United States Patent

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[54] **ROTATABLE HOT METAL DISCHARGING VESSEL CAR**
19 Claims, 11 Drawing Figs.

[52] **U.S. Cl.** **105/265,** 51/3, 74/202, 74/206, 105/271, 105/279, 105/358
[51] **Int. Cl.** **B61d 9/02,** F16h 13/02, F16h 15/02
[50] **Field of Search** 105/239, 264, 265, 266, 267, 270, 271, 358, 360, 279; 51/13; 74/216.5, 221, 202, 206

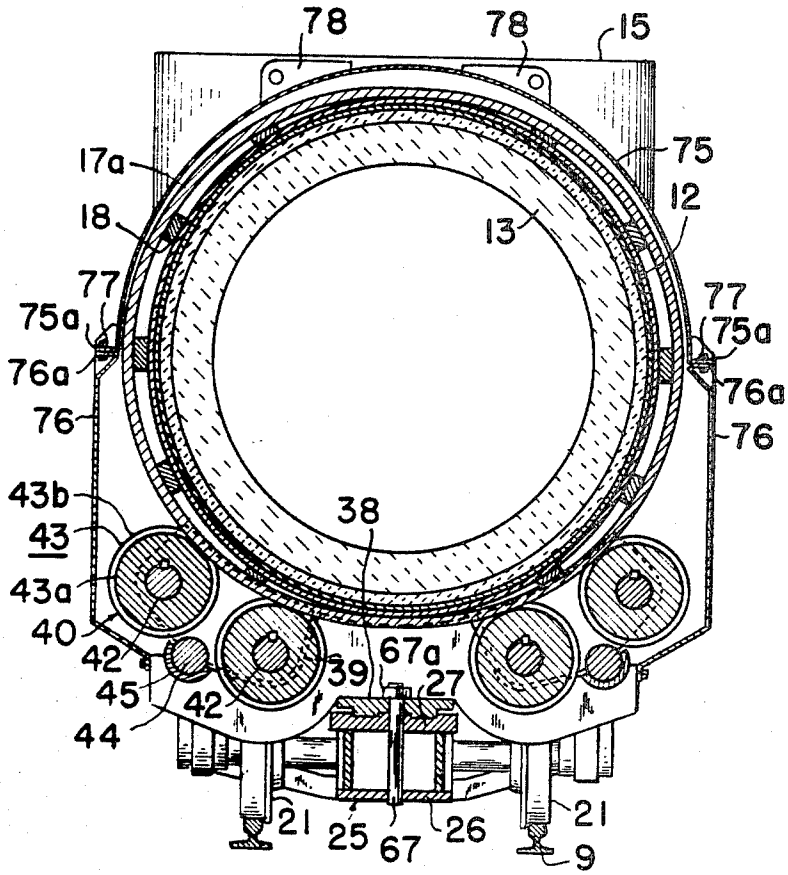
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ABSTRACT: A hot metal carrier apparatus in the nature of a horizontally elongated symmetrical vessel body or container having a metal shell wall and a refractory lining wall is provided with an open mouth portion for receiving and pouring molten metal and, if desired, for applying melting and refining heat to a metal charge therein through the agency of an oxygen lance. The vessel body is constructed to receive and carry a large tonnage of molten metal along a plant floor or the like on a pair of longitudinally spaced-apart wheeled truck assemblies. The vessel body is mounted for rotating movement on the truck assemblies by carriage, swing frame and roller means, in order that its open mouth portion may be moved between vertical and horizontal positions. Drive rollers of each assembly engage an associated rim flange assembly of a spaced pair about the vessel body to support it in a balanced relation and to enable its effective and safe rotation.



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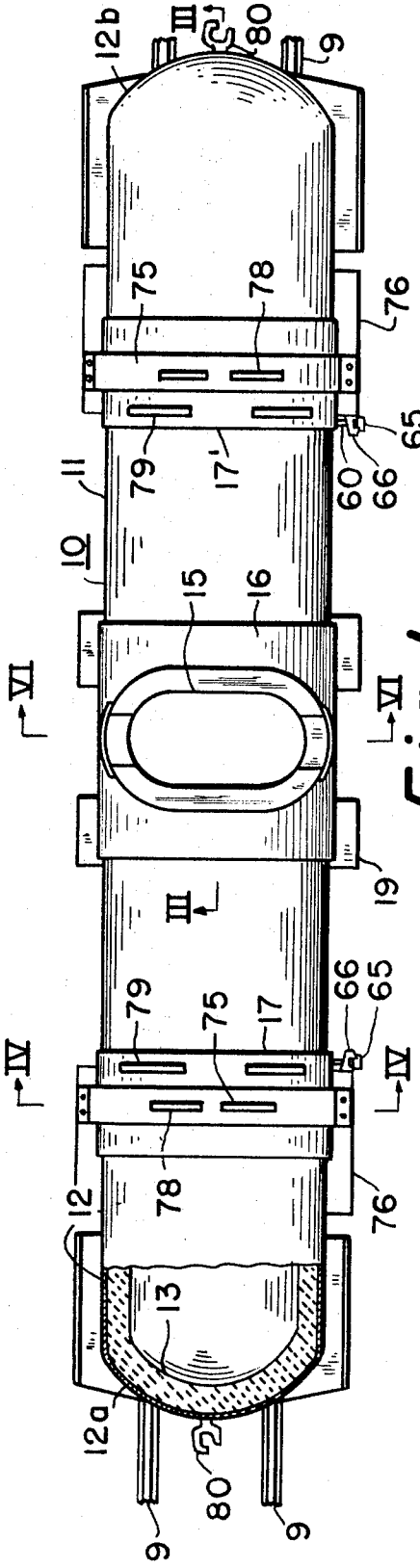


