

[54] CARRIAGE FOR GRINDING UNDULATIONS
IN RAILWAY TRACK RAILS

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[58] Field of Search..... 51/178

[56] References Cited

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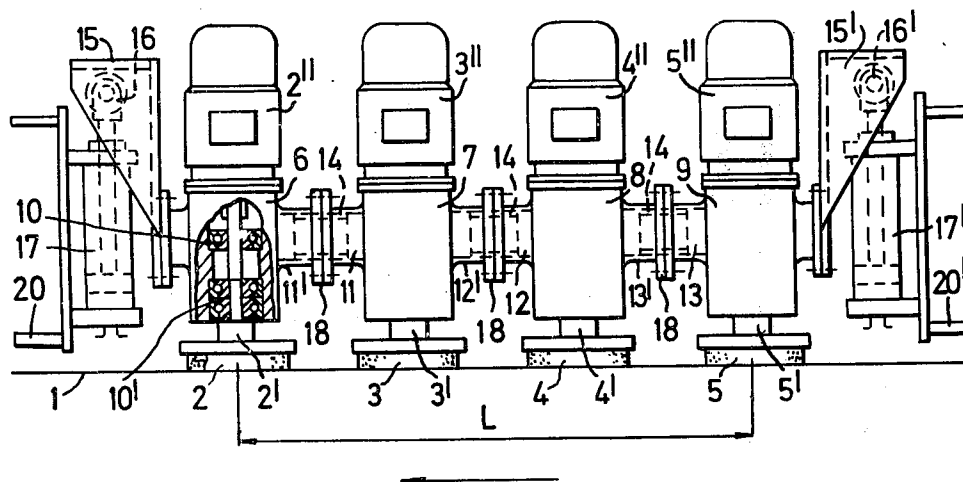
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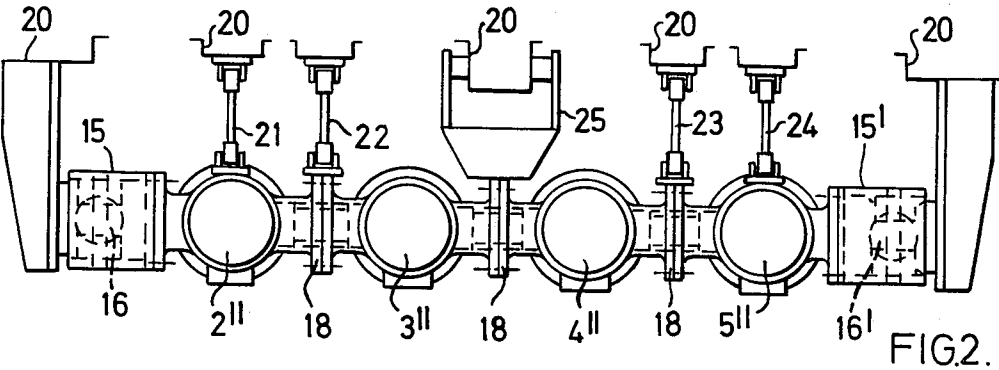
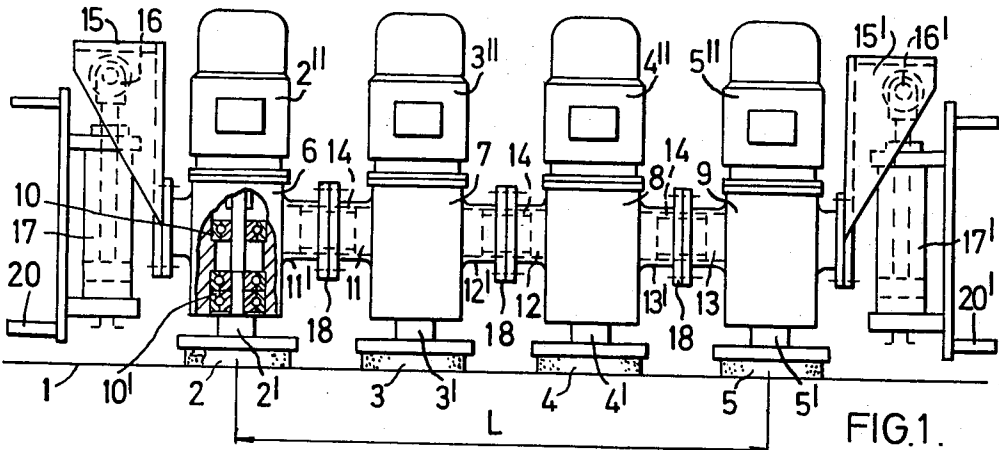
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ABSTRACT

A railway carriage with rail grinding apparatus for grinding undulating track rails which comprises the combination of a support linked to the carriage main body so as to be displaced together with the main body along the track, and for each set of rails to be ground, a rigid assembly of at least three grinding units, each unit comprising a grinding wheel fixed on a shaft, a motor for rotation of the shaft and a shaft bearing, means for relieving loads positioned between said support and the rigid assembly on which they act, complementary links between said assembly and said support designed with a view to enable the assembly to execute slight movements which are imparted to it by the passage of the grinding wheels over the bumps in the undulations of the rail, and means dimensioned so as to prevent the penetration by any grinding wheel into a trough of the undulation over which the grinding wheel is crossing.

