

SPECIFICATION

Grate Bar Assembly

The present invention relates to a grate bar assembly and to a reciprocating grate comprising a plurality of such grate bar assemblies.

Air gaps must be present between the individual grate bars in grate furnaces to allow for thermal expansion and for the introduction of combustion air to the burning mass on the grate.

In the case of known grates some of the burning mass may get into these gaps and tend to enlarge them. The displacement of individual grate bars out of their normal working position can result in the rising-up of individual grate bars and the wedging of entire grate stages.

To avoid the rising-up of the grate bars, it has been proposed to shape onto each grate bar at least one lateral projection which engages into an opening of the adjacent grate bar or under a rib of the adjacent grate bar, whereby the grate bars are coupled with one another. To prevent lateral deviation of the grate bars it has been proposed for example to use movable lateral limiting plates. DE-PS 911,317 discloses a grate in which adjacent grate bars are connected by means of a hook-like coupling, whereby not only rising-up of individual grate bars but also their mutual moving apart is prevented. When the hook-like coupling device engages in a longitudinal slot of an adjacent grate bar, mutual relative displacement of adjacent grate bars is possible which allows the air gaps between adjacent grate bars to be cleaned of ingressed foreign bodies. In that case, one of the grate bars is non-displaceably suspended on a carrier frame, while the adjacent grate bar bears with play on the carrier frame.

When foreign bodies between adjacent grate bars prevent the free mobility of the movable bar, the end of the movable grate bar resting loosely on the carrier frame may lift off. Since the coupling, which connects adjacent bars is provided either in the forward half or in the middle of the grate bar, a scissors effect arises because adjacent grate bars are pivotable relative to one another about a common axis formed by the coupling device. The end, disposed opposite the end at which the bar is suspended, of the firmly suspended grate bar can lift off from the grate bar lying thereunder. Further parts from the burning layer can then penetrate between the grate bars pivoted relative to one another and prevent the grate bar which is raised at its suspension end from lowering. The grate stage concerned cannot operate effectively in this state and there is the danger that this grate stage may block and in some circumstances be destroyed.

According to the present invention there is provided a grate bar assembly for a reciprocating grate, comprising a plurality of elongate grate bars disposed side-by-side and carrier means to support an end portion of each bar, each bar being coupled to an adjacent bar at a first region thereof remote from the end portion and at a second region thereof between the first region

and the end portion by coupling means acting to prevent at least one of the bars of each two adjacent intercoupled bars from movement at least in an upward direction relative to the respective other one of the two bars.

Each bar may be provided with a recess for engagement by the carrier means. Preferably, the respective other end portion of each bar normally rests on a respective further such bar.

The coupling means of an adjacent pair of side-by-side bars is preferably displaceable relative to at least one of the bars in the longitudinal direction of the grate bars.

The coupling means at the second region may comprise projections each extending from a respective bar for supporting an adjacent bar, the adjacent bar preferably being provided with an opening to receive the projection.

Advantageously, at least one of an adjacent pair of side-by-side bars may be provided with opening means, the coupling means of the second region of the other bar of that pair comprising rod means extending through the opening means.

For preference, the coupling means at the second region of each bar comprises hook means to limit movement of that bar relative to a respective intercoupled bar in a direction transverse to the longitudinal direction of the bar.

Embodiments of the present invention will now be more particularly described by way of example and with reference to the accompanying drawings, in which:—

Fig. 1 shows a section through a grate bar and a view onto an adjacent grate bar of a known grate covering,

Fig. 2 shows a section through a first embodiment of a grate bar within a grate covering,

Fig. 3 shows a section along line III—III of Fig. 2,

Fig. 4 shows a longitudinal section through a second embodiment of a grate bar within a grate covering,

Fig. 5 shows a section along line V—V of Fig. 4,

Fig. 6 shows a longitudinal section through a third embodiment of a grate bar within a grate covering,

Fig. 7 shows a section along line VII—VII of Fig. 6,

Fig. 8 shows a longitudinal section through a fourth embodiment of a grate bar within a grate covering,

Fig. 9 shows a section along line IX—IX of Fig. 8,

Fig. 10 shows a longitudinal section through a fifth embodiment of a grate bar within a grate covering, and

Fig. 11 shows a section along line XI—XI of Fig. 10.

