United States Patent

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[33] **Germany**
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[54] **COAL-MINING MACHINE**
8 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **299/43,** 299/53
[51] **Int. Cl.** **E21c 27/24,** E21c 29/18
[50] **Field of Search** 299/34, 33, 43–46

[56] **References Cited**

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ABSTRACT: A coal mining machine movable between the coal seam and a conveyor, which by means of mining tools cuts the coal seam in front of the machine and which by means of a driving sprocket wheel engages a chain substantially parallel to the conveyor while a guiding rail is provided adjacent the mining machine which guiding rail has an inner substantially cylindrical surface with a longitudinal slot having a width at least wide enough to permit insertion of a chain into the guiding rail, said chain being located within the guiding rail which latter positively guides guiding members embracing said chain and connected to the mining machine.

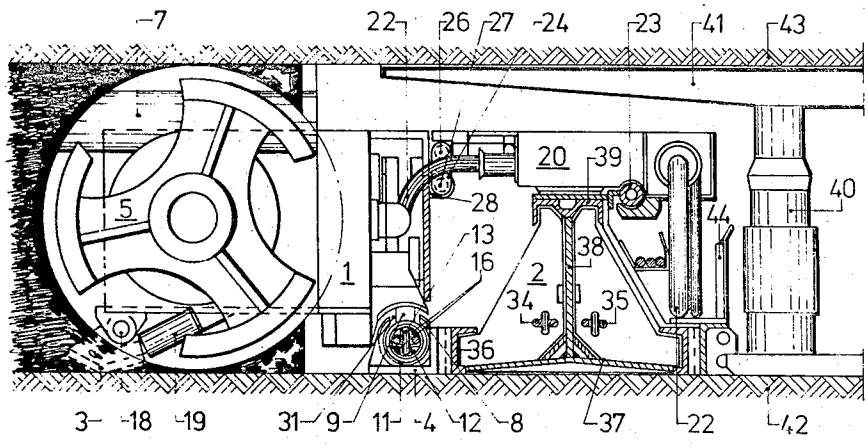

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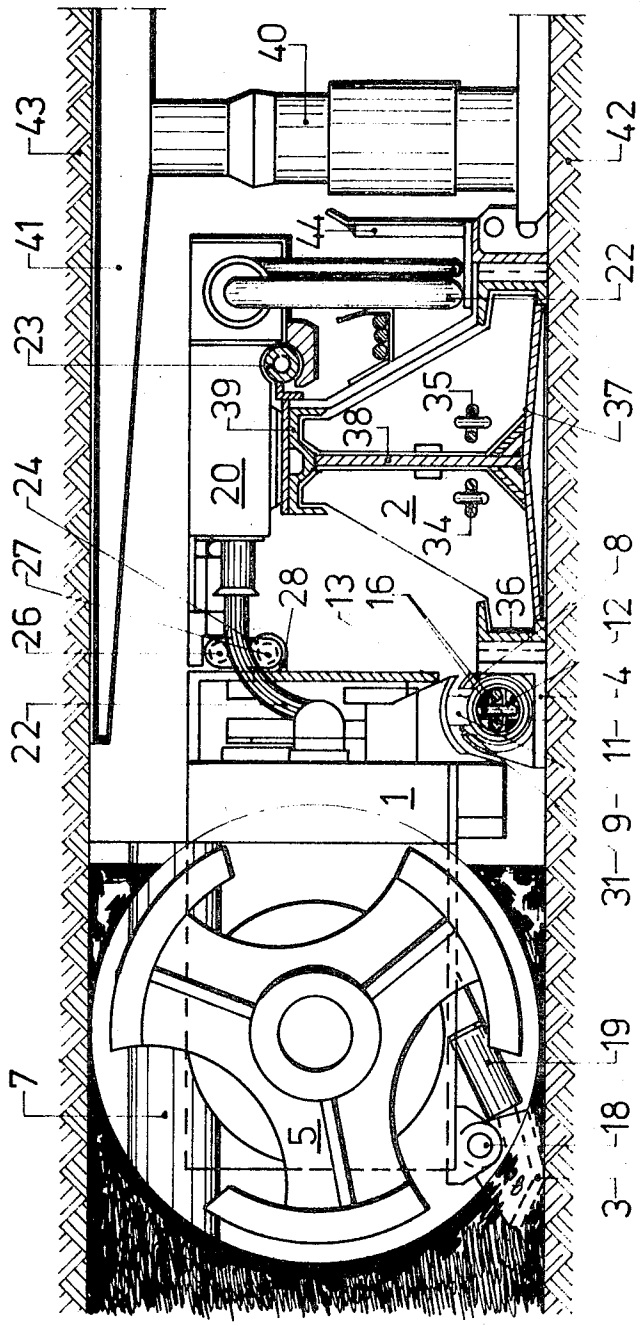
Fig. 1