6 Claims, 2 Drawing Figures





CARRIAGE FOR GRINDING UNDULATIONS IN RAILWAY TRACK RAILS

The present invention relates to railway carriages with rail grinding apparatus for grinding crests of undulations in track rails.

Rail grinding trains for railway tracks, comprising vehicles equipped with grinding units each made up of motorized rotary grinding wheels which are inclinable with respect to the track, their effective bearing weight on the rail being individually counterbalanced and controllable by a hydraulic jack, while each unit is carried by a rigid structure in which the unit can pivot, have been known for many years and are described, in particular, in U.S. Pat. No. 2,197,729 of 1938.

According to these earlier descriptions, the grinding wheels abraded short wave contours on the rail but, on the other hand and because they followed the contour, reproduced long undulations instead of eliminating them.

Much later on, in 1967, Swiss Pat. No. 444,204 disclosed the combination of a permanent hydraulic jack partially counterbalancing the weight of a grinding unit, the jack being specific to the said unit, together with a second system which is likewise specific to the grinding unit, arranged to relieve also the weight of said units, and which automatically and intermittently interrupts the grinding action of that grinding wheel which is situated above a trough in the wave contour on the rail. In the case of this second system relieving arrangement, this combination is illustrated by a rigid beam which is common to a number of units and specific springs, the beam being mounted in a structure in a floating manner, the said second system relieving means having no rigid connection with a grinding wheel.

Now, a grinding wheel is naturally incapable of distinguishing between a trough in the contour and the space which separates it from the rail when it wears away and does not automatically take up its wear, as is the case with the grinding wheels in the above-mentioned Swiss patent. In other words, according to this patent, a grinding wheel, when it wears, first becomes ineffectual because its bearing-contact with the rail is constantly diminishing, and then becomes completely inoperative. Consequently, the combination of the two means in question demands continuous and difficult adjustment of the second system relieving means. In practice, this adjustment is almost impossible. Furthermore, the fact of a grinding wheel becoming inoperative is in no way beneficial to the other grinding wheels.

The grinding wheels of the present invention attempt to trim the contour by effectively abrading the crests of the waves without penetrating into their troughs. The carriage cooperating with the rail grinding apparatus may be incorporated in a grinding train such as, for example, the one described in Swiss patent applications Nos. 004247/70 and 6244/70 by the same author.

This grinding carriage, located above each set of rails and provided with motorized grinding wheels and means for relieving loads of said grinding wheels on the rails, is characterised in that it comprises a support linked to the carriage main body so as to be displaced together with the main body along the track, at least one rail grinding apparatus for each set of rails to be ground comprising a rigid assembly of at least three

grinding units, each comprising a grinding wheel fixed on a shaft, a motor for rotation of the shaft, and a shaft bearing, weight relieving means operatively connected to said apparatus for relieving loads being positioned between said support and the rigid assembly, complementary links mounted on said carriage between said assembly and said support to enable the assembly to execute slight movements which are imparted to it by the passage of the grinding wheels over the crests in the undulations of the rail, and dimensional means, defined herebelow, so as to prevent the penetration by any grinding wheel into a trough of the undulation over which the grinding wheel is crossing.

The support may be constituted by either a part of the carriage directly, or by a chariot rolling on the track and itself linked to the carriage in order to take part in its displacement along the track while still being able to experience slight transverse displacements relative to this carriage.

The conditions for preventing any grinding wheel of its respective assembly from penetrating into a trough over which it is crossing are satisfied and the assembly thus always rests in practice on two peaks when, on the one hand, (1) the gap between two adjacent grinding wheels of an assembly is less than, and, on the other hand, (2) the distance between the axes of the two end grinding wheels of the assembly is more or less equal to, two wave lengths of an undulation wave in the rails. The possibility of extending the assembly, which is hereinafter described is an advantageous means of satisfying the second condition as a function of the wave length. These two criteria thus form the said dimension means according to another characteristic of the invention.

The weight relieving elements are, for example, jacks. These may be pneumatic or hydraulic. Contrary to present known equipment, a jack does not belong to one grinding unit but to an assembly consisting of a number of units.

For any object resting on a support such as a rail, which has, in practice, only one supporting dimension, there can only be two points of support at one and the same time. In other words, the two grinding wheels which are momentarily situated on the two highest humps or crests, alone take on all the abrading work. It is these grinding wheels which are momentarily operative. At each moment, the abrading work is transferred from one grinding wheel to another, so that they all wear equally, and consequently the wear is taken up automatically.

It is also due to the rigidity of the assembly, which comprises at least three grinding wheels, that the latter pass over a trough in turn without penetrating into it.

A particular embodiment of the present invention will now be described, by way of an example, with reference to the accompanying drawings, in which:

FIG. 1 illustrates a longitudinal partial view of the carriage with rail grinding apparatus constituted by four grinding units; and

FIG. 2 is a plan view of the apparatus of FIG. 1.

