

[54] **APPARATUS FOR CONTINUOUSLY LAYING TRACK**

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[22] Filed: **Feb. 8, 1971**

[21] Appl. No.: **113,758**

Related U.S. Application Data

[62] Division of Ser. No. 785,477, Dec. 20, 1968, abandoned.

[30] **Foreign Application Priority Data**

Dec. 29, 1967 Austria..... 11824/67

[52] **U.S. Cl.**..... **104/2; 219/213**

[51] **Int. Cl.**..... **E01b 29/16**

[58] **Field of Search**..... 104/12, 15, 2-9; 219/213; 126/271.2

[56] **References Cited**

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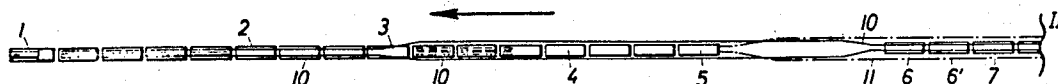
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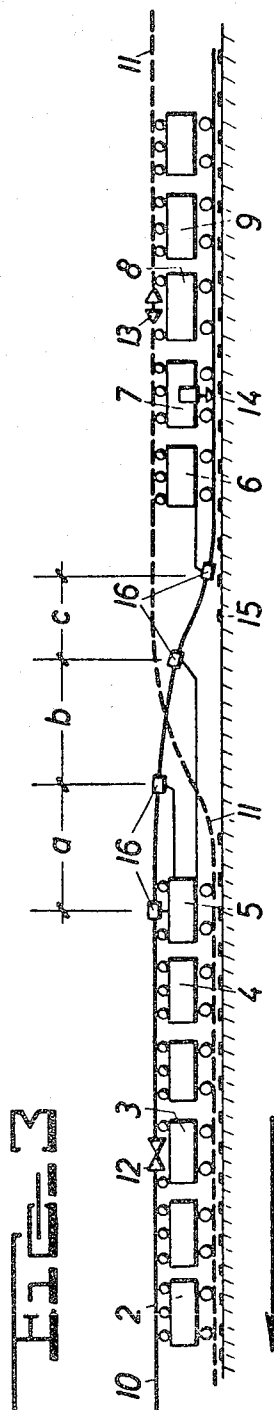
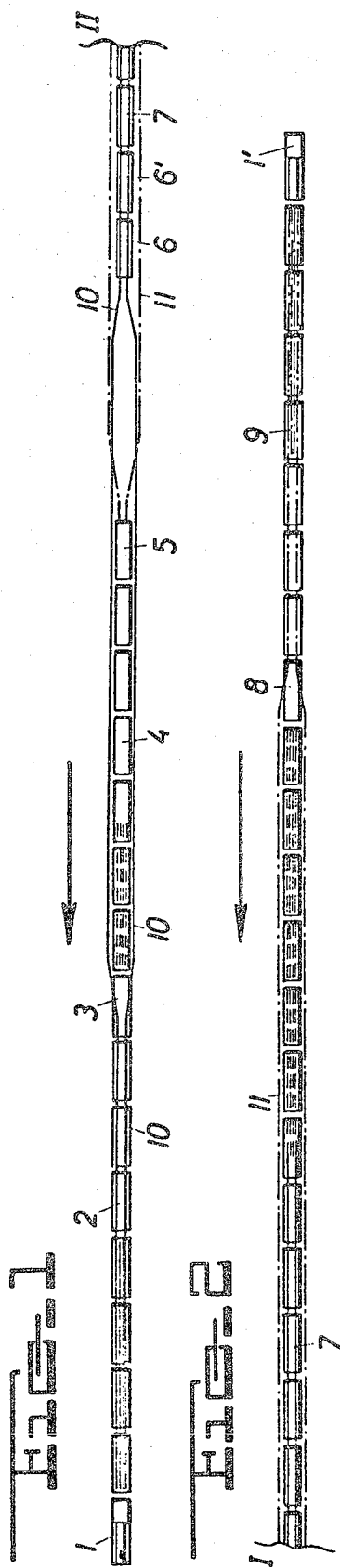
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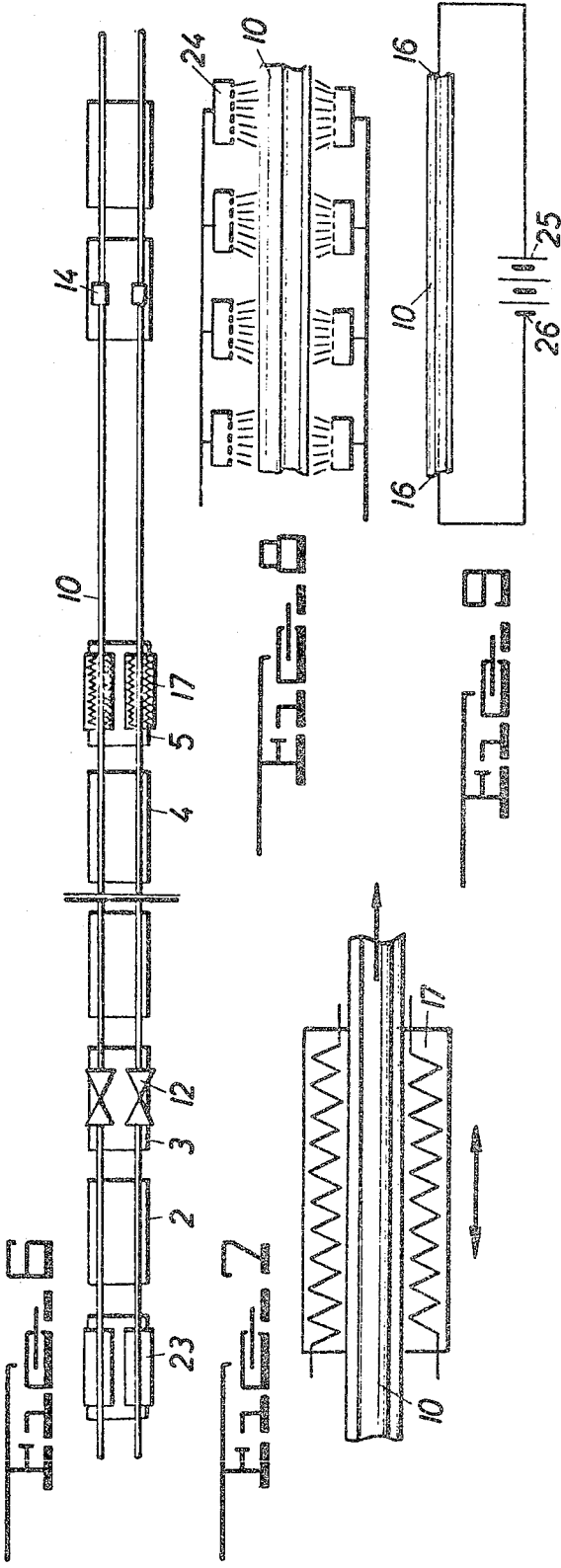
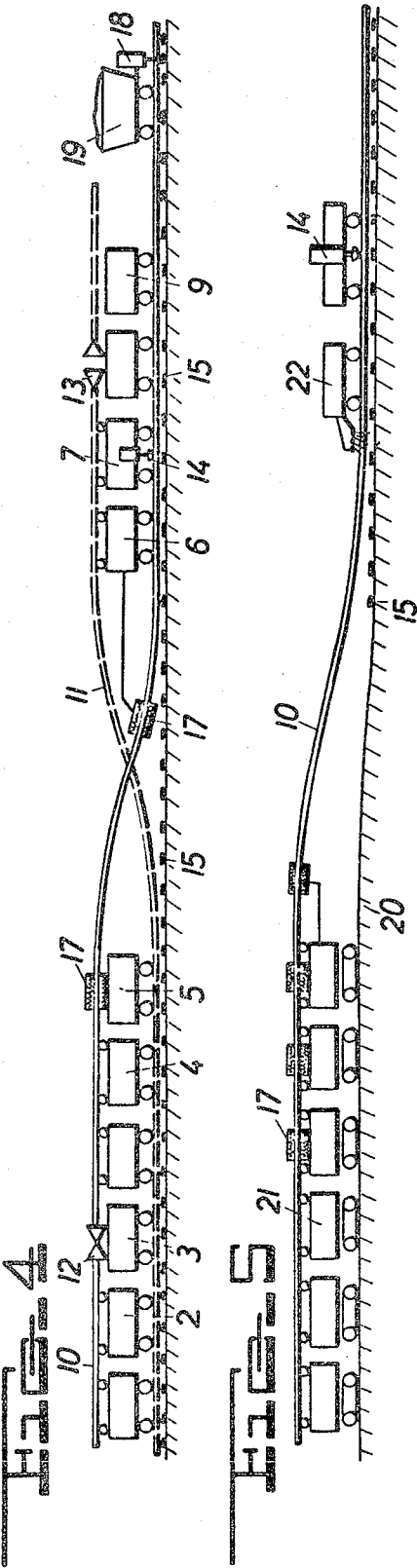
ABSTRACT

