

Method for Converting a Ballasted Track into a Slab Track

5 The invention relates to a method for converting a ballasted track into a slab track.

The increasing travelling speeds of trains call for slab tracks, which are capable of taking up the arising loads
10 better than ballasted tracks. The reference WO00/61866 describes a method for renewing a railway line where the existing superstructure that is associated with the track is removed and the track is laid on the substructure. After optionally embedding a substructure for the new railway
15 line, at least one support layer for a solid railway is embedded and subsequently the existing track is retreated. A solid railway, more particularly one with a track which is mounted on a concrete or asphalt support layer or with a track with sleepers which are cast into a concrete layer, is
20 produced by building a new track and adjusting and fastening the new track.

The increasing traffic density on the railway networks calls for ever shorter interruptions for track maintenance and
25 renewal. The aforementioned method is not suitable for a conversion of short track sections with short operation interruptions.

On the background of this prior art, it is the object of the
30 invention to suggest a method for converting a ballasted track into a slab track that is implementable on short track sections and therefore in relatively short periods such that the track is operable between these periods.

According to the invention, this object is achieved by the measures indicated in the characterizing part of claim 1.

In particular, the solution according to the invention
5 offers the advantage that the removal of ballast in a section that extends over a plurality of sleepers makes room for producing a slab track without the need of changing the position of the rails. After the placement of the supports, the track is immediately operable again so that the relevant
10 section need not remain closed until all method steps are completed. Since the supports are adjustable, no additional adjusting means are required for a precise vertical adjustment of the rails.

15 Particular embodiments of the method according to the invention are indicated in the dependent claims.

Another aspect of the invention relates to a sleeper unit for implementing the method according to the invention.
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A further aspect of the invention relates to a support for implementing the method according to the invention.

Exemplary embodiments of the method according to the
25 invention and of the sleeper unit and the support will be described in more detail hereinafter by way of examples with reference to the appended drawings. The latter show

Figure 1 in a perspective view, the initial condition of a
30 ballasted track laid in a concrete trough;

Figures 2 to 5 different method steps;

Figure 6 a cross-section of the situation according to
Figure 5;

Figure 7 a further method step;

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Figure 8 the ballasted track with a section converted into
a slab track;

Figure 9 a perspective view of a prefabricated sleeper
unit;

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Figure 10 an elevation of a support with a rail fastened
thereto, and

15 Figure 11 the support of Figure 10 in a perspective view
without the rail and the rail fixture.

Figure 1 shows the initial condition of the method, i.e. a
ballasted track inside a concrete trough 1 that comprises
20 sleepers 3, e.g. wooden sleepers, lying in a bed of ballast
2, and rails 5 fastened thereto by means of fixtures 4. The
sleeper spacing is e.g. 60 centimeters.

Figure 2 illustrates a condition where in a track section 6
25 a part of ballast 2 has been removed so that in this track
section 5 the lower surface of sleepers 3 no longer lies on
ballast 2 but sleepers 3 are suspended to rails 5. The
length of track section 6 is chosen such that substantially
no sagging of the rails results in this section. In the
30 depicted condition, of the ten sleepers 3 originally located
in track section 6, four were initially pushed together at
one end of track section 6 after previously releasing
fixtures 4 just enough to allow sleepers 3 to be moved along
rails 5 while being suspended thereto. By pushing them

together in this manner, room is made for rotating the remaining six sleepers 3 located in track section 6 by 90 degrees one after another and lifting them out between rails 5 without having to change the position of rails 5 for this purpose. Alternatively it would also be possible to dismantle the sleepers that are to be removed and to remove them in pieces.

Figure 3 shows a condition where inside track section 6 a working area 7 extending from the sleepers 3 on the right side of the drawing that are still resting in ballast 2 to the sleepers on the left of the drawing that have been pushed together has been completely emptied of ballast down to the bottom of concrete trough 1, and cleaned. The removal of the ballast can be achieved by mechanical or pneumatic means such as a suction device. Basically it is also possible to completely remove the ballast in a single operation, but the described stepwise procedure offers the advantage that the remaining ballast is much better accessible after pushing sleepers 3 together resp. removing them. At both ends of working area 7, temporary boarding is inserted in order to retain the remaining ballast 2, only board 8 being visible in the figure.

