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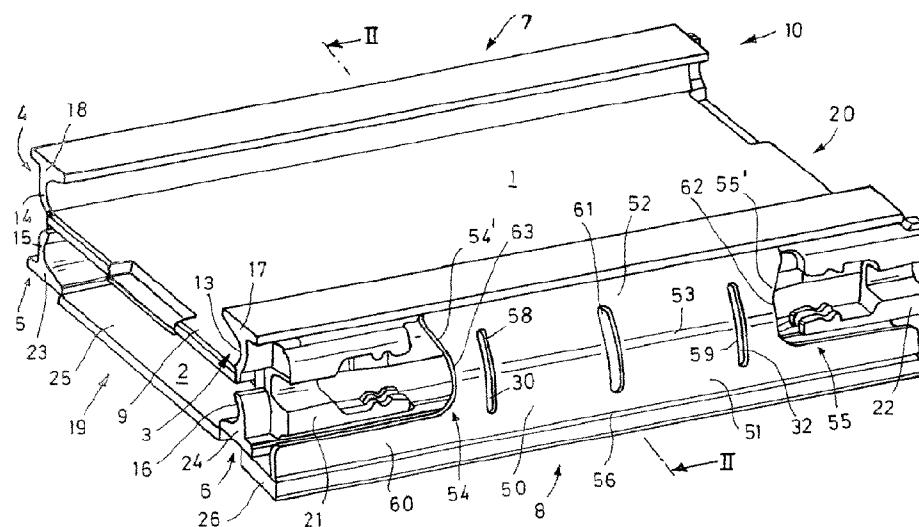
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[Fortsetzung auf der nächsten Seite]

(54) **Title:** TROUGH PAN FOR A FACE CONVEYOR WITH A LOADING RAMP

(54) **Bezeichnung:** RINNENSCHUSS FÜR STREBFÖRDERER MIT LADERAMPE



(57) **Abstract:** The invention relates to a trough pan (10) for face conveyors for underground coal mining systems, comprising a hoisting compartment (1) and a return compartment (2) between which a groove bottom (9) is formed, consisting of toggle pouches (21), with guiding means for an extraction machine which can be moved along a working face, especially a roller-type loader, and a static loading ramp which extends from the footwall to the winding compartment and which is connected on the working face side to the trough pan and which is used to load coal that is won into the hoisting compartment when the face conveyor is moved. The loading ramp consists of a bent guiding plate (50) which extends in a steeper manner (50) towards the groove bottom (9) or working face (11) than in the top section (52), whereby the trough pan (10) has a very compact design and does not have a tendency to rise upwards.

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WO 03/091541 A1



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Zur Erklärung der Zweibuchstaben-Codes und der anderen Abkürzungen wird auf die Erklärungen ("Guidance Notes on Codes and Abbreviations") am Anfang jeder regulären Ausgabe der PCT-Gazette verwiesen.

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(57) Zusammenfassung: Die Erfindung betrifft einen Rinnenschuss (10) für Strebförderer von untertägigen Kohलगewinnungsanlagen, mit Fördertrum (1) und Rücklauftrum (2), zwischen denen ein Rinnenboden (9) ausgebildet ist, mit Knebeltaschen (21), mit Führungsmitteln für eine am Abbaustoss entlangbewegbare Gewinnungsmaschine, insbesondere einen Walzenlader und mit einer abbaustossseitig am Rinnenschuss angeschlossenen, vom Liegenden bis auf Höhe des Fördertrums sich erstreckenden statischen Laderampe, über die beim Rücken des Strebförderers Haulwerk in den Fördertrum ladbar ist. Die Laderampe besteht aus einem abgewinkelten Leitblech (50), das in seinem unteren Abschnitt (51) steiler zum Rinnenboden (9) bzw. Liegenden (11) verläuft als im oberen Abschnitt (52). Hierdurch baut der Rinnenschuss (10) sehr kompakt und zeigt keine Kletterneigung.

