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RELEASABLE BEARING FOR CRUCIBLE OR CONVERTER

Filed Feb. 18, 1966

3 Sheets-Sheet 1

FIG. 1

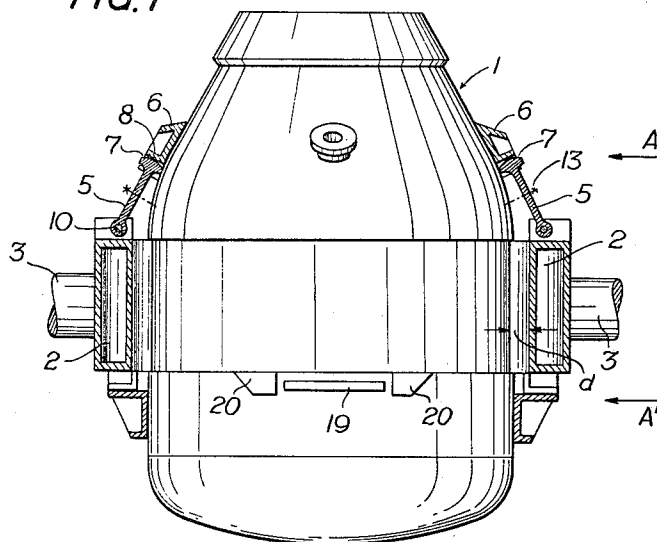
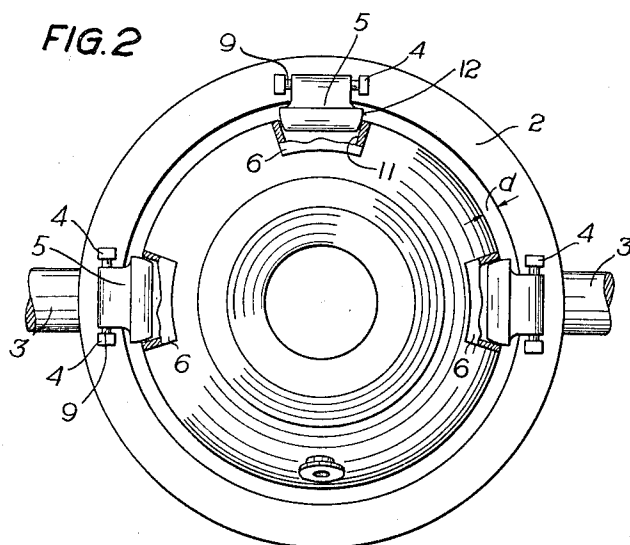


