PATENT SPECIFICATION (11) 1 586 452

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(21) Application No. 24283/78 (22) Filed 30 May 1978 (19)

(31) Convention Application No. 2820804 (32) Filed 12 May 1978 in

(33) Fed. Rep. of Germany (DE)

(44) Complete Specification Published 18 Mar. 1981

(51) INT. CL.[3] E01B 29/42

(52) Index at Acceptance
E1G 420 GD

(54) METHOD OF AND APPARATUS FOR LOOSENING RAIL SECTIONS

(71) We, ELEKTRO-THERMIT G.m.b.H., a German Body Corporate of Gerlingstrasse 65, 4300 Essen 1, Germany, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

The invention relates to a method of loosening rail sections which have been released from their fastenings, before the sections are welded to give continuous rail tracks, by blows against the sides of the rails and to apparatus for striking such blows against the rails.

When carrying out continuous welding of rails by aluminothermic intermediate cast welding of individual rail sections it is necessary to weld the rail sections to one another within a specific normal temperature range in order to keep as small as possible the tensile and compressive stresses which have to be taken up by the superstructure when the temperature changes. So that welding can also be carried out at low ambeint temperatures, the rails are warmed with preheating devices to this nominal temperature range. The change in length of the rails corresponding to the difference in temperature serves as an indication that the rails to be welded have reached the nominal temperature. The change in length can thus be monitored by appropriate check marks.

Before warming to the nominal temperature, the rail sections are released from their fastenings. However, even after release, the change in length of the rails which takes place as a result of the rise in temperature is hindered by friction, especially by the friction between the rail foot and the baseplate.

In order to overcome this sticking and slipping expansion it is customary to strike the rails manually with heavy hammers, the head of the hammer consisting of a plastics material or being covered with such a material. By this means the rail is loosened and expands by so-called "micro-jumps" to the length corresponding to the temperature.

If the striking of the rails with the hammers is not carried out uniformly and carefully it can happen that the change in length does not take place to the extent which corresponds to the difference in temperature. This leads to stresses in the welded track which, under unfavourable conditions, can trigger rail warping or rail fractures. When striking is carried out manually, however, the striking force cannot be metered and is dependent on the strength and endurance of the workmen assigned to this task. The frequency of blows is low and cannot exceed a certain level. As a result of this it is not possible to ensure that the expansion of the rail is as uniform as possible.

The object on which the present invention is based is to develop a procedure which so improves the way in which the rails are struck that the warmed rail reliably and with great certainty expands to the length corresponding to the temperature.

This object can be achieved by the blows being struck mechanically in a constant blow sequence, the frequency of which can, however, be regulated, and with constant blow force alternately against the outer side and the inner side of the rail in a direction which is horizontal relative to the plane of the track.

The possibility of a constant blow sequence of controllable frequency enables the rail to be made to vibrate by setting the frequency to a specific value and by this means the so-called "micro-jumps" of the rail are kept small but the expansion of the rail takes place uniformly. The blow sequence and blow force can be adjusted to optimum values depending on the rail profile. This was not possible with the manual

procedures used hitherto.

In addition to the controllable frequency of the blow sequence and the controllability of the blow force, it is particularly important that the rails are struck alternately on the outside and on the inside. Particularly good loosening of the rail is achieved by this means.

A blow frequency of about 15 to 25 double blows per minute and per rail has proved particularly advantageous. The blow force depends on the state of the rail, the way in which it is laid and its profile.

According to the invention there is provided a method of loosening rail sections which have been released from their fastenings, before the sections are welded to give continuous rail tracks, by striking blows with hammers against the sides of the rails, the blows being struck mechanically in a constant blow sequence at a regulatable frequency and with a constant blow force alternately against the outer side and the inner side of the rail in a direction which is horizontal relative to the plane of the track.

Another aspect of the invention provides apparatus for striking blows against the sides of rails or railway track, such apparatus comprising a frame adapted to be mounted for movement along the rails of the track at least two pairs of hammers so carried by the frame that the head of one hammer of each pair of hammers will be inside the rail or rails to be loosened and the head of the other hammer will be outside the said rail or rails when the frame is supported by said rails, the apparatus including means whereby the frequency and force of the blows applied by the hammers to the rails may be adjusted.

