

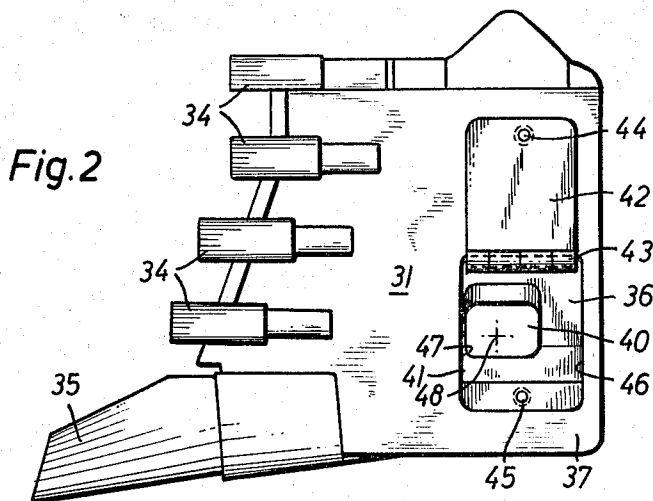
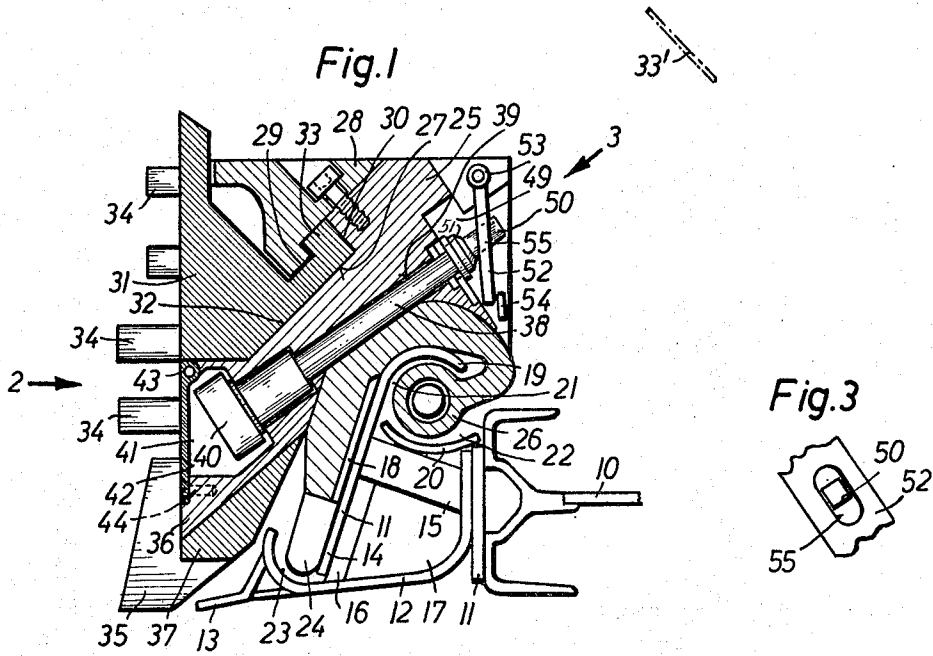
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PIVOTAL PLANER CUTTER WITH ADJUSTABLE ECCENTRIC STOP

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PIVOTAL PLANER CUTTER WITH ADJUSTABLE ECCENTRIC STOP

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The present invention relates to a mining planer having pivoting cutter means, and more particularly to a mining planer for the extraction of mineral from a mine face in which a cutting tool carrier means is slidably mounted on a base means for limited arcuate pivoting of the carrier means on the base means.

It will be appreciated by the artisan that in the automatic winning or extracting of minerals, such as coal, by the use of a mining planer conducted along the working face, the output obtainable depends very much upon the cutters having the correct attitude or angle of attack with respect to the coal face or mine face being worked. It is important furthermore to note that the optimum setting of the cutting tools can be determined as a rule only in an empirical way. Actually, a number of cutter positions has to be tried at the mine site in order to arrive at the best setting of the cutting tools, i.e. that setting with which the greatest possible amount of mineral may be won or extracted utilizing the lowest possible expenditure of power.

