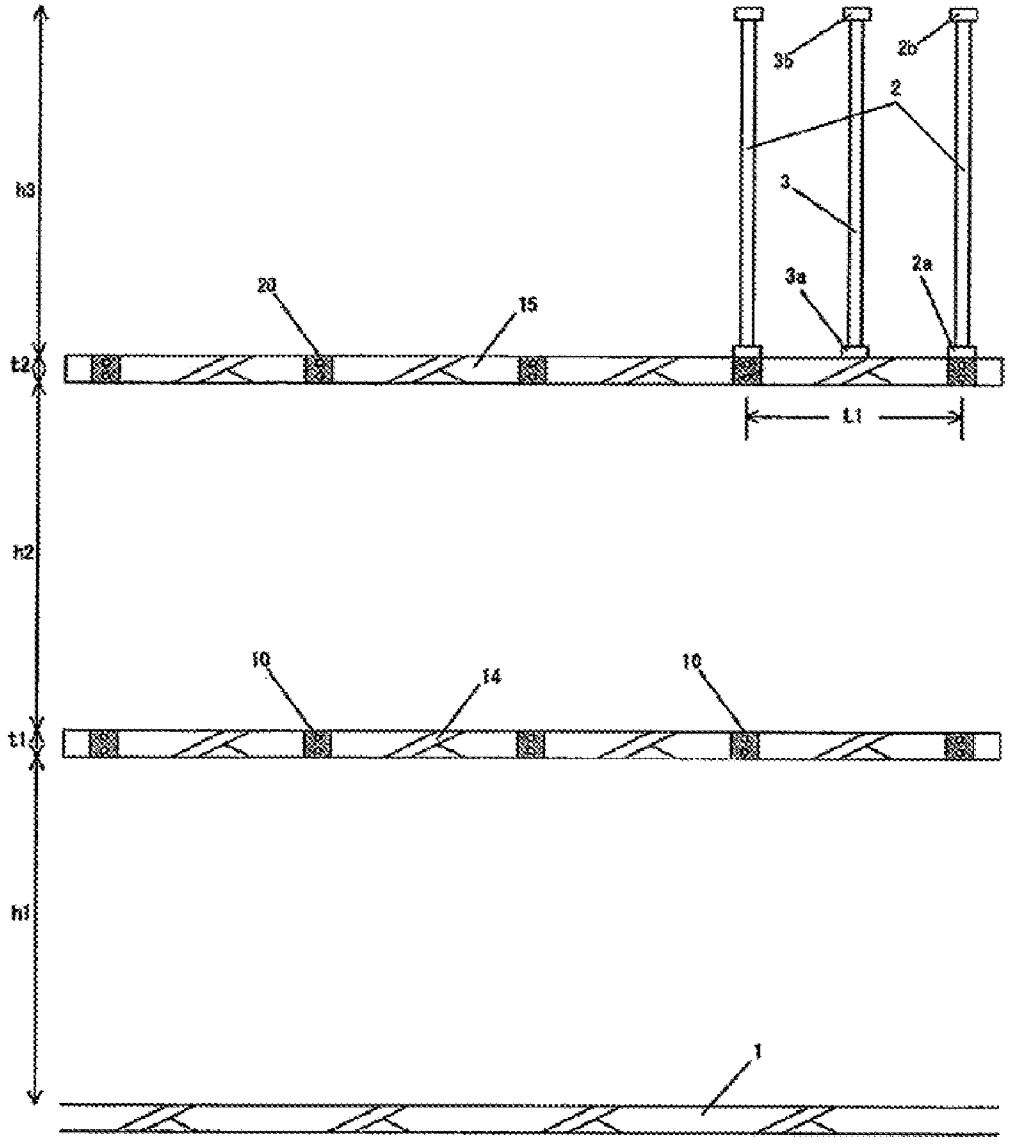


Fig. 6

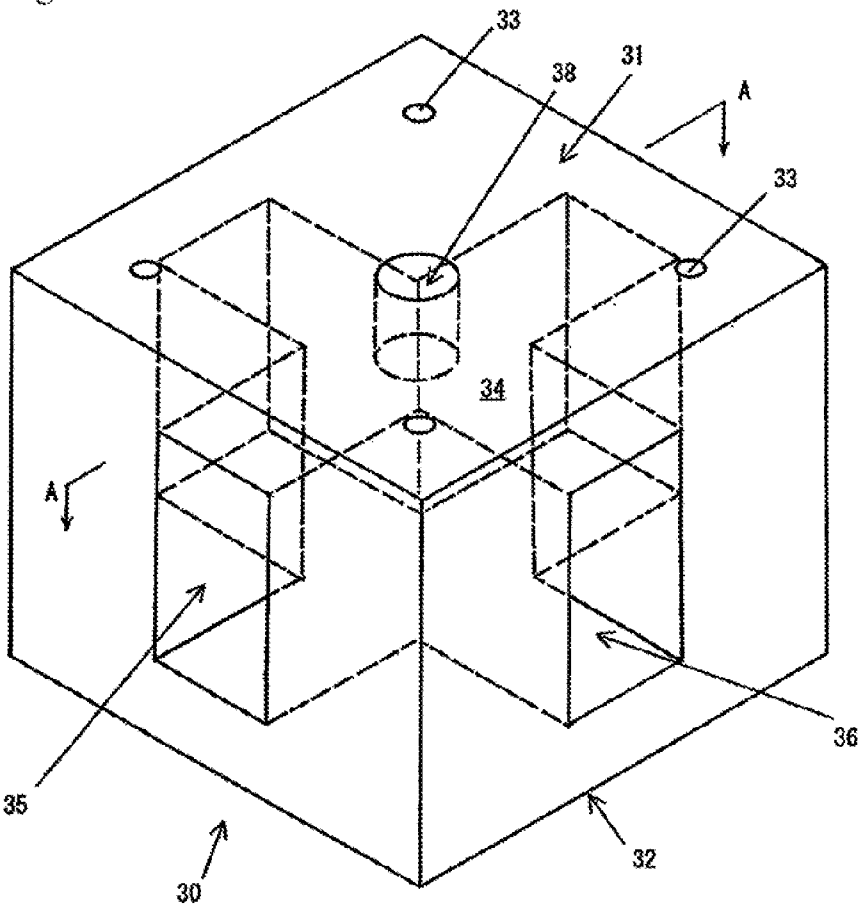


Fig. 7

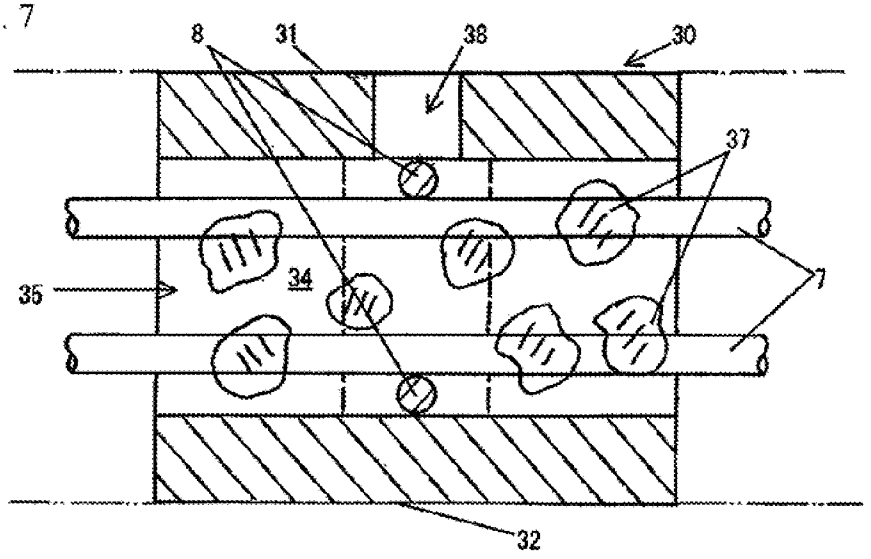