FIG. 2



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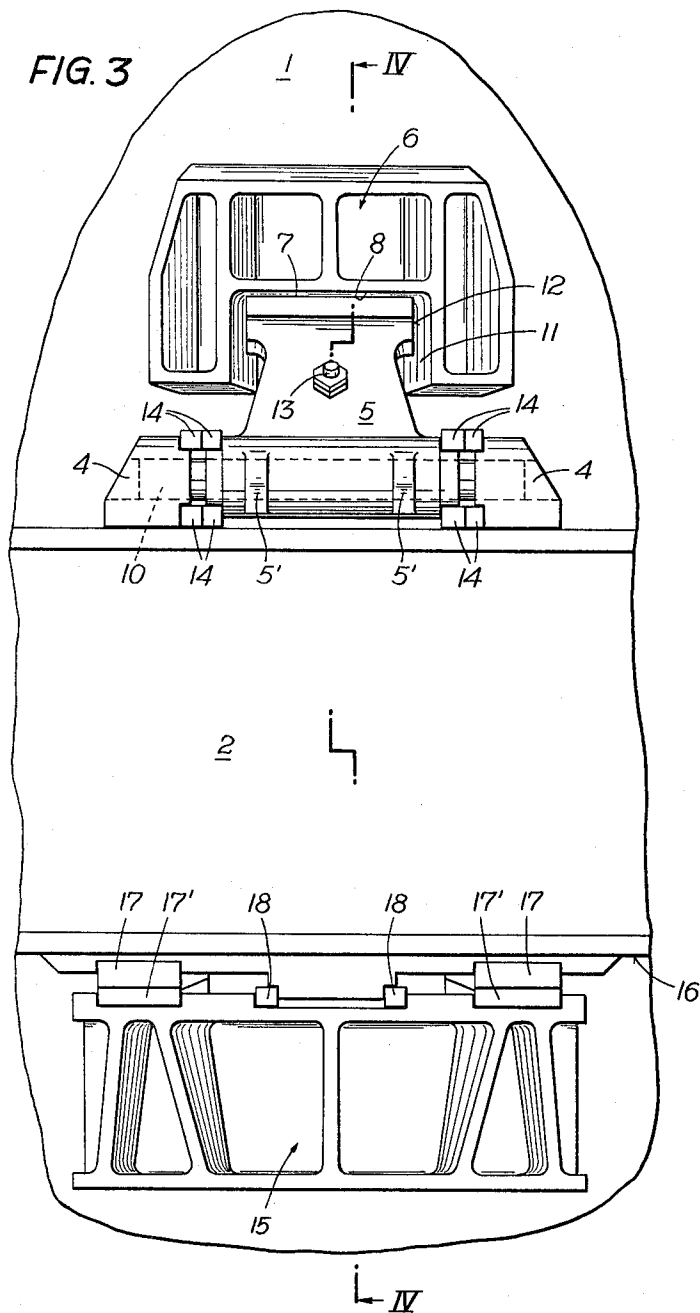
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3 Sheets-Sheet 2



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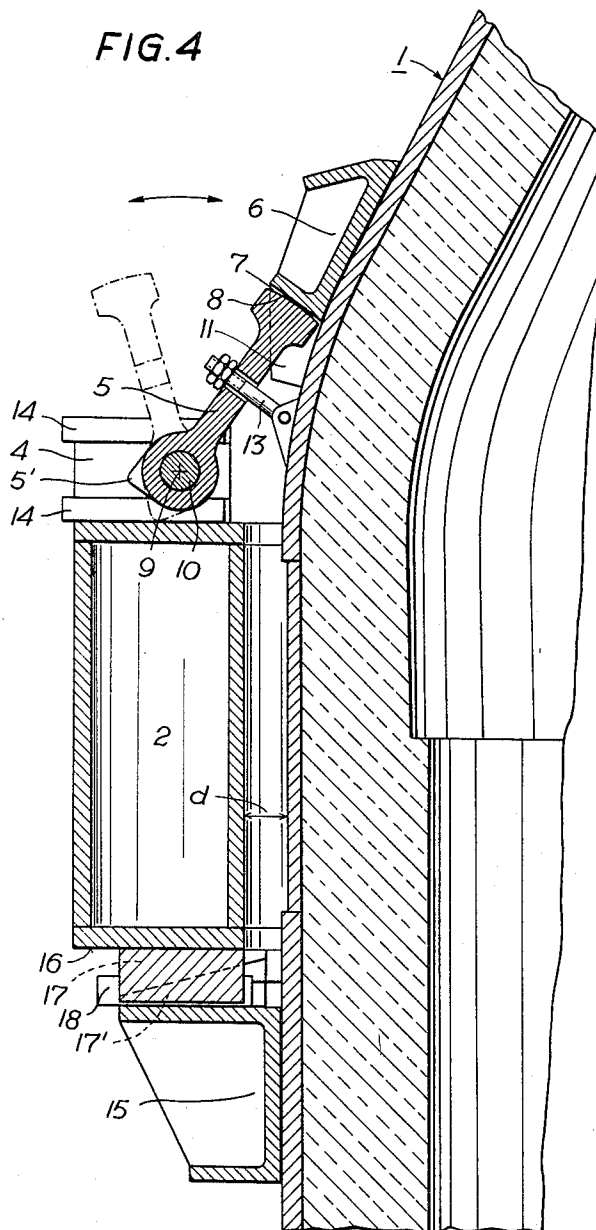
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RELEASABLE BEARING FOR CRUCIBLE OR CONVERTER