Mining planers, especially for the extraction of coal, are known, such as those having a pivoting or displaceable cutting tool carrier. The cutting tool carrier may be pivoted upon its base means so that its position, and in turn the position of the cutting tools thereon, may be regulated to achieve the best angle of attack of the cutting tools with respect to the mine face. Adjustable stop means are known for determining the pivotal limits of the cutting tool carriers on base means, but these adjustable stop means are located on the side of the planer facing the mine face being worked. Accordingly, the stop means can only be adjusted after the planer has been drawn back from the working face. This can be accomplished either by drawing the planer transversely away from the coal face or by conducting the planer sufficiently beyond one or the other end of the mine face being worked whereby to permit access to the side of the planer normally urged against the coal face. Understandably, adjustment of the stop means for changing the pivotal limits of the cutting tool carrier on the base means utilizing the foregoing known construction is difficult and time consuming. A mining planer of the known type, yet having particular constructional details for positioning the tool carrier means on the base means is disclosed in copending U.S. application Serial No. 300,285, filed August 8, 1963. The construction shown in said co-pending application utilizes stop means on the planer arrangement on the side thereof normally adjacent the mine face.

It is an object of the present invention to overcome the foregoing drawbacks of previous mining planers having tool carrier means of the pivotal type which are adjusted in their range by adjustable stop means, and to provide a planer for extracting mineral from a mine face which utilizes a pivotal carrier means for the cutting tools slidably mounted on a base means, such that the control of the adjustment for changing the range of pivoting is situated at the off side of the planer, i.e. at the side thereof remote from the mine face.

It is another object of the present invention to provide a construction of a pivotal cutting tool carrier on a base means in such a manner that the adjustment of the

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pivotal range of the cutting tool carrier can be carried out with practically no effort and at any time during the mining operation.

It is still a further object of the present invention to provide a construction of the foregoing type in which adjustments in the pivotal range of the cutting tool carrier can be effected with a minimum of work on the part of the operating personnel.

Other and further objects of the invention will become apparent from the within specification and accompanying drawings, in which:

FIG. 1 is a schematic sectional view of a mining planer in accordance with the present invention,

FIG. 2 is a schematic front view of the planer of FIG. 1, as seen in the direction of arrow 2, and

FIG. 3 is a schematic partial view of the adjusting mechanism for the cutting carrier means of the invention shown in FIG. 1, as seen in the direction of arrow 3.

It has been found that in accordance with the present invention a planer for extracting mineral from a mine face may be provided which comprises base means longitudinally movable back and forth along the mine face, cutting means, said base means and cutting means having coating means, including surface portions for slidably mounting the cutting means on one lateral side of the base means, i.e. the side adjacent the mine face, for limited arcuate pivoting of the cutting means on the base means in sliding surface contact therewith, such that adjustments in the limits of the pivoting of the cutting means or carrier means may be carried out on the side of the planer remote from the mine face. Specifically, spaced apart edge means are defined in the surface portion of the cutting means and eccentric stop means extend through the base means from one lateral side of the base means, i.e. adjacent the mine face, to the other lateral side thereof, i.e. remote from the mine face, such that the stop means project between the edge means at said one lateral side. Releasable locking means are conveniently provided on the other lateral side of the base means, i.e. remote from the mine face, for adjusting the eccentricity of the stop means with respect to the edge means, in a more or less remote manner, and thus, in turn changing the range of arcuate pivoting of the cutting means or cutting carrier means with respect to the base means upon which the same is slidably mounted.