Fig. 8

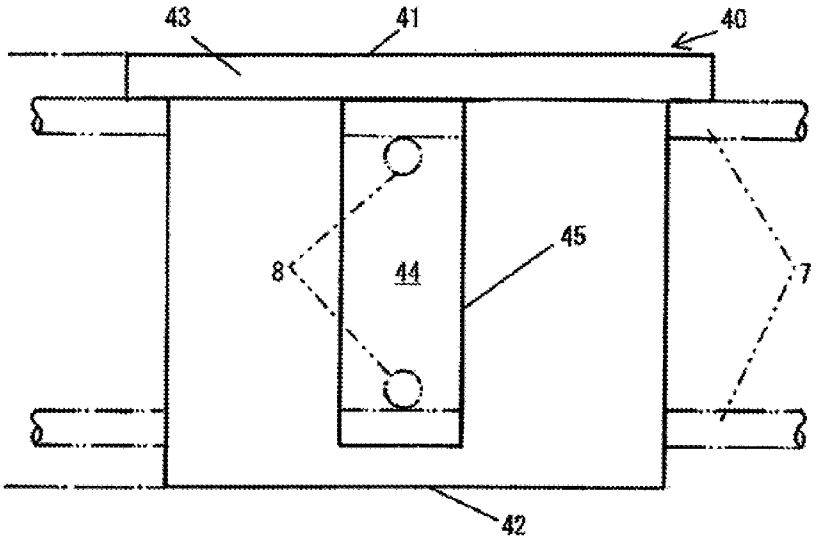


Fig. 9

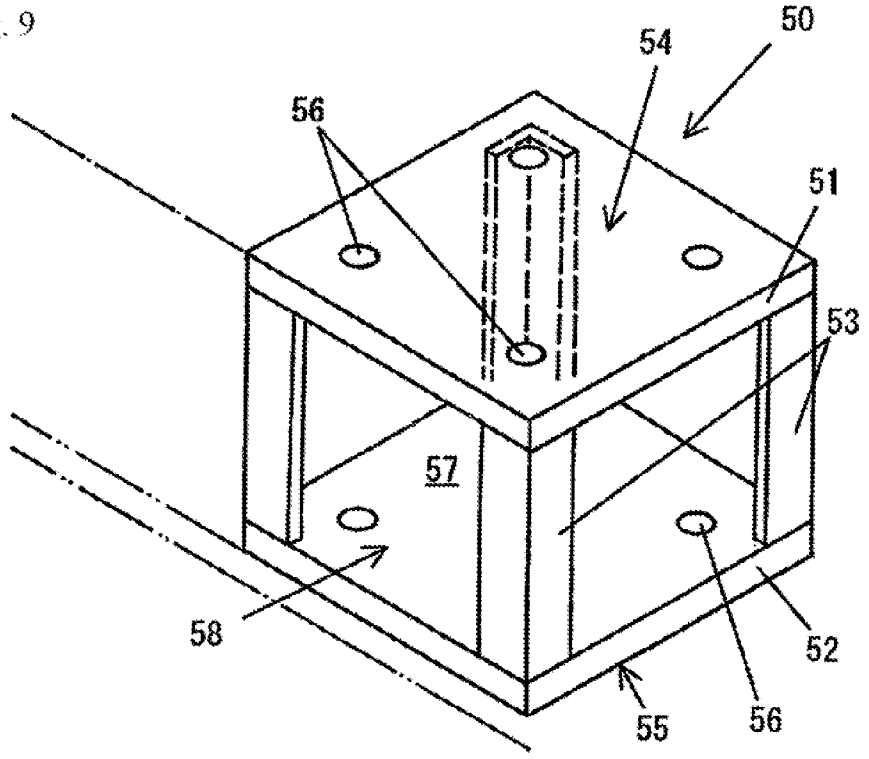


Fig. 10

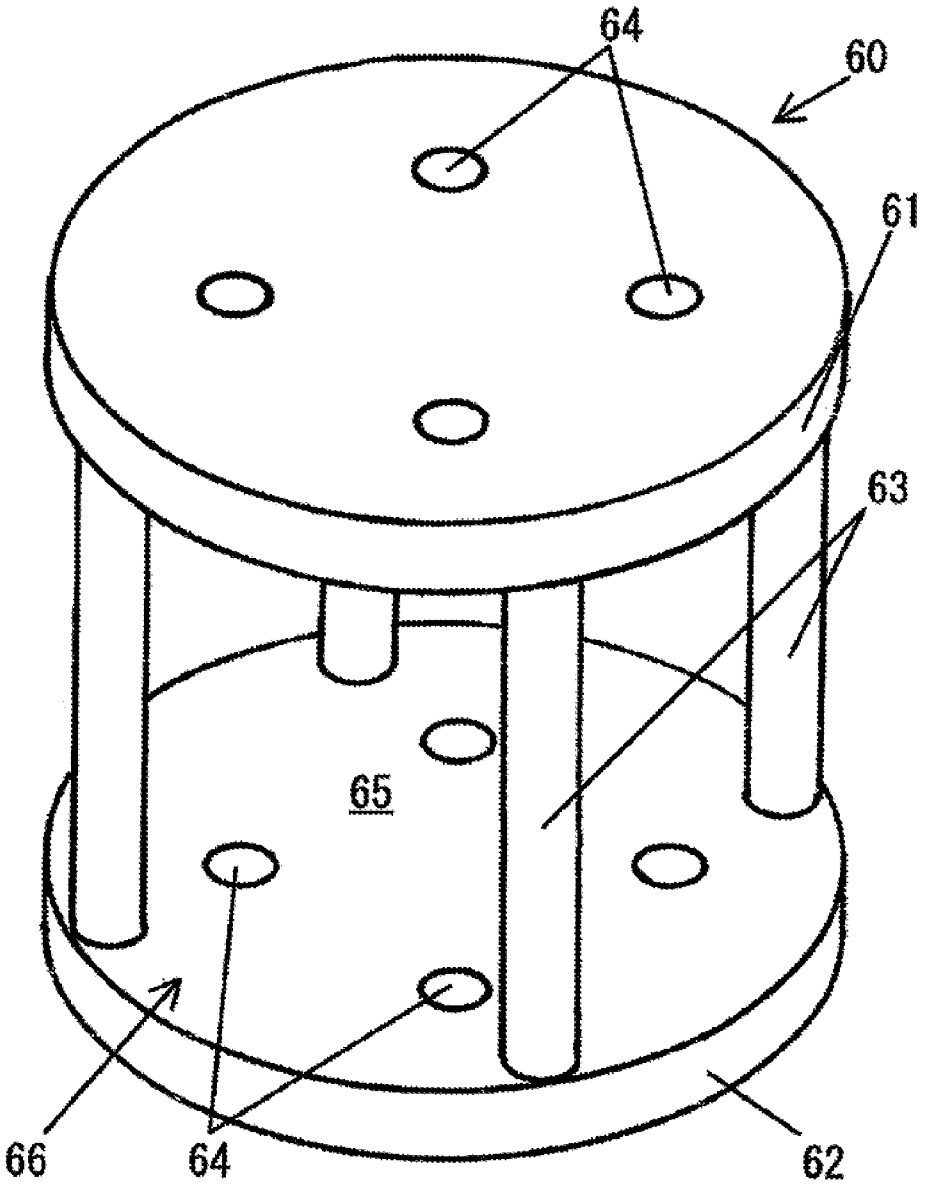


