

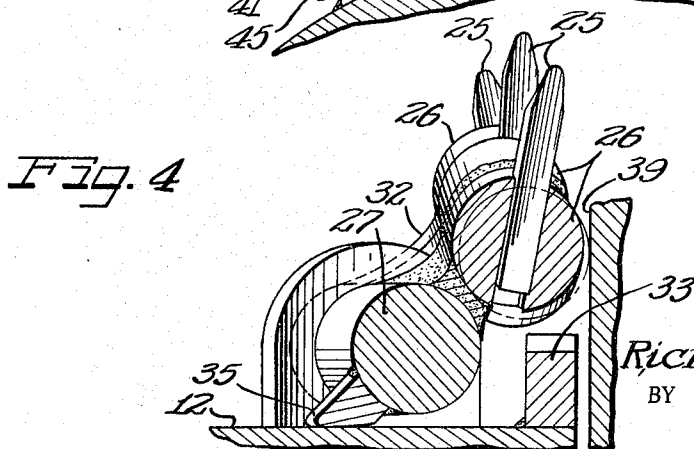
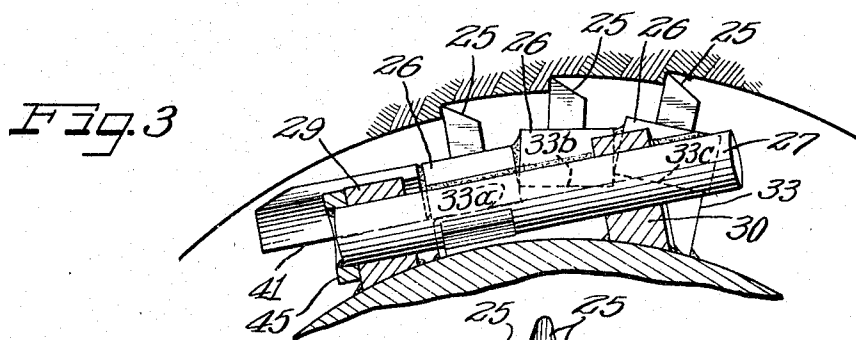
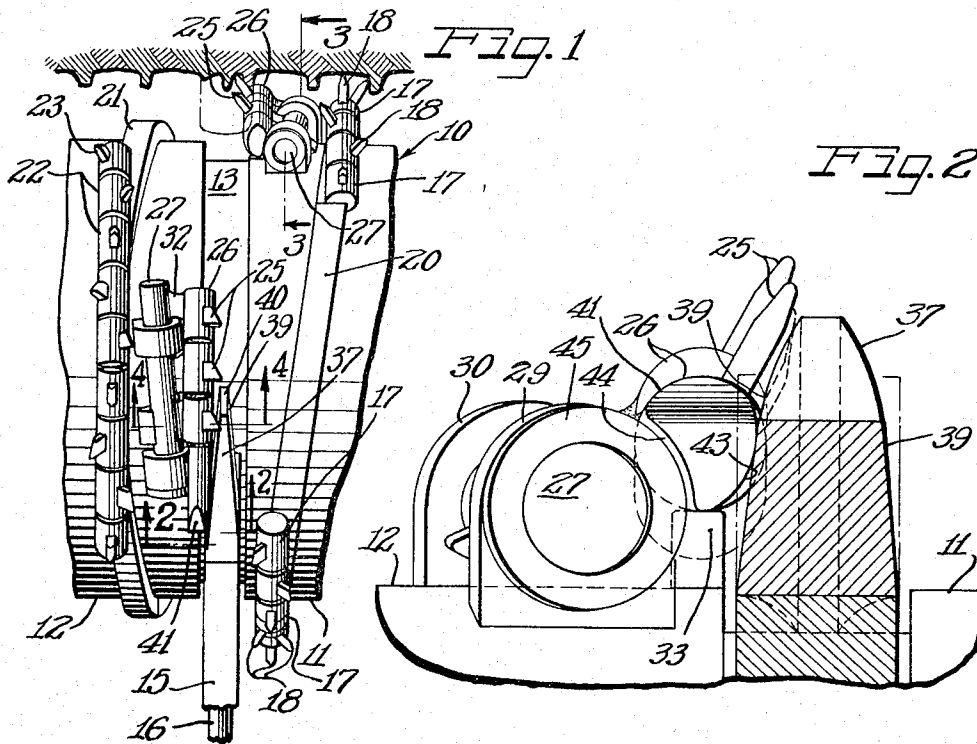
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CORE CUTTERS FOR RIPPER TYPE MINERS

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CORE CUTTERS FOR RIPPER TYPE MINERS

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This invention relates to improvements in continuous mining machines of the ripper type and more particularly relates to an improved form of core cutter therefor.

