

[54] POUR POT MANIPULATOR

[75] Inventor: James Carroll Muller, Carrollton, Ga.

[73] Assignee: Southwire Company, Carrollton, Ga.

[22] Filed: June 14, 1974

[21] Appl. No.: 479,448

[52] U.S. Cl. 164/278; 164/337

[51] Int. Cl. B22d 11/06

[58] Field of Search 164/87, 136, 278, 337

[56] References Cited

UNITED STATES PATENTS

2,693,012	11/1954	Harris et al.	164/87
3,331,431	7/1967	Bray et al.	164/278 X
3,478,813	11/1969	Cofer et al.	164/278
3,710,846	1/1973	Properzi.	164/278

Primary Examiner—Francis S. Husar

Assistant Examiner—John E. Roethel

Attorney, Agent, or Firm—Herbert M. Hanegan; Van C. Wilks; Stanley L. Tate

[57]

ABSTRACT

This disclosure relates to apparatus for positioning a vessel and pouring spout which extends therefrom relative to the casting mold of a wheel-band type continuous casting machine. The positioning apparatus includes vertical adjustment means for adjusting the position of the vessel and spout relative to the mold inlet along a straight, substantially vertical line of motion substantially perpendicular to the axis of rotation of the casting wheel, horizontal adjustment means for adjusting the position of the vessel and spout relative to the mold inlet along a straight, substantially horizontal line of motion substantially perpendicular to both the axis of rotation of the casting wheel and the vertical line of adjustment, and means for rotatably adjusting the position of the vessel and spout relative to the mold inlet about a rotational axis extending through the mold inlet substantially parallel to the axis of rotation of the casting wheel. The various adjusting means are supported in a vertically extending tower disposed adjacent the casting wheel.

15 Claims, 8 Drawing Figures

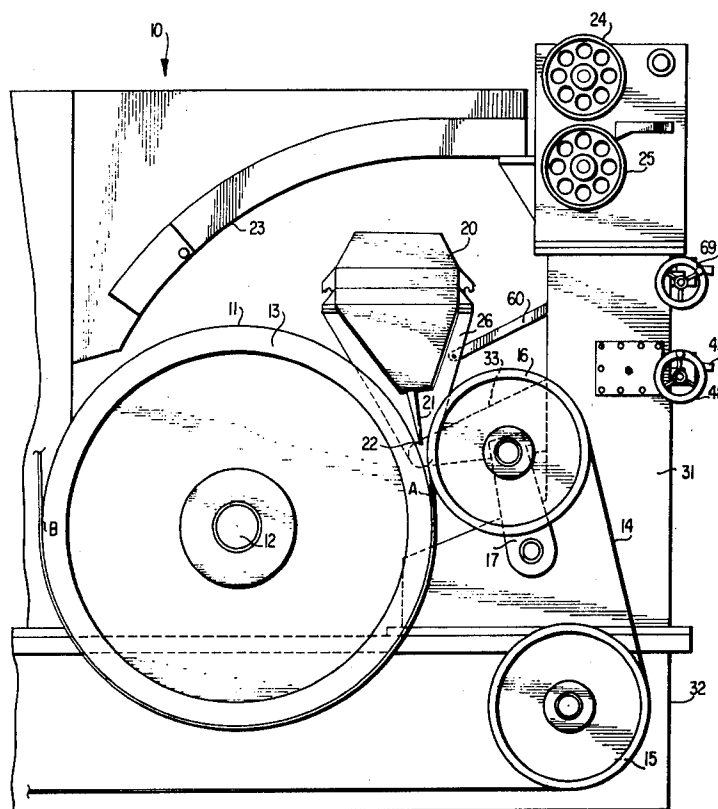
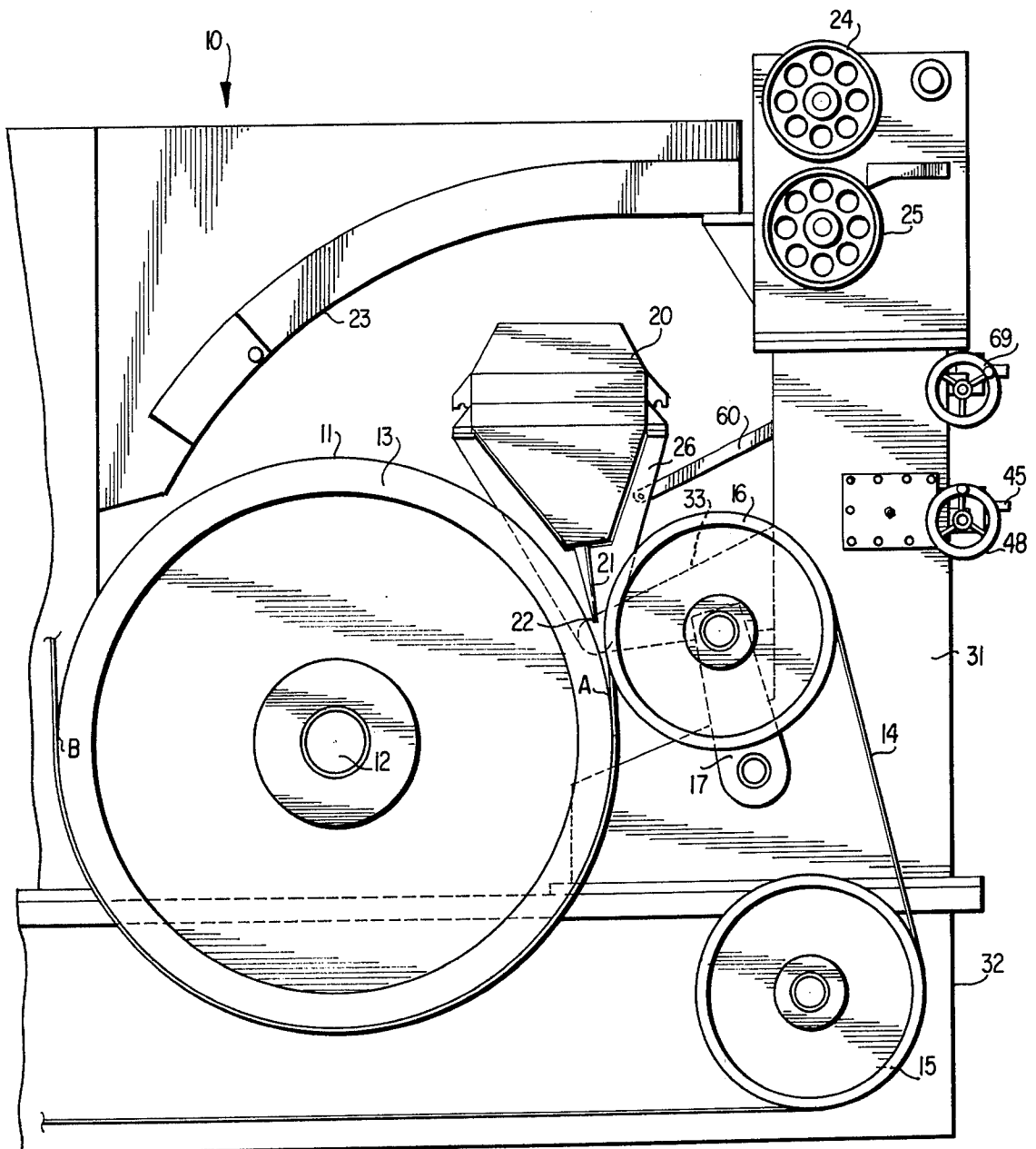