Fig. 11

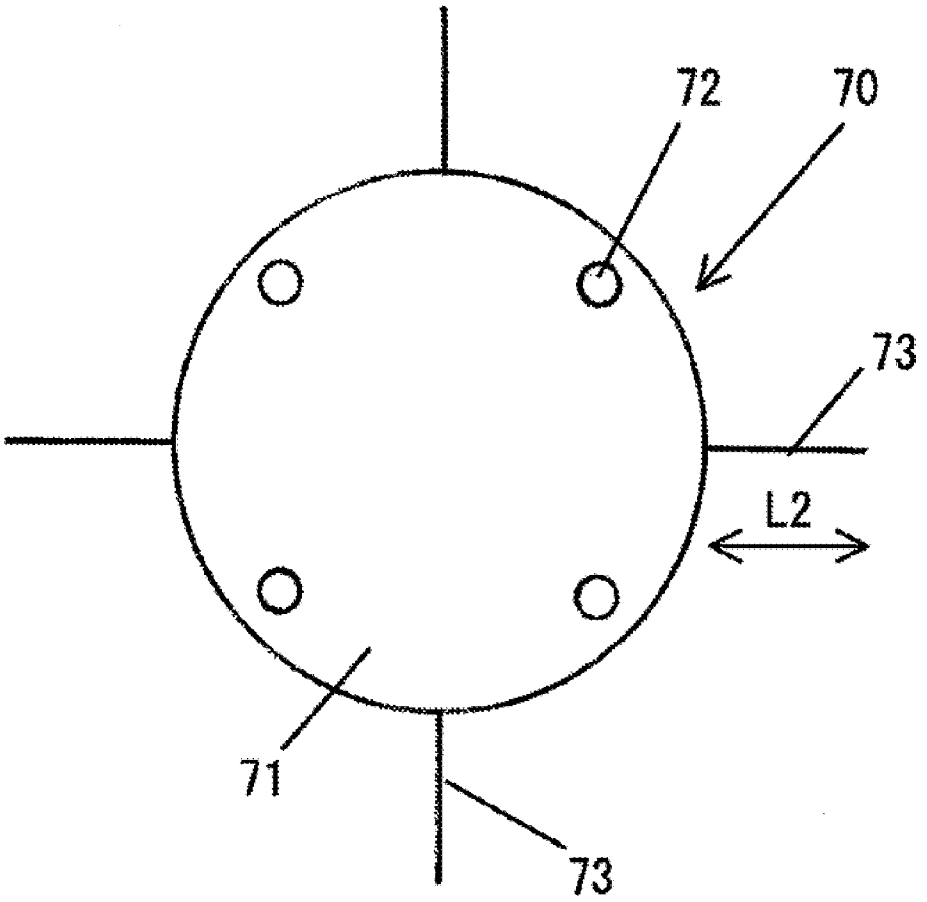


Fig. 12

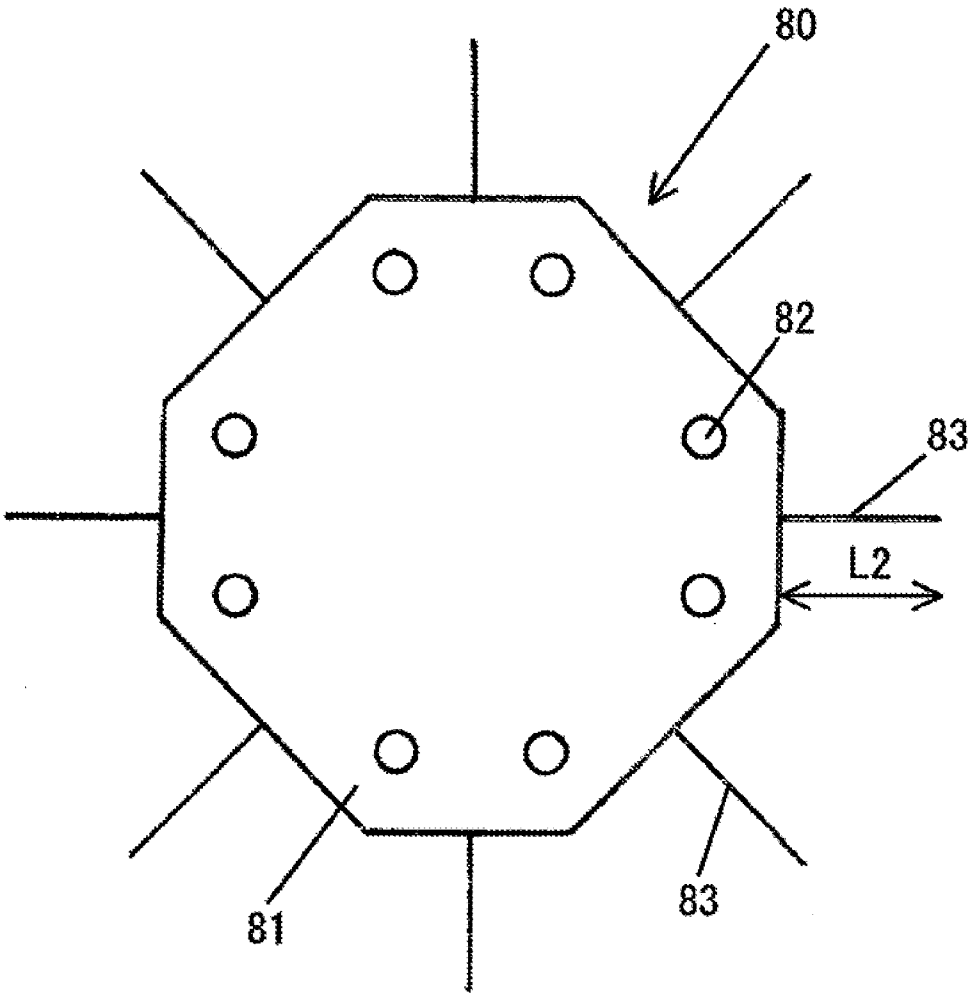
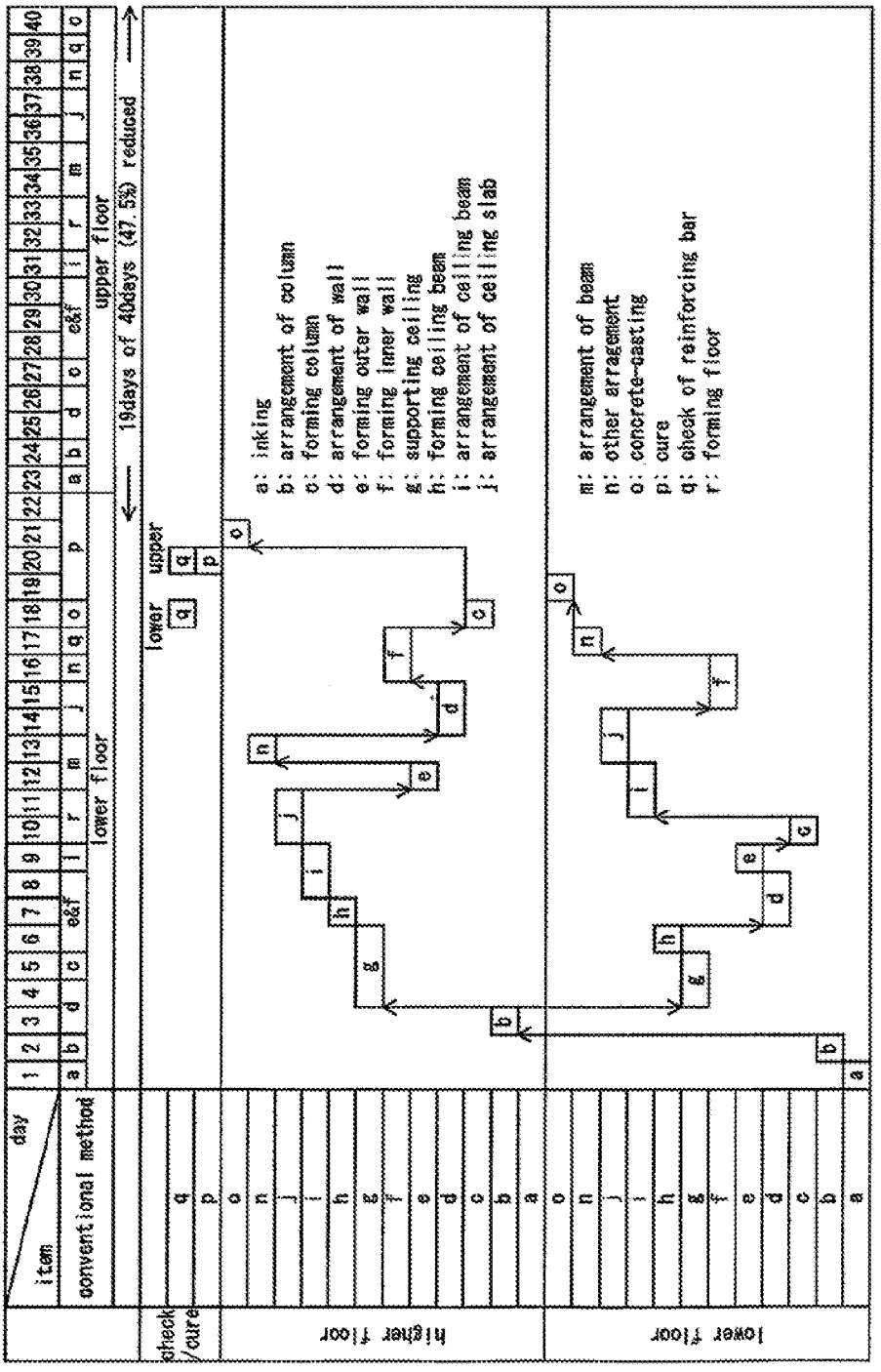


