United States Patent [19]

Krekeler

[11] **3,856,359**

[45] **Dec. 24, 1974**

[54] **ANTI-CORING DEVICE FOR USE WITH BIT MOUNTING MEANS ON MINING, EARTH WORKING AND DIGGING MACHINES**

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[73] Assignee: **The Cincinnati Mine Machinery Co.,** Cincinnati, Ohio

[22] Filed: **Sept. 21, 1973**

[21] Appl. No.: **399,468**

Related U.S. Application Data

[60] Division of Ser. No. 181,771, Sept. 20, 1971, Pat. No. 3,778,112, which is a continuation-in-part of Ser. No. 842,791, June 30, 1969, Pat. No. 3,622,206, which is a continuation-in-part of Ser. No. 753,398, Aug. 19, 1968, abandoned.

[52] **U.S. Cl.** ..... **299/92,** 37/142 A, 299/86

[51] **Int. Cl.** **E21c 35/18**

[58] **Field of Search** ..... 299/79–93; 175/413; 37/142 R, 142 A

[56] **References Cited**

UNITED STATES PATENTS

3,659,654 5/1972 Davies et al. ..... 37/142 R X

Primary Examiner—Ernest R. Purser

Attorney, Agent, or Firm—Melville, Strasser, Foster & Hoffman

[57] **ABSTRACT**

An anti-coring device to protect the bit mounting means on a mining machine, digging machine, earth working machine or the like. The anti-coring device comprises a replaceable member detachable affixed at 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. In certain embodiments, the anti-coring device will be provided with a notch or perforation through which the bit passes, so that support for the anti-coring device can be provided in part at least by the bit.

16 Claims, 15 Drawing Figures

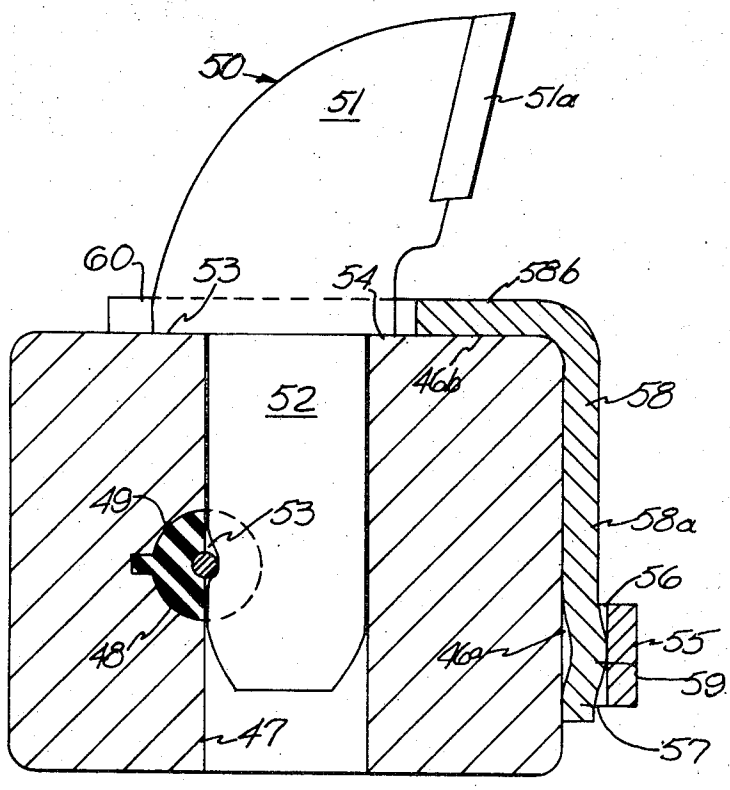
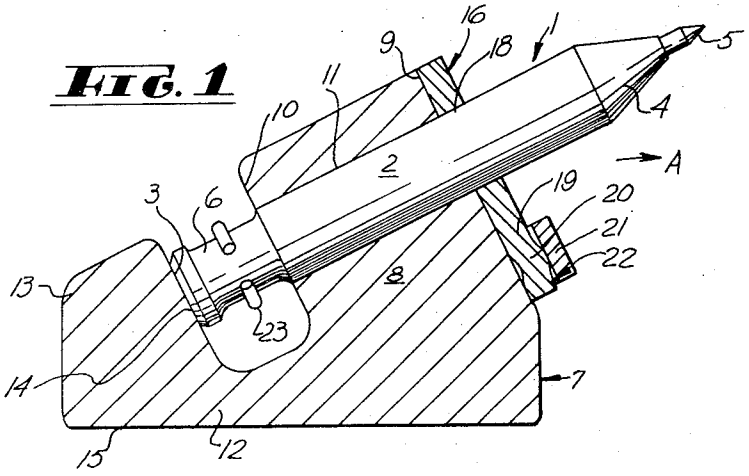