More particularly, the eccentric stop means may take the form of a rotatable shaft extending through the base means from said one lateral side thereof to the other lateral side thereof with an eccentric end stop provided on such shaft at said one lateral side and projecting between the edge means. Upon releasing the locking means at the other lateral side of the base means, the shaft may be set in one of a plurality of circumferential positions by simply rotating such shaft whereby to adjust the eccentricity of the end stop with respect to the edge means and in turn the range of arcuate pivoting of the cutting means with respect to the base means. The shaft is preferably fixed against substantial axial movement and is inclined downwardly from the side of the planer remote from the mine face to the side of the planer adjacent the mine face.

The end of the shaft at the remote side of the base means is advantageously provided with a head of polygonal shape and the releasable locking means includes a locking plate having means defining an aperture of corresponding polygonal shape therein, with the plate being movable from a position in which the aperture is in enclosing engagement with the head to lock the head against rotation to a position in which the aperture is out of such engagement to permit the head and in turn the shaft and eccentric end stop to be rotated for changing the eccen-

tricity of the end stop with respect to the edge means. A recess may be defined in the base means at the remote side thereof, such that the shaft head will extend thereinto. Thus, the plate may be hingedly mounted on the base means in a manner permitting the plate to cover over substantially the recess when such plate is in engagement with the shaft head. On the other hand, an aperture is conveniently provided in the surface portion of the cutting means on the side of the base means adjacent the mine face, the aperture having vertical side faces which serve as the edge means for limiting the pivotal movement of the cutting means or cutting carrier means, depending upon the position of the eccentric end stop with respect to such vertical side faces. In order to prevent mineral and waste material developed during the planing operations from entering the aperture in the cutting means, a lid may be placed over the aperture whereby to seal off the same.

Cutting tools are conveniently provided on the cutting means or cutting carrier means so that the same will extend outwardly from that side of the cutting means remote from the base means, i.e. in a direction toward the mine face to be worked. By suitably adjusting the pivotal range of the cutting means, the cutting tools will be disposed at the proper angle of attack for extracting mineral from the mine face, depending upon the particular extracting conditions. The base means of the mining planer is generally provided with a slide contact face thereon remote from the cutting means so that the base means and in turn the mining planer in its entirety may engage a guide means disposed longitudinally along the mine face being worked, whereby the mining planer may be conducted back and forth on such guide means at the mine face to enable the cutting tools to extract mineral from the mine face in the best possible manner.

In accordance with a particular embodiment of the present invention, a planer for extracting mineral from a mine face is provided which comprises base means movable longitudinally back and forth along the mine face, and an arcuate retaining groove defined in the base means on one lateral side thereof, i.e. adjacent the mine face, cutting means, an arcuate retaining flange defined on the cutting means, said arcuate groove representing the arc of a chord of a circle in a plane passing through the planer and having its center at a point remote from such planer, said base means and said cutting means being provided with coacting surface portions, the cutting means being slidably mounted on the base means on said one lateral side thereof via the surface portions, for arcuate pivoting on the base means about an axis of pivot defined by the center of such circle with the retaining flange in arcuate slidable retaining engagement with the retaining groove to permit such arcuate pivoting while preventing otherwise displacement of the cutting means with respect to the base means, spaced apart edge means being defined in the surface portion of the cutting means, and a rotatable shaft extending through the base means from one lateral side thereof to the other lateral side thereof, as well as an eccentric end stop on the shaft at said one lateral side and projecting between the edge means. Of course, releasable locking means are provided on the other lateral side of the base means, remote from the mine face, so as to permit adjustable setting of the shaft in a plurality of circumferential positions to adjust the eccentricity of the end stop with respect to the edge means and in turn the range of arcuate pivoting of the cutting means with respect to the base means. Such adjustments, naturally, may be carried out at any time with a minimum of effort, in view of the fact that the shaft to be rotated for accomplishing the desired adjustment is accessible at the side of the mining planer remote from the mine face.