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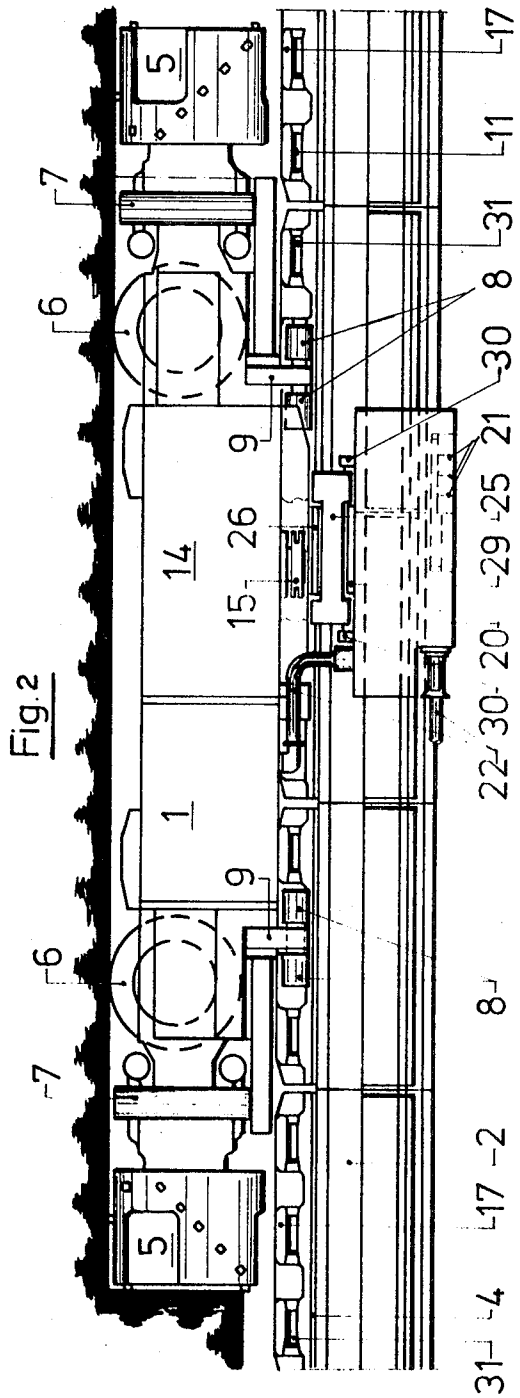

