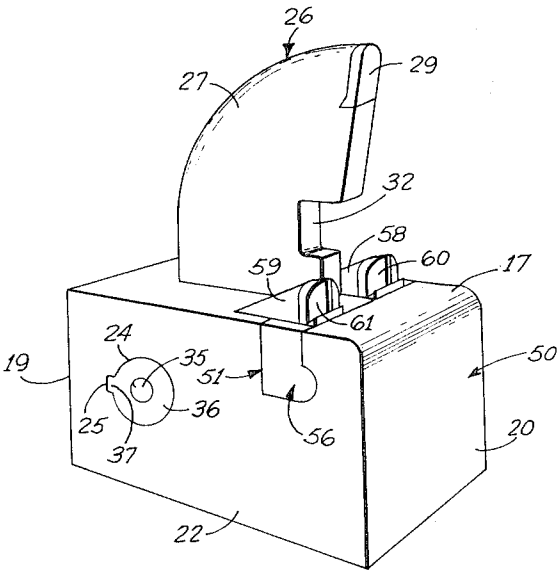


[54] CORE BREAKING MEANS
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[73] Assignee: The Cincinnati Mine Machinery Co., Cincinnati, Ohio
[22] Filed: Aug. 11, 1972
[21] Appl. No.: 279,816
[52] U.S. Cl. 299/86, 37/142 A, 299/88, 299/92
[51] Int. Cl. E21c 35/18
[58] Field of Search 299/83, 88-93; 37/141 T, 142 R, 142 A

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Primary Examiner—Ernest R. Purser
Attorney, Agent, or Firm—John W. Melville; Albert E. Strasser; Stanley H. Foster

[57] ABSTRACT
Core breaking means for use with mining machines and the like of the type having cutter bits and mounting means therefor. The core breaking means are mounted on the cutter bit mounting means and provide core cutting or breaking tips to one or both sides of the cutter bit. The core breaking means for each cutter bit mounting means may comprise a pair of separate elements, or they may comprise a single, integral, unitary structure. Finally, the core breaking means may constitute an integral part of the cutter bit.
80 Claims, 37 Drawing Figures