Figure 4 shows a situation where a prefabricated sleeper unit consisting of a concrete slab 9 provided in this example with four fixtures 11 for rails 5 mounted on concrete blocks 10 has been laid down on the underground between rails 5. However, the method according to the invention is not limited to the illustrated sleeper units but may alternatively be implemented with single block sleepers or with sleepers having two fixtures, one for each rail. Since the shorter side of concrete slab 9 fits between rails 5, concrete slab 9 can also be laid down without

spreading rails 5 apart. At this point, reference is made to Figure 9 which shows a sleeper unit consisting of a concrete slab 9 provided with four fixtures 11 for rails 5 mounted on concrete blocks 10 in perspective at an enlarged scale as compared to Figure 4. Here, concrete blocks 10 are inserted in concrete slab 9 with intercalated rubber shoes that are not visible in the figure. The rubber shoes may e.g. be designed as shown in Patent CH695698, and a respective elastic inlay may be arranged between each rubber shoe and the bottom surface of concrete block 10. The long lateral edges of concrete slab 9 are provided with recesses 12 whose function will be described below in connection with Figure 5. At the center of concrete slab 9, a drainage channel 13 to be arranged in parallel to the rails is visible. Four threaded sleeves 14 cast in in concrete slab 9 are intended for temporarily screwing in non-represented threaded spindles that are supported on the underground in order to thus lift and precisely position concrete slab 9 vertically and to maintain the latter in the vertical position until the infill concrete 24 to be described below has reached the desired early strength. Reference numeral 15 denotes lifting sleeves that may also be designed as threaded sleeves and serve for attaching lifting means such as eyebolts.

In the situation depicted in Figures 5 and 6, concrete slab 9 has been rotated 90 degrees relative to the position of Figure 4, lifted, and fastened to rails 5 by means of fixtures 11. Consequently, concrete slab 9 is initially positioned at a distance above the underground on rails 5.

Before another concrete slab 9 is inserted in the described manner, two supports 17 are placed on the underground so as to come to lie in recesses 12 of concrete slab 9 fastened to rails 5 without contacting concrete slab 9. Recesses 12 allow placing adjacent concrete slabs 9 very close to each

other. Figures 10 and 11 show a support denoted by 17 as a whole. A conical concrete body 18 forms a base on which a first plate 19 is resting the underside of which has a recess to which the upper side of concrete body 18 is adapted so that plate 19 is precisely positioned on concrete body 18 and cannot slip laterally. A bearing plate 20 is supported on first plate 19 by spindles 22. By rotating spindles 22, the distance between plates 19 and 20 is adjustable. On upper bearing plate 20 lugs 21 are arranged which serve for receiving the heads of hook bolts by which provisional rail fixtures are fastened to rails 5. A fork 23 arranged on bearing plate 20 serves for fastening a lateral adjusting spindle 16 as illustrated in Figures 5 to 7. Figure 6 shows the situation of Figure 5 in a cross-sectional view. Supports 17 are shown which extend into the lateral recesses 12 of two concrete slabs 9 adjoining in the direction of the track. In this situation, if the track has to be temporarily operable for rail traffic, additional supports 17 may be built in in the free area between the concrete slab and boarding 8 to take up the loads.

Figure 7 shows the situation after casting in two concrete slabs 9 by means of an infill concrete 24 that is as shrink-free as possible, e.g. from the company Concretum, or an equivalent product. Prior to concreting, form boards have been inserted on both sides of concrete slabs 9 as seen in the direction of the rails. Before infill concrete 24 has completely hardened, the threaded spindles maintaining concrete slab 9 in its vertical position are unscrewed from threaded sleeves 14. Subsequently or after the complete hardening of infill concrete 24, the units consisting of upper plates 20 and lower plates 19 are removed by first approaching upper plates 20 to lower plates 19 by rotating spindles 22 and then removing the units from concrete bodies

18, which remain in the track. As a result, the rails are supported on fixtures 11 and sleeper blocks 10 can freely move relative to concrete slab 9 under a passing train. Of course, adjusting spindles 16 are removed too.

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In the situation illustrated in Figure 8, the sleepers 3 that were initially pushed together are again distributed according to the original sleeper spacing and ballast 2 is packed under them. This means that in this condition rails 5
10 are no longer supported by any temporary supports 17 of the kind shown in Figure 10, which would be disadvantageous in that the track would not be able to yield under load and vibrations would be transmitted to the underground by supports 17. Consequently, in the condition illustrated in
15 Figure 8, the track section is operable without restrictions. The conversion of a different track section again starts with the method step described above with reference to Figure 2. It is also possible to continue working on both sides of the already converted track section
20 simultaneously.

