Pipe quenching units used in pipe rolling lines with a plug mill.

2 Claims, 2 Drawing Figures
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PIPE QUENCHING UNIT

The unit has an outside sprayer working simultaneously with an inside sprayer, with the inside sprayer being located in the wall of a hollow thrust bar holding the plug, and a mechanism for the simultaneous rotation and axial displacement of the pipe after its exit from the rolls.

BACKGROUND OF THE INVENTION

The invention relates to pipe quenching units used in pipe rolling lines with a plug mill.

PRIOR ART

Known in the art is a pipe quenching unit used in a pipe rolling line, comprising a sprayer for cooling the pipe from inside. In this conventional unit, the inside sprayer is located in the end of the plug, and is in the form of a circular slit. This unit can be employed only in a pilger mill, since only in this mill the direction of movement of the pipe coolant coincides with the direction of rolling, with the pipe in the unit moving without any intense rotation with respect to the plug, thus causing non-uniform pipe cooling both in its length, and periphery.

Outside and inside cooling of the pipes directly in reducing and sizing mills and after the exit therefrom also causes non-uniform temperature distribution across the periphery and length of the pipes, as they do not rotate altogether.

The object of the present invention is to provide a pipe quenching unit, which secures uniform cooling of the pipe across its length, periphery, and wall thickness at the rolling speeds of modern pipe rolling lines.

SUMMARY OF THE INVENTION

The above and other objects are achieved by the present pipe quenching unit to be employed in a pipe rolling line, embodying a sprayer for inside pipe cooling. According to the invention, it has an outside sprayer working concurrently with the inside sprayer, with the inside sprayer being located in the wall of a hollow thrust bar holding the plug, and a mechanism for the simultaneous rotation and axial displacement of the pipe after its exit from the rolls. The inside sprayer preferably is in the form of two rows of inclined channels, one row of which is disposed along the periphery of the cap of the hollow thrust bar retaining the plug, the channels being inclined in the direction of pipe movement for the fluid to cool the inner surface of the forward part of the rolling pipe, while the other row is located in the front part of the thrust bar, also along the periphery thereof, with its channels being inclined opposite the direction of pipe movement to cool the inner surface of the rear part of the pipe after its exit from the mill rolls, bar retaining the plug, which valves open the channels located in the bar cap, in the course of pipe rolling, as well as the channels disposed in the front part of the bar, after pipe rolling is completed.

As a result of the present invention, there has been developed a pipe quenching unit to be used in a pipe rolling line, which permits uniformly cooling pipes across their length, periphery, and wall thickness at rolling speeds of modern pipe rolling lines.

The present unit is to be combined with screw rolling mills in a pipe rolling line. Such combination enables realizing the progressive movement of the pipe together with its intense rotation by the reducing rolls of the mill, which provides favorable conditions for cooling the front part of the pipe along its periphery. Since after its exit from the mill rolls the pipe stops, a mechanism is provided to secure uniform cooling of its rear end along the periphery thereof, which mechanism in such period realizes its movement through the cooling arrangements and its intense rotation.

The invention is now exemplified with an embodiment thereof and the drawings, wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 shows the pipe quenching unit according to the invention, in the process of cooling the front part of the pipe, the view being in longitudinal section;
FIG. 2 is a view similar to FIG. 1, in the process of cooling the rear part of the pipe.

DETAILED DESCRIPTION OF THE INVENTION

The pipe quenching unit has inside and outside sprayers operating at the same time. The inside sprayer is integrated with a hollow thrust bar 1 (FIG. 1) which holds a plug 2 of the screw rolling mill. Cooling of a pipe 3 from inside is effected through a gap or space 4 between the pipe 3 and the hollow thrust bar 1, into which the coolant is pressurized from the hollow bar. To cool the inner side of the front part of the pipe being rolled which is located near a cap 5 of the thrust bar, one row of channels 6 inclined in the direction of movement of the pipe is provided along the periphery of the cap. In order to cool the inner surface of the rear part of the pipe after its exit from rolls 7 of the mill (not shown in the drawings), another or second row of channels 8 inclined opposite the direction of pipe movement is formed in the front part of the thrust bar along the periphery thereof. The two rows of channels 6 and 8 work alternately. This is achieved by fitting inside the thrust bar slide-type valves 9 and 10 provided with a valve rod 11, with the valves, by means of a spring 12 and the axial rolling force, alternately opening the rows of channels 6 and 8 (the direction of the coolant movement towards channels 6 and 8 is shown by arrows).