Referring to the drawing, and especially FIGURE 1 thereof, it will be seen that a portion of a guiding means for a mining planer is shown, the same being of the conventional type. Specifically, a portion of the mining

conveyor 10 is illustrated, the side thereof shown having the backing plate 11 attached thereto so as to accommodate the lower flange 12 which extends out to a knife edge 13 adapted to be urged against the mine face adjacent the mine floor. A guide plate 14 is secured via the transverse spacers 15 and the upwardly directed struts 16 to the backing plate 11 and in turn the conveyor 10, the spacers 15 and the struts 16 being positioned at intervals along the longitudinal guide means in question. By means of the arrangement shown, a lower passageway or channel 17 is provided which is meant to receive slidably therealong the return flight of the drive chain used for conducting the mining planer back and forth along the mine face. The guide plate 14 is provided with a slanted longitudinal track portion 18 and a curved crest portion 19. A curved plate 20 extends above the spacers 15 and is supported thereby as well as by the uppermost portions of the flange 12 and the backing plate 11. The crest portion 19 and the curved plate 20, together form an upper channel or passageway 21 which is meant to contain the upper flight or forward chain portion of the drive chain used to convey the mining planer back and forth along the mine face. A slit 22 longitudinally extends along the channel 21 to permit access thereof to the connecting piece 26 of the mining planer. In the same way a groove 23 is provided at the portion of flange 12 extending upwardly beyond the lower end portion of the track 18 whereby to accommodate thereat the lower flange 24 of the mining planer. Thus, the mining planer may travel on the guide means with appropriately shaped portions sliding along the track 18 and the crest 19 with the connecting piece 26 being inserted through the longitudinal slit 22 into the upper channel 21 for longitudinal travel therealong as the drive chain operates to conduct the mining planer in the desired back and forth directions. In this connection the mining planer generally comprises the base 25 on which the cutting means or cutting carrier means 31 is pivotally mounted.

Base 25 is provided with a slide surface 27 and a cover plate 28 attached to base 25 by suitable means, said cover plate 28 having a curved flange 29 whereby to form with the appropriate portions of base 25 a groove 30 into which the arcuate flange 33 of the cutting means 31 is slidably received. The cutting means slide surface 32 coacts with the base slide surface 27 so that the arcuate flange 33 of the cutting means 31 may be displaced along the arcuate groove 30 of the base 25, whereby to cause limited pivoting of the cutting means 31 about the axis 33', which represents the center of the circle corresponding to the arcuate groove 30. As the cutting means or cutting carrier means 31 pivots, the cutting tools 34 for the side face and the cutting tool 35 for the floor mineral to be extracted are brought into play at the desired angle of attack with the mineral face being worked.

Actually, base 25 is provided with an extension 36 over which the lip 37 of the cutting means 31 is disposed, so as to prevent undesired displacement between the cutting means 31 and the base 25, as for example at the interface formed by the surfaces 27 and 32. The construction described up to this point has been utilized in the past, but the means for limiting the pivotal movement of the cutting means 31 with respect to the base 25 have been provided at the side of the mining planer adjacent the mine face and thus problems were encountered in attempting to make adjustment during the mining operations. Indeed, as may be seen from FIG. 1, such adjustments would entail the withdrawing of the entire guide means assembly from the mine face, including the guide means upon which the planer is conducted and the mining conveyor as well.

In accordance with the present invention, the desired adjustment of the range of pivoting of the cutting means with respect to the base means is achieved by providing a rotatable shaft 38 passing through a bore hole 39 in the body of base 25 in a direction slanting downwardly from

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the off side to the mine side of the arrangement. At the lower end of the shaft 38, an eccentric end stop 40 is provided which projects into the aperture 41 in the cutting means 31 (see FIG. 2). Such aperture is provided with a lid 42 hingedly connected by the hinge 43 to the cutting means 31 and carrying a pin 44 which may be releasably inserted in a friction recess 45 so as to cover over recess 41 and prevent coal, waste, and dirt from entering recess 41 and obstructing the functioning of the arrangement.