CONVEYOR PAN FOR FACE CONVEYORS WITH LOADING RAMP

The invention relates to a conveyor pan for face conveyors in underground winning systems, in particular coal winning systems, with outward race and return
5 race for guiding a scraper chain, between which a conveyor bottom is formed, with securing means attached to the ends of the conveyor pans on the goaf side and the wall side for a connecting component linking adjacent conveyor pans traction-proof together, preferably with guide means for a mining machine which may be moved along the wall and with a static loading ramp connected to the conveyor pan on the
10 wall side and extending from the floor to the level of the outward race, by means of which muck may be loaded into the outward race as the face conveyor is advanced.

Conveyor pans for face conveyors are known in various embodiments. In underground workings in which the mining machine travels along the wall, as for example in workings using a plow, the muck can be loaded into the outward race of
15 the face conveyor by means of special devices or guide plates on the mining machine. Conveyor pans with static loading ramps are used in particular in mining systems which operate using traveling mining machines, moving along between the conveyor and the wall, which have stationary mining machines, for example attached to the powered support assembly (DE 197 36 662), or which are designed as guides
20 for drum cutter-loaders. In this type of workings with drum cutter-loaders the guide means on the wall side, for example a sliding rail or track for the drum cutter-loader, may simultaneously also form the lower section of the face conveyor loading ramp (DE 197 20 536).

Within face support systems, the conveyor pans connected together to form a
25 face conveyor are advanced by means of the booms or pushers abutting the powered shield support frames. During advancing, the conveyor pans of the face conveyor tend to climb, in other words to rise up off the floor, and this disadvantageous climbing has to be countered with suitable control measures for adjusting the cutting horizon. Climbing of the face conveyor is particularly
30 disadvantageous when, as in the case of drum cutter-loaders, the mining machine is guided along the face conveyor.

Clearly the prior art devices discussed above have well recognized shortcomings and/or limitations. It would be advantageous if a way could be found of

at least ameliorating the shortcomings of the art discussed above. It would be particularly advantageous if a way could be found of reducing the tendency of a conveyor pan of a face conveyor to climb.

According to one aspect of this invention there is provided a conveyor pan for
5 face conveyors in underground mining systems, in particular coal mining systems, with outward race and return race to guide a scraper chain, between which a conveyor bottom is disposed, with holding means on the goaf side and on the wall side located at the conveyor pan ends for a connecting component to link adjacent conveyor pans together, preferably with guide means for a mining machine which may be moved
10 along the wall and with a static loading ramp connected to the conveyor pan on the wall side and extending from the floor to the level of the outward race, by means of which muck may be loaded into the outward race as the face conveyor is advanced and which consists of a curved or angled guide plate, the lower section of which is steeper relative to the floor or to the conveyor bottom than its upper section, wherein the
15 guide plate) is equipped at the conveyor pan ends with recesses, the size of which is matched to the dimensions of the holding means and/or conveyor pan-connecting component.

Thus the loading ramp consists of a curved or, in particular, an angled guide plate, the lower section of which is steeper relative to the floor or relative to the
20 bottom of the channel than its upper section. Static loading ramps in the prior art consisted of modular components which on the wall side were attached to the side walls or side sections of the conveyor pans and a ramp which was flat for the entire extent of the conveyor pan, i.e. was disposed in a wedge-shaped position relative to the wall or to the floor or, alternatively, had a curved ramp with a relatively flat lower
25 section, becoming steeper towards the outward race, and thus being curved towards the wall. The applicant has determined that by attachment of a wall-side guide plate and modification of the contour of the guide plate into a curve away from the wall the climbing tendency of the face conveyor during advancing is reduced. The curve entails in particular bending the guide plate such that its lower section is steeper. By
30 means of these measures the static loading ramp is kept relatively short overall and increases the overall weight of the conveyor pan only slightly.