FIG. 1



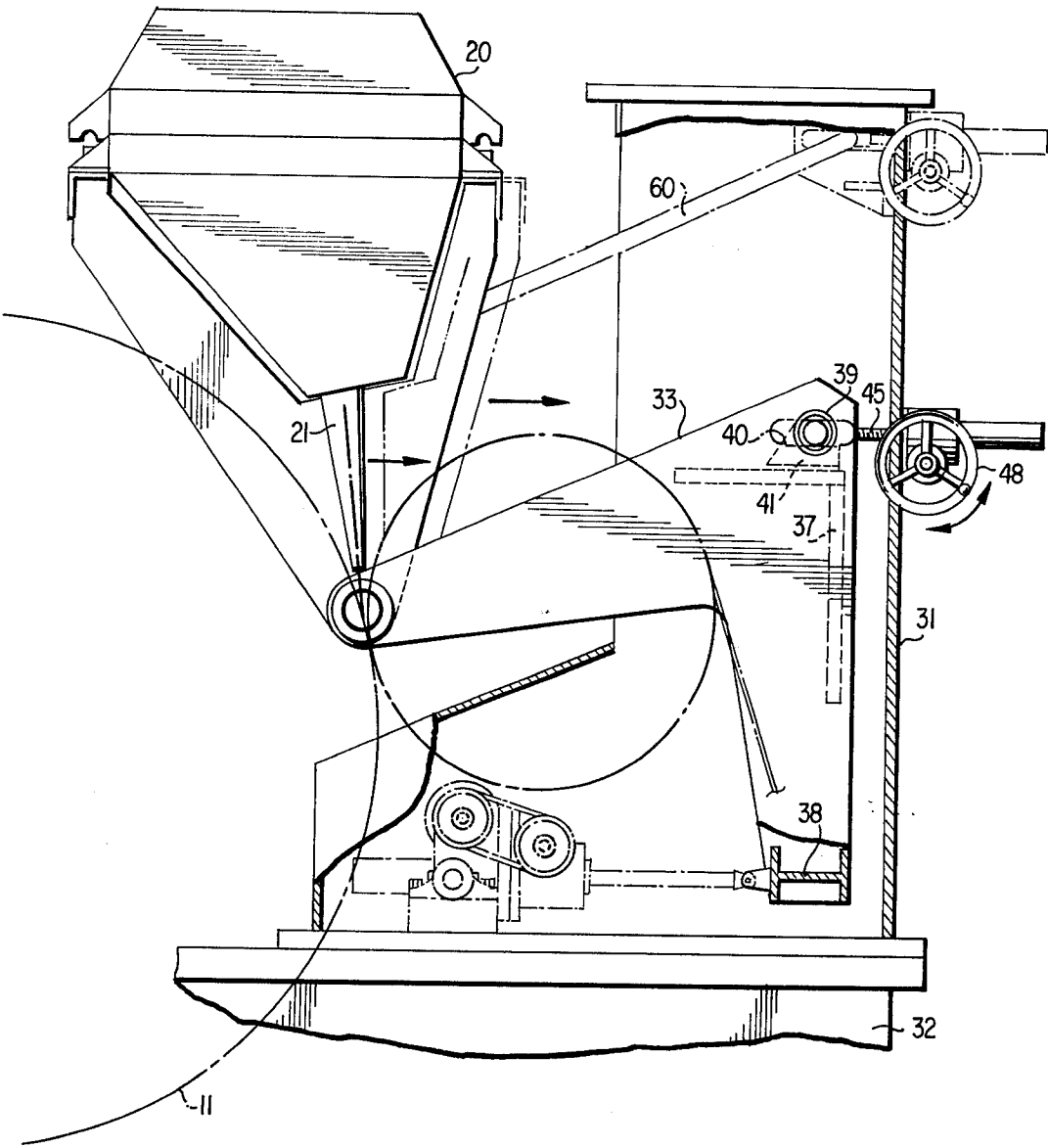


FIG. 2

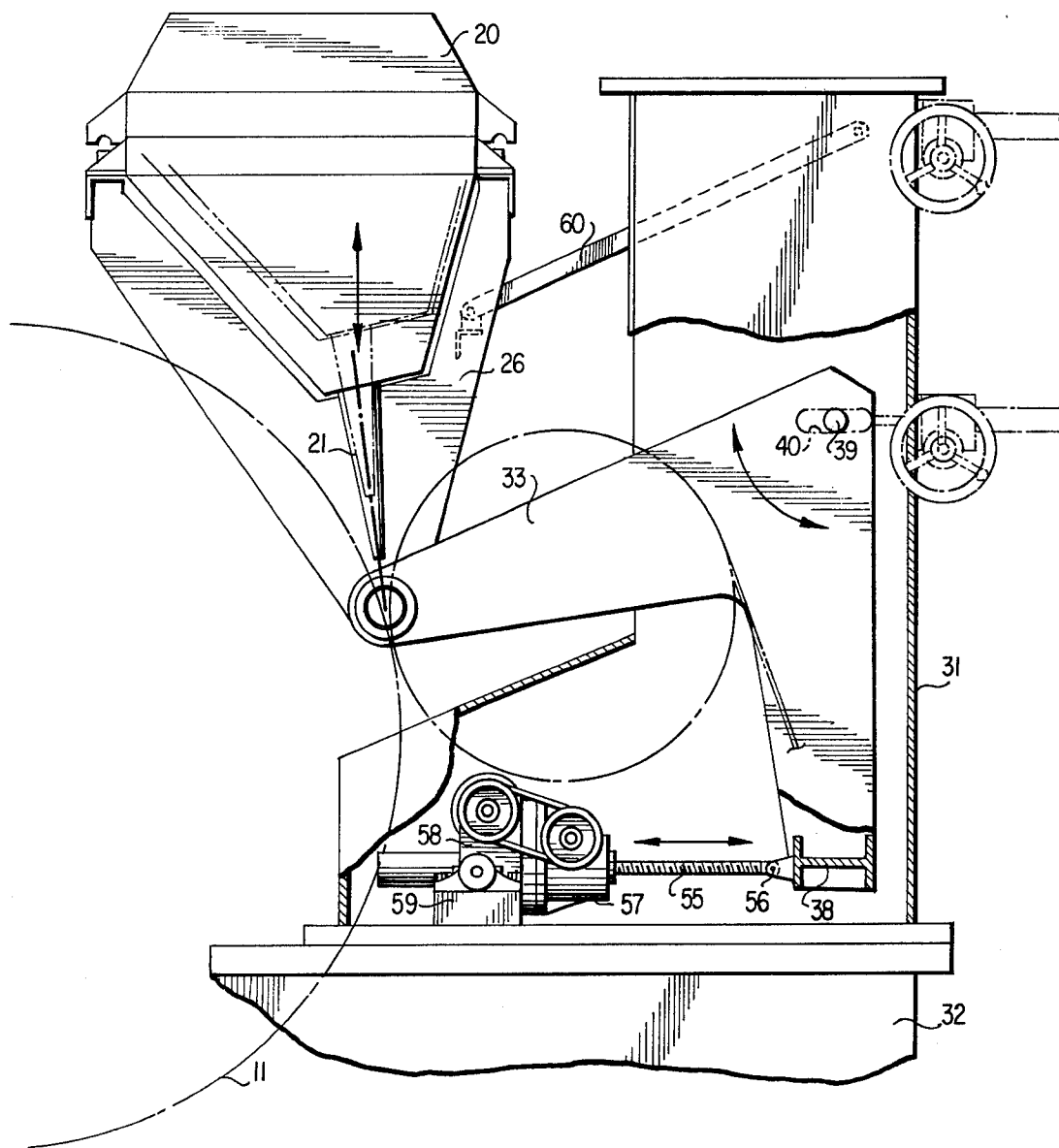


FIG. 3

