United States Patent [19]

Meier

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[54] **ALIGNING RING FOR REFRACTORY BRICK AND SLEEVE OF SLIDING GATE**

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Apr. 17, 1973 Switzerland 5532/73

[52] **U.S. Cl.** **222/561;** 222/567

[51] **Int. Cl.²** **B22D 37/00**

[58] **Field of Search** ..... 222/566, 567, 561, DIG. 1, 222/DIG. 7; 239/424.5; 266/38

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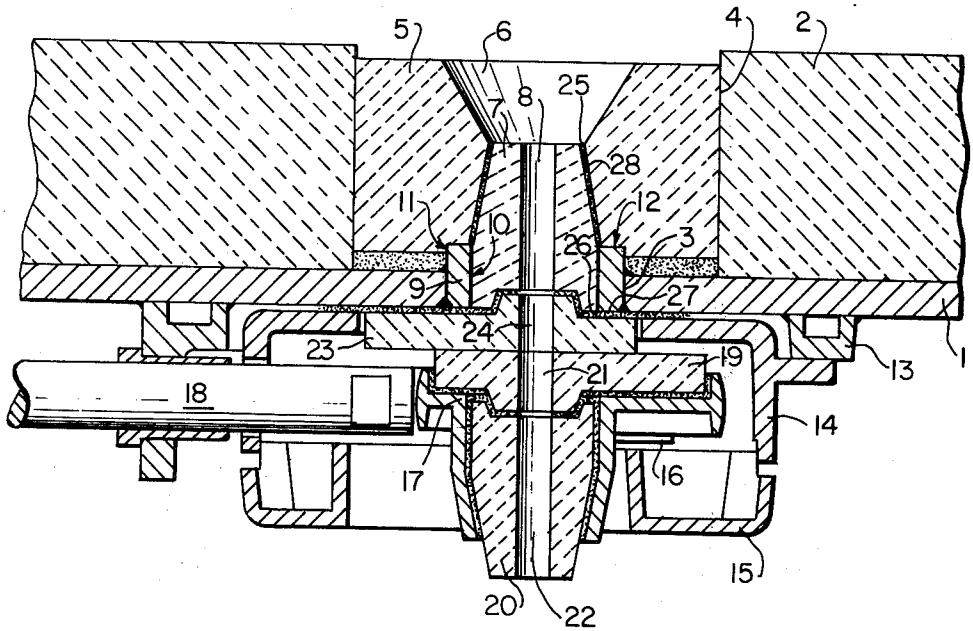
[57] **ABSTRACT**

A spout for a metallurgical vessel including a refractory brick and a refractory sleeve includes a cylindrical ring fixed to the inner surface of the vessel jacket opening and having abutment surfaces for centrally positioning the brick and sleeve and for vertically positioning the brick.