Fig. 1

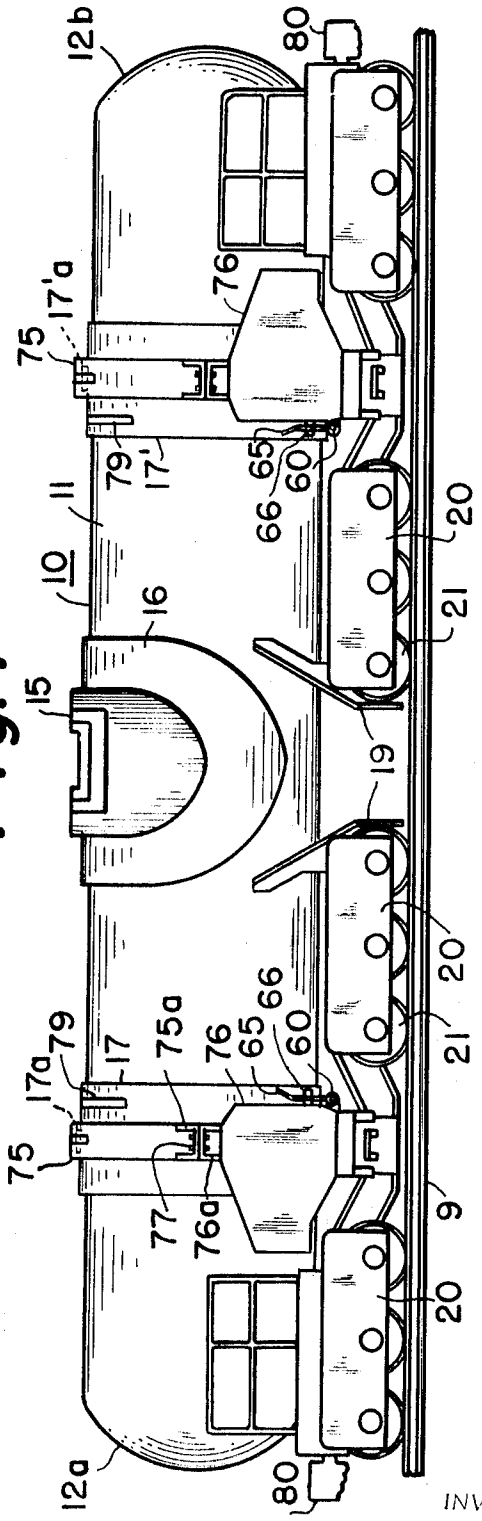


Fig. 2

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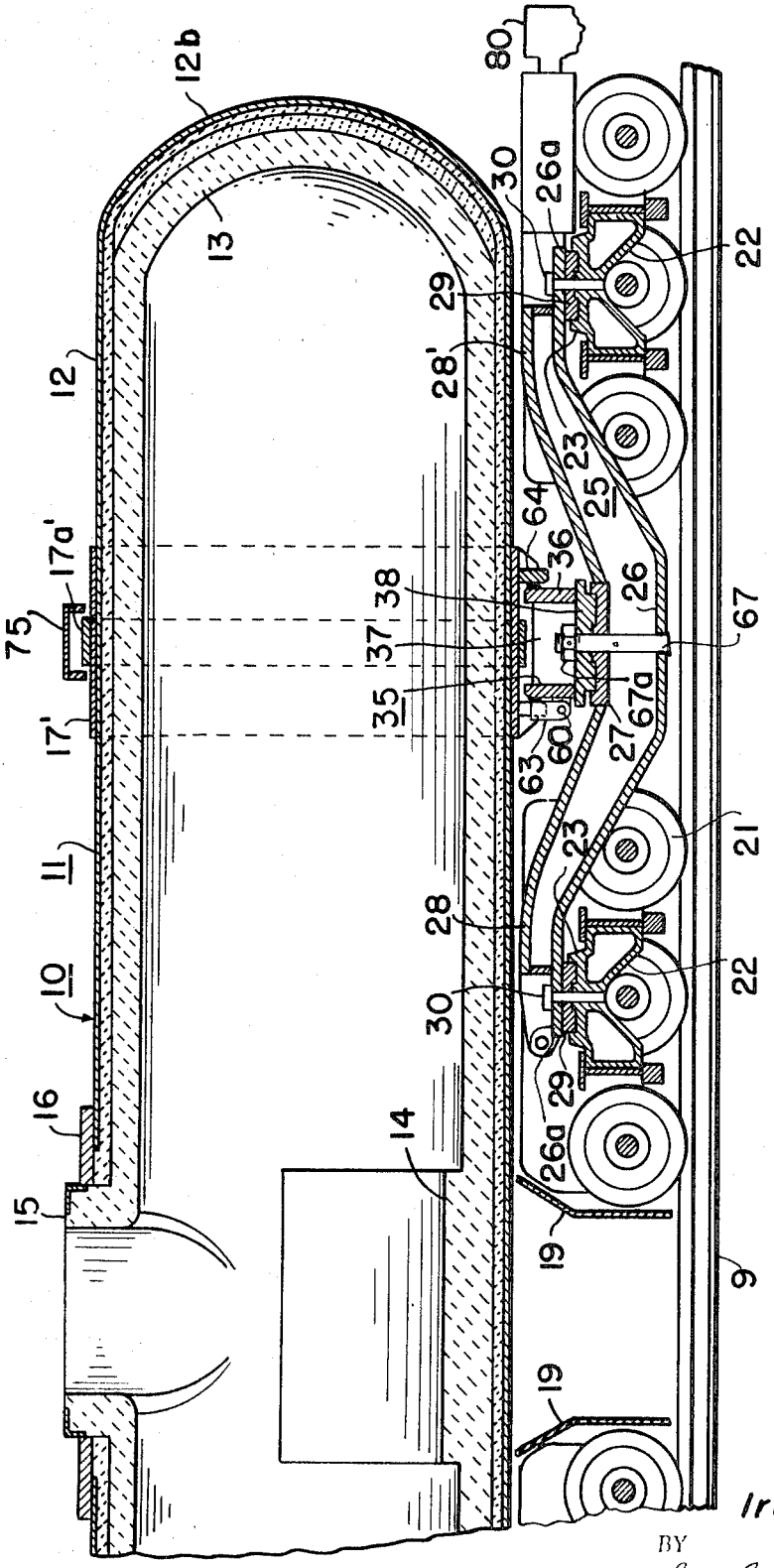