FIG. 1



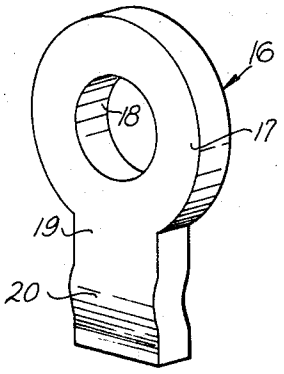


FIG. 2

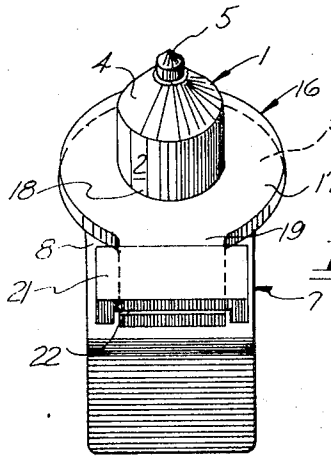


FIG. 3

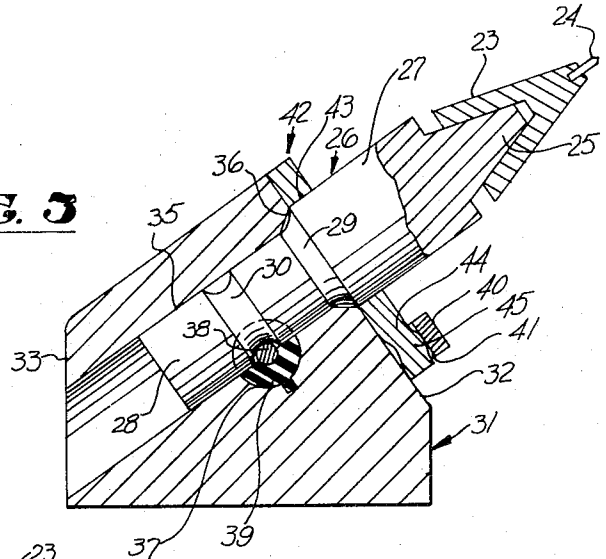


FIG. 4

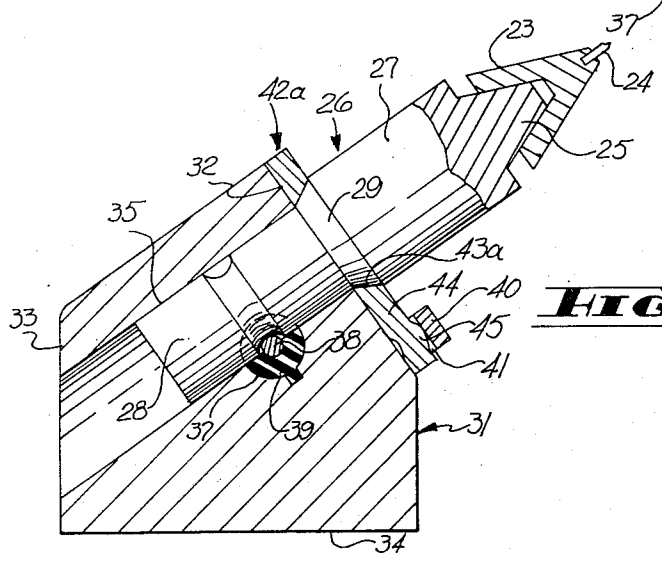


FIG. 5

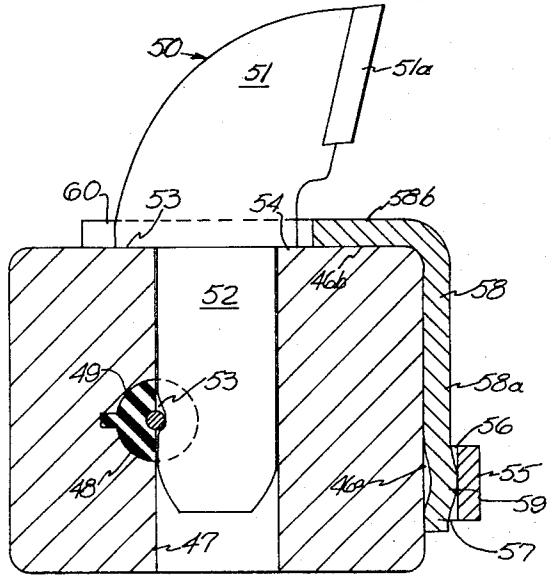


FIG. 6

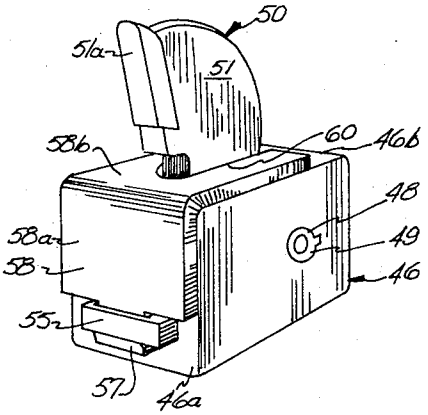


FIG. 7

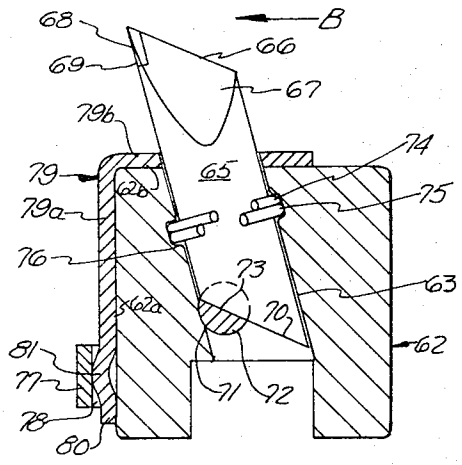


FIG. 9

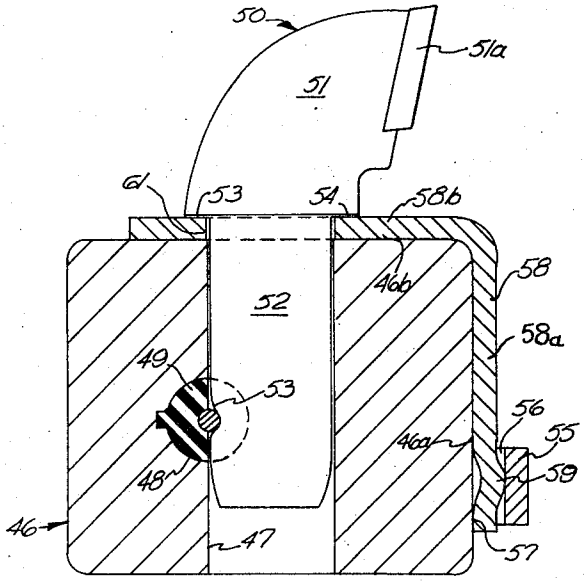


FIG. 8

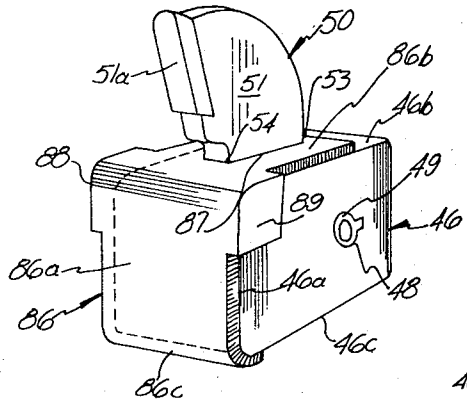


FIG. 11

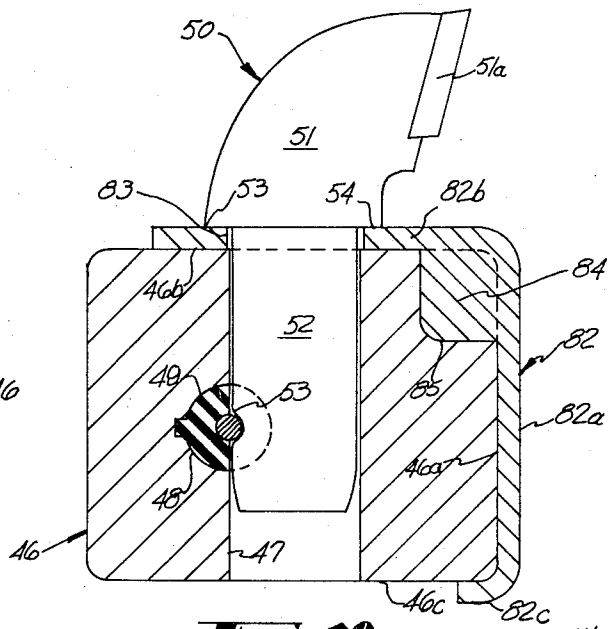


FIG 10

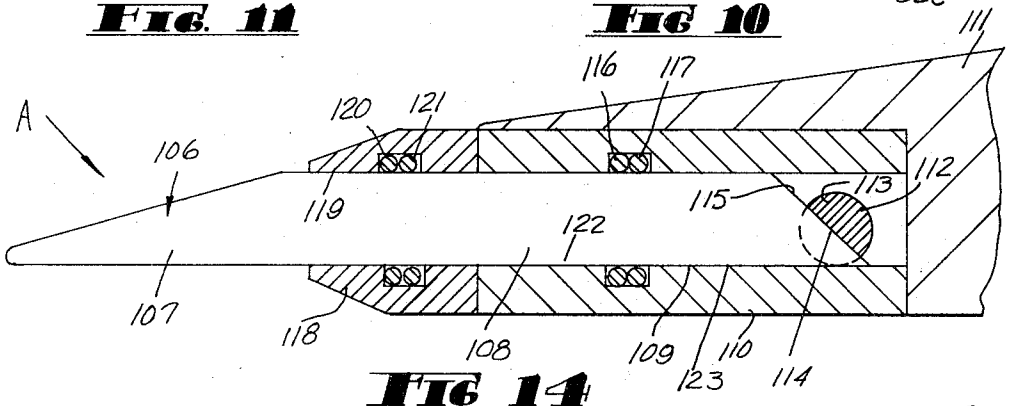


FIG 14

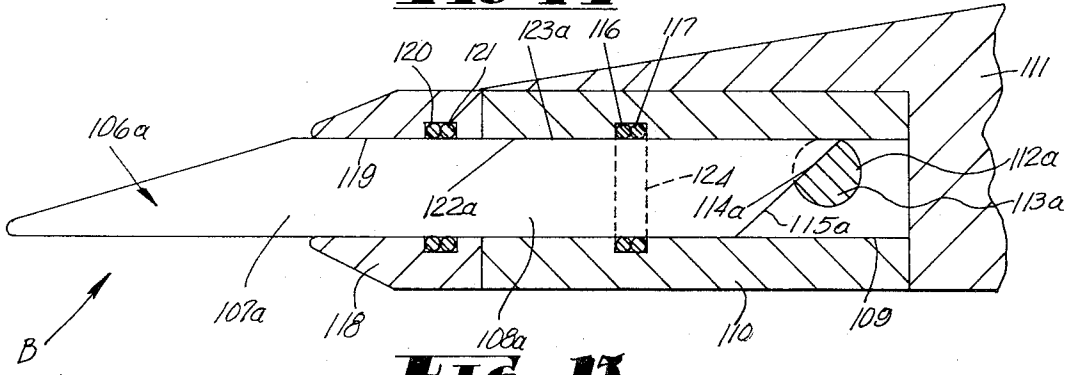


FIG 15

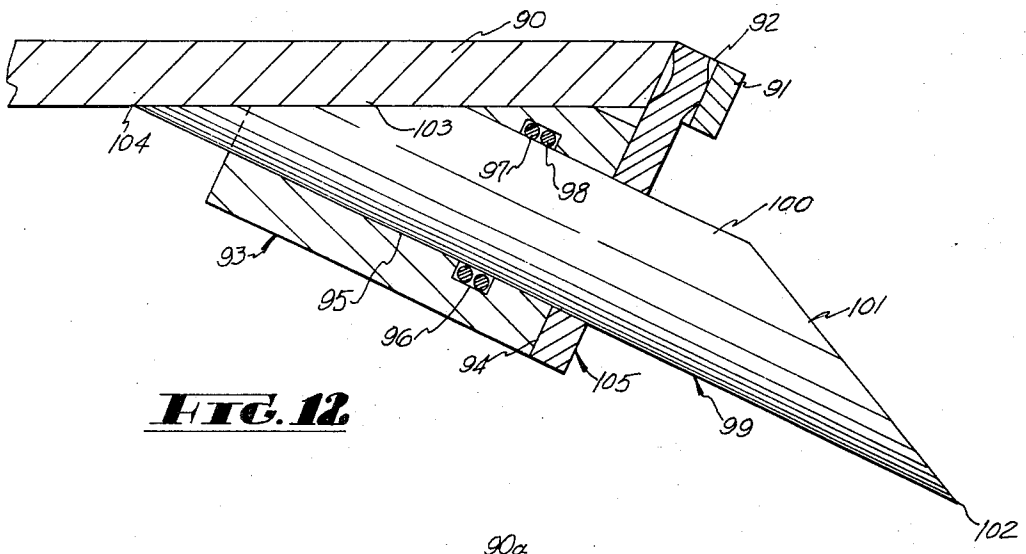

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FIG. 12

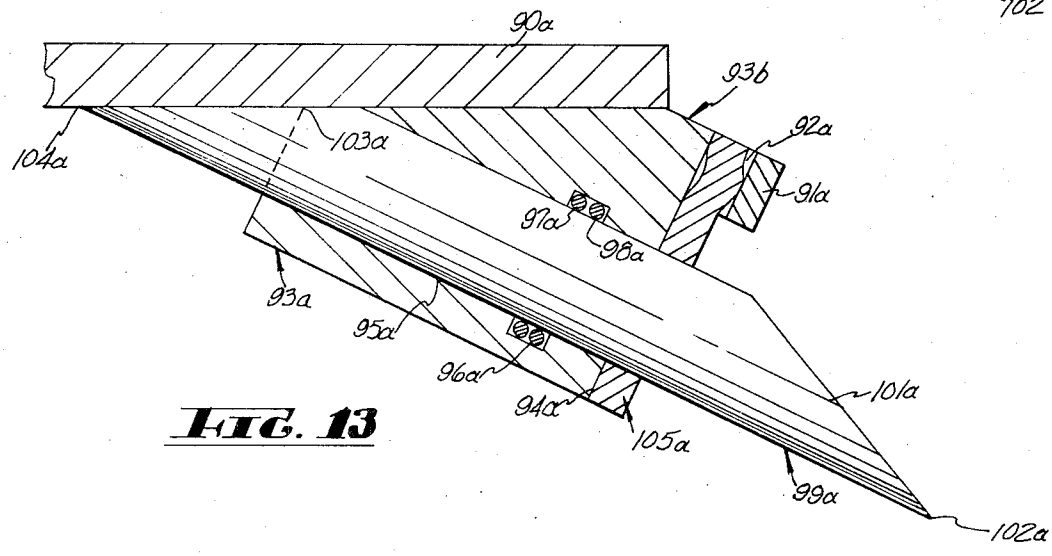

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102a

FIG. 13

ANTI-CORING DEVICE FOR USE WITH BIT MOUNTING MEANS ON MINING, EARTH WORKING AND DIGGING MACHINES

CROSS-REFERENCE TO RELATED APPLICATIONS

This is a divisional application of the copending application Ser. No. 181,771, filed Sept. 20, 1971, now U.S. Pat. No. 3,778,112, in the name of the same inventor and entitled ANTI-CORING DEVICE FOR USE WITH BIT MOUNTING MEANS ON MINING, EARTHWORKING AND DIGGING MACHINES. The last mentioned Ser. No. 181,771 is a continuation-in-part of the copending application of the same inventor, Ser. No. 842,791, 1971 June 30, 1969, now U.S. Pat. No. 3,622,206 and entitled, CUTTER BITS AND MEANS FOR MOUNTING THEM which, in turn, is a continuation-in-part of the copending application of the same inventor (now abandoned), Ser. No. 753,398, filed Aug. 19, 1968 and entitled CUTTER BITS AND MEANS FOR MOUNTING THEM.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a protective device for the mounting means of cutter bits, digger teeth and the like, and more particularly to a readily replaceable means to protect the mounting means from coring.

2. Description of the Prior Art

The anti-coring device of the present invention is applicable to a wide variety of mounting means for a wide variety of cutter bits, digger teeth and the like. The problem of "coring" as will be described hereinafter, is encountered both with the cutter bit-mounting means assemblies of mining machines and the digger tooth-mounting means assemblies of digging machines, earth working machines and the like. Thus, as used herein, the terms "bit" and "mounting means" are intended to be broadly construed to encompass both cutter bits and digger teeth and their respective mounting means.

Prior art workers have developed a great many embodiments of bits and mounting means for use with mining machines. In some instances, the bit-mounting means assemblies are so construed as to permit free rotation of the bit in its mounting means. In other instances, the bits are intended to be non-rotatively held within their mounting means.

In use, the mounting means are affixed to a driven element of the mining machine. The driven element may take a number of forms such as a cutter chain, a cutter wheel, a cutter arm or a rotating drum.