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3 Sheets-Sheet 3



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RELEASABLE BEARING FOR CRUCIBLE OR CONVERTER

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10 Claims. (Cl. 266—36)

Tiltable crucible or converters for refining crude iron or for carrying out other metallurgical processes consist of a refractory-lined cylindrical or pear-shaped vessel. For supporting the crucible, a carrying body is mounted to surround the shell approximately in the height of the center of gravity, which carrying body is rigidly connected with two trunnions. The crucible must be capable of being tilted by means of electromechanic or hydraulic drives acting on the trunnions from the substantially vertical blowing position into the upside-down position for emptying and back again. For this purpose, the crucible is supported on the carrying ring by means of a number of claws spaced around the periphery of the shell of the crucible and suitably provided in pairs. In the known constructions, these claws consist of angular brackets fixed to the crucible shell with one flange or leg, while the other flange or leg, which projects from the crucible wall, rests against the carrier body on the top and bottom surfaces thereof.

In the practical operation of steel mills usually several crucibles are arranged in a row one beside the other, the crucibles working in a cycle system, one being charged, for instance, while one or two others are blowing and a further crucible is being tapped, etc., because in this manner the most rational and quick operation can be achieved. As the lining of the crucibles has to be renewed from time to time, it is endeavored to effect the relining work at a place remote from the blowing stands in order to avoid the blowing stand in question having to be shut down during the overhaul of the crucible. Thus, it has already been proposed to have the refining vessel replaceably suspended in the frame and to move the crucible, if required, from the blowing stand to the relining stand or to a side stand by means of a transfer vehicle and to mount a newly lined crucible into the frame which has become available. Known releasable crucible carrier constructions consist, for instance, of a frame which is open on one side and has a horseshoe-like shape. It has further been proposed to use an approximately square ring as the carrier body, into which the converter can be suspended in one angular position and, upon rotation through 45°, released from the suspended position.

The first-mentioned releasable bearing comprising a frame construction open on one side has the disadvantage that this system is statically indeterminate. Also square carrier rings do not represent superior constructions from the statical point of view; in any case, circular carrier rings can be manufactured with a higher degree of rigidity, and there are no problems as to corner joints. They also require less space.

It is an object of the invention to provide a construction for releasably supporting a crucible or converter, comprising a closed carrier body which is arranged to surround the periphery of the crucible in spaced relationship and on which the crucible is supported by supporting means, said construction avoiding the above-mentioned difficulties and having the additional advantages that any deformations of the crucible occurring during operation will not affect the releasable bearing and that also certain dimensional differences of the crucibles to be exchanged (interchangeable vessels) which may arise upon a prolonged use will not matter.

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The construction of the invention is characterized in that each of the upper supporting means consists of a supporting member pivotally mounted on the annular carrying body and an abutment member having a counter or stop face and being rigidly secured to the shell of the crucible, the radial extension of the abutment members being smaller than the inside radius of the carrier body so that upon release of the upper supporting means the crucible can be lowered out of the carrier ring, and that the lower supporting means which are rigidly mounted on the crucible wall are adapted to be positioned against the lower surface of the annular carrier body by detachable adjustment means.

The pivotable upper supporting members are suitably adapted to be swung around an axis which is parallel to the plane of the ring and parallel to the tangent to the converter in the bearing point, preferably in such manner that said supporting members are arranged on a shaft mounted in side pieces (cheeks) on the carrier body.

Preferably the pivotable supporting members are displaceable along the mentioned axis; this may be realized in such manner that the supporting members are slidable along the shaft and/or the shaft is slidable in the side pieces.

The abutment members may comprise guide faces conically expanding in radial direction, which guide faces exert a centering action on the supporting members when the pivotable supporting members are swung into their supporting position. The pivotable supporting members may have cambered side faces.

According to a further feature of the invention, wedges or similar clamping devices are provided for fixing the pivotable supporting members in the swung-in supporting position, which block the slidability of the supporting members along the shaft.

The adjustment means between the lower supporting means and the annular carrier ring may likewise consist of one or several pairs of wedges, a fixation in horizontal and in vertical direction being feasible.