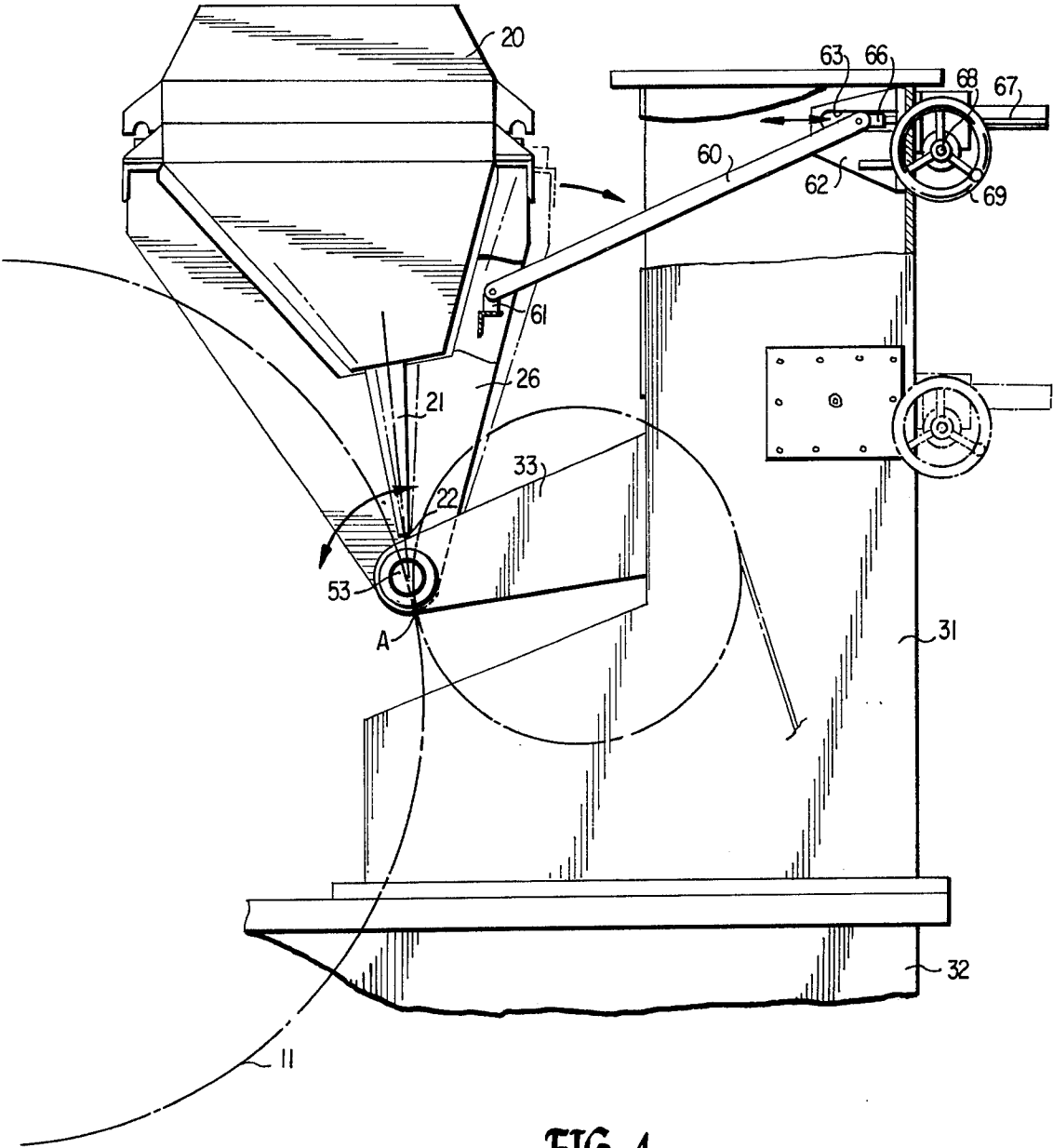


FIG. 4

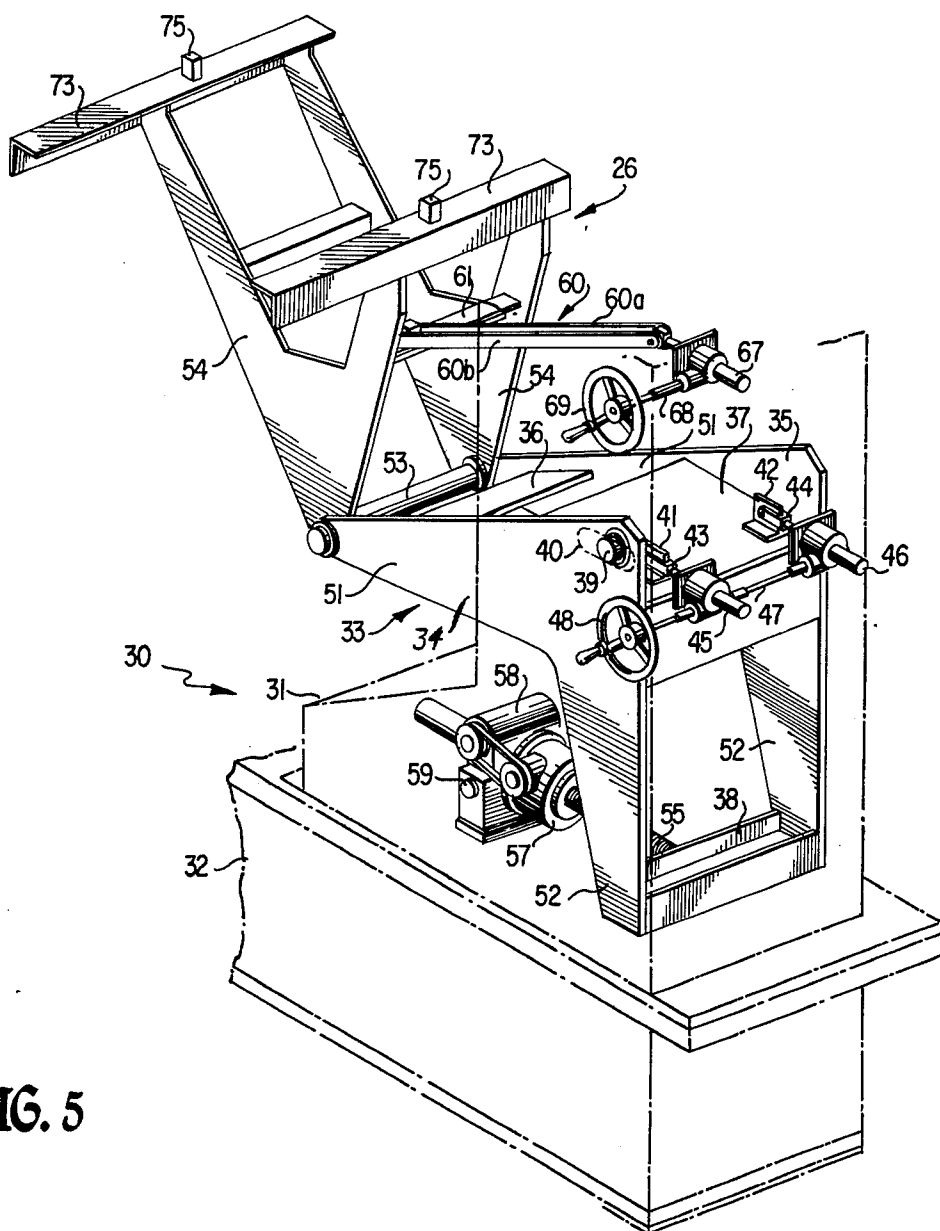


FIG. 5

