| | |
|---|---|
| United States Patent Application Publication | 20250256439 |
| Kind Code | A1 |
| Publication Date | August 14, 2025 |
| Inventor(s) | NAKAYAMA; Kiyotaka |


# VERTICAL MOLD CLAMPING DEVICE AND VERTICAL INJECTION MOLDING MACHINE


## Abstract

A vertical mold clamping device includes a fixed platen, an upper movable platen provided above the fixed platen, a lower movable platen provided below the fixed platen, a plurality of tie bars penetrating the fixed platen and each having an upper end portion fixed to the upper movable platen by a tie bar nut and a lower end portion coupled to the lower movable platen, a mold clamping mechanism provided between the fixed platen and the lower movable platen, and a rotary table rotatably provided on an upper surface of the fixed platen. One of the tie bars is a center tie bar penetrating the rotary table. The center tie bar is fixed by the tie bar nut in a state of being attached to the upper movable platen via a detachable sleeve having a predetermined thickness.



**Inventors:** **NAKAYAMA; Kiyotaka (Tokyo, JP)**

**Applicant:** **THE JAPAN STEEL WORKS, LTD.** (Tokyo, JP)



**Family ID:** **96615909**

**Appl. No.:** **19/045156**

**Filed:** **February 04, 2025**

## Foreign Application Priority Data

| | | |
|---|---|---|
| JP | 2024-017615 | Feb. 08, 2024 |

## Publication Classification

**Int. Cl.:** **B29C45/17** (20060101); **B29C45/04** (20060101)

**U.S. Cl.:**

CPC **B29C45/1744** (20130101); **B29C45/0408** (20130101); **B29C45/1761** (20130101);

## Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is based on and claims priority under 35 USC 119 from Japanese Patent Application No. 2024-017615 filed on Feb. 8, 2024, the entire content of which is incorporated herein by reference.

TECHNICAL FIELD
[0002] The present disclosure relates to a vertical mold clamping device including a rotary table that rotates about a center tie bar, and a vertical injection molding machine.
BACKGROUND
[0003] A vertical injection molding machine includes a vertical mold clamping device that is opened and closed in an upper-lower direction and an injection device. The vertical mold clamping device includes a fixed platen fixed to a frame, an upper movable platen provided above the fixed platen, and a lower movable platen provided below the fixed platen. The upper movable platen and the lower movable platen are coupled by a plurality of tie bars, and a mold clamping mechanism is provided between the lower movable platen and the fixed platen. In the case of a vertical injection molding machine including a rotary table, the rotary table is provided on a fixed platen and rotates about one tie bar, that is, a center tie bar.
[0004] When supplying a fluid to a mold for the purpose of heating, cooling, or the like, a fluid supply device is required. In the case of a vertical injection molding machine including a rotary table, the fluid supply device is often provided on the rotary table and penetrated by a center tie bar as described in, for example, JPH07-40119U. Such a fluid supply device generally includes a cylindrical supply cylinder provided concentrically with the center tie bar and fixed to a fixed platen or an upper movable platen, and a cylindrical distribution cylinder provided outside the supply cylinder and configured to slide with respect to the supply cylinder. The distribution cylinder is fixed to the rotary table and rotates together with the rotary table. A predetermined flow path is formed in the supply cylinder and the distribution cylinder, a fluid supplied from the supply cylinder is sent to a mold via the distribution cylinder regardless of a rotation position of the rotary table, and a fluid discharged from the mold is returned to the supply cylinder via the distribution cylinder.
SUMMARY
[0005] In the fluid supply device, since the distribution cylinder rotates with respect to the supply cylinder, a plurality of annular seals are provided on sliding surfaces of the supply cylinder and the distribution cylinder to prevent leakage of a liquid. Since the seals deteriorate over long periods of operation, periodical replacement is required. The annular seal is provided between the supply cylinder and the distribution cylinder, which are penetrated by the center tie bar, and therefore is necessarily penetrated by the center tie bar. That is, when a new seal is attached, it is necessary to insert the seal from an end portion of the center tie bar so as to penetrate the center tie bar. To insert the seal in this manner, the upper movable platen gets in the way. Thus, it is necessary to remove the upper movable platen to expose the end portion of the center tie bar. That is, when a vertical injection molding machine includes a fluid supply device of a type that is penetrated by a center tie bar, there is a problem in that a large amount of work is required to replace the seal, resulting in high maintenance costs.
[0006] The present disclosure provides a vertical mold clamping device in which a seal of a fluid supply device can be easily replaced even when the fluid supply device is provided.
[0007] Other problems and novel features will become apparent from description of the present description and the accompanying drawings.
[0008] A vertical mold clamping device includes a fixed platen, an upper movable platen provided above the fixed platen, a lower movable platen provided below the fixed platen, a plurality of tie

