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Arndt

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[54] **PROCESS FOR MAKING RAILS RESISTANT TO WEAR AND TEAR**

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[52] **U.S. Cl.** **29/527.4**, 29/401, 219/76
[51] **Int. Cl.** **B23p 17/04**
[58] **Field of Search** 29/401, 527.4; 219/76

[56] **References Cited**
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[57] **ABSTRACT**

A process for producing rails with a lateral guide surface, together with or without an inner or running edge, and/or a bearing or running surface which is highly resistant to wear and tear, which comprises

a. preparing the lateral guide surface, with or without an inner or running edge, and/or bearing surface by the formation of a substantially rectangular recess therein, whereby

a1. in the case of the preparation of the lateral guide surface together with an inner or running edge, the rectangular recess has a height of at least 10 mm and maximally 34 mm, and a width of at least 3 mm and maximally 10 mm, and

a2. in the case of the preparation of the running or bearing surface, at least one recess positioned essentially parallel to the longitudinal rail axis has a height of at least 3 mm and maximally 8 mm, and a width of at least 10 mm and maximally 30 mm,

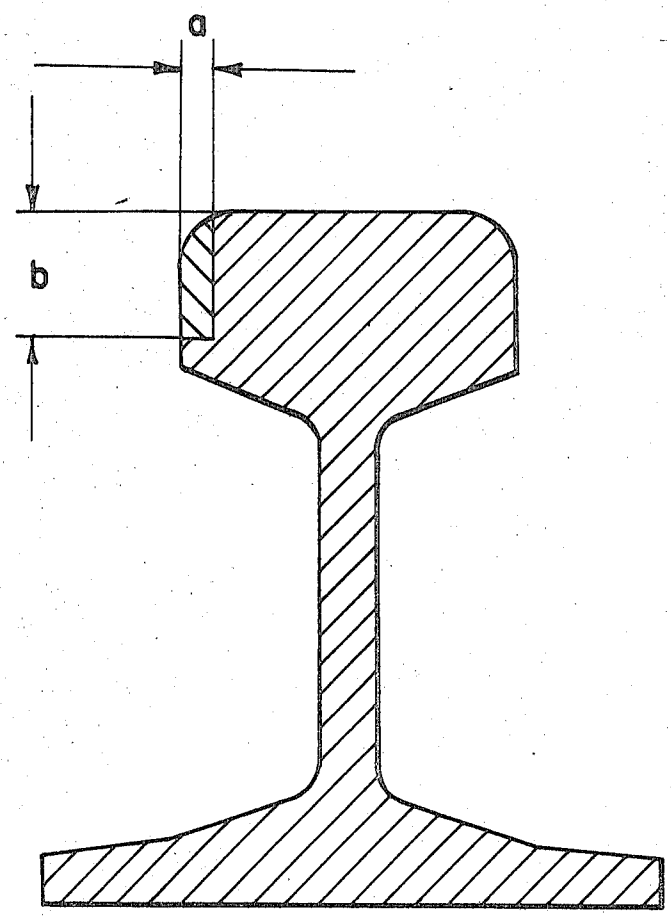
b. filling the recesses by welding on a welding material having the following composition (in percent):

C = 0.45 to 0.65
Si = 0.30 to 0.50
Ni = 3.00 to 4.00
Mn = 13.00 to 16.00

remainder Fe and impurities resulting from the manufacturing process, and

c. treating the welded-on material for the purpose of exactly reestablishing the profile of the rail.