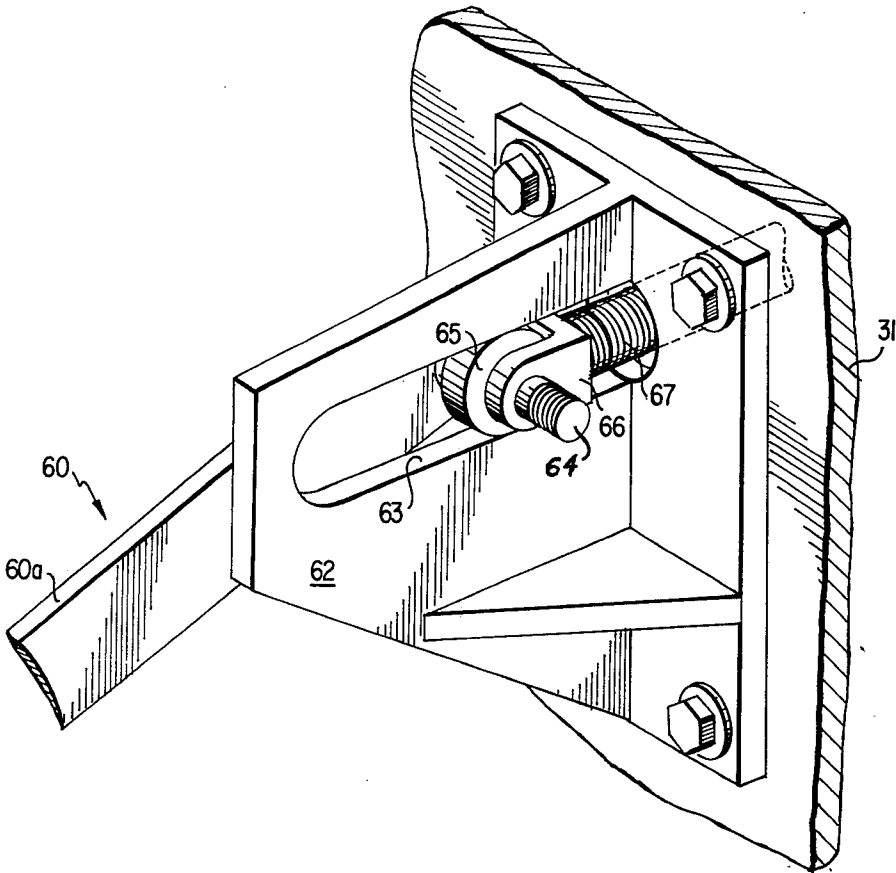
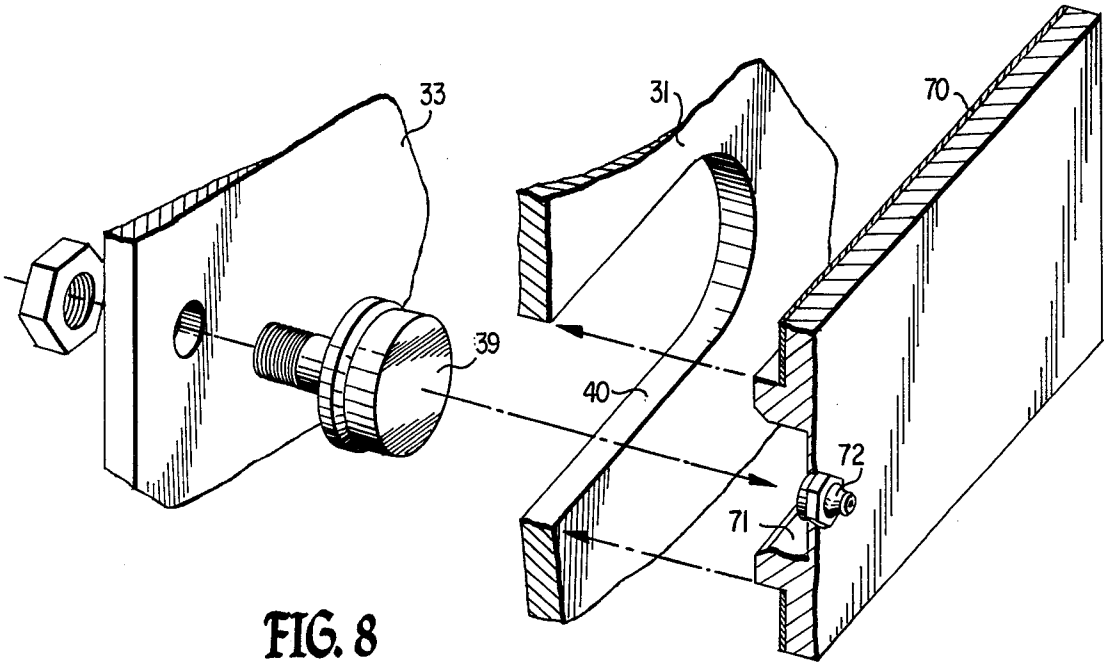
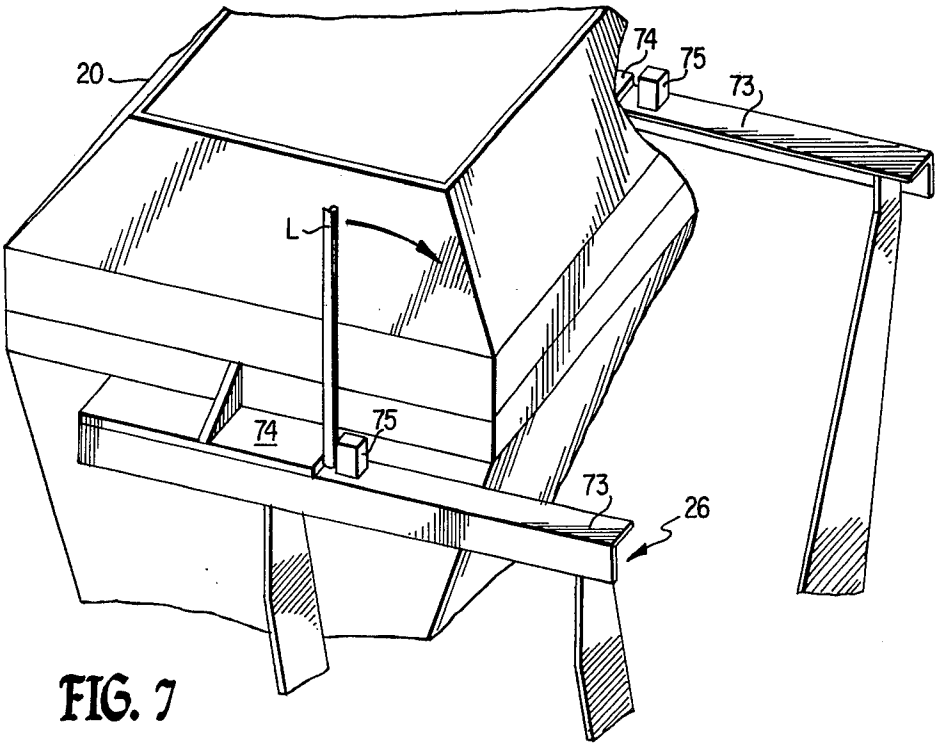