Irrespective of the nature of the driven element of the mining machine, the cutter bit-mounting means assemblies are generally arranged thereon in a pattern so that the cut produced thereby 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 intended to bring these paths as close together as is feasible, they nevertheless are spaced from each other by a short distance. 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 material being mined is substantially unavoidable. However, core growth is greater in some types of material 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 cores are formed, a portion of them will lie in the path of travel of the mounting means of 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 the 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.

In the mining means process, bits require frequent replacement and provision is generally made so that their replacement can be easily and quickly affected. Mounting means, on the other hand, generally have a much greater service life than the cutter bits and are not intended for frequent replacement. In general, the mounting means are affixed to the driven element of the mining machine by welding or the like. Thus, replacement of the mounting means is both difficult and time consuming. In addition, mounting means are not made as expandable items, and therefore are far more expensive than the bits.

While the problem of coring has plagued the mining industry for many years, prior art worker have simply accepted it as an unavoidable problem. The present invention is based upon the discovery that if a simple, expendable, inexpensive protective means is removably affixed at the forward face of the mounting means, the protective means will be subjected to the coring or wear normally sustained by the mounting means. When the coring of the protective means of the present invention becomes severe, it may be easily and quickly replaced. Therefore, the service life of the more expensive mounting means is greatly increased.

SUMMARY OF THE INVENTION

The anti-coring device of the present invention comprises a metallic member removably mountable at the forward face of a bit mounting means. While the anti-coring device may be mounted in any suitable fashion, one simple arrangement entails the provision of means on the mounting means to provide a slot on the forward face thereof. The anti-coring device is provided with a tongue receivable in the slot. The tongue may be configured to have a frictional engagement in the slot.

In certain embodiments of the present invention, the anti-coring device has a perforation therethrough, through which the bit extends. Thus, the bit assures that the tongue of the anti-coring device cannot be dislodged from the mounting means slot.

In other embodiments of the present invention, the bit again extends through a perforation in the anti-coring device. In these instances however, the anti-coring device also provides an abutment surface

adapted to cooperate with the gauge-determining abutment surface or surfaces on the bit. Thus, in these embodiments the device not only serves as an anti-coring device, but also as a replaceable gauge-determining abutment surface.

In yet another embodiment of the present invention, the anti-coring device is provided with a slot, rather than a perforation, through which the bit extends.

In another embodiment of the present invention the anti-coring device is held in place by the bit and a hook-like engagement of the mounting means. Finally, the anti-coring device may be held in place by the bit alone, there being means to retain the anti-coring device on the bit.