Referring now to the accompanying drawings, two grate bars of a known grate covering, which are designated by 1 and 1', are shown in Fig. 1. The grate bar 1 is sectioned in its longitudinal direction. The two grate bars 1 and 1' have ends 2 and 3, respectively, by which the bars can be

hung on a suspension rail 4 of a carrier frame (not shown). In a region remote from the ends 2 and 3, the grate bars 1 and 1' are pivotally connected together by a coupling device in the form of a bolt 5 in such a manner as to substantially prevent relative upward displacement. The coupling device 5 acts as a pivot around which each grate bar 1 and 1' is movable relative to the other when a tilting moment occurs which raises the grate bar 1, loosely resting on the suspension rail 4.

This scissors-like splaying apart of adjacent grate bars is avoided by the embodiments of the present invention described below.

In the embodiment shown in Figs. 2 and 3, adjacent grate bars 6, which have a T-shaped cross-section, are coupled with one another by means of a projection 8 shaped onto the underside of the grate bar back 7 at one side of the grate bar. The projection 8 engages below the grate bar back 7 of the adjacent grate bar 6. Since the projection 8 is disposed at the suspension end 9 of the grate bar 6, a scissors effect is inhibited.

Since the projection 8 of the grate bar 6 engages below the grate bar back 7 of the adjacent grate bar, it is displaceable relative to this so that the grate bars can move relative to one another as well as be non-displaceable in their longitudinal direction.

In the embodiment shown in Figs. 4 and 5, all the grate bars 11 of one grate stage are connected with one another through a rod member 12, which is led through openings 13 in ribs 14 of the grate bars 11. The openings 13 can be matched to the cross-section of the rod member 12, when grate bars which are non-displaceable in their longitudinal direction are concerned. If, however, every second grate bar is displaceable in its longitudinal direction relative to its adjacent grate bar, then the opening 13 of this grate bar is in the form of an elongate hole, as indicated by chain-dotted lines in Fig. 4.

In the embodiment shown in Figs. 6 and 7, different grate bars 15 and 16, which have a U-shaped cross-section, are arranged within a grate stage. The grate bars 16, in the proximity of their suspension end portion, have side portions 17 which are provided with an opening 18, through which a rod member 19 extends by for example being plugged through the opening. The rod member 19 engages below the limbs 20 of adjacent grate bars 15 which at this location do not have side portions corresponding to the side portions 17. In this embodiment, the grate bars 15 are firmly hung into the not illustrated suspension rail, while the grate bars 16 are laid onto the suspension rail to be movable relative to the grate bars 15 in their longitudinal direction. Raising of the grate bar 16, which rests with play, from the suspension rail is not possible because the rod member 19 engages below the limbs 20 of the grate bars 15, which are suspended firmly, i.e. not raisable.

In the embodiment shown in Figs. 8 and 9, the grate bars are equally constructed in respect of their coupling at the suspension end portion and

are therefore provided with the same reference numeral 21. These grate bars are U-shaped in cross-section have an opening 23 in one limb 22 and a projection 25 extending from the other limb 24. In the assembled state of the grate bars the projection 25 of one grate bar engages into the opening 23 of the adjacent grate bar. When grate bars, which are movable relative to the suspension rail and thereby also displaceable relative to the adjacent grate bar, alternate with grate bars firmly suspended from the suspension rail, then it is necessary for the openings 23 to be in the form of elongate holes as indicated by chain-dotted lines in Fig. 8.

Designated by 25' is a hook-like projection which is indicated in Fig. 9 by chain-dotted lines and which serves for the coupling of adjacent grate bars in their transverse direction.

In the embodiment shown in Figs. 10 and 11, the grate bars have a T-shaped cross-section and firmly suspended grate bars 26 alternate with grate bars 27 which are displaceable relative thereto. The webs or ribs 28 of the displaceably suspended grate bars 27 are provided with an opening 29, through which a rod member 30 extends, which by its projecting ends engages below the grate bar backs 31 of adjacent stationary grate bars so that the grate bar 27, loosely laid on the suspension rail, cannot be raised in the region of its suspension end portion.

All embodiments of grate bars illustrated in the Figs. 2 to 11 may be coupled together in their region lying opposite the suspension end portion by means of a coupling device 5 corresponding to that shown in Fig. 1.

Claims

1. A grate bar assembly for a reciprocating grate, comprising a plurality of elongate grate bars disposed side-by-side and carrier means to support an end portion of each bar, each bar being coupled to an adjacent bar at a first region thereof remote from the end portion and at a second region thereof between the first region and the end portion by coupling means acting to prevent at least one of the bars of each two adjacent intercoupled bars from movement at least in an upward direction relative to the respective other one of the two bars.

2. An assembly as claimed in Claim 1, wherein each bar is provided with a recess for engagement by the carrier means.

3. An assembly as claimed in either Claim 1 or Claim 2, wherein the respective other end portion of each bar normally rests on a respective further such bar.

