April 25, 1967 R. D. LOWRY ET AL 3,315,332

MILLING CUTTER

Filed March 18, 1966

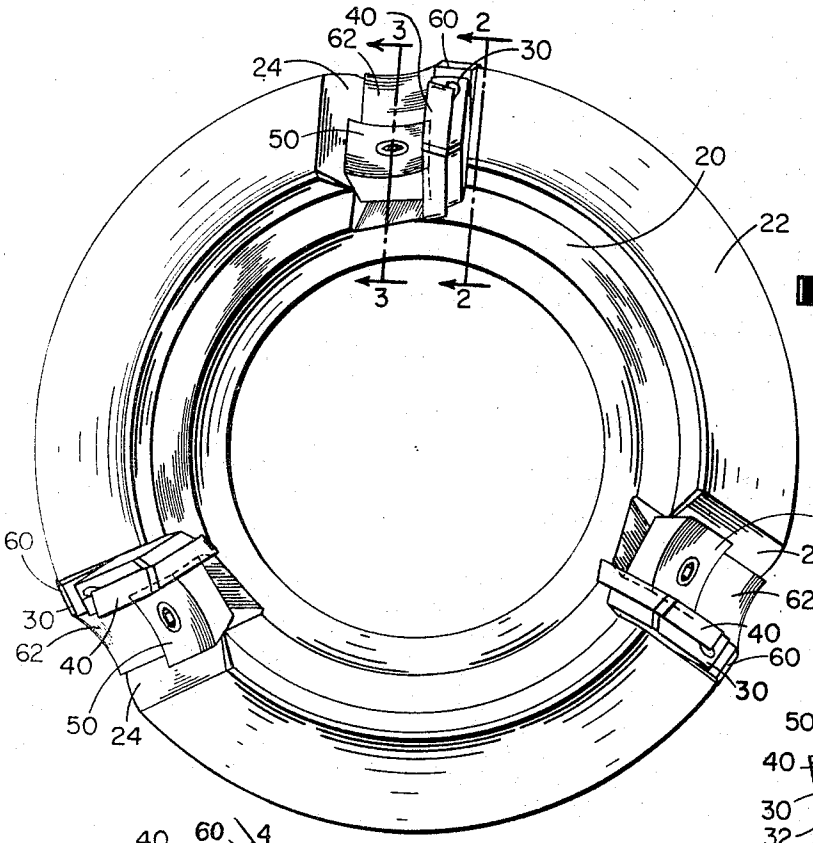


FIG. 1

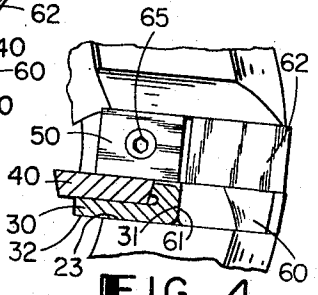


FIG. 4

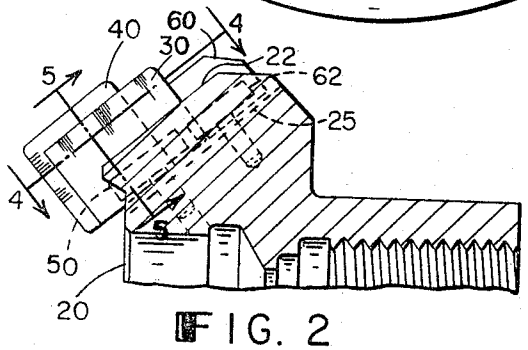


FIG. 2

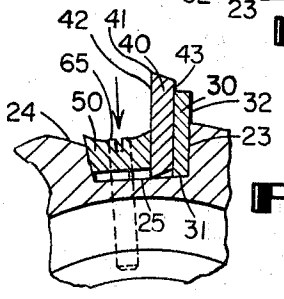


FIG. 5

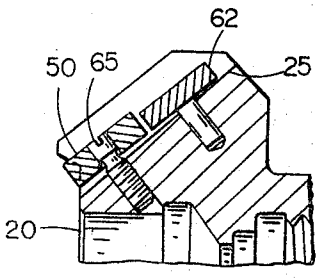


FIG. 3

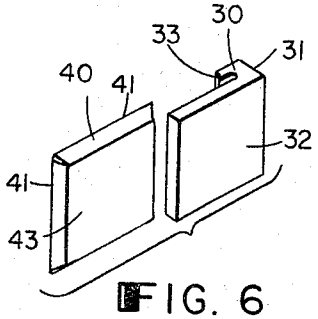


FIG. 6

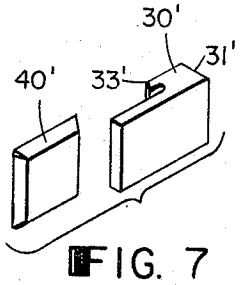


FIG. 7

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MILLING CUTTER

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1 Claim. (Cl. 29—105)

This invention relates to milling cutters and more particularly to end mill heads adapted to interchangeably receive indexable blades of different sizes or contour with precise positioning of the blades.

