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LOCKING DEVICES

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FIG. 1.

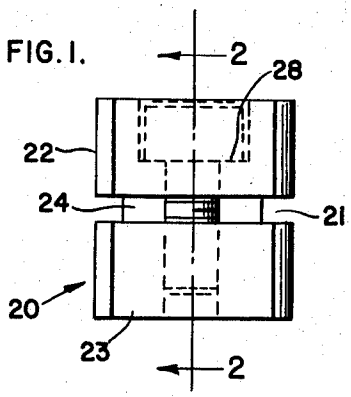


FIG. 2.

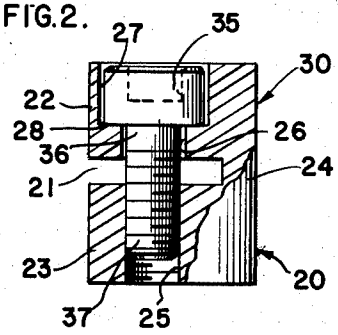
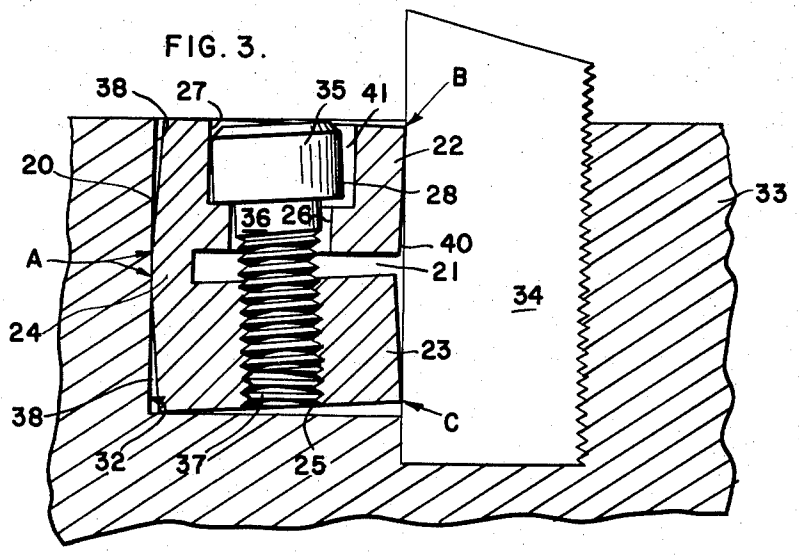


FIG. 3.



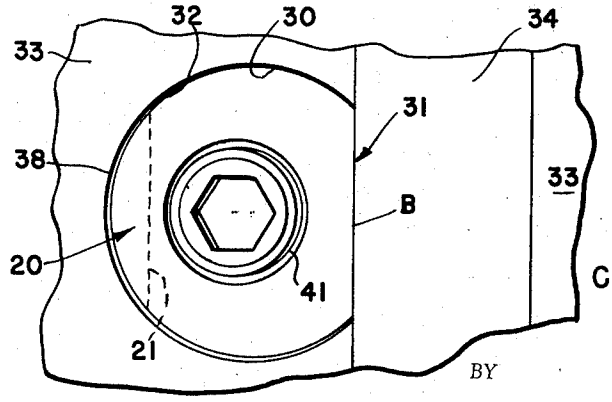


FIG. 4.

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FIG. 5.

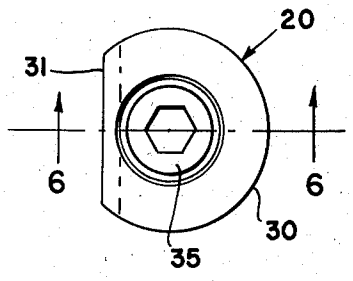


FIG. 6.

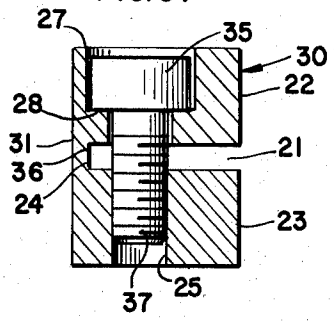


FIG. 7.