4. An assembly as claimed in any one of the preceding claim, the coupling means of an adjacent pair of side-by-side bars being displaceable relative to at least one of the bars in the longitudinal direction of the grate bars.

5. An assembly as claimed in any one of the preceding claims, the coupling means at the second regions of the bars comprising projections



hung on a suspension rail 4 of a carrier frame (not shown). In a region remote from the ends 2 and 3, the grate bars 1 and 1' are pivotally connected together by a coupling device in the form of a bolt 5 in such a manner as to substantially prevent relative upward displacement. The coupling device 5 acts as a pivot around which each grate bar 1 and 1' is movable relative to the other when a tilting moment occurs which raises the grate bar 1, loosely resting on the suspension rail 4.

This scissors-like splaying apart of adjacent grate bars is avoided by the embodiments of the present invention described below.

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Since the projection 8 of the grate bar 6 engages below the grate bar back 7 of the adjacent grate bar, it is displaceable relative to this so that the grate bars can move relative to one another as well as be non-displaceable in their longitudinal direction.

In the embodiment shown in Figs. 4 and 5, all the grate bars 11 of one grate stage are connected with one another through a rod member 12, which is led through openings 13 in ribs 14 of the grate bars 11. The openings 11 can be matched to the cross-section of the rod member 12, when grate bars which are non-displaceable in their longitudinal direction are concerned. If, however, every second grate bar is displaceable in its longitudinal direction relative to its adjacent grate bar, then the opening 13 of this grate bar is in the form of an elongate hole, as indicated by chain-dotted lines in Fig. 4.

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In the embodiment shown in Figs. 8 and 9, the grate bars are equally constructed in respect of their coupling at the suspension end portion and

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Designated by 25' is a hook-like projection which is indicated in Fig. 9 by chain-dotted lines and which serves for the coupling of adjacent grate bars in their transverse direction.

In the embodiment shown in Figs. 10 and 11, the grate bars have a T-shaped cross-section and firmly suspended grate bars 26 alternate with grate bars 27 which are displaceable relative thereto. The webs or ribs 28 of the displaceably suspended grate bars 27 are provided with an opening 29, through which a rod member 30 extends, which by its projecting ends engages below the grate bar backs 31 of adjacent stationary grate bars so that the grate bar 27, loosely laid on the suspension rail, cannot be raised in the region of its suspension end portion.

All embodiments of grate bars illustrated in the Figs. 2 to 11 may be coupled together in their region lying opposite the suspension end portion by means of a coupling device 5 corresponding to that shown in Fig. 1.

Claims

1. A grate bar assembly for a reciprocating grate, comprising a plurality of elongate grate bars disposed side-by-side and carrier means to support an end portion of each bar, each bar being coupled to an adjacent bar at a first region thereof remote from the end portion and at a second region thereof between the first region and the end portion by coupling means acting to prevent at least one of the bars of each two adjacent intercoupled bars from movement at least in an upward direction relative to the respective other one of the two bars.

2. An assembly as claimed in Claim 1, wherein each bar is provided with a recess for engagement by the carrier means.

3. An assembly as claimed in either Claim 1 or Claim 2, wherein the respective other end portion of each bar normally rests on a respective further such bar.

4. An assembly as claimed in any one of the preceding claim, the coupling means of an adjacent pair of side-by-side bars being displaceable relative to at least one of the bars in the longitudinal direction of the grate bars.

5. An assembly as claimed in any one of the preceding claims, the coupling means at the second regions of the bars comprising projections



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each extending from a respective bar for supporting an adjacent bar.

- 5 6. An assembly as claimed in Claim 5, wherein said adjacent bar is provided with an opening to receive the projection.

- 10 7. An assembly as claimed in any one of the preceding claims, wherein at least one of an adjacent pair of side-by-side bars is provided with opening means, the coupling means at the second region of the other bar of that pair comprising rod means extending through the opening means.

8. An assembly as claimed in any one of the preceding claims, the coupling means at the

- 15 second region of each bar comprising hook means to limit movement of that bar relative to a respective intercoupled bar in a direction transverse to the longitudinal direction of the bars.

- 20 9. A grate bar assembly substantially as hereinbefore described with reference to Figs. 2 and 3, Figs. 4 and 5, Figs. 6 and 7, Figs. 8 and 9 or Figs. 10 and 11 of the accompanying drawings.

- 25 10. A reciprocating grate comprising a plurality of grate bar assemblies, each as claimed in any one of the preceding claims.