Fig. 3

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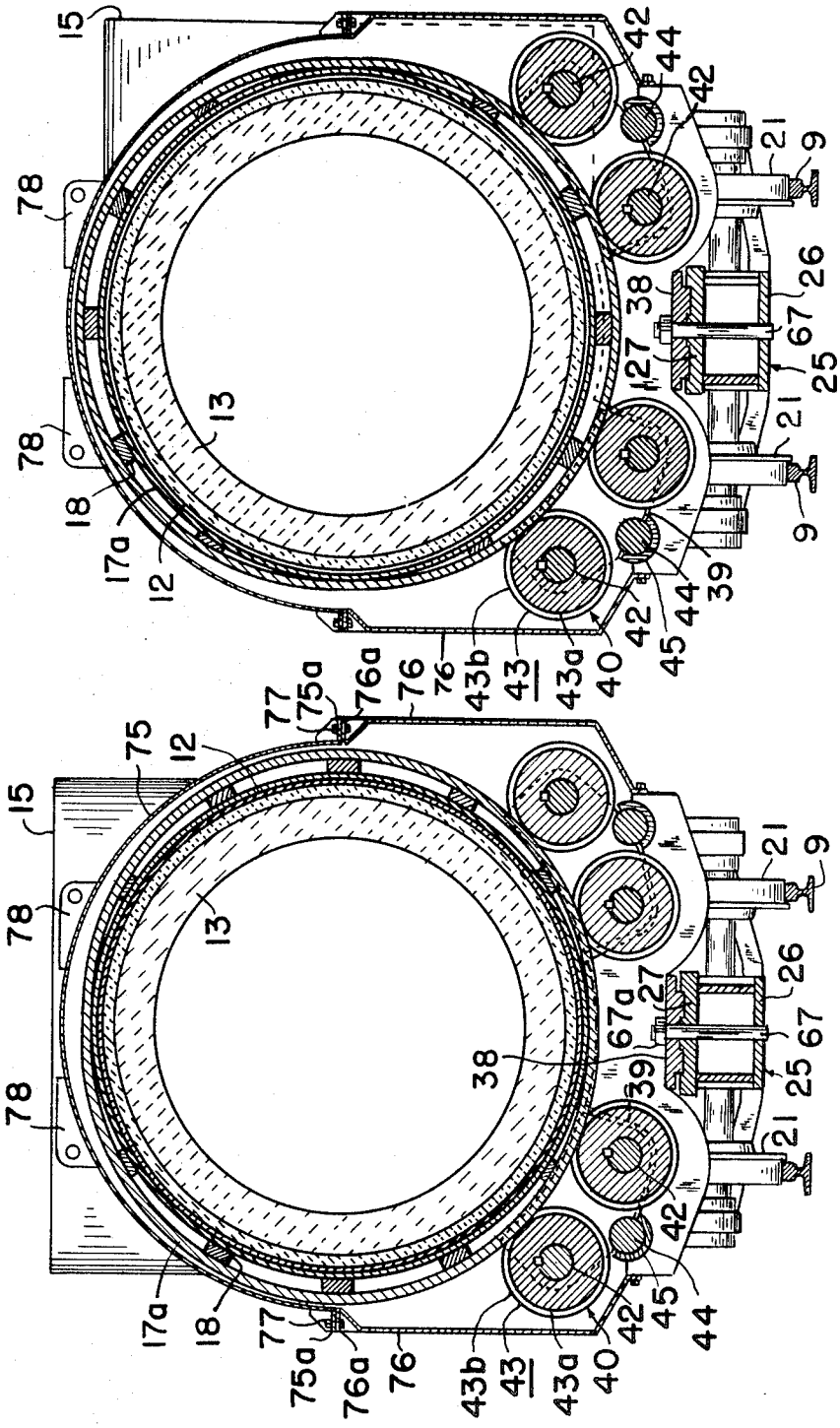


Fig. 5

Fig. 4

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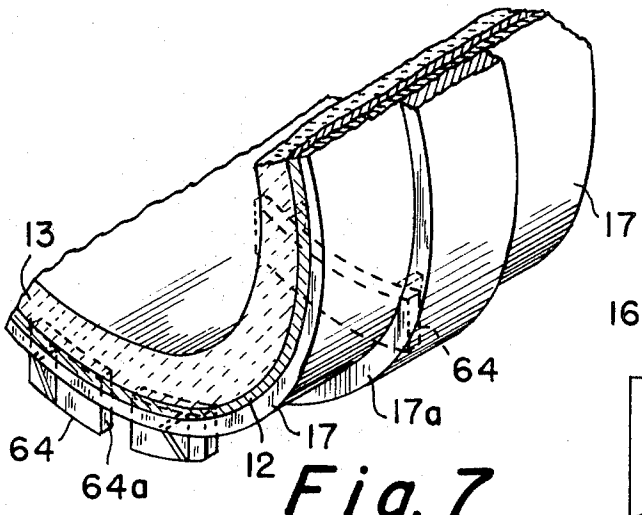