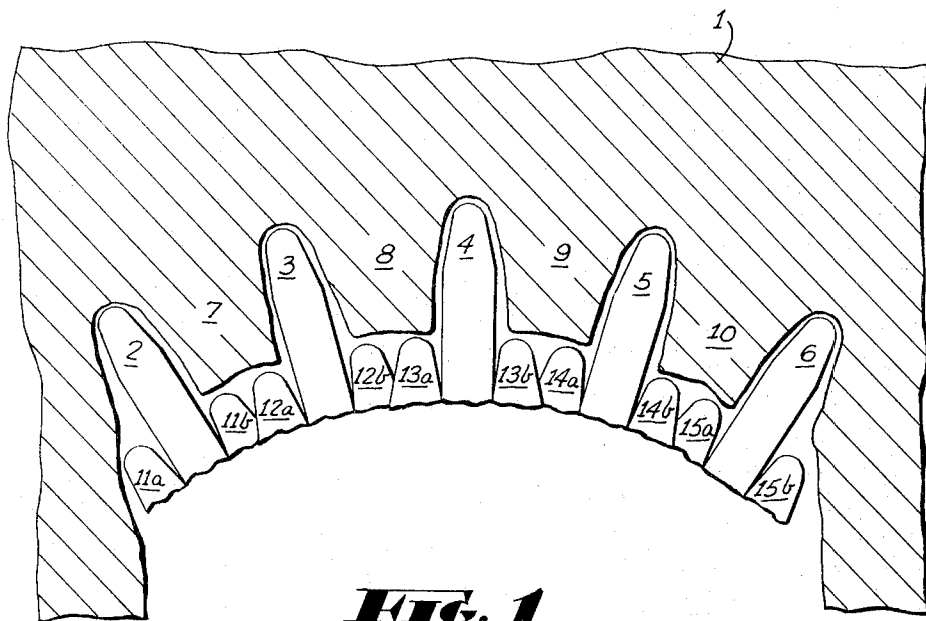


FIG. 1

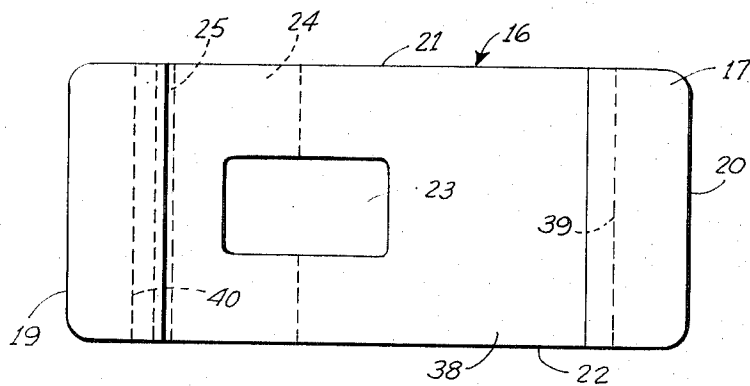


FIG. 3

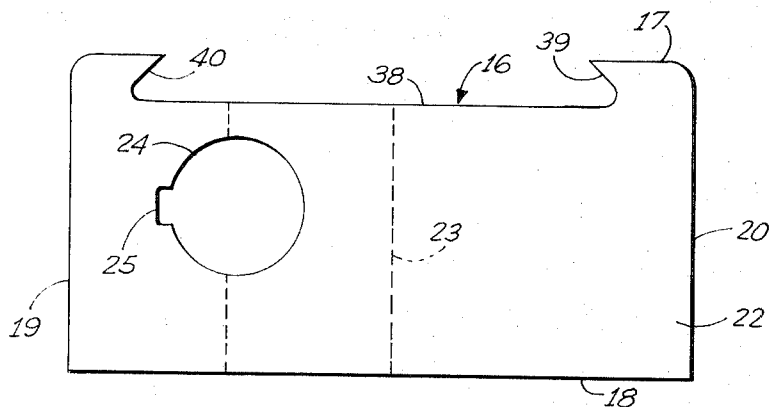


FIG. 2

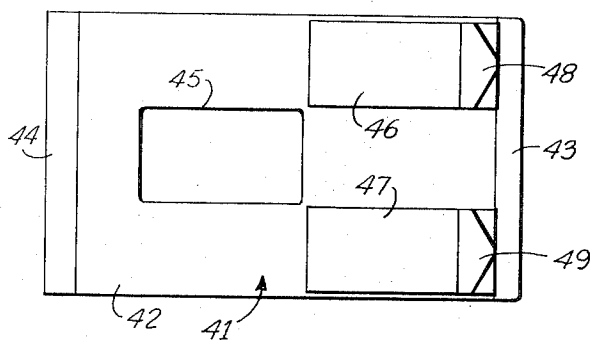


FIG. 5

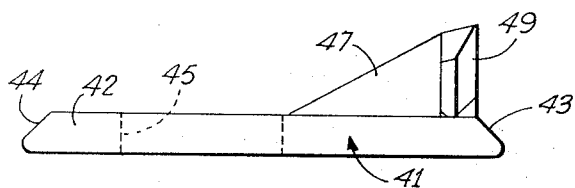


FIG. 4

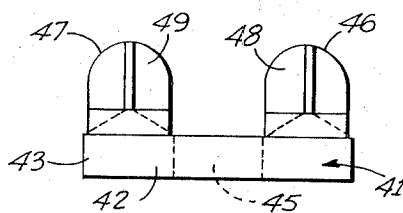


FIG. 6

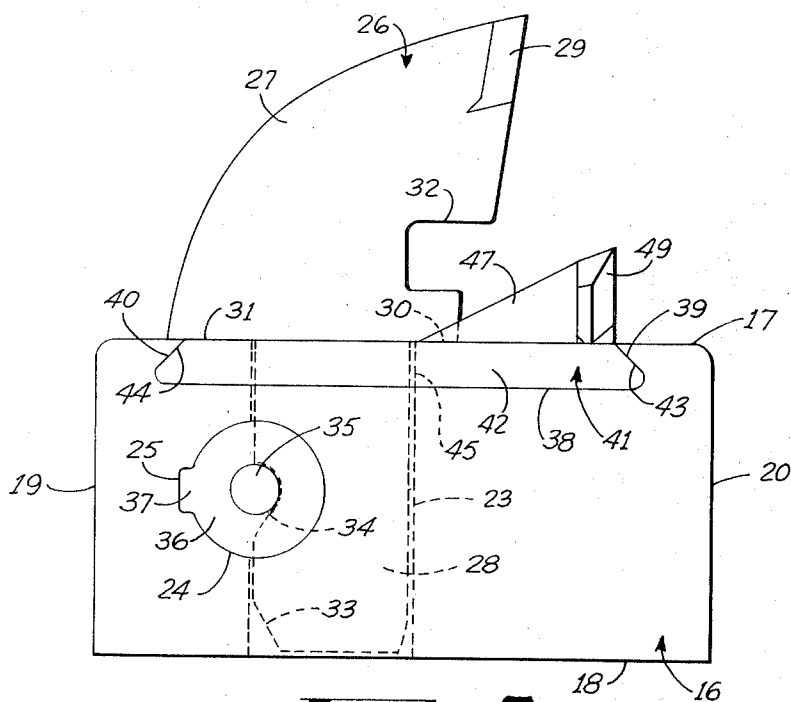


FIG. 7

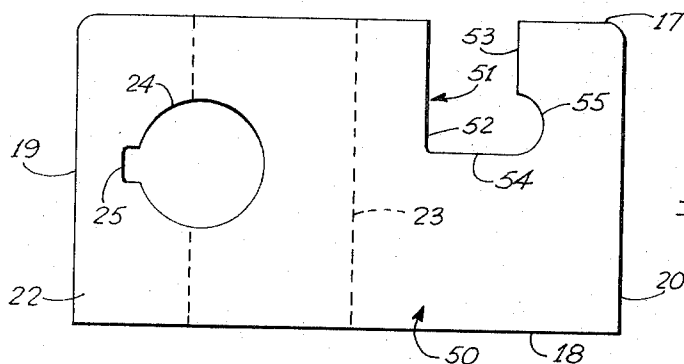


FIG. 8

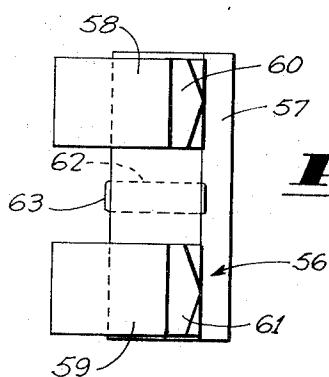


FIG. 10

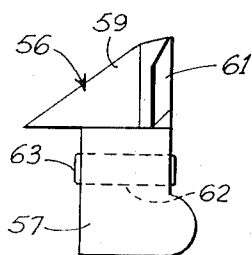


FIG. 9

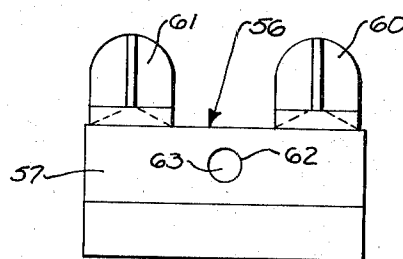


FIG. 11

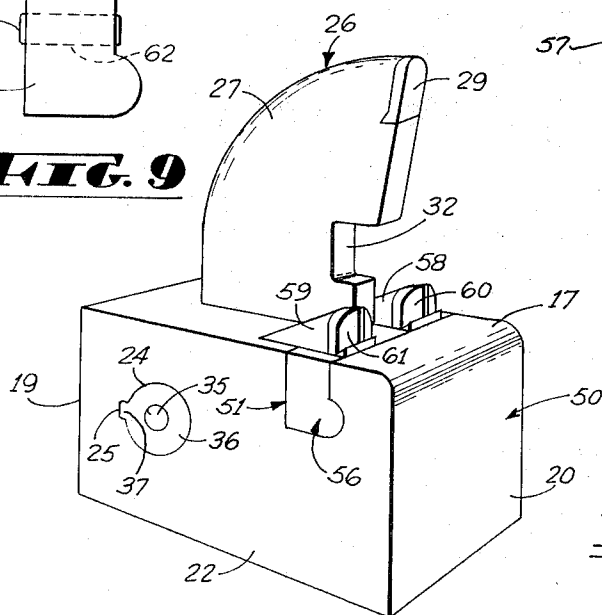


FIG. 12

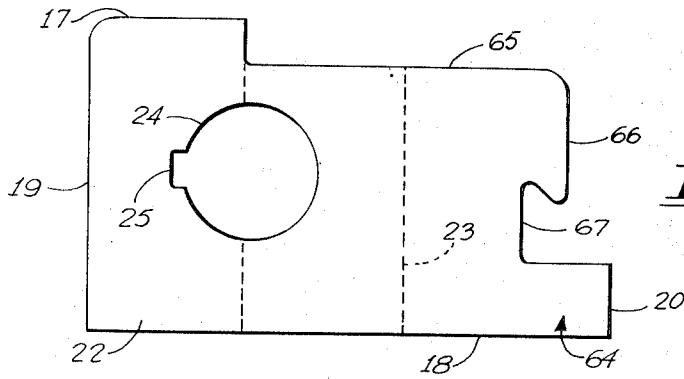


FIG. 13

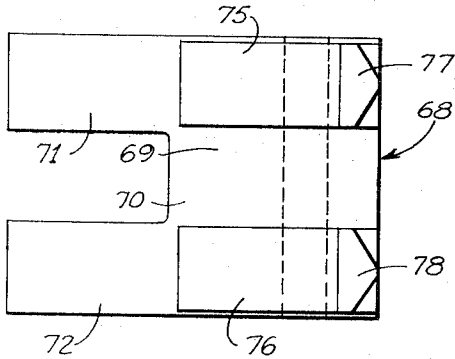


FIG. 15

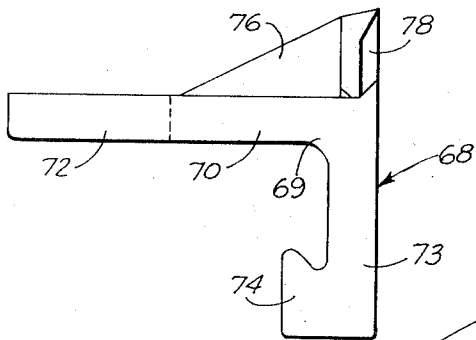


FIG. 14

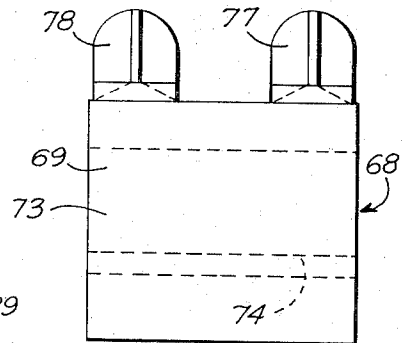


FIG. 16

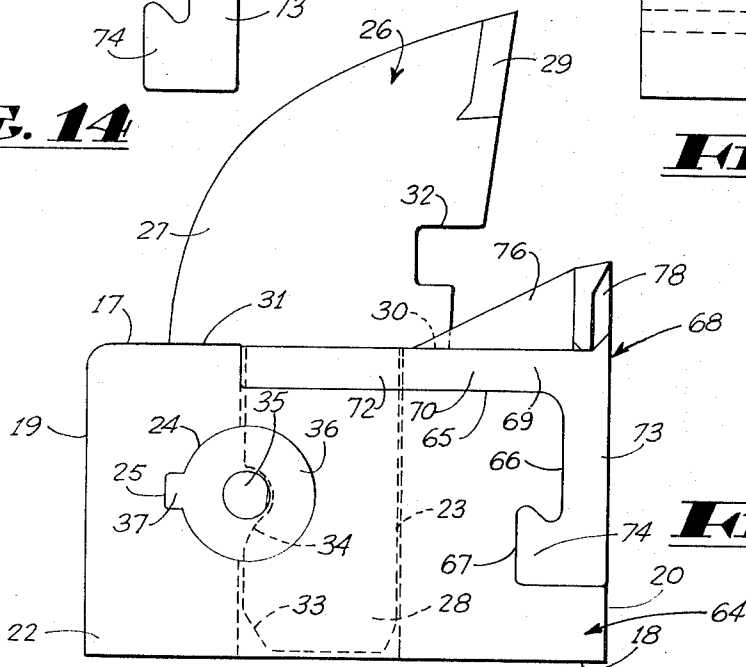


FIG. 17

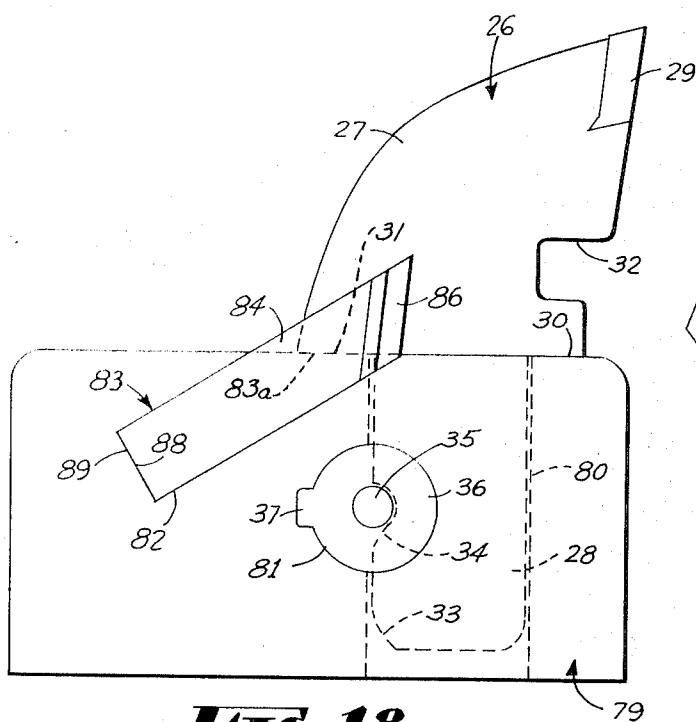


FIG. 18

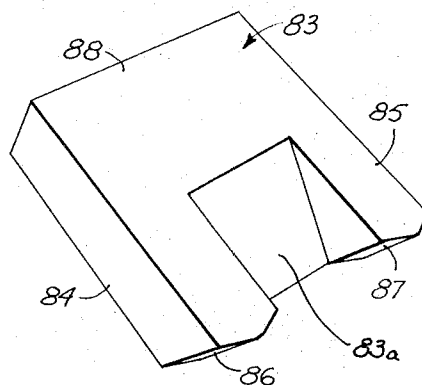


FIG. 19

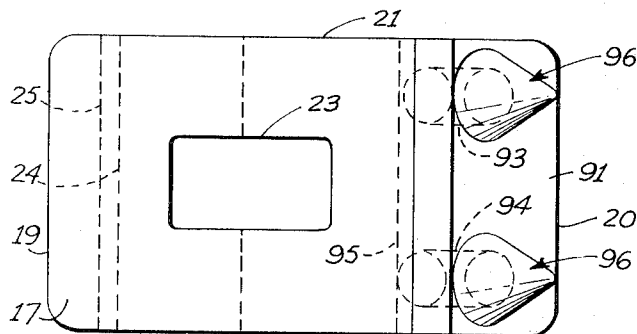


FIG. 22

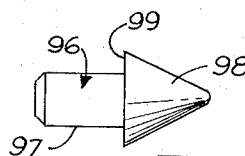


FIG. 21

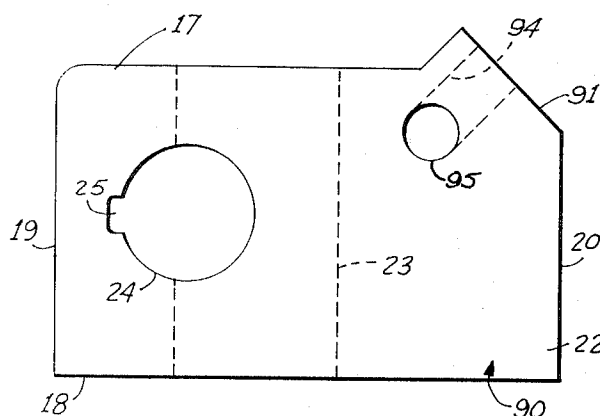


FIG. 20

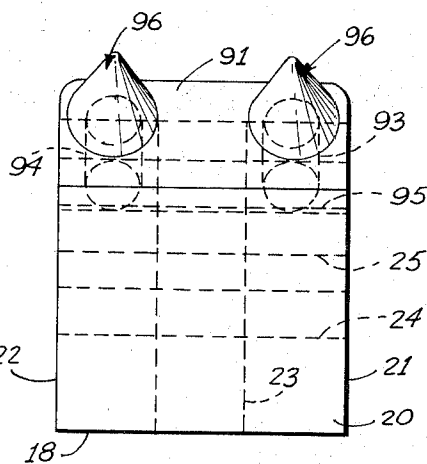


FIG. 23

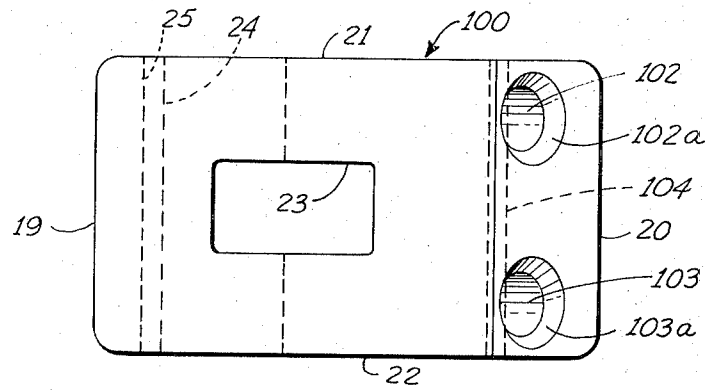


FIG. 25

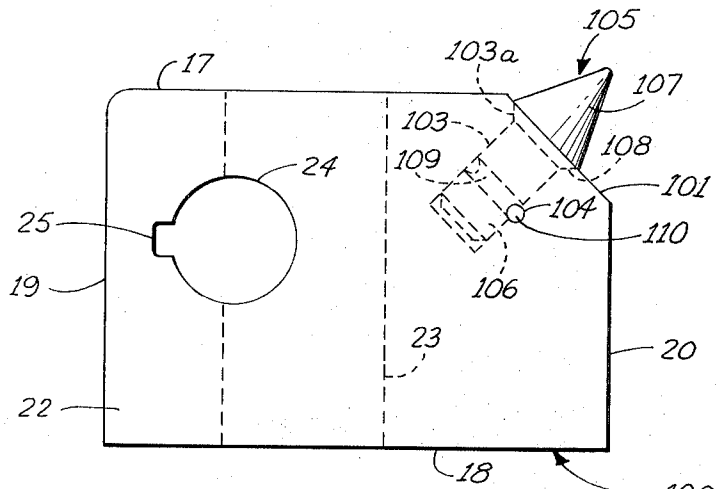


FIG. 24

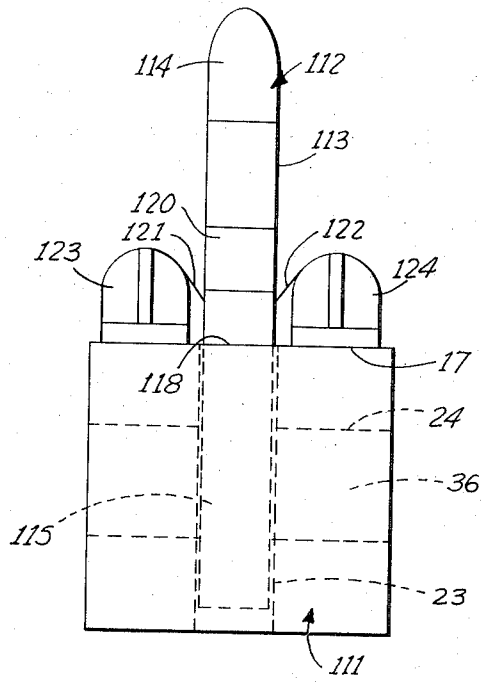


FIG. 26

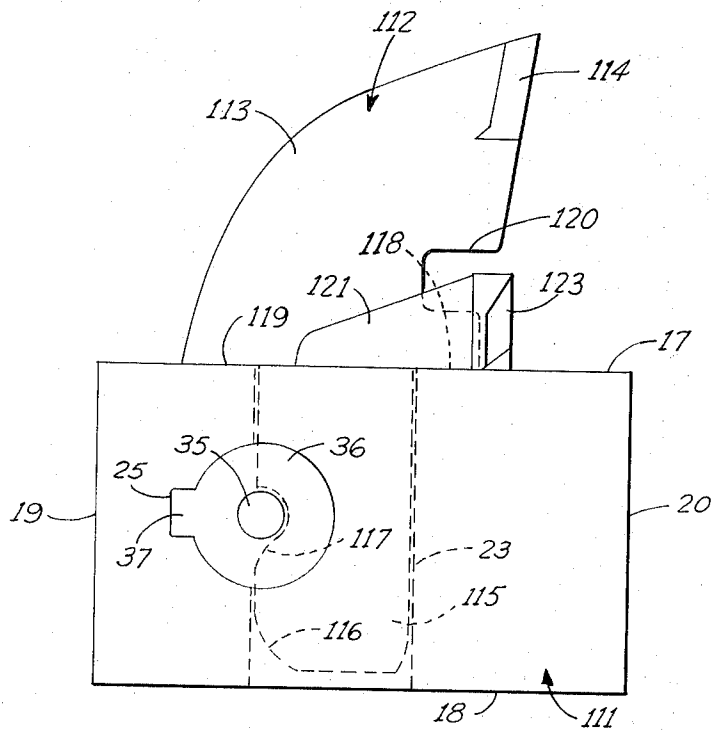


FIG. 27

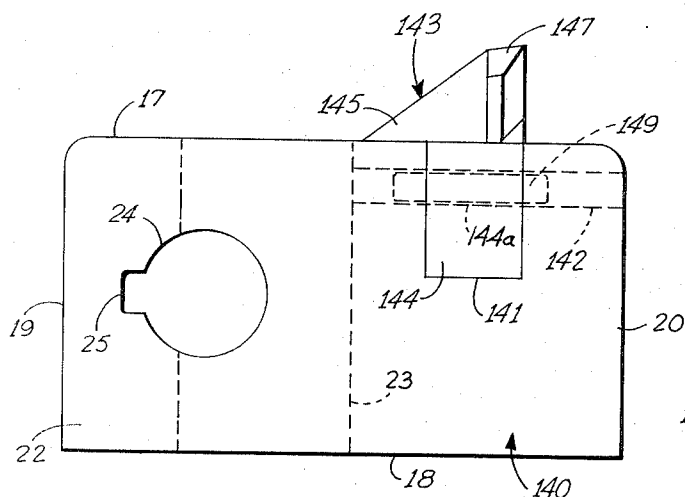


FIG. 30

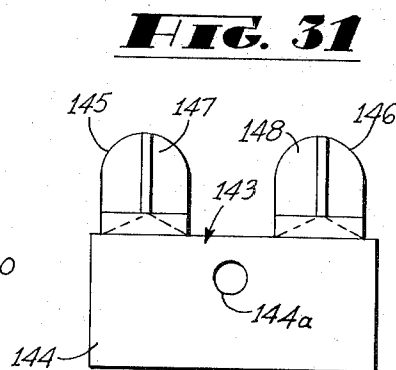


FIG. 31

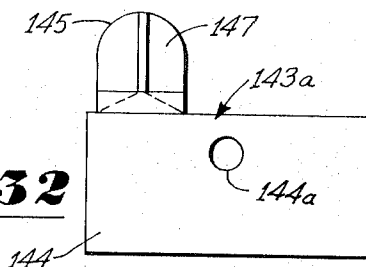


FIG. 32

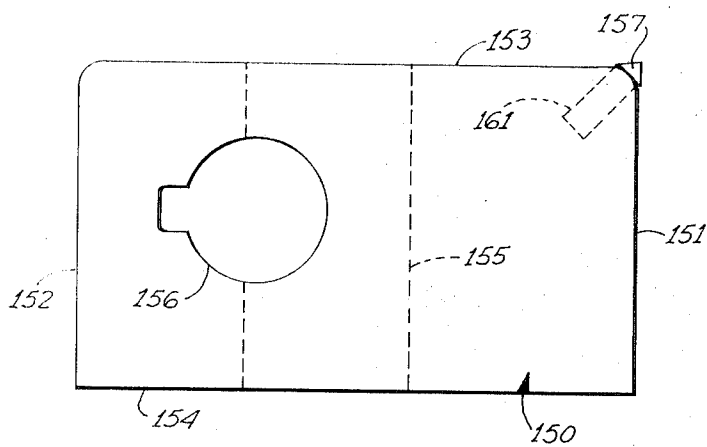


FIG. 33