2A

In the embodiment of the conveyor pan preferred by the applicant the apex line of the curve or the apex line of the bend of the guide plate may be disposed at the level of the conveyor bottom, preferably between the middle and the underside of the conveyor bottom and/or positioned below the center line of the point of application of
5 force to the conveyor pan by the booms or pushers abutting the support system, and consequently below the articulation point of the advancing system disposed on the goaf side for moving the face conveyor. A particularly preferred variant has a guide plate with sections angled relative to each other, with the lower and the upper section both being essentially flat and enclosing an angle of approximately 150° - 170° ,
10 preferably approximately $160^{\circ} \pm 4^{\circ}$. It is also advantageous if the lower section is angled by approximately 65° - 85° , preferably $78^{\circ} \pm 4^{\circ}$, relative to the conveyor bottom and the upper section is angled by approximately 45° - 65° , preferably $55^{\circ} \pm 4^{\circ}$, relative to the conveyor bottom.

The securing means on the conveyor pan preferably consist of toggle bolt sockets and the conveyor pan connecting components preferably consist of toggle bolts, the heads of which can be inserted in the sockets. The recess may in particular be formed such that the lower section of the guide plate has or forms a bar at the lower edge, this bar extending as far as both conveyor pan ends, so that the guide plate at its lower edge is fully in contact with the conveyor pan's sheet metal bottom or similar and only has recesses at the respective conveyor pan ends, into which slack and fines can enter. Since after a short period of operation of the face conveyor these recesses clog up, the loading performance of the static loading ramp is not impacted by the recesses and the conveyor pan in accordance with the present invention retains its lesser degree of disadvantageous climbing by comparison with generic conveyor pans. The limiting wall of the recess, which runs essentially parallel to the conveyor pan ends and continues as far as the level of the outward race, is preferably equipped with a detent, so that on the one hand sufficient clearance is provided to insert/remove the heads of the toggles, and on the other hand by means of the detent a type of cutout is created, thus giving, at the transition point from the guide plate to the recess, a better direction of the forces to be absorbed into the connected or welded-on area of the conveyor pan.

In a preferred embodiment the guide plate is welded to the conveyor pan. This is particularly advantageous if the lower section of the guide plate, in particular the bar at its lower edge, is welded to a bottom bar on the wall side, to a sliding bar or to a machinery guide for the mining machine. By means of the weld seam at the lower edge and the connection with a bottom bar or sliding bar the layers of muck disposed on the floor are forced upwards over the entire width of the conveyor pan as the conveyor is advanced, without its being possible for coal or similar in this area to penetrate behind the guide plate and cause disadvantageous climbing of the conveyor.

The guide plate in accordance with the present invention may be used both with conveyor pans having lower race and outward race permanently attached to each other and with conveyor pans having a removable trough as the outward race. With the permanently attached outward race, the side section may consist of rolled steel sections and comprise an approximately T-shaped cross-section, as is known for example from DE 40 06 183 A1, rendering it possible for the upper section of the guide plate to be welded to the underside of the horizontal web of the L-shaped or T-

shaped side section. With conveyor pans having a removable trough as the outward race the upper section of the guide plate is preferably welded to the framework holding the removable trough.

Since considerable forces are applied to the guide plate when the face conveyor is advanced and when muck is loaded into the outward race, it is preferable if at least two support plates are disposed between the guide plate and the side wall on the wall side and/or the side sections of the outward race and/or return race. This also makes it possible to keep the thickness of the guide plate relatively low. It is beneficial if the guide plate then features vertical slots at the level of the support plates, so that additional weld seams can be located in the slots, thus connecting the guide plate to the conveyor pan. The guide plate may be equipped with a hole for the hook of a lifting device, either between the slotted recesses and/or in the center.