In laying track rails from a continuously moving train which supports continuous lengths of butt-welded rails and whence the rails are placed on successive ties as the train moves forward, successive rail sections are subjected to heating or cooling while they are placed on the ties and before they are secured thereto, to impart to these rail sections immediately adjacent the point at which they are secured a temperature approximately equal to the median or average yearly ambient temperature.

13 Claims, 9 Drawing Figures







APPARATUS FOR CONTINUOUSLY LAYING TRACK

This is a division of copending application Ser. No. 785,477, filed Dec. 20, 1968, now abandoned.

BACKGROUND AND SUMMARY OF THE INVENTION

The present invention relates to the continuous laying of successive sections of continuous lengths of track rails, such as butt-welded rails laid from a moving train supporting the rails as the train moves forward.

The major problem in butt-welded, continuous lengths of rails consists in the deformation of the rails in a longitudinal direction due to changes in the ambient temperatures throughout the year. Such temperature changes may cause internal stresses in the rails of a sufficient extent to produce a break or at least a serious bend in the rails.

For this reason, it has been proposed to butt-weld the track sections into a continuous length in a temperature which approximates the median or average temperature expected in the region where the track is laid. In Central Europe, for instance, the outer limits of the ambient temperature are between about $-30^{\circ}\text{C}.$ and $+60^{\circ}\text{C}.$ so that the predetermined temperature at which the welding should be carried out is about $+15^{\circ}\text{C}.$

However, it is usually not possible for economic and practical reasons to wait for the ambient temperature to reach the desired level, particularly if track laying operations are effected with mobile trains which replace old track with new track in a continuous manner.

It is the primary object of this invention to make such operations practically feasible while avoiding temperature gradients in the newly laid rails, which may cause undue internal stresses, and without causing delays in the continuous track laying operation.

This and other objects are accomplished in accordance with the invention by subjecting the successive track rail sections to temperature conditioning, i.e. heating or cooling, while they are placed on the ties, to impart a predetermined temperature to the track rail sections immediately adjacent the point at which they are secured to the ties. Preferably, the track rail sections are subjected to the temperature conditioning before they are placed on the ties, and before or while they are secured thereto. The predetermined temperature is approximately the median or average yearly ambient temperature.

The essential result of the present invention is that the rails have at least approximately this predetermined temperature at the time when they are placed on, and secured to, the ties. Since the rails thus have the average temperature of the location at the time when they are fixed in position on the ties, internal stresses due to temperature changes will be reduced to a minimum.

It is even better if the desired temperature is imparted to the rail sections as soon as they are placed on the ties because, otherwise, frictions caused by temperature-induced elongation or shortening of the rail sections could produce internal stresses which remain in the rails after they have been secured to the ties.

In principle, the nature and the exact timing of the heating or cooling of the rails are of no importance as long as the predetermined rail temperature is attained while the rails are placed on the ties. Preferably, temperature conditioning is effected in successive stages to avoid stresses due to steep temperature gradients.