In one preferred embodiment the heads of the hammers of a particular coupled pair of hammers are arranged to strike respectively against the inside of one rail and against the outside of the other rail of track supporting the apparatus, at least two pairs of hammers being arranged one behind the other lengthwise of the track and being staggered, the hammers of each pair of hammers being coupled to one another by a rod pivotally connected to each hammer.

However, in another embodiment the heads of the hammers of each pair of hammers strike respectively against the inside and outside of the same rail, the pair of hammers engageable with one line being connected to a similar pair of hammers engageable with the other line of the track supporting the apparatus by a cross rod pivoted to each of the pairs of hammers. Appropriately, the hammers of one pair of hammers are connected to one another at an angle in the region of their axis of rotation.

Means of adjusting the blow frequency and blow force of the hammers are known to those skilled in the art. To enable the apparatus to be constructed in as simple as possible a manner and adapted to the rugged building site, it is preferred to tension the striking hammers by means of springs, the springs being released when a certain tensile stress is reached to cause the hammers to strick against the rail or rails. A particularly preferred embodiment has at least one hammer of a pair of hammers connected by a spring to the frame and the spring is arranged by means of a tensioning device so that it can be alternately loaded and released in a predetermined cycle.

The alternate loading and release of the springs can be solved structurally in a particularly simple manner by the rods having projections which engage with driving pins of a rotatable disc, the speed of rotation of which can be regulated, over a specific angle of rotation of the disc, by which means the springs of the hammers are first loaded and are then released by the stops slipping from engagement with the driving pins.

It has proved convenient to construct the hammers so that they are arranged in a resilient and/or swivelling manner in the longitudinal direction of the rails. This ensures that the apparatus can be moved along the track without hindrance, even when there are projecting parts, such as, for example, train safeguarding units, on the outer surface of the rail head, as the lower operative ends of the hammers can simply swivel out of the way as they pass such projecting parts.

It is also possible to arrange the hammers so that they can be raised and lowered relative to the level of the rails. This facilitates movability of the equipment according to the invention with raised hammers, that is to say when not in operation, or in the region of points.

The invention will be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of an embodiment of apparatus for hammering the sides of the rails of railway track;

Figure 2 shows a detail of a modified embodiment of the apparatus in which one coupled pair of hammers strikes against the inside and the outside of the same rail; and

Figure 3 shows further modification in which the hammer head is jointed.

Referring to the drawings, in Figure 1 a frame (1) is illustrated which is movable by means of wheels (2) on a pair of rails (3) and (4). Two pairs of hammers (5/6) and (7/8) are carried behind one another on the frame. The hammers (5) and (6) are coupled by means of a rod (9) pivotally connected to each hammer and the hammers (7) and (8) are similarly coupled by means of a rod (10).

The hammers are pivotally supported on the frame (1) by means of pivot shafts (11), (12), (13) and (14). The hammers (5 to 8) are also connected to the frame (1) by means of individual tension springs (15 to 18).

Each of the rods (9) and (10) are provided with driving means in the form of projections, the projection on joint rod (9) being designated (19).

A motor (21) is mounted on a yoke portion (20) of the movable frame (1) and drives rotary disc (24), which has one or more driving pins (25), *via* a worm drive comprising a worm (22) and a gear (23).

The arrangement is such that when the disc (24) is driven to rotate in the direction of the arrow, the driving pin (25) on the disc (24) comes into contact with the projection (19). By this means the rod (9) is moved in the direction of the arrow and the springs (15) and (16) are tensioned. Upon further rotation of the disc (24) the driving pin (25) releases the stop (19), so that the springs (15) and (16) then pull the hammers (5) and (6) to cause the heads (26) and (27) of the hammers to strike against the inside and the outside respectively of the opposite rails (3) and (4). Upon further rotation of the disc, the pair of hammers (7 and 8) located behind the first pair is actuated in the same way.

The blow frequency can be controlled by the rotational speed of the driving disc (24). The blow force can be adjusted by choosing suitable springs. The degree of tensioning of the springs, and thus the blow force, can also be adjusted by the choice of the distance between the driving pin (25) and the centre of rotation of the disc (24).