Fig. 7

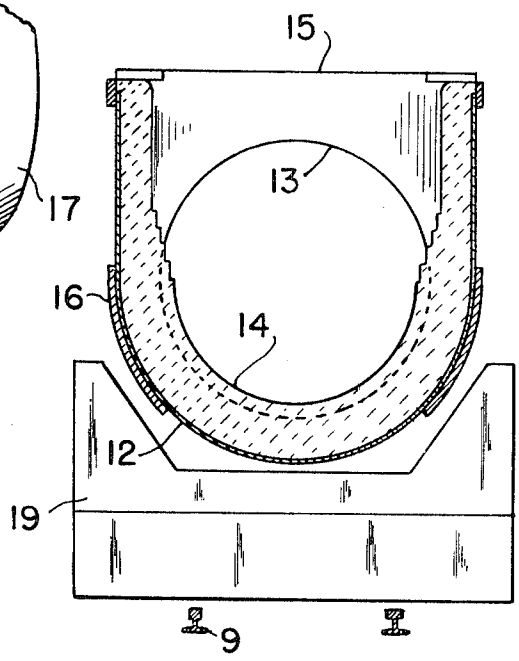


Fig. 6

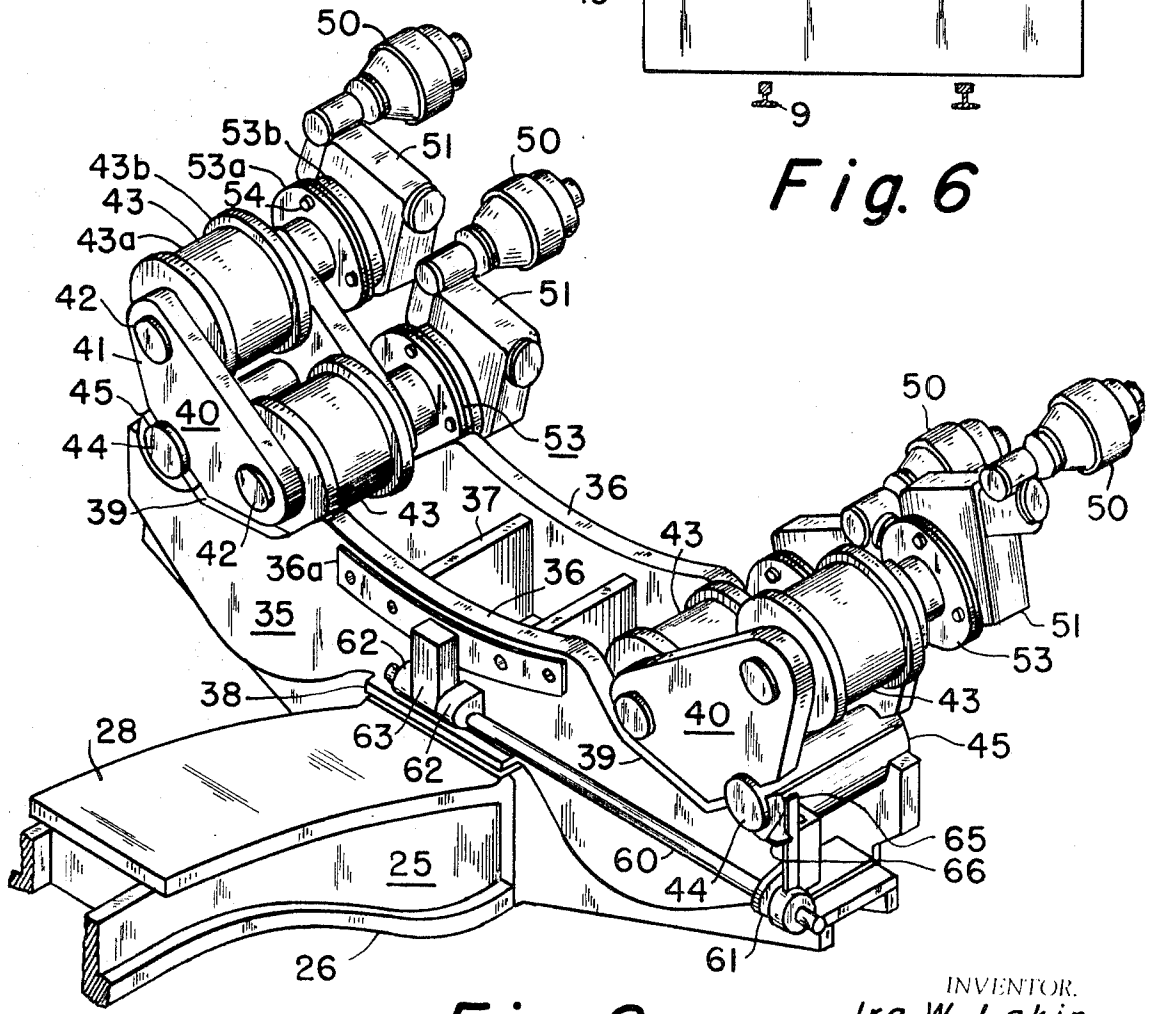


Fig. 8

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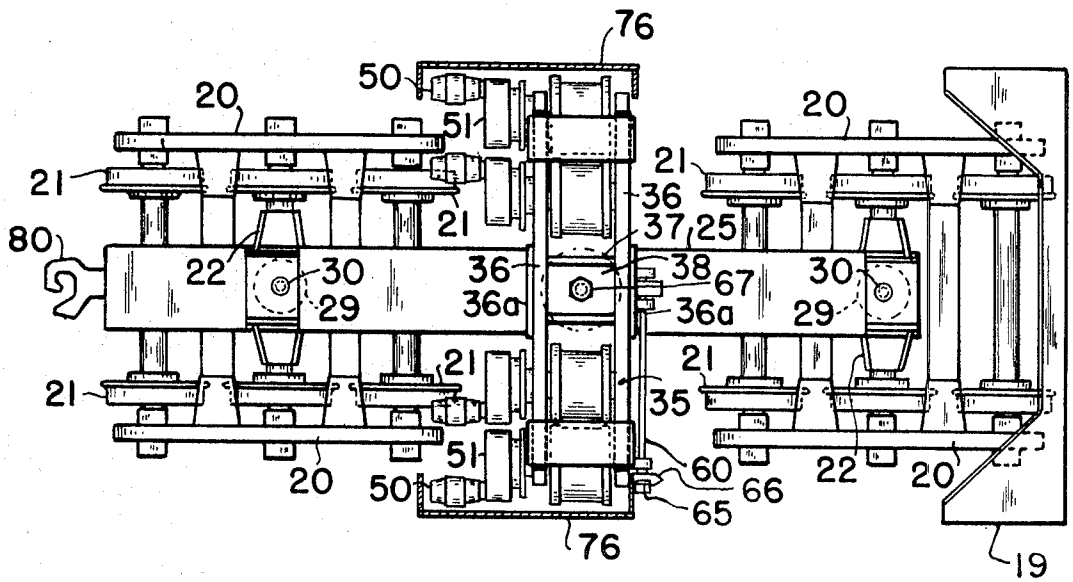


Fig. 9

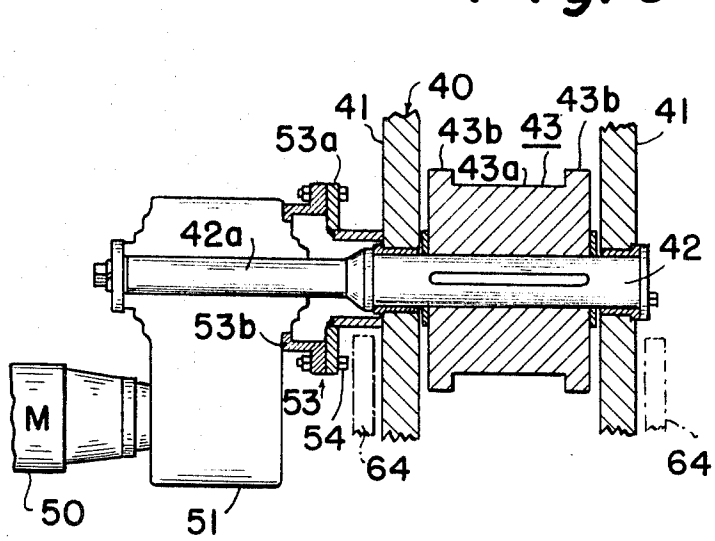


Fig. 10

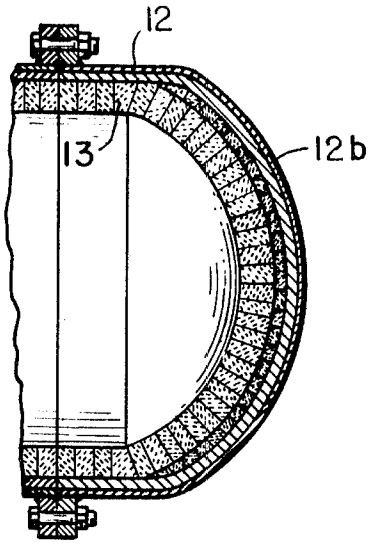


Fig. 11

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ROTATABLE HOT METAL DISCHARGING VESSEL CAR

The invention relates to an improved hot metal vessel or furnace carrier apparatus which has a relatively large tonnage capacity and which may be used for melting and refining metal as well as for carrying it in a molten condition from one operating station to another.