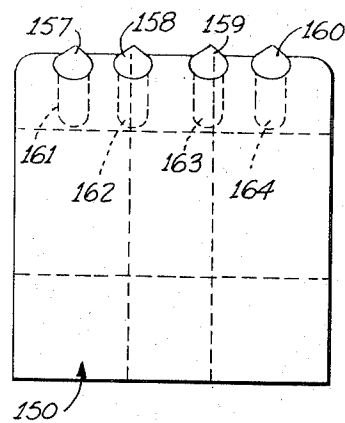


FIG. 34

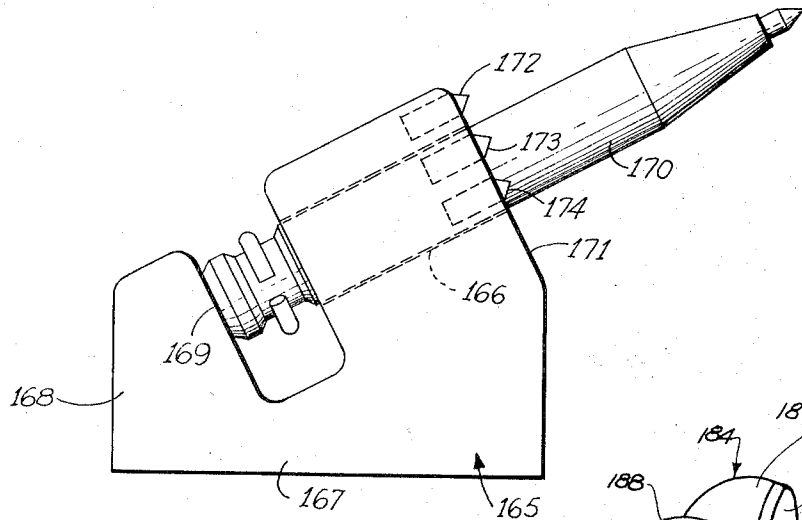


FIG. 35

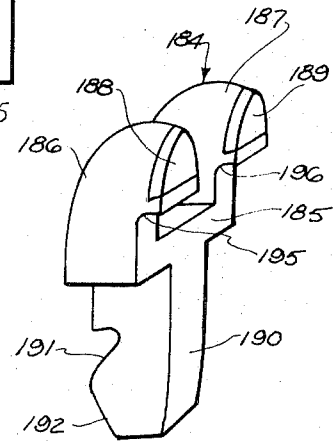


FIG. 37

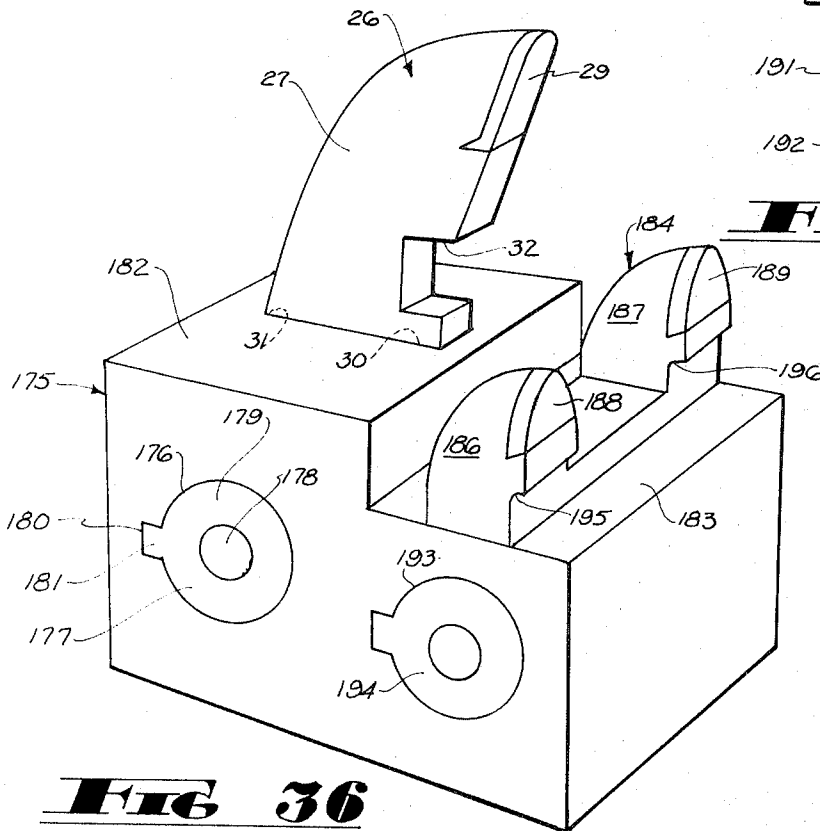


FIG. 36

CORE BREAKING MEANS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to core breaking means for the mounting means of cutter bits and the like, and more particularly to core breaking means adapted to protect the bit mounting means from wear and to reduce the number of bit positions required, naturally resulting in a possible increased feed rate.

2. Description of the Prior Art

In the typical mining machine or earth working machine cutter bits are replaceably mounted in mounting means. The mounting means, in turn, are affixed to driven elements which drive the mounting means-cutter bit assemblies in the cutting direction along the material being mined. Finally, as the cutter bits cut into the material, the entire mining machine (or at least that portion of it bearing the driven element) is advanced toward the material being cut so that the cutting operation can continue.

Prior art workers have developed a great many embodiments of cutter bits and mounting means therefor. In some instances, the bit-mounting means assemblies are so constructed as to permit free rotation of the bit in its mounting means. In other instances, the bits are intended to be nonrotatably held within their mounting means.

The driven element to which the bit mounting means are affixed also may take a number of forms. Cutter chains, cutter wheels, cutter arms and rotating drums are all well known in the art.