Fig. 13


day
item
conventional method
lower floor
upper floor
19days of 40days (47.5%) reduced
lower
upper
a: inking
b: arrangement of column
c: forming column
d: arrangement of wall
e: forming outar wall
f: forming inner wall
g: supporting ceiling
h: forming ceiling beam
i: arrangement of ceiling slab
m: arrangement of beam
n: other arragement
o: concrete-casting
p: cure
q: check of reinforcing bar
r: forming floor
check /cure
higher floor
lower floor

TEMPORARY POST JOINT, TEMPORARY STRUCTURE, AND METHOD FOR CONSTRUCTING SLABS OF FLOORS

TECHNICAL FIELD

[0001] The present invention relates to a temporary post joint, a temporary structure, and a method for casting-in-place ready-mixed concrete with forms, thereby constructing slabs of a plurality of floors in parallel.

BACKGROUND ART

[0002] Document 1 (Japanese patent application laid-open on No. 1109-217417) discloses a technology of constructing pre-cast concrete longitudinal direction beams, and craning up pre-cast concrete boards to bring them down in a skeleton body. This enables to construct slabs without a support.

[0003] However, in this way, the width of slabs must be the multiple of the width of the pre-cast boards, and also the thickness of the slabs is limited. In other words, it must be said that the flexibility of slab construction is low.

[0004] Therefore, in general, forms are supported with a plurality of supports, and a slab of every floor is constructed individually as disclosed in Document 2 (Japanese patent application laid-open on No. H08-270069).

[0005] In this way, the flexibility of slab-designing is high. It takes, however, a long time to harden and solidify cast-in-place ready-mixed concrete, resulting in a long term of works and a huge cost according thereto. This is a serious problem.

[Document 1] Japanese patent application laid-open on No. H09-217417

[Document 2] Japanese patent application laid-open on No. 1108-270069

DISCLOSURE OF INVENTION

[Problem(s) to be Solved by Invention]

[0006] In view of the above, an object according to the present invention is to provide a temporary post joint, a temporary structure, and a method for constructing slabs of a plurality of floors that can maintain high flexibility of slab-designing, while reducing the term of works remarkably.

[Means for Solving Problem(s)]

[0007] A first aspect according to the present invention provides a temporary post joint operable to being used in a temporary structure comprising a first temporary post and a second temporary post being arranged in a higher floor than the first temporary post, the temporary post joint comprising: a bottom face formed connectable to an upper end portion of the first temporary post; and a top face formed connectable to a lower end portion of the second temporary post, wherein the temporary post joint connects the first temporary post and the second temporary post in a vertical direction, and wherein the temporary post joint is formed operable to engage with arranged reinforcing bars and is integrally held within a slab even after cast-in-place concrete contacting with the reinforcing bars has hardened and solidified.

[0008] The temporary post joint according to this arrangement connects the first temporary post and the second temporary post in the vertical direction. Ready-mixed concrete can be cast-in-place above both the first and second temporary posts. Hardening and solidifying the cast ready-mixed concrete above both the temporary posts can be performed concurrently.

[0009] The terms of works can be remarkably shortened in comparison with the prior art that individually performs casting ready-mixed concrete of every floor to harden and solidify it.

[0010] Since usage of forms is not hindered, the flexibility of design can be kept high.

[0011] The temporary post joint is integrally held within the slab even after hardening and solidifying the cast-in-place concrete has been completed. By merely removing the forms and the temporary posts after the hardening and solidifying, the construction of the slabs can be completed.

[0012] A second aspect according to the present invention provides a temporary post joint as defined in the first aspect, wherein height from the bottom face to the top face is equal to the thickness of cast-in-place concrete.

[0013] With this arrangement, a worker who casts the ready-mixed concrete can exhaust the ready-mixed concrete referring to the top face of the temporary post joint as a landmark. Conventionally, he used to do the work by intuition without any basis. According to the arrangement, he can do the work more precisely and easily, thereby improving the precision of slab thickness.

[0014] A third aspect according to the present invention provides a temporary post joint as defined in the first aspect, wherein the bottom face is connected to the upper end portion of the first temporary post via a form contacting with the concrete.

[0015] With this arrangement, the temporary post joint connects the first and second temporary posts in the vertical direction inserting the form there-between, thereby constructing a solid temporary structure.

[0016] A forth aspect according to the present invention provides a temporary post joint as defined in the first aspect, wherein an anchor is provided with the top face and the bottom face, respectively.

[0017] With this arrangement, the worker can strongly connect the temporary post and the temporary post joint using an anchor bolt, and can easily do his work by loosening the anchor bolt when the temporary post should be removed.

[0018] A fifth aspect according to the present invention provides a temporary post joint as defined in the first aspect, wherein a bar arrangement space opening to the concrete via an opening part is provided within the interior of the temporary post joint, and wherein bars penetrate the bar arrangement space via the opening part, thereby the temporary post joint engages with the bars.

[0019] With this arrangement, the worker easily do his work because it is sufficient for him to insert the bars into the bar arrangement space almost similarly to a case where the temporary post joint does not exist. The temporary post joint may have a flat shape without a protruding member from a side face, which may be box-shaped or tubular. In this way, the worker is free from obstruction and injury caused by the protruding member when the temporary post joint should be loaded or conveyed.

[0020] A sixth aspect according to the present invention provides a temporary post joint as defined in the first aspect, wherein specific gravity of the temporary post joint is not less than specific gravity of the cast-in-place concrete.

[0021] With this arrangement, possibility that the temporary post joint may rise up caused by buoyancy can be reduced from casting the ready-mixed concrete till the completion of hardening and solidifying thereof, thereby enabling stable construction of slabs.

[0022] A seventh aspect according to the present invention provides a temporary post joint as defined in the first aspect, wherein the temporary post joint comprises: a solid pre-cast concrete block; and an extending bar extending outward from a side of the concrete block, and wherein the temporary post joint engages with a bar outside arranged using the extending bar.

[0023] With this structure, the worker need not in place insert the bar outside arranged through the temporary post joint. The worker can construct the slabs by merely engaging the extending bar with the bar outside arranged.