These and further features of the invention are explained in more detail in the following description in connection with the accompanying drawing. FIG. 1 is an elevation and FIG. 2 is a plan view of a crucible which is releasably supported in accordance with the invention. FIG. 3 shows on an enlarged scale representations of the upper and lower supporting means in the supporting position as viewed in the direction of the two arrows A and A', respectively, according to FIG. 1. FIG. 4 shows on an enlarged scale a vertical sectional view through the crucible wall, the carrier ring and the releasable bearing construction.

In the figures, numeral 1 denotes the crucible and 2 a circular carrier ring arranged to surround the crucible with a clearance d and having a box-type profile, to which carrier ring the trunnions 3 are secured. Mounted on the carrier ring and on the crucible (see FIG. 2) there are three supporting means, namely two, diametrically opposite to each other, in the plane of the trunnions and one perpendicularly thereto, in the plane of tilting. The supporting means consist of supporting members 5 pivoted in side pieces 4 and of abutment members 6 rigidly secured to the shell of the crucible, the supporting members having supporting faces 7 and the abutment members having counter or stop faces 8, which faces in the swung-in position (supporting position) are in engagement with each other.

As is evident from FIG. 1, the abutment members 6 are provided on the conical upper portion of the crucible so that their radial extension is in any case smaller than the inside radius of the carrier body. It is thus possible that after swinging out the supporting members 5, as is

shown in dash lines in FIG. 4, the crucible can be lowered out of the carrier ring. Provided at the hubs of the supporting members 5 there are stop noses 5' limiting the swing path of the supporting members. The clearance d , which also in the conventional crucible-bearing arrangement is about 100 mm., may be increased in the bearing of the invention to 150 to 200 mm. Thereby—without having to put up with any statical drawbacks—the advantage is achieved that no deformations due to thermal stresses or brick pressure have to be feared even in large crucibles. The increased clearance has the further advantage that the air-space insulation between the hot crucible wall and the carrier ring is improved, the bearings of the supporting members 5 on the carrier ring remain cool, the moving parts thus being uninfluenced by the radiation of heat from the crucible and a deformation being avoided.

As is evident from FIG. 2, the supporting members 5 are pivotable around axes 9 which are parallel to the plane of the ring and parallel to the tangent to the converter in the bearing point.

For centering the supporting faces 7 and 8 it is provided that the supporting members 5 are adapted to be slidable along the mentioned axes. This may be realized in such manner that either the supporting members 5 are slidable along a shaft 10 (FIG. 4) and/or the shaft is arranged to be slidable in the side pieces or cheeks 4. As is apparent from FIG. 2, the centering device comprises the guide faces 11 of the abutment members 6, which guide faces conically expand in radial direction, and of the check side-faces 12 of the supporting members 5, which are correspondingly conically shaped and, in addition, cambered. In the swung-in supporting position the supporting members can be secured to the converter wall by means of screws 13, which pass through bores in the supporting members 5.

As has been mentioned, displaceability along the axes 9 and centering of the faces 12 will, as a rule, be necessary when the crucibles are exchanged, because of dimensional differences of the individual vessels which are a result of thermal stresses occurring upon continued operation. Therefore, it is also necessary that in the swung-in supporting position a fixation is effected. To this end, pairs of wedges 14 are provided, which block any displacement of the supporting members along shaft 10.

Since, as has been mentioned hereinbefore, crucibles for refining crude iron and the like must be capable of being tilted from the vertical blowing position into the upside-down position, also the provision of lower supporting means is necessary which hold the converter when it has been tilted in the upside-down position. In the construction of the invention lower claws 15 are provided for this purpose which, as illustrated, are designed as open trough sections. They are rigidly secured to the crucible wall. For positioning these supporting means against the lower carrier ring surface 16, pairs of wedges 17, 17' are provided which bar any movement in vertical direction, and in addition there are two wedges 18, 18' (see FIG. 3) which also prevent a displacement in horizontal direction.