Several, for example two or three, driving pins (25) can be fastened to the driving disc (24).

The movement of the rods (9) and (10) transversely to the track is restricted by rubber buffers (28) and (29) and stops (30) and (31).

Figure 2 shows a modified embodiment comprising a pair of hammers (32) which is pivoted to a cross rod (9). A tension spring (15) is provided as before. In this embodiment of the equipment, the heads (33) and (34) of the hammers of one pair of hammers (32) act on the same rail. In an embodiment of this type it is possible to arrange all the hammers in one plane and thus to keep the equipment relatively compact. However, several pairs of hammers of this type, which are connected to one another by means of cross rods, can also be arranged behind one another and in this case the pairs of hammers are appropriately staggered in respect of the blow sequence.

In Figure 3 a hammer (35) is pivotally linked to a cross rod (9) and carries a tension spring (15). The hammer has a joint (36), by means of which the lower part (37) of the hammer with the hammer head (38) can be swivelled in the longitudinal direction of the rails. If equipment of this type is moved over a track and there is a projection on the outer surface of the rail head of a rail, the arm (37) can pivot or swivel and after passing over the obstruction return to its initial position. The pivoting joint can have a stop and spring so that the extent to which the arm can swivel is restricted and the return to and the normal retention of the hammer in its extended form is ensured.

Preferably means are provided whereby the height of the hammers relative to the supporting rails may be adjusted. This can be done by adjusting the position of pivotal connection of the hammers to the frame or by making the frame itself height adjustable relative to the rail-engaging wheels.

WHAT WE CLAIM IS:-

1. A method of loosening rail sections which have been released from their fastenings, before the sections are welded to give continuous rail tracks, by striking blows with hammers against the sides of the rails, the blows being struck mechanically in a constant blow sequence at a regulatable frequency and with a constant blow force alternately against the outer side and the inner side of the rail in a direction which is horizontal relative to the plane of the track.

2. Apparatus for striking blows against the sides of rails of railway tracks, such apparatus comprising a frame adapted to be mounted for movement along the rails of the track, at least two pairs of hammers so carried by the frame that the head of one hammer of each pair of hammers will be inside the rail or rails to be loosened and the head of the other hammer will be outside the said rail or rails when the frame is supported by said rails, the apparatus including means whereby the frequency and force of blows applied by the hammers to the rails may be adjusted.

3. Apparatus according to claim 2, wherein the heads of the hammers of a particular coupled pair of hammers are arranged to strike respectively against the inside of one rail and against the outside of the other rail of the track supporting the apparatus, as least two pairs of hammers being arranged one behind the other lengthwise of the track and being staggered, the hammers of each pair of hammers being coupled to one another by a rod pivotally connected to each hammer.

4. Apparatus according to claim 2, wherein the heads of the hammers of each pair of hammers strike respectively against the inside and the outside of the same rail, the pair of hammers engageable with one line being connected to a similar pair of

hammers engageable with the other line of the track supporting the apparatus by a cross rod pivoted to each of the pairs of hammers.

5. Apparatus according to claim 3 or 4, wherein the hammers are connected by tension springs to the frame, the apparatus includes means for alternately tensioning and releasing the springs in a predetermined cycle, the release causing contact of a hammer under the action of an associated spring with the rail.

6. Apparatus according to claim 5, wherein the means for tensioning and releasing the tension springs comprise means on the rods engageable by driving pins on a rotatable disc, the speed of rotation of which can be regulated, over a specific angle of rotation of disc, by which means the tension springs are first tensioned and are then released after the means on the rods slip from the driving pins.

7. Apparatus according to claim 6, wherein the disc is driven by a controllably variable speed electric motor.

8. Apparatus according to any one of claims 2 to 7, wherein the hammers are arranged to be swivellable in the longitudinal direction of the rails for pivoting out of conflict with obstructions beside a rail during movement of the apparatus therealong.

9. Apparatus according to any one of claims 2 to 8, wherein means are provided whereby the height of the hammers can be raised and lowered relative to the level of the rails supporting the apparatus.

10. Apparatus for striking blows against the rails of railway tracks, such apparatus being constructed and arranged to operate substantially as herein described with reference to and as illustrated in Figure 1 of the accompanying drawings.