bars penetrating the fixed platen and each having an upper end portion fixed to the upper movable platen by a tie bar nut and a lower end portion coupled to the lower movable platen, a mold clamping mechanism provided between the fixed platen and the lower movable platen, and a rotary table rotatably provided on an upper surface of the fixed platen. One of the tie bars is a center tie bar penetrating the rotary table. The center tie bar is fixed by the tie bar nut in a state of being attached to the upper movable platen via a detachable sleeve having a predetermined thickness.
[0009] According to the present disclosure, when a fluid supply device is provided, a seal of the fluid supply device can be easily replaced.

---

## Description

BRIEF DESCRIPTION OF DRAWINGS
[0010] FIG. **1** is a front view of a vertical injection molding machine according to a first illustrative embodiment.
[0011] FIG. **2** is a side sectional view showing a part of the vertical mold clamping devices and a fluid supply device according to the first illustrative embodiment.
[0012] FIG. **3**A is a perspective view showing an upper movable platen and a sleeve according to the first illustrative embodiment.
[0013] FIG. **3**B is a perspective view showing a part of the vertical mold clamping device according to the first illustrative embodiment.
[0014] FIG. **4**A is a perspective view showing a part of the vertical mold clamping device according to the first illustrative embodiment.
[0015] FIG. **4**B is a perspective view showing a part of the vertical mold clamping device according to the first illustrative embodiment.
[0016] FIG. **4**C is a perspective view showing a part of the vertical mold clamping device according to the first illustrative embodiment.
[0017] FIG. **4**D is a perspective view showing a part of the vertical mold clamping device according to the first illustrative embodiment.
[0018] FIG. **5**A is a perspective view showing an upper movable platen, a sleeve, and a closing member according to a modification of the first illustrative embodiment.
[0019] FIG. **5**B is a perspective view showing a part of the upper movable platen according to the modification of the first illustrative embodiment.
[0020] FIG. **5**C is a perspective view showing a part of a vertical mold clamping device according to the modification of the first illustrative embodiment.
[0021] FIG. **6** is a side view of a vertical injection molding machine according to a second illustrative embodiment.
[0022] FIG. **7**A is a top view of the vertical mold clamping device according to the second illustrative embodiment.
[0023] FIG. **7**B is a top view showing a part of the vertical mold clamping device according to the second illustrative embodiment.
DETAILED DESCRIPTION
[0024] Hereinafter, specific illustrative embodiments will be described in detail with reference to the drawings. The present disclosure is not limited to the following illustrative embodiments. In order to clarify the description, the following description and the drawings are simplified as appropriate. In the drawings, the same elements are denoted by the same reference numerals, and repeated description thereof is omitted as necessary. In addition, hatching may be omitted to avoid complicating the drawings.
First Illustrative Embodiment
{Vertical Injection Molding Machine}

[0025] As shown in FIG. **1**, a vertical injection molding machine **1** according to a first illustrative embodiment includes: a mold clamping device of a vertical type, that is, a vertical mold clamping device **2**; an injection device **3** provided above the vertical mold clamping device **2**; a control device **4** configured to control these devices; and a fluid supply device **5** configured to supply a fluid to a mold.

