Feb. 22, 1938. C. L. BOWMAN 2,109,082

MINING MACHINE CUTTER BAR

Filed June 13, 1936

Fig. 1.

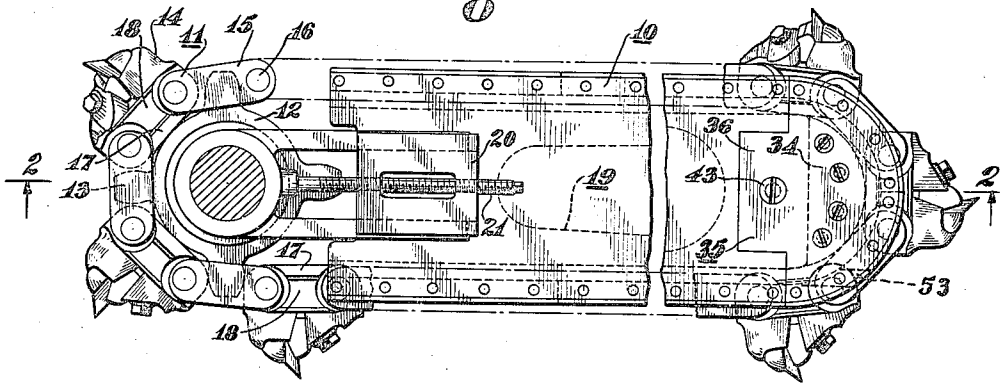


Fig. 2.

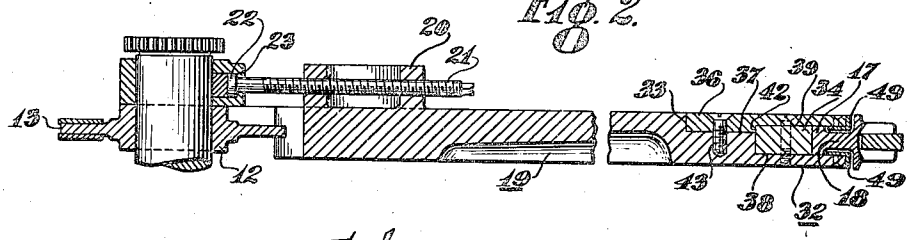


Fig. 3.

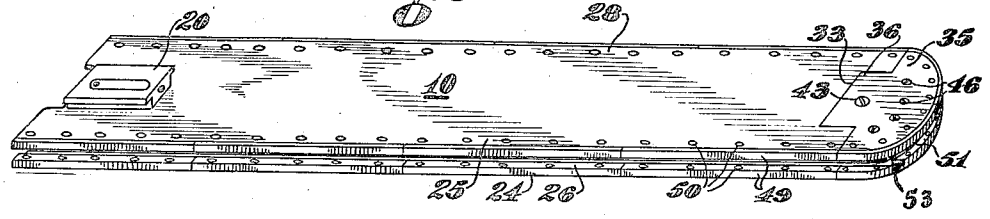


Fig. 4.

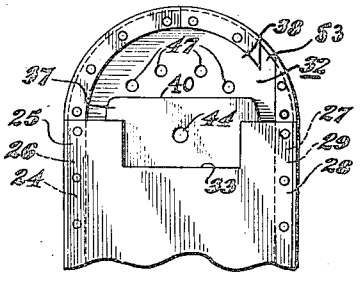
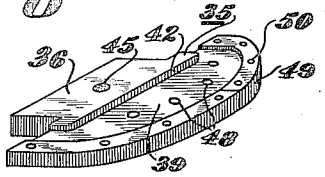


Fig. 5.



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MINING MACHINE CUTTER BAR

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Application June 13, 1936, Serial No. 85,140

3 Claims. (Cl. 262—33)

My invention relates, in general, to mining machines, and more particularly to cutter bars for mining machines.

In the mining of coal, the cutter bar and the tooth carrying chain cuts a cleft in the lower level of the vein of coal, and forms a shelf which is subsequently broken off by means of explosives or any other suitable methods.

When cutting the cleft, in the interest of economy, it is highly desirable that the depth of the cleft or cut be as narrow as possible because the cut-away coal is of no commercial value. Furthermore, it is highly essential that the depth of the cleft cut in the vein of coal be as narrow as possible; because nowadays, the coal mines have been exhausted to the point that it is necessary to mine much narrower veins than formerly necessary. Thus, if the coal vein if only three or four feet thick, and if the width of the cut in the cleft is as much as six or seven inches, there is a considerably high percentage of loss resulting from the relatively wide cut.

Therefore, an object of my invention is the provision of a relatively thin and solid cutter bar which cuts a very narrow cleft in the vein of coal.