Therefore, it is useful to subject the rail sections to heating or cooling in successive stages wherein the temperature is continuously and gradually increased or decreased until the predetermined temperature has been reached.

While the exact nature of the temperature conditioning means may be widely varied, it will be advantageous to use such heating or cooling means that may be readily operable in conjunction with a continuously moving train used in the track laying operation. Particularly useful heating means include electric resistance heating while a very useful cooling means is an air stream or jet with air cooled with dry ice.

Particularly where the prevailing temperature differs substantially from the predetermined temperature to which the laid track sections have been heated or cooled, it will be advantageous to avoid internal stresses in the laid track rails by subjecting the laid track rails to suitable temperature conditioning subsequent to securing them to the ties.

The apparatus of the invention will be found particularly useful in the system described and claimed in our U.S. patent application Ser. No. 738,475, filed June 20, 1968 now U.S. Pat. No. 3,521,565.

BRIEF DESCRIPTION OF DRAWING

The above and other objects, advantages and features of the present invention will become more apparent from the following detailed description of preferred embodiments of apparatus designed to move continuously along a right of way to replace the ties and rails of an existing track with a new track, taken in conjunction with the accompanying drawing wherein

FIGS. 1 and 2 are schematic top views of one embodiment of such an arrangement, the views being separated into two figures merely for the sake of convenience to avoid showing various parts of the rather long arrangement on too small a scale, FIG. 1 showing the forward portion in the direction of movement of the apparatus, as indicated by the arrow, while FIG. 2 illustrates the rear portion, the two portions being contiguous along lines I and II of the figures;

FIG. 3 is a schematic side view, on an enlarged scale, of the track replacement section itself;

FIGS. 4 and 5 are views similar to that of FIG. 3 and showing modified arrangements;

FIG. 6 is a schematic top view of another modified arrangement; and

FIGS. 7, 8 and 9 schematically illustrate different temperature conditioning apparatus according to the invention.

DETAILED DESCRIPTION

Referring now to the drawing and first to the overall arrangement shown in FIGS. 1 and 2, which is identical with that described and claimed in our U.S. Pat. No. 3,521,565 the horizontal arrows indicate the direction of movement of the apparatus along the right of way during the track renewal operation. This apparatus moves continuously in the direction of the arrows at an approximate speed of about three to five meters per minute, and consists of a train including a forward locomotive 1 and a rear locomotive 1' which pull, respectively push, the train along the track. Seven flat cars 2 carry the rail sections for the new rails to be laid, followed by a work car 3 on which the rail sections are connected, preferably by butt-welding, to form contin-

uous rails. Normally, rail sections are delivered in lengths of about 120 meters, and these sections are welded together on car 3 to form the two continuous rails of the new track.

The work car 3 is followed by six flat freight cars 4 which carry the old ties previously removed from the right of way, and a loading car 5 for the old ties precedes the track replacement section. This section is about 60 to 70 meters long and constitutes the actual track renewal or replacement section wherein the old rails are removed and new rails are laid and, preferably, new ties are substituted for the old ties.

Immediately behind the track replacement section follow loading cars 6, 6' for the new ties, succeeded by fourteen flat freight cars 7 for the new ties, work car 8, on which the removed old rails are cut into sections which can be more readily transported, and seven flat freight cars 9 which carry the old rail sections coming from work car 8.

For clarity's sake, the new rails 10 are shown in full lines while the old rails 11 are indicated in chaindotted lines. It will be understood, of course, that the term "new" rails or ties, as used throughout the specification and claims, denotes only the fact that they form part of a newly laid track and that such replacement rails and/or ties may, in fact, be used and restored parts.

The replacement of the track rails 11 by new track rails 10 is illustrated in FIG. 3 which, for clarity's sake, has been longitudinally foreshortened, with a reduced number of freight cars 4 and 7 being shown. The freight cars 2 and 4 (pulled by locomotive 1), the work car 3 and the loading car 5 run on wheels on existing track 11, while the loading cars, 6', freight cars 7 and 9, and work car 8 (all pushed by locomotive 1') run on wheels on the new track 10. The rails of the old and new track are guided on top of all the cars by friction-reducing supports, such as rollers, to eliminate friction which would cause stresses in the rails.

