ABSTRACT OF THE DISCLOSER

A pilger rolling mill provided with means for rotation of the rolled billet including a rotating cam disc and worm gearing wherein the disc has at least two cam surfaces which extend away from the center of rotation of the disc to different distances, and the disc is rotated by the driving crank of the mill through reduction gears which have a reduction ratio corresponding to the number of cam surfaces. The wear of the pass thereby is materially reduced.

This invention relates to pilger rolling mills, particularly pilger cold-rolling mills, of the kind in which the billet is rotated at a stage in the rolling process through a worm and worm-wheel arrangement in which the worm is moved longitudinally to effect operation by a cam follower bearing on a rotating cam disc.

As a rule high-quality material is treated in tube making by the pilger rolling process. It is therefore also necessary to select for this purpose tooling made of suitable high-alloy material treated by special processes. Since the rolls thus treated, that is to say the roll jaws and the rolls (referred to hereinafter as "a pass"), are costly, the rolling mill specialists and tube manufacturers have given a great deal of consideration to the manner in which the life of the pass can be increased to such an extent as to contribute to the more economic utilization of the plant as a whole.

In addition to natural wear caused in the pass by the rolling process there are other matters to be taken into account. As is sufficiently well known, tube-wall thickening occurs on the billets in the region of the roll gap and this tube-wall thickening can be equalized again by rotating the billet through a certain angle during the subsequent step-back movement. Since, in all known pilger mills, this angle is about 60°, it is only natural that wear on the pass, being always at the same place, is particularly striking. "Eroded" places are produced, which can only be removed by subsequent machining and the consequent considerable loss of material so that the life of the pass is reduced.

The invention is concerned with the problem of controlling the rotation of the billet, so that the wear of the pass due to roll-gap thickening will be distributed over a larger angular range, and in addition, the depth of the "eroded" places will be kept within acceptable limits.

In a pilger rolling mill according to the invention the cam disc has two or more cam surfaces which extend away from the center of rotation of the disc to different distances and the disc is rotated by the driving crank of the rolling mill through reduction gearing having a reduction ratio corresponding to the number of cam surfaces on the disc.

Preferably the cam disc is provided with at least three cam surfaces of different heights, rotation of the cam disc being adapted to the working rhythm of a reduction gearing with the ratio of at least 3:1.

So that the invention will be better understood it will be further described by way of example with reference to the accompanying drawings in which:

FIGURE 1 is a plan of a pilger cold-rolling mill according to the invention;
FIGURE 2 is a diagram of the control gearing of the mill shown in FIGURE 1;
FIGURES 3A and 3B illustrate details of the device according to the invention, the detail being that indicated at A in FIGURE 2;
FIGURE 4 shows, with reference to a pass represented in section, on the left-hand side the wear herefore produced by rotation of a billet through about 60°, and on the right-hand side, the variation in wear according to the invention using three cams of different heights on the cam disc.

Referring now to the drawings, a roll stand 1 (FIGURE 1) is reciprocated by means of connecting rods 2, crankshaft 3, coupling 4, gearing 5 and driving motor 6. Simultaneously with the reciprocation of the roll stand 1, a rotary movement of a pass 7 is produced by means of stationary racks 8 on which pinions 9, on the pass axes 10, are fixed. The pinions 9 are thereby drawn to a finished tube 11 on a mandrel 12. The necessary feed and rotary movements of the billet 10 are produced by a control gearing 11, which is driven through a control shaft 13, rigidly connected to the gearing 5 by a bevel gear pair 13 and a coupling 14.

FIGURE 2 shows on the left how feed is effected by means of the control shaft 12 through spur gears and bevel gears, while on the right, rotation of the billet is produced through bevel gearing and reduction gearing at point A.

In the rotating device (FIGURES 2, 3A and 3B) the control shaft 12 drives a worm 15 through bevel gearing 14, transmission shaft 16 and spur gearing 17. A worm-wheel 19 is connected to a rotating shaft 20 leading to a clamping slide 27 having clamping jaws (FIGURE 1).

Through the control shaft 12, a reduction gearing 21 forms the drive for a cam disc 22, which by means of a roller 23 connected to the worm 18, moves the worm radially upward. Due to this upward movement of the worm 18, the worm-wheel 19 and hence the rotating shaft 20 are rotated through a certain angle. By means of the rotating shaft 20, the billet 10 will be rotated in the clamping slide 27 by means of its extension, and rearwardly a mandrel abutment 31 with mandrel rod 29 will be rotated through the same angle as the billet 10. A helical compression spring 28 or like means ensures firm application of the roller 23 on the track surface of the cam disc 22. As will be seen from the drawings by way of example, the rotary movement of the billet 10 will be operated through the rotating shaft 20, which is rotated through an angular range, the magnitude of which is determined by the upward movement of the worm 18 caused by the individual different cams (a—b—c) (FIGURE 3A) on the cam disc 22, the rotation process in regard to time being controlled through the reduction gearing 21 by the control shaft 12 off the crank mechanism 5 of the rolling mill.

Return of the worm 18 is effected in a positive manner by its connection with the spur gearing 17 and bevel gearing 15, the worm-wheel 19 forming the fixed abutment and not rotating, due to its connection with the clamping slide 27, so that the worm 18 is screwed out of the latter.

Due to the introduction, according to the invention, of a cam disc having two or more cams a, b, c, of different heights (FIGURE 3A) uniformly distributed over the circumference, in the rotating operation and corresponding reduction gearing, the tube or billet thickening of the tube or billet occurs at the same place in the pass only in the course, for example, of three complete revolutions, so that wear in the pass, due to tube thickening, is distributed over a larger angular range (a—b—c), FIGURE 4, where-
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3. by the depth of wear moves within the scope of the normal erosion by the rolling process, so that subsequent machining offers in the long run greater possibilities of re-utilization of the roll pass.

I claim:

1. In a pilger rolling mill including a reciprocating roll stand; a pass consisting of rollers and roll jaws disposed therein; a billet engaged in said pass; a drive shaft for rotating said billet, a control shaft connected to said drive shaft; the improvements which comprise said drive shaft and control shaft being connected by means of gears, and a cam disc interposed between said gears, said cam disc having at least two cam surfaces extending away from the center of rotation of the disc to distances which are different relative to each other; said disc being connected to said control shaft by a reduction gear having a reduction ratio corresponding to the number of cam surfaces on said disc.

2. The pilger rolling mill as defined in claim 1, wherein said cam disc effects periodic repetition of the angles of rotation of said cams.

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