To cool the pipe from the outside, working simultaneously with the inside sprayer is an outside sprayer denoted generally 13 which has heads 14 with longitudinal slits directing a continuous water flow (shown with arrows) onto the outer surface of the pipe 3. The heads 14 are connected together through pipes 15 and a common header 16 to which water (shown with an arrow) is supplied under excess pressure from a pump (not shown) through a common pipe 17.

Movement of the quenching pipe 3 through the simultaneously working outside sprayer 13 and one row of channels 6 in the cap 5 of the thrust bar 1, in the process of rolling, is effected by rolls 7 of the mill, and its movement through the simultaneously working outside sprayer 13 and the other row of channels 8 located in the front part of the thrust bar, is effected by a wheel table 18 which is rotated from separate motors through reduction gears (not shown).

The unit operates as follows. As pipe 3 enters the rolls 7 of the mill, and the rolls 7 begin exerting pressure on the pipe 3 and plug 2, water feed is started from the pump into the outside and inside sprayers. The generated axial force on the pipe is transmitted through plug 2, a head 19, and the valve rod 11, thus opening, by means of the valve 9, one row of channels 6 in the cap, and at the same time closing, by the valve 10, the
other row of channels 8 in the front part of the thrust bar 1. In this period, the plug presses the head 19 to cap 5 of the thrust bar, with this head at the same time compressing the spring 12. All of the amount of water entering the hollow thrust bar exits through one row of channels 6 in the cap 5. Simultaneous double-side cooling of the pipe being rolled starts through the outer sprayer 13 and one row of channels 6 in the cap 5 of the thrust bar.

The moment the pipe 3 goes off the plug 2, the pressure compressing spring 12 disappears, with the plug 2 being shifted by elastic reaction of the thrust bar 1 opposite the direction of rolling, thus creating a clearance between it and the cap 5. This results in movement of the head 19, valve rod 11, and valves 9 and 10 opposite the direction of movement of the pipe being quenched as is shown in FIG. 2, thus opening the other row of channels 8 in the front part of the thrust bar with a simultaneous closing of the row of channels 6 in the cap thereof. In this case, all of the amount of water is directed (as shown by the arrow) through the other row of channels 8 in the front part of the bar, opposite the direction of the pipe movement.

After the pipe 3 separates from the rolls 7 of the mill, its further rotational and progressive movement is effected by the wheel table 18, with simultaneous double-side cooling of the rear part of the pipe being continued by the outside sprayer 13 and the other row of channels 8 in the front part of the thrust bar, until the pipe being quenched completely leaves the cooling zone. The pipe, after passing out from the rolls 7, moves in the axial direction and simultaneously rotates due to a certain angle in the horizontal plane which is defined between the axis of the wheels and the longitudinal axis of the pipe being treated.

After the quenching process is finished, the water supply to the outside and inside sprayers is arrested, and the pipe is removed from the mill line.

What we claim is:

1. A pipe quenching unit to be employed in a line of pipe rolling mills having rolls and a hollow thrust bar holding a plug, comprising: a sprayer for outside cooling of the pipe being rolled; a further sprayer for cooling the inside of the pipe, operable simultaneously with said outside sprayer, said further sprayer being located in the wall of said hollow thrust bar holding said plug, wherein said further sprayer is defined by first and second rows of inclined channels, said first row of the channels being disposed along the periphery of a cap of said thrust bar holding said plug, said first row of channels being inclined in the direction of pipe movement for the fluid to cool the inner surface of the front part of the pipe being rolled in said mill, and the second row of channels being located in a front part of the thrust bar, remote from said plug, along the periphery thereof, the channels of said second row being inclined opposite the direction of pipe movement to cool the inner surface of the rear part of the pipe after its exit from said rolls of the mill; and a mechanism for simultaneous rotation and axial displacement of the pipe after its exit from said rolls.

2. The unit as claimed in claim 1, including valves positioned in said hollow thrust bar, said valves being operable to open the channels of said first row, in the course of pipe rolling, as well as the channels of said second row, after pipe rolling is completed.

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