A principal object of the present invention is to provide an improved apparatus for avoiding the interference of the progress of the sectional cutter drums of ripper type miners by the cores left in front of the supports for drum sections by providing a simple form of core cutter means movable in front of the supports for the drum sections to cut the cores from in front of the supports and then movable away from the supports to avoid interference therewith.

Another object of the invention is to provide an improved form of sectional cutter drum for continuous mining machines of the ripper type in which the drum is supported between the sections thereof and in which clusters of cutter bits are pivotally mounted on at least one section of the drum to extend over the support and be moved thereover by the camming action effected by contact with the coal, to cut the core between the rows of bits on the cutter drum sections, in which the clusters of cutter bits are positively moved away from the support as the cutter drum rotatably moves to position the core cutters rearwardly of the mine face.

A further object of the invention is to provide an improved form of ripper type of continuous mining machine having a vertically movable sectional cutter drum rotatably supported between the sections of the drum, in which clusters of cutter bits are pivotally mounted on the drum to extend over the support for the sections of the drum and cut the core from the face in front of the support, and in which the support has a cam formed thereon camming the clusters of cutter bits away from the support at the point of rotation of the drum opposite from the mine face.

A still further object of the invention is to provide an improved form of core cutter for cutting the core in advance of the support for adjacent drum sections of a sectional rotatable cutter drum, in which the core cutters are in the form of clusters of cutter bits mounted on the drum for pivotal movement about axes spaced from the surface of the drum and extending in the general direction of rotation thereof and skewed with respect to the direction of rotation of the drum to effect movement of the clusters of cutter bits in front of the support by contact with the coal, as the cutter bits approach the mine face, to cut the core between the sections of the drum, and having cam means for camming the clusters of cutter bits away from the support at a point of drum rotation opposite from the mine face.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawing wherein:

FIGURE 1 is a fragmentary top plan view of portions of two adjacent drum sections of a cutter drum for a ripper type continuous mining machine, partially showing the support for the drum sections, and showing core cutters constructed in accordance with the principles of the present invention, mounted on the drum sections, to extend in front of the support as the drum rotates and is advanced vertically along a mine face;

FIGURE 2 is a partial fragmentary sectional view taken substantially along line 2—2 of FIGURE 1;

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FIGURE 3 is a partial fragmentary sectional view taken substantially along line 3—3 of FIGURE 1; and

FIGURE 4 is a fragmentary sectional view taken substantially along line 4—4 of FIGURE 1.

In the embodiment of the invention illustrated in the drawing, I have shown in FIGURE 1 a portion of one end portion of a cutter drum 10 for a continuous mining machine of the ripper type. The cutter drum 10 is shown as being a sectional drum and may be like that shown and described in an application Serial No. 277,540 filed by Richard C. Lundquist on May 2, 1963, and now Patent No. 3,157,438, so need not herein be shown or described in detail.

The portion of the cutter drum 10 herein shown is a portion of a center drum section 11 and a portion of an outer drum section 12. The drum sections 11 and 12 are supported at their adjacent ends on a cylindrical housing 13 mounted on and projecting from a support arm 15, transversely pivoted to the main frame (not shown) of the machine. The support arm 15 forms a housing for a drive shaft 16 suitably driven from a motor (not shown) mounted on the machine in a conventional manner. While I have only shown fragments of the cutter drum and of the adjacent drum sections 11 and 12, it should be understood that drum sections 12 are spaced from the opposite ends of the center drum section 11 and that individual cylindrical supports are provided for opposite ends of the drum section 11 and the adjacent drum section 12 and that the supports for each end of the drum section 11 are the same.

The support arms 15 are transversely pivoted to the main frame (not shown) of the machine and extend in advance thereof as shown in the aforementioned Lundquist Patent No. 3,157,438.

The drum section 11 has spaced rows of cutter blocks 17 mounted thereon and projecting therefrom and having cutter bits 18 projecting therefrom for cutting centrally of said blocks and to each side of center, to cut clearance therefor. The cutter blocks 17 are shown as being mounted in clusters on skewed rings 20 as in application Serial No. 325,588 filed by John S. Newton and James S. Kemper on November 22, 1963, and entitled "Cutter Bit Mounting for Ripper Type Miner," and no part of the present invention so not herein shown or described further. The outer cutter drum 12 likewise has skewed rings 21 extending from the periphery thereof and forming mounting means for clusters of cutter blocks 22 having cutter bits 23 projecting radially outwardly therefrom and arranged in the same manner as the cutter blocks 17 and cutter bits 18.