Another object of my invention is the provision of a solid cutter bar that is relatively thin and flexible and that has a variable section modulus to prevent the concentration of stresses as the bar is flexed.

A further object of my invention is the provision of a solid cutter bar having a detachable wall portion on one side of the forward end thereof.

Another object of my invention is the provision of a wear resistance block positioned in the forward end of the cutter bar to reduce the wear caused by the moving chain to a minimum.

Another object of my invention is the provision of a detachable wall portion on one side of the forward end of the cutter bar, so that when the detachable wall portion is removed, the cutting chain may be assembled or disassembled.

Another object of my invention is the provision of a cutter bar having one side wall of the forward end formed integrally with the body of the cutter bar, and having the other side wall of the forward end of the cutter bar detachably connected to the body of the cutter bar, taken in combination with a wear resistance block which is detachably positioned between the two forward walls of the cutter bar.

A still further object of my invention is to provide for interlockingly and detachably connecting one side of the forward end of a cutter bar to the body portion of the cutter bar.

Another object of my invention is to provide for mounting or otherwise attaching wear resistance strips along the guide channel of a cutter bar.

Other objects and a fuller understanding of my invention may be had by referring to the following description and claims, taken in connection with the accompanying drawing, in which:

Figure 1 represents a longitudinal plan view of a cutter bar embodying the features of my invention, taken in combination with a driving sprocket which drives a tooth carrying chain in the guide channel of the cutter bar;

Figure 2 represents a longitudinal cross-sectional view of the cutter bar and sprocket wheel, taken along the line 2—2 of Figure 1;

Figure 3 is a longitudinal perspective view of a cutter bar embodying the features of my invention;

Figure 4 is a plan view of the forward end of the cutter bar embodying the features of my invention, and illustrated with the detachable forward wall member removed; and

Figure 5 represents a perspective view of a detachable forward wall member which is arranged to be detachably connected to one side of the forward end of the cutter bar, and which is shown in an inverted position.

With reference to the drawing, my cutter bar is indicated generally by the reference character 10 and is adapted to be held in operating alignment with a driving sprocket wheel indicated by the reference character 12, which drives a tooth carrying chain, indicated generally by the reference character 11. The tooth carrying chain 11 is constructed of alternately interconnected chain lugs 14 and side straps 15 pivotally connected together by means of pivotal pins 16. The arrangement of the chain lugs 14 and side straps 15 is such that the space between the side straps 15 constitutes a chain socket which straddles the sprocket teeth 13 of the driving sprocket wheel 12. The lowermost portion of each of the chain lugs 14 is provided with lateral lugs 17 which are integrally connected to the uppermost portion of each of the chain lugs 14 by means of a reduced portion indicated by the reference character 18.

The cutter bar 10 is slidably mounted relative to the driving sprocket wheel 12. To take care of these slidable longitudinal adjustments, there is provided upon the rearward end of the cutter

bar 10 a lug 20, through which a threaded adjusting bolt 21 extends. As illustrated, the end of the threaded bolt 21 has a head 22 for rotatively engaging a socket 23 in a boss upon the mining machine. Therefore, by turning the threaded bolt 21, the cutter bar 10 is moved longitudinally relative to the driving sprocket wheel 12. This adjustment takes care of the slack in the tooth carrying chain 11 and keeps the tooth carrying chain upon the cutter bar 10.

In the practice of my invention, the cutter bar 10 may be constructed of one solid piece of steel such as by casting the cutter bar.

After it is cast, there is milled a channel 26 on one longitudinal edge of the cutter bar and a channel 29 in the other longitudinal edge of the cutter bar. When the channel 26 is cut or milled into the longitudinal edge of the cutter bar, there is integrally formed two spaced side walls 24 and 25 which provide lateral support for the tooth carrying chain 11. When the channel 29 is milled or cut into the other longitudinal edge of the cutter bar 10, there is integrally formed two spaced side walls 27 and 28 which constitutes a lateral support for the tooth carrying chain 11. As shown, the lower side of the forward end of the cutter bar 10 extends forwardly and integrally forms with the body portion of the cutter bar a forward integral stepped wall or a wall portion; which is indicated generally by the reference character 32. As illustrated, in Figures 2 and 4, the forward integral wall portion 32 is stepped, the upper surface of the stepped wall portion 32 is indicated by the reference character 37 and the lower surface thereof is indicated by the reference character 38, and the stepped edge between the two surfaces is indicated by the reference character 40. Detachably connected on the opposite side of the cutter bar 10 at its forward end is a detachable and stepped forward wall or wall member indicated generally by the reference character 35. The rearward part of the uppermost stepped portion 36 of the detachable forward wall 35 is arranged to engage interlockingly with an angular recess 33 provided in the forward end of the solid cutter bar. The underneath side of the rearward part 36 of the detachable forward wall 35 is disposed to engage the upper stepped surface 37 of the forward integral stepped wall portion 32. Therefore, when the rearward part 36 is positioned into the angular recess 33, the detachable forward wall 35 is restrained against lateral movement during the cutting operation of the coal.

