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RETAINER FOR COAL CUTTER BITS

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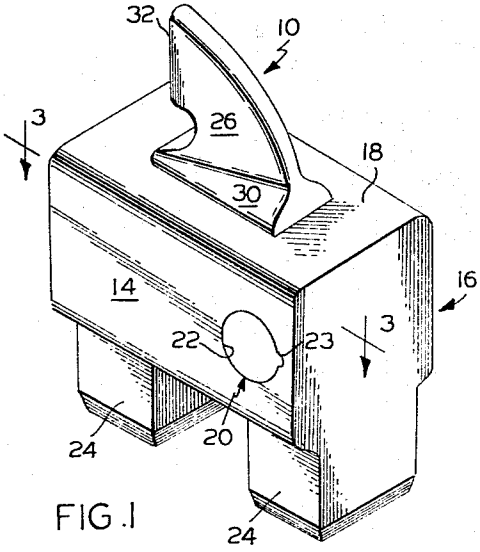


FIG. 1

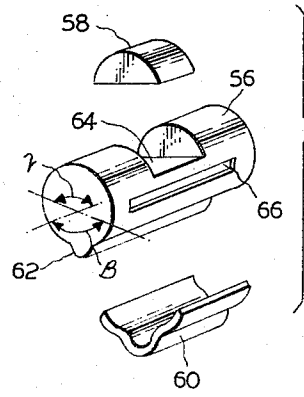


FIG. 4

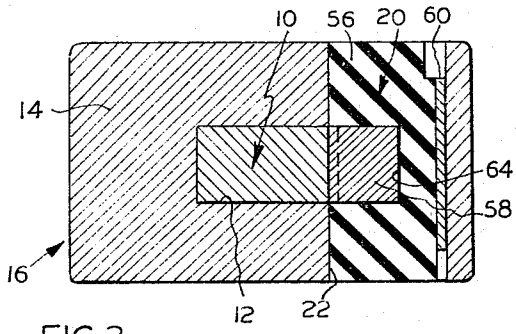


FIG. 3

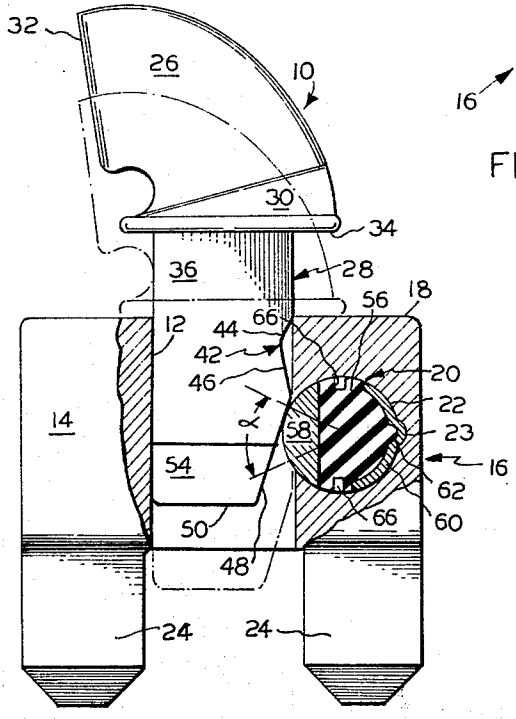


FIG. 2

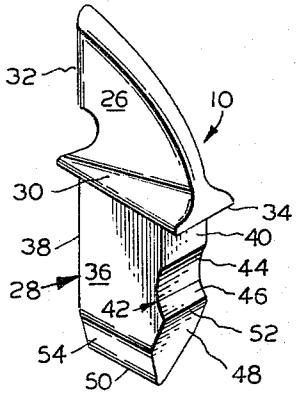


FIG. 5

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RETAINER FOR COAL CUTTER BITS

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This invention relates to coal type mining machinery, more particularly to a resilient detent for the holding of mining cutter bits in a cutter chain or bar socket.

Mining operations, such as the undercutting of coal or potash are presently accomplished by utilizing large high-speed machines such as cutter chains or bars upon which are mounted a multitude of cutter socket members with replaceable bits. The bits are arranged around the chain or bar at different angles so as to effect a width of cut sufficient to clear the cutter chain or bar and its mountings. The bits themselves take a variety of forms, from the simple integral element consisting of a shank and cutting head, to more sophisticated devices comprising a bit holder with a removable or renewable cutting edge. The present invention relates to all assemblies in which the various chain links or bars are provided with sockets, and the cutter bits have shank elements for engagement and retention of the cutter bit shanks in the sockets.