Numerals 19 and 20 denote a side guide means for the crucible, which may be of any desired known design. In the embodiment shown, a rib 19 which is rigidly mounted on the crucible shell is arranged between guide shoes 20 secured to the carrier ring.

The function of the construction of the invention is as follows:

If a crucible, when its lining is worn out, is to be removed from its blowing stand and to be transferred to the relining stand, a crucible transfer car having a suitable lifting device is first moved underneath the crucible. Then the lower adjustment means—pairs of wedges 17, 17' and wedges 18, 18'—are released, and thereafter the lifting or carrying platform of the transfer car is lifted until the bottom part of the crucible is in contact

with the lifting platform and in taking-up position. Then the screws 13 are released, the pairs of wedges 14 removed and the supporting members 5 swung out. Now the crucible can be lowered out of the carrier ring and, if desired, moved out horizontally upon tilting of the carrier ring. Tilting of the carrier ring saves part of the lowering path, because in that manner the crucible can be moved out already before its mouth has reached that level at which the carrier ring would be in the horizontal position.

The mounting of a crucible coming from the relining stand and being newly lined is effected in like manner, but in reversed sequence.

What I claim is:

1. A releasable bearing for a tiltable converter having a substantially cylindrical shell, comprising a closed, annular carrier body which is arranged to surround the periphery of the converter in spaced relationship and on which the converter is supported by upper and lower supporting means, each of said upper supporting means consisting of a supporting member pivotably mounted on said annular carrier body and of an abutment member having a stop face adapted to cooperate with said supporting member in its swung-in supporting position and being rigidly secured to the converter shell, the radial extension of said abutment members being smaller than the inside radius of said carrier body so that upon release of said upper supporting means the converter can be lowered out of said carrier body, and said lower supporting means including means rigidly mounted on the converter shell and detachable adjustment means adapted to be positioned against the lower surface of said annular carrier body.

2. A releasable bearing for a tiltable converter having a substantially cylindrical shell, comprising a carrier ring which has two dimetrically spaced trunnions and is arranged to surround the converter shell in spaced relationship, the converter being supported on said carrier ring by upper and lower supporting means, each of said upper supporting means consisting of a supporting member arranged on a shaft mounted in side pieces on said carrier ring so as to be pivotable around an axis which is parallel to the plane of said carrier ring and parallel to the tangent to the converter in the bearing point, and of an abutment member having a stop face adapted to cooperate with said supporting member in its swung-in position and being rigidly secured to the converter shell, the radial extension of said abutment members being smaller than the inside radius of said carrier ring so that upon release of said upper supporting means the converter can be lowered out of said carrier ring, and said lower supporting means including means rigidly mounted on the converter shell and detachable adjustment means adapted to be brought into engagement with the lower surface of said carrier ring.

3. The releasable bearing set forth in claim 2, wherein each of said pivotable supporting members is displaceable along its axis in that the supporting member is slidable along its shaft.

4. The releasable bearing set forth in claim 2, wherein each of said pivotable supporting members is displaceable along its axis in that the shaft is slidable in its side pieces.

5. The releasable bearing set forth in claim 2, wherein each of said abutment members comprises guide faces conically expanding in radial direction, which guide faces center the pivotable supporting members between them, when the latter are swung into their supporting position.

6. The releasable bearing set forth in claim 2, wherein the pivotable supporting members have cambered side faces.

7. The releasable bearing set forth in claim 2, wherein the pivotable supporting members are adapted to be fixed in the swung-in supporting position by means of

screws passing through bores in the supporting members.

8. The releasable bearing as set forth in claim 2, wherein each of said pivotable supporting members is fixed in its swung-in supporting position by wedges which prevent said supporting member from sliding along its shaft.

9. The releasable bearing as set forth in claim 2, wherein the adjustment means between the lower supporting means and the carrier ring consist of at least one pair of wedges, an adjustment and fixation being effected both in horizontal and in vertical direction.

10. The releasable bearing as set forth in claim 2, wherein three upper supporting means are provided, two being arranged diametrically opposite to each other on a diameter substantially coinciding with the axis of said

trunnions and the third extending at a right angle to said trunnion axis in the plane of tilting.

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