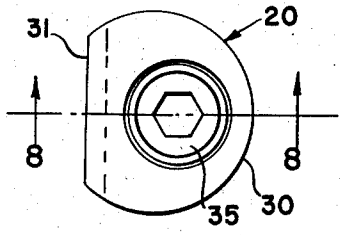
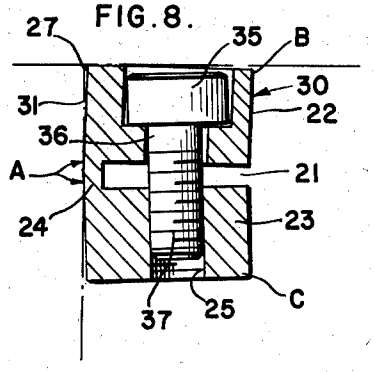


FIG. 8.



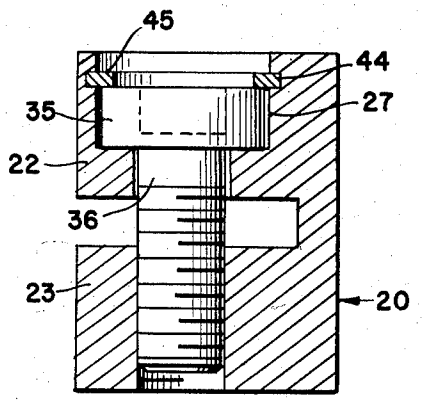


FIG. 9.

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FIG. 10.

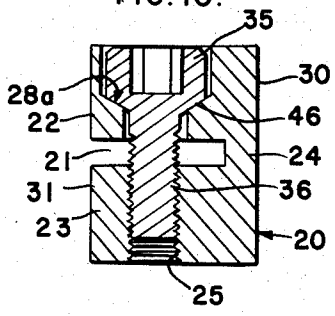


FIG. 11.

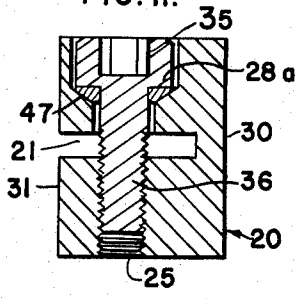


FIG. 12.

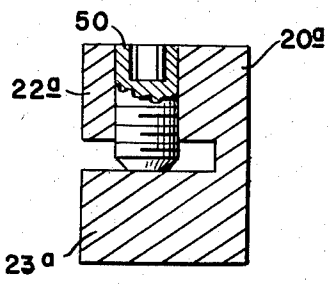


FIG. 13.

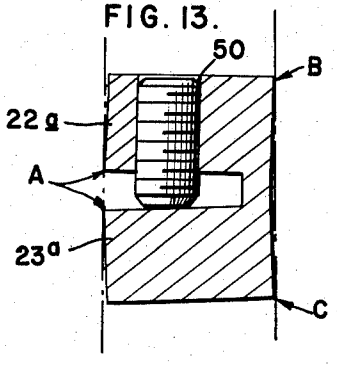


FIG. 14.

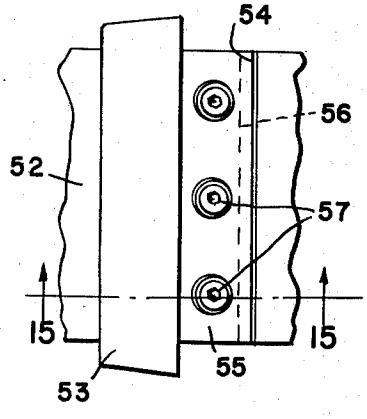
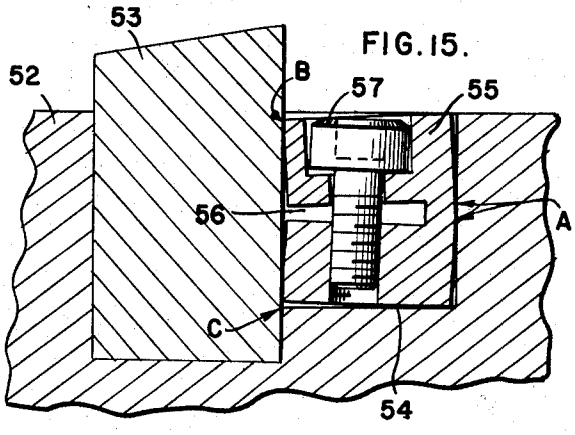


FIG. 15.