As may be seen in FIG. 2, the recess 41 is provided with the vertical faces 46 and 47 which act as limiting edges with respect to the end stop 40 situated therebetween. The axis of rotation of shaft 38 is shown in FIG. 2 at 48.

In FIG. 1, the recess 49 is shown at the upper rear portion of base 25, the square shaped head 50 of shaft 38 protruding into recess 49. Shaft 38 is fixed from substantial axial movement by the collar 51 so as to prevent in the slanted position of shaft 38 any undesired play between the various adjustment parts. A locking plate 52 is connected by hinge 53 to the base 25 and is normally kept closed by latch 54. Locking plate 52 is provided with an aperture 55 of slot-like configuration but having two sides arranged for alignment with two corresponding sides of the square head 50 of shaft 38. In this way, when the latch 54 is opened and the locking plate 52 is raised away from the head 50, shaft 38 may be turned manually, as for example by the use of a wrench, to attain a new adjustment position as desired of the eccentric end stop 40 with respect to the vertical faces 46 and 47 (see FIG. 2).

It will be appreciated that the head 50 may assume any polygonal configuration and an appropriately dimensioned polygonal aperture 55 may be provided for use therewith, so long as there will always remain in any position of the shaft 38 and in turn of the head 50 an abutting portion of the aperture 55 to retain in locked position such head and in turn the shaft and end stop 40. Accordingly, by the provision for the adjustment of the end stop 40 at the side of the mining planer remote from the mine face, there will be no need to interrupt the mining operations in order to make a new adjustment to change the range of pivoting of the cutting means 31 with respect to the base 25. Easy access at the rear side of the planer is accordingly possible as opposed to the previous need for removing the planer from the corresponding end of the mine face or withdrawing transversely the entire arrangement from the mine face at a particular point therealong.

The general construction of the conveyor arrangement, including the guide means for the planer and arcuately pivotable cutting means of the instant type have been disclosed in the aforesaid co-pending U.S. application, Serial No. 300,285, filed August 8, 1963. Of course, mining conveyors are well known and these are usually of the double chain scraper conveyor type as illustrated in U.S. Patent 2,745,651, such mining conveyors being normally urged against the mine face by urging cylinders or shifting cylinders as disclosed in particular in FIG. 8 of said patent. The drive means for conducting the mining planer back and forth along the mine face are of conventional design and the forward chain connected to the piece 26 in the upper channel 21 will travel in one direction whereas the return chain portion in the lower channel 17 will be conducted in the opposite direction, both portions of the chain being looped at the corresponding ends of the mine face being worked over the drive sprockets of the drive means arrangement being utilized.

It will be appreciated that because of the nature of the rotational or pivotal mounting of the cutting means or cutting carrier means on the base, the end stop means to determine the pivoting range or rotational displacement of the cutting means will be placed close to the lower portion of the base adjacent the mine floor at the side of the planer next to the mine face being worked. Accordingly,

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the shaft may pass upwardly and outwardly in a slanting direction through the bore hole in the base, preferably cross-wise or transversely to the direction of movement of the planer, whereby the opposite end of the shaft at which the control of the end stop means is carried out will be positioned at a height sufficiently above the guide means and/or mining conveyor to permit easy access to the shaft at the rear of the planer adjacent the mining conveyor. While a suitable dog, having an opening corresponding to the square head of the shaft, may be used to secure the shaft against rotation in a selected position, naturally any other suitable means for securing the shaft may be used instead of the holding, gripping, or fastening dog of the type specifically shown, the only requirement being that the shaft be, in fact, secured against rotational movement when set. Preferably the securing means should be such that the end stop means on the other end of the shaft may be positioned adjustably in a rapid, precise, and effortless manner, even by an unskilled workman. Depending upon the pivotal position of the cutting carrier means on the base, the cutting tools which are foremost in the direction of movement of the planer will be brought forward toward the mine face for engagement therewith to extract mineral therefrom. As may be appreciated from FIG. 1, taken together with FIG. 2, the floor cutter 35 will also be lowered into engagement with the mine floor as the side cutters 34 are brought into the range of the vertical mine face being worked, whereby an efficient extraction of coal or other mineral may be carried out down to the mine floor itself. At the same time, the remainder of the cutting carrier means and the base will be prevented from dragging against the mine face being worked, which would, in turn, make the resistance of the planer unnecessarily greater, due to the fact that the cutting tools 34 and 35 extend outwardly and downwardly sufficiently to permit the desired extraction of mineral to be carried out without the mineral face or mine floor coming into dragging contact with the cutting carrier means and base of the mining planer proper.

