STOPPER ROD ASSEMBLIES

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1 Claim. (Cl. 22—85)

This invention relates to stoppers and stopper rod assemblies.

In the steel industry, the increased steel tonnages require a longer pouring time and higher pouring temperatures and have given rise to a real problem in stopper rod assemblies.

In some stopper rod assemblies a bolt is inserted through a bore in the bottom of the stopper, the bore being plugged after the rod is in place and the bolt affixed to the rod. The increased pouring temperature and increased tonnages cause accelerated erosion at the bottom or nose portion of the stopper, particularly in the case of stoppers having plugged bottoms.

This invention has for its salient object to provide a solid nose stopper, thus minimizing erosion and thermoshock cracks, and means for fastening it to the assembly.

Another object of the invention is to provide a lock for locking a stopper rod to a stopper in such a manner that the rod cannot be loosened or removed from the stopper by twisting one of the parts relatively to the other.

Another object of the invention is to provide a stopper rod assembly so constructed and arranged that the sleeves around the stopper rod will be supported by the rod and by the stopper.

Another object of the invention is to provide a stopper rod assembly so constructed and arranged that the rod and stopper can be easily and quickly assembled.

Further objects of the invention will appear from the following specification taken in connection with the drawings which form a part of this application, and in which:

FIG. 1 is a vertical sectional elevation of the stopper rod assembly constructed in accordance with the invention;
FIG. 2 is a transverse sectional elevation taken substantially on line 2—2 of FIG. 1, looking in the direction of the arrows;
FIG. 3 is a sectional elevation similar to FIG. 2 but showing the sleeve sections in diametrically opposed position around the rod before they are expanded to locking position; and
FIG. 4 is an exploded view, partly in section, showing the various parts in separated position before they are assembled and moved to locking position.

In the particular embodiment of the invention illustrated in the drawings, there is shown a stopper rod 13, having a flange or washer 14 on the lower end thereof, has mounted thereon and substantially encircling the circumference thereof, a pair of semi-cylindrical locking sections 15 and 16. Each section has a flange 17 at the upper end thereof and has an outwardly extending projection or protuberance 18 at the lower end thereof. The protuberances 18 at the lower ends of the sections are dimensioned to fit within the annular groove 12 in the stopper when the sections are moved out to locking position.

The sections 15 and 16 are assembled on the rod in the manner shown in FIG. 3 and the rod and sections thereon, which are supported on the flange 14 of the rod, are then lowered into the recess 11. Thereafter, the locking sections are forced outwardly into locking position by any suitable means, such as that shown in FIGS. 1 and 4 of the drawings. This means consists of an annular ring 20 dimensioned to fit around the rod, the ring having extending downwardly therefrom projections 21 having reduced, and portions 22. When the ring is moved downwardly to force the projections 21 between the ends of the sleeve sections 15 and 16, the sections will be forced outwardly away from the rod and the projections 18, 19 will be moved into the groove 12. The ring 20 will then rest on the upper ends of the sections 15 and 16 in the manner shown in FIG. 1.

If desired, the sleeve sections 15 and 16 may be manually pushed laterally to their stopper engaging positions, in which case the projections 21 will act as spacers to hold the sections apart and in locking position.

Above the ring 20 are mounted a plurality of sleeves 25 which rest on the ring and are supported by the sleeve sections 15 and 16, which in turn rest on the upper surface of the face of the flange 14. Thus, the weight of the sleeves is supported by the rod and flange 14 and not by the stopper.

If desired, the sections 15 and 16 may be coated with refractory material to reduce or eliminate any possibility of fusing the sections together or to the rod.

Although one particular embodiment of the invention has been particularly shown and described it will be understood that the invention is capable of modification and that changes in the construction and in the arrangement of the various cooperating parts may be made without departing from the spirit or scope of the invention, as expressed in the following claim.

What I claim is:

In a stopper rod assembly, a solid stopper including a planar upper end surface intersected by an axial recess terminating intermittently of said solid stopper, said recess including a planar bottom portion parallel to said upper end surface and an indentation spaced above said bottom portion, a stopper rod disposed axially and concentrically within said stopper recess and including a lower, integral annular flange disposed adjacent the recess bottom portion and upon which the weight of the stopper rod assembly is supported, a pair of semi-cylindrical, locking sections having a combined maximum dimension less than the cross-section of said stopper recess, said locking sections including a lower lateral protuberance disposed in diametrically opposed portions of said indentation and prevented thereby from having axial movement in said recess, said locking sections including upper lateral flanges engaged on the upper end surface of said stopper, and an annular ring circumposed about said stopper rod in juxtaposed relation with respect to said lateral flanges of said locking sections, said annular ring including integral, diametrically opposed projections having side portions disposed longitudinally between opposed edge portions of said semi-cylindrical locking sections and maintaining said locking sections and stopper rod in locked and stabilized relation with respect to said stopper.

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