{Vertical Mold Clamping Device}

[0026] The vertical mold clamping device **2** includes a fixed platen **9** fixed to a bed **7**, an upper movable platen **10** provided above the fixed platen **9**, and a lower movable platen **11** provided in the bed **7**. In the present illustrative embodiment, the upper movable platen **10** and the lower movable platen **11** are coupled by three tie bars **12**A, **12**, . . . . A mold clamping mechanism, that is, a toggle mechanism **14** in the present illustrative embodiment, is provided between the lower movable platen **11** and the fixed platen **9**.

[0027] A rotary table **15** is provided on the fixed platen **9**. The rotary table **15** rotates about one tie bar **12**A at the center in FIG. **1**. The tie bar **12**A is disposed at the center of the rotary table **15**, and is therefore referred to as a center tie bar **12**A. A coupling structure **17** between the center tie bar **12**A and the upper movable platen **10**, that is, the coupling structure **17** according to the present illustrative embodiment is different from coupling structures **18** and **18** between other tie bars **12** and **12** and the upper movable platen **10**, and is a characteristic structure in the first illustrative embodiment. This will be described later. The fluid supply device **5** is provided on the fixed platen **9** and the rotary table **15**, which will be described later.

{Injection Device}

[0028] The injection device **3** is provided above the upper movable platen **10**. The injection device **3** includes a heating cylinder **19**, a screw **20** provided in the heating cylinder **19**, a screw driving mechanism **22** configured to drive the screw **20**, and a lifting-lowering device **23** configured to lift and lower the entire injection device **3**. In the injection device **3**, the screw **20** is rotated to melt an injection material, and the screw **20** is driven in an axial direction to inject the injection material.

{Fluid Supply Device}

[0029] In the present illustrative embodiment, the fluid supply device **5** is penetrated by the center tie bar **12**A as shown in FIG. **2**. As long as the fluid supply device **5** is of a type that is penetrated by the center tie bar **12**A in this manner, the effects of the present disclosure can be achieved regardless of the configuration. Here, the fluid supply device **5** shown in FIG. **2** will be described as an example of a type that is penetrated by the center tie bar **12**A.

[0030] The fluid supply device **5** schematically includes a cylindrical supply cylinder **26** provided to surround the center tie bar **12**A and fixed to the fixed platen **9**, and a cylindrical distribution cylinder **27** provided outside the supply cylinder **26** and fixed to the rotary table **15**. The supply cylinder **26** has a fluid supply flow path **29** and a fluid discharge flow path **30** formed therein. The supply cylinder **26** is designed to allow a fluid supplied from the outside to be supplied through the fluid supply flow path **29**, and a fluid to be discharged to the outside through the fluid discharge flow path **30**. Two annular grooves, that is, a supply annular groove **32** and a discharge annular groove **33** are formed on an outer peripheral surface of the supply cylinder **26**. The fluid supply flow path **29** communicates with the supply annular groove **32**, and the fluid discharge flow path **30** communicates with the discharge annular groove **33**.

[0031] An inner peripheral surface of the distribution cylinder **27** is in contact with the outer peripheral surface of the supply cylinder **26**, and when the rotary table **15** rotates, the distribution cylinder **27** slidably rotates with respect to the supply cylinder **26**. The distribution cylinder **27** is formed with two fluid supply ports **34** and **34** which are through holes opened in a radial direction, and similarly, with two fluid discharge ports **35** and **35** which are through holes opened in the radial direction. Regardless of a rotation position of the distribution cylinder **27**, the two fluid supply ports **34** and **34** always communicate with the supply annular groove **32**, and the two fluid discharge ports **35** and **35** always communicate with the discharge annular groove **33**. Therefore,

although not shown, in a case where a mold is provided on the rotary table **15**, a fluid can be supplied to the mold and discharged from the mold regardless of the rotation position of the rotary table **15**.