It has heretofore been proposed that separate anvils be provided for such indexable blades and that these anvils be locked in slidably adjustable manually set positions adapted to seat the several like blades with uniform projection and rake. The blades are then separately locked in their seated positions by manually set blade locks that are independent of the anvil locks, so the blades may be indexed without disturbing the anvils. With this arrangement, if blades of changed depth are to be used, each anvil must be manually slidably reset and because of the sliding adjustment, the anvil will hence not always be seated against any fixed internal end surface. In addition, each anvil must be re-set to a given tolerance.

It is an object of this invention, in a multiple-anvil, multiple-blade cutter head assembly to eliminate the hazard, inherent in slidable manual multiple anvil setting, of non-uniformity in initial or maintained anvil setting.

To this end, the invention contemplates the provision of multiple anvil sets, all of which are seated against fixed cutter head surfaces, but each set of which has blade seating shoulders at different depths to accommodate different blade depths. Accordingly, different blade sizes are no longer accommodated by manual depth adjustment of the anvils, but by substitution of different anvils. This expedient permits the lock for each blade and anvil to be a common single lock, greatly simplifying any change-over operation by requiring release and re-tightening of only one lock, instead of two locks as heretofore, and particularly reducing the hazard of mis-setting by a factor of two. In addition, the inner end of the anvils are always firmly seated in abutting relation against a matching fixed head surface.

The above and other objects of the invention will be better understood when taken in connection with the accompanying description which refers to a typical embodiment of the invention as shown in the attached drawings wherein:

FIG. 1 is an elevational view of the cutting face of the milling cutter having cutting edges set in accordance with the invention;

FIG. 2 is a cross-sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is a detailed cross-sectional view taken along the line 4—4 of FIG. 2;

FIG. 5 is a detailed cross-sectional view taken along the line 5—5 of FIG. 2;

FIG. 6 is an exploded view of one blade and its matched anvil; and

FIG. 7 is an exploded view of a different size blade and its matched anvil.

As shown in FIGS. 1 and 2, the cutter head designed for counter-clockwise rotation as shown in FIG. 1, has an enlarged portion providing a countersunk radial face 20 and an outer tapered face 22, in which are cut three

recesses for the accommodation of blades and blade holding parts, as is normal. Each recess includes a precision ground forwardly facing trailing tapered surface 23 and a rearwardly facing leading oppositely tapered surface 24 joined at the bottom of the recess by surface 25.

There are three removable elements which go into each recess. These include an anvil 30, a lozenge shape blade 40 and a wedge-shaped locking block 50.

The anvil, as shown in FIG. 6, includes an inner end face 31, trailing face 32 and an angled shoulder 33 on its leading side spaced a predetermined distance from inner end face 31. Blade 40 is conventional, being square with tapered sidewalls, to provide four cutting edges 41, one on each side, a leading face 42 and a trailing face 43.

As shown in FIG. 4, the recess is also provided at its back end with a fixed block 60 providing an outwardly facing precision ground surface 61 acting as a bottom seat for the inner end 31 of anvil 30. Block 60 may be welded in place or permanently fixed by a welded-in pin block 62 or fixed in position by any other suitable means.

Thus, after anvil 30 has been inserted into the recess in firm abutting relation to precision ground and permanently micro-set surface 61, blade 40 is placed flat against the anvil 30 with its inner wall seated in firm abutting relation on anvil shoulder 33. Block 50 then is jammed between surface 24 and the leading face of blade 50 by tightening screw 65. As will be seen, block 50 has its trailing wall bearing solely against the leading face 42 of blade 40 and bears on anvil 30 only through blade 40 and so constitutes a common sole means for locking both the blade and the anvil in the recess.

The blades may be indexed simply by loosening the blocks 50 exposing the next blade surfaces and retightening screws 65.

When it is desired to use a smaller blade 40′, there is provided a set of different anvils wherein the shoulder 33′ is at a greater distance from the back wall 31′. These anvils may be substituted for anvils 30 solely by loosening the single screws 65. By interchanging various size blades and various size anvils, various projections may be secured.

This type of assembly thus provides a highly versatile tool for precision cutting having a minimum chance for mis-setting and not requiring micrometer guided manual replacement setting.

What is claimed is:

In a rotary end cutting tool head having a front face and a back face with through multiple recesses extending therebetween for receiving replaceable blades and associated anvils, a fixed anvil back-up block in each said recess precision ground surfaces on each back-up block and an adjacent angularly related wall in each recess forming seats for the inner end and trailing face respectively of an anvil, a separable anvil seated against the bottom wall of said recess and against said precision ground block surface and against said recess side wall surface, the leading face of each anvil having a shoulder facing the front face of said head, a separable blade having a cutting edge projecting beyond the front face of said head, said blade having an inner end opposite to the said cutting edge seated against said front facing shoulder of said anvil, said blade having a thickness greater than the transverse width of said anvil shoulder, and a wedge-shaped block in said recess having its trailing wall bearing solely against the leading surface of said blade and constituting common sole means for removably locking both said blade and said anvil against the trailing wall of said recess with said blade projecting from the face

of said head in accordance with the particular depth location of said shoulder on said anvil, whereby said anvil may be replaced with other anvils having their shoulders at varying depth locations with respect to their inner ends to vary the depth location of said blade without regard to the depth location of the inner end of said block, thus obviating any necessity for changing said block when the block has a greater depth than the depth of said anvil shoulder.

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