Irrespective of the nature of the driven element of the mining machine, the cutter bit-mounting means assemblies are generally arranged thereon in a carefully determined pattern so that the cut produced by the cutter bits in the material being mined is of sufficient width to accept a portion of the driven element and thereby permit it to be advanced toward the material being cut. As a consequence, the above mentioned pattern of arrangement of the bit-mounting means assemblies is such that the cutting tips of the bits, as they advance in the cutting direction, follow parallel or concentric paths through the material. While the above mentioned pattern arrangement is often intended to bring these paths as close together as is feasible, they generally become spaced from each other by increasing distance due to wear of the driven element, i.e., wear of the chain and the chain guide means when the driven element is a cutter chain. As a consequence, there will be formed between adjacent paths a "core" of unfractured material which will tend to "grow" as the bits proceed in the cutting direction. Thus, in essence, there will be rows of unfractured material between the paths followed by the bit cutting tips.

The formation of cores in the materials being mined is substantially unavoidable. However, core growth is greater in some types of materials than in others. For example, material such as relatively clean coal, which is easily fractured, displays a minimum core growth. On the other hand, the mining of material such as coal containing stratified impurities (including iron pyrites, sulfur, fire clay, etc.), which is difficultly fractured, results in serious core growth.

When the cores are formed, a portion of them will lie in the path of travel of the mounting means for the bits. While impact with the mounting means will fracture

the cores and remove them, the mounting means themselves are subjected to wear by virtue of this contact or impact. Such wear of mounting means, caused by the cores, is generally referred to as "coring". With the passage of time, this wear will finally result in the necessity for replacing the mounting means.

The problem of coring is a serious one because, while cutter bits are intended to be frequently replaced and means are generally provided whereby their replacement can be easily and quickly affected, this is not true of the mounting means which are far more expensive and frequently far more difficult to replace.

Prior art workers have taken a number of approaches toward the solution of the coring problem. Primary among these was the provision of a considerable number of bit positions so that the paths of travel of the bit cutting tips would be as close together as possible, thereby minimizing, to the extent possible, the growth of cores. An example of such an arrangement is taught in U.S. Pat. No. 1,528,546. In addition, prior art workers have developed chains wherein some of the bits are arranged in primary cutting positions and others of the bits are located in secondary or lower cutting positions. Examples of such chains are taught in U.S. Pat. Nos. 2,832,579 and 3,307,875. While these approaches have helped the situation, they are not without disadvantages. First of all, as indicated above, the growth of cores cannot be completely eliminated. Secondly, for each bit position a specialized mounting means must be provided to maintain its bit in that position and this, in turn, results in difficulty and expense for the mine owner who must maintain a supply of the numerous different mounting means. Finally, it has been found that as the number of bit positions is increased, the feeding of the driven element into the material being mined is slowed.

Yet another approach by the prior art has been to provide means to minimize wear of the mounting means by cores. To this end hard surfacing has been applied to those mounting means surfaces vulnerable to coring. Another expedient is represented by the co-pending application in the name of the same inventor, Ser. No. 181,771, filed Sept. 20, 1971, and entitled ANTI-CORING DEVICE FOR USE WITH BIT MOUNTING MEANS ON MINING, EARTH WORKING AND DIGGING MACHINES. This application teaches the use of a replaceable anti-coring device detachably affixed to the forward face of the mounting means and configured with respect to the mounting means to be subjected to the wear by cores which would normally be sustained by the mounting means itself. While such hard surfacing and anti-coring devices are successful in reducing or eliminating the wear or coring of the mounting means, they do not solve the other aforementioned problems.

The present invention is directed to a wholly different approach. In accordance with the present invention the number of bit positions is reduced, and cores are purposefully permitted to grow. However, some or all of the bit-carrying mounting means are provided with core breaking means presenting to one or both sides of the cutter bit a core cutting or breaking tip. The core breaking means prevent wear or coring of the mounting means and are, themselves, as readily replaceable as are the cutter bits. With the reduction of the number of bit positions, the driven element may be fed faster into the material being cut and the number of different

types of mounting means to be stocked by the mine owner is reeducated.

As will be apparent to one skilled in the art, the core breaking means of the present invention may be used with many different types of mounting means carrying different types of cutter bits. Furthermore, the nature of the drive element bearing the bit mounting means does not constitute a limitation on the present invention. However, for purposes of an exemplary showing and to simplify the description hereinafter, the core breaking means of the present invention will be described in their application on mounting means of the type, frequently used on driven elements such as cutter chains and the like.

SUMMARY OF THE INVENTION

The core breaking means of the present invention are supported by the mounting means and are adapted to present cutting or breaking tips to one or both sides of the cutter bit located in the shank receiving perforation of the mounting means. In some embodiments, the core breaking means is a unitary structure slidably mounted in a specially configured depression or groove formed in the mounting means. The core breaking means may be frictionally held in place, held in position by the cutter bit, or held in place by other means such as mechanical means, brazing and the like.

While the core breaking means provides cutting or breaking tips intended to have paths of travel to either side of the path of travel of the cutter bit, they may be located ahead of, alongside or behind the cutter bit.

In other embodiments of the core breaking means, they may comprise separate elements frictionally or otherwise held in depressions or holes in the mounting means.

Finally, the core breaking means may constitute integral parts of the cutter bit itself. When this is the case, the core breaking means will rest upon the mounting means and be supported thereby. They are affixed to the mounting means by virtue of the fact that the cutter bit is affixed to the mounting means.

Finally, as will be shown hereinafter, the nature of the cutter bit and the type of mounting means used does not constitute a limitation on the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a diagrammatic view, partly in cross section and illustrating the theory upon which the present invention is based.

FIGS. 2 and 3 are respectively a side elevational view and a plan view of a mounting means adapted for use with a core breaking means of the present invention.

FIGS. 4, 5 and 6 are, respectively, a side elevational view, a plan view and a front elevational view of a core breaking means to be used with the mounting means of FIGS. 2 and 3.

FIG. 7 is a side elevational view of the mounting means of FIGS. 1 and 2 illustrating a cutter bit and the core breaking means of FIGS. 4, 5 and 6 mounted thereon.

FIG. 8 is a side elevational view of a mounting means adapted to support another embodiment of the core breaking means of the present invention.

FIGS. 9, 10 and 11 are, respectively, a side elevational view, a plan view and a front elevational view of

the core breaking means to be used with the mounting means of FIG. 8.

FIG. 12 is a perspective view illustrating the mounting means of FIG. 8 with a cutter bit and the core breaking means of FIGS. 9, 10 and 11 mounted thereon.

FIG. 13 is a side elevational view of a mounting means adapted for use with yet another embodiment of the core breaking means of the present invention.

FIGS. 14, 15 and 16 are, respectively, a side elevational view, a plan view and a front elevational view of a core breaking means for use with the mounting means of FIG. 13.

FIG. 17 is a side elevational view illustrating the mounting means of FIG. 13 with a cutter bit and the core breaking means of FIGS. 14, 15 and 16 affixed thereto.

FIG. 18 is a side elevational view of a mounting means, a cutter bit and yet another embodiment of the core breaking means of the present invention.

FIG. 19 is a perspective view of the core breaking means of FIG. 18.

FIG. 20 is a side elevational view of a mounting means adapted to support a pair of individual core breaking means.

FIG. 21 is a side elevational view of one of the core breaking means to be used with the mounting means of FIG. 20.

FIGS. 22 and 23 are, respectively, a plan view and a front elevational view of the mounting means of FIG. 20 with a pair of core breaking means of the type shown in FIG. 21 affixed thereto.

FIGS. 24 and 25 are, respectively, a side elevational view and a plan view of a mounting means similar to that of FIG. 20; FIG. 24 illustrating a core breaking means similar to that of FIG. 21 but rotatively mounted in the mounting means.

FIGS. 26 and 27 are, respectively, a front elevational view and a side elevational view of a mounting means and a cutter bit having integral core breaking means.

FIG. 28 is a side elevational view illustrating the application of the core breaking means of FIGS. 9, 10 and 11 to a cutter bit and mounting means assembly of the type wherein the cutter bit is rotatably mounted in the mounting means.

FIG. 29 is a side elevational view illustrating the application of the core breaking means of FIGS. 14, 15 and 16 to yet another type of mounting means-cutter bit assembly.

FIG. 30 is a side elevational view illustrating a mounting means and a core breaking means similar to those of FIGS. 8 through 12 and showing the use of a pin-like retainer for the core breaking means.

FIG. 31 is a front elevational view of the core breaking means of FIG. 30.

FIG. 32 is a front elevational view similar to FIG. 31 illustrating a core breaking means provided with one breaking or cutting tip.

FIGS. 33 and 34 are respectively side elevational and front elevational views of a mounting means provided with another embodiment of the core breaking means.

FIG. 35 is a side elevational view illustrating the application of the core breaking means of FIGS. 33 and 34 to a different type of mounting means.

FIG. 36 is a perspective view of a cutter bit and mounting means affixed to the mounting means with a "knock-in, pry-out" relationship.

FIG. 37 is a perspective view of the core breaking means of FIG. 36.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As indicated above, the present invention is based upon the discovery that if core breaking means are provided on the mounting means and are so configured as to present a cutting or breaking tip to one or both sides of the cutter bit mounted in that mounting means, the number of cutting positions may be reduced and the driving element, such as a cutting chain, may be advanced more rapidly through the material being cut. In accordance with this discovery, cores are permitted to grow between the paths of travel of the various cutter bits, but are broken off by the core breaking means thus precluding or greatly diminishing wear on the mounting means. This theory is diagrammatically illustrated in FIG. 1 which is a cross sectional view through the material being cut. The material being cut is designated by the index numeral 1. A plurality of cutter bits, in various cutting positions are shown at 2 through 6. As will be understood by one skilled in the art, each of the cutter bits 2 through 6 may be supported by its own separate mounting means (not shown). The mounting means for each cutter bit may comprise a lug or block of the well known type mounted on a cutting chain (not shown). As illustrated in FIG. 1, cores 7 through 10 are formed between the paths of travel of the bits 2 through 6. The bottom portions of the cores are shown as being broken off by core breaking means 11a-11b through 15a-15b. As will be evident hereinafter, the present invention contemplates that the core breaking means will be such as to provide a core cutting or breaking tip at one or both sides of at least some of the cutter bits.

While five bit positions are diagrammatically represented in FIG. 1, the number of bit positions actually used does not constitute a limitation on the present invention. The number of bit positions used will depend on a number of different factors such as the type of bit used, the nature of the material being cut, the width of the kerf being cut and the like, all of which is known to those skilled in the art. FIG. 1 does show, however, that cores are permitted to form between the bits, but are broken off by the provision of core breaking means. As indicated above, this arrangement has enabled faster feeding of the cutter chain, a reduction in the number of different types of mounting means used and has protected the mounting means themselves from wear or coring.

A simple embodiment of the present invention is illustrated in FIGS. 2 through 7. Turning first to FIGS. 2 and 3, a lug or mounting means is generally indicated at 16, the lug comprising a body having a top surface 17, a bottom surface 18, ends 19 and 20 and sides 21 and 22. The lug has a vertical shank-receiving perforation 23 therein extending from its top surface to its bottom surface. The shank-receiving perforation 23 is partially intersected by a transverse hole 24 extending from the side 21 to the side 22 and having a key-way 25.

As is shown in FIG. 7, the mounting means 16 is adapted to support a conventional cutter bit held in place by a conventional retaining means. Such cutter

bits and retaining means are taught, for example, in U.S. Pat. No. 3,114,537. Briefly, the cutter bit (generally indicated at 26) comprises a head portion 27 and a shank portion 28. The head portion may be provided with a hard cutting tip 29, gauge-determining abutment shoulders 30 and 31 and a notch 32 by which the bit may be engaged by a suitable removal tool.

