Feb. 23, 1971 B. TINNES 3,564,698

APPARATUS FOR THE INSTALLATION OF REFRACTORY BLOCKS

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Fig.1

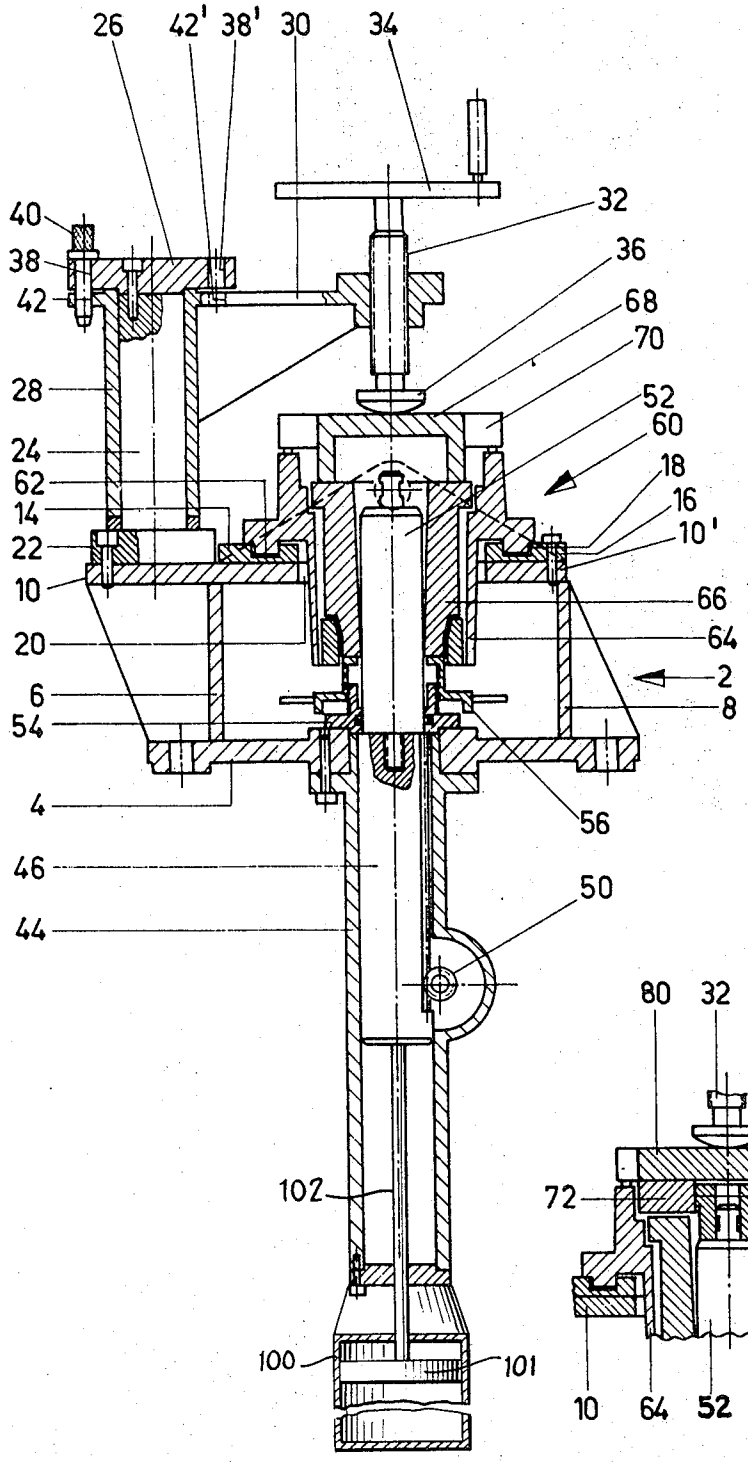
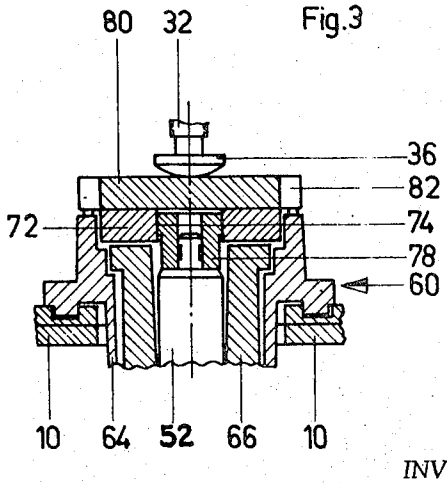


Fig.3



INVENTOR

BERNHARD TINNES

BY Jacobi & Davidson

ATTORNEYS.