9 Claims, 3 Drawing Figures



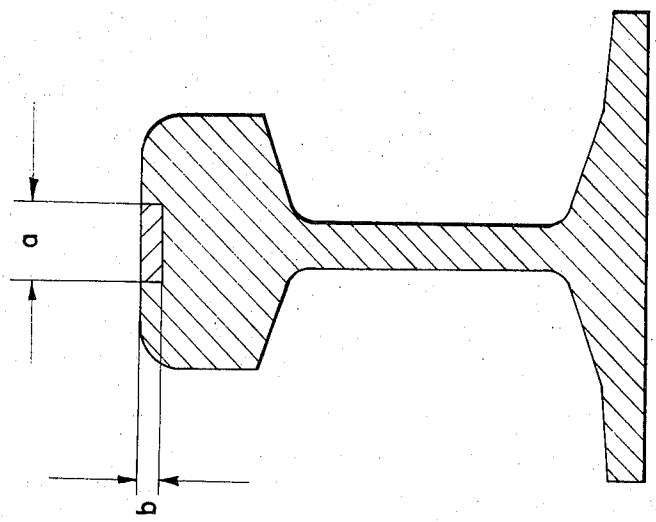


FIG. 3

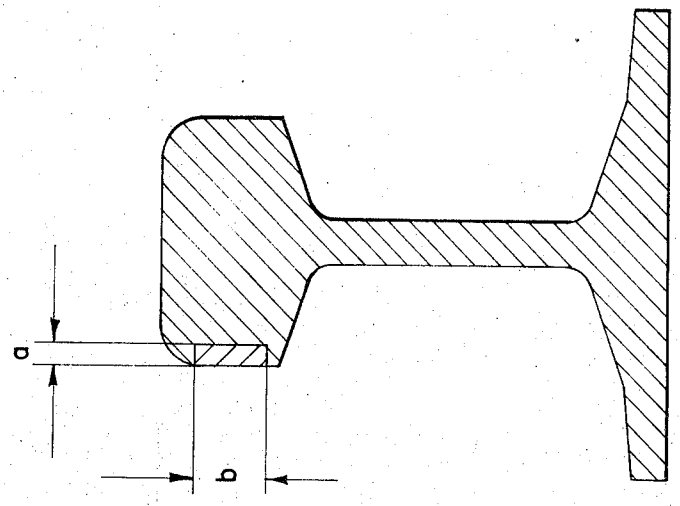


FIG. 2

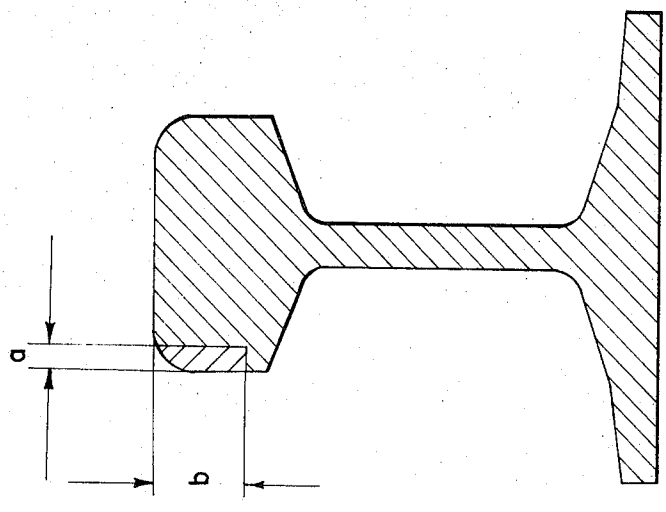


FIG. 1

PROCESS FOR MAKING RAILS RESISTANT TO WEAR AND TEAR

The present invention relates to a process for producing rails with a lateral guide surface, together with or without an inner or running edge, and/or a bearing or running surface which is highly resistant to wear and tear.

It is known that worn-out rails are built up by welding and subsequently ground down for the purpose of re-establishing or re-constituting the profile at the worn-out parts of the rail head. These operations can be carried out either while the rails are in place, or while they are disassembled.

Heretofore, it has been the practice to weld on worn-out rails in the in-place condition thereof, and for this purpose additional materials preferably were used having an increased resistance to wear as compared to the rail material. It has been found, however, that the method of operation employed to date no longer satisfies the requirements made in connection with the bearing and guide surfaces of the rail, which arise as a result of increased traffic operations. Furthermore, higher traveling speeds require the most accurate profiling of the welded-on surfaces, which cannot be achieved in the in-place condition.

It further has been found that the use of the known wear-resistant additional materials for this build-up welding process brought about an increased abrasion of the rims of the vehicle wheels. As a result, the traveling properties of the vehicles were impaired, and the expediency and economy of repairing worn-out rails by build-up welding were seriously questioned.

The present invention rails with a highly wear-resistant lateral guide surface, together with or without an inner or running edge, and/or a bearing or running surface and, in accordance therewith, the rail, i.e., a new rail, is provided with the highly wear-resistant surface or surfaces prior to being assembled or put in place. Alternatively, rails that are already assembled or are in place may be disassembled, provided with the wear-resistant running surface or surfaces in the workshop, and then reassembled or put in place.

In this connection, the object sought to be obtained by the present invention is having the lateral guide surface, together with or without an inner running edge, and/or a bearing or running surface display an extremely high wear-resistance so that a rail treated in this manner can be left in place for a long period of time, and in re-establishing, by means of exact grinding, the exact and uniform rail profile, which is necessary for producing good running properties. It is preferred that the required operation be performed, if possible, automatically and in the workshop.

These objects are obtained in accordance with the present invention by the combination of the following steps:

a. preparing the lateral guide surface, with or without an inner or running edge, and/or bearing surface by the formation of a substantially rectangular recess therein whereby

a 1 in the case of the preparation of the lateral guide surface together with an inner or running edge, the rectangular recess has a height b of at least 10 mm and maximally 34 mm, and a width a of at least 3 mm and maximally 10 mm, and

a 2 in the case of the preparation of the bearing or running surface, either one or several recesses positioned essentially parallel to the longitudinal rail axis have a height *b* of at least 3 mm and maximally 8 mm, and a width a of at least 10 mm and maximally 30 mm,

b filling the recesses by welding on a welding rod or welding band having the following composition (in percent):

C = 0.45 to 0.65

Si = 0.30 to 0.50

Ni = 3.00 to 4.00

Mn = *13.00* to 16.00

remainder Fe and impurities resulting from the manufacturing process, and

c working on the welded-on material for the purpose of exactly re-establishing the profile of the rail.