The preferred application of the conveyor pans in accordance with the present invention is with face conveyors having guide means for a cutting mining machine, in particular having guide means for a drum cutter-loader. In the case of a conveyor pan having guide means for a drum cutter-loader the tendency to climb can be further minimized if the horizontal web of the outward race's side section on the wall side simultaneously forms the wall-side guide for the drum cutter-loader and the drum cutter-loader then runs on that horizontal web. These measures also allow the mining machine to be kept more compact, so that the roof shield over the shield supports can also be kept shorter than with conveyor pans featuring on the wall side a separate machine track ahead of the wall-side side section of the conveyor pans.

Further advantages and embodiments of the conveyor pan in accordance with the present invention will be found in the following description of an exemplary embodiment represented in the drawing. In the drawing:

Figure 1 shows a perspective view of a conveyor pan in accordance with the present invention with a guide plate welded on the wall side as the loading ramp; and

Figure 2 shows a partial cross-sectional view along line II-II in Figure 1.

Conveyor pan 10 shown in perspective in Figure 1 is used, for example, on center-chain or double center-chain scraper conveyors, on which the single or double scraper chain is guided approximately in the middle of the conveying trough and on which the ends of the scrapers are guided in guide channels, formed in upper out-

ward race 1 and in return race or lower race 2 and, for example, limited by means of T-shaped side sections 3, 4, 5, 6. A face conveyor is then formed in the normal manner from individual conveyor pans 10. The longitudinal side 7 of the face conveyor, shown in the rear of Figure 1, is disposed on the goaf side, while the longitudinal side 8, shown in the front of Figure 1, is aligned parallel to the wall in the underground face, not shown. Between outward race 1 and lower race 2 is a conveyor bottom 9, to which are welded -in the exemplary embodiment shown - all side sections 3, 4, 5, 6 with their supports 13, 14, 15, 16 facing conveyor bottom 9 and matched to the shape of the scrapers, not shown. In the exemplary embodiment shown, all side sections 3 to 6 are identical and consist of rolled steel sections of an essentially T-shaped cross-section, with the supports 13, 14, 15, 16, matched in shape to the scraper ends, forming the "stalk" of the T and transitioning into a horizontal web 17, 18, 23, 24. Both on the goaf side and on the wall side, toggle sockets 21 or 22 are welded in the vicinity, respectively, of the conveyor pan ends 19 or 20 formed by the transverse sides, into which the toggle heads of toggle bolts engage in the normal manner, in order to join together adjacent conveyor pans 10 such that they are resistant to traction but have a slight permissible horizontal and vertical angular movement. The toggle sockets on the goaf side and the toggle bolts are not shown. A bottom plate 25 is welded in place below horizontal webs 23, 24 of the side sections 5, 6 of lower race 2. Figure 1 also shows that, as is already known, conveyor bottom 9 is fitted at both conveyor pan ends 19, 20 with overlapping sections shaped to match each other.

In accordance with the present invention conveyor pan 10 comprises on the wall side 8 a static loading ramp for muck from loosened rock, in particular loosened coal, consisting of the guide plate identified in its entirety as 50, welded to conveyor pan 10 and extending from floor 11 (Figure 2) up to the level of outward race 1. Guide plate 50 comprises a lower section 51 and an upper section 52, which are each essentially flat and are angled relative to each other at the apex line 53. In the area of the two toggle sockets 21, 22 guide plate 50 is fitted with recesses 54, 55, extending over the entire height of upper section 52 and over approximately half the height of lower section 51. The scale and dimensions of recesses 54, 55 on guide plate 50 are matched to the scale and dimensions of toggle sockets 21, 22 and to those of the toggle bolts, not shown, that can be engaged in the latter. Lower edge