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Fig. 2

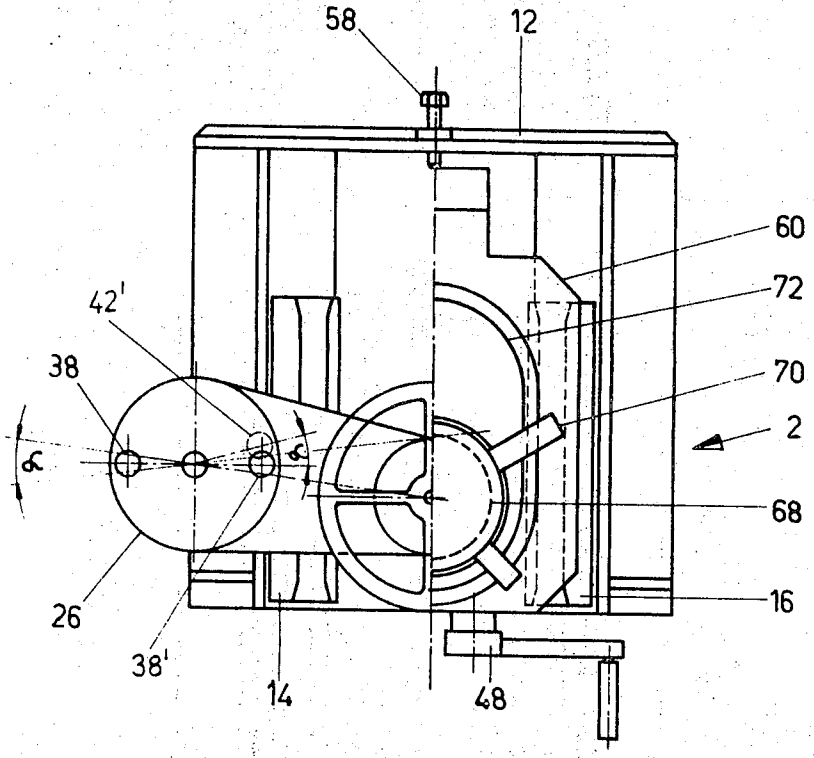
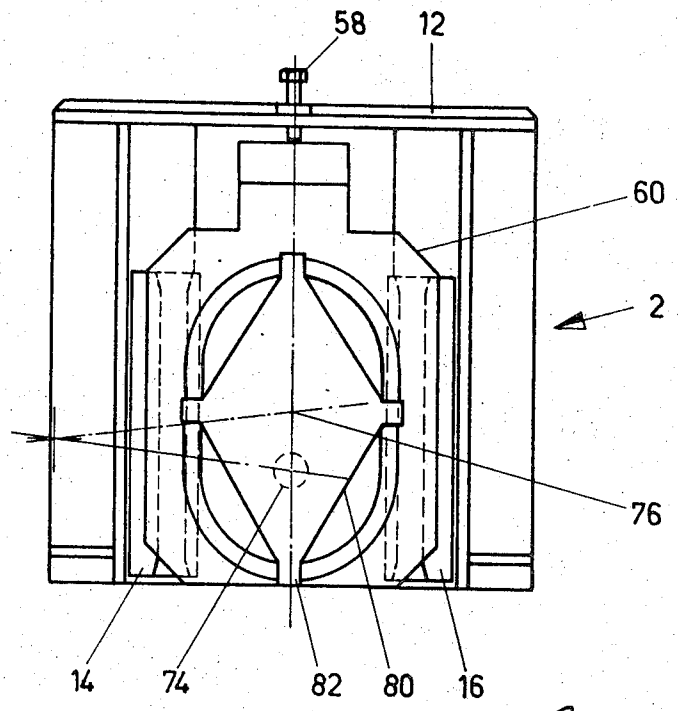


Fig. 4



INVENTOR
BERNHARD TINNES
BY Jacobi & Davidson
ATTORNEYS

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APPARATUS FOR THE INSTALLATION OF REFRACTORY BLOCKS

Bernhard Tinnes, Zollikon, Switzerland, assignor to Metacon A.G., Zollikon, Switzerland, a corporation of Switzerland

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Int. Cl. B23p 19/02
U.S. Cl. 29—251 11 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus for the installation of refractory blocks or stones at the control-or shutoff slide mechanism of a liquid metal container or the like which comprises frame means, and positioning means for the movable slide element of the slide mechanism provided at the frame means. A centering mandrel is supported in the frame means and is adapted to always engage with a refractory block or stone. Furthermore, there is provided a press-in mechanism including a press mandrel having a press axis. The press mandrel is mounted to be relatively movable with respect to the frame means into at least two working positions. The press-in mechanism serves to displace the frame means and the press mandrel relative to one another. In one of the working positions the press axis of the press mandrel coincides with the lengthwise axis of the centering mandrel and in the other working position this press axis is displaced parallel to such lengthwise axis.