In all of the embodiments of the present invention the anti-coring device does not interfere with replacement of the bits.

As used herein, the term "cutting direction" refers to the direction in which the bit-mounting means assembly is moved by the driven element to which they are mounted, irrespective of any movement of the entire machine itself. The term "forward surface" of the mounting means refers to that surface substantially facing in the cutting direction and normally subject to coring.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view, partly in cross section, illustrating an exemplary form of bit-mounting means assembly provided with an anti-coring device of the present invention.

FIG. 2 is a perspective view of the anti-coring device illustrated in FIG. 1.

FIG. 3 is a front elevational view of the structure of FIG. 1.

FIG. 4 is a side elevational view, partly in cross section, illustrating another exemplary form of bit-mounting means assembly and the application of the anti-coring device of the present invention thereto.

FIG. 5 is a side elevational view, partly in cross section, similar to that of FIG. 4, but illustrating the use of an anti-coring device presenting a gauge-determining surface cooperating with the gauge-determining abutment surface of the bit.

FIG. 6 is a side elevational view, partly in cross section, of another form of bit-mounting means assembly with an anti-coring device of the present invention applied thereto.

FIG. 7 is a perspective view of the structure of FIG. 6.

FIG. 8 is a side elevational view, partly in cross section, similar to that of FIG. 6 and illustrating the use of an anti-coring device presenting a gauge-determining abutment surface cooperating with the gauge-determining abutment surfaces of the bit.

FIG. 9 is a side elevational view, partly in cross section, illustrating the application of the anti-coring device to yet another exemplary form of bit-mounting means assembly.

FIG. 10 is a side elevational view, partly in cross section, illustrating an anti-coring device similar to that of FIG. 8.

FIG. 11 is a perspective view similar to FIG. 7 and illustrates another form of anti-coring device of the present invention, similar to that of FIG. 10.

FIG. 12 is a side elevational view, partly in cross section, illustrating the application of the anti-coring device of the present invention to the mounting means of a digger tooth.

FIG. 13 is a view, similar to FIG. 12, illustrating an alternate means of affixing the anti-coring device to the mounting means of a digger tooth.

FIGS. 14 and 15 are side elevational views, partly in cross section, and illustrating digger teeth and mounting means therefore, with anti-coring devices supported by the digger teeth.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates one exemplary form of bit-mounting means assembly, provided with the anti-coring device of the present invention. The bit-mounting means assembly is of the type taught in U.S. Pat. Nos. 3,397,012 and 3,397,013. Briefly, the bit (generally indicated at 1) comprises an elongated shank 2 of circular cross section, terminating at one end in an abutment surface 3 and terminating at the other end in a nose portion 4 which may be provided with a hard cutting tip 5. The shank 2 has, near its abutment end, an annular notch 6.

The mounting means, generally indicated at 7, comprises a body portion 8 having a forward surface 9, a rearward surface 10 and a shank receiving perforation 11 extending therebetween. The diameter of the shank receiving perforation 11 and the diameter of the shank 2 of the bit are so sized that the bit is free to rotate within the shank receiving perforation.

The body portion 8 has a rearward extension 12 terminating in an upstanding anvil portion 13. The anvil portion 13 has an abutment surface 14 thereon adapted to cooperate with the bit shank abutment surface 3 to determine the gauge of the bit (i.e. the depth to which the bit extends in the shank receiving perforation 11). The mounting means has a bottom surface 15 by which it may be welded or otherwise affixed to a driven element of a mining machine.

In use, the bit-mounting means assembly will be driven in a cutting direction, generally indicated by the arrow A. It will be readily understood that the forward surface 9 of the mounting means body will be subjected to coring, particularly at the peripheral edges thereof.

FIG. 2 is a perspective view of an exemplary form of anti-coring device for use with the mounting means of FIG. 1. The anti-coring device is generally indicated at 16 and has a body portion 17 of circular configuration. It will be understood by one skilled in the art that the peripheral configuration of the body portion 17 will be determined by the peripheral shape of the forward surface 9 of the mounting means 7. In the embodiment shown (see also FIG. 3) that portion of the mounting means body 8, through which the shank receiving perforation 11 extends, is generally cylindrical in configuration. Thus, in this particular embodiment, the circular body portion 17 of the anti-coring device will have edge portions substantially conforming to the edge portions of the forward face 9 of the mounting means. This is clearly shown in FIG. 3.

The body portion 17 of the anti-coring device has a central perforation 18 adapted to receive the shank 2 of the bit 1 with clearance. Thus, the anti-coring device will not interfere with the rotation of the bit.

The anti-coring device has a tongue **19.** The tongue may be provided with a transverse corrugation as at **20.**

As is most clearly seen in FIGS. **1** and **3,** the forward face of **9** of the mounting means **7** may have affixed thereto a U-shaped, strap-like member **21.** The member **21** forms a slot generally indicated at **22,** adapted to receive the tongue **19** of the anti-coring device. As will be clear form FIG. **1,** the anti-coring device lies along the forward surface of the mounting means except at the position of the corrugation **20.** The corrugation **20** coacts with the strap-like member **21** to assure that the tongue fits into the slot **22** with a frictional engagement.

From the above description, it will be apparent that when the anti-coring device **16** is placed in the position shown in FIGS. **1** and **3,** it will be held in place by the location of the tongue **19** in the slot **22.** Thereafter, the bit **1** may be inserted and a retaining ring **23,** or the like, may be affixed thereto at the position of the bit groove **16.** In the assembly shown in FIGS. **1** and **3,** the bit (extending through the central perforation **18** in the anti-coring device will assure that the tongue **19** cannot be inadvertently dislodged from the slot **22.**

The bit **1** may be removed from the mounting means **7,** for purposes of replacement, simply by disengaging the retaining ring **23** therefrom and pulling the bit out of the shank receiving perforation **11.** Thus, the anti-coring device does not interfere in any way with the replacement of the bit. Whenever the anti-coring device **16** is to be replaced, it is only necessary to remove the bit and disengage the anti-coring device tongue **19** from the slot **22.** A new anti-coring device may then be positioned on the mounting means, whereupon the bit may be replaced.

FIG. **4** illustrates another embodiment of cutter bit-mounting means of the type taught in U.S. Pat. No. 3,342,532. In this instance, the bit comprises a hollow conical member **23** which may be provided with a hard cutting tip **24.** The bit **23** is adapted to frictionally engage a nose **25** at the forward end of a bit holder, generally indicated at **26.** The bit holder **26** has a shank with a portion **27** of larger diameter and an additional portion **28** of smaller diameter. The portions **27** and **28** of the bit holder shank are joined by a tapered portion **29,** forming a gauge-determining abutment surface on the bit holder. The shank portion **28** may be provided with an annular groove **30** adapted to cooperate with a retaining means.

The mounting means, generally indicated at **31,** comprises a body having a forward surface **32,** a rearward surface **33** and a bottom surface **34,** by which it may be affixed to the driven member of a mining machine. A shank receiving perforation **35** extends inwardly of the forward surface **32.** In the preferred embodiment, the shank receiving perforation **35** may extend all the way through the rear surface **33,** to provide an opening though which fines and foreign material collecting within the shank receiving perforation may exit therefrom. At the point where the shank receiving perforation **35** meets the forward surface **32** of the mounting means, the perforation is outwardly flared or tapered, to form a gauge-determining abutment surface **36** on the mounting means. The abutment surface **36** cooperates with the abutment surface **29** on the bit holder **26** to determine the depth to which the bit holder extends into the shank receiving perforation **35.**

It will be understood that the shank portion **28** of the bit holder will have a diameter such that it will be freely rotatable in the shank receiving perforation **35.** For purposes of an exemplary showing, the mounting means **31** is illustrated as being provided with a resilient retaining means of the type taught in U.S. Pat. 2,965,365. In this instance, the mounting means has a transverse hole **37** partially intersecting the shank receiving perforation **35.** The resilient mounting means is located in the transverse hole and comprises a metallic pin **38** surrounded by a body of resilient material **39** except for that portion of the pin which extends into the shank receiving perforation **35.** The last mentioned portion of the pin **38** cooperates with the annular notch **30** in the bit holder shank portion **28** to maintain the bit holder in place and to provide a "knock-in, pry-out" relationship between the bit holder and the mounting means **31.**

The forward surface **32** of the mounting means **31** has affixed thereto a U-shaped, strap-like member **40,** which may be identical to the member **21** of FIGS. **1** and **3,** and which forms a slot **41.** The anti-coring device of this embodiment is generally indicated at **42.** If that portion of the body of the mounting means **31** containing the shank receiving perforation **35** is rounded, the anti-coring device **42** may be identical to that shown in FIGS. **1** through **3.** If the forward face **32** of the mounting means **31** has some other peripheral configuration, it will be understood that the anti-coring device **42** will have a matching peripheral configuration. Again, the anti-coring device has a perforation **43** through which the shank portion **27** of the bit holder extends with clearance. Thus, the anti-coring device **42** will not interfere with the rotation of the bit holder **27,** nor will it interfere with the removal and insertion of the bit holder in the shank receiving perforation.