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LOCKING DEVICES

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Application July 30, 1952, Serial No. 301,636

2 Claims. (Cl. 29—105)

This invention relates to devices for locking or adjusting the blades or cutters of mills, boring bars, and the like, wherein the cutting or boring operation is accomplished by a rotation of the tool body or holder. They are also applicable for the same purpose in conjunction with tools and stationary or non-rotating tool holders, such as are found in lathes, shapers and inserted-bit broaches. While the invention will be specifically described in connection with the tool body of a mill its application thereto is not to be construed as a limitation thereof for the reasons just given.

More particularly, the present invention is concerned with an effective but relatively inexpensive blade-locking unit to be substituted for those in the prior art. Basically, this new unit consists of a metal body that is partially divided transversely into two parts which carry one or more screws operable to distort the body to produce a locking action when the unit is in position beside a cutter blade.

In its general aspects the invention contemplates the provision of one or more blade receptacles in a tool body or holder for the reception of one or more cutting blades or tools and a corresponding number of blade locking devices, each constructed in the form of an assembly readily insertible and removable as a unit.

It is the primary object of the present invention to devise a locking unit that can be distorted to fulfill its purpose by changing its shape without appreciable change in its external size. In this connection, it is an object to form the unit body of a material that will spring back to its original shape when released from the forces creating the distortion.

Another major object of this invention resides in the provision of a clamping block that can be distorted to create three separate external points, lines or areas of outward force application; the purpose of this being to obtain the full desired locking action automatically, and this in spite of errors in shaping the block and the walls of the tool body and blade against which it is designed to react. Thus, substantial machining tolerances are permissible.

It is a further object to design a slotted locking member in such manner that the slot is concealed when in use and hence closed against the entry of dirt and chips that might clog it and prevent or impede movement of the parts.

It also is an object to provide a locking unit body with a transverse slot that extends to a great depth from one side of the body towards the other and that is disposed approximately half way between the top and bottom of the body; all for the purpose of facilitating actuation of a locking screw and of assuring the three-zone contacts previously mentioned.

A still further object is to slot a clamping body so as to form a pair of integrally connected lever arms or leaves, and to provide one or the other of such arms with internal screw threads for association with a screw so that the arms are forced either towards each other or apart.

In any case, whether the screw is placed under tension or compression, the body is distorted to create three external zones for application of clamping forces.

Continuing with the foregoing general object, if a headed screw is utilized the head may have a universal seat, provided either by machining the bottom of the head spherically or by placing a beveled washer or ring against the bottom of a conventional screw head.

It is a still further object to create resilience of the locking body by appropriate heat treatment for the material selected so that the parts will spring back to initial shape after distortion; and, in this connection, to incorporate a snap ring or split washer sometimes in the assembled unit, particularly where the unit has a large and heavy clamping body, to provide an abutment against which the screw head may react to augment the inherent spring action of the distorted lever arms when they are released. It should be understood, however, that the washer may be utilized alone to aid in restoring "dead" arms to initial shape or position.

Another object is to incorporate the invention in an elongated, substantially rectangular bar designed to be placed adjacent a cutting blade; this bar-shaped block being slotted lengthwise to form a pair of leaves for association with a plurality of spaced operating or clamping screws.

The foregoing and further objects of my invention should be readily apparent from a study of the following description when taken in conjunction with the accompanying drawings, wherein:

Figure 1 shows, in side elevation and looking into the slot, one of the preferred embodiments of the locking unit of this invention.

Figure 2 represents a section taken vertically on the plane of line 2—2, Figure 1.

Figure 3 illustrates, chiefly in section, the unit of Figures 1 and 2 in association with a blade of a milling cutter head, the screw having been tightened to effect a lock. (In Figs. 3 and 4, possible machining errors are incorporated for later discussion.)

