

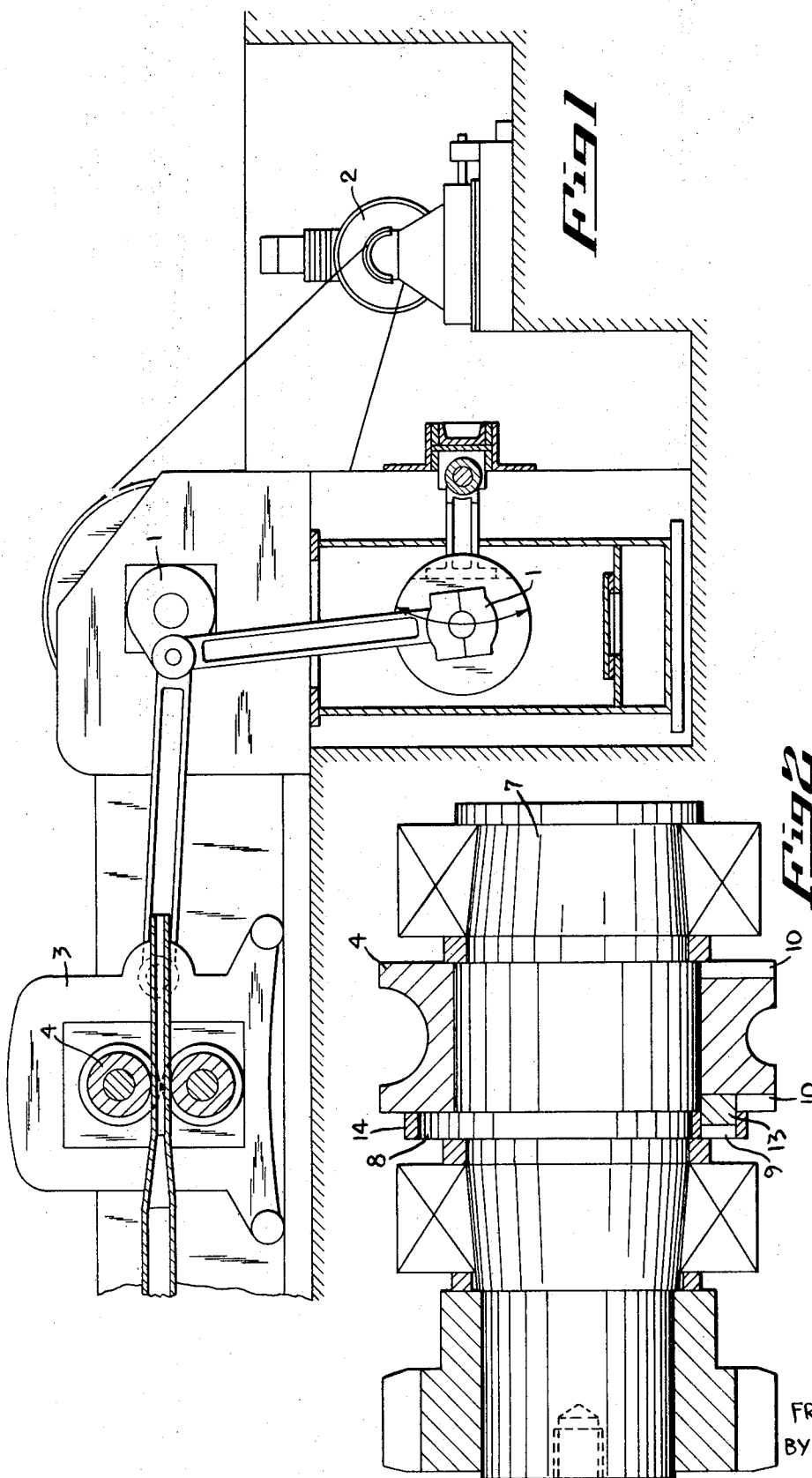
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COLD ROLLING MILL WITH ROLL PASS RING

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COLD ROLLING MILL WITH ROLL PASS RING
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1966. This application Oct. 20, 1969, Ser. No. 867,960
Claims priority, application Germany, Oct. 26, 1965,
M 67,061

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1 Claim

ABSTRACT OF THE DISCLOSURE

A cold rolling mill of the step-back type has a rotatable shaft and a roll pass ring heat shrunk thereon sufficiently intensively for the slip-free carrying out of high-speed step-back rolling.

This is a continuation of my application Ser. No. 582,288, filed Sept. 27, 1966, now abandoned.

The invention relates to cold rolling mills, and relates more particularly to cold rolling mills of the step-back type for the cold rolling of tubes; still more particularly, the invention relates to cold rolling mills of this type utilizing roll pass rings.

It is known to use cold rolling mills of this type with two or more working passes in order to step up the production output of cold rolled tubes; this, however, has certain disadvantages, as it necessitates the use of multiple equipment for clamping, turning and feeding the rolled stock, and therefore involves considerable expenditure and costs, apart from the fact that it requires the coordination of the moving actions. In order to avoid these disadvantages, cold rolling mills of the step-back type have been proposed and used that had only one working pass, yet obtained the output of a multiple pass machine.

According to one suggestion, this problem was solved in that the length of the working pass was considerably extended by using, instead of jaws, so-called roll pass rings, the circumference of which are finished as working passes.

Reference is made to the patent application filed by the instant applicant jointly with others on June 6, 1966, Ser. No. 555,420, now Pat. No. 3,503,241, issued on Mar. 31, 1970.