The anti-coring device **42** will be provided with a tongue **44,** substantially identical to the tongue **19** and having a transverse corrugation **45,** similar to the corrugation **20** in the structure of FIG. **2.** Thus, the tongue **44** will be frictionally engaged in the slot **41** when the anti-coring device is in place. Again, since the bit holder **27** extends through the perforation **43** in the anti-coring device, it will assure that the tongue **44** will not be inadvertently dislodged from the slot **41.** Replacement of the anti-coring device **42** requires only that the bit-bit holder assembly be removed from the shank receiving perforation **35.** Thereafter, the replacement of the anti-coring device may be accomplished in a manner identical to that described with respect to FIGS. **1** through **3.**

The structure of FIG. **5** is similar to that of FIG. **4,** and like parts have been given like index numerals. The bit-bit holder assembly of FIG. **5** is identical to that of FIG. **4.** The mounting means is also identical, except that the shank receiving perforation **35** is not provided with a tapered shoulder or abutment surface **36.** In this instance, the perforation **43***a*, through the anti-coring device **42***a*, is tapered and serves as the gauge-determing abutment surface cooperating with the abutment surface **29** on bit holder **27.** In all other respects, the structure of FIG. **5** and its operation is identical to that of FIG. **4.** The anti-coring device **42***a* does not interfere with either the replacement of the bit-bit holder assembly or its rotation. The anti-coring device **42***a* may be replaced in the same manner described with respect to the above embodiments.

In all the embodiments thus far described, the bit or bit-bit holder assembly has been of the so-called "pick" type. There are some embodiments of pick-type bits which are not intended to be rotatable. It will be understood, however that the anti-coring device of the present invention may be applied to the mounting means of non-rotating pick-type bits in the same manner described with respect to the embodiments of FIGS. **1** through **5.** If such bits have shanks of noncircular cross section, it will be understood that both the shank receiving perforation in the mounting means and the perforation through the anti-coring device may have an appropriate configuration to receive such shanks. In all instances, the anti-coring device protects the forward face of the mounting means from coring.

FIGS. **6** and **7** illustrate the anti-coring device of the present invention in the form suitable for use with cutter bit-mounting means assemblies of well known type taught, for example, in U.S. Pat. No. 3,114,537. The mounting means, generally indicated at **46** comprises a metallic block having a shank receiving perforation **47** extending therethrough. The shank receiving perforation **47** is of rectangular cross section. The mounting means may also have a transverse perforation **48** for receipt of a resilent retaining means **49.** For purposes of an exemplary showing, the retaining means **49** is illustrated as being identical to the retaining means shown in FIGS. **4** and **5.**

The cutter bit, generally indicated at **50,** comprises a head portion **51** and a shank portion **52.** The shank portion is of rectangular cross section and is adapted to be received in the shank receiving perforation **47.** The shank **52** may be provided with a hook-shaped notch **53** adapted to cooperate the metallic rod of the retaining means **49** to hold the cutter bit in seated position.

The head portion **51** of the cutter bit may be provided with a hard cutting tip **51**a and gauge-determining shoulders or abutment surfaces **53** and **54,** which cooperate with the top surface of the mounting means **46** to determine the depth to which the shank **52** extends into the shank receiving perforation **47.** In the above mentioned patent various forms of abutment surfaces or shoulders are taught. For example, only one of the shoulders **53** and **54** may be present, or shoulders extending along the sides of the shank (rather than at the end therof as illustrated) may be provided. The nature of the nature of the various type of shoulders or abutment surfaces on the head portion of the bit does not constitute a limitation on the present invention.

As in the case of the previously described embodiment, the mounting means of FIGS. **6** and **7** may have a slot forming means thereon. For purposes of an exemplary showing a U-shaped strap **55** is illustrated as being affixed to the forward surface **46**a of the mounting means. The U-shaped element **55** may be identical to the element **21** of FIGS. **1** and **3,** or the element **40** of FIGS. **4** and **5.** It may be an integral part of the lug or affixed thereto by welding or the like. The element **55** forms a slot **56** adapted to receive the tongue **57** of an anti-coring means **58.** The tongue **57** may be identical to the tongue **19** of FIG. **2** and may have a corrugation **59** identical to that shown at **20** in FIG. **2.** This insures a tight frictional engagement between the tongue **57** and the U-shaped element **55.**

As has been discussed above, the configuration of the anit-coring device **58** will depend upon the configuration of the mounting means **46.** In the embodiment illustrated in FIGS. **6** and **7,** the mounting means is essentially block-shaped, having a substantially rectangular forward face **46***a*. As a consequence, the anti-coring device **58** is illustrated as having a substantially rectangular portion **58***a* adapted to cover the forward face of the mounting means. While not necessary, the anti-coring device **58** may have a second portion **58***b* extending rearwardly of the portion **58***a* and adapted to lie over a portion at least of the top surface **46***b* of the mounting means. The portion **58***b* has a longitudinally extending slot **60** located centrally thereof and adapted to accommodate the head portion **51** of the cutter bit **50.** The slot **60** is so sized as to permit the coaction between the abutment shoulders **53** and **54** of the cutter bit head and the top surface **46**b of the mounting means. The portion **58***b* of the anti-coring device no only provides additional protection for the mounting means, but also serves to maintain the anti-coring device in it proper position. This is accomplished through the coaction of the cutter bit head portion **51** and the slot **60.**

FIG. **8** illustrates a cutter bit-mounting means assembly which is substantially similar to that of FIGS. **6** and **7,** and like parts have been given like index numerals. Again a U-shaped slot-forming member **55** is provided in association with the lug. The anti-coring device is also substantially similar to that of FIGS. **6** and **7** and again like parts have been given like index numerals.

The embodiment of FIG. **8** differs from that of FIGS. **6** and **7** in that the portion **58***b* of the anti-coring device is provided with a perforation **61** rather than a slot of the type shown at **60** in FIGS. **6** and **7.** In this instance, the shank **52** of the cutter bit extends through the perforation **61** and the gauge-determining abutment shoulders **53** and **54** coact with the top surface of the portion **58***b* of the anti-coring device **58.** Thus, in this embodiment, the anti-coring device serves not only to prevent coring of the mounting means, but also has an abutment surface for the shoulders **53** and **54.** In this way, wear caused by the abutment shoulders **53** and **54** will be absorbed by the disposable anti-coring device rather than the mounting means itself.

In the embodiment of FIG. **8,** it will be understood that dimensional adjustments will have to be made to accommodate the thickness of the anti-coring device. Thus, the location of the transverse perforation **48** in the mounting means will have to be shifted upwardly by a distance equal to the thickness of an anti-coring device, or the shank **52** of the cutter bit will have to be lengthened by the same distance. Again, the bit **50** serves to cooperate with the U-shaped member **55** to lock the anti-coring device in place.

In both the embodiment of FIG. **6** and **7** and the embodiment of FIG. **8,** the anti-coring device does not interfere with removal and replacement of the cutter bit **50.** In both embodiments, the anti-coring device itself may be readily replaced upon removal of the cutter bit.

