Feb. 7, 1956 J. F. JOY 2,733,906

UNIVERSAL CUTTER CHAIN FOR MINING MACHINES

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Fig. 1.

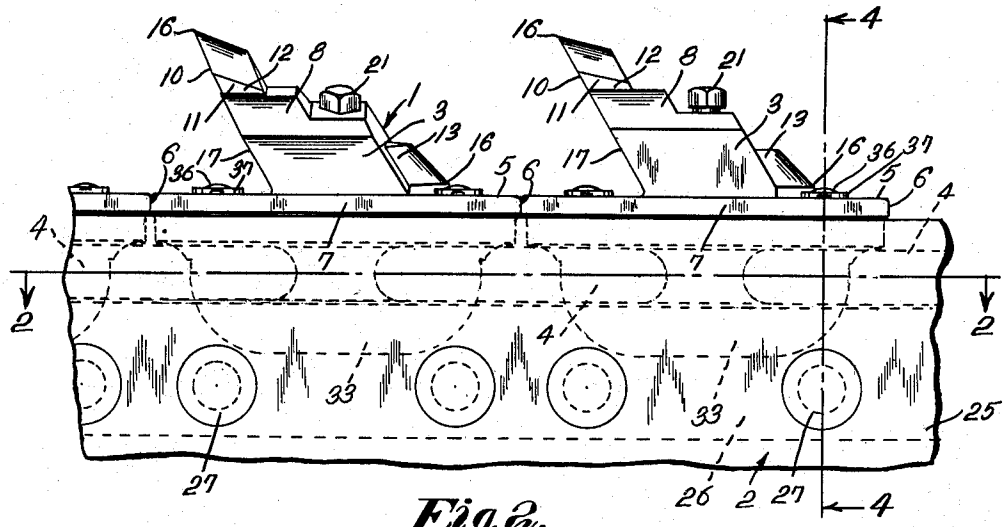


Fig. 2.

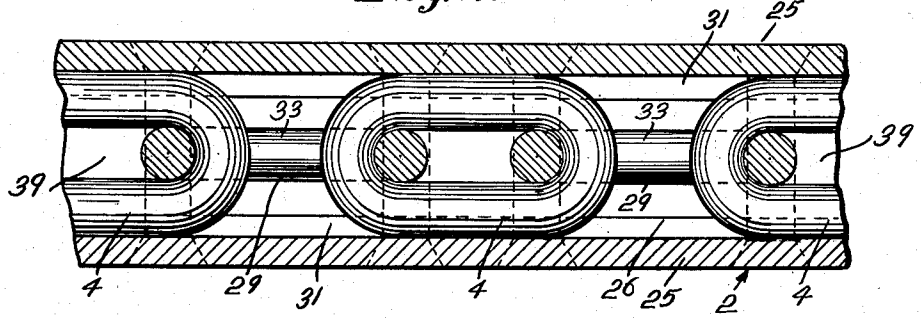


Fig. 3.

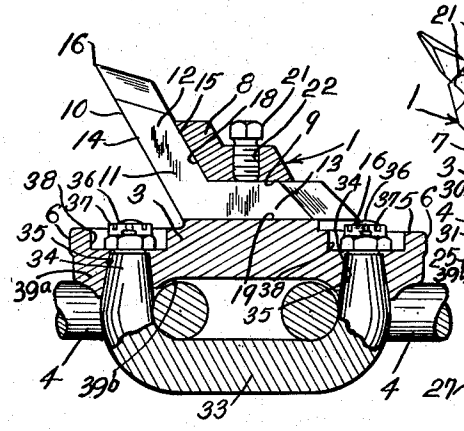
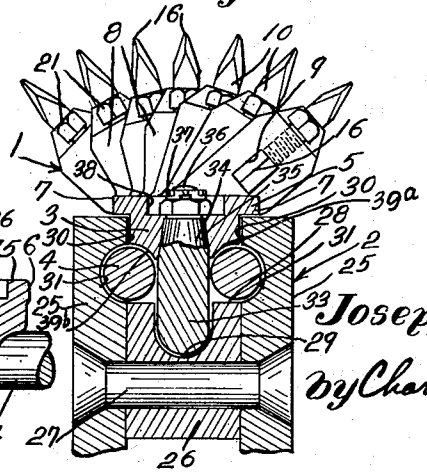


Fig. 4.