Naturally, the planer arrangement shown is such that the cutting tools are only positioned for active operation in one direction of longitudinal movement along the mine face. The cutting carrier means only bears cutting tools at one longitudinal end thereof whereby the same is effective for extracting mineral from the mine face in only one corresponding direction. During movement of the planer arrangement in the opposite direction, the cutting tools will be lifted away from the mine face by suitable pivoting action of the cutting carrier means as noted above, and preferably, another planer arrangement, connected in tandem with that shown in FIGS. 1 and 2, but having its cutting tools positioned for operation in the opposite direction, may be employed to extract coal when conducting the arrangement in such opposite direction. Moreover, the base itself may be provided with a second cutting carrier means with cutting tools extending in the opposite direction of movement, the cutting carrier means being pivotable on the base in the same way as the cutting carrier means shown in FIGS. 1 and 2, whereby the particular cutting carrier means will be pivoted into active position in one direction of movement and be pivoted to inactive position in the other direction of movement. Suitable adjustment of the end stop means will effect such pivoting as desired. Where two separate cutting carrier means are provided on one base, of course, each may have a separate end stop means and shaft for adjusting the pivotal position of the cutting carrier means on the base, and this may be accomplished as to each cutting carrier means independently of the other. In this way optimum efficiency of operations can be achieved in both directions of travel. Even so, a single end stop means on a shaft may be used in such a way that it is designed to serve to adjust a suitable cutting carrier means for pivotally positioning cutting tools for use in extracting mineral in both directions of movement of the mining planer.

It will be appreciated that the instant specification is set forth for the purpose of illustration and not limitation, and that changes and modifications will occur to the artisan which may be made without departing from the spirit and scope of the present invention, such invention being limited only by the scope of the appended claims.

What is claimed is:

1. Planer for extracting mineral from a mine face which comprises base means longitudinally movable back and forth along the mine face, cutting means, said base means and cutting means having coating means including surface portions for slidably mounting said cutting means on one lateral side of said base means for limited arcuate pivoting of said cutting means on said base means in sliding surface contact therewith, spaced apart edge means defined in the surface portion of said cutting means, eccentric stop means extending through said base means from said one lateral side of said base means to the other lateral side thereof and projecting between said edge means at said one lateral side, and releasable locking means on the other lateral side of said base means for adjusting the eccentricity of said stop means with respect to said edge means and in turn the range of arcuate pivoting of said cutting means with respect to said base means.

2. Mining planer for extracting mineral from a mine face which comprises base means longitudinally movable back and forth along the mine face, cutting means, said base means and cutting means having coating means including surface portions for slidably mounting said cutting means on one lateral side of said base means for limited arcuate pivoting of said cutting means on said base means in sliding surface contact therewith, spaced apart edge means defined in the surface portion of said cutting means, a rotatable shaft extending through said base means from said one lateral side thereof to the other lateral side thereof, an eccentric end stop provided on said shaft at said one lateral side and projecting between said edge means, and releasable locking means on said other lateral side of said base means for adjustably setting said shaft in a plurality of circumferential positions to adjust the eccentricity of said end stop with respect to said edge means and in turn the range of arcuate pivoting of said cutting means with respect to said base means.