FIG. **8** illustrates the application of the principle of the present invention to bit-mounting means assemblies of the type taught in the above mentioned copending application (of which this is a continuation-in-part) in the name of the same inventor, Ser. No. 842,791, filed June 30, 1969, and entitled CUTTER BITS AND MEANS FOR MOUNTING THEM. Briefly, the mounting means (generally indicated at **62**) comprises

a block-like structure having a shank receiving perforation **63.** The axis of the shank receiving perforation **63** is inclined toward the cutting direction (indicated by the arrows B). While the angularity of the shank receiving perforation axis to the cutting direction may be varied, an angularity of less than 90° is generally preferred so that the component of force tending to shove the bit into the shank receiving perforation is greater and so that the resultant cutting stresses on the bit will be more nearly in line with the bit axis.

As illustrated in FIG. **9,** the bit (generally indicated at **64**) comprises an elongated shank **65,** preferably of circular cross section. The upper end of the shank terminates in a clearance surface **66** lying at an angle to the shank axis and is relieved on opposite sides, one such relief being shown at **67.** The reliefs form a cutting tip **68** having a cutting surface **69** substantially parallel to the axis of the shank **65.** The lower end of the shank terminates in an abutment surface **70** lying at an angle to the shank axis.

The mounting means **62** has a transverse hole **71** extending through the mounting means and intersecting the shank receiving perforation **63.** A pin **72** is located in the hole **71.** The pin **72** carries an abutment surface **73** adapted to cooperate with the abutment surface **70** on the bit shank, to determine the gauge of the bit.

A retaining means must be provided to prevent loss of the bit during the cutting operation. For purposes of an exemplary showing, the retaining means is illustrated as being a pair of split metal rings **74** and **75** captively held in an annular groove **76** in the mounting means **62.** The split metal rings **74** and **75** are so sized as to frictionally engage the bit shank **65.**

The mounting means **62** is provided on its forward face **62**a with a U-shaped element **77** forming a slot **78.** The U-shaped element **77** may constitute an integral part of the mounting means **62** or it may be a separate part affixed thereto by welding or the like. The element **77** may be substantially identical to the element **21** in FIGS. **1** and **3,** the element **40** in FIGS. **4** and **5** or the element **55** in FIGS. **6–8.**

The anti-coring device is generally indicated at **79.** It has a tongue **80** (with a corrugation **81** therein) adapted to be received in the slot **78,** in the same manner described with respect to the previous embodiments. The anti-coring device **79** has a portion **79***a* adapted to cover the forward face or surface **62***a* of the mounting means. Again the configuration of the portion **79***a* will depend upon the configuration of the forward surface **62***a*. For purposes of an exemplary showing, the mounting means **62** is illustrated as having a block-like configuration. Thus, the portion **79***a* of the anti-coring device may be substantially identical to the portion **58***a* of the anti-coring device **58** (see FIG. **7**).

Preferably, the anti-coring device **79** will have a rearwardly extending portion **79***b*, similar to the portion **58***b* of the anti-coring device **58** (see FIG. **7**). In this instance, the portion **79***b* extends along a part at least of the upper surface **62***b* of the mounting means **62,** and has a perforation **82** therein, through which the bit **64** extends. Thus, the bit cooperates with the tongue **80** to maintain the anti-coring device in place. The anti-coring device does not interfere with removal and replacement of the bit **64** and may itself be readily replaced upon removal of the bit **64.**

FIG. **10** is similar to FIG. **8** and illustrates a substantially identical mounting means, cutter bit and retaining means. As a consequence, like parts have been given like index numerals. The embodiment of FIG. **10** illustrates the use of an anti-coring device (generally indicated at **82**) which is similar to that shown at **58** in FIG. **8.** The anti-coring device **82** has a first portion **82***a* covering the front surface **46***a* of the mounting means **46,** and a second portion **82***b* covering a large part of the top surface **46***b* of the mounting means. The portion **82***b* has a perforation **83** therein, adapted to accept the shank **52** of the cutter bit **50.** As in the case of the embodiment of FIG. **8,** the anti-coring device **82** also serves as a gauge-determining abutment means, cooperating with the abutment surfaces **53** and **54** of the cutter bit.

Unlike the anti-coring device **58** of FIG. **8,** the anti-coring device **82** of FIG. **10** is not provided with a tongue to be engaged in a slot-forming means. In this embodiment, the portion **82***a* of the anti-coring device has a hook-like configuration **82***c* at its bottom edge which is adapted to engage the bottom surface **46***c* of the mounting means **46.** The portion **82***a* of the anti-coring device will have a width at least as great as that of the forward face **46***a* of the mounting means. The hook-like element **82***c* may simply by a continuation of the portion **82***a* and hence also extend the full width of the surfaces **46***a* and **46***c*. Alternatively, the hook-like portion **82***c* may be of a lesser width, simply constituting a centrally located extension on the portion **82***a* of the anti-coring device.

In use, the anti-coring device **82** may be applied to the mounting mean **46** by first engaging the hook-like portion **82***c* on the bottom surface **46***c* of the mounting means. Thereafter, the anti-coring device may be pivoted to the position shown in FIG. **10** and the cutter bit **50** may thereafter be installed. The combination of the hook-like means **82***c* and the cutter bit **50,** passing through the perforation **38,** will hold the anti-coring device in its proper position.

For additional stabilization of the anti-coring device with respect to the mounting means, it is possible to provide the inside surface of the anti-coring device with a lug **84.** The lug **84** extends from the inside surfaces of the portions **82***a* and **82***b* at the juncture thereof and may be located centrally of the surfaces. Centrally of the mounting means surfaces **46***a* and **46***b*, and at the juncture thereof, the mounting means may be provided with a slot **85.**

The slot is so positioned and so configured as to accept the lug **84.** The interengagement of the lug **84** in the slot **85** will tend to further impede any movement of the anti-coring device transversely of the mounting means.

FIG. **11** illustrates a cutter bit, mounting means and retaining means identical to that shown in FIG. **10** and like parts have been given like index numerals. An anti-coring device is generally indicated at **86.** It is in most respects similar to the anti-coring device **82** of FIG. **10.** Thus, the portion **86***a*, the portion **86***b*, the perforation **87** and the hook-like configuration **86***c* correspond to the portions **82***a* and **82***b*, the perforation **83** and the hook-like configuration **82***c* of FIG. **10,** respectively.

The anti-coring device **86** can be installed in the same manner described with respect to the anti-coring device of FIG. **10,** and performs the same functions. It differs from the anti-coring device of FIG. **10** in that

rather than a single centrally located lug **84**, the embodiment of FIG. **11** is provided with a pair of lugs **88** and **89** which are adapted to engage the side surfaces of the mounting means **46** at the juncture of the forward surface **46***a* and top surface **46***b*. It will be evident to one skilled in the art that the lugs **88** and **89** will tend to preclude any movement of the anti-coring device transversely of the mounting means **46**.

To remove the anti-coring devices of FIGS. **10** and **11**, it is only necessary to extract the cutter bit **50**. The anti-coring devices may then be replaced, followed by the replacement of the cutter bit.

FIG. **12** illustrates the application of the anti-coring device of the present invention to the mounting means for a bit or digger tooth of a digging or trenching machine. The digger tooth-mounting means assembly of FIG. **12** is illustrated as being affixed to an element **90**. The element **90** may be considered as being the forward portion of the bucket of a rotary or chain-type trenching machine. It will be understood that the element **90** could also be considered as the forward portion of the bucket or shovel of any type of digging machine such as a power shovel, back hoe, or the like. To the forward edge of the shovel element **90** there is affixed a U-shaped element **91** forming a slot **92**. It will be understood that the U-shaped element **91** could comprise an integral part of the forward edge of the shovel **90**. A mounting means, generally indicated at **93**, is affixed to the bottom surface of the shovel member **90**. The mounting means comprises a cylindrical element having a forward surface **94** and a shank receiving perforation **95**. The shank receiving perforation **95** has an annular groove **96** therein, in which retaining means **97** and **98** are captively held. For purposes of an exemplary showing, the retaining means **97** and **98** may be split metal rings identical to those illustrated at **74** and **75** in FIG. **9**.