FIG. 6



POUR POT MANIPULATOR

BACKGROUND OF THE INVENTION

This invention relates generally to the metal forming arts, and more particularly to apparatus for positioning a vessel and pouring spout which extends therefrom relative to the casting mold of a wheel-band type continuous casting machine.

In the casting art molten metal is usually transferred from a furnace where the metal is first melted to a casting mold by using an intermediate vessel which provides more accurate control of the pouring of the molten metal into the mold than can be accomplished by pouring the metal directly from the furnace into the mold. In conventional foundry practice wherein ingots are cast in a stationary mold, the necessity for providing apparatus to facilitate accurate pouring of the metal into the mold is of relatively little concern. On the other hand, in continuous casting practice wherein the mold is moving relative to the vessel from whence the metal is being poured, more accurate control of the pouring is required than is required in conventional metal foundry practice. This is because the pouring vessel must not only be accurately positioned with respect to the continuous casting mold, but must also be quickly and easily changed in position with respect to the continuous casting mold and the molten metal in the casting mold.

It should be apparent, therefore, that the position of the pouring vessel disposed intermediate the furnace and the mold, as well as changes in the position of the intermediate pouring vessel with respect to the continuous casting mold are of paramount concern in continuous casting practice. Consequently, the prior art has developed various positioning systems and apparatus for positioning a pouring vessel containing molten metal with respect to a continuous casting mold in which the molten metal is adapted to be poured.

Perhaps the greatest shortcoming of the prior art positioning apparatuses has been their failure to provide sufficient flexibility to position the pouring vessel and pouring spout in the variety of positions required in continuous casting, and to accomplish this positioning with ease and rapidity and with minimum danger to operating personnel. In particular, a major deficiency of such prior art systems has been their failure to provide rotational adjustment of the pouring vessel and spout about an axis extending parallel to the axis of rotation of the casting wheel, especially wherein such rotational adjustment can be accomplished while maintaining the tip of the pouring spout in proximity to the mold inlet without the necessity for making vertical and horizontal corrections after the rotational adjustment.

Two such prior art positioning arrangements are disclosed in U.S. Pat. No. 3,331,431 issued to T. L. Bray et al., and U.S. Pat. No. 3,478,813 issued to D. B. Cofer et al. In the Bray et al U.S. Pat. No. 3,331,431, rotational adjustment of the pouring vessel is accomplished by providing vessel support structure including two arcuate bearing plates adapted to slide relative to one another. Rotational adjustment of the pouring vessel is about an axis containing the centers of curvature of the two bearing plates. However, this axis is above the pouring vessel and thus offset from the point at which the metal enters the casting mold. Consequently, rotational adjustment of the vessel causes the tip of the pouring spout to rotate out of the mold inlet, thus re-

quiring a vertical transverse correction or realignment of the vessel to reposition the tip of the spout in relation to the casting mold. Moreover, it should be apparent that the bearing plates required in the positioning apparatus disclosed in U.S. Pat. No. 3,331,431 are relatively expensive to manufacture because of the degree of accuracy required in the curved bearing surfaces. Furthermore, rotation about bearing plates as disclosed in this patent requires frequent lubrication and other maintenance.

In the Cofer et al U.S. Pat. No. 3,478,813, rotational adjustment of the pouring vessel and spout is accomplished by two separate rotational adjusting means which rotate the vessel and spout about spaced axes of rotation. The two axes are positioned on opposite sides of a radial plane of the casting wheel which extends through the tip of the spout. Thus, actuation of both of these rotational adjusting means, as well as corrective manipulation of the vertical and horizontal adjusting means is required to effect a change in the inclination of the spout.

SUMMARY OF THE INVENTION

In view of the foregoing, it should be apparent that there is still a need in this art for a vessel positioning apparatus that will provide still more flexibility than existing prior art positioning systems, and in particular apparatus which will facilitate rotational adjustment of the vessel so as to change the inclination of the spout without substantially removing the tip of the spout from its position in proximity to the mold inlet. It is, therefore, a primary object of this invention to provide a positioning apparatus which facilitates the positioning of a vessel and pouring spout into a variety of positions with respect to a casting mold with ease and rapidity.

