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FEED FOR CONTINUOUS CASTING APPARATUS

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ABSTRACT OF THE DISCLOSURE

A generally horizontal annular trough forming a circular mold cavity is rotated about a generally vertical axis to transfer molten metal through a solidifying zone and thence through a station where the solidified metal is continuously removed from the trough. The molten metal is fed to the mold cavity from a supply means by way of a pouring cup having a main chamber, a discharge spout and an overflow weir over which the chamber communicates with the spout, the latter having a discharge end leading into the mold cavity in the direction of its rotation. Shoe means secured to the pouring cup have a sliding fit in the mold for floatingly supporting the cup, and an element coacts with the shoe means to restrain the cup against rotation with the mold. Preferably, the shoe means form a dam to limit reverse flow of the molten metal delivered to the mold, and a lower surface of the shoe means is slanted so as to raise the pouring cup when engaged by solidified metal not discharged at the removing station. The overflow weir is preferably located at such an elevation above the mold that the molten metal at the discharge end of the spout is travelling at approximately the same linear speed as the mold.

THE DISCLOSURE

This invention relates to casting apparatus of the type in which the molten metal is continuously fed from a supply station into a mold consisting essentially of a circular trough rotating about a generally vertical axis of the circle, whereby the metal solidifies as it is carried by the rotating trough to a discharge station which removes the metal continuously as a rod, or the like.

An apparatus of the above-mentioned type affords numerous advantages, especially in the improved form disclosed in U.S. Patent No. 3,284,859, granted Nov. 15, 1966. However, the quality of the cast product from such apparatus is dependent to a considerable extent upon the means for feeding the molten metal into the circular mold. More particularly, the quality is improved if the feeding means operate to provide a uniform feed and to avoid undue turbulence of molten metal in the mold. Among the conditions which have largely defeated attainment of these objectives are unavoidable variations in the rate at which the molten metal is delivered from the launder or other source supplying the feeding means, and changes in the diameter or position of the circular mold due to thermal expansion and contraction.

The principal object of the present invention is to provide apparatus of the type described having improved means by which the above-noted objectives are attained in feeding the molten metal to the circular mold.

According to the invention, the molten metal is fed to the circular mold from a supply source by way of a pouring cup having a main chamber, a discharge spout and a weir over which the chamber communicates with the spout, the latter having a discharge end leading into the mold in the direction of its rotation. The pouring cup is floatingly supported by shoe means seated in the mold with a sliding fit, an element being provided for restraining the cup against rotation with the mold while allowing free movements of the cup vertically and laterally. The overflow weir is preferably located at a level above the mold such that the molten metal flows through the discharge end of the spout at a linear speed approximately equal to the linear speed of the mold. Also, the shoe means are preferably provided with a slanted lower surface forming with the bottom of the trough mold a wedge-shaped recess tapering in the direction of rotation, whereby any solidified particles remaining in the mold will lift the pouring cup by a camming action on the slanted surface, rather than cause breakage.

The invention is described in further detail hereinafter with reference to the accompanying drawings, in which:

FIG. 1 is a plan view of a preferred form of the new apparatus;

FIG. 2 is a side elevational view of part of the apparatus illustrated in FIG. 1, showing the feeding means for the molten metal; and

FIG. 3 is a sectional view on line 3—3 in FIG. 2.

Referring to FIG. 1, the continuous casting apparatus there shown comprises a stationary vertical post or axle **20** extending through a hub **21** having a close rotating fit on the axle. Hub **21** is adapted to be rotated on the axle at constant speed by a motor **22** connected through a variable speed transmission **23** and shaft **24** to a bevel gear **25** meshing with a large bevel gear **26**, the latter being secured to hub **21**.

The hub **21** has rotating spokes **28** secured at their outer ends, as by welding, to an annular trough **29** having a circular mold cavity **29***a* which is open at the top. The ring-shaped trough **29** is supported on horizontal rollers **30** spaced around the vertical axle **20** and mounted on suitable stationary supports (not shown).

The motor **22** operates through hub **21** and spokes **28** to rotate the annular trough **29** about the vertical axle **20** as an axis. For simplicity and to avoid duplication, only some of the rollers **30** are illustrated, it being understood that they are provided in sufficient number to support the circular trough **29** in a horizontal position when it is rotated and loaded with the casting metal.

The molten metal is fed continuously into the rotating mold cavity **29***a* by a feeding means **32** to be described in greater detail presently. The mold rotates counterclockwise as viewed in FIG. 1, thereby carrying the metal from the feeding means **32** through an overlying gas-applying station **33** and through underlying and overlying cooling stations (not shown). Continued rotation of the mold then carries the solidified metal to a cast metal discharge station **34**, where it is continuously discharged from the mold. As the mold continues to rotate from the discharge station **34**, it may pass through stations (not shown) for preheating and dressing the mold before it reaches the feeding means **32**. The details of the gas-applying station **33**, the cooling stations, the discharge station **34** and the preheating and dressing stations may be as disclosed in the aforementioned Patent No. 3,284,859.

Referring now to FIGS. 2 and 3, the feeding means **32** comprise a pouring cup **36** which is preferably lined with a refractory material. The cup **36** has a main chamber **37** open at the top for receiving molten metal from a launder **38** or other source. The pouring cup also has an overflow weir **39** over which the main chamber **37** communicates with a discharge spout **40** of the cup. The spout **40** has an entrance end **40***a* which receives the molten metal from the overflow weir **39** by way of a subchamber **37***a* of the cup. From its entrance end **40***a*, the spout extends downwardly and forwardly in the direction of rotation of the underlying mold cavity **29***a*, the spout terminating outside the body of the cup **36** in a discharge end **40***b*. The latter is received in the upper part of