[0024] A seventh aspect according to the present invention provides a method for constructing slabs of a plurality of floors, comprising: standing a plurality of first posts in a first floor layer; supporting a first form at a boundary between the first floor layer and a second floor layer right above the first floor layer with the plurality of first posts; connecting bottom faces of a plurality of first post joints to upper end portions of the plurality of first posts, respectively; connecting lower end portions of a plurality of second post joints to top faces of the plurality of first post joints, respectively, thereby standing the plurality of second posts in the second floor layer; supporting a second form at a boundary between the second floor layer and a third floor layer right above the second floor layer with the plurality of second posts; connecting bottom faces of a plurality of second post joints to upper end portions of the plurality of second posts, respectively; casting-in-place first ready-mixed concrete contacting with the first form; and casting-in-place second ready-mixed concrete contacting with the second form, wherein the first ready-mixed concrete and the second ready-mixed concrete is hardened and solidified in at least a part of period concurrently, and afterward the first post joint and the second post joint are integrally held within slabs composed of the hardened and solidified concrete.

[0025] The temporary post joints according to this arrangement connect the plurality of first temporary posts and the plurality of second temporary posts in the vertical direction. By using the forms, constructing the plurality of floors can be performed concurrently. Accordingly, the terms of works can be remarkably shortened in comparison with the prior art that individually performs casting ready-mixed concrete of every floor to harden and solidify the cast concrete.

[0026] Moreover, usage of the forms is not hindered, thereby keeping high flexibility of design.

[0027] The temporary post joint is integrally held within the slab even after hardening and solidifying the cast-in-place concrete has been completed. By merely removing the forms and the temporary posts after the hardening and solidifying, the construction of the slabs can be completed.

[Effect of Invention]

[0028] According to the present invention, since constructing the plurality of floors can be performed concurrently utilizing the temporary post joints, the terms of works can be remarkably shortened in comparison with the conventional method. Usage of forms enables design with high flexibility.

BRIEF DESCRIPTION OF DRAWINGS

[0029] FIG. **1** is a process diagram of a slab construction method in an embodiment according to the present invention;

[0030] FIG. **2** is a process diagram of the slab construction method in the embodiment according to the present invention;

[0031] FIG. **3** is a process diagram of the slab construction method in the embodiment according to the present invention;

[0032] FIG. **4** is a process diagram of the slab construction method in the embodiment according to the present invention;

[0033] FIG. **5** is a process diagram of the slab construction method in the embodiment according to the present invention;

[0034] FIG. **6** is a perspective view of a temporary post joint in a first example according to the present invention;

[0035] FIG. **7** is a sectional view of FIG. **6** by an A-A line;

[0036] FIG. **8** is a side view of a temporary post joint in a second example according to the present invention;

[0037] FIG. **9** is a perspective view of a temporary post joint in a third example according to the present invention;

[0038] FIG. **10** is a perspective view of a temporary post joint in a forth example according to the present invention;

[0039] FIG. **11** is a plane view of a temporary post joint in a fifth example according to the present invention;

[0040] FIG. **12** is a plane view of a temporary post joint in a sixth example according to the present invention; and

[0041] FIG. **13** is a process diagram of a slab construction process of a plurality of floors in the embodiment according to the present invention.

DESCRIPTION OF SYMBOLS

[0042] h**1** to h**3**: support height

[0043] t**1** to t**2**: margin for slab

[0044] **1**: established slab

[0045] **2**, **3**, and **5**: temporary post

[0046] **2***a*, **3***a*, and **5***a*: lower end plate

[0047] **2***b*, **3***b*, and **5***b*: upper end plate

[0048] **4**, **6**: form

[0049] **10**, **20**, **30**, **40**, **50**, **60**, **70**, and **80**: temporary post joint

[0050] **31**, **41**, and **54**: top face

[0051] **32**, **42**, and **55**: bottom face

[0052] **33**, **56**, and **64**: anchor

[0053] **35**, **36**, **45**, **58**, and **66**: opening part

[0054] **34**, **44**, **57**, and **65**: bar arrangement space

[0055] **37**: aggregate

[0056] **53**, **63**: column

[0057] **51**, **61**: top board

[0058] **52**, **62**: bottom board

[0059] **71**, **81**: pre-cast concrete column

[0060] **73**, **83**: extending bar

BEST MODE FOR CARRYING OUT THE INVENTION

[0061] Hereinafter, a preferred embodiment of the present invention will now be described with reference to the accompanying drawings. First, processes of a slab construction method in this embodiment will be described, next, various kinds of temporary posts will be explained, and at last, an

example of the term of works according to this embodiment will be explained in comparison with that of conventional method.

(Slab Construction Method)

[0062] FIGS. **1**, **2**, **3**, **4** and **5** are process diagrams of a slab construction method in the embodiment according to the present invention. Hereinafter, since construction methods and elements with respect to members standing in the vertical direction, such as columns and walls, do not relate to the subject matter of the present invention and may be those of well-known art, therefore explanation thereof is omitted.

<Premised Matter>

[0063] First, as illustrated in FIG. **1**, it is assumed that a horizontal established slab **1** has been already built. Above the slab, slabs of a plurality of floors should be constructed to build a concrete structure in a medium or large (two or more-storied) scale. The established slab **1** is normally composed of a concrete slab. Theoretically speaking, the established slab **1**, however, may be constituted arbitrarily as long as the established slab **1** can without any problem support a group of temporary posts described below.

[0064] In this example, a space of three layers, which have support height h**1**, support height h**2**, and support height h**3**, respectively, is formed above the established slab **1**. A margin for slab t**1** is set up between the support height h**1** and the support height h**2**, and a margin for slab t**2** is set up between the support height h**2** and the support height h**3**, respectively.

[0065] Each of the support height h**1**, h**2** and h**3** corresponds to floor height of a building. A part or all of the support height h**1**, h**2** and h**3** may be different from the other, by changing substantial height of the temporary posts. The present invention includes such a case.

[0066] Hereinafter, in order to simplify explanation, it is assumed that temporary posts having the same substantial height are used for every floor, and further that the support height h**1**, h**2** and h**3** is equal to each other accordingly.

[0067] Similarly, it is also assumed that the margin for slab t**1** and the margin for slab t**2** are equal to each other. Herein, the margin for slab t**1** and the margin for slab t**2** indicate the sum of thickness of slab to be constructed and the substantial thickness of a form below post joints (if any). Needless to say, the form is located at a boundary between an upper floor layer and a lower floor layer.

[0068] According to convenience of illustration, only spaces between slabs until the third floor are illustrated in FIGS. **1** to **5**. This is, however, a mere example. Only the first and second floors may be constructed. The first, second, third, fourth, or more floors may be constructed by repeating the construction processes described below. The present invention includes these cases.

<Temporary Structure of Lower Floor Layer>

[0069] After the completion of preparing the above-mentioned established slab **1**, a plurality of temporary posts **2** and **3** are stood at intervals. Herein, it is assumed that the temporary post **2** carries a load from the middle or higher floor. The span thereof is set up, for example, about 1400 mm Of course, this value is a mere example, and can be changed if needed.

[0070] On the other hand, the temporary post **3** is a reinforcement, which does not carry the load from the middle or higher floor (except for weight of the form, bars, and cast concrete). In the illustrated example, although the temporary post **3** is arranged in the middle of a span L**1**, this can also be changed properly.

[0071] As illustrated in the figures, many temporary posts **2** and **3** stand close together, and the worker moves dodging about. It is preferable to take consideration so that movement of the worker is not disturbed because of too many temporary posts **2** and **3**, while maintaining the strength of the temporary structure.