[0032] A plurality of annular seals **37**, **37**, . . . are provided between the distribution cylinder **27** and the supply cylinder **26** to prevent leakage of a liquid. Since these seals **37**, **37**, . . . deteriorate over long periods of operation, periodical replacement is required.

{Coupling Structure}

[0033] The coupling structures **17**, **18**, **18** that connect the upper movable platen **10** (see FIG. **1**) and the tie bars **12**A, **12**, . . . will be described. FIG. **3**A shows the upper movable platen **10** and a sleeve **40**, which is one of the components of the coupling structure **17**. FIG. **3**B shows a state in which the upper movable platen **10** and the tie bars **12**A, **12**, . . . are coupled by the coupling structures **17**, **18**, **18**.

[0034] First, a commonly used coupling structure **18**, **18** will be described. As shown in FIG. **3**A, the upper movable platen **10** has an opening **42** at the center into which an injection nozzle (not shown) of the injection device **3** (see FIG. **1**) is inserted, and two tie bar holes **43** and **43** on the left and right sides. A plurality of tapped holes **44** and **44** are formed around each of the tie bar holes **43** and **43**. As shown in FIG. **3**B, upper ends of the tie bars **12** and **12** are inserted into the tie bar holes **43** and **43**, tie bar nuts **46** and **46** are screwed onto the tie bars, and then tie bar covers **47** and **47** are installed. Although not shown in the drawings, the tie bar covers **47** and **47** and the tie bar nuts **46** and **46** have bolt holes that pass through them, and bolts **49**, **49**, . . . are inserted and tightened. In this way, the tie bars **12** and **12** are fixed to the upper movable platen **10**. The coupling structures **18** and **18** of the tie bars **12** and **12** and the upper movable platen **10** are configured as described above.

[0035] Next, the coupling structure **17** according to the first illustrative embodiment will be described. As shown in FIG. **3**A, a through hole **51** having a relatively large diameter is formed at a tip end of the upper movable platen **10**. An upper side of the through hole **51** is expanded in diameter, thereby forming an annular step portion **52**. A plurality of tapped holes **53**, **53**, . . . are formed in the step portion **52**.

[0036] The sleeve **40** includes a body portion **55** having an outer diameter slightly smaller than an inner diameter of the through hole **51**, and a flange portion **56** having an enlarged diameter and formed on the body portion **55**. A tie bar hole **58** is formed at the center of the sleeve **40**. The flange portion **56** has a plurality of tapped holes **59**, **59**, . . . on a radially inner side, and is formed with a plurality of penetrating bolt holes **60**, **60**, . . . on a radially outer side.

[0037] When the sleeve **40** is inserted from above into the through hole **51** of the upper movable platen **10**, the body portion **55** is smoothly inserted into the through hole **51**, and the flange portion **56** is placed on the step portion **52**. As shown in FIG. **3**B, the sleeve **40** is fixed to the upper movable platen **10** when the bolts **62**, **62**, . . . are tightened.

[0038] A tip end of the center tie bar **12**A is inserted into the tie bar hole **58** of the sleeve **40**, the tie bar nut **63** is screwed onto the center tie bar **12**A, and then a tie bar cover **64** is installed. Although not shown in the drawings, the tie bar cover **64** and the tie bar nut **63** have penetrating bolt holes. When a plurality of bolts **65**,**65**, . . . are inserted and tightened, the center tie bar **12**A is fixed to the sleeve **40**. That is, the center tie bar **12**A is fixed to the upper movable platen **10**. The coupling structure **17** according to the first illustrative embodiment is configured as described above, and is characterized in that the upper movable platen **10** and the center tie bar **12**A are coupled via the sleeve **40**.

{Method for Replacing Seal}

[0039] A method for replacing the seals **37**, **37**, . . . in the fluid supply device **5** (see FIG. **2**) will be described. In the fluid supply device **5**, the coupling between the distribution cylinder **27** and the rotary table **15** is released. Next, the distribution cylinder **27** is pulled out upward. Then, the distribution cylinder **27** is separated from the supply cylinder **26**. The seals **37**, **37**, . . . are exposed

and are removed from the distribution cylinder **27**. The seals **37**, **37**, . . . are penetrated by the center tie bar **12**A, but can be easily removed by cutting. To install a new seal, the new seal needs to be passed through from the tip end of the center tie bar **12**A and moved to the vicinity of the distribution cylinder **27**. This is performed as follows.