14 Claims, 6 Drawing Figures



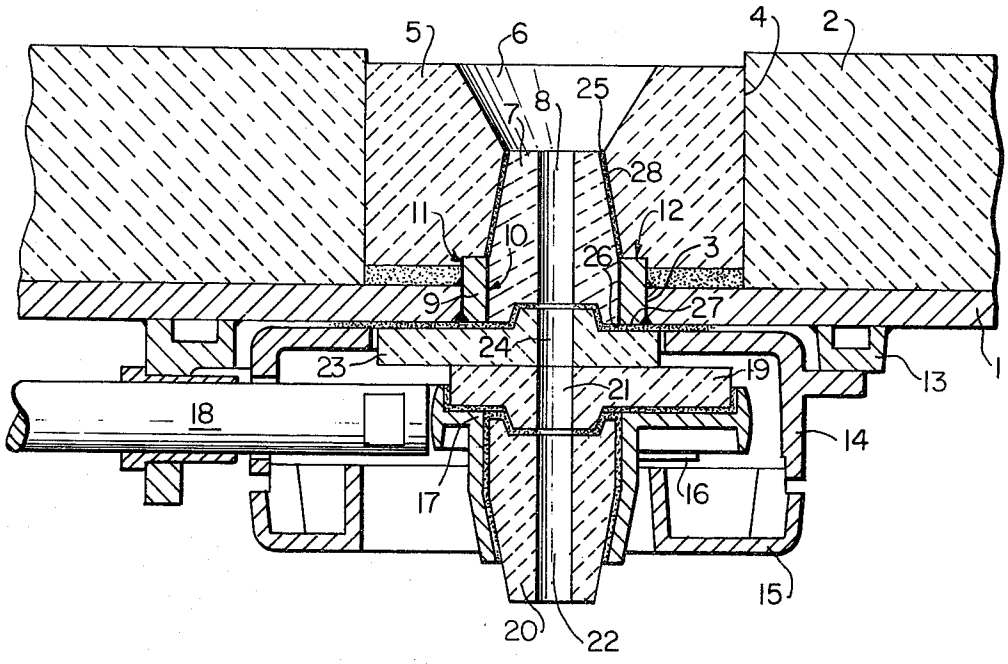

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FIG. 1

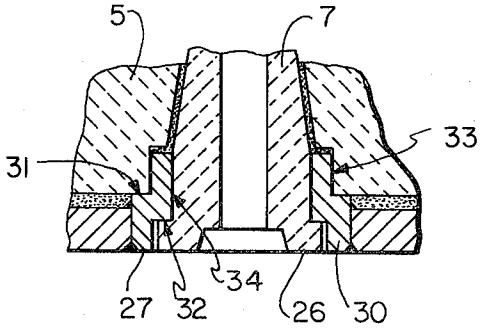
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FIG. 2

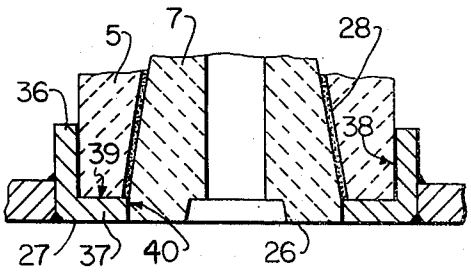

FIG. 3

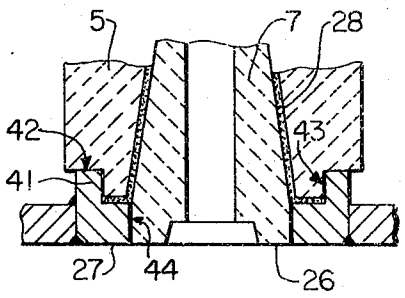

FIG. 4

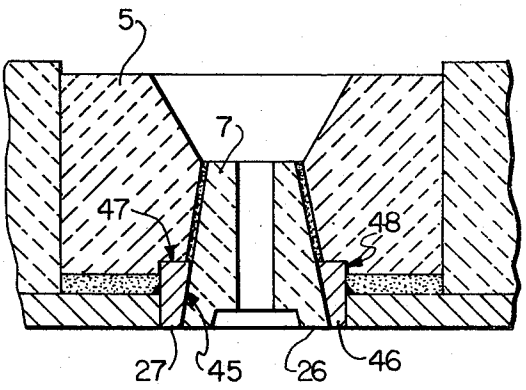

FIG. 5

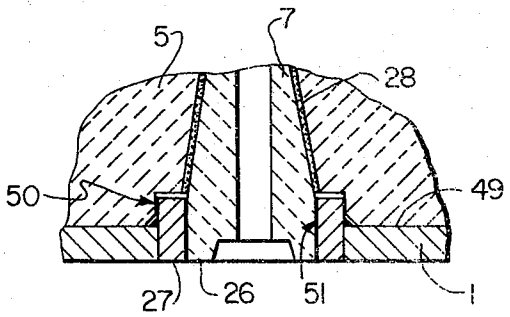

FIG. 6

ALIGNING RING FOR REFRACTORY BRICK AND SLEEVE OF SLIDING GATE

BACKGROUND OF THE INVENTION

The invention relates to a spout for metallurgical vessels, in particular of the type including a slide closure and a refractory sleeve that can be exchanged outwardly through the opening of the metal jacket of the vessel, such sleeve being mounted in an apertured refractory brick accessible from the interior of the vessel and arranged in the refractory lining of the vessel.