The digger tooth, generally indicated at **99**, has a cylindrical shank portion **100** adapted to be received in the shank receiving perforation **95** and to be frictionally engaged by the retaining means **97** and **98**. While the precise nature of the digger tooth does not constitute limitation on the present invention, it is, for purposes of exemplary showing, illustrated as being of the double-ended type. Thus, at one end, the shank **100** terminates in a flat surface **101** lying at an angle to the long axis of the bit and forming a cutting or digging tip **102**. The other end of the shank similarly terminates in a flat surface **103** forming a cutting or digging tip **104**. In the position shown, it will be noted that the surface **103** cooperates with the bottom surface of the shovel member **90** to determine the gauge of the digger tooth. When the cutting tip becomes worn, the digger tooth may be removed and reversed so that the surface **101** will abut the bottom surface of the shovel element **90** and the cutting or digging tip **104** will be exposed.

The anti-coring device is generally indicated at **105**. Since the mounting means **93** has been described as being cylindrical, the forward face or surface **94** thereof will be circular. Thus, the anti-coring device **105** may be identical to that shown in FIG. **2**. Again, it will be understood that the anti-coring device **104** may have a different peripheral shape if the forward face **94** of the mounting means were to have a configuration other than a circular one.

It will be readily understood that the anti-coring device **105** will not interfere with removal and reversal or replacement of the digger tooth **99**. When the digger tooth **99** is in place, it will cooperate with the U-shaped element **91** to maintain the anti-coring device in position. The anti-coring device may be replaced in the same manner as described with respect to FIGS. **1** through **3**, when the digger tooth **99** has been removed.

FIG. **13** illustrates a modified version of the structure of FIG. **12**, and like parts have been given like index numerals followed by "*a*." Again, the element **90***a* may comprise the forward portion of the bucket of a trenching machine, a power shovel, a back hoe, or the like. The primary difference between the embodiment of FIG. **13** and the embodiment of FIG. **12** lies in the fact that the portion **93***b* of the mounting means **93***a* has been extended and the U-shaped element **91***a* is affixed to, or comprised an integral part of, the mounting means **93***a*. The bit **99***a* and the retaining means **97***a* and **98***a* are essentially identical to their counterparts in the structure of FIG. **12**. The anti-coring device **105***a* may be in every way identical to that of FIG. **12**. The installation, replacement, operation and characteristics of the anti-coring device **105***a* are, in every way, identical to those of the anti-coring device **105** of FIG. **12**.

It will be understood that the nature of the retaining means used in the embodiments of FIGS. **12** and **13** does not constitute a limitation on the present invention. The same is true of the cross sectional configurations of the cutter bit shank and shank receiving perforation, except in so far as the perforation in the anti-coring device must be properly configured to receive the bit shank.

FIG. **14** illustrates another application of the teachings of the present invention to a bit-mounting means assembly wherein the bit serves as a digger tooth on the lead edge of a scoop, shovel, or like device of an excavating or earth working machine. In this instance, the bit **106** has a head portion **107** and a shank portion **108**. While the head portion **107** is shown as terminating in a point, the configuration of the head portion does not constitute a limitation on the present invention and may be determined in part by the type of machine to which it is applied and the nature of the work performed by the machine. The shank **108** is, for purposes of illustration, shown as being cylindrical. Again, its cross sectional configuration does not constitute a limitation on the present invention.

The bit shank **108** is received in a shank receiving perforation **109** in the mounting means **110**. The cross sectional configuration of the shank receiving perforation **109** is here shown as being cylindrical, but will be determined by the cross sectional configuration of the bit shank. The exterior configuration of the mounting means **110**, again, does not constitute a limitation on the present invention and will be dependent upon the nature of the machine device to which it is affixed. For purposes of an exemplary showing the mounting means **110** is illustrated as being affixed to the lead edge of a shovel **111**. The mounting means **110** may be affixed to the shovel in any suitable permanent or removable manner. The mounting means **110** has a transverse hole **112** adapted to receive a rodlike element **113**. The rodlike element **113** has an abutment surface **114** thereon, adapted to cooperate with an abutment surface **115** on the bit or tooth **106**.

The shank receiving perforation **109** is provided with an annular notch **116** containing retaining means **117.** The retaining means **117** may again be of any suitable type including one or more split metal rings, or twisted split metal ring, a split metal ring of more than one convolution, etc. The retaining means will have a frictional engagement with the shank **108.**

An anti-coring device is shown at **118,** in the form of a ferrule element having a shank receiving perforation **119** similar to the perforation **109** and having an annular notch **120.** The notch **120** will captively hold retaining means **121** which may be the same as the retaining means **117.** The anti-coring device **118** will be inserted on the bit shank and will be shoved into contact with the mounting means **110.** It need not be affixed to the mounting means **110** since it can be adequately supported by the bit shank.

Forces acting on the tooth **106** will insure that it will remain fully seated despite wear of the parts. In many instances, the digger tooth **106** may be made of rod stock, rather than an expensive forging operation or the like. Similarly, the bit or tooth mounting means may have a simple shank receiving perforation **109** achieved by drilling rather than by broaching or the like.

It will be understood that in the embodiment of FIG. **14,** a full line or surface-to-surface contact will be maintained between the bit surface **122** and the shank receiving perforation surface **123** whenever there is a component of cutting or digging force acting on the bit in a direction ranging from a direction which is substantially parallel to the bit axis to a direction which is substantially perpendicular to the bit axis and extending vertically downwardly as viewed in FIG. **14.** A typical component of force within this range is indicated by the arrow A.

FIG. **15** illustrates a structure similar to that of FIG. **14** and like parts have been given like index numerals. In this instance, however, the shank **108***a* of the bit **106***a* terminates in an abutment surface **115***a* which extends rearwardly and upwardly, as opposed to the abutment surface **115** of FIG. **14** which extends rearwardly and downwardly. The mounting means **110** is provided with a transverse perforation **112***a* similar to the perforation **112** of FIG. **14,** but positioned slightly differently, as illustrated. A rod-like element **113***a* is provided, having an abutment surface **114***a*. In this instance the abutment surface **114**a is oriented to lie in abutting relationship to the bit or digger tooth abutment surface **115***a*.

In all other respects, the structure of FIG. **15** is substantially identical to that of FIG. **14.** All of the components act in the same way. In this instance, however, a full line or surface-to-surface contact will be maintained between the bit surface **122***a* and the shank receiving perforation surface **123***a* whenever there is a component of cutting or digging force acting on the bit and lying within the range of directions between a direction substantially parallel to the bit axis and a direction substantially perpendicular to the bit axis and oriented vertically upwardly as seen in FIG. **50.** A typical component of force within this range is indicated by the arrow B.

It will be understood by one skilled in the art that in either of the embodiments illustrated in FIGS. **14** and **15** the transverse hole **112** or **112***a* could be centrally positioned so that its axis would intersect the axis of the shank receiving perforation. In addition, it would be within the scope of the invention to provide a centrally located transverse perforation and a rod-like element having a pair of abutment surfaces. In this way, the cutter bit or digger tooth could be reversed, depending upon the type of work done by the digging or earth working machine.

The bits or digger teeth of FIGS. **14** and **15** may be provided with a shallow depression to receive the retaining means **117.** Such a depression would increase the retaining ability of the retaining means, but should be shallow so as not to constitute a significant stress raiser. The depression should be so configured as to not present a shoulder interfering with the pry-out feature of the bits. The depression may lie on one side only of the bit or more than one depression may be provided located at various positions about the bit. Similarly, the depression may be a continuous annular one extending fully about the bit. For purposes of an examplary showing, an annular shallow depression is shown at **124** in dotted lines in FIG. **15.** In using the term depression it is to be understood that what is meant is a configuration which will help to increase the holding power of the retaining means with respect to the bit, but not to a degree to preclude the pry-out feature.

The anti-coring device **118** of FIG. **15** is identical to that of FIG. **14** and functions in the same manner. Its exterior configuration will depend upon the configuration of the mounting means **110.** The configuration of the perforation **119** will depend upon the cross sectional shape of the bit shank **108***a*. Again, for purposes of an examplary showing, the anti-coring device **118** is illustrated as a simple cylindrical member having a tapered forward end and a shank receiving perforation of circular cross section.

Modification may be made in the invention without departing from the spirit of it. For example, in the above described embodiments the anti-coring device may be removably held in place by suitable means. It would be within the scope of the invention to mount the anti-coring device to the forward face of the mounting means by a bolt, a set screw or the like passing through a perforation in the anti-coring device and extending into a threaded hole in the mounting means. Clip means, or the like, could also be used.