Fig.2

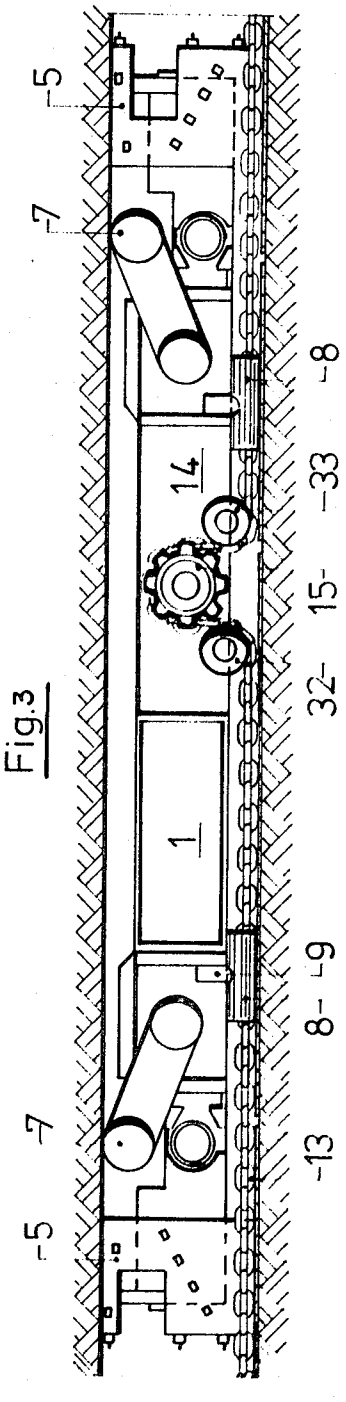

Fig.3

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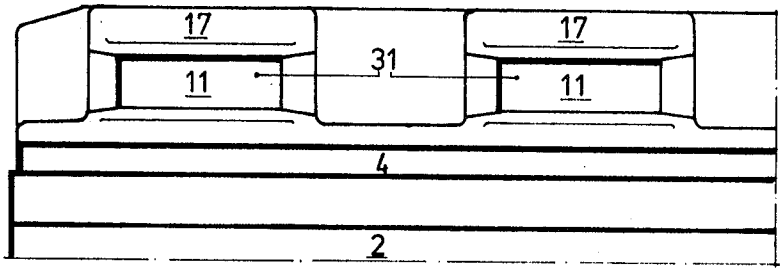


Fig.4

Fig.5

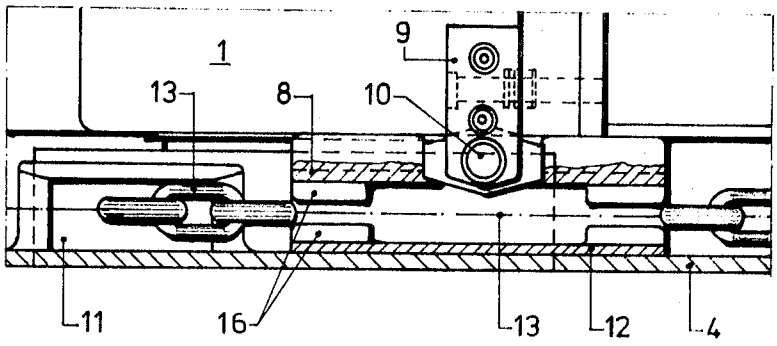
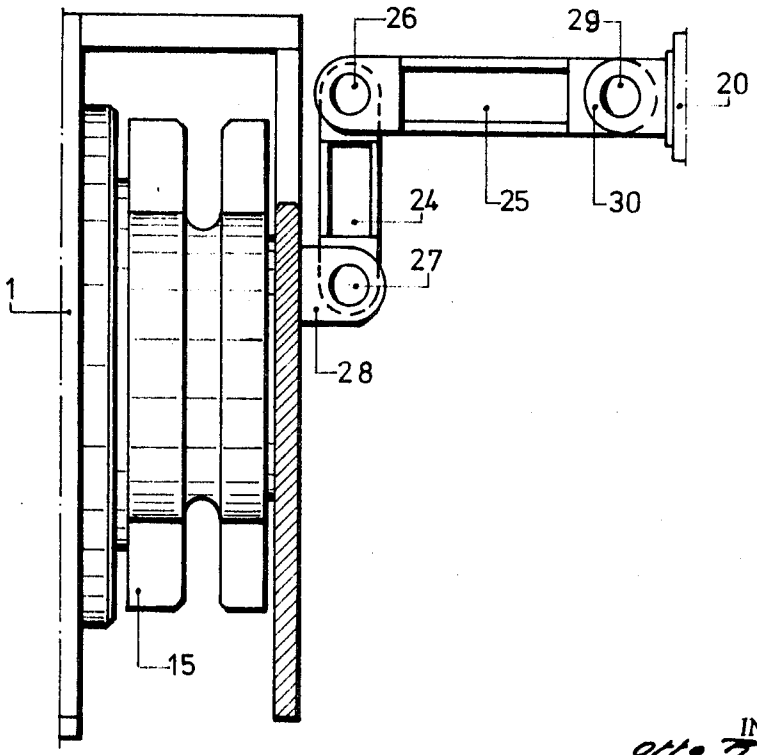


Fig.6



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COAL-MINING MACHINE

The present invention relates to a coal mining machine which is movable between the coal face and a conveyor. The machine is guided in a guiding rail on the conveyor and by means of a driving sprocket wheel engages a chain which extends parallel to the conveyor.