11. Apparatus according to claim 10, when modified substantially as herein described with reference to and as illustrated in Figure 2 or Figure 3 of the accompanying drawings.

12. A method of loosening rail section substantially as herein described with reference to the accompanying drawings.

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Printed for Her Majesty's Stationery Office,
by Croydon Printing Company Limited, Croydon, Surrey, 1981.
Published by The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.

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Sheet 1

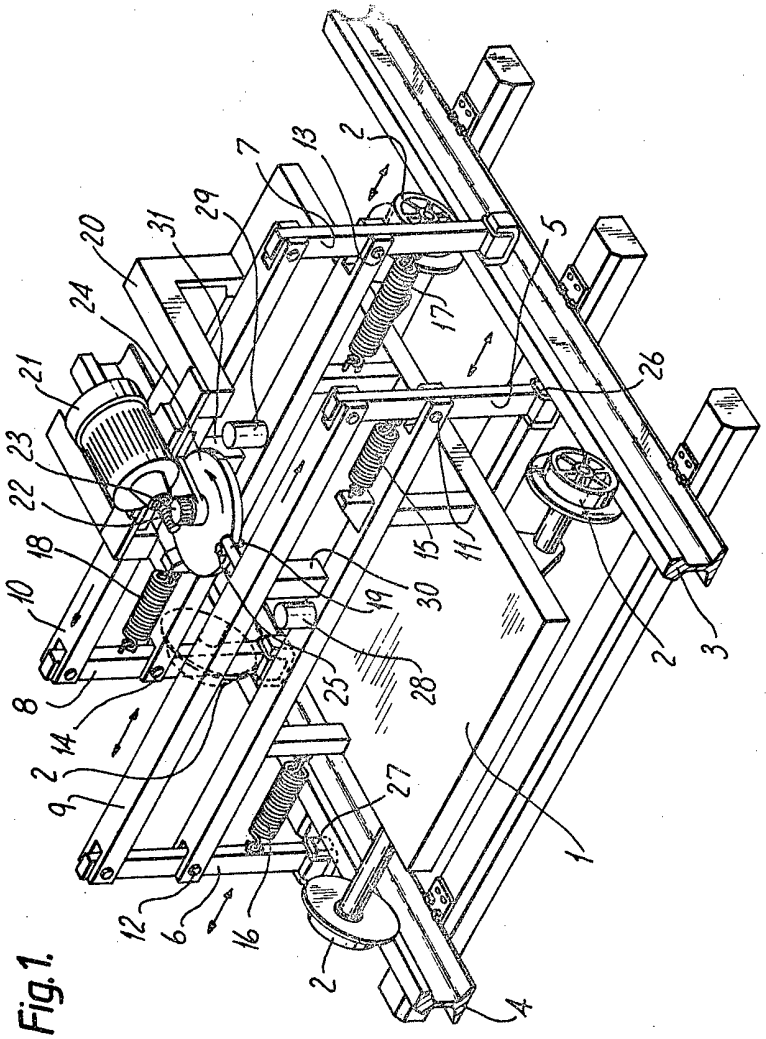

Fig.1.

1586452 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheet 2

Fig. 2.

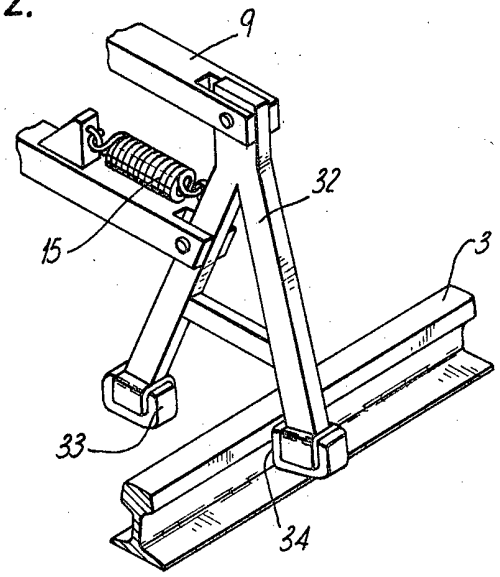

Fig. 3.