The shank 28 is of rectangular cross section. While considerable clearance is shown between the shank and the shank receiving perforation 23, for purposes of clarity it will be understood that the shank is so sized as to be slidably received within the shank receiving perforation 23 with as little clearance as is practical. The rear surface of the shank has a lowermost sloping portion 33 and a hook-shaped notch 34.

The nature of the retaining means for holding the cutter bit shank in the shank receiving perforation does not constitute a limitation on the present invention. For purposes of illustration a well known retainer is shown of the type comprising a metallic rod 35 encased in a body 36 of resilient material. The body 36 of resilient material is so shaped as to expose that portion of the metallic rod 35 lying within the shank receiving portion 23. The resilient body 36 has a longitudinally extending key portion 37 thereon (either an integral portion of the body or a separate member) adapted to lie in the key-way 25 and maintain the retaining means properly oriented.

When the bit shank 28 is inserted in the shank receiving perforation and a blow is administered to the head 27 of the bit, the sloping portion 33 of the bit shank will cause the metallic rod 35 of the retainer to shift rearwardly out of the shank receiving perforation. When the hook-shaped notch 34 is located adjacent the rod 35, the rod will be free to return to the position shown. The rod cooperates with the hook-shaped notch and the gauge-determining abutment shoulders 30 and 31 to maintain a constant downward pressure on the bit shank 28. For removal of the bit, an appropriate tool is engaged in the notch 32 and a prying force is applied to the bit, the hook-shaped notch is configured to move the rod 35 of the retaining means rearwardly and out of the shank receiving perforation 23, thereby releasing the bit. The structure thus far described is conventional in the art and constitutes the well known knock-in-pry-out type of bit.

Returning to FIGS. 2 and 3, it will be noted that the upper surface 17 of the mounting means 16 has a notch or depression 38 therein extending from the side 21 to the side 22. At its forward end, the depression 38 terminates in an undercut 39. Similarly, at its rearward end the depression terminates in an undercut 40.

The core breaking means is illustrated in FIGS. 4, 5 and 6 and is generally indicated by index numeral 41. The core breaking means comprises a plate-like body 42 having a width equal to the width of mounting means 16 and a length equal to the length of the notch or depression 38 in the mounting means. The forward and rearward ends of the body 42 are sloped as at 43 and 44. The body 42 also has a perforation 45 therein of the same dimensions and cross sectional configuration as the shank receiving perforation 23 of FIG. 3.

Near its forward end, the body 42 of the core breaking means has a pair of spaced forwardly and upwardly sloping extensions or lugs 46 and 47. The lugs 46 and 47 lie to either side of the perforation 45 and may be

provided at their forwardmost ends with hard cutting tips 48 and 49, respectively.

Returning to FIG. 7, the core breaking means 41 is illustrated in position on the mounting means 16. It will be noted that the body portion 42 of the core breaking means just nicely fits into the depression 38 in the mounting means with its sloping forward end 43 and rearward end 44 cooperating with undercuts 39 and 40, respectively, in dove-tail fashion.

The shank 28 of the cutter bit 26 extends through the perforation 25 of the core breaking means and the gauge-determining shoulders 30 and 31 of the bit rest on the upper surface of the core breaking means. Thus it will be evident that the bit 26 will prevent lateral displacement of the core breaking means. It will similarly be evident that the upwardly extending lugs 46 and 47 will lie to either side of the bit 26, their hard cutting tips 48 and 49 serving to break off cores lying to either side of the bit. It will similarly be evident that the core breaking means will protect the mounting means 16.

To assemble the structure shown in FIG. 7, it is only necessary to locate the core breaking means 41 in the notch or depression 38 of the mounting means and then to insert the bit shank 28 through the perforation 45 of the core breaking means and into the shank receiving perforation 23. It will be understood that the core breaking means will not interfere with removal and replacement of the bit 26. Replacement of the core breaking means, itself, can be effected by removal of the bit 26 and lateral removal of the core breaking means.

Another embodiment of the core breaking means of the present invention is taught in FIGS. 8 through 12. In FIG. 8, a lug or mounting means 50 is shown substantially identical to the mounting means 16 of FIGS. 2 and 3. Like parts have therefore been given like index numerals. The mounting means 50 differs from that of FIGS. 2 and 3 in that its upper surface has a notch 51 of different configuration from the notch 38 of mounting means 16.

The notch 51 extends from one side to the other of the mounting means 50. The notch has a planar rearward surface 52, a parallel planar forward surface 53 and a planar bottom surface 54. The bottom surface 54 joins the forward surface 53 by means of an undercut 55.

The core breaking means for use with the mounting means 50 is illustrated in FIG. 9, 10 and 11 and is generally indicated by index numeral 56. The core breaking means 56 has a body portion 57 equal in length to the width of the mounting means 50. The body 57 has a cross sectional configuration equivalent to that of notch 51 in the mounting means and is so sized as to be nicely received therein.

The body 57 of the core breaking means has on its upper surface a pair of extensions or lugs 58 and 59, provided with hard cutting tips 60 and 61, respectively. The lugs 58 and 59 are similar to the lugs 46 and 47 in the embodiment of FIGS. 4 through 6 and are spaced from each other and extend transversely of the long axis of the core breaking means body 57.

FIG. 12 is a perspective view illustrating the mounting means of FIG. 8 provided with a cutter bit and the core breaking means of FIGS. 9 through 11. The bit illustrated in FIG. 12 may be identical to that described with respect to FIG. 7 and like parts have been given

like index numerals. The same is true with respect to the retaining means for the bit.

The core breaking means 56 is inserted in the slot 51 of the mounting means 50. In the embodiment illustrated, the lug portions 58 and 59 of the core breaking means are shown to be of sufficient length to extend beyond the forward edge of the cutter bit 26. Therefore, the cutter bit will prevent lateral shifting of the core breaking means 56.

To further assure that the core breaking means will remain in position, the body portion 57 thereof may have a transverse hole 62 formed therein. A rod-like element of resilient material 63 may be located in the hole 62 with its ends extending slightly beyond the surfaces of the body 57. The resilient material will be compressed upon insertion of the core breaking means 56 in the slot 51 and will maintain the core breaking means in position by friction. Under these circumstances, it is not necessary that the rearward ends of lugs 58 and 59 of the core breaking means extend rearwardly beyond the forward edge of cutter bit 26.

Again, in the embodiment of FIGS. 8 through 12, it will be noted that the core breaking means 56 will not interfere with the insertion and removal of the bit 26. The core breaking means itself may be removed and inserted without disturbing the bit 26, unless the lug portions 58 and 59 are of the length shown. Otherwise, the core breaking means will function in the same way described with respect to the core breaking means of FIGS. 2 through 7.

Another embodiment of the core breaking means of the present invention is illustrated in FIGS. 13 through 17. Turning first to FIG. 13, a mounting means is generally indicated by index numeral 64. The mounting means is basically similar to that of FIGS. 2 and 3, and again like parts have been given like index numerals. In this embodiment, however, the upper surface of the mounting means is relieved from its forward edge to the rearward surface of the shank receiving perforation 23, as shown at 65. The forward surface of the mounting means is similarly relieved as at 66 and provided with a hook-shaped notch 67.

The core breaking means for use with the mounting means 64 is illustrated in FIGS. 14 through 16 and generally designated by the index numeral 68. The core breaking means has a body 69 which, in essence, is configured to complete the mounting means 64. The body has an upper portion 70 terminating in bifurcations 71 and 72. The space between the bifurcations is substantially of the same size and shape as the cross sectional dimensions of the shank receiving perforation 23 in the mounting means 64. The body 69 also has a downwardly depending forward portion 73 terminating in a hook-shaped configuration 74 adapted to be received in the notch 67 of the mounting means.

Near its forward edge, the upper surface of the upper portion 70 of the core breaking means body 69 has thereon a pair of upwardly extending lugs 75 and 76 having hard cutting tips 77 and 78, respectively, affixed thereto. The lugs 75 and 76 and their hard cutting tips are substantially identical to the lugs 46 and 47 of the embodiment of FIGS. 4 through 6.

FIG. 17 illustrates the assembly of the mounting means 64 and the core breaking means 68 together with a cutter bit and retaining means. The cutter bit and retaining means are identical to those shown in

FIG. 7 and like parts have been given like index numerals.

It will be evident from FIG. 17 that prior to the installation of the cutter bit 26 the core breaking means 68 may be placed on the mounting means 64 by sliding the hook-shaped portion 74 transversely of the mounting means 64 and into engagement in the mounting means notch 67. When in position, the bifurcations 71 and 72 of the core breaking means will lie to either side of the shank receiving perforation 23 and will complete the shank receiving perforation. Once the core breaking means is in position, the shank 28 of cutter bit 26 may be inserted in the shank receiving perforation and the cutter bit driven home. The gauge-determining abutment shoulder 31 of the cutter bit will rest on the upper surface 17 of the mounting means 64 while the gauge-determining abutment surface 30 will rest upon the upper surface of the core breaking means between its lugs 75 and 76. The engagement of the hook-shaped portion 74 of the core breaking means in the hook-shaped notch 67 of the mounting means and the engagement of the upper surface of the core breaking means by the gauge-determining abutment surface 30 of the cutter bit will assure that the core breaking means is locked in place. The bifurcations 71 and 72 will also cooperate with the shank of the cutter bit to assure that there will be no shifting of the core breaking means laterally of the mounting means.

Again, the core breaking means 68 will not interfere with removal and replacement of cutter bit 26. Upon removal of cutter bit 26 the core breaking means, itself, may be readily removed and replaced. The core breaking means 68 will again serve the same function described with respect to the core breaking means of FIGS. 2 through 7.

FIGS. 18 and 19 illustrate a core breaking means mounted behind the cutter bit. In FIG. 18 a mounting means is shown at 79 having a shank receiving perforation 80 and a transverse hole 81. The perforation 80 is adapted to receive the shank of a cutter bit which is in every way identical to the cutter bit of FIG. 7 and has been given like index numerals. The transverse perforation 81 is adapted to receive a retaining means, again identical to that shown in FIG. 7 and given like index numerals. The mounting means 79 differs from those previously described in two primary respects. First of all, the shank receiving perforation 80 is located nearer the forward end of the mounting means. Secondly, the mounting means is provided with a downwardly and rearwardly sloping notch 82 behind the shank receiving perforation 80.

The core breaking means for use with the mounting means 79 is most clearly shown in FIG. 19 and is generally designated by index numeral 83. The member 83 has a U-shaped configuration, the free ends of the legs 84 and 85 of the U being provided with hard cutting tips 86 and 87, respectively. The legs 84 and 85 are spaced from each other by a distance sufficient to permit a portion of the head 27 of cutter bit 26 to lie therebetween.

As will be evident from FIG. 18, the core breaking means 83 is adapted to be slipped into the notch 82, transversely of the mounting means 79. Thereafter, the shank 28 of bit 26 may be located in the shank receiving perforation 80 of the mounting means. The fact that a portion of the head 26 of the cutter bit lies between the legs 84 and 85 of the core breaking means will

cause the core breaking means to be locked in position, since the abutment shoulder 31 will rest upon the surface 83a of the core breaking means.

When in place, it will be noted that the rear end 88 of the core breaking means will be in abutting relationship with the bottom 89 of notch 82 and the legs 84 and 85 will have their axes substantially parallel to the resultant cutting force, thereby adding greatly to the strength of the core breaking means.

In all of the embodiments thus far described, the core breaking means comprised a single, unitary structure presenting a spaced pair of hard cutting tips. It is within the scope of the invention to provide core breaking means for each mounting means in the form of two or more separate elements. This is shown in FIGS. 20 through 23.

Turning first to FIG. 20, a mounting means 90 is illustrated. The mounting means 90 is similar to the mounting means 16 of FIG. 7 and like parts have been given like index numerals. The mounting means 90 is intended to support a bit and a retaining means identical to those described with respect to FIG. 7 and these elements are not shown.