[0072] The temporary posts **2** and **3** may be commercially available temporary posts, and are preferably posts whose height is adjustable, having lower end plates **2***a* and **3***a* at their lower end portions, and having upper end plates **2***b* and **3***b* at their upper end portions, respectively. The lower end plates **2***a*, **3***a* and the upper end plates **2***b*, and **3***b* are preferably formed broadly like horizontal flanges, respectively. The horizontal cross section of each post may be a polygon, such as a rectangle, or a circle, and so on.

<Temporary Structure of Medium Floor Layer>

[0073] Next, a form **4** is arranged on the upper end plates **2***b* and **3***b*. The form **4** is normally constituted including a flat concrete panel and joists and beams (not shown) reinforcing the flat concrete panel. The form is not limited to this type, if there is no problem when constructing the temporary structure, casting ready-mixed concrete, and curing (hardening and solidifying) the cast concrete.

[0074] Next, after completion of setting up the form **4**, the temporary post joints **10** are arranged right above the upper end plates **2***b* of the temporary posts **2** in the middle floor. That is, the temporary post joints **10** are arranged per the span L**1**.

[0075] Various examples of the temporary post joint **10** will be explained later. The examples commonly include the feature of "wherein the temporary post joint connects temporary posts in a vertical direction in a temporary structure, and wherein the temporary post joint is formed operable to engage with arranged reinforcing bars and is integrally held within a slab even after cast-in-place concrete contacting with the reinforcing bars has hardened and solidified".

[0076] When the temporary post joint **10** is located on the concrete panel of the form **4** and neither joist nor beam exists right below the temporary post joint **10**, it is preferable for the worker to screw an anchor bolt upward from a lower floor layer side into an anchor provided with the bottom face of the temporary post joint **10** to make the anchor bolt penetrate the concrete panel, thereby combining the anchor bolt with the anchor of the temporary post joint **10**.

[0077] If a commonly used form is used, some consideration of design can easily enable to adopt layout that the temporary post joint **10** is located on the concrete panel and neither joist nor beam exists right below the temporary post joint **10**.

[0078] When this relationship is formed, the above-mentioned margin for slab is the sum of the height of the temporary post joint **10** and the thickness of the concrete panel.

[0079] A through hole may be opened in the concrete panel (that is, a part of the forms **4**) to directly combine the bottom face of the temporary post joint **10** with a top face of the upper end plate. In this case, it is, however, necessary to take consideration so that cast ready-mixed concrete does not leak from the through hole.

[0080] Next, as illustrated in FIG. **2**, a plurality of temporary posts **5** are stood on the plurality of temporary post joints in the middle floor, respectively. Similar to the above-men-

tioned, the temporary posts **5** preferably have lower end plates **5***a* at the lower end portions thereof, and lower end plates **5***b* at upper end portions thereof, and the end plates **5***a* and **5***b* are formed broadly like horizontal flanges.

[0081] In this example, since all of the support height h**1** to h**3** is equal to each other, the temporary posts **5** have the same height as the temporary posts **2** and **3**. It is preferable to combine the lower end plates **5***a* with the anchors on the top faces of the temporary post joints **10** with anchor bolts.

[0082] As the result, the respective temporary post joints **10** are stood at intervals of the span L**1**.

<Temporary Structure of Upper Floor Layer>

[0083] Next, similar to the middle floor, a form **6** is arranged on the upper end plates **5***b*. As the same as the form **4**, the form **6** is normally constituted including a flat concrete panel, and joists and beams (not shown) reinforcing the panel. The form is not limited to this type, if there is no problem when constructing the temporary structure, casting ready-mixed concrete, and curing (hardening and solidifying) the cast concrete.

[0084] Next, after completion of setting up the form **6**, the temporary post joints **20** are arranged right above the upper end plates **5***b* of the temporary posts **5** in the higher floor. That is, the temporary post joints **20** are constituted as the same as the temporary post joints **10**, and are arranged per the span L**1**.

[0085] When the temporary post joint **20** is located on the concrete panel of the form **6** and neither joist nor beam exists right below the temporary post joint **20**, it is preferable for the worker to screw an anchor bolt upward from a lower floor layer side into an anchor (the details thereof will be described later) provided with the bottom face of the temporary post joint **20** to make the anchor bolt penetrate the concrete panel, thereby combining the anchor bolt with the anchor of the temporary post joint **20**.

[0086] When this relationship is formed, the above-mentioned margin for slab t**2** is the sum of the height of the temporary post joint **20** and the thickness of the concrete panel.

[0087] A through hole may be opened in the concrete panel (that is, a part of the forms **6**) to directly combine the bottom face of the temporary post joint **20** with a top face of the upper end plate **5***b*. In this case, it is, however, necessary to take consideration so that cast ready-mixed concrete does not leak from the through hole.

[0088] Due to the above, the temporary structure has been constructed.

[0089] Referring to FIG. **3**, it may be understood that the temporary post joints **10** are joints that attachably and detachably connect the temporary posts **2** and the temporary posts **5** in the vertical direction. It should be noted that the temporary post joints **10** are integrally held within the concrete even after casting, hardening, and solidifying the cast concrete.

<Bar Arrangement>

[0090] Next, as illustrated in FIG. **3**, bars **7** are arranged to be engaged with the temporary post joints **10** in the middle floor. Furthermore, bars **8** are arranged to be engaged with the temporary post joints **20** in the higher floor.

[0091] As for a method for arranging the bars **7** and **8** and themselves, well-known technology can be used. Therefore, detailed explanation thereof is omitted.

[0092] Arranging bars in the middle floor may be performed prior to and/or concurrently with construction of the temporary structure of the higher floor.

<Casting Ready-Mixed Concrete>

[0093] Using ready-mixed concrete-supplying hoses **9**, concrete **14** is cast-in-place in the middle floor, and concrete **15** is cast-in-place in the higher floor, respectively.

[0094] Herein, when a slab is constructed by casting-in-place according to conventional art, the thickness of the slab relies upon the intuitions and experiences of a worker casting concrete. Even if the worker is fully skilled in casting, unevenness and inclination of the slab may easily occur in many cases.

[0095] According to this embodiment, it is enough for the worker to cast concrete until the top faces of the temporary post joints **10** and **20**. In other words, during casting, the worker can make sure a landmark (that is, top faces of the temporary post joints **10** and **20**) of thickness by his eyes. Such unevenness and inclination can be reduced to the minimum, thereby enabling to easily construct slabs with high quality.

[0096] As the same as the bar arrangement, casting ready-mixed concrete in the middle floor can be performed prior to and/or concurrently with casting ready-mixed concrete in the higher floor.

<Curing Concrete>

[0097] When casting ready-mixed concrete in the middle and higher floors has been completed, it is necessary to wait for the cast concrete to be hardened and solidified. Referring to FIG. **4**, it is apparent that hardening and solidifying the concrete advances almost in parallel in the middle and higher floors.

[0098] That is, hardening and solidifying the cast-in-place concrete of a plurality of floors concurrently and at once can be performed. Thereby, wasteful time to wait the works can be reduced, and the terms of whole works is remarkably shortened.

<Completion of Slab and Repetition>

[0099] As illustrated in FIG. **5**, after completion of curing the concrete, the temporary posts **2**, **3**, and **5** that have stood in the middle and lower floor layer are removed. Thereby, construction of the cured concrete **14** which is the ceiling of the lower floor layer and also is the floor of the middle floor layer and the cured concrete **15** which is the ceiling of the middle floor layer and also is the floor of the higher floor layer is completed.

[0100] Referring to FIG. **5**, it may be understood that the temporary post joints **10** are not only joints that connect the temporary post **2** and the temporary post **5** in the longitudinal direction, but also are buried bodies that are integrally held within the concrete even after casting, hardening, and solidifying the concrete.

[0101] The inventors of the present invention have invented the temporary post joints **10**, and, utilizing the joints, also have completed the slab construction method for constructing slabs of a plurality of floors that can remarkably shorten the term of works in comparison with the conventional method.