In the foregoing, possible embodiments of the invention have been described whereas the invention is not limited to the depicted particular situations and views but various other
25 combinations of features of the described and illustrated embodiments are possible.

List of Reference Numerals

- 1 concrete trough
- 2 ballast
- 3 sleeper
- 4 fixture
- 5 rail
- 6 track section
- 7 working section
- 8 boarding
- 9 concrete slab
- 10 sleeper block
- 11 fixture
- 12 recess
- 13 drainage channel
- 14 threaded sleeve
- 15 lifting sleeve
- 16 adjusting spindle
- 17 support
- 18 concrete body
- 19 plate
- 20 plate
- 21 lug
- 22 spindle
- 23 fork
- 24 infill concrete
- 25

Claims

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1. Method for converting a ballasted track consisting of a ballast bed (2) resting on a solid underground and of sleepers (3) lying thereon, to which rails (5) are fastened by means of fixtures (4), into a slab track, characterized
10 by the following method steps:

- ballast (2) is removed in a section (6) that extends over a plurality of sleepers (3),
- in the section (6) a first number of sleepers (3) are removed after releasing the rail fixtures (4),
- 15 - in the section (6), sleeper blocks (10) are inserted, vertically positioned, and fastened to the rails (5),
- in the section (6), temporary, vertically adjustable supports (17) are inserted on which the rails (5) are resting and are supported on the underground,
- 20 - in an area that extends over a number of sleeper blocks (10) as seen in the direction of the rails, infill concrete (24) is filled in from the underground up to at least part of the height of the sleeper blocks (10),
- after the infill concrete (24) has at least partly
25 hardened, at least a part (19, 20) of each of the supports (17) located between two respective sleeper blocks (10) in the direction of the rails is removed.

2. Method according to claim 1, characterized in that
30 before removing the first number of sleepers (3), a second number of sleepers (3) are pushed together at one end of the section (6) after loosening their rail fixtures (4).

3. Method according to claim 2, characterized in that the
35 ballast (2) is initially removed down to a level situated

below the contact surface of the sleepers (3), and after the second number of sleepers (3) have been pushed together, the remaining ballast (2) is removed down to the underground in an area (7) that is free of sleepers.

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4. Method according to claim 2, characterized in that in order to be removed, the first number of sleepers (3) are rotated in the longitudinal direction of the sleepers (5) and lifted out between the rails (5).

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5. Method according to one of claims 3 to 4, characterized in that at one end at least of the section (7) that is free of sleepers, temporary boarding (8) for retaining the ballast (2) remaining outside the section (7)

15 without sleepers is arranged.

6. Method according to one of the preceding claims, characterized in that at least two sleeper blocks (10) are placed in a respective concrete slab (9) and inserted

20 together with the concrete slab (9).

7. Method according to claim 6, characterized in that the concrete slabs (9) are inserted by lowering them between the rails (5) while oriented in the longitudinal direction of the rails (5) and turning them around below the rails (5).

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8. Method according to one of the preceding claims, characterized in that before filling in the infill concrete (24), the space to be filled is separated by form boards.

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9. Method according to one of the preceding claims, characterized in that after the infill concrete (24) has hardened, the sleepers (3) that were initially pushed together are again set apart and ballast (2) is packed under them.

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10. Sleeper unit for implementing the method according to one of the preceding claims, consisting of a concrete slab (9) and of at least two sleeper blocks (10) received therein
5 that are provided with fixtures (11) for rails (5).

11. Sleeper unit according to claim 10, characterized in that threaded sleeves (14) for lifting spindles are embedded in the concrete slab (9).

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12. Sleeper unit according to one of claims 10 to 11, characterized in that at least one lateral surface thereof is provided with a recess (12) in the area of the fixture (11).

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13. Sleeper unit according to one of claims 10 to 12, characterized in that each sleeper block (10) is received in the concrete slab (9) with an intercalated elastic shoe that partly encloses the sleeper block.

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14. Support (17) for implementing the method according to one of claims 1 to 9, consisting of a supporting body (18) and of a bearing plate (20) for the rail (5), characterized in that adjusting means (22) for adjusting the distance
25 between the supporting body (18) and the bearing plate (20) are provided.

15. Support (17) according to claim 14, characterized in that on the bearing plate (20), fixtures (21) for fastening
30 the rails (5) are arranged and preferably retaining means (23) for lateral fasteners (16) are arranged.