In the case of a spout including a slide closure and particularly when employed in steel pouring vessels, it is necessary after regular intervals, due to wear, to routinely replace the sleeve arranged in the apertured brick, together with the bottom plate, the slide plate and the outflow sleeve of the slide closure. The apertured brick is also often replaced at this time, if necessary. Within permissible tolerances, the new sleeve must be mounted in the same predetermined position as the preceding sleeve, in order to preserve the relative arrangement of the parts of the slide closure, and accordingly, its operational reliability. The same is true for the apertured brick that receives the sleeve, the position of which within the refractory lining of the metallurgical vessel is predetermined in dependence on the assembled positions of the sleeve, bottom plate, slide plate and outflow sleeve.

The above mentioned requirements, which are indispensable for the operational reliability of the spout and the slide closure, have previously been obtained by a relatively complex and time-consuming mounting of the sleeve and apertured brick by means of auxiliary assembly means, e.g., special fitting and centering means, that are arranged on the vessel and which then must be removed after the mounting of the sleeve and the apertured brick is completed. The replacement of the apertured brick is particularly difficult, since it is accessible only from the interior of the vessel which is generally hot. In spite of observing the greatest precautions during these predominantly manual operations, it repeatedly occurs that the results of the assembly operation lead to unsatisfactory functioning of the spout, so that additional alignment and replacement work is required beyond the customary replacement which is based on time of service and state of wear.

Further, known spouts including a slide closure are associated with the disadvantage that the forces acting during operation within the vessel on the apertured brick and the forces outside the vessel resulting from the movement of the slide and acting on the bottom plate, may lead to cracks in the mortar joints. This presents a substantial problem in attempting to achieve operational reliability, since the mortar sealing joints between the elements are stressed by the full hydrostatic pressure of the metal melt. Hence it is desirable to adopt measures for eliminating the influence of these forces, or at least to substantially reduce such influence.

SUMMARY OF THE INVENTION

The object of the present invention is, with low capital expenditures, to simplify the manner of mounting the sleeve and apertured brick and to improve the positioning arrangement of these elements in the bottom of the vessel.

This is achieved in accordance with the present invention by providing adjusting and holding means at the edge of the spout opening of the metal jacket of the vessel, for the purpose of the central mounting of the sleeve and the apertured brick and for holding the sleeve and the apertured brick in their respective operational positions. The sleeve and the apertured brick are thus automatically centered during their respective mounting operations, and brought into their respective predetermined central positions with but few manipulations and without the need for auxiliary assembly means. Such central positions of the assembled sleeve and brick are necessary for the achievement of reliable operation of the spout and the later assembled slide closure. The vertical positioning of the sleeve and apertured brick is effected by means of abutment surfaces provided on adjusting and holding means. However, such a vertical positioning can also be obtained with the same expediency in a customary manner by means of abutment surfaces provided on the apertured brick, in which case it is of advantage if comparable positioning points, preferably on the adjusting and holding means and on the sleeve, indicate the desired vertical position. The sleeve and the apertured brick are centered within reasonable and commercially practicable tolerances. The fit of the sleeve, which is to be mounted into the spout from the lower side of the vessel, is expediently provided as a friction seat, to thereby overcome the weight of the sleeve. Briefly stated, the invention involves the replacement of parts which are subjected to wear, in particular on a spout equipped with a slide closure, whereby it is possible to provide for rapid and reliable mounting and assembly of the sleeve and the apertured brick, while at the same time substantially eliminating the insufficiencies and risks that are involved in previously known manual handling methods. Further, in accordance with the invention, the adjusting and holding means position the sleeve and the apertured brick firmly in the desired assembled position, thus insuring that they are immovably positioned during later operation and use.

According to the invention, a cylindrical ring is employed as the adjusting and holding means, such ring being attached to the jacket of the vessel, and projecting inwardly toward the lining of the vessel. The ring has adjusting surfaces for the sleeve and the apertured brick, and also may have horizontal surfaces providing vertical abutments for such elements. The cylindrical ring is advantageously provided on the inner cylindrical surface thereon with an adjusting surface for the sleeve and on the outer cylindrical surface thereof with an adjusting surface for the apertured brick. This arrangement is simple in construction and provides, if desired, the possibility of employing the cylindrical surfaces completely or only partially for centering purposes. When centering is achieved only partially with these surfaces, raised portions can be provided for aiding in centering.