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Fig. 5.

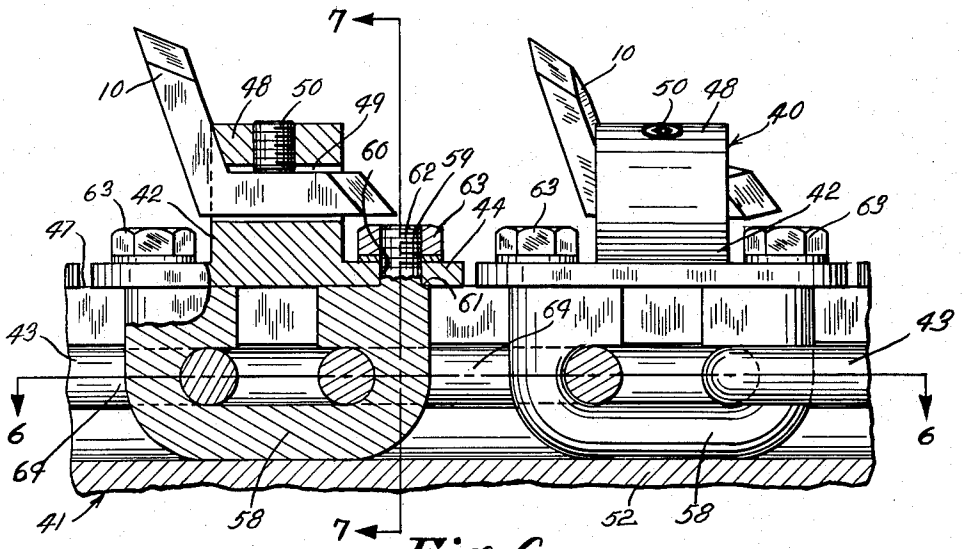


Fig. 6.

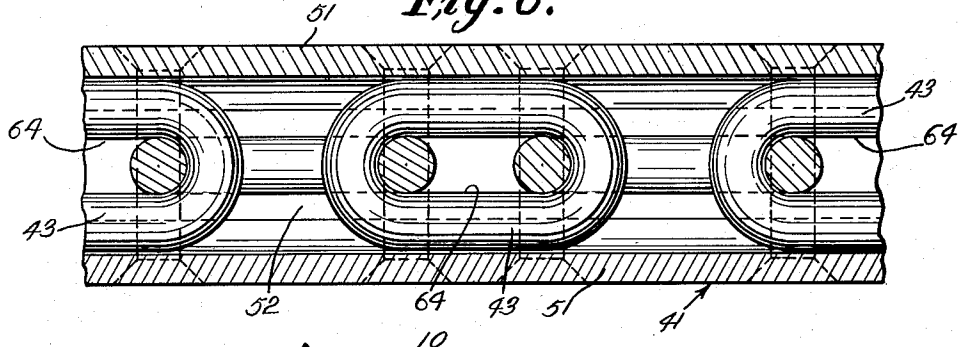
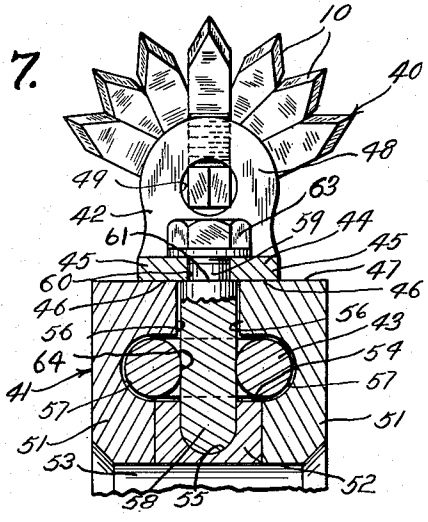


Fig. 7.



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UNIVERSAL CUTTER CHAIN FOR MINING MACHINES

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Application July 15, 1953, Serial No. 368,084

8 Claims. (Cl. 262—33)

This invention relates to mining chains and more particularly to a cutting or disintegrating chain of the universal type having the capability of flexure in a plurality of angularly related planes.

