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METHOD AND DEVICE FOR RECONDITIONING OF WORN RAILROAD
RAILS BY RE-PROFILING THE RAIL HEAD
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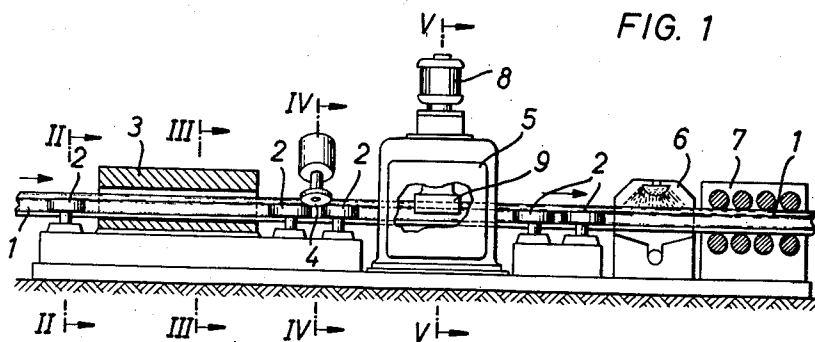


FIG. 2

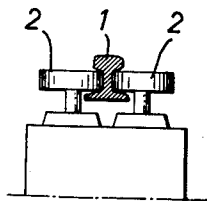


FIG. 3

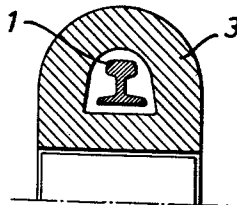


FIG. 4

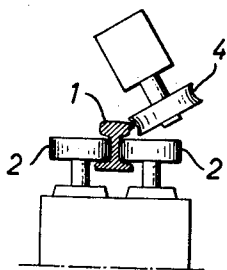
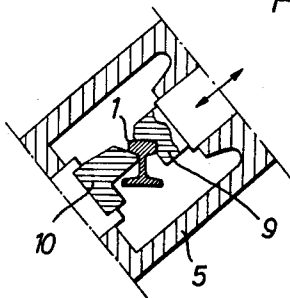


FIG. 5



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METHOD AND DEVICE FOR RECONDITIONING OF WORN RAILROAD RAILS BY RE-PROFILING THE RAIL HEAD

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This invention is concerned with a method and device for reconditioning of worn railroad rails by re-profiling the rail head.

It is well-known in the art that dismantled worn but still useable railroad rails are reconditioned by removing the burr that has formed on the rail by means of a metal-cutting machining operation, e.g., by grinding, planing or milling, and by which operation the rounded-off portion at the running edge of the rail head is restored. The tread of the rail is not machined during this reconditioning operation. When re-laying the reconditioned rail, however, care must be taken that the less worn side of the rail head, i.e., the higher side of it, is used as the new running edge of the rail. The well-known disadvantage with this is that the wheel no longer contacts the tread of the rail on the entire surface of its rim. Worn rails reconditioned in this manner can therefore only be used for secondary and station tracks or the like. When worn reconditioned rails are intended to be used for continuous main tracks classified for high speeds and great loads, such as express train lines, for instance, a complete re-profiling of the rail head is necessary on the running edge as well as on the tread of the rail. This re-profiling has hitherto also been done by metal-cutting machining operations, e.g., by planing or milling. The disadvantage of this method of re-profiling is a very high tool wear. Moreover, undulated surfaces, so-called chatter marks, are likely to be produced owing to the non-vibration resistant relative movement between the rail and the tool. A further disadvantage of the well-known re-profiling methods is that the reconditioned rail is less wear resistant than a non-reconditioned rail.

The new and improved method according to the invention claimed herein for reconditioning worn railroad rails distinguishes from the prior art by re-profiling the rail head by a non-cutting shaping operation and by mechanical hammering. This shaping operation can be effected by cold hammering or hot hammering after prior local heating of the rail in a pusher-type furnace or by inductive means.