Referring now to the improved means of the present invention for cutting the core left between the drum sections 11 and 12 in front of the cylindrical support 13, each drum section 11 and 12 has a cluster of cutter bits 25 movably mounted thereon to extend over the adjacent edges of said drum sections over the support 13 at a region of upward travel of said drum, to cut out the core left between the cutter bits 18 and 23 and in front of the support 13.

As shown in FIGURE 3, the cutter bits 25 are mounted in individual cutter blocks 26 arranged in tiers having a leading cutter bit 25, a trailing cutter bit 25 in alignment with the leading cutter bit 25 and spaced radially outwardly of the leading cutter bit and another trailing cutter bit 25 spaced radially outwardly of the first two bits and in alignment therewith. The bits are all inclined in the same direction to extend over the support 13 towards the center thereof and the succeeding bits are spaced radially outwardly of the advance bits an amount substantially equal to the bit penetration in the coal.

The cutter blocks 26 are shown in FIGURE 3 as being

welded together and as being spaced from and mounted on a pivot shaft 27. The pivot shaft 27 is spaced outwardly of the periphery of the drum and extends generally parallel to a line extending tangentially of the face of the drum and is pivotally mounted at its forward end in an advance lug 29 extending radially of the surface of the associated drum and at its rear end in a lug 30 extending radially outwardly of the surface of the drum. The advance cutter block 26 is shown in FIGURE 4 as being welded on the pivot shaft 27 while the trailing block 26 is shown in FIGURE 1 as having a support leg 32 extending inwardly therefrom and welded or otherwise secured to the trailing end of the shaft 27. The lug 29 is spaced closer to the edge of its associated drum section than the lug 30, to place the pivot shaft 27 in skewed relation with respect to the direction of rotation of the cutter drum, so that the leading end of said pivot shaft is closer to the inner edge of its associated cutter drum than the trailing end of said shaft. The cutter blocks 26, 26, however, are so mounted on the shaft 27 as to extend and be in alignment with the direction of rotation of the cutter drum 10. This angular relation between the shaft 27 and the cutter blocks 26 assures that the cutter blocks 26 and cutter bits 25 projecting therefrom will move into the space between the adjacent ends of the sectional cutter drums by engagement with the coal face as the cutter blocks start their travel in an upward direction. This angular relation of the pivot shaft 27 with respect to the edges of the drums also assures that the bits 25 engaging the core will cam the blocks 26 over the support 13 to position the bits 25 to cut the core left in front of said support between the rows of cutter bits 18, 18 and 23, 23.

A stepped stop 33 is shown in FIGURE 2 as extending radially outwardly of the inner edge of the drum section 12. A similar stop extends radially outwardly of the inner edge of the drum section 11. The stop 33 has three steps 33a, 33b and 33c each of which steps is engaged by an individual block 26 during the core cutting operation and support the cluster of cutter blocks and bits in cutting position over the support 13 during upward movement of the cutter drum 10 (FIGURE 3). A stop 35 extends from the pivot shaft 27 in a direction opposite to the cutter blocks 26 and limits outward movement of said cutter blocks when cammed away from the support arm 15.

Referring now to the means for camming the cutter blocks 26 and cutter bits 25 out of the way of the support arm 15 at the completion of a core cutting cycle of rotation of the clusters of cutter bits 26, the support arm 15 has a cam 37 extending upwardly therefrom from a point spaced rearwardly of the working face. The cam 37 diverges from a peak facing the core face and has oppositely diverging camming faces 39 engaged by camming pins 41 extending in advance of the advance cutter blocks 26. As shown in FIGURES 1 and 2, each camming pin 41 has an inner camming face 43 initially engaging a camming surface 39 of the cam 37 and diverging from the advance end of said camming pin to the surface of the advance block 26, to effect the camming of an associated cluster of cutter blocks and bits out of the way of the support arm 15 and drive shaft 16 extending therealong, to avoid interference between the clusters of cutter blocks and bits with said support arm and drive shaft. The camming pin 41 also has a recess 44 extending along an advance retaining collar 45 for the pivot shaft 27 and the supporting lug 29 for said shaft to accommodate free movement of the cluster of cutter blocks 26 about the axis of the pivot shaft 27.

It may be seen from the foregoing that a simple and improved means has been provided for removing the cores between the rows of bits on the drum sections and just ahead of the supports for the drum sections of a sectional cutter drum of a ripper type miner, which would otherwise slow down or stop the advance of the cutter

drum, and that this core cutting means consists in clusters of cutter bits pivotally mounted on the adjacent ends of adjacent drum sections of the cutter drum and moved into the core during upward movement of the clusters of cutter bits by contact with the coal and automatically cammed out of the way of the support for the drum at a point spaced rearwardly of the face and on the rotational phase of the drum opposite from the face.