The apparatus comprises four grinding wheels 2, 3, 4 and 5, on spindles 2', 3', 4' and 5', in bearings at 6, 7, 8 and 9. The bearing 6 has been shown in section so that rolling bearings 10 and 10' thereof are visible. The grinding wheels 2, 3, 4 and 5 are illustrated in contact with a rail 1.

Motors of the grinding wheels can be seen at 2'', 3'', 4'' and 5''. A grinding unit is constituted by a grinding wheel, its spindle together with its bearing, and its motor.

The casings of these bearings have lugs, more particularly at 11, 11', 12, 12', and 13, 13', which facilitate the rigid assembly thereof by means of the side-plates 18.

The end casings are connected by lugs and side-plates, to the brackets 15 and 15' which rest, via the articulations 16 and 16', on the ends of the pistons of the jacks 17 and 17' which jacks are supported on the frame 20 of the wagon, this frame being the support of the assembly whereas the casings, lugs and side-plates form the rigid structure.

At 14, cores (in broken lines) can be seen inside the lugs; these cores make it possible for two grinding units to move away from one another and, therefore, for the length L between the axes of the end grinding wheels to be increased.

It should also be noted that each grinding unit may have its own particular inclination (in a transverse plane); the side-plates 18 in fact make it possible, with the aid of elongated holes for their bolts, to impart the desired inclination to each unit.

If particular reference is made to FIG. 2, the elements already mentioned will be found again and also, in addition, the small rods 21, 22, 23 and 24, which are articulately mounted on the frame 20 on the one hand, and on the assembly on the other. The device for carrying the unit assembly along will be seen at 25; it acts upon the side-plate 18 and conducts the assembly away in the direction of travel of the train, which direction is symbolically illustrated by the arrow.

For the purpose of light grinding, the units are raised. This may be brought about by connecting the jacks to a high-pressure pipe-system, but this elevation can also be carried out by mechanical means, for example tensioned springs which can be abruptly released by a manually controlled or remote-controlled triggering operation.

The, preferably spherical, articulated connections (such as 16 and 16' in the example) between the frames and the assembly via jacks, are noteworthy in that they transmit vibrations from the vehicle to the assembly only via the fluid in the jacks, which fact damps the said vibrations.

Supplementary articulated connections (such as 21, 22, 23 and 24 in the example) may limit, facilitate or prohibit certain movements, or else guide them.

In practice, since the movements imparted to the assembly by the humps of the undulations are very slight (of the order of 1 mm or even less), the usual state of manufacture of the articulated connections, as diagrammatically illustrated in the drawing, is sufficient to allow the assembly freedom to move (in the course of its travel along the rail) in small rocking movements about one of the two undulation crests on which this assembly is momentarily supported, the said crest then being the instantaneous centre of rotation.

One, less advantageous, form of manufacture would comprise articulated connections provided with elastic

or sliding elements.

If the grinding wheels are of equal thickness, adjustment of the height of the spindles is superfluous; if this is not the case, however, it is possible to cause the lower length of the spindle to slide in relation to its upper end, and to lock the slide at the desired height.

The jacks have the function of unballasting the weight of the assembly; pneumatic jacks are more flexible than hydraulic jacks, but there is nothing to prevent the connection of a hydraulic jack, generally of the oil type, to a compressed-air reservoir, thus combining the respective properties of the two types of fluid.

I claim:

1. A carriage for grinding undulations in railway track rails, said carriage being provided with a plurality of motorized rotary grinding wheels and means for relieving the loads of said grinding wheels on the rails, comprising a support linked to the carriage main body so as to be displaced together with the main body along the railway track; a rail grinding apparatus comprising a rigid assembly of at least three grinding units, each comprising a grinding wheel fixed on a shaft, a motor for rotation of the shaft, and a shaft bearing; a weight relieving means comprising a plurality of jacks operatively connected to said apparatus for relieving loads being positioned between said support and the rigid assembly; and complementary links mounted on said support between said assembly and said support and operatively connected to said jacks to enable the assembly to execute slight movements which are imparted to it by the passage of the grinding wheels over the crests of the undulations of the rail, the distance between the peripheries of the grinding wheels and the distance between the edges of the extreme grinding wheels are such as to prevent the penetration by any grinding wheel of a trough of the undulation over which the grinding wheel is crossing, the distance between the edges of the extreme grinding wheels being approximately equal to the amplitude of two wave lengths of the undulations in the rail, said distance between the edges of the extreme grinding wheels being controllable by core means positionable on or between the units.

2. A carriage with several rail grinding apparatus as claimed in claim 1, wherein the drive means for each rotatable grinding wheel comprises a motor.

3. A carriage with several rail grinding apparatus as claimed in claim 1, wherein the grinding units are fixed with respect to each other in a substantially horizontal plane.

4. A carriage with several rail grinding apparatus as claimed in claim 1, comprising locking means for locking the grinding wheels on their respective spindles at variable heights.

5. A carriage with several rail grinding apparatus as claimed in claim 1, wherein the rigid connection between two grinding units of an assembly is provided by a structure comprising the bearings of these units.

6. A carriage with several rail grinding apparatus as claimed in claim 1, wherein said grinding units are fixed with respect to each other in at least one inclined plane.

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