The primary difference between the mounting means 90 and the mounting means 16 of FIG. 7 lies in the fact that the upper surface of the mounting means 90 does not have a depression therein. On the contrary, near the forward end of the mounting means the upper surface is raised slightly and provides a downwardly and forwardly sloping surface 91. As will be evident from FIGS. 20, 22 and 23, the sloping surface 91 has a pair of downwardly and rearwardly sloping perforations 93 and 94 therein, the axes of these perforations being perpendicular to the sloping surface 91. Near their bottom ends, the perforations 93 and 94 are intersected by a transverse hole 95 extending the full width of the mounting means.

The mounting means 90 is intended to be provided with a pair of identical core breaking means, one of which is illustrated in FIG. 21 and generally indicated by index numeral 96. The core breaking means 96 comprises a cylindrical shank 97 with a conical head or cutting tip 98 at its forward end. The base of the head 98 is of greater diameter than the shank 97, forming a shoulder 99. The entire core breaking means 96 may be made of a hard alloy such as is generally used for the hard cutting tips of cutter bits and the like, or it may be made of steel and provided with a hard cutting tip.

As shown in FIGS. 22 and 23, each of the perforations 93 and 94 in the mounting means 90 is intended to receive the shank 97 of a core breaking means 98. The shanks of the core breaking means are so sized with respect to the perforations 93 and 94 that they are frictionally held therein. The extent to which the shanks enter perforations 93 and 94 is determined by the abutment of the core breaking means shoulder 99 with the sloping mounting means surface 91.

It will be evident from FIGS. 22 and 23 that the core breaking means 96 will not interfere with the insertion and removal of a cutter bit. The core breaking means themselves may be removed and replaced by the insertion of a drift in the transverse hole 95.

An embodiment similar to that described with respect to FIGS. 20 through 23 is illustrated in FIGS. 24 and 25. In these Figures, a mounting means 100 is shown. The mounting means 100 is similar to the mounting means 90 of FIG. 20 and like parts have been

given like index numerals. In this embodiment, the upper surface 17 of the mounting means is joined to the forward surface 20 thereof by a sloping surface 101 substantially similar to the sloping surface 91 of mounting means 90. The sloping surface 101 has a pair of spaced perforations 102 and 103 therein, the axes of which are perpendicular to the surface 101. The perforations 102 and 103 differ from perforations 93 and 94 in FIG. 22 primarily in that they terminate at their upper ends in upwardly and outwardly flaring surfaces 102a and 103a, respectively. The perforations 102 and 103, approximately half way down their length, are partially intersected by a small transverse hole 104 extending through the mounting means.

The core breaking means of this embodiment is substantially the same as that shown in FIG. 21. It will be understood that identical core breaking means will be located in the holes 102 and 103. One such core breaking means is shown at 105 in FIG. 24. The core breaking means 105 comprises a cylindrical shank 106 surmounted by a conical head 107. At the point of juncture between the shank 106 and head 107 there is a downwardly and inwardly tapering shoulder 108 adapted to conform to the outwardly flaring surface 103a of perforation 103. Again, the entire core breaking means 105 may be made of a hard cutting alloy, or provided with a hard cutting tip.

The shank 106 of the core breaking means is provided with an annular notch 109. The annular notch is so positioned on the shank 106 as to lie substantially opposite the transverse hole 104. Therefore, a pin 110 located in the transverse hole 104 will serve as a retaining means for the core breaking means 105, since it will extend into the annular notch 109. The same pin will similarly retain the core breaking means (not shown) located in perforation 102.

When desired, the perforations 102 and 103 and the shanks of the core breaking means may be so sized with respect to each other that the shanks will be freely rotatable in the perforations 102 and 103. The pin 110 and the annular notches in the core breaking means shanks should be so sized with respect to each other as to permit such rotation.

It will be evident from FIGS. 24 and 25 that the mounting means 100 is adapted to support a cutter bit and a retaining means (not shown) identical to those illustrated in FIG. 7. The core breaking means will not interfere with removal and insertion of such a bit and the core breaking means, themselves, may be replaced by simply removing pin 110. Replacement of the core breaking means does not require removal of the cutter bit.

FIGS. 26 and 27 illustrate an embodiment of the present invention wherein the core breaking means and the cutter bit constitute an integral, one-piece structure. In these Figures, a mounting means 111 is shown which is substantially conventional. The mounting means 111 differs from that shown in FIGS. 1 and 2 only in that no depression is present in the upper surface of the mounting means. For this reason, like parts have been given like index numerals.

The mounting means of FIGS. 26 and 27 has a transverse hole adapted to receive the same type of retaining means shown and described with respect to FIG. 7. For this reason, like parts have again been given like index numerals.

The cutter bit, itself, is generally indicated by index numeral 112. The cutter bit is similar to that shown in FIG. 7, comprising a head portion 113 having a hard cutting tip 114 and a shank portion 115 having a downwardly and inwardly tapering surface 116 and a hook-shaped notch 117. At the juncture of shank 115 and head portion 113 the head is provided with gauge-determining abutment shoulders 118 and 119 adapted to cooperate with the upper surface 17 of the mounting means. Finally, the cutter bit 112 may have a notch such as is shown at 120 by which the bits may be engaged by a suitable prying tool for removal of the bit shank 115 from the shank receiving perforation 23. It will be understood that installation and removal of the bit 112 is accomplished in the same manner described with respect to the bit 26 of FIG. 7.

The bit 112 differs from the bit 26 of FIG. 7 primarily in that the lower portion of the bit head 113 has thereon integral, laterally extending bodies 121 and 122 provided at their forward faces with hard cutting tips 123 and 124, respectively. The bodies 121 and 122 may be quite similar in configuration to the extensions 46 and 47 shown in FIG. 6. The bottom surfaces of the bodies 121 and 122 rest upon and are supported by the upper surface 17 of the mounting means 111. In all other respects, the core breaking means of FIGS. 26 and 27 function in the same way and accomplish the same purposes described with respect to the core breaking means of FIG. 7.

As indicated above, the core breaking means of the present invention are not limited with respect to the mounting means to which they are applicable. This is illustrated in FIGS. 28 and 29. Turning first to FIG. 28, a mounting means and cutter bit assembly are shown of the type taught in U.S. Pat. No. 3,397,012. Briefly, the mounting means (generally indicated at 111) comprises a body portion 112 having a shank receiving perforation 113. The body portion 112 has a rearward extension 114 terminating in an anvil portion 115 providing an abutment surface 116.

The cutter bit (generally indicated at 117) comprises a cylindrical shank 118 terminating at one end in a conical nose 119 with a hard cutting tip 120. At its other end, the shank 118 terminates in an abutment surface 121 adapted to cooperate with the mounting means abutment surface 116. Near its rear end, the shank 118 has an annular notch 122 for the receipt of a split metal retaining ring 123.

The structure thus far described with respect to FIG. 28 is typical of the well known "pick type" bit and mounting means therefor, which is in common usage on modern, heavy duty mining machines. The cutter bit 117 is rotatable within the shank receiving perforation 113 of the mounting means.

FIG. 28 illustrates the manner in which a core breaking means of the present invention may be used with such a bit-mounting means assembly. For purposes of an exemplary showing, the core breaking means of FIGS. 9, 10 and 11 is illustrated, and like parts have been given like index numerals. The mounting means 111 will be provided with a notch or groove 124 identical to the notch or groove 54 in the mounting means 50 of Fig. 8. The core breaking means 56 will serve the same function taught with respect to the core breaking means of FIGS. 9 through 11 and will be precluded from lateral displacement by the cutter bit 117, itself. In addition, the core breaking means may be provided

with the resilient friction member 63 to further assure that it will remain in its proper position. The core breaking means will not interfere with the removal and replacement of the cutter bit 117, and upon removal of the cutter bit 117 the core breaking means, itself, may be readily removed and replaced simply by removing it laterally of the mounting means 111 from notch 124.

FIG. 29 illustrates a cutter bit and mounting means of the type taught in U.S. Pat. No. 3,622,206. The mounting means (generally indicated at 125) comprises a block-like structure having a shank receiving perforation 126. The mounting means also has a transverse hole 127 intersecting the shank receiving perforation. In the hole 127 there is mounted a rod 128 presenting (at least within the shank receiving perforation) a flat abutment surface 129. Finally, the shank receiving perforation 126 has an annular notch 130 for the receipt of retaining means.

The cutter bit (generally indicated at 131) comprises an elongated member of matching cross sectional configuration to the shank receiving perforation 126. The bit terminates at its lowermost end in a downwardly and rearwardly sloping abutment surface 132. At its upper end, the bit also slopes as at 133 to provide a clearance angle. At the juncture of the sloping portion 133 and the forward peripheral portion of the bit a cutting tip is formed. A hard cutting tip may be located at this position, as is indicated at 134.

Within the annular notch 130 in the shank receiving perforation various types of retaining means may be used. For purposes of an exemplary showing a pair of split metal rings 135 and 136 are illustrated. The split metal rings have an outside diameter slightly less than the diameter of the annular notch but greater than the diameter of the shank receiving perforation. At the same time, the annular rings have an inside diameter slightly less than the diameter of the bit. As a consequence, when the bit is seated by inserting it in the shank receiving perforation and driving it home with an appropriate tool, the bit will be frictionally held in position by the rings 135 and 136. The abutment surface 132 of the bit and the abutment surface 129 of the rod 128 will cooperate to urge the bit toward its seated position and into a full line contact with the rear surface of the shank receiving perforation when the bit is subjected to the cutting forces.

For purposes of an exemplary showing, the core breaking means of FIGS. 14 through 16 is shown applied to the mounting means 125. The core breaking means may be substantially identical to that shown in FIGS. 14 through 16 and like parts have been given like index numerals. The mounting means 125 is provided with reliefs 137 and 138 and a hook-shaped notch 139 identical to the reliefs 65 and 66 and the hook-shaped notch 67 of mounting means 64 in Fig. 17.

The core breaking means 68 will serve the same function taught with respect to FIG. 17 and will be maintained in place by means of its engagement in the hook-shaped notch 139 and by the cutter bit itself. The core breaking means will not interfere with replacement of the cutter bit and the cutter bit will preclude lateral displacement of the core breaking means.

FIGS. 30 and 31 illustrate a modification of the embodiment of FIGS. 10 through 12. The mounting means generally indicated at 140 in FIG. 30 is similar to the mounting means 50 of FIG. 8 and like parts have been

given like index numerals. The mounting means 140 may, for example, be adapted to use a cutter bit and retaining means of the type illustrated in FIG. 12. The mounting means 140 has a transverse notch 141 differing from the notch 51 of FIG. 8 primarily in that its forward and rearward walls are planar and extend to the bottom of the notch without an undercut equivalent to undercut 55 of FIG. 8. The mounting means also has a longitudinal bore 142 intersecting notch 144 and extending to the shank receiving perforation 23.

The core breaking means is generally indicated at 143 and comprises a substantially rectangular body portion 144 so sized as to just nicely fit in the mounting means notch 141. On its upper surface, the body portion 144 has two spaced, parallel lugs or extensions 145 and 146 provided with hard cutting tips 147 and 148, respectively. Finally, the body portion 144 of the core breaking means has a transverse perforation 144a adapted to achieve coaxial alignment with the longitudinal bore 142 of the mounting means.

It will be evident that the core breaking means thus far described differs from that of FIGS. 9 through 11 only in that its body portion 144 does not have on its forward surface a portion adapted to fill an undercut.