Figure 4 is a fragmentary top plan view of the assembly seen in Figure 3.

Figures 5 and 6 show, respectively, in plan and vertical section, a clamping unit that differs only in that the slot is cut into the round surface instead of the flat side of the block.

Figures 7 and 8 correspond with Figures 5 and 6, the essential difference being that the screw is positioned eccentrically instead of coaxially with respect to the curved surface of the block.

Figure 9 illustrates, in vertical section, a unit (usually heavier than normal) in which a split ring has been added.

Figures 10 and 11 show, in vertical section, two ways of providing a spherical surface at the bottom of the locking screw head of any of the preceding forms of the invention.

Figure 12 is a section illustrating a modification in which a headless screw is provided for the clamping action; and Figure 13 shows this same embodiment after the screw has been placed under compression to effect a lock.

Figure 14 is a plan view of a further embodiment of the invention comprising an elongated and slotted bar in association with a blade of a milling cutter body.

Figure 15 is a sectional view taken on the plane of line 15—15, Figure 14.

With continued reference to the drawings, and first to Figures 1–4, a locking unit is provided comprising a block 20, preferably formed of heat-treated steel to impart to it a substantial resilience; and this block, which may vary in shape, has a transverse (approximately horizontal)

slot **21** of substantially uniform width that divides it into a pair of lever arms or leaves **22, 23**, bridged by an integral web or rib **24** that contains a cantilever fulcrum for a locking action presently described.

The arm **23** has an internally threaded hole **25** and the arm **22** has a plain hole **26** aligned with but larger than hole **25**. The arm **22** has a counter-bored recess **27** aligned with both holes and of enough larger diameter to provide a horizontal annular shoulder **28**.

Figure 4 shows that the block **20** has a cylindrically curved wall **30** intersected by a vertical flat face 31, the purpose of this shape being to fit the block freely into a correspondingly shaped recess **32** in a tool body **33** (sometimes rotary) that carries a cutting blade **34**. Normally, the recess **32** is accurately formed, but it will be appreciated that it may have substantially errors in machining, this also being true of the block.

A screw comprising a round-cap and hex-recessed head **35** and a shank **36** has external threads **37** for reception in the hole **25**. The head and shank have clearances in the recess **27** and the hole **26**, respectively. The normal position of these parts is shown in Figures 1 and 2, with the head lightly engaging the shoulder **28**. When the screw is tightened to place it under tension the free ends of the lever arms **22, 23** are drawn toward each other to narrow the slot **21** and distort the entire body **20**; the fulcrum for this action being in the web **24** and creating three zones of force application A, B, and C. These zones are very important and, as seen in Figures 3 and 4, are theoretical points or lines but, probably, actually result in small deformed surface areas that produce exaggerated clearances **38** and **40** and also cock the screw head **35** to produce a clearance **41** (likewise exaggerated).

The action of the three zones A, B and C is triangular and automatic, thus under normal conditions causing the contact edges of the block **20** to bite into the matching surfaces of the recess **32** and the blade **34**. The scheme is not just to latch the unit against radial outward movement, but to automatically adjust and lock itself with a tripod action into a socket that may have been created with appreciable machining tolerances. For example, although recess **32** is larger in Figures 3 and 4 at the bottom than at its top (as might occur in practice) the unit has locked itself securely at the three points A, B, C, and has done so without appreciable change in its body volume.

The cylindrically curved walls of the block **20** and the recess **32** permit the block to rockably adjust itself to ensure that the full width of its flat face contacts the blade in the locking zones B, C.

A further advantage resides in such arrangement of the slot **21** with respect to the other parts of the combination that its openings are fully concealed, except for small clearances; thus it cannot receive or accumulate chips and foreign material that might clog it and prevent free manipulation of the screw and the leverage arms.

In the foregoing treatment of the invention, the slot **21** was cut or otherwise formed into the flat side of the insertible body **20**. It (the slot) may also be oppositely directed, coming into the rounded wall surface as shown in Figures 5 and 6. In either case and particularly that of Figures 5 and 6 because of the tightening screw possibly being too close to the fulcrum web **24** to give adequate leverage, the screw may be disposed off center as in Figures 7 and 8 (the offset depending upon which direction the slot is cut into the block **20**) to increase the locking leverage exerted by the lever arms **22, 23**.