The inner or upper end face of the cylindrical ring, which faces the refractory lining, is available as a vertical abutment for the apertured brick. However, it is also possible to employ the area of the inner or upper surface of the metal jacket which is directly adjacent to the cylindrical ring as an abutment for the apertured brick.

In a further development of the cylindrical ring, an advantageous structure is that the ring has a smaller di-

ameter stepped portion positioned coaxially inwardly toward the longitudinal axis of the ring. The inner stepped surface provides an abutment for the sleeve, while the outer stepped surface provides an abutment for the apertured brick.

A furrher modified embodiment is that the cylindrical ring is widened from a smaller diameter to a greater diameter in the direction of the lining of the vessel, and the cylindrical inner surface having the smaller diameter centers the sleeve, while the inner surface having the larger diameter centers the perforate brick. In this arrangement, the transverse surface situated between the small and the large inner diameters is expediently employed as an abutment for the apertured brick.

An embodiment wherein the inner surface of the cylindrical ring is shaped as a cone, tapering toward the lining of the vessel, is particularly advantageous. The centering and the vertical positioning of the sleeve is thereby achieved by means of a single surface.

Generally, in a spout including a slide closure, the cylindrical ring should center the sleeve coaxially with the flow opening of the opened slide closure, and the lower face of the ring as well as the lower end surface of the sleeve are positioned in the same horizontal plane to provide a point of reference for the correct vertical assembled position of the sleeve.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be explained in more detail in the following description taken with the accompanying drawings wherein:

FIG. **1** is a sectional view of a vessel spout including a slide closure in accordance with the present invention; and

FIGS. **2 – 6** are sectional views of modified embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. **1**, a metal jacket **1** of a metallurgical vessel is illustrated only in the area of the nozzle thereof, the vessel being provided with a refractory lining **2**. Jacket **1** has an opening **3** therethrough, and lining **2** has an opening **4** therethrough. A refractory brick **5** is mounted in opening **4** and has a passage **6** therein which receives a refractory wear sleeve **7** having a flow passage **8** therein.

A cylindrical ring **9** is welded into opening **3** of jacket **1**, ring **9** being flush with the outer surface of the jacket and projecting beyond the inner surface thereof. An inner surface **10** of ring **9** receives wear sleeve **7**, while an outer surface **11** of ring **9** positions refractory brick **5** in a predetermined position. Upper end surface **12** of ring **9** acts as an abutment or support for brick **5**.

A slide closure is attached to the outer surface of jacket **1** for the purpose of opening and closing flow passage **8** of sleeve **7**. The slide closure includes a frame **13**, a slide housing **14**, and a housing cover **15** including slide guides or tracks **16** on which a displaceable supporting slide **17** can be reciprocated by means of an operating rod **18**. Slide **17** carries a refractory slide plate **19** and an outwardly depending refractory outflow sleeve **20**. Plate **19** and sleeve **20** are provided with coaxial outlet openings **21** and **22**, respectively, and are sealed by a suitable mortar to slide **17**. Above slide plate **19**, a stationary bottom orifice plate **23** is arranged such that its flow opening **24** is aligned with flow passage **8** of sleeve **7**. Bottom plate **23** and sleeve **7**, and slide plate **19** and outflow sleeve **20**, are respectively connected tightly by means of splined interlocking joints and by a suitable mortar.

In the spout including the slide closure of FIG. **1**, plates **23** and **19** and sleeves **7** and **20** are parts that are subjected to wear and which must routinely be replaced. In connection with their replacement, refractory apertured brick **5** may also be replaced if necessary.