[0102] Afterward, if needed, a slab of further higher floor can be constructed by regarding the cured concrete **15** as the established slab **1** in FIG. **1**, and repeating processes after

FIG. **1**. Also in that case, hardening and solidifying the cast-in-place concrete of a plurality of floors concurrently and at once can be performed.

[0103] In the above explanation, it is assumed that the temporary structure for the slabs for two floors is built. However, constructing slabs of three or more floors may be performed by changing strength and/or density of temporary posts. The present invention includes such a case.

(Post Joint)

[0104] Hereinafter, various kinds of post joints are explained giving some examples. The following various post joints can be used as any of the temporary post joint **10** and the temporary post joint **20**.

[0105] As mentioned above, the temporary post joint according to the embodiment is not only a joint that connects the temporary posts in the longitudinal direction, but also a buried body that is integrally held within the concrete even after casting, hardening, and solidifying the concrete.

[0106] If the specific gravity of the post joint is smaller than that of ready-mixed concrete, buoyancy is given to the temporary post joint after casting the ready-mixed concrete until the completion of hardening and solidification thereof.

[0107] Therefore, it is preferable that the specific gravity of the post joint is equal to or slightly greater than that of ready-mixed concrete.

[0108] That is, it may be understood that the post joint of this embodiment has quite a different meaning from a member embedded in ready-mixed concrete in order to form a void in a slab.

[0109] Small buoyancy may be given to the post joint when a flange of the post joint is fixed with an anchor. The post joint according to the present invention is not limited to a member having specific gravity not less than that of ready-mixed concrete.

First Example

[0110] FIG. **6** is a perspective view of a post joint of a first example according to the present invention, and FIG. **7** is a sectional view of FIG. **1** by an A-A line.

[0111] FIG. **6** illustrates a temporary post joint **30** of precast concrete with respect to the first example.

[0112] The temporary post joint **30** of the first example is almost rectangular. Anchors **33** at four positions are arranged on a top face **31** and a bottom face **32** of the temporary post joint **30**.

[0113] By screwing anchor bolts into the anchors **33**, the top face **31** is connectable to a temporary post arranged in a higher floor layer, and the bottom face **32** is connectable to a temporary post arranged in a lower floor layer, respectively.

[0114] The bottom face **32** and the temporary post arranged in the lower floor layer may be connected interleaving a concrete panel of a form, or the like there-between, or alternatively may be directly connected via a hole passing through the concrete panel of the form, or the like.

[0115] A bar arrangement space **34**, which has the shape of a cross in a horizontal cross section thereof, is opened in the interior of the temporary post joint **30**. The bar arrangement space **34** opens into the outside via opening parts **35** and **36** of four side faces.

[0116] As illustrated in FIG. **7**, reinforcing bars **7** and **8** can be inserted in into the bar arrangement space **34** via the opening parts **35** and **36**, and also they can penetrate to an opposite side.

[0117] Since the bar arrangement space **34** has the shape of the cross in the horizontal cross section thereof, the reinforcing bars **7** and **8** can intersect perpendicularly with each other in the bar arrangement space **34**. Thereby, the reinforcing bars **7** and **8** engage with the temporary post joint **30**.

[0118] The level of the bottom face **32** is substantially as the same as the level of the form. The level of the top face **31** is used as a landmark indicating an upper limit of ready-mixed concrete to be exhausted.

[0119] When the ready-mixed concrete is exhausted around the temporary post joint **30**, aggregate contained in the ready-mixed concrete can go into the bar arrangement space **34** through the opening part **35**. In the bar arrangement space **34**, the components of the ready-mixed concrete can be distributed as the same as the outside of the temporary post joint **30**, and also can be hardened and solidified.

[0120] Herein, as illustrated in FIG. **6** and FIG. **7**, an air hole **38** opening upwards from the bar arrangement space **34** is formed in the temporary post joint **30**. When the ready-mixed concrete goes into the bar arrangement space **34** from the opening part **35**, air existed in the interior of the bar arrangement space **34** is upward exhausted to the outside via the air hole **38**. Although illustration of the air hole is omitted in the second or later examples, it is preferable to provide with the air hole similarly. In addition, it is preferable to cast ready-mixed concrete so much that the concrete fills the air hole up, and further so much that a part of the concrete mounds on the air hole **38**. Under these conditions, the bar arrangement space **34** is filled up with the ready-mixed concrete, and air hardly remains therein. When the ready-mixed concrete mounds from the air hole **38**, it is preferable for the worker to remove extra ready-mixed concrete with a trowel.

[0121] As understood referring to FIG. **6**, outer faces of the temporary post joints **30** are all flat and have no part extending outward until the reinforcing bars **7** and **8** are inserted into the bar arrangement space **34**. Accordingly, when the worker loads and/or conveys the temporary post joint **30**, he is neither disturbed by any extending part (especially, by an extending bar, or the like) nor injured thereby. The temporary post joint **30** can be dealt with very easily.

Second Example

[0122] In the first example, the temporary post joint **30** which is box-like is used. In the second example, as illustrated in FIG. **8**, an upper part of a temporary post joint **40** is formed with a flange part **43** that is wider than a lower part thereof Therefore, a top face **41** is formed more widely than a bottom face **42**.

[0123] Also in the second example, a bar arrangement space **44**, which has the shape of a cross in a horizontal cross section thereof, is formed. The bar arrangement space **44** opens into the outside via opening parts **45**.

[0124] Similar to the first example, also in the second example, by inserting and making the reinforcing bars **7** and **8** penetrate into the bar arrangement space **44**, the reinforcing bars **7** and **8** can be arranged intersecting perpendicularly in the bar arrangement space **44**. Thereby, the reinforcing bars **7** and **8** engage with the temporary post joint **40**.

[0125] The level of the bottom face **42** is substantially as the same as the level of the form. The level of the top face **41** is used as a landmark indicating an upper limit of ready-mixed concrete to be exhausted.

[0126] As the same as the first example as shown in FIG. **2**, ready-mixed concrete can be exhausted, hardened, and solidified.

[0127] As understood referring to FIG. **8**, also in the second example, outer faces of the temporary post joint **40** are all flat and have no part extending outward until the reinforcing bars **7** and **8** are inserted into the bar arrangement space **34**.

[0128] Accordingly, as the same as the first example, when the worker loads and/or conveys the temporary post joint **30** according to the second example, he is neither disturbed by any extending part (especially, by an extending bar, or the like) nor injured thereby.

[0129] In addition, when the worker carries the temporary post joint **40** by his hands, he can grip an edge of the flange part **43**. Handling thereof is very easy.

Third Example

[0130] The temporary post joints of pre-cast concrete have been described in the first and second examples. In the third example, as illustrated in FIG. **9**, not a temporary post joint of pre-cast concrete but a temporary post joint **50** of steel or fiber-reinforced plastic is adopted.

[0131] The specific gravity of the temporary post joint **50** is preferably more than that of ready-mixed concrete. When the specific gravity is not enough, a weight may be added properly.

[0132] As illustrated in FIG. **9**, a top board **51** and a bottom board **52** are rectangular and flat, and constitute an up-and-down pair. The top and bottom boards **51** and **52** are joined with columns at four corners to be formed in the shape of a box. As illustrated, it is preferable to use an angle member as the column **53**.

[0133] Anchors **56** are properly arranged on the top board **51** and the bottom board **52**.

[0134] In this way, a top face **54** of the top board **51** is a top face **54** of the temporary post joint **50**, and a bottom face **55** of the bottom board **52** is a bottom face **55** of the temporary post joint **50**. The top and bottom boards **51** and **52** are rectangular boards, respectively.

[0135] Similar to the first and second examples, the level of the bottom face **55** is substantially as the same as the level of the form. The level of the top face **54** is used as a landmark indicating an upper limit of ready-mixed concrete to be exhausted.