Mining machines of this type are at both end faces provided with a group of core bits. These core bits cut their driving field in both directions inasmuch as they loosen the respective section of the coal seam in front thereof by means of a plurality of adjacent core bits, and the thus loosened material is by means of a cutter chain, which circulates behind the core bits on the floor of the seam, conveyed to the long wall conveyor. Frequently, with machines of this type, the upper side of their housing heads are provided with two serially arranged cutter arms each which extend over the entire width of the machine and which loosen the coal which after the core bits have passed remains still suspended over the machine body and likewise convey the material to the long wall conveyor. When the machine body is relatively narrow, the core bits are arranged in a row one above the other.

These machines usually rest on the floor of the seam by means of skids and, more specifically, on that section which has just been cut free by the core bits and cutting tools. The supporting skids may be adjustable as to height. The guiding of such a cutting machine is effected by a, for instance, tubular rail which is fixedly connected to that wall of the conveyor which is adjacent to the coal seam. The machine is thus adapted to pivot about the guiding means by means of which it is pivotally mounted on the guiding rail, and in this way the machine can adapt itself to the irregular contour of the floor of the coal seam. The advancing movement is with a cutting machine of this type effected by a winch by means of which the sprocket wheel is driven which latter engages the chain extending parallel to the conveyor.

With heretofore known constructions of machines of this type, it was customary to extend the chain between the guiding rail and that sidewall of the conveyor which is adjacent the coal seam so that the engagement of the sprocket wheel with the chain was dependent on the position of the machine which position varies in conformity with the possible pivoting movement. As a result thereof, the possibility of pivoting the cutting machine was considerably limited.

It is an object of the present invention to provide a coal-cutting machine of the above-mentioned type in which the engagement of the sprocket wheel of the machine winch with the pulled chain extending parallel to the conveyor will not be affected by the pivoting movements of the machine body.

It is another object of this invention to assure a protective mounting of the chain so that the chain will always be in proper engagement with the sprocket wheel driven by the winch.

Still another object of the invention consists in mounting the cable for supplying the electric driving energy for the winch motor and the driving motor for the cutting tools on the mine-filling side of the conveyor and to guide said cable behind the conveyor into the mining machine while taking into consideration the pivoting capability of the machine.

It is still another object of the present invention so to design the supporting skids for the machine body that the said skids can be adjusted independently of the pivoting movement of the machine.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawings, in which:

FIG. 1 is a diagrammatic front view of the coal cutting machine according to the invention showing the conveyor in section and showing a view of the gantry protruding beyond the conveyor.

FIG. 2 is a top view of the mining machine according to the invention and shows a portion of the conveyor.

FIG. 3 is a side view of the mining machine according to the invention seen in the direction toward the coal face while the guiding rail has been omitted and the chain is being shown.

FIG. 4 represents a top view of the guiding rail but on a larger scale than that of FIGS. 1 to 3.

FIG. 5 illustrates on the same scale as FIG. 4 the guiding member in a longitudinal section.

FIG. 6 is a cutout of FIG. 1 on a larger scale than that of FIG. 1 and shows the connection between the gantry and the machine body.

The coal-cutting machine according to the present invention is characterized primarily in that the interior space of the guiding rail is cylindrical and has an upper longitudinal slot corresponding at least to the width of the chain, and is furthermore characterized in that the chain is located in the guiding rail and is positively engaged by hollow guiding members extending around the chain and pertaining to the coal-cutting machine.

Referring now to the drawings in detail, the coal-cutting machine **1** has associated therewith a long wall conveyor **2** and is supported on the floor of the coal seam by skids **3**. The guiding rail which is connected to that conveyor sidewall which is adjacent the coal face is designated with the reference numeral **4**. At both sides of the end face of the machine there are provided the cutter heads **5** which cut the coal in both driving directions. The cutting discs **6** cut the floor seam and the two cutting rollers **7** cut smooth the roof of the seam. The chain **13** is engaged by the sprocket wheel **15** which is driven by the winch **14**. The machine is guided in the guiding rail **4** by the two guiding members **8**.