Worn rails with marked sharp burrs, in particular, on that side of the rail head which is intended to be used as the running edge after re-laying, can within the scope of this invention be subjected to a well-known de-burring operation prior to the non-cutting re-profiling operation. The application of the method according to the invention is preferably done by continually advancing the rails with a longitudinal motion through a mechanical hammer equipped with exchangeable top and bottom tools adapted to the specified profile of the rail head. If necessary, the rails are moved through appropriate devices arranged in front of the mechanical hammer for de-burring and/or heating up of the rail head. The rails are finally subjected, in the same passage, to a heat-treatment and/or straightening operation.

The method according to the invention offers a number of significant advantages over the well-known methods for reconditioning of railroad rails. Compared with the well-known methods, there is very little tool wear which is limited to the few top and bottom tools of the mechanical hammer which can be easily exchanged without any readjustment work necessary. As a consequence of

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the elimination of frequent readjustment and exchange of worn tools and owing to the relatively little force to be applied for the feed motion of the rail, it is now possible to handle rails of any length, so that even a plurality of rails of approximately identical degree of wear and deformation can be linked or welded together so as to be treated in one passage by the application of the claimed method. The surface quality of the re-profiled rails obtained by the claimed method is substantially superior to that hitherto obtained by the well-known metal-cutting machining operations. Moreover, owing to its relatively greater density of grain structure, the reworked surface is less subject to corrosive attack. Another important advantage of the present invention consists in a greater wear resistance of the reconditioned rails which is due to the material hardening obtained by the shaping operation.

Another object of the claimed invention is to provide new and improved devices and equipment for the carrying out the claimed method. Such devices and equipment substantially consist of a mechanical cold or hot hammer designed to fit the particular purpose of rail working. This hammer may operate in combination with a roller bed with guide and driving rollers for the feed of the rail through the mechanical hammer. It is possible, in the direction of feed, to arrange appropriate devices for de-burring and/or heating up of the rail in front of the mechanical hammer, and, if necessary, appropriate equipment for the heat treatment and/or straightening of the re-profiled rail can be arranged in line after the mechanical hammer. These devices and equipment are intended to be covered by the scope of this invention when adapted completely or in part to the purpose of the present invention.

These and other advantageous objects of the invention will no doubt appear from the following detailed description drawn in conjunction with the drawings which show an embodiment of the invention in simplified schematic representation.

In the drawings:

FIG. 1 shows a device suitable for the carrying out of the method according to the invention in front view and partial section;

FIG. 2 is a cross section taken on line II—II of FIG. 1;

FIG. 3 is a section taken on line III—III of FIG. 1;

FIG. 4 is a section taken on line IV—IV of FIG. 1, and

FIG. 5 is a section taken on line V—V of FIG. 1.

In the embodiment selected for illustration, numeral 1 designates the worn rail to be reconditioned. The rail 1 is passed through a roller bed comprising guide and driving roller pairs 2 in the direction of the arrows and successively through a rail heating zone 3, e.g., a pusher-type furnace, through a de-burring zone 4 which may, for example, have the form of a rotating cutter head with inclined axis of rotation, through a re-profiling zone for the rail head which is a mechanical hammer 5, through a hardening zone 6 for the rail head, e.g., a quenching equipment, and finally through a straightening zone 7 in the form of a rail straightening machine. The principal element of the reconditioning device conceived and constructed according to the invention is the mechanical hammer 5 for the re-profiling of the rail head in the zone of the running edge and the tread of the rail. The forging hammer with exchangeable striking hammer head 9, which is driven at a high rate of blows in the direction of the double arrow (FIG. 5) by the motor 8, acts at adjustable forging performance against the tread and running edge of the rail head and has a supporting hammer head 10 gripping the rail underneath its rail head and forming an anvil. The inclusion of the de-burring, heat-treatment and straightening equipment 4, 6 and 7 into the reconditioning installation according to the invention

depends on the condition of the worn rail to be reconditioned as well as on the quality requirements made with regard to the re-profiled rail. The inclusion of this equipment is not absolutely necessary for the realization of the idea of the invention.