The work car 3 carries a butt-welding apparatus 12 for butt-welding adjacent ends of rail sections of new rails 10 and thus to produce continuous lengths of welded rails. Rail cutting apparatus 13 is mounted on work car 8 to cut the continuous rails of old track 11 into convenient lengths. One of the cars 7 carries an apparatus 14 for securing the new rails 10 to the new ties 15, all in a manner more fully described and illustrated in our U.S. Pat. No. 3,521,565, the track replacement operation forming part of the present invention only inasmuch as it is combined with the novel features thereof.

According to this invention, the butt-welded, continuous new rails 10 are brought to the desired temperature before they are placed on, and secured to, the new ties 15. For this purpose, a mobile heating or cooling apparatus is associated with the track replacement train for movement therewith ahead of the point where the new rails are placed on, and secured to, the new ties so that the new rails will have a substantially uniform and desired temperature at that point. The heating or cooling apparatus must be sufficiently spaced from the point of rail placement so that the form changes of the rails, due to the temperature changes imparted thereto by the apparatus, exert no influence at the rail placement point.

In the embodiment illustrated in FIG. 3, the butt-welded rails 10 are heated at three points spaced apart by successively smaller distances *a*, *b* and *c*, pre-heating

being effected in zone *a*, the main heating being effected in zone *b*, and the desired temperature being obtained in heating zone *c*. In other words, heating is effected in successive zones until the desired temperature is reached, which is the median or average temperature of the location. This final temperature may be controlled by a thermostat.

The specific heating apparatus used in the embodiment of FIG. 3 is more fully shown in FIG. 9. In this apparatus, electrical terminals 16, which glidingly engage the rails 10, subject the rails to electric resistance heating, with the rails themselves constituting the resistance element in the electric circuit 25 receiving power from voltage source 26. The terminals 16 may be fixed on cars of the train, in which case the rails will glide through and in contact with the fixed terminals, or the terminals may be clamped onto the rails and travel with them through the heating zones.

It will be advantageous to avoid rapid cooling of the heated rails after they have been placed on, and secured to, the ties, which may cause stresses in the rails. For this purpose, some heating may be continued for a short time after the rails have been laid so that the ambient temperature is only slowly reached.

Another embodiment of the rail temperature conditioning apparatus is shown in FIGS. 4 and 7. To avoid redundancy, like parts operating in a like manner have shown by like reference numerals in FIG. 4. However, the temperature of rails 10 is controlled in this embodiment by a temperature conditioning apparatus 17 which carries coils connected to a source (not shown) of heating or cooling fluid. As shown in FIG. 4, temperature conditioning is effected in two successive zones. If the rails are cooled, apparatus 17 must not be positioned too closely to butt-welding apparatus 12 so as to avoid undue temperature gradients and corresponding stresses in the rails.

As shown in FIG. 7, the coils of apparatus 17 may receive a hot or cool liquid or gaseous medium, or they may be electrical heating coils. The apparatus may either be fixedly mounted on one of the train cars for gliding engagement with the rails or, as in the case with the electric resistance heating, the apparatus may be clamped to the rails for movement therewith or independently thereof, i.e. faster or slower than the rails move. Such an arrangement makes it possible accurately to control the final temperature of the rails before they are laid.

FIG. 4 also shows a ballast tamping apparatus following the track replacement train. As shown, a ballast storage car 19 carries a ballast surface tamper 18 so that the newly laid track may be promptly fixed in its position by providing a solid ballast bed. In this manner, all the advantages of the present invention are assured.

FIG. 5 shows a rail temperature conditioning apparatus used in an arrangement for laying a track including butt-welded, continuous rails. In this embodiment, no track replacement takes place but rails 10 are laid on ties 15 on a railroad bed without replacing a former track, in which case cars 21 move on endless tracks on ballast 20.