[0136] When the ready-mixed concrete is exhausted around the temporary post joint **50**, aggregate contained in the ready-mixed concrete can go into the bar arrangement space **57** through the opening part **58**. In the bar arrangement space **57**, the components of the ready-mixed concrete can be distributed as the same as the outside of the temporary post joint **50**, and also can be hardened and solidified.

[0137] As understood referring to FIG. **9**, there is no part extending outward until the reinforcing bars **7** and **8** are inserted into the opening part **58**.

[0138] Accordingly, when the worker loads and/or conveys the temporary post joint **50**, he is neither disturbed by any extending part (especially, by an extending bar, or the like) nor injured thereby. Handling of the temporary post joint **50** is very easy.

Fourth Example

[0139] In the forth example, as illustrated in FIG. **10**, not a temporary post joint of pre-cast concrete but a temporary post joint **60** of steel or fiber-reinforced plastic is adopted like the third example.

[0140] The specific gravity of the temporary post joint **60** is preferably more than that of ready-mixed concrete. When the specific gravity is not enough, a weight may be added properly.

[0141] The fourth example changes the shape of the third example. As illustrated in FIG. **10**, a top board **61** and a bottom board **62** are circular and flat, and constitute an up-and-down pair. The top and bottom boards **61** and **62** are joined with a plurality of columns **63** to be formed in the shape of a cylinder. As illustrated, it is preferable to use a round bar or pipe of a round section shape as the column **63**.

[0142] Anchors **64** are properly arranged on the top board **61** and the bottom board **62**.

[0143] In this way, a top face of the top board **61** is a top face of the temporary post joint **60**, and a bottom face of the bottom board **62** is a bottom face of the temporary post joint **60**. The top board **61** and the bottom board **62** are circular boards, respectively.

[0144] Similar to the first and second examples, the level of the bottom face of the bottom board **62** is substantially as the same as the level of the form. The level of the top face of the top board **61** is used as a landmark indicating an upper limit of ready-mixed concrete to be exhausted. Other points are the same as those of the third example.

Fifth Example and Sixth Example

[0145] In the first to fourth examples, the temporary post joints having a bar arrangement space therein have been described. FIG. **11** is a plane view of a temporary post joint according to the fifth example, and FIG. **12** is a plane view according to the sixth example.

[0146] In FIG. **11**, a temporary post joint **70** including extending bars **73** extending radially and outward in predetermined length L**2** from the temporary post joint, which is solid and cylindrical. A temporary post joint **80** including extending bars **83** extending radially and outward in predetermined length L**2** from the temporary post joint, which is solid and octagonal, is shown in FIG. **12**.

[0147] Anchors **72** and **82** are arranged in these pre-cast concrete blocks **71** and **81**, respectively. As illustrated in FIG. **11** and FIG. **12**, the concrete blocks may have a horizontal cross section of a circle or a polygon, such as a rectangle, a hexagon, an octagon, and so on.

[0148] Furthermore, the horizontal cross section may change in the vertical direction having, for example, a trapezoidal or conical shape.

[0149] When extending bars are outward extended form the concrete block and arranged bars are engaged with the extending bars, it is not needed to insert bars into the temporary post joint. It is, however, necessary to pay attention to handling thereof, because the worker may be disturbed by the extending bars or may be injured thereby when he loads and/or conveys the temporary post joint.

(Comparison of Term of Works)

[0150] FIG. **13** illustrates respective terms of works according to the conventional slab construction method and the slab construction method according to this embodiment. Referring to FIG. **13**, it may be understood that until works for a lower floor layer and curing thereof has been completed it is impossible to start works for a floor right above the lower floor layer.

[0151] Whereas, according to the slab building method according to this embodiment, by utilizing the above-mentioned temporary post joints, it is possible to perform in parallel both of the works for the lower floor layer and the works for the upper floor layer. Since it is also possible to perform casting the ready-mixed concrete and curing the cast concrete concurrently in parallel, the terms of works according to this embodiment can be remarkably shortened (about 40% or more in FIG. **13**) in comparison with the conventional art.

[0152] FIG. **13** shows, however, a mere example, and the present invention is not limited to this example.

[0153] In the above explanation, needless to say, the temporary post joints need not be arranged at all the crossings of bars. That is, the present invention includes a case where there are one or more crossings at which no temporary post joint is arranged.

INDUSTRIAL APPLICABILITY

[0154] The temporary post joint according to the present invention and a construction method using the same are suitably used in the field, for example, of casting-in-place concrete with forms to construct slabs of a plurality of floors especially for shortening the term of works.

1. A temporary post joint operable to being used in a temporary structure comprising a first temporary post, and a second temporary post being arranged in a higher floor than the first temporary post, the temporary post joint comprising:
- a bottom face formed connectable to an upper end portion of the first temporary post; and
- a top face formed connectable to a lower end portion of the second temporary post,
- wherein the temporary post joint connects the first temporary post and the second temporary post in a vertical direction, and
- wherein the temporary post joint is formed operable to engage with arranged reinforcing bars and is integrally held within a slab even after cast-in-place concrete contacting with the reinforcing bars has hardened and solidified.

2. A temporary post joint as defined in claim **1**, wherein height from the bottom face to the top face is equal to the thickness of cast-in-place concrete.

3. A temporary post joint as defined in claim **1**, wherein the bottom face is connected to the upper end portion of the first temporary post via a form contacting with the concrete.

4. A temporary post joint as defined in claim **1**, wherein an anchor is provided with the top face and the bottom face, respectively.

5. A temporary post joint as defined in claim **1**, wherein a bar arrangement space opening to the concrete via an opening part is provided within the interior of the temporary post joint, and
- wherein bars penetrate the bar arrangement space via the opening part, thereby the temporary post joint engages with the bars.

6. A temporary post joint as defined in claim **1**, wherein specific gravity of the temporary post joint is not less than specific gravity of the cast-in-place concrete.

7. A temporary post joint as defined in claim **1**, wherein the temporary post joint comprises: a solid pre-cast concrete block; and an extending bar extending outward from a side of the concrete block, and
- wherein the temporary post joint engages with a bar outside arranged using said extending bar.

8. A temporary structure, comprising:
- a plurality of first posts standing in a first floor layer;
- a first form supported at a boundary between the first floor layer and a second floor layer right above the first floor layer with said plurality of first posts;
- a plurality of first post joints including bottom faces connectable to upper end portions of said plurality of first posts, respectively;
- a plurality of second post joints including lower end portions connectable to top faces of said plurality of first post joints, respectively, thereby said plurality of second post joints standing in the second floor layer;
- a second form supportable at a boundary between the second floor layer and a third floor layer right above the second floor layer with said plurality of second posts; and
- a plurality of second post joints including bottom faces connectable to upper end portions of said plurality of second posts, respectively.

9. A method for constructing slabs of a plurality of floors, comprising:
- standing a plurality of first posts in a first floor layer;
- supporting a first form at a boundary between the first floor layer and a second floor layer right above the first floor layer with the plurality of first posts;
- connecting bottom faces of a plurality of first post joints to upper end portions of the plurality of first posts, respectively;
- connecting lower end portions of a plurality of second post joints to top faces of the plurality of first post joints, respectively, thereby standing the plurality of second posts in the second floor layer;
- supporting a second form at a boundary between the second floor layer and a third floor layer right above the second floor layer with the plurality of second posts;
- connecting bottom faces of a plurality of second post joints to upper end portions of the plurality of second posts, respectively;
- casting-in-place first ready-mixed concrete contacting with the first form; and
- casting-in-place second ready-mixed concrete contacting with the second form,
- wherein the first ready-mixed concrete and the second ready-mixed concrete is hardened and solidified in at least a part of period concurrently, and afterward the first post joint and the second post joint are integrally held within slabs composed of the hardened and solidified concrete.

* * * * *