I claim:

1. A method of reconditioning a rail head of a worn rail comprising the steps of moving said rail longitudinally through a roller guided bed, grinding the edges of the rail head to remove its burrs, gripping and supporting said rail below its rail head, hammering said rail head to reform its surface into a predetermined profile, and treating said rail to harden its rail head.

2. A method of reconditioning a rail head of a worn rail comprising the steps of moving said rail longitudinally through a roller guided bed, heating said rail to a predetermined temperature, grinding the edges of the rail head to remove its burrs, gripping and supporting the rail below its rail head, hammering the rail head to reform its surface into a predetermined profile, treating said rail to harden its rail head, and applying a force longitudinally of said rail to straighten its length.

3. A device for reconditioning worn railroad rails comprising in combination a bed, roller means for guiding worn rails along said bed, means for continually advancing said worn rails longitudinally along said bed, grinding means mounted along said bed for removing the burrs from said rail head, hammering means mounted adjacent said deburring means for pounding said rail head into a predetermined profile, and means arranged along said bed adjacent said hammering means for sequentially hardening said rail head.

4. A device for reconditioning worn railroad rails comprising in combination a bed, roller means for guiding worn rails along said bed, means for continually advancing said worn rails longitudinally along said bed, grinding means mounted along said bed for removing the burrs from said rail head, hammering means mounted adjacent said deburring means for pounding said rail head into a predetermined profile, said hammering means comprising an anvil head for gripping said rail underneath said rail head and a hammering head for pounding the top of said rail head, and means arranged along said bed adjacent said hammering means for sequentially hardening said rail head.

5. A device for reconditioning worn railroad rails comprising in combination a bed, roller means for guiding worn rails along said bed, means for continually advancing said worn rails longitudinally along said bed, induction heating means mounted along said bed for heating said rail, grinding means mounted along said bed adjacent said induction heating means for removing the burrs from said heated rail head, hammering means mounted adjacent said deburring means for pounding said rail head into a predetermined profile, means arranged along said bed adjacent said hammering means for sequentially hardening said rail head, and means mounted along said bed for straightening the length of said rail.

6. A device for reconditioning worn railroad rails comprising in combination a bed, roller means for guiding worn rails along said bed, means for continually advancing said worn rails longitudinally along said bed, induction heating means mounted along said bed for heating said rail, grinding means mounted along said bed adjacent said induction heating means for removing the burrs from said heated rail head, reciprocating hammering means mounted adjacent said deburring means for pounding said rail head into a predetermined profile, said hammering means comprising an adjustable anvil head for gripping said rail underneath said rail head and a replaceable hammering head for pounding the top of said rail head, means arranged along said bed adjacent said hammering means for sequentially hardening said rail head, and means mounted along said bed for straightening the length of said rail.

7. A method of reconditioning a rail head of a worn rail comprising the steps of moving said rail progressively longitudinally through a roller guided bed, gripping and supporting said rail below its rail head, and hammering the rail head of said rail in a hammering machine to reform the rail head and restore the original shape of the profile by displacement of surface material.

8. A method of reconditioning a rail head of a worn rail comprising the steps of moving said rail progressively longitudinally through a roller guided bed, gripping and supporting said rail below its rail head, and hammering the rail head of said rail in a hammering machine to reform the rail head and restore the original shape of the profile by displacement of surface material, and subjecting said rail to heat to harden its rail head.

9. A method of reconditioning a rail head of a worn rail comprising the steps of moving said rail longitudinally through a roller guided bed, removing the burrs from the edges of the rail head, gripping and supporting said rail below its rail head, hammering said rail head to reform its surface into a predetermined profile, and treating said rail to harden its rail head.

10. A method of reconditioning a rail head of a worn rail comprising the steps of moving said rail longitudinally through a roller guided bed, heating said rail to a predetermined temperature, removing the burrs from the edges of the rail head, gripping and supporting the rail below its rail head, hammering the rail head to reform its surface into a predetermined profile, treating said rail to harden its rail head, and applying a force longitudinally of said rail to straighten its length.

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