The efficiency of such machines depends on the ease with which cutter bits may be replaced. Besides the problem of the bits dulling rather rapidly, vibration and shock breaks a large number of them. To replace bits, an entire machine must be shut down, the dulled or broken bits removed from their sockets where they are generally held by some form of retainer, and new bits inserted. Since in this type of machinery, the cutter bits are subjected to rapid wear and abrasion as well as vibration it is a problem to design a detent means for holding a cutter bit shank in a socket for resisting loosening, allowing quick replacement of the cutter bit, and still being easily replaceable itself.

A number of detent devices have been developed and are now in use in the industry. One conventional method for providing such a result is by attaching the cutter bit shanks within their sockets with set screws biased against the face of the shank or fitting into a hole therein. It has been found, however, that a set screw is slow to release, and with the ever present coal dust and rock chips found in a mine, the head and thread channels are soon filled. The operator must go through the time consuming step of cleaning off the head of the screw before loosening it and then may find that it takes an inordinate force to turn the dirt clogged threads. In hurrying to replace bits, it has been found that it is not uncommon for the threaded apertures and respective set screws to become cross threaded and therefore no longer even able to hold the bits in the socket member or the excessive pressure needed to turn the dirt clogged threads may cause the operator to think that the connection is tight while in reality the shank of the cutter bit is not being gripped at all but is merely laying loosely in the socket. A set screw can also vibrate loose from the action of the machine and the bit pull out when lodged in an especially hard vein of coal. Since the socket members are an integral part of the mining machinery, the machinery must be completely halted to allow the damaged socket or a lost cutter bit to be replaced.

In the light of the known disadvantgaes of set screw holding means, the industry has proposed numerous alternatives, one of the most recent of these being a resilient elastomer biasing means backing a metal detent head.

These resilient retainers are usually in the form of plungers operating in bores perpendicular to the shank of a bit with the metallic head abutting a notch in the shank of a bit and allowing movement back along the axis of the bore when sufficient pressure is applied as during the cutter bit insertion and removal. A most recent development in the field is that of a retainer operating in a bore traversing the socket member from side to side and having a section intersecting the cutter bit socket passage. In this instance the metallic abutting means either has been a bar which extends across a notch in the cutter bit shank and is anchored by its ends in a elastomeric backing material, or is a finger based in the elastomer and extending into the intersection of the passages.

These resilient detent means, although a comparatively successful alternative, are still subject to extreme wear and lose their resiliency at which time they must be replaced. The elastomeric portion tends to deteriorate, becoming gummy or sticky and making removal difficult. Also to prevent the rotation of the detent element to a position in which the metallic portion is not facing the intersection, the retainer must be keyed in position. A simple expedient is a slot extending the length of the detent passage and an integral key, formed of the elastomer. However, an integral elastomeric key will not last the life of retainer due to the tearing action of the rotative forces and the effects of deterioration on this thin section.

With the designs utilizing metallic bars or fingers, a free portion of the metal abutting element extends into the cutter bit socket and the cutter bit shank notch or cavity, and continued shock on the unsupported free portion of the abutting element may cause untimely failures. The finger type of detent may even be torn loose from its anchorage in the elastomeric backing material and fall into the socket when the contained cutter bit is removed. Also, it takes considerable force to remove a bit from a socket, the loss of a cutter bit head preventing removal of the remainder of the bit without disassembly of the unit, since the finger interlocks with the notch in the shank, preventing the retainer from being removed instead. Furthermore, devices having a metal detent embedded within the estomer are more costly than other competing resilient retainers.

One of the principal objects of this invention is the provision of a resilient detent means which does not suffer from the above defects.

Another object of the invention is the provision of a resilient detent means which does not depend for its action on a reciprocating plunger.

A further object of the invention is the provision of a detent means fabricated so as to be easily removed from the socket member regardless of the condition of the elastomeric backing material.

A still further object of the invention is the provision of a detent means in which the metallic abutting means is not subject to breakage as in prior art devices.

A further object of the invention is the provision of a detent means having a metallic abutting means which can not become displaced as long as the retainer is fixed within the socket.

A still further object of the invention is the provision of a detent means which may be removed from the socket without the prior removal of the held cutter bit.

Further objects and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a perspective view of a cutter bit secured in a socket member by the resilient detent of the present invention;

FIGURE 2 is a side elevational view, partially broken

away, illustrating the method of inserting a cutter bit into the socket member;

FIG. 3 is a longitudinal view taken along the lines 3—3 of FIG. 1;

FIG. 4 is an exploded perspective view of the resilient detent of the invention illustrating the shapes of each of the three elements thereof, and;

FIG. 5 is a perspective view of the cutter bit removed from the socket member.

In FIGURES 1, 2 and 3, a cutter bit, generally designated **10** is fixedly mounted in a rectangular cutter bit holding passageway **12** in the rectangular body portion **14** of a socket member, generally designated **16**, and extends outwardly from the upper face **18** thereof. A resilient detent, generally designated **20**, which releasably secures the cutter bit **10** in the socket member **16**, resides in a circular horizontal passageway **22** in the rectangular body portion **14** intersecting the rectangular vertical bit holding passageway **12** over an arc α of the passageway **22** of less than 180°, and preferably about 90°. A keyway slot **23** cut in the wall of the retainer passageway **22** opposite the intersection with the cutter bit holding passageway **12**, is parallel to the axis of the passageway **22** and extends the length thereof. A pair of rectangular legs **24** extend vertically downward from the base of the socket member body portion **14** for connecting the socket member to the chain or bar of a coal cutting machine (not shown) in a manner well known in the art.

The cutter bit **10**, as shown best in FIG. 5, has a head portion **26**, with a cutting portion **32** formed on one upper edge, and a shank **28**, with an integral rectangular flange **30** formed therebetween. The shank portion **28** of the cutter bit **10** is substantially rectangular in cross-section for mating with the passageway **12** of the socket member **16** while the lower face **34** of the flange **30** forms a flat surface for abutting the upper surface **18** of the body portion **14** upon insertion of the cutter bit shank **28** into the bit holding passageway in the socket member **16**. The shank **28** has a pair of parallel planer side faces **36**, a planer front face **38**, and a rear face, generally designated **40**. The rear face **40** has a contoured notch **42** formed transversely across the surface thereof to mate with the detent **20**, the notch **42** consisting of a curved section **44** and an upper camming section **46**. The upper camming section **46** extends downward and outward from the inner end of the curved section **44** to the plane of the rear face **40** of the shank **28**. A lower camming section **48** extends from the lower end of the upper camming section **46** downward and inward to the lower face **50** of the shank **28** and forms an apex **52** at the junction with the upper camming section **46**. The lower ends of the side faces **36** have converging lower sections **54** meeting approximately at the lower face **50** to form a wedge shaped profile.

The resilient retainer **20** consists of; a substantially cylindrical block **56** of an elastomeric material such as rubber, a metallic abutting element **58**, and a metallic cover plate **60**. The elastomeric block **56** has an integral key flange **62** extending along a portion of one side thereof parallel to the axis of the cylinder **56**. The cover plate **60** consisting of a spring steel sheet stamped to conform to the surface of the cylinder including the key flange **62**, is molded into the surface and contiguous therewith, to form a reinforced key. The angle β of the sector of the cylinder **56** covered by the plate **60** is less than 180°.

Opposite the key **62**, a planar bottomed section **64**, not extending to either end, is removed from the cylinder **56** and the metallic abutting element **68**, similarly shaped, is molded therein forming a contiguous surface of metal and elastomer. The angle γ between the ends of the section **64** and the axis of the cylinder is preferably less than 180° but greater than the angle α which denotes the arc of the cylinder **56** extending into the intersection of the passageways **12, 22**. A rectangular compression slot **66**, may be formed on each side of the cylinder **56**, parallel to the axis thereof, between each side of the cover plate **60** and the abutting element **58**, without extending all the way to the ends of the cylinder **56**.

Before a cutter bit is to be inserted into the socket member **16**, the resilient retainer **20** is placed in the retainer passageway **22** with the key **62**, and its formed cover plate portion **60**, fitting into the keyway **23** and a portion of the abutting element **58** lying within the intersection of the retainer passageway **22** with the cutter bit socket passageway **12**.

In operation, when a cutter bit **10** is to be inserted into the socket member **16** (solid lines FIG. 2) the lower camming section **48** drives the abutting element **58** out of the rectangular cutter bit passageway **12** by compressing the cylindrical elastomer block **56**. As the cutter bit **10** continues to descend, the abutting element **58** passes the apex **52** and moves into the notch **42** allowing the elastomer to expand and drive the element **58** back into the intersection of the passageways **12, 22**, against the upper camming section **46** of the shank **28** to urge the cutter bit **10** downward and to hold the bit **10** securely in place (in phantom, FIG. 2). When the cutter bit is driven upward to be removed from the socket **16**, the upper camming section **46** compresses the abutting element **58** until the apex is passed, after which the re-expanding cylindrical block **56** drives against the lower camming section **48** urging the cutter bit **10** upward. To reduce the pressure required to insert a cutter bit **10** into the socket **16**, compressions slots **66**, as shown may be cut into the sides of the block **56**. If such slots **66** are used, they should not extend to the ends of the cylindrical block **56** so as to prevent the accumulation of dirt in the open spaces which would impair their functions.

The resilient detent **20** may be easily removed, even when the elastomer has partially decomposed, due to the design of the plate **60** which covers the key flange **62** in the keyway **23**. The cover plate **60** also shields nearly ⅓ of the surface area of the elastomeric cylinder **56** allowing only enough of the elastomer surface free to contact the walls of the retainer passageway **22** as is needed to provide the necessary frictional engagement to prevent accident axial movement of the resilient retainer **20**. The particular design of the resilient detent **20** permits the use of a short abutting element **58**, supported along its entire length by the elastomer backing to prevent shock or fatigue failures of the element. Since the angle γ, denoting the arc of the cylindrical block **56** over which the abutting element **58** extends, is greater than the angle α, denoting the arc of the cylindrical block **56** over which the block **56** extends into the intersection of the passageways **12, 22**, the abutting element **58** can never fall into the socket passageway **12** even if the bond holding the element **58** in the cut-out **64** in the blade **56** should fail. Moreover the design of the abutting element **58** of the retainer **20**, to extend completely across the intersection of the passageways **12, 22** and mate with the notch **42** extending completely across the rear face **40** of the shank **28** of the cutter bit **10**, permits the retainer **20** to be driven out of the passageway **22** to release the cutter bit **10** if the head portion of the bit **10** has broken off so that the proper force can no longer be applied to the bit **10** to cam it up and out past a retainer **20** in place in passageway **22**.

While the forms of apparatus herein described constitute a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

I claim:

1. In combination; a socket member, first and second intersecting passageways each extending through said socket member, an interconnecting aperture formed by the intersecting of said passageways, a cutter bit, said cutter bit having a head section and a shank section, said

shank section being slidably fitted through said first passageway in the socket member; detent means; said detent means being fixed against rotation in said second passageway to releasably secure said cutter bit shank in said first passageway; said detent means comprising an elongated estomeric cylinder, a cut-out section midway along said cylinder, non-yielding abutting means, said abutting means being fixed in said cut-out so as to form a contiguous surface with the elastomeric cylinder, said abutting means being resiliently fixed adjacent the intersection of said first and second passageways when the detent means is fixed in the second passageway to releasably secure the cutter bit shank in the first passageway.

2. The combination of claim 1 in which rotation of said cylinder in said second passageway is prevented by means comprising a slot in the wall of said second passageway and extending the length thereof and an integral elongated flange on the cylinder, said flange adapted to fit into said slot when said abutting means lies in the intersection of the first and second passageways.

3. The combination of claim 2 in which a non-yielding element extends over a portion of said cylinder including said flange, formed to the shape of said cylinder and flange said element being fixed to the surface of said cylinder.

4. The combination of claim 1 wherein the surface of said abutting means, which forms a contiguous surface with said elastomeric cylinder has a greater surface area

than that of the aperture formed by the intersection of the second passageway and the first passageway.

5. A resilient detent means consisting of; a elastomeric cylinder, an integral flange extending from the surface of said cylinder parallel to the axis thereof, a cut-out section midway along the length of the cylinder opposite said flange, a rigid abutment means, said abutment means being shaped identically to the cut-out in the cylinder, means fixing said abutment means in the cut-out in the cylinder so as to form a contiguous surface including the elastomeric material and the abutment means.

6. The combination of claim 5 wherein there is a plate fixed to said cylinder extending over at least a portion of said integral flange, said plate being shaped to conform to the surface covered.

7. The combination of claim 6 wherein at least one extended compression slot is formed in the cylinder between a side of said abutment means and said shaped plate.

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