BACKGROUND OF THE INVENTION

The present invention relates to an improved apparatus for the installation of refractory blocks or stones in the movable slide element of a control-or shutoff slide mechanism of a liquid metal container or the like.

It is necessary to oftentimes replace or exchange the refractory blocks or stones of the slide closure mechanisms of liquid metal containers, due to the high temperatures or thermal loads to which such blocks are subjected. In carrying out this replacement operation it is of paramount importance for the functionality of the slide closure mechanism that the refractory blocks which are secured by mortar in the metallic components of the slide housing which, for instance, is rigidly connected with the ladle, or the mortar-connected blocks of the slide element, assume a predetermined relative position. In other words, these blocks must be centrally aligned with respect to the pouring axis and, in particular, the actual slide block or stone arranged at the movable slide element, hereinafter such slide block or stone being referred to as a slide plate, must assume a predetermined elevational position in order to insure for a tight closure with the bottom block or stone mounted at the slide housing. Naturally, it is of equal paramount importance for the functionality of the slide element that the surface of the slide plate is disposed in a plane which extends parallel to that of the bottom block or stone.

The exact manual mounting or installation of the slide plate and also the pouring block or stone, hereinafter referred to as the pouring sleeve member, into the movable slide element not only places very high demands upon the skill of the operating personnel, rather it is also extremely time consuming and cumbersome. Therefore, it has already been proposed to utilize auxiliary devices for the installation of the refractory blocks or stones at the slide closure mechanism, which possess means for aligning or centering the blocks.

SUMMARY OF THE INVENTION

Accordingly, it is a primary object of the present invention to provide an improved apparatus for the installation of refractory blocks or the like at the movable slide element.

Another, more specific object of the present invention relates to improved apparatus for the installation of refractory blocks at the movable slide element of a control-or shutoff slide mechanism of a liquid metal container or the like in a highly efficient, accurate, quick and relatively easy manner.

Still a further significant object of the present invention relates to an improved apparatus which enables refractory blocks or stones to be mounted quickly, easily, and without requiring exceptional skills on the part of the operating personnel, into or at the movable slide element of a control-or shutoff slide mechanism of a liquid metal container or the like.

Now, in order to implement these and still further objects of the present invention, which will become more readily apparent as the description proceeds, the inventive apparatus is generally manifested by the features of a frame means equipped with positioning means for the movable slide element. A centering mandrel is retained at the frame means and serves to always engage in one of the blocks. Additionally, there is provided a press man drel which is movable relative to the frame means into at least two working positions. Additionally, there is provided a press-in mechanism which includes the press mandrel, this press-in mechanism serving to move the frame means and press mandrel relative to one another. The press axis of the press mandrel in one of the working positions coincides with the lengthwise axis of the centering mandrel and in the other working position this press axis is displaced parallel to such lengthwise axis.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood, and objects other than those set forth above, will become apparent, when consideration is given to the following detailed description thereof. Such description makes reference to the annexed drawings wherein:

FIG. 1 is a vertical sectional view through the inventive apparatus during mounting or installation of the pouring sleeve member;

FIG. 2 is a top plan view of the exemplary embodiment of inventive apparatus as shown in the position depicted in FIG. 1, with the right-hand portion of such figure being cut away to expose details of the cooperative relationship of pressure plate and slide element, and wherein certain components at the right-hand side of such figure have been omitted for purposes of clarity in illustration;

FIG. 3 is a fragmentary sectional view of a portion of the apparatus of FIG. 1 during mounting of the slide plate; and

FIG. 4 is a top plan view of the apparatus shown in the position of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Describing now the drawings, in FIG. 1 there is depicted a substantially box-like frame means **2** which is formed by a base plate **4**, the side wall members **6** and **8**, a dual component cover plate unit **10**, **10'**, and a rear wall **12** (FIGS. 2 and 4). The cover plate unit **10**, **10'**, carries two guide rail members **14** and **16** provided with two guide grooves **18** which in profile or cross section are substantially U-shaped. These guide grooves **18** extend in parallelism to one another at a predetermined spacing from one another. Both of the components **10** and **10'** of the cover plate unit as well as both of the guide rails **14**

and **16** limit or bound therebetween an elongate opening **20** appearing at the upper side of the frame means **2**.