The essence of the invention is seen in the fact that the inner space of the guiding rail **4** is cylindrical and has a longitudinal slot **31** which has a width at least sufficient to permit insertion of the chain **13**. The chain **13** is located in the guiding rail **4**, and the guiding members **8** of the cutting machine are hollow and positively engage the guiding rail **4**. With this way of guiding the cutting machine by guiding members **8** positively engaging the rail **4**, a relatively large pivoting range is available. Since the pivot axis of the machine and the path of the chain coincide, the chain engagement will not be affected or will hardly be affected by the pivoting movements of the machine.

Even when, as in the present embodiment, the round link chain is passed to the sprocket wheel **15** over reversing wheels **32** and **33** in order to obtain a larger loop, the arrangement is advantageous because the driving sprocket wheel which rotates above the guiding rail will in the presence of a pivotal movement of the machine move only slightly out of the plane of symmetry of the guiding rail.

The ends of the bores of the guiding members **8** are provided with noses **16** for guiding the chain **13**. In this way it will be assured that the driving sprocket wheel will meet the chain always in its proper position. The noses **16** see to it that the respective chain section therebetween is turned in conformity with the respective pivoting position of the machine body. The chain engagement will in this way be completely independent of the respective position of the cutting machine.

It is not necessary for the guiding rail to extend as to its total profile over the entire length of the long wall. It will rather suffice when the bottom plate of the rail, in other words one leg of the angle iron which is connected to that wall of the conveyor which is adjacent the coal face, will extend all the way through. The cylindrical upper profile of the guiding rail **4** may consist of individual short sections **17** which have to be spaced from each other by a distance less than the length of the guiding members **8**. This design of the profile sections **17** is clearly shown in FIG. **4**. From FIG. **4** there will also be seen the longitudinal slot **31** by means of which the profile opens toward the top. Since the distance of the sections **17**, as mentioned above, is less than the length of the guiding members **8**, the cutting machine **1** and the guiding rail **4** are permanently positively connected to each other.

The cylindrical guiding members **8** are pivotally mounted on extensions **9** of the machine body so as to be pivotable

about bolts 10 as is clearly shown in FIG. 5. The guiding members 8 engage the cylindrical inner space 11 of the guiding rail 4 and in the longitudinal bore 12 of said guiding rail 4 there is received the round link chain 13 which is always located within the guiding rail and (FIG. 3) is lifted out of said guiding rail by the reversing wheels 32 and 33 only in order to be passed over the sprocket wheel 15. The above-mentioned noses 16 see to it that the chain 1 is always passed in the proper position to one of the two reversing wheels 32, 33 and thus to the sprocket wheel 15. The following reversing wheel then passes the chain back to the guiding rail. Ahead of the reversing wheels 32 and 33 there are provided sliding plates (not illustrated) which hold the chain in its proper height and prevent vertically directed chain forces in the two guiding members 8 from becoming effective.

The skids 3 by means of which the cutting machine rests on the floor of the coal seam have a rolling surface which forms the circumference of a segment of a circle. The skids 3 are pivotable about a shaft 18. That end of the skids 3 which faces toward the mine-filling side is under the influence of the piston rod of a cylinder 19. That bottom of the pressure cylinder 19 which faces the conveyor 2 is located at the higher level than the point of attack of the piston rod. The pivot shaft 18 is eccentrically located with regard to the circular segment formed by the rolling surface of the skids.

In this form, the pressure cylinders introducing the pivoting movement into the skids require only little space and can easily be arranged below the machine body without increasing to any material extent the overall height of the mining machine. In addition thereto, the skids 3 are adapted in view of the particular design of the rolling surface as the peripheral surface of a circular segment and in view of the position of the pivot axis of the skids with regard to the pivot axis of the machine, to bring about a desired adjusting movement, namely a lifting and lowering of the machine already with a short stroke of the cylinder.

In cooperation with the mining machine according to the invention a conveyor 2 designed in a special way may be employed. More specifically, a scraper conveyor is involved according to which the scrapers, as seen in FIG. 1, have the approximate shape of right-angled triangles which with one of their sides extend on the bottom 37 while the other side extends along the intermediate wall 38. The conveyor trough, i.e. the trough which faces the coal face, and the trough which serves for guiding the slack section of the conveyor are located adjacent to each other and symmetrically with regard to the partition 38 separating the troughs. For purposes of guiding the followers, there are employed inwardly arched outer marginal portions 36 of the trough bottom 37 and the downwardly opening arched portions of the head rail 39 located on the partition 38. The reference numeral 34 designates the tight section of the conveyor and the reference numeral 35 designates the slack section of the conveyor. On that wall of the conveyor 2 which is adjacent the mine-filling side, a trough is formed by a wall 44. In this trough, the supply conduits, cables, and the like, may be located and also the cable for the cutting machine which cable is in this way particularly well protected.