3. Planer according to claim 2 wherein said shaft is fixed against substantial axial movement and is inclined downwardly from said other lateral side to said one lateral side.

4. Planer according to claim 2 wherein the end of said shaft at said other side of said base means is provided with a head of polygonal shape and said releasable locking means includes a locking plate having means defining an aperture of corresponding polygonal shape therein, said plate being movable from a position in which said aperture is in enclosing engagement with said head to lock said head against rotation to a position in which said aperture is out of such engagement to permit said head and in turn said shaft and eccentric end stop to be rotated for changing the eccentricity of said end stop with respect to said edge means.

5. Planer according to claim 4 wherein a recess is defined in said base means at said other side thereof and said head extends into said recess, said plate being hingedly mounted on said base means such that when in engagement with said head said plate also substantially covers over said recess.

6. Planer according to claim 5 wherein an aperture having vertical side faces is provided in said surface portion of the cutting means, said edge means being defined by said vertical side faces, and lid means being provided at the side of said aperture remote from said base means to seal off said aperture.

7. Planer according to claim 6 wherein cutting tools are provided on said cutting means extending outwardly from the side thereof remote from said base means, and wherein slide contact face means are provided on said base means remote from said cutting means for engaging a guide means back and forth along which said base means may be moved while the cutting tools extract mineral from the mine face.

8. Mining planer for extracting mineral from a mine face which comprises base means movable longitudinally back and forth along the mine face, an arcuate retaining groove defined in said base means on one lateral side thereof, cutting means, an arcuate retaining flange defined on said cutting means, said arcuate groove representing the arc of a chord of a circle in a plane passing through the planer and having its center at a point remote from such planer, said base means and said cutting means having coating surface portions, said cutting means being slidably mounted on said base means on said one lateral side thereof via said surface portions for arcuate pivoting on said base means about an axis of pivot defined by the center of such circle with said retaining flange in arcuate slidable retaining engagement with said retaining groove to permit such arcuate pivoting while preventing otherwise displacement of said cutting means with respect to said base means, spaced apart edge means defined in the surface portion of said cutting means, a rotatable shaft extending through said base means from said one lateral side thereof to the other lateral side thereof, an eccentric end stop provided on said shaft at said one lateral side and projecting between said edge means, releasable locking means on said other lateral side of said base means for adjustably setting said shaft in a plurality of circumferential positions to adjust the eccentricity of said end stop with respect to said edge means and in turn the range of arcuate pivoting of said cutting means with respect to said base means, and cutting tools on said cutting means extending outwardly from the side thereof remote from said base means.

9. Planer according to claim 8 wherein a recess is defined in said base means at said other side thereof, said shaft is fixed against substantial axial movement and is inclined downwardly from said other side of said base means to said one side thereof, the end of said shaft at said other side of said base means is provided with a head of polygonal shape extending into said recess, said releasable locking means includes a locking plate having means defining an aperture of corresponding polygonal shape therein, said plate being hingedly mounted on said base means and movable from a position in which said aperture is in enclosing engagement with said head to lock said head against rotation to a position in which said aperture is out of such engagement to permit said head and in turn said shaft and eccentric end stop to be rotated for changing the eccentricity of said end stop with respect to said edge means, said plate when in engagement with said head also substantially covering over said recess, an aperture having vertical side faces is provided in said surface portion of the cutting means, said edge means being defined by said vertical side faces, and lid means are provided at the side of said aperture remote from said base means to seal off said aperture.

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ERNEST R. PURSER, *Primary Examiner*.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,285,663

November 15, 1966

Alois Hauschopp

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the heading to the printed specification, lines 4 and 5, name of assignee, for "Gewerkschaft Eisenhutte Westphalia" read -- Gewerkschaft Eisenhutte Westfalia --.

Signed and sealed this 19th day of September 1967.

(SEAL)

Attest:

ERNEST W. SWIDER

Attesting Officer

EDWARD J. BRENNER

Commissioner of Patents