In this embodiment, a plurality of temperature conditioning zones are provided by a succession of temperature conditioning devices 17 fixedly mounted on the cars. Additionally, a mobile car 22 is arranged ahead of the point where apparatus 14 secures the rails to the

ties. This car carries temperature conditioning means to heat or cool the newly placed rails so that they have the desired temperature when they are secured to the ties.

In the arrangement of FIG. 6, wherein like parts operating in a like manner are shown by like reference numerals, the rail sections are heated or cooled before they are butt-welded by a temperature conditioning apparatus 23 mounted ahead of the butt-welding apparatus 12. This not only improves the welding conditions but also reduces or eliminates stresses arising from sudden temperature gradients produced by the welding operation.

Any of the illustrated or other suitable temperature conditioning apparatus may be used in any of the indicated temperature conditioning zones in the above-described embodiments. If desired, an open flame or a burner may be used, for instance, for heating the rail to the desired temperature before it is laid and secured to the tie.

A useful temperature conditioning apparatus is illustrated in top view in FIG. 8 which shows a series of jets 24 discharging a cold or hot fluid, preferably gas, against both sides of the rail 10.

While the invention has been described and illustrated in connection with certain preferred embodiments, it will be understood that modifications may occur to those skilled in the art, particularly after benefiting from the present teaching, without departing from the spirit and scope of the invention.

We claim:

1. In apparatus for continuously laying successive sections of continuous lengths of track rails, comprising means for placing said successive sections on successive ties and for securing each of said rail sections to said ties, the improvement of mobile means subjecting the successive rail sections to temperature conditioning, said temperature conditioning means preceding the means for placing and securing the rail sections to the ties, and being spaced from the point at which the track rail sections are placed on, and secured to, the ties a distance sufficient to maintain substantially uniformity of the predetermined temperature at said point.

2. In the apparatus of claim 1, said means for placing the successive track rail sections on successive ties and for securing them thereto being mounted for mobility on a right of way whereon the continuous lengths of track rails are to be laid.

3. In the apparatus of claim 2, further comprising a train including a car supporting the continuous lengths of rails and whence the successive track rail sections are laid as the train moves forwardly, and said temperature conditioning means being mounted on said car.

4. In the apparatus of claim 3, the temperature condi-

tioning means being spaced from the point at which the track rail sections are placed on, and secured to, the ties a distance sufficient not to transmit any form change of the track rail sections due to the temperature conditioning to the said point.

5. In the apparatus of claim 1, said temperature conditioning means including a series of temperature conditioners spaced from each other along said continuous lengths of track rails.

6. In the apparatus of claim 1, ballast supply and tamping means succeeding the means for securing the rail sections to the ties.

7. In the apparatus of claim 1, temperature control means associated with the temperature conditioning means.

8. In the apparatus of claim 1, said temperature conditioning means including means for subjecting the track rail sections to a stream of a temperature conditioning fluid.

9. In the apparatus of claim 1, said temperature conditioning means including means for electrically heating the rail sections.

10. In the apparatus of claim 9, the electric heating means including an electric heating circuit and terminals in gliding contact with successive ones of said track rail sections, said rail sections serving as a resistance element in the electric resistance heating thereof.

11. In apparatus for continuously laying successive sections of continuous lengths of track rails, comprising means for placing said successive sections on successive ties and for securing each of said rail sections to said ties, the improvement of mobile means subjecting the successive rail sections to temperature conditioning, said temperature conditioning means preceding the means for placing and securing the rail sections to the ties, and means for butt-welding adjacent ends of rail sections to produce the continuous lengths of track rails, said butt-welding means preceding the temperature conditioning means.

12. In the apparatus of claim 11, means for preheating the rail sections preceding the butt-welding means.

13. In apparatus for continuously laying successive sections of continuous lengths of track rails, comprising means for placing said successive sections on successive ties and for securing each of said rail sections to said ties, the improvement of mobile means subjecting the successive rail sections to temperature conditioning, said temperature conditioning means preceding the means for placing and securing the rail sections to the ties, and the temperature conditioning means defining a temperature conditioning chamber surrounding the track rail sections before they are laid and secured.

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