In order to be able to pass the cable for the cutting machine over the conveyor 2 to the cutting machine, the cutting machine is equipped with a gantry 20 extending over the conveyor. The gantry 20 carries the control elements 21 (FIG. 2) and serves for guiding the cable for the cutting machine to the driving elements of the machine. The gantry 20 is guided on a tubular rail 23 which is arranged on the conveyor. In order to make sure that the gantry rigidly guided in this way can adapt itself to the pivoting movements of the machine, the connection between the gantry 20 and the machine 1 is effected through the intervention of an elbow joint which is illustrated in detail in FIG. 6 and comprises the two links or plates 24 and 25 which are connected by means of a joint 26. The plate 25 is connected to an extension member 30 of the gantry 20 by means of a joint 29, while the plate 24 is connected to the extension member 28 of the machine body through a joint 27. The floor of the seam is indicated in FIG. 1 with the reference numeral 42 while the roof of the seam is designated with the reference numeral 43. The arrangement of FIG. 1 furthermore shows a mine prop 40 while the reference numeral 41 designates a so-called horn.

As will be seen from the above, the coal-cutting machine according to the present invention has the advantage that always a safe guiding of the machine along the conveyor is possible and that the location of the machine as to height can at any time be varied so as to adapt the location of the machine to the character of the floor of the seam. By adding the gantry which is pivotally connected to and protrudes beyond the conveyor, a convenient feeding of the energy conveying means to the coal-cutting machine will be assured. It is also possible in this way to build the machine relatively narrow, thereby making possible high cutting speeds and high outputs.

It is, of course, to be understood that the present invention is, by no means, limited to the particular showing in the drawings, but also comprises any modifications within the scope of the appended claims.

1. A guiding arrangement for a mining machine having a chain driving sprocket wheel, especially coal mining machine, which includes: guiding rail means, chain means operable by said sprocket wheel and movably arranged within and extending in the longitudinal direction of said rail means, said guiding rail means having an inner substantially cylindrical surface and having its upper portion provided with slot means extending in the longitudinal direction of said rail means and having a width at least wide enough to permit the introduction of said chain means through said slot means into said rail means, and hollow guiding means slidably arranged within said guiding rail means and connectable to said mining machine, said hollow guiding means embracing portions of said chain means.

2. A guiding arrangement according to claim 1, in which said hollow guiding means is pivotally connected to said mining machine for pivoting about a substantially horizontal axis.

3. A guiding arrangement according to claim 1, in which said hollow guiding means comprises two hollow guiding members.

4. A guiding arrangement according to claim 1, in which the end portions of said hollow guiding means are provided with noses for guiding said chain means.

5. A guiding arrangement according to claim 1, which includes additional guiding rail means provided on that portion of the mining machine which is adjacent to the filling side of the mining machine, a guiding member guided on said additional guiding rail means, conveyor means, gantry means located above said conveyor means, elbow means together with said gantry means connecting said guiding member to the machine so that said guiding member will be able to follow a pivoting movement of the machine about said guiding rail means.

6. A guiding arrangement according to claim 1, in which the profile of said guiding rail means embracing said hollow guiding means comprises a plurality of individual relatively short sections spaced from each other by a distance less than the length of said hollow guiding means.

7. A guiding arrangement according to claim 1, which includes conveyor means associated with said mining machine and skids arranged at the respective lowermost cutting level of the machine and having rolling surfaces following the contour of a circular segment, said skids being pivotable about an axis parallel to said conveyor means and eccentrically located with regard to said circular segment.

8. A guiding arrangement according to claim 7, which includes fluid pressure operable cylinder piston means associated with said skids and extending in a direction transverse to the driving direction of the machine, the cylinder bottom of said cylinder piston means which face said conveyor means being located at a level higher than the point of attack of the piston rods connected to said cylinder piston means.