[0040] First, as shown in FIG. **4**A, the bolts **65**, **65**, . . . are removed from the coupling structure **17** according to the first illustrative embodiment. Then, the tie bar cover **64** can be removed. Next, when the tie bar nut **63** is loosened, it can be removed as shown in FIG. **4**B. The bolts **62**, **62**, . . . fixing the sleeve **40** are removed, and the sleeve **40** is pulled out. Then, as shown in FIG. **4**C, an annular gap having a predetermined width is formed between the center tie bar **12**A and the through hole **51**. As shown in FIG. **4**D, a new seal **67** is inserted from the upper end of the center tie bar **12**A. The seal **67** can be moved downward through the annular gap. Similarly, a plurality of new seals are inserted downward along the center tie bar **12**A.

[0041] After a new seal is attached to the distribution cylinder **27** (see FIG. **2**), the distribution cylinder **27** is inserted into the supply cylinder **26**. The distribution cylinder **27** is fixed to the rotary table **15**. The replacement of the seal is completed. To assemble the coupling structure **17** (see FIG. **3**B) according to the present illustrative embodiment and couple the center tie bar **12**A and the upper movable platen **10**, the above-described steps are carried out in reverse order. In the vertical mold clamping device **2** (see FIG. **1**) according to the first illustrative embodiment, the center tie bar **12**A is coupled to the upper movable platen **10** by the coupling structure **17** including the sleeve **40** (see FIG. **3**A), so that a seal of the fluid supply device **5** can be easily replaced by removing the sleeve **40**.

Modification to First Illustrative Embodiment

[0042] The first illustrative embodiment can be variously modified. For example, the coupling structure **17** according to the first illustrative embodiment may be modified to a coupling structure **17**′ according to a modification. FIG. **5**A shows an upper movable platen **10**′, the sleeve **40**, and a closing member **70** according to the modification of the first illustrative embodiment. The upper movable platen **10**′ is formed with a slit **71** having a predetermined width extending from a through hole **51**′ to a side surface of the upper movable platen **10**′. That is, the through hole **51**′ opens to the side surface of the upper movable platen **10**′ via the slit **71**. In the vicinity of the slit **71**, penetrating bolt holes **73**, **73**, . . . are formed.

[0043] The closing member **70** is a member specific to the modification of the first illustrative embodiment, is a member to be inserted into the slit **71**, and has bolt holes **74** and **74** formed therein. As shown in FIG. **5**B, when the closing member **70** is inserted into the slit **71** and fixed to the upper movable platen **10**′ by bolts **75** and **75**, the slit **71** is completely closed. In this state, the through hole **51**′ has substantially the same configuration as the through hole **51** in the first illustrative embodiment described with reference to FIG. **3**A. As can be easily understood by those skilled in the art, the sleeve **40** is inserted and fixed in the through hole **51**′. Then, as shown in FIG. **3**B, when the center tie bar **12**A is inserted and the tie bar nut **63** and the tie bar cover **64** are provided and fixed by the bolts **65**, **65**, . . . , the upper movable platen **10**′ and the center tie bar **12**A can be coupled to each other.

[0044] In the coupling structure **17**′ (see FIG. **5**A) according to the modification of the first illustrative embodiment, when the sleeve **40** and the closing member **70** are removed, the through hole **51**′ opens to the side surface of the upper movable platen **10**′ via the slit **71** as described above. Then, as shown in FIG. **5**C, when inserting the new seal **67**, there is a margin corresponding to a width of the slit **71**, so that the seal **67** can be easily inserted.