Cylindrical ring **9** facilitates considerably the mounting of sleeve **7** and of brick **5** during the replacement of parts **23, 19, 20** as well as **5** in a given case. Apertured brick **5** is centered automatically by means of outer surface **11** of ring **9** and held in the proper vertical position by means of abutment with upper end surface **12.** Likewise, the central position of sleeve **7**, which normally has to be replaced more frequently than apertured brick **5**, is determined automatically by means of inner surface **10** of ring **9.** The vertical upward position of sleeve **7** is fixed by indirect abutment against a conical inner surface **28** of the opening **6** of brick **5** and by means of a layer **25** of refractory sealing material which fills up the space between and absorbs any tolerances in the dimensions of brick **5** and sleeve **7.** Sleeve **7** is at its proper lower vertical position when its lower end surface **26** is situated on the same vertical level with a lower face **27** of ring **9.**

The inner and outer diameters of cylindrical ring **9** with inner surfaces **10** and **11**, on the one hand, and the diameters of the corresponding engaging surfaces on sleeve **7** and brick **5**, on the other hand, vary within normal tolerances which align sleeve **7** and perforate brick **5** in a predetermined central position. When required, the fit may permit a thin layer of refractory mortar or a film of another refractory material between the respective engaging parts, while of course still always insuring the desired identical position for any replaced sleeves **7** and perforate bricks **5.**

After sleeve **7** is mounted in brick **5**, bottom plate **23** of the slide closure can be mounted, and then the remainder of the slide closure can be prepared and assembled as required.

According to FIG. **2**, a cylindrical ring **30** is provided with steps extending inwardly in the direction of the longitudinal axis of the ring, so that an external abutment **31** is provided for the bottom level of perforate brick **5**, and inner abutment **32** is provided to establish the upper vertical position of sleeve **7.** Elements **5** and **7** are provided with countersurfaces corresponding to abutments **31** and **32.** The central position adjusting surface for apertured brick **5** is indicated by numeral **33** and that of sleeve **7** by numeral **34.**

In the embodiment of FIG. **3**, a cylindrical ring **36** is provided at the lower end thereof with an inwardly extending horizontal annular flange **37.** Thus, the cross-section of ring **36** is angular. Brick **5** is centered by means of the vertical inner surface **38** of ring **36,** and its vertical position is determined by the upper horizontal surface **39** of flange **37.** Sleeve **7** is centered by the inner annular surface **40** of flange **37,** while the upper vertical position of sleeve **7** is determined in the same manner as in the embodiment of FIG. **1,** i.e. by conical inner surface **28** of passage **6** of brick **5.**

A ring **41** of FIG. **4** is likewise angular in shape but provided with thicker profile dimensions. The difference from the embodiment of FIG. **3** is that the vertical abutment for apertured brick **5** is formed by an upper

face 42 of ring 41. Brick 5 and sleeve 7 are connected by means of surfaces 43 and 44, respectively.

FIG. 5 shows an embodiment wherein an inner surface 45 of cylindrical ring 46 is conically shaped. Surface 45 determines the position of the sleeve 7 both centrally and also vertically upwardly. Number 47 indicates an abutment for apertured brick 5 and numeral 48 indicates its centering surface.

Finally, FIG. 6 shows an example wherein the inner surface 49 of the vessel jacket 1 is employed as the horizontal abutment surface for apertured brick 5. An outer annular surface 50 and an inner surface 51 of cylindrical ring 52 form the central adjustment surfaces for apertured brick 5 and sleeve 7, respectively. The upward vertical abutment of sleeve 7 is provided through conical inner surface 28 of passage 6 of the apertured brick.

As in FIG. 1, the lower face 27 of cylindrical ring 9 and the lower end surface 26 of sleeve 7 of the embodiments of FIGS. 2 to 6 are in the same plane, which will service as a visual point of reference for the correct positioning of the sleeve.

Any one of the illustrated embodiments is readily suitable for metallurgical vessels employing slide closures, since the ejection of the sleeve, centered with cylindrical or conical surfaces, by the melt is prevented by the bottom and slide plates of the slide closure.

Further, the sleeve and apertured brick of any one of the illustrated embodiments are immovably mounted by means of the ring that acts as a firm holding means against both horizontal and vertical forces that act on the parts from the side of the vessel. This eliminates the disadvantageous influence of such forces on the mortar joints.