More particularly, it is an object of this invention to provide a positioning apparatus which facilitates rotational adjustment of a pouring vessel about an axis extending parallel to the axis of rotation of a casting wheel so as to change the inclination of the pouring spout while maintaining the tip thereof in operative proximity to the inlet of the casting mold without the need for corrective vertical and horizontal readjustment.

Another object of this invention is to provide a wheel-band type continuous casting machine having a rotatable casting wheel formed with a groove in the periphery thereof and partially closed by an endless band to define a casting mold, a vessel including a pouring spout through which molten metal is discharged into the mold, and apparatus for positioning the vessel and spout relative to the mold including vertical adjustment means, horizontal adjustment means and rotational adjustment means, and wherein a vertically extending tower is disposed adjacent the casting wheel for enclosing and supporting at least a portion of each of the vertical, horizontal and rotational adjustment means.

Still another object of this invention is to provide apparatus for improving the continuous casting practice by facilitating the positioning of an intermediate vessel and pouring spout, through which molten metal is delivered to the casting mold, into a plurality of positions with respect to the inlet of the casting mold.

A further object of this invention is to provide positioning apparatus of the aforementioned type which facilitates adjustment in the position of the pouring vessel and spout in such a manner that associated equipment

is not subjected to the damage and operating personnel are not subjected to the danger of burns which are generally associated with adjustments made using prior art vessel positioning apparatus.

Briefly described, these and other objects of the invention that will become hereinafter apparent are accomplished in accordance with this invention by providing apparatus for positioning a vessel relative to a casting wheel rotatable about an axis of rotation and having a peripheral groove partially closed by an endless band to define a casting mold, the band initially engaging the wheel at a first point defining a mold inlet and disengaging the wheel at a second point defining a mold outlet. The vessel includes a pouring spout which extends therefrom and is movable therewith through which molten metal may be poured into the inlet of the casting mold. The vessel is supported in a cradle and vertical adjustment means are provided for adjusting the position of the cradle and the spout relative to the mold inlet along a straight, substantially vertical line of motion substantially perpendicular to the axis of rotation of the casting wheel. Horizontal adjustment means are also provided for adjusting the position of the cradle and the pouring spout relative to the mold inlet along a straight, substantially horizontal line of motion substantially perpendicular to both the axis of rotation of the casting wheel and the vertical line of adjusting motion. Moreover, means are also provided for rotatably adjusting the position of the cradle and the spout relative to the mold inlet about a rotational axis extending through the mold inlet substantially parallel to the axis of rotation of the casting wheel.

It should be apparent, therefore, that inasmuch as the axis of rotational adjustment extends through the mold inlet, the tip of the pouring spout, which is, of course, in proximity to the mold inlet, will not be displaced from its operative position in proximity to the mold inlet during rotational adjustment thereof. Thus, the need for vertical and horizontal corrective repositioning of the spout as in the prior art is not required with the apparatus of this invention.

Further in accordance with this invention there is provided a crank member rotatably mounted about an axis extending substantially parallel with the axis of rotation of the casting wheel, and both the vertical adjustment means and the horizontal adjustment means are operatively connected to the vessel-supporting cradle through the medium of this crank member.

In another aspect of this invention there is provided a vertically extending tower disposed adjacent the casting wheel for enclosing and supporting at least a portion of each of the vertical, horizontal and rotational adjustment means. The crank member discussed above is rotatably mounted in this tower and is adapted to translate along a horizontal line of motion therein. To this end, cooperative cam and follower means are provided between the crank member and the tower for constraining the crank member to move along a horizontal line of motion during the horizontal adjusting mode of operation.

With the above and other objects in view that may become hereinafter apparent, the nature of the invention may be more clearly understood by reference to the several views illustrated in the accompanying drawings, the following detailed description thereof, and the appended claimed subject matter:

IN THE DRAWINGS

FIG. 1 is a fragmentary elevation view of a wheel-band type continuous casting machine, and illustrates a pouring vessel supported on a cradle disposed adjacent the inlet of the casting mold, and a tower, constructed in accordance with this invention, supporting means for vertically, horizontally and rotatably adjusting the position of the pouring vessel;

FIG. 2 is an enlarged elevation view of portions of the casting machine illustrated in FIG. 1, portions of the tower being cut away to depict in solid line those elements which comprise the horizontal adjusting means, while the vertical and rotational adjusting means are depicted in phantom;

FIG. 3 is an enlarged elevation view of portions of the apparatus illustrated in FIG. 1, portions of the tower being cut away to depict in solid line those elements of the positioning apparatus which comprise the vertical adjustment means, while the horizontal and rotational adjustment means are depicted in phantom;

FIG. 4 is an enlarged elevation view of portions of the apparatus illustrated in FIG. 1, the upper portion of the tower being cut away to depict in solid line those portions of the positioning apparatus which comprises the rotational adjustment means;

FIG. 5 is a perspective view of the vessel adjusting means of this invention;

FIG. 6 is a fragmentary perspective view of a portion of the rotational adjustment means, and illustrates the manner in which the rotational adjusting link is supported in the tower structure;

FIG. 7 is a fragmentary perspective view of the pouring vessel and a portion of its supporting cradle, and illustrates two bosses extending upwardly from the cradle rails which provide fulcrum points for a lever whereby the vessel may be moved along the cradle rails; and

FIG. 8 is an exploded fragmentary perspective view of the cam slot and follower which provides for both rotation and translation of the crank member through which both the vertical and horizontal adjustment means are operatively connected to the vessel-supporting cradle.

DETAILED DESCRIPTION OF ILLUSTRATED EMBODIMENT

Referring now to the drawings in detail, there is illustrated in FIG. 1 a wheel-band type continuous casting machine generally referred to by the numeral 10. The machine 10 includes a rotatable casting wheel 11 mounted for rotation about a horizontally extending axis 12. The casting wheel 11 includes a peripheral groove 13 which is partially closed by an endless flexible band 14 to define a casting mold. The band 14 is supported on a number of idler rollers 15 which define its path of travel in cooperation with the casting wheel 11. A presser-guide wheel 16 is mounted adjacent one side of the casting wheel 11 for guiding the band 14 into initial engagement with the wheel 11 thereby defining a mold inlet point A. Similarly, the band 14 leaves the periphery of the wheel 11 at a point B defining a mold outlet. The presser-guide wheel 16 is rotatably mounted on a pivotable arm 17 and suitable means (not shown) are provided for rotating the pivotable arm 17 toward and away from the periphery of the casting wheel 11 thereby varying the point at which the

band 14 initially engages the periphery of the wheel 11, thus changing the position of the mold inlet point A.