56 of guide plate's 50 lower section 51 extends over the entire width of the conveyor pan, so that guide plate 50 forms a narrow bar 60 extending over the entire width of the conveyor pan, in order to direct the muck towards outward race 1 as the face conveyor is advanced. The lower edge of the bar 60 is welded to a sliding bar 26 by means of a weld seam (57, Figure 2), with the sliding bar being welded below the horizontal web 24 of the lower side section 6 on the wall side. The sliding bar extends beyond the side wall of conveyor pan 10 formed by the outer faces of side sections 3, 6 and conveyor bottom 9, on the wall side. Bar 60 forms the lower limiting wall of recesses 54, 55 while the essentially vertical limiting wall 54', 55' of recesses 54, 55 is fitted approximately at the level of apex line 53 with a detent 62 or 63. As a result of detent 62, 63 the upper section 52 of the guide plates transitions in a curve into the conveyor pan. Detents 62, 63 and the curved shape reduce the danger of formation of fracture cracks in side section 3.

As Figure 2 shows clearly, sliding bar 26 is slightly angled relative to the conveyor bottom or to sheet metal bottom 25 by approximately 5° , so that conveyor pan 10 is in contact with floor 11 in the underground face only in the frontal area 27 of the underside of sliding bar 26. Figure 2 also shows in particular that guide plate 50 forming the loading ramp includes an angle α of approximately 160° between lower section 51 and upper section 52 and that lower section 51 of guide plate 50 is steeper relative to floor 11 or to conveyor bottom 9 than upper section 52. The bend of the lower, essentially flat section 51 of guide plate 50 relative to conveyor bottom 9 is shown in Figure 2 as β and is approximately $78^\circ \pm 4^\circ$, while the angle γ of upper section 52 to conveyor bottom 9 is approximately $55^\circ \pm 4^\circ$. As a result of this differing slope of lower section 51 and upper section 52 and the overall extremely steep shape of loading ramp 50 between the wall-side front face 28 of sliding bar 26 and the front face 29 of horizontal web 17 of the outward race's side section 3, the conveyor pan in accordance with the present invention is made considerably shorter than was the case with known conveyor pans.

Between guide plate 50 and the outer faces of side sections 3, 6 support plates 30 are disposed, with the wall-side edge 31 being matched to the contour of the bend of guide plate 50. Support plates 30 are welded to side sections 3, 6 and if appropriate also to conveyor bottom 9, and guide plate 50 features, as shown in Fig-

ure 1, two vertical slots 58, 59, which run level with and parallel to support plates 30, 32, in order that weld seams in vertical slots 58, 69 may give additional reinforcement between guide plate 50 and support plates 30, 32. Between vertical slots 58, 59 a hook hole 61 is formed, being located in the center of guide plate 50 and being
5 vertically disposed.

The representation of conveyor pan 10 does not show the guide means for a mining machine. In the preferred application of the conveyor pans a mounting shaft with, for example, a drive rack for a drum cutter-loader is mounted on the goaf side and the upper face 17 of the horizontal web 17 of the wall-side side section 3 of out-
10 ward race 1 forms a track for the drum cutter-loader.

The person skilled in the art can deduce from the preceding description a series of modifications which are also intended to fall within the protection of the dependent claims. In one embodiment, not shown, with removable trough the upper edge of the guide plate is welded to the frame construction for supporting and fixing the
15 removable trough. In addition, ahead of the angled guide plate forming the static loading ramp a section of a machine track could also be formed. Instead of an angled guide plate with flat sections the guide plate could also be rounded or curved, within limits, and the apex line could also be located higher than the conveyor bottom. The securing means and conveyor pan-joining components could be different from the
20 toggle sockets and matching toggle bolts shown, which would also cause the shape of the recesses to be different.

The reference to any prior art in this specification is not, and should not be taken as an acknowledgement or any form of suggestion that the referenced prior art forms part of the common general knowledge in Australia.

25 In the specification and the claims the term "comprising" shall be understood to have a broad meaning similar to the term "including" and will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps. This definition also applies to variations on the term "comprising" such as "comprise" and
30 "comprises".