Second Illustrative Embodiment

[0045] A vertical injection molding machine **80** according to a second embodiment shown in FIG. **6** will be described. The vertical injection molding machine **80** according to the second illustrative embodiment is schematically configured such that two vertical injection molding machines **1** (see FIG. **1**) according to the first illustrative embodiment are arranged in parallel. That is, a vertical

mold clamping device **85** according to the second illustrative embodiment, which is configured as one unit by combining two vertical mold clamping devices **2** (see FIG. **1**) according to the first illustrative embodiment, and two injection devices **3** and **3** according to the first illustrative embodiment are provided. In the vertical injection molding machine **80** according to the second illustrative embodiment, members similar to those of the first illustrative embodiment or members similar to those of the modification of the first illustrative embodiment are denoted by the same reference numerals, and description thereof will be omitted.

[0046] The vertical mold clamping device **85** according to the second illustrative embodiment is a combination of two vertical mold clamping devices **2** (see FIG. **1**) according to the first illustrative embodiment, but differs in the following points. That is, one common rotary table **86** is provided over the two fixed platens **9** and **9**. As shown in FIG. **7**A, the rotary table **86** has a relatively large opening **87** at the center, and the two center tie bars **12**A and **12**A penetrate the opening **87**. Therefore, the rotary table **86** is rotatable about the two center tie bars **12**A and **12**A. In the vertical mold clamping device **85**, the two upper movable platens **10**′ and **10**′ are configured in the same manner as the upper movable platen **10**′ according to the modification of the first illustrative embodiment, and are coupled with the center tie bars **12**A and **12**A by the coupling structures **17**′ and **17**′ according to the modification of the first illustrative embodiment.

[0047] Although not shown in FIG. **6**, when a fluid supply device is provided in the vertical mold clamping device **85** according to the second illustrative embodiment, the fluid supply device is provided in the rotary table **86**. The fluid supply device is penetrated by the two center tie bars **12**A and **12**A. In this way, when replacing a seal provided in the fluid supply device, it is necessary to insert a new seal in a state where the seal penetrates the two center tie bars **12**A and **12**A.

[0048] FIG. **7**A shows a state in which the coupling structures **17**′ and **17**′ according to the modification of the first illustrative embodiment are disassembled in the two upper movable platens **10**′ and **10**′, and FIG. **7**B shows a partially enlarged view thereof. In this state, an annular gap is formed between the center tie bar **12**A, **12**A and the through hole **51**′, **51**′, and the center tie bars **12**A and **12**A face each other via the slits **71** and **71**. That is, there is no member that separates the center tie bars **12**A and **12**A from each other. Therefore, as shown in FIG. **7**B, a new seal **89** can be inserted while being penetrated by the two center tie bars **12**A and **12**A.

[0049] Although the invention made by the present inventor has been specifically described above based on the illustrative embodiments, it is needless to say that the present invention is not limited to the illustrative embodiments described above, and various modifications can be made without departing from the scope of the invention. The plurality of examples described above may be appropriately combined.

## Claims

**1**. A vertical mold clamping device comprising: a fixed platen; an upper movable platen provided above the fixed platen; a lower movable platen provided below the fixed platen; a plurality of tie bars penetrating the fixed platen and each having an upper end portion fixed to the upper movable platen by a tie bar nut and a lower end portion coupled to the lower movable platen; a mold clamping mechanism provided between the fixed platen and the lower movable platen; and a rotary table rotatably provided on an upper surface of the fixed platen, wherein one of the tie bars is a center tie bar penetrating the rotary table, and wherein the center tie bar is fixed by the tie bar nut in a state of being attached to the upper movable platen via a detachable sleeve having a predetermined thickness.

**2**. The vertical mold clamping device according to claim 1, further comprising: a fluid supply device configured to supply a fluid to a mold, wherein the fluid supply device is provided on the rotary table and is penetrated by the center tie bar.