Although horizontally positioned movable furnaces have heretofore been provided, they have disadvantageous features which have limited their use. In the so-called torpedo type, the furnace vessel is supported at each of its tapered ends by a cup-shaped holder that has an end-bearing for the wheeled trucks. One holder is driven by gear and pinion means. Such a mounting requires especially tapered or reduced diameter ends in the body of the vessel and a longitudinal compressing force on opposite ends of the vessel. The mass or weight of the torpedo type of vessel and of a charge is, in effect, cantilevered between two end bearings. Thus, the vessel tends to centrally sag, particularly under the intense heat to which it is subjected; its operating life is shortened, and there is an ever present threat of a downward drop of the vessel and the spilling of its molten slag or metal content to endanger the lives the workmen.

A second type of horizontally positioned removable furnace also makes use of an unsymmetrical vessel or container body and endeavors to drive or turn the vessel by a ring gear mounted and driven from one reduced end portion of the body. Pairs of rings are used for supporting the vessel on fixed rollers, with the ring gear about the vessel body at the drive end of the apparatus being positioned between the pair of rings thereat.

Both of the above types of mixer or torpedo hot metal car apparatus retain the same basic ladle shape or configuration of an enlarged central portion and reduced end portions, with the rotation being effected by driving a bull gear mounted at one end portion. Cars of this type have been built in capacities up to about 300 tons. However, due to space limitations, particularly at blast furnaces, the use of larger cars is limited to a few of the newer plants where the cast houses are especially designed to accommodate them. The average plant can handle cars no longer than about 50 to 54 feet in length, about 11 to 13 feet in height and about 10 to 11½ feet in width. A conventional car of about 200 to 250 tons can be used in such a space. However, due to the continued improvement in blast furnace practice resulting in higher rates of production, larger hot metal carrier apparatus is being required and today's conventional apparatus has about reached its limit without going into a costly redesigning of cast houses. The need has been for an increased capacity of vessel within given dimensions, without requiring changes in cast houses, reladling pits, tunnels or other facilities.

There has heretofore been no furnace vessel body for such a type of utilization that is of a shape that is most efficient for the molten metal and that enables a fully balanced distribution of the weight of the mass or load throughout its extent or elongate length. There has thus been a need for an improved apparatus including supporting-operating or rotation actuating mechanism therefor, and for apparatus which will not require a lengthening of the construction to provide bearing and drive supports for the vessel on wheeled trucks.

It has thus been an object of the invention to solve the problem presented in this connection and provide an improved hot metal carrier apparatus;

Another object has been to discover important factors in providing an improved apparatus and to utilize them in such a manner as to provide a foolproof operating and support structure and to, at the same time, increase the effective metal carrying capacity of the container vessel;

Another object has been to devise a new and improved hot metal carrying apparatus that will provide a balanced support and, at the same time, assure a maximum utilization of end spacing in the vessel body, all in such a manner as to provide an increased capacity with a lessened endwise extent of the apparatus;

A further object has been to devise a new and improved approach to supporting and rotating a longitudinally extending vessel body;

A further object of the invention has been to provide means for rotating a hot metal vessel body which has and will increase its frictional driving engagement as the body is rotated;

A still further object of the invention has been to provide an improved carrier apparatus which will provide a safe utilization and will also provide an increased operating life of its vessel body;

These and other objects of the invention will appear to those skilled in the art from the illustrated embodiment and the claims.

In the drawings, FIG. 1 is a top plan view of a hot metal furnace carrier apparatus illustrating the invention; in this figure, one end portion of the vessel body of the apparatus has been broken away to illustrate its construction.

FIG. 2 is a side view in elevation on the same scale as and of the apparatus of FIG. 1.

FIG. 3 is an enlarged side section in elevation taken longitudinally of one end portion of the apparatus along line III–III of FIG. 1; it also illustrates the construction of a similar opposite end portion of the apparatus.

FIG. 4 is an end section in elevation on the scale of FIG. 3 and taken along the line IV–IV of FIG. 1.

FIG. 5 is an end section in elevation on the same scale as FIG. 4 and taken along the same line as FIG. 4; FIG. 4 shows the vessel body of the apparatus in a normal position in which its open mouth portion faces substantially vertically upwardly and FIG. 5 shows the body after it has been rotated or turned clockwise about 90° to a position at which its open mouth portion is substantially horizontal for the purpose of pouring molten metal therefrom.

FIG. 6 is a transverse or end section in elevation through the mouth portion of the vessel body, taken along the line VI–VI of FIG. 1, and on an intermediate scale between FIGS. 1 and 4.

FIG. 7 is an isometric fragment in elevation and partial section on the scale of FIG. 6 and taken in the direction of a ring flange of the body to illustrate position latching means for the body.

FIG. 8 is an isometric view illustrating details of the construction of carriage, swing frame and roller drive means carried by each of a pair of wheeled truck assemblies adjacent each end of the apparatus. This view is on an enlarged scale with respect to FIGS. 4 and 5.

FIG. 9 is a top plan view taken below the vessel body, on a scale slightly smaller than FIGS. 4 and 5, and illustrating the construction and mounting of the means of FIG. 8.

FIG. 10 is an enlarged fragmental end view in elevation and partial section on the scale of and showing details of one motor drive and roller assembly or set of the group of assemblies or sets illustrated in FIG. 8.

And FIG. 11 is a fragmental side section in elevation showing the end construction of a modified embodiment of the vessel body of the apparatus and on the scale of FIG. 3.

In carrying out the invention and solving the problem presented, a hot metal carrier apparatus has been devised having a larger hot metal capacity for a given maximum length, width and height to thus reduce the number or length of arm runners at cast houses. It enables a quick and easy removal of a vessel body for relining and a release of the driving mechanism and rotating components for insertion of a spare vessel or ladle. Its body is fully symmetrical along its length which results in a lower cost of refractory lining and much easier and simplified relining operations. Patching of burned sections is simplified since there are no conical, sharply offset or reduced portions. Further, since the ends of the vessel are free, the addition of flues for other processing is permitted. Importantly, the construction is such that expansion and contraction of the vessel body does not adversely affect the driving thereof, since there is no direct meshing of gears involved from the standpoint of the furnace body or its direct support. On the other hand, a foolproof, serviceable, frictional drive is

provided that compensates automatically by means of swing frames and spaced roller mountings for temperature-induced variations in the contour of the metal shell wall representing the vessel body. Also, means is provided for assuring increased frictional force of driving engagement in the direction of major torque development during the turning or rotation of the vessel in its use.