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A conveyor pan for face conveyors in underground mining systems, in particular coal mining systems, with outward race and return race to guide a scraper chain, between which a conveyor bottom is disposed, with holding means on the goaf side and on the wall side located at the conveyor pan ends for a connecting component to link adjacent conveyor pans together, preferably with guide means for a mining machine which may be moved along the wall and with a static loading ramp connected to the conveyor pan on the wall side and extending from the floor to the level of the outward race, by means of which muck may be loaded into the outward race as the face conveyor is advanced and which consists of a curved or angled guide plate, the lower section of which is steeper relative to the floor or to the conveyor bottom than its upper section, wherein the guide plate) is equipped at the conveyor pan ends with recesses, the size of which is matched to the dimensions of the holding means and/or conveyor pan-connecting component.
2. The conveyor pan as recited in Claim 1, wherein the apex line of the curve or bend of the guide plate is disposed at the level of the conveyor bottom, preferably between the middle and the underside of the conveyor bottom.
3. The conveyor pan as recited in Claim 1 or 2, wherein the apex line of the curve or bend of the guide plate is located below the articulation point of the advancing system or pusher beams disposed on the goaf side for moving the face conveyor.
4. The conveyor pan as recited in any one of Claims 1 to 3, wherein the lower section and the upper section of angled guide plate are essentially flat and include an angle (α) of approximately 150° - 170° , preferably approximately $160^{\circ} \pm 4^{\circ}$.
5. The conveyor pan as recited in any one of Claims 1 to 4, wherein the lower section is inclined relative to the conveyor bottom by an angle (β) of approximately 65° - 85° , preferably $78^{\circ} \pm 4^{\circ}$, and the upper section is inclined relative to the conveyor bottom by an angle (γ) of approximately 45° - 65° , preferably $55^{\circ} \pm 4^{\circ}$.

5 6. The conveyor pan as recited in any one of Claims 1 to 5, wherein the holding means consist of toggle bolt sockets and the conveyor pan-connecting components consist of toggle bolts, the toggle heads of which can be engaged in the toggle bolt sockets.

10 6. The conveyor pan as recited in any one of Claims 1 to 6, wherein the lower section of the guide plate forms a bar at the lower edge, which extends as far as the conveyor pan ends.

7. The conveyor pan as recited in claim 6 or 7, wherein the limiting wall of the recess is equipped with a detent parallel to the conveyor pan ends.

15 8. The conveyor pan as recited in any one of Claims 1 to 8, wherein the guide plate is welded to the conveyor pan.

20 9. The conveyor pan as recited in any one of Claims 1 to 9, wherein the lower section of the guide plate, in particular the bar at its lower edge, is welded to a sliding bar on the wall side or to a machinery guide for the mining machine.

10. The conveyor pan as recited in any one of Claims 1 to 10, wherein the upper section of the guide plate is welded to the underside or front face of the horizontal web of an approximately T-shaped or L-shaped and in particular rolled steel side section.

25 11. The conveyor pan as recited in any one of Claims 1 to 11, wherein the conveyor pan features a removable trough as the outward race and the upper section of the guide plate is welded to the frame holding the removable trough.

30 13. The conveyor pan as recited in any one of Claims 1 to 12, wherein in the center area of the guide plate, and preferably in the middle, a hole for a lifting hook is provided.

14. The conveyor pan as recited in any one of Claims 1 to 13, wherein at least two support plates are disposed between the guide plate and the side wall on the wall side and/or the side sections of the outward race and/or return race.

5 15. The conveyor pan as recited in Claim 14, wherein the guide plate has vertical slots at the level of the support plates.

10 16. The conveyor pan as recited in any one of Claims 1 to 15, wherein guide means for a cutting mining machine, in particular a drum cutter-loader, are provided with the horizontal web of the outward race's side section on the wall side preferably forming the wall-side guide for the drum cutter-loader.

15 17. A conveyor pan for a face conveyor substantially as hereinbefore described in the detailed description of the invention with reference to the accompanying drawings.