**3**. The vertical mold clamping device according to claim 1, wherein the number of the tie bars is

three.
**4**. The vertical mold clamping device according to claim 1, wherein a flange portion is formed on the sleeve.
**5**. The vertical mold clamping device according to claim 4, wherein the sleeve is fixed to the upper movable platen by fixing the flange portion to the upper movable platen by a fastener.
**6**. The vertical mold clamping device according to claim 4, wherein a through hole formed in the upper movable platen and into which the sleeve is inserted is formed with a step portion having an enlarged diameter at an upper portion, and the flange portion is placed on the step portion.
**7**. The vertical mold clamping device according to claim 1, wherein a through hole formed in the upper movable platen and into which the sleeve is inserted is formed with a slit having a predetermined width that reaches a side surface of the upper movable platen, and opens to the side surface.
**8**. The vertical mold clamping device according to claim 7, wherein a closing member configured to close the slit is detachably provided in the slit.
**9**. The vertical mold clamping device according to claim 2, wherein the fluid supply device includes: a cylindrical supply cylinder disposed to surround the center tie bar and fixed to the fixed platen; and a cylindrical distribution cylinder disposed outside the supply cylinder and fixed to the rotary table, and wherein an annular leakage-prevention seal is provided between the distribution cylinder and the supply cylinder.
**10**. The vertical mold clamping device according to claim 9, wherein a fluid supply flow path for supplying the fluid from an outside and a fluid discharge flow path for discharging the fluid to the outside are formed in the supply cylinder, wherein the distribution cylinder is formed with a fluid supply port communicating with the supply flow path and a fluid discharge port communicating with the discharge flow path, and wherein an inner peripheral surface of the distribution cylinder faces an outer peripheral surface of the supply cylinder, and the distribution cylinder is slidably rotatable with respect to the supply cylinder when the rotary table rotates.
**11**. A vertical injection molding machine comprising: a vertical mold clamping device; and an injection device provided above the vertical mold clamping device and configured to inject an injection material, wherein the vertical mold clamping device includes: a fixed platen; an upper movable platen provided above the fixed platen; a lower movable platen provided below the fixed platen; a plurality of tie bars penetrating the fixed platen and each having an upper end portion fixed to the upper movable platen by a tie bar nut and a lower end portion coupled to the lower movable platen; a mold clamping mechanism provided between the fixed platen and the lower movable platen; and a rotary table rotatably provided on an upper surface of the fixed platen, wherein one of the tie bars is a center tie bar penetrating the rotary table, and wherein the center tie bar is fixed by the tie bar nut in a state of being attached to the upper movable platen via a detachable sleeve having a predetermined thickness.
**12**. The vertical injection molding machine according to claim 11, wherein the vertical mold clamping device includes a fluid supply device configured to supply a fluid to a mold, and wherein the fluid supply device is provided on the rotary table and is penetrated by the center tie bar.
**13**. The vertical injection molding machine according to claim 11, wherein the number of the tie bars is three.
**14**. The vertical injection molding machine according to claim 11, wherein a flange portion is formed on the sleeve.
**15**. The vertical injection molding machine according to claim 14, wherein the sleeve is fixed to the upper movable platen by fixing the flange portion to the upper movable platen by a fastener.
**16**. The vertical injection molding machine according to claim 14, wherein a through hole formed in the upper movable platen and into which the sleeve is inserted is formed with a step portion having an enlarged diameter at an upper portion, and the flange portion is placed on the step portion.

**17**. The vertical injection molding machine according to claim 11, wherein a through hole formed in the upper movable platen and into which the sleeve is inserted is formed with a slit having a predetermined width that reaches a side surface of the upper movable platen, and opens to the side surface.

**18**. The vertical injection molding machine according to claim 17, wherein a closing member configured to close the slit is detachably provided in the slit.

**19**. The vertical injection molding machine according to claim 11, wherein the injection device includes a heating cylinder, a screw provided in the heating cylinder, and a screw driving mechanism configured to drive the screw, the injection device being configured to rotate the screw to melt the injection material and to drive the screw in an axial direction to inject the injection material, and wherein the injection device is provided above the upper movable platen.