A column or standard **24** provided with a base or pedestal **22** is secured in vertical position at the component **10** of the cover plate unit **10, 10'**, externally of the guide rail **14**. Furthermore, a column tube **28** rotatably mounted upon the column **24** is secured against axial displacement by means of an end plate **26** which is secured to the upper end of this column **24**. The column tube **28** carries a radial arm member **30**. A press-in threaded spindle member **32** extends through the free end of the radial arm member **30** and parallel to the column **24**. The upper end of the aforementioned threaded spindle member **32** carries a handwheel **34** and at its lower end it carries a base member **36**. This base member **36** is preferably rotatably mounted with regard to the threaded spindle member **32**. Furthermore, the end plate **26** is provided with two axially parallel bores **38** and **38'** which are offset through 180° with respect to one another. A positioning pin **40** can be selectively inserted in one or the other of these bores **38** and **38'**. In so doing, the pin **40** can be selectively brought into engagement with one of two bores **42** and **42'** provided at the radially extending arm member **30**. Furthermore, both of these bores **42** and **42'** are offset or displaced with respect to one another more or less, respectively, than 180°, and specifically in such a manner that when the pin **40** piercingly extends through the bores **38'** and **42'** the radial arm member **30** encloses an acute angle α with respect to that position in which the bore members **38** and **42** are pierced by such pin **40**.

Continuing, it will be recognized that a guide tube **44** is secured to the base plate **4**. The longitudinal or lengthwise axis of this guide tube **44** extends parallel to the lengthwise axis of the column **24** and in one of both predetermined pivotal positions of the radial arm member **30** the lengthwise axis of such guide tube **44** coincides with the longitudinal axis of the press-in spindle member **32**. Furthermore, the guide tube **44** contains a gear or toothed rack **46** which is guided to be axially displaceable and without play within such guide tube **44**. As best recognized by referring to FIGS. 1 and 2, a drive pinion **50** operably connected with a handwheel **48** engages or meshes with this toothed rack **46**. The toothed rack **46** is connected at its upper end with a centering mandrel **52**, forming a co-axial extension of this gear or toothed rack **46**. In the upper terminal position of the centering mandrel **52** the latter piercingly extends through the box-like frame means **2**. Additionally, a threaded ring member **54** which is secured to the base plate **4** is arranged substantially co-axially with respect to the centering mandrel **52**. An adjustment or positioning nut member **56** is threaded upon the threaded ring member **54**.

A movable slide element **60** of a slide closure mechanism of the type for instance employed at the pouring ladle, is arranged in the box-like frame means **2**. More particularly, it will be seen that the movable slide element **60** bears upon the guide rails **14** and **16** and engages by means of its guide ledges **62** in the associated guide grooves **18**. As recognized by referring to FIGS. 2 and 4, the slide element **60** is additionally in contact at its one end with a positioning or adjustment screw member **58** which is inserted in the rear wall **12**. Consequently, the slide element **60** assumes an exactly predetermined spatial position with respect to the frame means **2**.

In the position illustrated in FIGS. 1 and 2 the centering mandrel **52** piercingly extends through the sleeve-shaped pouring portion **64** which extends downwardly from the slide element **60** and centers within such pouring portion **64** the cylindrical pouring sleeve **66** formed of refractory material, during such time as the latter is pressed into the slide element **60** by means of the press-in spindle member **32**. Now, in order to press in the sleeve member **66** a pressure plate member **68** is mounted upon this sleeve member **66**, and the arms **70** (FIG. 2) of this pressure plate **68** bear against the upper end of the slide element **60** when the sleeve member **66** has reached its predetermined position within the pouring portion **64**. In order to press in the sleeve member **66** the radial arm **30** is located in the position secured by the pin member **40** and shown in FIG. 2, in which the spindle member **32** and the centering mandrel **52** extend co-axially with respect to one another. The positioning nut member **56** is preferably first then brought into the position shown in FIG. 1 after the sleeve member **66** has reached its predetermined position in the slide element **60**.

Now, if the slide plate **72** (FIG. 2) which in plan view is of substantially oval configuration, should be pressed into the corresponding recess of the slide element **60**, with the throughflow opening **74** of such slide plate **72** being offset with respect to the center point **76** (FIG. 4) of this block in its lengthwise direction, then, the radial arm member **30** must be pivoted, with respect to the position of FIG. 2, in counterclockwise direction through the angle α. In so doing, the spindle member **32** comes to lie above the center point **76** of the slide plate **72**, and in the throughflow opening **74** of which there engages an extension **78** of the centering mandrel **52**. This extension member **78** is detachably connected with the centering mandrel **52**. The pressure exerted by the spindle member **32** is transmitted through the agency of a second pressure plate **80** (FIGS. 3 and 4) upon the slide plate **72**. The arm members **82** of the pressure plate **80** come to bear upon the movable slide element **60** when the slide plate **72** has reached its final position. The positioning nut member **56** prevents that the sleeve member **66** will be displaced downwardly under the action of any existing pressure resulting during pressing in of the slide plate **72**.