In mining apparatus of certain types, as for example an apparatus embodying a flexible loop cutter for partially or completely cutting out a section of a mine vein or coal seam, the chain which carries the cutters is guided in a suitable guideway on an open-centered guide frame or bar and is arranged to flex in a plurality of angularly related planes. The present invention contemplates improvements over known types of universal cutter chains in that the link structure is simplified and is made more rugged and durable. While the cutter chain of the present invention is shown as being of the flexible loop cutter type it will be evident that the novel structural features of the invention may be incorporated in cutter chains of the conventional plane kerf cutter type. Also, certain features of the invention may be embodied in the disintegrating chains of a continuous mining apparatus.

An object of the present invention is to provide an improved mining chain especially designed for use in the mining of coal or similar minerals. Another object is to provide an improved cutting or disintegrating chain having novel features of construction and design. Yet another object is to provide an improved mining chain of the flexible loop cutter type. A still further object is to provide an improved cutter carrying chain block and novel interconnecting links. Another object is to provide an improved guide frame or bar structure for a mining chain of the above character. These and other objects and advantages of the invention will, however, hereinafter more fully appear in the course of the ensuing description.

This application is a continuation-in-part of my co-pending application, Serial No. 109,685, filed August 11, 1949, now abandoned.

In the accompanying drawings there are shown for purposes of illustration two forms which the invention may assume in practice.

In these drawings:

Fig. 1 is a side view of a mining chain constructed in accordance with an illustrative embodiment of the invention and shown associated with a novel guide frame or bar.

Fig. 2 is a longitudinal section taken substantially on line 2—2 of Fig. 1, illustrating details of the chain and its associated bar-guideways.

Fig. 3 is a central longitudinal section taken through one of the chain blocks of Fig. 1 and showing portions of the connecting links.

Fig. 4 is a fragmentary cross sectional view taken on line 4—4 of Fig. 1.

Fig. 5 is a view, partially in longitudinal section and partially in side elevation, showing a cutter chain and bar of a modified construction.

Fig. 6 is a longitudinal section taken on line 6—6 of Fig. 5.

Fig. 7 is a cross section taken on line 7—7 of Fig. 5.

In the illustrative construction, as shown in Figs. 1 to 4 inclusive of the drawings, the improved mining chain is generally designated 1 and the guide-bar or frame by which the chain is guided for orbital movement is generally designated 2.

The mining chain may be used with a plane kerf cutter, a loop cutter or as a disintegrator, depending upon the purpose for which it is desired to be employed. As above pointed out while the chain is of the universal type especially designed for use as a loop cutter, features of its design may be used with a conventional plane cutter bar or with the bar structure of a disintegrator. The chain consists of a series of chain blocks 3 pivotally connected by connecting cable links 4. The chain blocks each comprise an upper transverse platelike portion 5 having end abutment surfaces 6 whereby the lugs are adapted to have end to end contact as they travel rectilinearly along the bar guideway and the abutments cooperate to provide a "stiff-back" chain structure which prevents inward bending of the chain as it moves in its orbital path along the bar guideway and about its drive sprocket. The platelike portions 5 of the blocks have lateral flanges or ledges 7 which overlie the outer peripheral surface of the cutter or guide bar, and integral with the portions 5 are projecting lugs 8 having longitudinal sockets 9 for receiving cutting or digging teeth or bits 10.

The bits or teeth 10 are of the double ended reversible type and each comprises a bit or tooth body 11 having relatively inclined body portions or arms 12 and 13 disposed at an obtuse angle. The bit or tooth body may desirably be of rectangular cross section, and the body arms have plane outer surfaces 14 and parallel inner surfaces 15, the outer and inner surfaces intersecting along straight lines which lie in a plane bisecting the bit or tooth body at the apex of the angle. The outer surfaces 14 terminate in cutting or digging points 16 at the opposite extremities of the bit or tooth. Thus a symmetrical double pointed tooth or bit is provided which may be reversed end for end to present either point to the work.