Positioned intermediate the lowermost forward surface 39 of the detachable forward wall 35 and the lowermost surface 38 of the forward integral wall 32 is a wear resistance block 34 which reduces the wear caused by the moving chain to a minimum. This wear resistance block 34 is detachably mounted along with the detachable forward wall 35. In other words, the wear resistance block 34 may be removed by disconnecting the forward detachable wall 35. In this manner, in the event that the wear resistance block 34 wears away, this may be replaced by a new one. As illustrated in Figures 2 and 5, the detachable forward wall 35 is provided with a shoulder 42 which engages the uppermost and rearward end of the wear resistance block 34. In this manner, the detachable forward wall 35 is constrained against forward movement when the shoulder 42 engages the uppermost and rearward portion of the wear resistance block 34. The detachable forward wall 35 is keyed and so interlocked, that it is restrained against movement in all directions. This is very important for the reason that in the operation of cutting coal the forward end of the cutter bar is subjected to very severe usage.

As illustrated, the detachable forward wall 35 and the wear resistance block 34 are connected to the forward end of the cutter bar by means of a large threaded screw 43 and four smaller screws 46. The large threaded screw 43 is arranged to extend through an opening 45 in the rearward part 46 of the detachable forward wall 45 and threadably engage a threaded opening 44 of the uppermost stepped portion 37 of the forward integral wall 32. The four screws 46 extend through the openings 48 in the forward end of the detachable forward wall 35 and threadably engage the threaded openings 47 in the lowermost stepped portion 38 of the forward integral wall 32. While I have shown one large screw 43 and four small screws 46 for holding the detachable forward wall 35 and the wear resistance block 34 to the forward end of the cutter bar, it is understood that any number of screws may be used for this purpose so long as the members are rigidly connected thereto. The arrangement of the forward integral wall 32 and the detachable forward wall 35, together with the wear resistance block 34 is such that there is provided a guide channel 51 in the forward end of the cutter bar around which the tooth carrying chain passes. This forward guiding channel 51 is in alignment with the guiding channels 26 and 29 provided respectively in the opposite edges of the cutter bar 10. In order to minimize the wear as much as possible upon the channels 26, 29, and 51, I provide for riveting or otherwise connecting the longitudinal wear strips 49 around the cutter bar, by means of the rivets 50. As illustrated, the longitudinal wear strips 49 are connected to the inside wall of the channels 26 and 29 and 51, and also extend laterally to cover the outer edges of the cutter bar to resist wear from the pressure of the tooth carrying chain. As illustrated best in Figure 2, the longitudinal wear strips 49 not only constitute a wearing surface to support the lateral stress upon the tooth carrying chain 11, but also keep the tooth carrying chain 11 from raising out of the channels 26, 29, and 51. This is because the lateral lugs 17 of the lowermost portion of the chain lugs 14 engage the inner longitudinal edges of the wear strips 49. Therefore, when assembling or disassembling the tooth carrying chain 11, upon the cutter bar 10, the detachable forward wall 35 is removed so that access may be had directly to either connecting or disconnecting the tooth carrying chain. The wear strip on the forward end of the wall 32 in alignment with the guide channel 26 is cut away as at 53 in order to allow the lugs 17 on the underneath side of the lugs 14 to be withdrawn from or admitted to the guide channel 26. The cutter chain 11 is quite stiff laterally and thus it would be difficult to remove or insert the chain in the guide channel 25 when the detachable wall 35 is removed, if the section 53 were not cut away.

In cutting coal, the cutter bar 10 is frequently subjected to large bending stresses which tend to bend the cutter bar beyond its yielding point, so that when the bar is free, it may not be returned to its original straight position. Therefore, in the construction of my cutter bar, I provide for varying the section modulus of the cutter bar in order to avoid this bending caused by the concentra-

tion of the bending stresses. To accomplish a variable section modulus, I provide a longitudinal recessed portion 19 upon one side of the cutter bar. The width of this depression portion 19, as well as the depth, increases towards the free end of the cutter bar. In other words, the section modulus beginning at the free end of the cutter bar gradually increases to a larger value towards the rear end of the cutter bar. This means that the cutter bar is relatively flexible and thus may be flexed a considerable amount without permanently bending the cutter bar such as caused by the large concentration of stresses.