I claim:

1. In a spout for metallurgical vessels, particularly including an exterior metal jacket with an opening therein, a refractory lining with an opening therein aligned with said jacket opening, a slide closure, a refractory apertured brick mounted in said opening of said refractory lining of said vessel and accessible from the interior of said vessel, and a refractory sleeve mounted in the aperture of said brick and removable outwardly therefrom, the improvement comprising:

a single cylindrical ring fixed to the inner surface of said jacket opening and extending inwardly of said vessel from said jacket, said ring having an inner first peripheral surface contacting an outer peripheral surface of said sleeve and comprising means for centrally positioning said sleeve with respect to said brick and said jacket opening, said ring having a second peripheral surface contacting an inner peripheral surface of said brick and comprising means for centrally positioning said brick with respect to said sleeve and said jacket opening.

2. The improvement claimed in claim 1, wherein said ring includes abutment surface means for vertically positioning said brick.

3. The improvement claimed in claim 2, wherein said abutment surface means comprises an upper end surface of said ring.

4. The improvement claimed in claim 2, wherein said ring has a stepped portion extending inwardly toward the longitudinal axis of said ring, and providing outer and inner step surfaces, and said abutment surface means comprises said outer step surface.

5. The improvement claimed in claim 4, wherein said inner step surface provides an abutment means for limiting the vertical upwardly extending position of said sleeve.

6. The improvement claimed in claim 2, wherein said ring has an inwardly extending flange adjacent the bottom portion thereof.

7. The improvement claimed in claim 6, wherein said abutment surface means comprises the upper surface of said flange.

8. The improvement claimed in claim 6, wherein said abutment surface means comprises an upper end surface of said ring.

9. The improvement claimed in claim 2, wherein said inner first peripheral surface of said ring comprises a conical surface tapering upwardly and inwardly from said jacket toward the interior of said vessel.

10. The improvement claimed in claim 1, wherein the upper inner surface of said jacket comprises abutment means for vertically positioning said brick.

11. In a spout for metallurgical vessels, particularly including an exterior metal jacket with an opening therein, a refractory lining with an opening therein aligned with said jacket opening, a slide closure, a refractory apertured brick mounted in said opening of said refractory lining of said vessel and accessible from the interior of said vessel, and a refractory sleeve mounted in the aperture of said brick and removable outwardly therefrom, the improvement comprising:

a cylindrical ring fixed to the inner surface of said jacket opening and comprising adjusting and holding means for centrally positioning said brick and said sleeve centrally of each other and of said jacket opening; said ring having a stepped portion extending inwardly toward the longitudinal axis of said ring, and providing outer and inner step surfaces, said outer step surface comprising abutment surface means for vertically positioning said brick.

12. The improvement claimed in claim 11, wherein said inner step surface provides an abutment means for limiting the vertical upwardly extending position of said sleeve.

13. In a spout for metallurgical vessels, particularly including an exterior metal jacket with an opening therein, a refractory lining with an opening therein aligned with said jacket opening, a slide closure, a refractory apertured brick mounted in said opening of said refractory lining of said vessel and accessible from the interior of said vessel, and a refractory sleeve mounted in the aperture of said brick and removable outwardly therefrom, the improvement comprising:

a cylindrical ring fixed to the inner surface of said jacket opening and comprising adjusting and holding means for centrally positioning said brick and said sleeve centrally of each other and of said jacket opening; said ring having an inwardly extending flange adjacent the bottom portion thereof; said flange having an upper surface comprising abutment surface means for vertically positioning said brick.

14. In a spout for metallurgical vessels, particularly including an exterior metal jacket with an opening therein, a refractory lining with an opening therein aligned with said jacket opening, a slide closure, a refractory apertured brick mounted in said opening of said refractory lining of said vessel and accessible from the interior of said vessel, and a refractory sleeve

mounted in the aperture of said brick and removable outwardly therefrom, the improvement comprising:

a cylindrical ring fixed to the inner surface of said jacket opening and comprising adjusting and holding means for centrally positioning said brick and said sleeve centrally of each other and of said jacket opening; said ring having an inwardly extending flange adjacent the bottom portion thereof; said ring further having an upper end surface comprising abutment surface means for vertically positioning said brick.

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