Heat treatment of the metal is regarded as highly important in most cases, but in some instances—particularly where a heavy unit is used—spring action alone may be inadequate to restore the lever arms to their initial positions when the device is to be unlocked. Accordingly, as in Figure 9, the counterbore **27** may have an annular groove **44** cut into it for reception of a snap ring **45**. Thus, when the screw is retracted its head **35** engages the snap ring and forces the arms **22, 23** apart. This action, of course, can take place without any augmenting spring action in the event the block has little or no resilience.

Figure 10 illustrates an expedient for assisting the rocking action of the screw head, consisting in the provision of a spherical formation **46** at the bottom of the head for universal movement within a complementally shaped seat formed by the modified shoulder **28*a***.

Instead, as in Figure 10, of utilizing a special screw, one with standard head will suffice if a beveled washer **47** is provided to seat universally upon the shoulder **28*a***, this being shown in Figure 11.

The modified form of Figures 12 and 13 consists of a block **20*a***, slotted as heretofore described to provide a pair of normally parallel arms or leaves **22*a*** and **23*a***. In this case the arm **23*a*** is solid and the other arm bored and tapped to receive an unheaded locking screw **50**. The latter bears against the top of arm **23*a*** and, when tightened, forces the arms apart, the screw thus being under compression rather than tension. Here, because of this different action the zone A occurs at the open end of the slot, and rocking zones B and C are transferred to points or edges at opposite corners. The functioning of this unit is essentially the same as the other type. The slot may be cut into either the flat or round side surfaces of the block; and the screw may be either centered or eccentric.

Figures 14 and 15 illustrate how the invention lends itself for use in an elongated bar-type locking device. A tool body **52** carries a cutter **53**. The recess or slot for the latter can be widened to form a full transverse socket **54** for reception of a rectangular block in the form of a bar **55**. This bar is slotted at one side from end to end to form the slot **56** substantially midway between its top and bottom. A plurality of screws **57** are added and, when tightened (Fig. 15), create the important three zones A, B, C in the form of parallel lines of contact for locking purposes.

The embodiment of Figures 14 and 15 may be modified to add or to substitute some of the novel features noted in describing the preceding forms.

What is claimed is:

1. The combination with a cylindrical tool body having a recess extending inwardly from the periphery thereof and a blade mounted therein for adjustment radially of the tool body; of a blade locking device comprising a resilient metallic block fitted endwise into said recess between said blade and a wall of said recess, said block having a deep slot located between its ends in a plane transversely of said direction of adjustment to form a pair of spaced superposed integrally joined lever arms, and means carried by said arms and adapted to cause relative movement between said arms for moving the free ends of the arms in substantially arcuate paths extending in the general direction in which the blade is adjustable, whereby said block is expanded to cause at least one edge of the free end of each arm and an opposite portion of the block to wedge between said wall of said recess and said blade with substantially line contacts to lock the blade in the tool body, said line contacts extending in a direction normal to the direction of adjustment of the blade in the tool body.

2. The combination with a tool body having a recess extending inwardly from a surface thereof, a blade mounted in said recess for adjustment in a direction outwardly of the surface of the tool body; and a blade locking device comprising a resilient metallic block fitted endwise in said recess between said blade and an opposed side of said recess and having a plane surface to engage said blade, said block having a deep slot located between its ends in a plane transversely of said direction of adjustment and through the plane surface thereof to form a pair of

spaced superposed lever arms integrally joined by a web portion of the block, and a headed actuating screw having its shank extending freely through the upper arm and into threaded connection with the lower arm for moving the free ends of the arms toward each other in substantially arcuate paths extending in the general direction in which the blade is adjustable, whereby the edges of the arms remote from the slot are forced into substantially line contact with the blade and an external portion of the block adjacent the slot and at the side of the block opposite the free ends of the arms is forced into substantially line contact with the wall of the recess to lock the blade in the tool body, said line contacts extending in a direction normal to the direction of adjustment of the blade in the tool body.

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