Although I have described my invention with a certain degree of particularity, it is understood that the present disclosure has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

I claim as my invention:

1. In a mining machine utilizing a cutter chain, a cutter bar having two opposite edges and a forward arcuate end over which the cutter chain passes, said cutter bar having two spaced longitudinal wall portions disposed along each of the said opposite edges of the cutter bar, to form a guide channel for the cutter chain, said cutter bar having a forward wall portion integrally connected to the forward end of the cutter bar and disposed along one side thereof, said forward wall portion having stepped surfaces and a stepped edge between the said surfaces, the other side of the forward end of the cutter bar having a recess, a detachable forward wall portion connected to the forward end of the cutter bar and disposed upon the said other side of the cutter bar and having its rearward part engaging the said recess, said detachable wall portion having stepped surfaces and a stepped edge between said surfaces, a detachable wear resistance block detachably positioned intermediate the said forward wall portions and between the lowermost stepped surfaces, the rearward edge of the detachable wear resistance block coinciding with the stepped edges of the said forward wall portions, and means for detachably connecting the detachable wall portion and the detachable wear resistance block to the forward end of the cutter bar, the two lowermost stepped surfaces of the two forward wall portions and forward surface of said wear resistance block forming a guide channel around the forward end of the cutter bar and in alignment with the guide channel formed in each edge of the cutter bar, the edge of the said recess and the rearward edge of the detachable wear resistance block constituting angular edges for constraining the detachable forward wall against lateral movement.

2. A mining machine cutter bar having a relatively long body portion with an arcuate forward end and a guide channel in its opposite edges and a deep channel extending around the forward arcuate end of the bar, said deep channel having a bottom surface disposed angularly with reference to the bottom surface of the two opposite guide channels, a wear resisting member having a forward arcuate surface and a rearward engaging surface to engage the angular bottom surface of the deep channel, means engaging the wear resisting member and the cutter bar for securely mounting the wear resisting member in the deep channel upon the forward end of the cutter bar, the width of the rearward surface of the wear resisting member being substantially the same as the width between the bottom surfaces of the two opposite guide channels and causing the arcuate surface to form the bottom of a guide channel extending around the arcuate forward end of the cutter bar of substantially the same depth as the depth of each of the two opposite guide channels, said deep channel being formed by two spaced forward wall portions, one of said forward wall portions comprising an integral part of the cutter bar, the other of said forward wall portions constituting a detachable part of the cutter bar, said detachable wall portion having a rearward part and a forward part with the rearward part being thicker than the forward part and presenting a stepped edge therebetween, said stepped edge constituting a portion of the bottom surface of the deep channel against which a portion of the rearward edge of the wear resisting member engages, said body portion of the cutter bar having a recess with side portions to receive the rearward part of the detachable wall portion, said recess and said rearward part of the detachable wall portion fitting therein having a width less than the width between the bottom surfaces of the two opposite guide channels of the cutter bar.

3. A mining machine cutter bar having a relatively long body portion with an arcuate forward end and a guide channel in its opposite edges and a deep channel extending around the forward arcuate end of the bar, said deep channel having a bottom surface disposed angularly with reference to the bottom surface of the two opposite guide channels, a wear resisting member having a forward arcuate surface and a rearward engaging surface to engage the angular bottom surface of the deep channel, means engaging the wear resisting member and the cutter bar for securely mounting the wear resisting member in the deep channel upon the forward end of the cutter bar, the width of the rearward surface of the wear resisting member being substantially the same as the width between the bottom surfaces of the two opposite guide channels and causing the arcuate surface to form the bottom of a guide channel extending around the arcuate forward end of the cutter bar of substantially the same depth as the depth of each of the two opposite guide channels, said deep channel being formed by two spaced forward wall portions, one of said forward wall portions comprising an integral part of the cutter bar, the other of said forward wall portions constituting a detachable part of the cutter bar, said detachable wall portion having a rearward part and a forward part with the rearward part being thicker than the forward part and presenting a stepped edge therebetween, said stepped edge constituting a portion of the bottom surface of the deep channel against which a portion of the rearward edge of the wear resisting member engages, said rearward part of the detachable wall portion having angularly disposed edges, said body portion of the cutter bar having a recess with angularly disposed side portions to receive interlockingly the rearward part of the detachable wall portion, said recess and said rearward part of the detachable wall portion fitting therein having a width less than the width between the bottom surfaces of the two opposite guide channels of the cutter bar.

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