While I have herein shown and described one form in which the invention may be embodied, it may readily be understood that various variations and modifications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. In a continuous mining machine, a sectional rotary cutter drum supported for rotation about a horizontal axis and having at least one outer drum section and an aligned inner drum section spaced therefrom, and also having a support member supporting said drum in the space between said drum sections and extending rearwardly of said drum, said drum sections each having rows of cutter bits extending thereabout and projecting radially therefrom, and means for removing the core left in front of said support member between said rows of cutter bits comprising a cluster of cutter bits movably mounted on at least one of said drum sections for movement about an axis spaced outwardly of said drum section and parallel to a line extending generally tangentially of said drum section and spaced closer to said support member at its leading end than its trailing end, whereby said clusters of cutter bits are pivotally supported to be moved in front of said support member at the start of the upward cycle of rotation of said cutter drum by contact with the coal and are thereby supported to cut the core ahead of said support member, and camming means camming said cluster of cutter bits away from said support member as said cluster of cutter bits approaches said support member.

2. A sectional rotary cutter drum for a continuous mining machine of the ripper type comprising at least two aligned drum sections and a support member supporting said drum between said drum sections, said drum sections having rows of cutter bits extending thereabout, and means for removing the core left between said rows of cutter bits in front of said drum sections comprising a cluster of cutter bits movably mounted on at least one of said drum sections for movement about an axis spaced outwardly of said drum section and extending generally in the direction of rotation thereof and canted at an acute angle with respect to the direction of rotation of said drum, closer to said drum at its leading edge than its trailing edge, the angle of said axis and the contact of said cutter bits with the coal, positioning said cutter bits to extend over said support member, and camming means extending along said support member and camming said cluster of cutter bits away from said support member.

3. A sectional rotary cutter drum for a continuous mining machine of the ripper type comprising at least two aligned drum sections and a support member supporting said drum between said drum sections, said drum sections having rows of cutter bits extending thereabout, and means for removing the core left in front of said support between said rows of cutter bits comprising a cluster of cutter bits pivotally mounted on at least one of said drum sections for movement about an axis spaced radially outwardly of said drum section and extending in the general direction of rotation of said drum section, pivotal support means for said row of cutter bits on said drum section comprising a pair of spaced lugs extending radially of said drum section, the leading lug being spaced closer to said support member than the trailing lug, a shaft pivotally mounted in said lugs, a plurality of cutter blocks on said shaft spaced outwardly therefrom to normally move into the space between said drum sections by contact with the coal and having cutter bits projecting radially therefrom, and a camming surface on said sup-

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port member having camming engagement with said blocks for camming said blocks away from said support member as they are moved downwardly along the rear side of said cutter drum.

4. A sectional rotary cutter drum in accordance with claim 3 wherein the camming surface on said support member extends rearwardly therealong from a position disposed rearwardly of the forward end portion of said cutter drum and wherein a camming pin extends in advance of the leading cutter block and forms a follower riding along said cam and pivoting said cutter block out of the way of said support member.

5. A sectional rotary cutter drum in accordance with claim 4 wherein the camming surface comprises a cam on said support diverging in the direction of rotation of said drum, wherein the camming pin extends in advance of the leading cutter block and slidably engages said cam, wherein stop means limit outward movement of said cutter blocks and bits, and other stop means retain said cutter blocks and bits in cutting positions in front of the support for said drum.

6. A sectional cutter drum for a continuous mining machine of the ripper type comprising at least two aligned drum sections and a support member supporting said drum between said drum sections, rows of cutter bits extending about said drum sections, and means on each of said drum sections for cutting the core between said rows of cutter bits in front of said support comprising a series of aligned cutter blocks having cutter bits project-

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ing therefrom pivotally mounted on said drum sections to overhang said support member, the mounting means for said cutter blocks comprising a pair of spaced lugs on each drum section, the leading lugs of which are spaced closer to said support member than the trailing lugs, a shaft pivotally mounted on each pair of lugs, means mounting said cutter blocks on said shaft to extend in the direction of travel of said drum, whereby said cutter blocks are supported to be cammed in front of said support member by contact with the coal, and thereby have cutting engagement with the core in front of said support member, means limiting inward movement of said cutter blocks toward said support member and retaining said blocks in position for cutting, and a diverging cam extending rearwardly along said support member and having camming engagement with said cutter blocks and camming said cutter blocks away from said support member as they pass rearwardly and downwardly therealong.

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