The present construction eliminates the need for costly and wide tolerance drive gearing and, at the same time, provides an efficient drive by means of rollers and rim flanges, and avoids damage or freezing under temperature variations of the body of the vessel. At the same time, it enables the use of a fully symmetrical type of vessel body that has a substantially uniform diameter of radius along its full extent to facilitate heating, melting and refining of the material therein and to assure an enlarged tonnage capacity within spacing limitations that has heretofore been unattainable. As distinguished from a torpedo type of apparatus, the apparatus of the present invention avoids endwise compression-applied driving force and applies circumferential driving force that is flexible from the standpoint of the vessel body and that is applied by a frictional engagement along a circular or curvilinear path about the vessel and at longitudinally spaced-apart and balanced positions along the vessel body at points equidistantly spaced from end portions thereof and from the center of the longitudinal extent thereof.

Referring particularly to FIGS. 1, 2 and 3 of the drawings, a hot metal carrier apparatus **10** is shown having an elongated horizontally extending vessel or container body **11** within which metal may be introduced, refined and carried from one operating station to another, and from which molten metal may be poured. The container or vessel body **11** is shown defined by an outer metal shell wall **12** of substantially cylindrical shape and section that is closed-off at its ends by rounded or outwardly convey front and back closure end walls **12***a* and **12***b*. The hollow inside of the metal wall **12**, including its ends walls **12***a* and **12***b*, are lined with a protective refractory lining **13** of the same general shape and configuration. As shown in FIGS. 3 and 6, an intermediate or central portion of the vessel body **11** has a semicircular bottom-positioned refractory portion **14** of greater thickness than the main portion **13**. This, in effect, reinforces the lining at the location where metal charges, including molten metal, are introduced into the chamber of the body through a normally vertically upwardly extending open mouth portion **15**.

Although the metal shell wall **12** and its end portions **12***a* and **12***b* are shown in FIG. 3 of unitary construction, it will be apparent that split-off end portions may be provided (as shown in FIG. **11**). Each end portion has a flange cooperating with an associated end flange of the main body **12**; the cooperating flanges may be securely bolted together, as illustrated. The purpose is to facilitate replacement or repair of the refractory lining. As shown particularly in FIGS. **1**, **2** and **3**, a reinforcing, encircling metal collar **16** is provided about the open mouth portion **15** which may, as shown in FIG. **1**, be of transversely elongated shape to facilitate the introduction of metal into the vessel **11** and the pouring of metal therefrom when the vessel is tilted at substantially right angles or to a position at which its mouth portion **15** extends substantially horizontally.

In supporting and providing for an efficient rotating or turning movement of the vessel body **11**, a pair of substantially circular or annular metal ring banding flange members or riding rings **17** and **17'** are secured on and about the metal shell wall **12** at longitudinally spaced locations with respect to each other adjacent opposite ends of the vessel, but in a spaced relation from such ends. Each banding member **17** and **17'** has an intermediately disposed, substantially circular, outwardly offset, drive rim flange **17***a* or **17***a'* secured on and thereabout. It will be noted that ring assemblies represented by the banding members **17** and **17'** and their respective rim flanges **17***a* and **17***a'* are located in a balanced relation along the vessel body **11**. Each ring assembly has a substantially equal spacing from the standpoint of the distance of each from the respective adjacent end wall **12***a* or **12***b* and the distance of each from a centerline through the open mouth portion **15** of the vessel body.

As shown particularly in FIGS. **4** and **5**, each assembly **17**, **17***a* and **17'**, **17***a'* is secured in a somewhat eccentric relation about the metal wall **12** by means of metal spacer pieces or blocks. The arrangement of the spacer pieces **18** is such that the assemblies **17**, **17***a* and **17'**, **17***a'* have a driven frictional engagement with flanged driving and supporting rollers or spools **43** that increases in a wedging fashion when, for example, the vessel **11** is turned or rotated 90° from the position represented in FIG. 4 (which corresponds to the position shown in FIGS. **1** and **2**) to a pouring position, such as represented in FIG. **5**. Such wedging action will progressively increase during the movement which, in effect, proportions the gripping engagement between the driving means to an increase of torque that may be required due to a shifting of the hot metal load within the vessel. This, of course, is true whether or not the vessel is tilted either counterclockwise or clockwise to and from a pouring position. In addition to the holding action accomplished by flanged rollers or spools **43**, means is provided and will be hereinafter explained for positively latching or locking the container or vessel body **11** in its upper position and its lower, tilted position.

Again referring to FIGS. **1**, **2** and **3**, the vessel **11** is shown supported on sets or assemblies of wheeled trucks **20**. Each truck assembly is made up of a pair of endwise spaced-apart adjacent trucks **20** whose flanged wheels **21** are adapted to ride along the rails of a trackway **9**. Each truck **20** may be of somewhat conventional construction and may be directly motor driven if the apparatus **10** is to be self-operated or may not, if the apparatus is to be connected by an end coupling **80** to an engine or tractor unit (not shown). However, each truck **20** has a centrally located inverted, V-shaped mount **22** whose upper turntable portion **23** is adapted to securely mount and carry a bearing surface part **29**. A U-shaped bridge, spanning or bolster frame **25** is, as shown in FIG. **3**, provided with a centrally downwardly offset, reinforced, central portion **26** and a pair of oppositely extending, reinforced arm portions **28** and **28'**. A bottom member of each arm portion **28** and **28'** has a longitudinally extending flat or planar mounting portion **26***a* that is adapted to rest upon an associated bearing plate **29** of an associated one of the wheeled trucks **20**. A headed pin **30** is adapted to extend through the portion **26***a*, the bearing plate **29**, and the portion **23** to removably pivotally mount or support each end portion of each arm **28** and **28'** on an associated one of the trucks **20**.

The central downwardly offset portion **26** of each bridge or spanner frame **25** has an upper, centrally positioned and transversely extending cradle mounting bearing plate or part **27**. A transversely or cross-extending cradle or carriage frame **35** (see also FIG. **8**) has a bottom swivel base mount plate or part **38** cooperating with the mounting bearing plate **27** for pivotally mounting the carriage **35** on the bearing plate **27** and thus, between each pair of trucks **20**. The part **38** has a circular under shape and a rectangular upper shape, and the plate **27** has a complementary circular upper shape. A pin **67** is adapted to extend through the base mount or part **38**, the bearing plate or part **27**, and the bridging or straddle frame **25** and may have an upper head or, as shown, a threaded-on nut **67***a*.