In use, the core breaking means of FIGS. 30 and 31 is affixed to the mounting means 140 by locating its body portion 144 in the mounting means notch 141. The core breaking means is held in place by means of a pin 149 which may be inserted into the longitudinal bore 142 of the mounting means from the front of the mounting means and caused to extend through the perforation 144a in the body portion of the core breaking means.

It will be evident that the structure thus far described will not interfere with removal and replacement of a cutter bit in the shank receiving perforation 23 of the mounting means 140. To replace the core breaking means 143, it is only necessary to remove the cutter bit from the mounting means and drive the pin 149 through the coaxial perforations or holes 142 and 144a into the shank receiving perforation 23. The length of pin 149 is less than the forward to rearward length of the shank receiving perforation 23 so that once the pin is driven into the shank receiving perforation, it is free to fall therethrough. The pin, itself, may take any suitable form including a roll pin or the like.

As has been mentioned above, the core breaking means of the present invention need not necessarily provide a core breaking or cutting tip at both sides of the cutter bit. Depending upon the nature of the mounting means, its position in the chain and the type of wear to which it is subjected, it is within the scope of the invention to provide a core breaking means having a cutting or breaking tip to only one side of the cutter bit. Such a structure is illustrated, for example, in FIG. 32. The core breaking means of FIG. 32 differs from that of FIG. 31 only in that the lug 146 and its hard cutting tip 148 have been eliminated therefrom. Therefore, like parts have been given like index numerals and the core breaking means of FIG. 32 has been generally indicated by index numerals 143a. A similar core breaking means could be provided having only the lug 146 and its hard cutting tip 148. It will be understood by one skilled in the art that in all the embodiments thus far described the core breaking means may comprise or may provide only one hard cutting or

breaking tip to one side or the other of the cutter bit.

FIGS. 33 and 34 illustrate yet another type of core breaking means. In these figures a mounting means is generally indicated at 150. The mounting means has a forward surface 151, a rearward surface 152, a top surface 153 and a bottom surface 154. The mounting means may be intended to support the same type of cutter bit and retaining means shown in Fig. 7 and to this end may have a shank receiving perforation 155 and a transverse, retaining means-receiving perforation 156.

As will be evident from both FIGS. 33 and 34, the core breaking means of this embodiment comprises a plurality of hard alloy inserts 157 through 160. The inserts may be provided with pointed tips as shown. The inserts are located at the juncture of the forward surface 151 and the top surface 153 of the mounting means 150. The inserts are located in bores 161 to 164 in the mounting means. The inserts may be held in place by a force fit, or by brazing or other suitable means.

It will be understood that the number of inserts and their precise location is not limiting. The number and location of the inserts will depend upon a number of factors such as the type of mounting means used, the location of the mounting means in the chain or on some other type of driven element, the type of material being mined, and the like. Again, all of the inserts could be located to one side or the other of the cutter bit.

FIG. 35 illustrates the point that the core breaking means of FIGS. 33 and 34 are not limited with respect to the type of mounting means to which they are affixed. In FIG. 35, a mounting means is generally shown at 165. The mounting means is similar to that shown in Fig. 28, having a shank receiving perforation 166, a rearward extension 167, an anvil portion 168 and an abutment surface 169. A cutter bit 170 is shown in the mounting means and is substantially identical to the well known pick-type bit illustrated in FIG. 28.

In FIG. 35, a portion of the forward face 171 of mounting means 165 may be provided with appropriate bores equivalent to bores 161 through 164 of FIG. 34. Inserts or core breaking means identical to core breaking means 157 through 160 of FIG. 34 may be located in the bores. Three such core breaking means are shown at 172 through 174. The core breaking means may be positioned about both sides of bit 170, or may be located to one side or the other, depending upon the conditions outlined above. Again, the core breaking means 172 through 174 do not interfere with the insertion or removal of bit 170. They may be held in place by any of the expedients mentioned with respect to FIGS. 33 and 34 and they may be provided with pointed tips as illustrated. In operation, the core breaking means 172 through 174 will function in the same manner as those illustrated in FIGS. 33 and 34 and will serve the same purpose as is served by all of the core breaking means taught herein.

In the description of Fig. 7 above, it was noted that the cutter bit 26 has a knock-in, pry-out relationship with the mounting means 16. It is within the scope of the invention to provide a removable core breaking means having the same knock-in, pry-out relationship with the mounting means. This is illustrated in FIGS. 36 and 37. In FIG. 36 a mounting means is generally indicated at 175. The mounting means is adapted to sup-

port a cutter bit identical to bit 26 of FIG. 7. Such a bit is shown in FIG. 36 and given the same index numerals. The bit 26 has a shank (not shown) mounted in a shank receiving perforation (not shown) in the mounting means 175. The mounting means has a transverse hole 176 which partially intersects its shank receiving perforation and is intended to receive a resilient retaining means 177, identical to the retaining means shown in FIG. 7. Thus, the retaining means has a rod-like member 178. The pin is surrounded by a resilient body 179, except for that portion of the pin which extends into the shank receiving perforation of the mounting means. Again, the hole 76 may have a keyway 180 to receive a key 181 on the retaining means. The mounting means 175 has a top surface 182 which is stepped at the forward end of the mounting means to provide a slightly lower top surface 183 which supports a core breaking means generally indicated at 184.

The core breaking means 184 is most clearly shown in FIG. 37. It comprises a body portion 185 having a pair of spaced upstanding lugs 186 and 187 provided with hard cutting tips 188 and 189, respectively. The body 185 also has a downwardly depending shank 190. The shank 190 may be identical to the shank of the cutter bit 26 (see FIG. 7). To this end, the shank has a substantially rectangular cross section with a hook-shaped notch 191 in its rearward surface and a relief 192 at the rearward portion of its bottom end. The shank 190 is adapted to be received in a shank receiving perforation (not shown) which extends downwardly into the mounting means 175 from the upper surface 183 therein. This shank receiving perforation may be identical to that shown at 23 in FIG. 7 and is again partially intersected by a transverse hole 193. The transverse hole 193 may be identical to the transverse hole 176 and may have therein a resilient retaining means 194 identical to the retaining means 177. The retaining means cooperates with the core breaking means shank 190 in a manner identical to that described with respect to the cutter bit shank 28 and the resilient retaining means 36 to FIG. 7.

From the above description it will be apparent that the core breaking means 184 has a knock-in, pry-out relationship with the mounting means 175. Thus, to mount the core breaking means it is only necessary to insert its shank 190 in the forward shank receiving perforation (not shown) in the mounting means 175 and administer a blow thereto, whereby the hook-shaped notch 191 will be engaged by the retaining means 194. To remove the core breaking means from the mounting means 175, it is only necessary to engage the pry-out notches 195 and 196 on the upstanding lugs 186 and 187 with an appropriate tool and apply a prying force.

Modifications may be made in the invention without departing from the spirit of it. For example, the various mounting means for the core breaking means need not necessarily be affixed to cutter chains. The mounting means may be driven by cutter wheels, cutter arms and the like. Furthermore, the core breaking means of the present invention need not be mounted on all of the mounting means of a cutter chain or other driven element. Similarly, it is not required that a mounting means for the core breaking means also carry a cutter bit.

The core breaking means of the present invention may be affixed to the mounting means in ways other

than those taught above. It would be within the scope of the invention, for example, to hold the core breaking means in place by a set screws or other mechanical means. Furthermore, any of the core breaking means embodiments taught above can be brazed or otherwise permanently affixed to its mounting means. Finally, any of the core breaking means may be totally made of hard alloy material, rather than being provided with hard cutting or breaking tips.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A core breaking means for use on the mounting means of a cutter bit of a mining machine and the like, said mining machine being of the type wherein a plurality of said cutter bits and mounting means therefor are affixed on a driven element of the mining machine in staggered patterns therealong to follow parallel paths of travel, said core breaking means comprising a body mountable on said mounting means and having at least one core breaking tip located to at least one side of said cutter bit when said core breaking means is mounted on said mounting means whereby to fracture a core formed to said at least one side of said cutter bit during the cutting operation and to prevent wear of said mounting means by said core.

2. The structure claimed in claim 1 wherein said core breaking means is configured to be removably mounted on said mounting means.

3. The structure claimed in claim 2 wherein said core breaking means is configured to have a knock-in, pry-out relationship with said mounting means.

4. The structure claimed in claim 1 wherein said core breaking means has at least two core breaking tips, said tips being located to either side of said cutter bit when said core breaking means is mounted on said mounting means.

5. The structure claimed in claim 1 wherein said body of said core breaking means has at least one upstanding extension, said at least one core breaking tip being located on said extension.

6. The structure claimed in claim 5 wherein said core breaking tip is made of a hard cutting alloy and is affixed to said extension.

7. The structure claimed in claim 1 wherein said body of said core breaking means is configured to be received in a transverse slot in the upper surface of said mounting means and means to maintain said body in said slot.

8. The structure claimed in claim 7 wherein said body of said core breaking means has at least one upstanding extension, said at least one core breaking tip being located on said extension.

9. The structure claimed in claim 7 including means on said body to be engaged by mechanical means to retain said body in said transverse slot in said mounting means.

10. The structure claimed in claim 7 wherein said body has a pair of spaced upstanding extensions thereon, said extensions being so positioned on said body as to be located to either side of said cutter bit when the body is located in said mounting means slot, a core breaking tip being located on each of said extensions.

11. The structure claimed in claim 7 wherein said body of said core breaking means has a perforation therethrough, an insert of resilient material being lo-

cated in said perforation and extending slightly beyond the ends thereof to frictionally engage the walls of said mounting means slot.

12. The structure claimed in claim 1 wherein said body of said core breaking means is configured to be received in a transverse slot in the upper surface of said mounting means, said mounting means being of the type having a shank receiving perforation adapted to receive the shank portion of a cutter bit, said body of said core breaking means having a hole therein adapted to overlie and be coaxial with said shank receiving perforation, said hole being sized to receive said shank portion of said cutter bit whereby said cutter bit will maintain said core breaking means in position on said mounting means.

13. The structure claimed in claim 12, wherein said body of said core breaking means has at least one upstanding extension, said at least one core breaking tip being located on said extension.

14. The structure claimed in claim 12 wherein said body has a pair of spaced upstanding extensions thereon, said extensions being so positioned on said body as to be located to either side of said cutter bit when said body is located in said mounting means slot, a core breaking tip being located on each of said extensions.

15. The structure claimed in claim 1 wherein said body of said core breaking means has a first downwardly depending portion adapted to overlie a forward portion of said mounting means, said downwardly depending portion terminating in a hook-like configuration to be engaged in a complementary shaped notch extending transversely of said forward portion of said mounting means, said body of said core breaking means having a second horizontal portion adapted to overlie a top portion of said mounting means, said mounting means being of the type having a shank receiving perforation to receive the shank portion of a cutter bit, said second portion of said body of said core breaking means terminating in bifurcations adapted to lie to either side of a cutter bit in said shank receiving perforation whereby said cutter bit will prevent lateral displacement of said core breaking means with respect to said mounting means.

16. The structure claimed in claim 15 wherein said body of said core breaking means has at least one upstanding extension, said at least one core breaking tip being located on said extension.

17. The structure claimed in claim 15 wherein said body has a pair of spaced upstanding extensions thereon, said extensions being so positioned on said body as to be located to either side of said cutter bit when said body is located in said mounting means slot, a core breaking tip being located on each of said extensions.

18. The structure claimed in claim 1 wherein said body of said core breaking means is of U-shaped configuration, the legs of said U-shaped body terminating in core breaking tips.

19. The structure claimed in claim 1 wherein said core breaking means comprises an elongated hard alloy insert pointed at one end, said insert being mountable in a perforation in a surface of said mounting means subject to coring.

20. The structure claimed in claim 1 wherein said core breaking means comprises a shank provided at one end with a conical core breaking head, a gauge de-

termining shoulder formed at the juncture of said shank and said head, said shank being mountable in a perforation in a downwardly and forwardly sloping surface at the forward end of said mounting means.