The preparation of the running edge and the lateral guide surface and/or the bearing surface, and the formation of the welding joint are preferably effected by grinding, planing, milling, or according to the so-called ARCAIR process. This assures that the rail need be only slightly heated.

It is particularly advantageous that, in the case of the preparation of the running edge and the lateral guide surface, the rectangular recess has a height *b* of 25 mm and a width a of 6 mm and, that in the case of the preparation of the bearing surface, the recess has a height *b* of 5 mm and a width a of 20 mm.

The data indicated for height and width of the recesses have been found in the course of long practical experiments since there are limits to the build-up welding process because of the susceptibility of the rail to cracks and fractures. Too large an amount of welding material requires the use of high temperatures, which will result in tensions or stresses being produced in the rail that may lead to cracks or fractures. Too small an amount of welding material may lead to fissures in the welding seam and therefore give rise at a later date to cracking and likewise to fissures.

The welding rod to be employed according to the present invention, or the welding band to be employed according to the present invention, having the composition indicated hereinabove, may be welded onto the cold rail. The pressure solidification of the welded-on alloy takes place by virtue of the wheel pressure of wheels traveling thereover. A specific preliminary heating of the rails may be dispensed with.

The welding rod or the welding band are welded on preferably according to the electric arc-welding method, particularly according to the submerged arc-welding method.

Preferred within the limits of the compensation of the inventive alloy as indicated herein is an alloy having (in percent) a carbon content from 0.55 to 0.60, a silicon content from 0.35 to 0.40, a nickel content from 3.60 to 3.70, and a manganese content from 14.00 to 15.00, with the remainder being iron and impurities resulting from the manufacturing process. With a rod having this composition there is obtained an optimum of weldability, treatability, ductility, cold hardening, and gliding properties.

In order to limit the warping or deformation of the rail during welding to a minimum, the rail is preferably either counter-heated during welding, or aligned after welding by counter-heating.

The finishing grinding operation after welding must produce dimensions which are true to profile. It is evident from this requirement that a manual grinding or polishing is suitable only to a limited extent. A grinding member gliding to and fro over the entire length of the rail is therefore preferably used for the grinding or polishing operation. W a correct clamping or stretching of the rail it is possible to grind the required rail head profile by finely setting or adjusting the grinding stone.

Practical tests have shown that a rail treated in accordance with the present invention satisfies all of the requirements made. Carrying out the individual working stages in the workship assures a speedy and reproducible operation.

The accompanying drawing further illustrates the present invention.

FIG. 1 shows the lateral bearing surface and running edge of the rail treated according to the present invention, and reference letter *a* identifies therein the width and reference letter *b* the height of the welding seam worked on or treated in a manner true to profile,

FIG. 2 illustrates a rail wherein the process of the present invention is carried out only at the lateral running edge of the rail, with reference letters *a* and *b* having the same significance as in FIG. 1, and

FIG. 3 illustrates a rail treated according to the present invention with a welded-on and treated bearing surface.

It will be obvious to those skilled in the art that many modifications may be made within the scope of the present invention without departing from the spirit thereof, and the invention includes all such modifications.

I claim:

1. A process for producing a rail with a lateral guide surface together with an inner edge which is highly resistant to wear and tear, which comprises forming a substantially rectangular recess in said lateral guide surface, said recess having a height of at least 10 mm and maximally 34 mm, and a width of at least 3 mm and maximally 10 mm,

filling said recess by welding on a welding material having the following composition (in percent:

C = 0.45 to 0.65

Si = 0.30 to 0.50

Ni = 3.00 to 4.00

Mn = 13.00 to 16.00

remainder Fe and impurities resulting from the manufacturing process, and

treating the welded-on material for the purpose of exactly reestablishing the profile of the rail.

2. A process according to claim 1 in which, the height of the recess is 25 mm and the width is 6 mm.

3. A process according to claim 1 in which the height of the recess is 5 mm and the width is 20 mm.

4. A process according to claim 1 in which the welding is performed according to the electric arc-welding method.

5. A process according to claim 1 in which the welding material has the following composition (in percent):

C = 0.55 to 0.60

Si = 0.35 to 0.40

Ni = 3.60 to 3.70

Mn = 14.00 to 15.00

remainder Fe and impurities resulting from the manufacturing process.

6. A process according to claim 1 in which the rail is counter-heated during the welding-on operation.

7. A process according to claim 1 in which the rail is aligned after the welding-on operation by counter-heating.

8. A process according to claim 1 in which the treatment of the welded-on material for re-establishing the profile of the rail is effected by grinding.

9. A process for producing a rail with a bearing surface which is highly resistant to wear and tear, which cmprises forming a substantially rectangular recess in said rail essentially parallel to the longitudinal rail axis, said recess having a height of at least 3 mm and maximally 8 mm, and a width of at least 10 mm and maximally 30 mm,

filling said recess by welding on a welding material having the following composition (in percent):

C = 0.45 to 0.65

Si = 0.30 to 0.50

Ni = 3.00 to 4.00

Mn = 13.00 to 16.00

remainder Fe and impurities resulting from the manufacturing process, and

treating the welded-on material for the purpose of exactly reestablishing the profile of the rail.

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