Referring particularly to FIG. **8**, the cradle or carriage frame **35** has a pair of spaced-apart upright sidewall members **36** that provide its transverse extension, and a pair of spaced-apart upright end wall members **37** which are secured both to the bottom plate **38** and to the side members **36** to form a reinforced upright boxlike construction. The side members **36** of the boxlike carriage or cradle frame **35** have offset or cutout end portions **39** to receive swing frame and drive units **40** in a balanced end-mounted relation to the carriage. Side thrust bearing plates of segmental shape **36***a* are removably secured centrally on the outside of each of the side members **36**.

Each swing frame and drive unit **40** is shown as having a pair of opposed and spaced-apart upright sidewall members **41** of substantially triangular shape that rotatably journal or carry actuating shafts **42** on each of which a drive roller or thimble **43** is secured. As shown, the shafts **42** provide an endwise-balanced mounting for a pair of the drive rollers **43**. As shown particularly in FIG. **10**, one end of each drive shaft **42** has a reduced, outwardly extending portion **42***a* on which a gear reduction unit **51** is mounted and which, in turn, carries a reversible electric drive motor **50**. A two-part weldment housing **53** extends about and encloses the extending portion of the shaft **42**. The housing **53** has one flanged part **53***a* that is secured to extend from one side member **41** and has a second flanged part **53***b* that is secured to extend from the housing of the speed reduction unit **51**. Bolt and nut assemblies **54** extend through the flanges of the two parts of the housing **53** to removably secure them together and provide a support for the speed reduction unit **51** in addition to the support provided by its mounting on the extending portion **42***a* of the shaft **42**.

As shown particularly in FIGS. **8** and **10**, each drive roller **43** has a complementary frictional drive engagement or fit with respect to an associated flange assembly **17**, **17***a* and **17'**, **17***a'* of the vessel **11**, such that its inwardly offset cylindrical body portion **43***a* is adapted to ride on and frictionally engage the associated rim flange **17***a* or **17***a'*, and its pair of spaced-apart side rim portions **43***b* are adapted to ride along opposite side edges of an associated rim flange **17***a* or **17***a'* and frictionally engage on an associated banding member **17** or **17'**. Each swing frame **40** is swingably or pivotally mounted on the cradle or carriage frame **35** by a pivot or swing pin shaft **44** that extends across and is inset within and rigidly secured to the under side of the pair of sidewall members **41**. A split-sleeve bearing collar **45** is secured in a concave mounting on and adjacent each end of the cradle **35** for pivotally or swingably receiving an associated one of the swing shafts **44**.

As a result of the above-described construction and mounting of the drive and support means for the vessel body, it will be apparent the actuating or drive means **50**, **51** for rotating the body is carried by the shafts **42** of a pair of circumferentially spaced-apart associated swing frames **40**. Separate actuating means **50**, **51** is shown provided for each drive shaft **42**. The swing mounting of each frame and drive unit **40** and the spaced location of its pair of rollers **43** is such that there is considerable flexibility of engagement with the banding and rim flange assemblies **17**, **17***a* and **17'**, **17***a'* to effect a rotation or driving of the vessel body **11**. Further, simplicity is involved from the standpoint that the drive means **50**, **51** is carried by the swing frame **40** and moves with it. Compensation in the driving mechanism is thus not required as would be the situation if the driving or motor means had a fixed mounting and a drive connection through suitable couplings, etc.

The locking or latching means for the turn positions of the vessel body **11** is illustrated particularly in FIGS. **1**, **2**, **7**, **8** and **9**. It comprises a latch operating shaft **60** which is rotatably positioned by mounting ears or lugs **61** and **62** to extend along an outer side of one of the side members **36** of each cradle or carriage **35**. A locking lug or key **63** is secured on the shaft **60** between an adjacent spaced-apart pair of mounting lugs **62** and is operated to move into and out of a locking slot portion **64***a* defined by a pair of latching segments **64** secured to project from an associated banding flange member **17** or **17'**, adjacent one of its edges. A set or pair of the lugs **64** is preferably provided at different spaced 90° locations about each banding member **17** or **17'**, in order that positive position-latching or locking can be attained independently of the position holding that may be effected by the drive and support rollers **43** and their driving mechanism. A manual lever or handle **65** is shown secured on the outer end of the latch operating shaft **60**, adjacent the outer mounting lug **61**. If desired, a position-hold catch or position rest **66** may be mounted on each cradle frame **35** to hold the handle **65** in any given desired manually moved position. The handle **65** is shown as a flat bar that is sprung into and out of position behind the catch **66**.

Again referring to FIGS. **1**, **2**, **4** and **5**, partible gear housing is shown positioned about each flange assembly **17**, **17***a*, and **17'**, **17***a'* and serves to keep out dirt and debris. Upper housing **75** cooperates with lower housing **76** which extends about the swing frames **40** and their roller assemblies. Cooperating flanges **75***a* and **76***a* of the respective housings are removably secured together by suitable bolt assemblies **77**.

As shown in FIGS. **1** to **3** and **6**, a shield **19** is mounted on and projects upwardly from each inner truck **20** to protect the trucks and other adjacent parts from hot metal, etc. being poured, and to guide the flow of hot material from the mouth **15**.

To facilitate maintenance and repair of the apparatus, lift eyelets **78** are shown provided on each housing **75**. Also the banding flanges **17** and **17'** may have suitable lifting ears or lugs **79**, in order that the vessel or container **11** may be lifted by overhead crane or hoist means off the trucks **20**. Conventional couplings **80** are provided on the end trucks **20**, as shown in FIGS. **1** and **2**, in order that the apparatus may be coupled to similar or other types of apparatus as well as to a prime mover in connection with its utilization in a steelmaking plant and the like.

Although a specific embodiment of the invention has been shown and described to illustrate its principles and operation, it will be apparent to those skilled in the art that various modifications, additions and subtractions may be effected with reference to the disclosed apparatus without departing from the spirit and scope of the invention as set forth in the claims.

I claim:

1. In a hot metal carrier apparatus having an elongated horizontally extending substantially symmetrical vessel body defined by an outer metal shell wall and an inner refractory lining and having a metal introducing and pouring mouth portion that is open through the metal shell wall and the refractory lining and that normally extends vertically upwardly, a pair of longitudinally spaced-apart substantially circular supporting and driving rings secured on and about the shell wall adjacent to and spaced inwardly from opposite ends of the body, a group of wheeled truck assemblies having trucks adjacent opposite ends of the body and providing undersupports therefor moving it along a plant floor, carriage means for supporting the body on each of said truck assemblies, drive shaft means mounted on said carriage means, roller means mounted on said carriage means and being in body-supporting and frictional driving engagement with an associated one of said rings, said roller means having a driven connection with said drive shaft means for rotating said rings to directly turn the body about a longitudinal axis between positions at which the open mouth portion thereof extends substantially vertically and horizontally, and actuating motor means on said carriage means connected to said drive shaft means.