Each projecting lug 8 of the chain block has a forwardly and outwardly inclined plane front face 17 obliquely disclosed with respect to the plane outer surface of the platelike portion 5 of the block. The front portion of each lug is slotted forwardly and outwardly at 18 and the slot communicates with the longitudinal socket 9, and the bit or tooth is reversible in the socket 9 and slot 18 with the inactive face 14 of the arm portion 13 resting at 19 against the plane bottom surface of the socket 9. When the bit or tooth is properly positioned in the lug socket the active portion 12 projects forwardly and outwardly from the lug with its plane front face 14 lying substantially flush with the front plane face 17 of the lug. A relatively small set screw 21 is threaded in a vertical opening 22 in the rearward portion of the lug rearwardly of the slot 18 and this set screw, when tightened, engages the inner surface of the inactive arm of the bit or tooth, rigidly securing the bit or tooth in the lug socket. The front faces of the bit or tooth points may be hard faced or may be provided with hard metal inserts thereby to provide wear resisting surfaces on the points.

The cutter or guide bar 2, as above mentioned, may be of the open-center loop type, the conventional plane kerf type, or the disintegrator type and, in this instance, includes parallel outer plates 25 separated by longitudinal bar members 26 and the plates and the bar members are secured together as by conventional rivets 27. The bar members at their outer surfaces 28 at the bottom of the

bar guideway are longitudinally grooved at 29 with the grooves formed with their inner portions of substantially semi-circular cross section. The inner surfaces 30 of the plates at the sides of the bar guideway are similarly longitudinally grooved at 31. The connecting links 4 are of the open-center welded coil type formed of stock of round cross section and are adapted to engage slidingly at their outer sides the grooves 31.

As shown in Figs. 3 and 4 the bases of the blocks consist of connecting or bridge link members 33 of elongated U-shape and of round cross section, having tapered portions 34 at the legs of the U, and these tapered portions have a tight drive fit in tapered bores 35 in the end portions of the platelike portions 5. The legs of the U are arranged at right angles to the plane outer surface of the platelike portions 5 and are threaded at 36 to receive tightening nuts 37. These nuts, when tightened, are arranged in circular recesses 38 in the plate portions 5 and abut the bottoms of the recesses. These bridge link members 33 pass through the center openings 39 in the links 4, and the links loosely pivotally connect the blocks together. The platelike portions 5 of each of the chain locks 3 have bottom projections 39^a extending within the open centers 39 of the adjacent pairs of cable links 4 with such projections provided with curved surfaces 39^b shaped substantially to conform to and lying against the adjacent curved surfaces of the cable links. Due to the arrangement and construction of the links and blocks the chain may flex in angularly related planes thus to provide a universal chain structure well adapted for use with a loop type cutter or guide bar. As the chain travels in its guideway about the margin of the bar the outer sides of the links 4, as previously mentioned, slidingly engage the grooves 31 and the rounded inner portions of the bridge link members 33 of the blocks slidingly engage the grooves 29. The chain is driven by a suitable drive sprocket properly shaped to fit the links and bridge members of the blocks, in an obvious manner.

In the modified embodiment of the invention shown in Figs. 5, 6 and 7 the mining chain is generally designated 40 and the guide-bar or frame is generally designated 41.

As in the embodiment above described, the mining chain may be used with a plane kerf cutter, a loop cutter or a disintegrator, and here, also, the chain is of the universal type. The chain consists of a series of chain blocks 42 pivotally connected by connecting cable links 43. The chain blocks each comprise an upper transverse platelike portion 44 having lateral flanges or ledges 45 formed with inner guide surfaces 46 slidingly engaging the exterior periphery 47 of the bar or guide frame. Lugs 48 project outwardly from the platelike portions 44 and have longitudinal sockets 49 for receiving the cutting or digging teeth or bits 10 held in position by set screws 50.

The frame or guide bar 41, as in the other embodiment, may be of the open-center loop type, the conventional plane kerf type or the disintegrator type, and likewise includes parallel outer plates 51 separated by longitudinal bar members 52 and the plates and bar members are secured together as by conventional rivets 53. The bar members at their outer surfaces 54 at the bottom of the bar guideway are longitudinally grooved at 55 with the grooves formed with their inner portions of substantially semi-circular cross section, and the inner surfaces 56 of the plates 51 are similarly longitudinally grooved at 57. The connecting cable links, as in the other form, are of the open-centered welded coil type and are adapted to engage slidingly at their sides the grooves 57.