The casting machine 10 further includes a tundish or pouring vessel 20 including a downwardly extending spout 21 through which molten metal is adapted to be poured into the casting mold. The spout 21 includes a tip portion 22 disposed in proximity to the mold inlet point A. It is to be understood that the mold inlet, as discussed herein, includes the general V-shaped area where the band 14 approaches the periphery of the casting wheel 11, and is not limited to the exact point where the band 14 actually first contacts the periphery of the wheel 11.

The molten metal which enters the casting mold at point A is cooled and solidified therein by suitable means and then leaves the casting mold as a cast bar at outlet B. The cast bar (not shown) is then conveyed upwardly over the casting wheel 11 along an arcuate support surface 23 and withdrawn from the casting machine 10 by means of nip rollers 24, 25. In a preferred method of continuously producing metal rod, the cast bar, in the as cast condition, is then continuously conveyed through a multiple stand rolling mill wherein the cast bar is continuously rolled into rod.

The pouring vessel 20 is supported on a cradle 26 which comprises an integral link in a positioning apparatus seen most completely in FIG. 5 wherein it is designated generally by the numeral 30. As will be discussed in more detail hereinafter, the positioning apparatus 30 includes means for varying the position of the cradle 26, and thus the vessel 20 and pouring spout 21, along (1) a substantially vertical line of motion substantially perpendicular to the axis of rotation 12 of the casting wheel 11, (2) a straight substantially horizontal line of motion substantially perpendicular to both the axis of rotation 12 of the casting wheel 11 and the aforementioned vertical line of motion, and (3) a curved path about a rotational axis extending through the mold inlet A substantially parallel to the axis of rotation 12 of the casting wheel 11.

Referring again to FIG. 1, as well as FIGS. 2-4, it can be seen that the positioning apparatus 30 is supported and at least partially housed in a tower 31 which extends vertically from and is supported on a bed frame 32 of the casting machine 10.

Referring primarily to FIG. 5, it can be seen that the positioning apparatus 30 includes a wishbone type crank member 33 including parallelly disposed L-shaped plates 34, 35 connected by suitable cross braces 36, 37 and 38. As seen in FIGS. 2, 3, 5 and 8, idler rollers 39 are rotatably journaled in each of the L-shaped plates 34, 35 of the crank member 33. The rollers 39 are received in horizontally extending slots 40 formed in opposite side walls of the tower 31. Thus, as will be explained in more detail hereinafter, the crank member 33 is adapted to rotate about the rollers 39, as well as to translate horizontally by means of the rollers 39 rolling within the slots 40.

The cross brace 37 of the crank member 33 includes upstanding flanges 41, 42 to which are pivotably mounted, on yoke members 43, 44, tandem screw jacks 45, 46 through which motive power is transmitted to the crank member 33 to cause it to translate horizontally. The screw jacks 45, 46 are suitably connected through a shaft 47 to a handwheel 48 by means of which manual adjustments of the crank member 33 can be effected.

Each of the L-shaped plates 34, 35 of the wishbone type crank member 33 includes a first leg 51 and a second leg 52. Each of the first legs 51, as seen in FIG. 5, is pivotably connected to the cradle 26 by means of a shaft 53 which extends through oppositely facing V-shaped support plates 54 of the cradle 26. The second legs 52 of the crank member 33 are connected, through the cross brace 38, to a powdered screw jack 55 which provides the motive force for vertical adjustments of the cradle 26.

As seen most clearly in FIG. 3, one end of the powdered screw jack 55 is pivotably hinged at 56 to the cross brace 38. The other end of the screw jack 55 is suitably received in a power transmission 57 of a motor 58 which is, in turn, suitably journaled in a trunion 59. It should be apparent, therefore, that as the screw jack 55 is extended by means of the motor 58 to rotate the crank member 33, the screw jack 55 will at the same time rotate about the pivotable mount of the trunion 59.

Also mounted in the tower 31 is a link assembly 60, having link members 60a, 60b, which is pivotably connected to a cross arm 61 which extends between the oppositely facing support plates 54 of the cradle 26. As seen most clearly in FIG. 6, the link assembly 60 is mounted in the tower 31 by means of a support bracket 62 having a horizontally extending slot 63. The link 60 is pivotably mounted on a shaft 64 which additionally carries a roller 65 adapted to roll in the slot 63. Although only one link member 60a is illustrated in FIG. 6, it is to be understood that the second link member 60b is preferably carried on the other side of the roller 65 to provide a tandem linkage as seen in FIG. 5.

The shaft 64 is carried by a U-shaped yoke 66 which extends from the end of a screw jack 67 through which motive power is transmitted to the link 60 to cause rotation of the cradle 26. As seen in most clearly in FIG. 4 and 5, the screw jack 67 is suitably connected through a shaft 68 to a handwheel 69. Consequently, manual adjustment of the handwheel 69 will effect translation of the screw jack 67 and thus cause the roller 65 to roll in the slot 63 thereby effecting translation of the link assembly 60. This motion will, in turn, cause the cradle 26 to rotate about the shaft 53, thereby changing the inclination of the pouring spout 21 with respect to the casting wheel 11.

Referring now to FIG. 8, there is illustrated in a preferred constructional aspect of the invention a plate 70 which is adapted to be secured to the tower 31 in inter-fitting relationship with each of the slots 40 formed in the opposite side walls thereof. Each of the plates 70 includes a cam track 71 adapted to receive the follower roller 39 in rolling engagement therein. A grease nipple 72 extends through the plate 70 in communication with the track 71 to facilitate lubrication thereof.

In view of the foregoing, the operation of the positioning apparatus 30 should be readily apparent. However, for the sake of additional clarity, the operation of the positioning apparatus 30 will now be briefly described:

As viewed in FIG. 1, the bed frame 32, upon which is supported the tower 31 and the positioning apparatus 30, is disposed behind the casting wheel 11. However, the cradle 26 includes rails 73 which extend over the casting wheel 11 (see FIG. 5) and upon which the pouring vessel 20 is mounted such that the pouring spout 21 extends downwardly in alignment with the peripheral

groove 13 of the casting mold. Thus, the tip 22 of the spout 21 is disposed in proximity to the inlet A of the casting wheel 11.

When it is desired to position the vessel 20 and spout 21 along a horizontal line of motion extending perpendicular to the axis 12 of the casting wheel 11, the handwheel 48 is manipulated so as to cause the tandem screw jacks 45, 46 to translate, thereby effecting horizontal movement of the crank member 33 which is constrained to move horizontally by means of the follower rollers 39 moving within the cam slots 40 formed in the tower 31. The horizontal movement of the crank member 33 is, of course, transmitted to the cradle 26 which carries the vessel 20. It should be noted that while the resulting movement of the cradle 26 is not purely in the horizontal direction because of the slight influence of the accompanying movement of the other links in the mechanism, this slight distortion of the pure horizontal movement in no way affects the operation of the machine 10 and can be adjusted out by working the other motions.