In order to remove the slide element **60** from the frame means **2** it is possible to retract the centering mandrel **52** within the tube **44** at the end of the pressing in operation; likewise, the adjustment nut member **56** can be downwardly threaded to such an extent that the pouring portion **64** is released.

Naturally, it is possible to replace the spindle member **32** as well as also the drive for the centering mandrel **52** by a hydraulic unit or to use a different mechanical actuation. For example, as best observed by referring to FIG. **1**, the hydraulic unit for driving the centering mandrel **52** may comprise a suitable hydraulic cylinder **100** attached to the lower end of tube **44**, this cylinder **100** containing a fluid-actuated displaceable piston member **101** whose piston rod **102** may be operatively connected with the member **46** or else directly to the centering mandrel **52** in order to selectively drivingly displace such mandrel.

The described exemplary embodiment of inventive apparatus has the advantage that the arm member **30** can be completely pivoted to the side in order to free the upper surface of the slide element. As a result, all components of the apparatus and the slide mechanism are therefore easily accessible.

It still remains to be mentioned that it would, of course, be possible to replace the arm member **30** with the spindle member **32** by an appropriate pivotable countersupport and to carry out the contact movement by performing an axial displacement of the frame means **2** or a portion thereof. With such type of physical structure of the apparatus it would also be conceivable to fixedly arrange the countersupport at the frame means and to construct at least the portion of the frame means which carries the slide element **60** so as to be not only axially displaceable, but rather to also be pivotable so that it can assume both of the working positions or to displaceably mount such for movement along a linear path. Naturally, in this case the portion of the frame means carrying the centering mandrel together with the portion carrying the slide must be movable. In the case of both of the previously mentioned embodiments of the apparatus, it would be possible to

particularly advantageously use a hydraulic actuation of the centering mandrel as well as also the press-in mechanism, the latter of which engages with the frame means.

It should be apparent from the foregoing detailed description, that the objects set forth at the outset to the specification have been successfully achieved.

Accordingly, what is claimed is:

1. Apparatus for the installation of refractory blocks at the control-or shutoff slide mechanism of a liquid metal container, comprising frame means, positioning means for the movable slide element of the slide mechanism provided at said frame means, a centering mandrel supported at said frame means and adapted to engage with a refractory block, a press-in mechanism including a press mandrel, said press mandrel having a press axis and being relatively movable with respect to said frame means into at least two working positions, said press-in mechanism serving to displace said frame means and press mandrel in one of said working positions substantially coinciding with the lengthwise axis of said centering mandrel and in the other working position said press axis being displaced substantially parallel to said lengthwise axis.

2. Apparatus for the installation of refractory blocks as defined in claim **1**, further including a component which is rigidly connected with said frame means, said press-in mechanism incorporating an arm member which is pivotable between said two working positions, said arm member being mounted at said rigidly connected component.

3. Apparatus for the installation of refractory blocks as defined in claim **1**, wherein said press-in mechanism incorporates threaded spindle means.

4. Apparatus for the installation of refractory blocks as defined in claim **1**, wherein said press-in mechanism incorporates a hydraulically actuated piston member.

5. Apparatus for the installation of refractory blocks as defined in claim **1**, further including means for selectively securing said press-in mechanism in both of said working positions.

6. Apparatus for the installation of refractory blocks as defined in claim **1**, further including means for axially displacing said centering mandrel.

7. Apparatus for the installation of refractory blocks as defined in claim **6**, wherein said means for axially displacing said centering mandrel incorporates gear rack means.

8. Apparatus for the installation of refractory blocks as defined in claim **6**, wherein said means for axially displacing said centering mandrel incorporates hydraulic means.

9. Apparatus for the installation of refractory blocks as defined in claim **1**, wherein said frame means defines a housing into which there can be displaced said movable slide element.

10. Apparatus for the installation of refractory blocks as defined in claim **1**, wherein said positioning means provided at said frame means includes guide rail means.

11. Apparatus for the installation of refractory blocks as defined in claim **6**, further including adjustment nut means provided at said frame means and adjustable substantially coaxial with respect to said centering mandrel.

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ROBERT C. RIORDON, Primary Examiner

J. C. PETERS, Assistant Examiner