As shown in Figs. 5 and 7 the bases of the blocks consist of connecting or bridge link members 58 of elongated U-shape, likewise similar to those of the other form, and of rounded cross section and having straight

right angle leg portions 59 fitted in straight bores 60 in the end portions of the platelike portions 44. These leg portions at 61, abut the bottoms of the platelike portions 44 and are threaded at 62 to receive tightening nuts 63. These bridge link members 58 pass through the center openings 64 in the links 43, and the links loosely pivotally connect the blocks together. The blocks are guided entirely at the exterior periphery of the guide bar or frame and, in this instance, do not rest upon the connecting links so that the guiding area in contact with the guide bar periphery is substantially increased. Due to the novel arrangement and construction of the links and blocks, the chain may flex in angularly related planes to provide a universal chain structure as in the embodiment above described. As the chain travels along its guideway about the margin of the bar or guide frame, the outer sides of the links 43 slidingly engage the grooves 57 and the rounded inner portions of the bridge link members 58 of the blocks slidingly engage the grooves 55. As in the other form, the chain is driven by a suitable drive sprocket properly shaped to fit the links and bridge link members of the blocks with the central teeth projecting between the adjacent ends of the bridge link members and with the outer teeth straddling the bridge link members to engage the read ends of the links.

As a result of this invention an improved mining chain is provided having novel features of construction and design whereby simplicity and ruggedness are obtained. By the provision of the open-center, coil type connecting links and the U-shaped bridge link members coacting with the links a universal chain structure is provided which is capable of flexure in a plurality of angularly related planes, resulting in a chain which is well adapted to use with a loop type cutter. Due to the novel arrangement of the guiding grooves of the cutter or guide bar with which the connecting links and U-shaped bridge link members of the chain blocks engage, improved guiding of the chain is attained. Various features of the chain are also adapted to use with a conventional plane type kerf cutter or with the cutter of a disintegrating head of a continuous mining machine. The chain structure is not only relatively simple and rugged in design but may also be manufactured at a minimum of cost, and is well adapted for the purpose to which it is intended. Other advantages of the invention will be clearly apparent to those skilled in the art.

While there are in this application specifically described two forms which the invention may assume in practice, it will be understood that these forms of the same are shown for purposes of illustration and that the invention may be further modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a mining chain, a series of chain blocks having projecting lugs for supporting teeth for disintegrating the mineral of a mine vein, said blocks having transverse outer platelike portions, said teeth supporting lugs projecting outwardly from said platelike portions, and bridge link members of elongated U-shape arranged at right angles to said platelike portions and extending lengthwise of said blocks midway between the sides of the latter, said bridge link members having legs rigidly secured to the end portions of said platelike portions respectively rearwardly and in advance of said lugs, open-centered cable links having their open centers receiving said legs of said bridge link members, for loosely connecting said blocks together whereby the chain may flex in angularly related planes, each of said platelike portions having bottom projections extending within the open centers of the adjacent pair of said cable links with said projections provided with curved surfaces shaped substantially to

conform to and lying against the adjacent curved surfaces of said pair of cable links.

2. In a mining chain, a series of chain blocks having projecting lugs for supporting teeth for disintegrating the mineral of a mine vein, said blocks having transverse outer platelike portions, said teeth supporting lugs projecting outwardly from said platelike portions, and bridge link members of elongated U-shape arranged at right angles to said platelike portions and extending lengthwise of said platelike portions and extending lengthwise of said blocks midway between the sides of the latter, said bridge link members having legs rigidly secured to the end portions of said platelike members respectively rearwardly and in advance of said lugs, open-centered cable links having their open centers receiving said legs of said bridge link members, for loosely connecting said blocks together whereby the chain may flex in angularly related planes, the inner surfaces of said platelike portions shaped substantially to conform to the adjacent surfaces of said cable links, said U-shaped bridge link members having tapered portions on their legs and said platelike portions having tapered openings beyond the ends of said lugs for receiving said tapered leg portions, and adjustable elements engaging outer surfaces on said platelike portions and cooperating with the outer portions of said legs for drawing said tapered portions tightly within said openings firmly detachably to secure said bridge link members and said platelike portions together.