It will be understood by one skilled in the art that, while the anti-coring device has been illustrated as applied to various forms of bit-mounting means assemblies, its use is not intended to be limited to those embodiments shown. The anti-coring device of the present invention may be applied to substantially any type of bit-mounting means assembly, so long as the anti-coring device is properly configured to protect those surfaces of the mounting means which are subject to coring.

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

1. An anti-coring device for use with bit and mounting means assemblies mounted on the driven elements of mining machines, digging machines and earthworking machines wherein each of said mounting means has at least one forward surface facing the cutting direction and subject to coring, said mounting means having a perforation therein adapted to receive the shank of a bit, said shank receiving perforation forming an opening in said at least one surface, said shank receiving perforation at said opening being countersunk, said

countersink forming a gauge-determining abutment surface adapted to cooperate with a matching gauge-determining abutment surface on said bit, said anti-coring device comprising a disposable element adapted to cover a part at least of said at least one surface of said mounting means, means for detachably maintaining said anti-coring device at said at least one surface of said mounting means, said anti-coring device having a perforation therethrough so positioned therein as to be coaxial with said shank receiving perforation when said anti-coring device is in position on said mounting means, said perforation in said anti-coring device being so sized as to expose said gauge-determining abutment surface on said mounting means.

2. The structure claimed in claim **1** wherein said shank of said bit, said shank receiving perforation and said perforation in said anti-coring device are of circular cross section, said perforations being so sized with respect to said bit shank that said shank is freely rotatable in said perforations.

3. An anti-coring device for use with bit and mounting means assemblies mounted on the driven elements of mining machines, digging machines and earthworking machines wherein each of said mounting means has at least one forward surface facing the cutting direction and subject to coring, said anti-coring device comprising a disposable element adapted to cover a part at least of said at least one surface of said mounting means, means for detachably maintaining said anti-coring device at said at least one surface of said mounting means, said last mentioned means comprising a tongue on said anti-coring device, said mounting means having a slot-forming means on said at least one surface, said tongue being configured to be received in said slot with a frictional fit.

4. An anti-coring device for use with bit and mounting means assemblies mounted on the driven elements of mining machines, digging machines and earthworking machines wherein each of said mounting means has at least one forward surface facing the cutting direction and subject to coring, said anti-coring device comprising a disposable element adapted to cover a part at least of said at least one surface of said mounting means and means for detachably maintaining said anti-coring device at said at least one surface of said mounting means, said last mentioned means comprising a tongue on said anti-coring device, said driven element to which said mounting means is affixed having a slot-forming means thereon, said tongue being configured to be received in said slot with a frictional fit.

5. An anti-coring device for use with bit and mounting means assemblies mounted on the driven elements of mining machines, digging machines and earthworking machines wherein each of said mounting means has at least one forward surface facing the cutting direction and subject to coring, said mounting means being of the type having a substantially rectangular block-like configuration with rearward, top, bottom and side surfaces as well as said at least one forward surface, said mounting means having a perforation therein adapted to receive the shank of a bit, said shank receiving perforation forming an opening in said top surface of said mounting means, said anti-coring device comprising a disposable element of substantially L-shaped configuration having a first portion adapted to cover said forward surface of said mounting means and a second portion adapted to cover a part at least of said top surface of said mounting means and means for detachably maintaining said anti-coring device on said mounting means with said first portion of said anti-coring device covering said forward surface of said mounting means and said second portion of said anti-coring device covering a part at least of said top surface of said mounting means.

6. The structure claimed in claim **5** wherein said second portion of said anti-coring device has a notch therein exposing said shank receiving perforation.

7. The structure claimed in claim **6** including a tongue on said first portion of said anti-coring device, a slot forming means on said forward surface of said mounting means, said tongue being configured to be received in said slot with a frictional fit.

8. The structure claimed in claim **5** wherein said second portion of said anti-coring device has a perforation therein adapted to be coaxial with said shank receiving perforation when said anti-coring device is in position on said mounting means, said perforation in said anti-coring device having a cross sectional configuration of at least the same dimensions as those of said shank receiving perforation.

9. The structure claimed in claim **8** including a tongue on said first portion of said anti-coring device, a slot-forming means on said forward surface of said mounting means, said tongue being configured to be received in said slot with a frictional fit.

10. The structure claimed in claim **8** wherein said second portion of said anti-coring device adjacent said perforation therein comprises a gauge-determining abutment surface for said bit.

11. The structure claimed in claim **10** wherein said first portion of said anti-coring device is provided with a hook-like configuration adapted to engage said bottom of said mounting means adjacent the juncture of said bottom and said forward surface of said mounting means.

12. The structure claimed in claim **11** including lug means on said anti-coring device, said lug means being configured to engage said mounting means to prevent movement of said anti-coring device transversely of said mounting means.

13. An anti-coring device for use with bit and mounting means assemblies mounted on the driven elements of mining machines, digging machines and earthworking machines wherein each of said mounting means has at least one forward surface facing the cutting direction and subject to coring and a perforation therein adapted to receive the shank of a bit, said shank receiving perforation forming an opening in said at least one surface, said anti-coring device comprising a disposable element adapted to cover a part at least of said at least one surface of said mounting means, means for detachably maintaining said anti-coring device at said at least one surface of said mounting means, said anti-coring device having a perforation therethrough, said perforation in said anti-coring device being so positioned in said anti-coring device as to be coaxial with said shank receiving perforation when said anti-coring device is maintained at said at least one surface of said mounting means, whereby said shank of said bit will extend through said perforation in said anti-coring device and into said shank receiving perforation, said perforation in said anti-coring device being countersunk to form a surface flaring outwardly from said shank receiving perforation, said flaring surface comprising an abutment sur-

face adapted to cooperate with a matching gauge-determining abutment surface on said bit.

14. The structure claimed in claim **13** wherein said shank of said bit, said shank receiving perforation and said perforation in said anti-coring device are of circular cross section, said perforations being so sized with respect to said bit shank that said shank is freely rotatable in said perforations.

15. An anti-coring device for use with bit and mounting means assemblies mounted on the driven elements of mining machines, digging machines and earthworking machines wherein each of said mounting means has at least one forward surface facing the cutting direction and subject to coring, said mounting means having a perforation therein adapted to receive the shank of a bit, said shank receiving perforation forming an opening in said at least one surface, said anti-coring device comprising a disposable element adapted to lie in abutment with and substantially cover said at least one surface of said mounting means and having a peripheral shape substantially the same as that of said at least one surface subject to coring, means for detachably maintaining said anti-coring device in abutment with said at least one surface of said mounting means, said anti-coring device having a perforation therethrough, said perforation in said anti-coring device being so positioned in said anti-coring device as to be coaxial with said shank receiving perforation when said anti-coring device is maintained in abutment with said at least one surface of said mounting means, whereby said shank of said bit will extend through said perforation in said anti-coring device and into said shank receiving perforation, said shank receiving perforation in said mounting means and said bit shank being of circular cross section and so sized that said bit shank is rotatable within said shank receiving perforation, said perforation in said anti-coring device being of circular cross section and having a diameter at least as great as the diameter of said shank receiving perforation.

16. An anti-coring device for use with bit and mounting means assemblies mounted on the driven elements of mining machines, digging machines and earthworking machines wherein each of said mounting means has at least one forward surface subject to coring, said mounting means having a shank receiving perforation therein to receive the shank of a bit and forming an opening in said at least one surface, said bit being of the type having an elongated shank terminating at its forward end in a cutting tip and terminating at its rearward end in an abutment surface adapted to be in abutment with a gauge determining abutment surface in association with the rearward end of said shank receiving perforation, said anti-coring device comprising a disposable element adapted to lie in abutment with and substantially cover said at least one surface subject to coring and having a peripheral shape substantially the same as that of said at least one surface subject to coring, said anti-coring device having a perforation therethrough of a diameter at least as great as that of said shank receiving perforation to receive said shank of said bit and means to detachably affix said anti-coring device to said mounting means in abutment with said at least one surface subject to coring with said perforation of said anti-coring device coaxial with said shank receiving perforation.

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