The roll pass rings mentioned are composed of high-alloyed material and, in their nature as tools, present a cost factor that needs to be kept within a reasonable range, its life span being of decisive importance in that respect. The life span, save for the wear and tear of the passes, is based mainly on the type of locking connection between the roll pass ring or rings with the driving shaft.

The use of roll pass rings for cold rolling machines of the step-back type is old, and the most persuasive factor for its use has been the weight reduction and saving of material achieved therewith. These roll pass rings generally were originally connected to the shaft by means of keys or wedges and slots or grooves, respectively, for the purpose of achieving the calibration relative to the driving gears, and additionally by a press fit.

Increasing output demands, however, have rendered the press fit insufficient, and therefore, while retaining the key and groove arrangement the press fit was replaced by a shrink fit. To prolong at the same time the life span of the pass, material of higher quality was chosen. A desirable consequence would have been to be able to refinish the pass after a period of wear and, finally, to replace the roll pass ring by a new ring, performing the removal of the roll pass ring in such a manner that the shaft remained undamaged.

Though it was known and hence possible to heat the

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ring to a sufficiently high temperature heat in order to remove it from its shrink fit seat, either by induction heat or by other heating means, difficulties were encountered in loosening the adhesion between the key and groove; that adhesion was found to be so intensive, having been generated by the working and by the shrinking operations, that the roll pass ring needed to be splintered off.

It is therefore among the principal objects of the invention to provide a cold rolling mill of the step-back type that avoids the disadvantages of the prior art.

It is another object of the invention to provide such a rolling mill in which the roll pass ring may be removed off the shaft without difficulty.

It is a further object of the invention to provide such a cold rolling mill in which the roll pass ring though removable without difficulty still offers a reliable locking connection for the positive transfer of the torque moment.

It is still another object of the invention to provide for a heat releasable locking connection of the aforesaid type between the roll pass ring and the shaft, capable of positively transferring a large torque moment as found in modern cold rolling mills.

It is still a further object of the invention to provide for a high heat releasable intensive bonding between the roll pass ring and its carrier shaft sufficient for the slip-free carrying out of a high speed step-back rolling operation.

Further objects and advantages of the invention will be set forth in part in the following specification and in part will be obvious therefrom without being specifically referred to, the same being realized and attained as pointed out in the claim hereof.

Due to the fact that modern cold rolling mills of this type generally have but a single drive for the upper and lower roll shafts, it is no longer necessary to adjust the roll ring to the driving gear, as one of the two drive racks may be adjusted in such a manner—the maximum distance being the pitch of the gear—that the upper and lower roll pass rings coincide in relation to the pass.

The instant solution of the problem, as a result of thorough investigations and observations, broadly comprises that the roll pass ring by correspondingly intensively shrinking is rigidly secured to the shaft without any key or groove, in such a manner that the shrink fit seat meets the requirements of modern high-speed machines. The connection is heat releasable, however, by the application of high heat, the ring being removable off the shaft for instance, by induction heating to a sufficiently high temperature followed by pulling off, without difficulty and without any damage to the shaft.

The shrinking of the roll pass ring onto the shaft without either key or groove in accordance with the instant invention, renders it possible to provide a single rolling mill of the step-back type that offers the advantages not only of having an extended length of the working pass in connection with mass balancing, and a large output, but also of preserving the working pass by exchanging the roll pass ring without damage to the shaft during the ring replacing procedure, resulting in considerable savings in tool costs.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description, taken in connection with the accompanying drawings, in which:

FIG. 1 is a schematic sectional view of a rolling mill of the step-back type including a frame, balancing means and a drive motor; and

FIG. 2 is a sectional view of a carrier shaft with a roll pass ring mounted thereon.

The construction according to FIG. 1 shows a cold rolling mill arrangement with mass balancing means 1, a drive motor 2, a reciprocating frame 3, and a roll pass ring 4 that is mounted on a carrier shaft 7 (FIG. 2). A

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rack rotates the roll pass rings but has, for the sake of simplicity and clarity of the drawing, not been shown. As shown in FIGS. 1 and 2, the roll pass ring 4 is mounted and locked on the carrier shaft 7 for positive rotation, by means of a shrink fit. Locking is accomplished without any key and groove connection between shaft and ring.

The carrier shaft 7 has a radially extending flange 8 that has near its circumference in an axial direction a prismatic axial groove 9. The roll pass ring 4, on the other hand, has on its opposite faces corresponding grooves 10, which, however, extend radially. A prismatic element 13 is inserted into the adjoining grooves 9 and 10 of the flange 8 and the roll pass ring 4, respectively, to fix the roll pass ring 4 peripherally relative to the carrier shaft 7. The element 13 is secured from falling off by means of a ring 14.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described, for obvious modifications will occur to a person skilled in the art.

Having thus described the invention, what I claim as new and desire to be secured by Letters Patent, is as follows:

1. A cold rolling mill of the step-back type comprising a rotatable shaft and a single exchangeable roll pass ring mounted on said shaft, and high temperature heat releasable locking means operable for securing said ring to said shaft consisting of a shrink fit frictional engagement between said ring and shaft thereby bonding said

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ring on said shaft sufficiently intensively for the slip-free carrying out of high-speed step-back rolling, said shaft including a radially extending flange, and registering means between said flange and said roll pass ring operable for fixing said roll pass ring peripherally relative to said shaft, said registering means including an axial groove defined in said flange and a radial groove defined in said roll pass ring, said grooves being positioned adjacent and in registry with each other, a prismatic element positioned in said adjacent grooves forming a connection therebetween, and a ring surrounding said shaft engaging said prismatic element thereby restraining its removal off its position.

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