3. A mining chain of the charatcer set forth in claim 2, wherein said outer leg portions are threaded and said adjustable elements comprise tightening nuts which engage said platelike portions and cooperate with said threaded leg portions for tightly drawing said tapered leg portions in said tapered openings.

4. A mining chain of the character set forth in claim 3, wherein the outer surfaces of said platelike portions are exteriorly recessed to receive said adjustable elements whereby the latter are partially recessed within said platelike portions to reduce the abrasive contact of said elements with the mineral being disintegrated.

5. In a mining chain, a series of chain blocks having projecting lugs for supporting teeth for disintegrating the mineral of a mine vein, said blocks having transverse outer platelike portions, said teeth supporting lugs projecting outwardly from said platelike portions, and bridge link members of elongated U-shape arranged at right angles to said platelike portions and extending lengthwise of said blocks midway between the sides of the latter, said bridge link members having legs rigidly secured to the end portions of said platelike portions respectively rearwardly and in advance of said lugs, open-centered cable links having their open centers receiving said legs of said bridge link members, for loosely connecting said blocks together whereby the chain may flex in angularly related planes, each of said platelike portions having bottom projections having recesses to receive the curved end portions of a pair of adjacent cable links and within which said end portions fit, with said bottom projections resting on said pair of cable links whereby the blocks of the chain are in part supported by the cable links during guiding of the chain.

6. In a mining chain, a series of chain blocks having projecting lugs for supporting teeth for disintegrating the mineral of a mine vein, said blocks having transverse outer platelike portions, and bridge link members of elongated U-shape arranged at right angles to said platelike portions and extending lengthwise of said blocks

midway between the sides of the latter, said bridge link members having legs rigidly secured to the end portions of said platelike portions respectively rearwardly and in advance of said lugs, open-centered cable links having their open centers receiving said legs of said bridge link members, for loosely connecting said blocks together whereby the chain may flex in angularly related planes, said platelike portions adapted to overlie the outer edges of a guide bar, said legs of said U-shaped bridge link members having reduced leg portions and said platelike portions having openings for receiving said reduced leg portions, and adjustable elements engaging outer surfaces on said platelike portions and cooperating with said reduced portions of said legs for securing said reduced portions tightly within said openings with said legs firmly abutting said platelike portions.

7. A mining chain as set forth in claim 6 wherein said platelike portions of said blocks provide inner guiding surfaces engageable with the exterior periphery of a guide bar and said cable links and said bridge link members at portions of their rearwardly facing surfaces disposed inwardly of said guiding surfaces are shaped for engagement with the teeth of a chain drive sprocket.

8. In a mining chain, a series of chain blocks having projecting lugs for supporting teeth for disintegrating the mineral of a mine vein, said blocks having transverse outer platelike portions, and bridge link members of elongated U-shape arranged at right angles to said platelike portions and extending lengthwise of said blocks midway between the sides of the latter, said bridge link members having legs rigidly secured to the end portions of said platelike portions respectively rearwardly and in advance of said lugs, open-centered cable links having their open centers receiving said legs of said bridge link members, for loosely connecting said blocks together whereby the chain may flex in angularly related planes, said platelike portions adapted to overlie the exterior periphery of a guide bar, said U-shaped bridge link members having reduced leg portions and said platelike portions having openings for receiving said reduced leg portions, said outer platelike portions having lateral ledges provided with inner guiding surfaces engageable with the outer edges of the guide bar, said bridge link members having spaces at the sides thereof between said ledges and said cable links with said spaces receiving the portions of the guide bar with the latter extending inwardly into close adjacency to the sides of said bridge link members, and adjustable elements engaging the outer surfaces of said platelike portions and cooperating with said reduced portions of said legs for securing said reduced portions tightly within said openings with said legs firmly abutting said platelike portions.

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