21. The structure claimed in claim 20 wherein said conical head of said core breaking means is provided with a hard cutting alloy tip.

22. The structure claimed in claim 20 wherein said core breaking means in its entirety is made of a hard cutting alloy.

23. The structure claimed in claim 20 wherein said shank of said core breaking means is of circular cross section and so sized as to be rotatable in said perforation in said downwardly and forwardly sloping mounting means surface.

24. The structure claimed in claim 23 wherein said shank of said core breaking means has an annular notch therein to be engaged by a retaining means for maintaining said shank in said perforation.

25. The structure claimed in claim 1 wherein said core breaking means in its entirety is made of a hard cutting metal alloy.

26. The structure claimed in claim 1 wherein said body of said core breaking means comprises a cutter bit of the non-rotatable type having a shank portion and a head portion provided with a hard cutting tip, said head portion of said bit having at least one lateral extension bearing said core breaking tip.

27. The structure claimed in claim 26 wherein said head portion of said cutter bit has a lateral extension to either side thereof, each of said lateral extensions bearing a core breaking tip.

28. The combination of a mounting means for a cutter bit of a mining machine and the like and a core breaking means for use thereon, said mining machine being of the type wherein a plurality of said cutter bits and mounting means therefor are affixed on a driven element of the mining machine in staggered patterns therealong to follow parallel paths of travel, said mounting means having a perforation therein to receive the shank portion of a cutter bit, said core breaking means comprising a body mountable on said mounting means and having at least one core breaking tip located to at least one side of said cutter bit when said core breaking means and a cutter bit are mounted on said mounting means whereby to fracture a core formed to said at least one side of said cutter bit during the cutting operation and to prevent wear of said mounting means by said core.

29. The structure claimed in claim 28 wherein said core breaking means is removably mounted on said mounting means.

30. The structure claimed in claim 29 wherein said core breaking means is mounted on said mounting means with a knock-in, pry-out relationship.

31. The structure claimed in claim 28 wherein said core breaking means has at least two core breaking tips, said tips being located to either side of said cutter bit when said core breaking means and a cutter bit are mounted on said mounting means.

32. The structure claimed in claim 28 wherein said mounting means comprises a block-like structure with forward and rearward ends, a pair of sides, a top and a bottom, said shank receiving perforation extending downwardly into said block-like structure from the top thereof.

33. The structure claimed in claim 32 wherein said mounting means has a transverse slot in the top thereof extending from one of said sides to the other, said body of said core breaking means being mounted in said slot and means to maintain said body in said slot.

34. The structure claimed in claim 33 wherein said body of said core breaking means has at least one up-standing extension, said at least one core breaking tip being located on said extensions.

35. The structure claimed in claim 33 wherein said body of said core breaking means has a pair of spaced extensions thereon, said extensions being so positioned on said body as to be located to either side of said cutter bit when said core breaking means and a cutter bit are mounted on said mounting means and a core breaking tip being located on each of said extensions.

36. The structure claimed in claim 33 wherein said transverse slot is located between said shank receiving perforation and said forward end of said mounting means.

37. The structure claimed in claim 36 wherein said body of said core breaking means has a perforation therethrough, an insert of resilient material being located in said perforation and extending slightly beyond the ends thereof to frictionally engage the walls of said mounting means slot.

38. The structure claimed in claim 36 including a first longitudinal hole in said mounting means extending from said forward end thereof to said transverse slot, a second longitudinal hole coaxial with said first hole and extending from said slot to said shank receiving perforation, a third hole in said body of said core breaking means in coaxial alignment with said first and second holes, a pin extending through said third hole and into said first and second holes to retain said core breaking means body in said mounting means slot.

39. The structure claimed in claim 33 wherein said transverse slot is located between said shank receiving perforation and said rearward end of said mounting means.

40. The structure claimed in claim 39 wherein said body of said core breaking means is of U-shaped configuration, the legs of said U-shaped body terminating in core breaking tips, said body being located in said slot with said tips to either side of said shank receiving perforation.

41. The structure claimed in claim 33 wherein said transverse slot intersects said shank receiving perforation, said body of said core breaking means having a hole therethrough overlying said shank receiving perforation, said hole being so sized as to receive said shank portion of a cutter bit whereby said cutter bit will maintain said core breaking means in position in said slot.

42. The structure claimed in claim 41 wherein said body of said core breaking means has at least one up-standing extension, said at least one core breaking tip being located on said extension.

43. The structure claimed in claim 41 wherein said body of said core breaking means has a pair of spaced extensions thereon, said extensions being so positioned on said body as to be located to either side of said cutter bit when said core breaking means and a cutter bit are mounted on said mounting means and a core breaking tip being located on each of said extensions.

44. The structure claimed in claim 33 including a cutter bit mounted in said shank receiving perforation,

said cutter bit comprising said means to maintain said core breaking means in said slot.

45. The structure claimed in claim 32 wherein said body of said core breaking means has a first downwardly depending portion overlying said forward end of said mounting means, said forward end of said mounting means having a transverse hook-shaped notch therein, said first portion of said core breaking means body terminating in a hook-shaped configuration engaged in said slot in said forward end of said mounting means, said body of said core breaking means having a second horizontal portion adapted to overlie said top of said mounting means, said second portion terminating in bifurcations lying to either side of said shank receiving perforation.

46. The structure claimed in claim 45 wherein said body of said core breaking means has at least one upstanding extension, said at least one core breaking tip being located on said extension.

47. The structure claimed in claim 45 wherein said body of said core breaking means has a pair of spaced extensions thereon, said extensions being so positioned on said body as to be located to either side of said cutter bit when said core breaking means and a cutter bit are mounted on said mounting means and a core breaking tip being located on each of said extensions.

48. The structure claimed in claim 45 including a cutter bit mounted in said shank receiving perforation and between said bifurcations.

49. The structure claimed in claim 32 wherein said body of said core breaking means comprises a cutter bit of the non-rotatable type having a shank portion and a head portion provided with a hard cutting tip, said head portion of said bit having at least one lateral extension bearing said core breaking tip.

50. The structure claimed in claim 49 wherein said head portion of said cutter bit has a lateral extension to either side thereof, each of said lateral extensions bearing a core breaking tip.

51. The structure claimed in claim 32 wherein said core breaking means comprises a hard alloy insert pointed at one end, said insert being mounted in a perforation at the juncture of said top and said forward end of said mounting means with said pointed end extending beyond said perforation.

52. The structure claimed in claim 51 including at least two of said inserts mounted in perforations at said juncture and located to one side of a cutter bit when said cutter bit is mounted in said shank receiving perforation.

53. The structure claimed in claim 51 including at least two of said inserts mounted in perforations at said juncture and so positioned as to be located to either side of a cutter bit when said cutter bit is mounted in said shank receiving perforation.

54. The structure claimed in claim 32 including a downwardly and forwardly sloping surface on said mounting means between said top and said forward end thereof, said core breaking means comprising a shank provided at one end with a conical core breaking head, a gauge determining shoulder formed at the juncture of said shank and head of said core breaking means, said core breaking means shank being mounted in a perforation in said sloping surface.

55. The structure claimed in claim 54 including at least two of said core breaking means mounted in perforations in said sloping surface and so positioned as to

be located to both sides of a cutter bit when said bit is mounted in said shank receiving perforation.

56. The structure claimed in claim 54 wherein said conical head of said core breaking means is provided with a hard cutting alloy tip.

57. The structure claimed in claim 54 wherein said core breaking means in its entirety is made of a hard cutting alloy.

58. The structure claimed in claim 54 wherein said shank of said core breaking means is of circular cross section and so sized as to be rotatable in said perforation in said downwardly and forwardly sloping mounting means surface.

59. The structure claimed in claim 58 wherein said shank of said core breaking means has an annular notch therein to be engaged by a retaining means for maintaining said shank in said perforation.

60. The structure claimed in claim 28 wherein said body of said core breaking means has at least one upstanding extension, said at least one core breaking tip being located on said extension.

61. The structure claimed in claim 60 wherein said core breaking tip is made of a hard cutting alloy and is affixed to said extension.

62. The structure claimed in claim 28 wherein said mounting means has a transverse slot in the upper surface thereof, said body of said core breaking means being mounted in said slot and means to maintain said body in said slot.

63. The structure claimed in claim 62 wherein said body of said core breaking means has at least one upstanding extension, said at least one core breaking tip being located on said extension.

64. The structure claimed in claim 62 wherein said body has a pair of spaced upstanding extensions thereon, said extensions being so positioned on said body as to be located to either side of said cutter bit when said body and a cutter bit are mounted on said mounting means, a core breaking tip being located on each of said extensions.

65. The structure claimed in claim 28 wherein said body of said core breaking means has a pair of spaced extensions thereon, said extensions being so positioned on said body as to be located to either side of said cutter bit when said core breaking means and a cutter bit are mounted on said mounting means and a core breaking tip being located on each of said extensions.

66. The structure claimed in claim 65 wherein said core breaking tips are made of hard cutting metal alloy and are permanently affixed to said extensions.

67. The structure claimed in claim 28 including a non-rotatable cutter bit mounted in said shank receiving perforation.

68. The structure claimed in claim 28 including a rotatable cutter bit mounted in said shank receiving perforation.

69. The structure claimed in claim 28 wherein said core breaking means comprises an elongated hard alloy insert pointed at one end, said insert being mounted in a perforation in a surface of said mounting means subject to coring.

70. The structure claimed in claim 69 including a plurality of said inserts mounted in a plurality of perforations in said surface.

71. The structure claimed in claim 28 wherein said core breaking means comprises a shank provided at one end with a conical core breaking head, a gauge de-

termining shoulder formed at the juncture of said shank and said head, said mounting means having a downwardly and forwardly sloping surface near the forward end thereof, said core breaking means shank being mounted in a perforation in said sloping surface.

72. The structure claimed in claim 71 wherein said shank of said core breaking means is of circular cross section and is rotatively mounted in said perforation in said sloping surface.

73. The structure claimed in claim 28 wherein said core breaking means in its entirety is made of a hard cutting metal alloy.

74. A mounting means for a cutter bit and a core breaking means of a mining machine and the like wherein the cutter bit is of the type having a shank portion and a hard cutting tip and the core breaking means is of the type having a body presenting at least one core breaking tip to at least one side of said cutter bit when mounted on said mounting means and said mining machine is of the type wherein a plurality of said cutter bits and mounting means therefor are affixed on a driven element of the mining machine in staggered patterns therealong to follow parallel paths of travel, said mounting means comprising a body having a shank receiving perforation to receive said shank portion of said cutter bit, and means on said mounting means to affix said body of said core breaking means thereto.

75. The structure claimed in claim 74 wherein said mounting means has a transverse slot therein to receive said body of said core breaking means.

76. The structure claimed in claim 75 wherein said mounting means comprises a block-like structure having a forward end, a rearward end, a top, a bottom and a pair of sides, said transverse slot being located in said top and extending from one of said sides to the other.

77. The structure claimed in claim 76 wherein said slots intersects said shank receiving perforation.

78. The structure claimed in claim 74 wherein said core breaking means is of the type comprising an elongated body terminating in a hard cutting tip, said mounting means having at least one hole therein to receive said elongated body of at least one of said core breaking means, said at least one hole being located in a surface of said mounting means subject to coring.

79. The structure claimed in claim 78 wherein said mounting means comprises a block-like structure having a forward end, a rearward end, a top, a bottom and sides, said at least one hole being located at the juncture of said top and said forward end.

80. The structure claimed in claim 79 wherein said juncture comprises a surface sloping downwardly and forwardly between said top and said forward end.

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