2. In a hot metal carrier apparatus as defined in claim **1**, said actuating motor means comprising motor means mounted on each said carriage and having a driving gear connected to an associated said drive shaft means, and said rollers being mounted on an associated said drive shaft means.

3. In a hot metal carrier apparatus as defined in claim **1**, said drive shaft means comprising drive shafts on which each of said roller means is mounted, and said actuating motor means being mounted on and carried by said drive shafts.

4. In a hot metal carrier as defined in claim **1**, said roller means of each of said carriages comprising transversely spaced-apart flanged rollers frictionally engaging an associated one of said circular rings.

5. In a hot metal carrier apparatus as defined in claim **1**, means pivotally mounting each of said carriage means on its associated wheeled truck assembly, each of said carriage means extending transversely of the body, a pair of swing frames pivotally mounted on each of said carriage means adjacent opposite transverse ends thereof, and said roller means comprising a pair of rollers operatively mounted in a balanced relation on each of said swing frames and in driving engagement with the associated ring.

6. In a hot metal furnace carrier apparatus as defined in claim 5, said drive shaft means having a drive shaft for each roller of said pair, and said actuating motor means comprising electric motor means operatively carried by said swing frames and said drive shafts for actuating said roller means.

7. In a hot metal furnace carrier apparatus as defined in claim 5, the rollers of each of said pairs being flanged rollers, each of said circular rings comprising an inner banding flange and an outer centrally disposed rim flange, a central body portion of each of said rollers being adapted to engage an associated rim flange, and flanges of each of said rollers being adapted to engage an associated banding flange adjacent side edges of the associated rim flange.

8. In a hot metal carrier apparatus as defined in claim 1, said rings having a varying radius with respect to a central longitudinal axis of the vessel body to provide a frictional-engagement with associated said roller means that increases with one direction of rotation of the body and that decreases with an opposite direction of rotation thereof.

9. In a hot metal carrier apparatus as defined in claim 1, swing frames pivotally mounted on each of said carriage means, said drive shaft means having drive shafts operatively carried by said swing frames, said roller means comprising rollers operatively mounted on said drive shafts, and said actuating means comprising electric motor and gear reduction units operatively mounted on said drive shafts for actuating said rollers to rotate the body.

10. In a hot metal carrier apparatus as defined in claim 1, each group of truck assemblies having an endwise spaced-apart pair of wheeled trucks, a bridging frame connected at its opposite ends in a spanning relation between the trucks of each pair of said group of assemblies, and each said carriage means having a support carriage centrally mounted on an associated one of said bridging frames.

11. In a hot metal carrier apparatus as defined in claim 10, substantially horizontally positioned bearing means pivotally mounting each of said carriages on an associated one of said bridging frames.

12. In a hot metal carrier apparatus as defined in claim 11, each of said carriages extending transversely of the associated one of said bridging frames on which it is mounted, a pair of swing frames mounted on each of said carriages in a balanced relation adjacent opposite transverse ends thereof, and said roller means being operatively mounted in and carried by said swing frames.

13. In a hot metal carrier apparatus as defined in claim 12, each of said swing frames having a cross-extending pivot and bearing means swingably mounting it on the associated one of said carriages.

14. In a hot metal carrier apparatus as defined in claim 1, latching means operatively carried by at least one of said carriage means and latching slot means carried by the shell wall and adapted to be latch-engaged by said latching means for locking the body in positions to which it is rotated.

15. In a hot metal carrier apparatus as defined in claim 1, the shell and refractory walls defining a substantially cylindrical container enclosure of uniform diameter fully along its length, each of said rings comprising a rim flange assembly extending about the shell wall of the body in a longitudinally spaced relation from an adjacent end portion thereof that substantially corresponds to its longitudinally spaced relation with respect to the open mouth portion.

16. In a hot metal carrier apparatus as defined in claim 1, a pair of swing frames carried on each of said carriage means in a circumferentially spaced under position with respect to the body, said roller means comprising a cooperating pair of flanged rollers operatively mounted in a balanced relation in each of said swing frames and in operative driving engagement with an associated one of said circular rings, and spacer means positioned between each of said rings and the metal shell wall adapted to mount each of said rings in an eccentric relation with respect to a longitudinal axis of the body and in such a manner as to progressively increase the force of engagement between each of said rings and the associated roller means when the body is turned to move the open mouth portion thereof from a vertically upright position to a horizontal pouring position.

17. In a hot metal carrier apparatus as defined in claim 1, a pair of swing frames for each of said carriage means, pivot means positioned centrally of each of said swing frames and swingably mounting it on an associated one of said carriage means, and said roller means for each said carriage means comprising a pair of rollers operatively carried by each of said swing frames in a balanced relation with respect to said pivot means.

18. In a hot metal carrier apparatus as defined in claim 17, said drive shaft means having individual drive shafts mounting each roller of each said pair, and said actuating motor means comprising an individual motor drive unit for each of said drive shafts.

19. In a hot metal furnace and carrier apparatus having an elongated vessel body defined by an outer metal shell wall and an inner refractory wall and having a mouth portion open through the shell wall and the refractory walls that normally extends vertically upwardly, a pair of endwise spaced-apart wheeled trucks adjacent each longitudinal end of the vessel body, a bridging member operatively connecting the spaced-apart trucks of each pair and having a centrally downwardly offset portion, a cross-extending carriage mounted on said downwardly offset portion, a pair of swing frames mounted on each said carriage adjacent opposite transverse ends thereof, a set of flanged rollers operatively carried by each of said swing frames, a pair of longitudinally spaced-apart substantially circular rim flange assemblies about the shell wall of the container body, means securing each of said rim flange assemblies on and about the shell wall, said flanged rollers of each of said swing frames being in functional driving engagement with an associated one of said rim flange assemblies and supporting said body thereon, motor means carried by each of said swing frames and having a driving connection with said flanged rollers of the associated swing frame for rotating the vessel body to move its open mouth portion between substantially vertical and horizontal positions, and means cooperating with the shell wall and each of said rim flange assemblies for increasing the radius of each assembly from the top portion of the body downwardly along a side portion thereof for applying an increased frictional-engagement of associated sets of flanged rollers therewith when the body is being rotated by said flanged rollers.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,589,303 Dated June 29, 1971

Inventor(s) Ira W. Lakin

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 36, change "convey" to --convex--.

Column 4, line 73, after "relation" change "to" to --on--.

Column 8, line 47 (claim 19) change "functional" to --frictional--.

Signed and sealed this 18th day of January 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents