March 31, 1964 G. W. ELDERS 3,127,153

RESILIENT LOCKING MECHANISM FOR A CUTTING DEVICE

Filed June 17, 1960

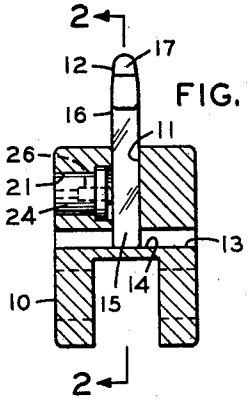

FIG. 1

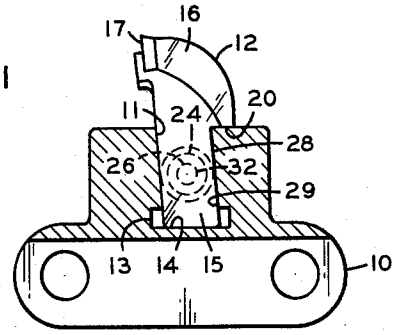

FIG. 2

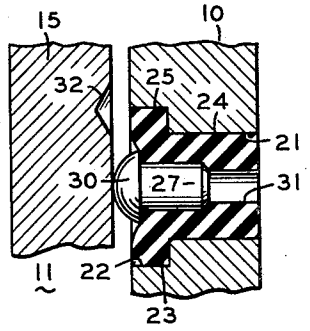

FIG. 3

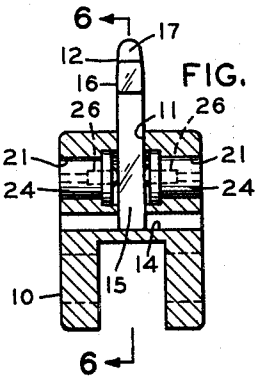

FIG. 5

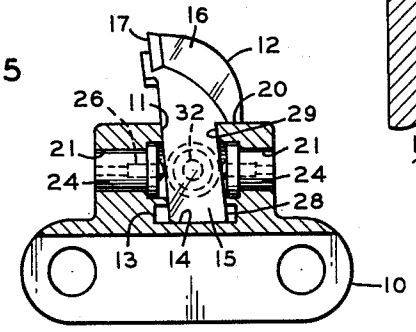

FIG. 6

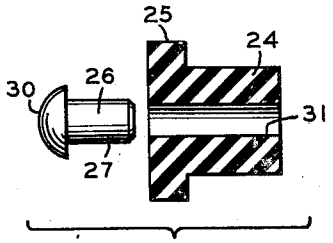

FIG. 4

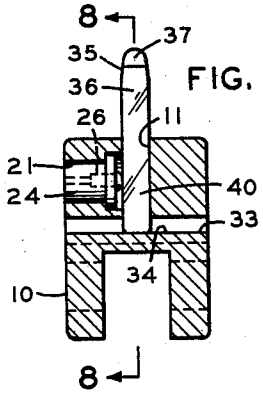

FIG. 7

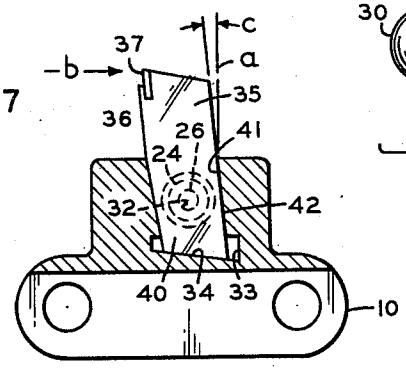

FIG. 8

INVENTOR
GERALD W. ELDERS
BY Cohn and Powell

ATTORNEYS

United States Patent Office 3,127,153 Patented Mar. 31, 1964

3,127,153

RESILIENT LOCKING MECHANISM FOR A CUTTING DEVICE

Gerald W. Elders, Christopher, Ill., assignor to E. & E. Mine Service Company, Christopher, Ill., a corporation of Delaware

Filed June 17, 1960, Ser. No. 36,916
4 Claims. (Cl. 262—33)

This invention relates generally to improvements in a locking mechanism for a cutting device, and more particularly to an improved means for selectively retaining a bit in a holder.

An important objective achieved by the present invention is the elimination of set screws, wedges, transverse pins and other means heretofore utilized to lock a cutter bit into a holder.

Furthermore in order to effect removal or insertion of the bit in the previously mentioned conventional constructions, various tools such as wrenches, drifts and the like had to be used. The instant locking mechanism eliminates the use of these implements and affords a simple system for causing ready attachment and detachment of a cutter bit in a holder.

Another important object is to provide a bit-locking mechanism that can be conveniently and advantageously utilized in cutter type machines or in boring type machines now being used throughout the industry today to mine coal, salt, ores or other minerals both above and underground. This improved mechanism can be used also in certain drilling type machines having large size units, commonly called "coal recovery drills."

Still another important objective is achieved by the provision of a solid, resilient block member made of rubber or the like which is attached to the holder and acts to exert pressure between a pin and a bit shank for retaining the bit in a holder socket. The resilient block member will not break, corrode, pack with dirt or dust and will remain resilient and operative for an indefinite period, thereby greatly minimizing repair costs and production loss because of machine shutdown while making repairs and replacement of parts.

Yet another important object is afforded by the structural arrangement of the resilient block member and its connection to the holder so as to preclude accidental or unintentional removal of the block member and to assure the exertion of a pressure on the bit shank at all times while held in the holder socket.

Another important object is realized by the provision of a recess or indentation in the side of the shank which is aligned with and adapted to receive, in interfitting relation, the enlarged head of a pin resiliently mounted and carried by the block member, the pin engaging the bit shank under pressure while disposed in such recess so as to prevent unintentional withdrawal of the bit from the holder.

Another important advantage obtained by the above structure is that the pin can be intentionally withdrawn from the holder socket upon application of sufficient pulling force axially on the bit, the pin being compressible into the block member to permit such a result.

Another important object is achieved by the novel structural arrangement and connection of the locking pin to the resilient block member which is extremely simple and economical, yet is highly efficient in enabling the pin to move between locked and unlocked positions incident to attachment and detachment of the bit shank.

An important object is provided by a bit-locking mechanism that is capable of coacting with a bit having any shaped shank, such as rectangular, square, hexangular, circular or the like. While in the preferred embodiment of the invention, only a single bit-locking mechanism is used

to engage operatively one side of the bit shank in the manner suggested previously, it is advantageous that any number of the mechanisms can be used for various or any sizes of the bit shank as is desired, subject only to the dictates of good design.

Another important objective is to provide a bit-locking mechanism that is simple and durable in construction, economical to manufacture, efficient in operation and which can be quickly and easily manipulated by anyone without any instruction.

The foregoing and numerous other objects and advantages of the invention will more clearly appear from the following detailed description of a preferred embodiment and modifications thereof, particularly when considered in connection with the accompanying drawing, in which:

FIG. 1 is a cross sectional view of the bit and holder shown in FIG. 2 as seen from the left along a vertical plane passed transversely through the center of FIG. 2;

FIG. 2 is a cross sectional view as seen along line 2—2 of FIG. 1;

FIG. 3 is a fragmentary, enlarged cross sectional view of the bit-locking mechanism;

FIG. 4 is an exploded view of the resilient block member and locking pin shown in FIG. 3;

FIG. 5 is a cross sectional view of a modified bit and block similar to that disclosed in FIG. 1, but illustrating a bit-locking mechanism on all sides;

FIG. 6 is a cross sectional view of the modified bit and holder as seen along line 6—6 of FIG. 5;

FIG. 7 is a cross sectional view of another modified bit and holder as seen from the left along a vertical plane passed through the center of FIG. 8, and

FIG. 8 is a cross sectional view of the modified bit and holder as seen along line 8—8 of FIG. 7.

Referring first to the bit and holder construction shown in FIGS. 1 and 2, it is seen that the holder generally indicated at 10 includes a top-open socket 11 adapted to receive the bit referred to at 12. The holder 10 includes a transverse slot 13 that communicates with the lower portion of socket 11. In fact, the holder 10 includes a wall 14 partially defining slot 13 which constitutes the bottom of socket 11.

The bit 12 includes a shank 15, the configuration of which closely approximates the shape of the socket 11. In addition, the bit 12 includes an enlarged head portion 16 adapted to carry a carbide tip 17 that constitutes the cutting element.

When fully inserted in holder 10, the shank 15 closely interfits the socket 11 and the shoulder 20 (FIG. 2) formed by the enlarged head portion 16 abuts the outermost face of holder 10 adjacent socket 11.

The details of the bit-locking mechanism utilized with this bit and holder are best shown in FIG. 3.

Formed in one side of holder 10 is an aperture 21 that communicates with the socket 11. More particularly, the aperture 21 includes an enlarged portion 22 immediately adjacent the socket 11 that provides an inwardly facing shoulder 23 on the holder 10.

Plugged into aperture 21 is a conforming resilient block member 24 formed of rubber or a similar solid material. It is seen that the block member 24 includes an enlarged portion 25 that interfits the enlarged aperture portion 22 and abuts the shoulder 23 in order to preclude detachment of the block member 24 from the holder aperture 21 when the block member 24 is pressed outwardly. It is preferred that the block member 24 lie flush with the inner wall of the holder defining the socket 11.

A pin 26 includes a shank 27 and a curvilinear, enlarged head portion 30. The diameter of pin shank 27 is larger than the diameter of a bore 31 provided longi-

tudinally through the resilient block member **24**. This relationship is best shown in FIG. 4.

When assembled, the pin shank **27** is press-fitted into the innermost end of longitudinal bore **31** so that the enlarged pin head **30** abuts the innermost face of the block member **24**. Then, this unit is plugged into the holder aperture **21** to provide the structure best shown in FIG. 3.

Formed in one side of bit shank **15** is a recess or indent **32** that is aligned with and adapted to receive the pin head **30** when the bit **12** is completely inserted into the holder socket **11**. The recess **32** could be formed by drilling a hole through the bit shank. Under the resilient force exerted by the block member **24**, the pin **26** retains the bit **12** in the holder **10** and precludes unintentional withdrawal.

Of course, the bit **12** can be intentionally removed from the socket **11** by applying sufficient pull to the bit **12** so that the pin head **30** rides out of the recess **32** against the resilient loading of solid block member **24**, the pin head **30** being depressible into the block member **24** as is best seen in FIG. 3.

Similarly, when the bit **12** is attached to the holder **10** and the shank **15** is inserted into the socket **11**, the bit shank **15** engages the pin head **30** and depresses it within the block member **24** until the bit is completely seated as described previously. When completely seated, the pin head **30** is snapped into the shank recess **32** under the resilient loading of block member **24** to retain the bit **12**.

It is seen that because of the particular construction and connection of the block member **24** in the aperture **21** and with the holder **10**, the block member cannot be pressed outwardly of the holder **10**. Moreover, the solid block member **24** will not corrode, break, pack with dirt or dust and will remain resilient and operative for an indefinite period.

As is shown, the rear wall **28** of bit shank **15** is inclined forwardly toward the direction of cut, and abuts a cooperating inclined rear socket wall **29**. The purpose and functional advantages of the inclined walls **28** and **29** will be described in detail subsequently relative to similar inclined walls in a modified construction shown in FIGS. 7 and 8.

The bit-locking mechanism can be advantageously utilized in many different ways as is suggested by the modification in FIGS. 5 and 6. In this embodiment, the structure of holder **10** and of bit **12** is exactly the same as that described in detail above with respect to the embodiment of FIGS. 1 and 2. The only exception is that a total of four bit-locking mechanisms are used, one on each side of the bit shank **15**. Consequently, there are four apertures **21** formed in the sides of holder **10**, each aperture **21** being adapted to receive a resilient block member **24**, together with its attached pin **26**. The four sides of the bit shank **15** are each provided with a corresponding recess **32** adapted to receive one of the pin heads **30** when the bit **12** is fully inserted.

While the embodiment of FIGS. 5 and 6 shows a total of four bit-locking mechanisms, one on each side of the bit shank **15**, it will be apparent that this structure is illustrative only. Of course, it is obvious that other modifications can be obtained by using two, three or any desired number of bit-locking mechanisms of the type previously described and best shown in FIGS. 3 and 4. Moreover, it will also appear that this bit-locking mechanism can be used with a bit shank **15** having any configuration, whether it be square, rectangular, hexagonal or any other shape. It is only necessary that the shank **15** be provided with a recess **32** on its side capable of receiving the pin **26** of each bit-locking mechanism utilized.

Again, it will be noted that the bit **12** includes a forwardly inclined rear wall **28** on the bit shank **15** adapted to engage an inclined rear socket wall **29**, the purpose of which is explained in the description of the embodiment shown in FIGS. 7 and 8.

Another modification is shown in FIGS. 7 and 8. In this embodiment, the holder **10** is substantially the same construction as that illustrated above in FIGS. 1 and 2, such holder **10** including a socket **11**, a single side aperture **21** adapted to receive one of the bit-locking mechanisms described in detail above and shown in FIGS. 3 and 4. The transverse slot **33** includes a rearwardly and downwardly inclined bottom wall **34** that forms the bottom of socket **11**.

The bit **35** in this modification is of a slightly different construction from the bit **12** described previously. For example, the bit **35** includes a head portion **36** shaped to receive and hold a carbide cutting tip **37** at its forward edge. In addition, the bit **35** includes a shank **40** adapted to be received in a compatible socket **11**, the bottom of shank **40** seating on the inclined bottom holder wall **34**.

The rear wall **41** (best shown in FIG. 8) of socket **11** is inclined forwardly in the direction of cut and corresponds to the inclined rear socket walls **29** in FIGS. 2 and 6. More particularly, the inclined rear socket wall **41** and the coacting inclined rear bit wall **42**, corresponding to the inclined rear walls **28** on the bit shanks in FIGS. 2 and 6, are located at an angle of up to twenty degrees, represented by reference character *c* in FIG. 8, relative to a vertical plane *a* passed transversely through the holder **10** and located perpendicular to the direction of cut represented by the arrow reference character *b*. In some applications of this particular bit and holder construction, the inclination of the rear bit wall **42** and rear socket wall **41** is approximately six degrees, but in other applications such inclination will vary up to twenty degrees forward toward the direction of cut.

It has been proved by extensive tests that a bit of this type and utilized in a holder having the inclined structure described has less tendency to be lost from the holder when in use or after the holder has worn. As a back vertical wall of a bit socket wears or hammers out, bits will lean back off of the vertical and be ripped out of the holders more readily than if leaned forward originally as taught in the present disclosure. With the inclined structure shown in FIGS. 7 and 8, by the time the holder must be replaced, the back wall **41** is still in an inclined or at least in a vertical plane. This means longer life expectancy for both bits and holders.

Furthermore, the abutting inclined surfaces of the rear bit wall **42** and the inclined rear socket wall **41** transmits the force exerted on the carbide cutting tip **37** to the abutting surfaces of the shank bottom and the bottom holder wall **34**, thus causing the cutting force exerted in the direction of arrow *b* to seat the bit **35** in the socket **11**. In other words, the inclined rear socket wall **41** tends to urge the shank downwardly into the socket **11** when the inclined rear bit wall **42** is urged against the inclined socket wall **41** upon exertion of the cutting force. Because the bit **35** cannot be ripped out of the socket **11** by the cutting force, it is seen that stresses are relieved from the bit-locking mechanism, and particularly relieved between the pin **26** and its coacting recess **32** formed in the bit shank **40**.

Moreover, the strength of the bit is increased because of the forward inclination of the bit without increasing the cross section of the metal. When the bit is inclined as described, the cross section of its metal in a horizontal plane passed through the bit parallel to direction of cut is inherently increased.

Of course, all of the advantages and functional results obtained with the inclined rear bit wall **42** and inclined rear socket wall **41** apply as well to the abutting rear bit walls **28** and rear socket walls **29** in the embodiments of FIGS. 2 and 6. The cutting force exerted on the carbide cutting tip **17** is transmitted to the abutting surfaces of the bit head shoulder **20** and the holder **10**, thus seating the bit in the socket **11**.

Although the invention has been described by making detailed reference to a preferred embodiment and several

modifications thereof, such detail is to be understood in an instructive, rather than in any restrictive sense, many variants being possible within the scope of the claims hereunto appended.

I claim as my invention:

1. A locking mechanism for a cutting device comprising a holder provided with a socket, a bit having a shank interfitting said socket, said shank being provided with a lateral recess, the holder being provided with an aperture communicating with said socket, said aperture including a relatively enlarged portion adjacent the socket to provide a shoulder on the holder, a resilient block member plugged in said aperture and including a relatively enlarged portion engaging the holder shoulder, and a pin carried by said block member engaging said shank in said recess to retain the bit detachably in said holder.

2. A locking mechanism for a cutting device comprising a holder provided with a socket, a bit having a shank interfitting said socket, said shank being provided with a lateral recess, the holder being provided with a lateral aperture communicating with said socket, said aperture including a relatively enlarged portion immediately adjacent the socket to provide a shoulder on the holder, a resilient block member plugged in said aperture, the block member including a relatively enlarged portion engaging the holder shoulder, the block member being provided with a bore therethrough, and a pin having a shank of larger dimension than the bore press-fitted in said bore of the resilient block member, said pin including an enlarged head interfitting said recess to retain the bit detachably in said holder, the pin being compressible in said block member to release the shank selectively.

3. A locking mechanism for a cutting device comprising a holder provided with a socket, a bit having a shank interfitting said socket, said shank being provided with a lateral recess, the holder being provided with an aperture communicating with said socket, means about said aperture providing a shoulder on the holder facing the socket, a resilient block member plugged in said aperture, said block member including a relatively enlarged portion engaging the holder shoulder, and a pin carried by said block member, said pin interfitting said shank recess to retain the bit detachably in said holder.

4. A locking mechanism for a cutting device comprising a holder provided with an elongate socket, a bit having a shank closely interfitting said socket, the holder including an abutment engaging the shank to limit the depth of insertion into said socket, the shank being provided with a recess on one side, the holder being provided with a lateral aperture communicating with said socket, said aperture including a relatively enlarged portion adjacent the socket to provide a shoulder on the holder facing said socket, a resilient block member disposed in said socket, the block member including an enlarged portion engaging said shoulder to preclude withdrawal when pressed outwardly, the block member being provided with a bore therethrough, and a pin having a shank of larger dimension than the bore press-fitted in said bore of the resilient block member, the pin including a head aligned with said recess when the shank is fully inserted in said socket, the pin head abutting the block member and interfitting said recess under resilient force of said block member to retain the bit detachably in said holder, the shank having a cam portion partially defining said recess and engaging the pin head to move the pin head out of said recess upon intentional withdrawal of the shank from the socket, the pin head being movable and compressible in said resilient block member when moved out of said shank recess incident to removal of the bit from the holder.

References Cited in the file of this patent

UNITED STATES PATENTS

1,375,638	Kienzle	Apr. 19, 1921
2,168,794	Fulke	Aug. 8, 1939
2,907,559	Brown et al.	Oct. 6, 1959
2,965,365	Krekeler	Dec. 20, 1960
2,996,291	Krekeler	Aug. 15, 1961