When it is desired to adjust the position of the vessel 20 and spout 21 in the vertical direction, the motor 58 is suitably energized to cause translation of the power screw jack 55. This motion, in turn, causes rotation of the crank member 33 about a pivot axis extending through the axis of rotation of the rollers 39. The cradle 26 will thus be caused to move in a vertical direction defined by the 4-bar-linkage composed of the cradle 26, the link assembly 60, the tower structure 31, and the crank member 33. The parallelogram-type linkage functions to move the vessel 20 in a substantially straight-line motion and maintains the vessel 20 level during the entire operation. The above-described elements facilitating the vertical motion are illustrated primarily in FIG. 3.

When it is desired to change the angular inclination of the vessel 20 and spout 21, the handwheel 69 is manipulated to cause translation of the screw jack 67, thereby causing translation of the link assembly 60. The cradle 26 is thereby caused to rotate about the shaft 53. Because the entire positioning apparatus 30 is disposed behind the casting wheel 11, the shaft 53 can be disposed in line with the inlet A of the casting mold such that the axis of rotation of the vessel 20 extends through the mold inlet A substantially parallel to the axis of rotation 12 of the casting wheel 11. Consequently, the tip 22 of the spout 21 will be maintained in constant proximity to the inlet A during rotational adjustment of the vessel 20 without the necessity of making horizontal and vertical corrective manipulations. The elements facilitating the rotational adjustment of the vessel 20 are illustrated primarily in FIG. 4.

Finally, when it is desired to move the vessel 20 along a line of motion extending parallel to the axis of rotation of the casting wheel 11, a lever L is inserted between laterally extending ears 74 of the vessel 20, which rest on the rails 73 of the cradle 26, and bosses 75 which extend upwardly from the rails 73. The bosses 75 provide fulcrum points for the lever L whereby the vessel 20 can be pried to move along the rails 73. This operation is generally performed when the vessel 20 is first positioned in the cradle 26 and rarely, if ever, attempted during the casting operation.

In view of the foregoing, it should be apparent that there is provided in accordance with this invention a

positioning apparatus which facilitates the positioning of a vessel and pouring spout into a variety of positions with respect to the casting mold with both ease and rapidity. In particular, the positioning apparatus of this invention facilitates rotational adjustment of the pouring vessel about an axis extending parallel to the axis of rotation of the casting wheel so as to change the inclination of the pouring spout while maintaining the tip thereof in operative proximity to the inlet of the casting mold without the need for corrective vertical and horizontal readjustments.

Moreover, the design of the positioning apparatus lends itself to relatively easy fabrication and assembly, and the load-carrying links in the mechanism (i.e., the cradle, wishbone crank member, and tower structure) can be made exceptionally rigid and rugged. In addition, inasmuch as substantially all of the working parts of the positioning apparatus are housed within the tower, they are protected from molten metal splatter and spills which could adversely affect their operational accuracy.

Although only a preferred embodiment of the invention has been specifically illustrated and described herein, it is to be understood that minor modifications could be made therein without departing from the spirit of the invention.

I claim:

1. Apparatus for positioning a vessel relative to a casting wheel rotatable about an axis of rotation and having a peripheral groove partially closed by an endless band to define a casting mold, said band initially engaging said wheel at a first point defining a mold inlet and disengaging said wheel at a second point defining a mold outlet, a spout extending from and movable with said vessel through which molten metal is adapted to be poured into said mold inlet, cradle means for receiving said vessel, vertical adjustment means for adjusting the position of said cradle means and said spout relative to said mold inlet along a straight substantially vertical line of motion substantially perpendicular to the axis of rotation of said wheel, horizontal adjustment means for adjusting the position of said cradle means and said spout relative to said mold inlet along a straight substantially horizontal line of motion substantially perpendicular to both the axis of rotation of said wheel and said vertical line of motion, and means for rotatably adjusting the position of said cradle means and said spout relative to said mold inlet about a rotational axis extending through said mold inlet substantially parallel to the axis of rotation of said wheel.

2. Apparatus as defined in claim 1 including a crank member rotatably mounted about an axis extending substantially parallel to the axis of rotation of said wheel, and wherein both said vertical adjustment means and said horizontal adjustment means are operatively connected to said cradle means through said crank member.

3. Apparatus as defined in claim 2 wherein said vertical adjustment means includes means for rotating said crank member about the axis of rotation thereof.

4. Apparatus as defined in claim 3 wherein said crank member includes a first leg and a second leg, said cradle means being connected to said first leg, and said means for rotating said crank member comprising motion transmitting means connected to said second leg.

5. Apparatus as defined in claim 4 wherein said motion transmitting means includes a powered screw jack.

6. Apparatus as defined in claim 2 wherein said horizontal adjustment means includes means for horizontally translating the axis of rotation of said crank member.

7. Apparatus as defined in claim 6 wherein said means for horizontally translating includes cam and follower means.

8. Apparatus as defined in claim 1, further including a housing for supporting said vertical adjustment means, said horizontal adjustment means and said means for rotatably adjusting the position of said cradle means, horizontally extending slot means formed in said housing, and follower means carried by said horizontal adjustment means cooperatively arranged with said slot means for constraining said horizontal adjustment means to move along said straight substantially horizontal line of motion.

9. Apparatus as defined in claim 8, wherein said vertical adjustment means includes a crank member rotatably mounted in said housing.

10. Apparatus as defined in claim 9 wherein said horizontal adjustment means includes said crank member.

11. Apparatus as defined in claim 1 wherein said cradle means includes two rails extending in a direction substantially parallel to the axis of rotation of said wheel for supporting said vessel, and boss means extending upwardly from said rails for providing a fulcrum point for lever means whereby said vessel may be moved relative to said cradle means along said rails.

12. In combination with a wheel-band type casting machine having a rotatable casting wheel formed with

a groove in the periphery thereof and partially closed by an endless band to define a casting mold, a vessel including a pouring spout through which molten metal is discharged into said mold, and means for positioning said vessel and said spout relative to said mold including vertical adjustment means, horizontal adjustment means and rotational adjustment means; the improvement comprising a vertically extending tower disposed adjacent said casting wheel, and wherein said tower includes means for enclosing and supporting at least a portion of each of said vertical, horizontal and rotational adjustment means.

13. A combination as defined in claim 12, the improvement further including a crank member rotatably mounted in said tower, and wherein both said vertical adjustment means and said horizontal adjustment means are operatively connected to said vessel through said crank member.

14. A combination as defined in claim 13, wherein said tower includes side walls, horizontally extending slot means formed in at least two of said side walls, and follower means carried by said crank member cooperatively arranged with said slot means for constraining said horizontal adjustment means to translate a straight substantially horizontal line of motion.

15. A combination as defined in claim 14, wherein said follower means include two rollers, and said crank member is rotatably mounted about an axis which is co-incident with the axis of rotation of said rollers.

* * * * *

35

40

45

50

55

60

65