Feb. 2, 1971 W. J. GREENLEAF 3,559,261

MILLING CUTTTER WITH BIT SEAT MEMBERS WELDED TO THE BODY

Filed Nov. 20, 1968

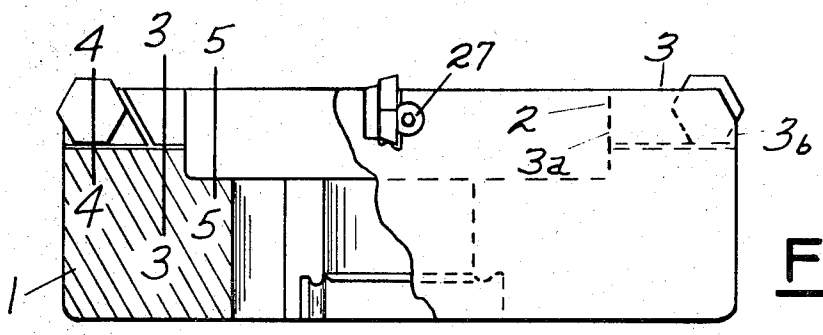


FIG. 2

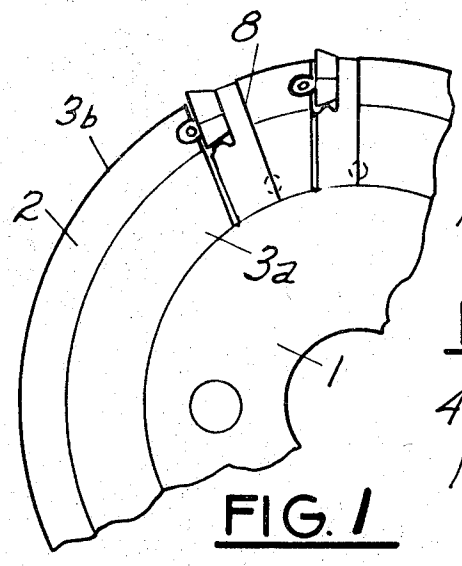


FIG. 1

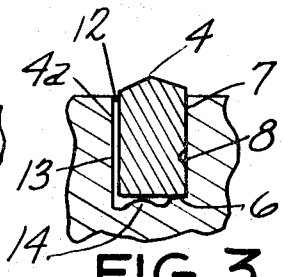


FIG. 3

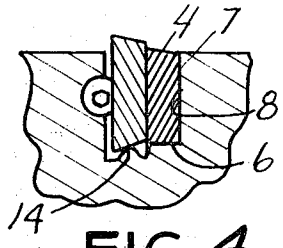


FIG. 4

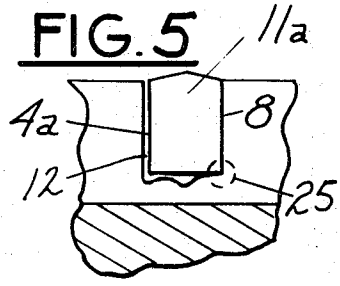


FIG. 5

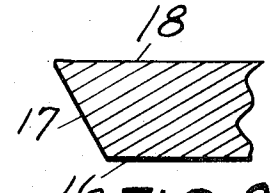


FIG. 8

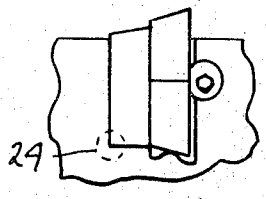


FIG. 6

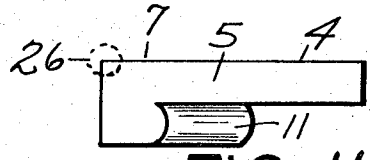


FIG. 11

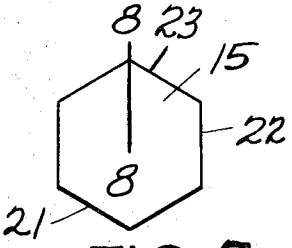


FIG. 7

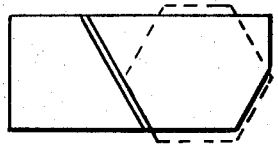


FIG. 10

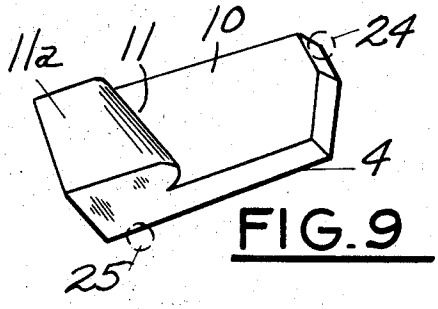


FIG. 9

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MILLING CUTTER WITH BIT SEAT MEMBERS WELDED TO THE BODY

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ABSTRACT OF THE DISCLOSURE

Patent 3,104,453 is improved by arc welding the bit seat members to the body at at least two points on the junctions between each bit seat member and the body and the trailing sides of the slots receiving the bit seat member, the points being remote from the bit seats.

This invention is an improvement on Pat. 3,104,453 where bits are located between edge seats respectively in the bottom of a slot in the body of the cutter and on a bit seat member positioned in the slot. The improvement consists in anchoring the bit seat member against a shoulder at the bottom of the slot and against the trailing side of the slot by arc welds at two or more points remote from the bit seats and bridging the junctions between the bit seat member and the adjacent portions of the slots. By keeping the welds remote from the bit seats, the hardness and accuracy of the seats is not affected. One advantage over the patented construction is that the number of bits per cutter may be increased substantially 50% with a corresponding increase in the work load of the cutter.

In the drawing, FIG. 1 is a fragmentary end view of a milling cutter, FIG. 2 is an edge view of the cutter partly broken away, FIGS. 3, 4 and 5 are sections on the correspondingly numbered lines in FIG. 2, FIG. 6 is a fragmentary view looking radially inward along one of the slots, FIG. 7 is a plan view of one of the bits, FIG. 8 is a section on line 8—8 of FIG. 7, FIG. 9 is a perspective of one of the bit seat members, FIG. 10 is a side elevation of the bit seat member with the position of the bit shown by dotted lines, and FIG. 11 is a bottom plan of the bit seat member.

The milling cutter has a body **1** with suitable means for attachment to a spindle and having a rim **2** with a generally axially presented face **3** and inner and outer generally radially presented faces **3***a* and **3***b*. A plurality of angularly spaced open ended slots **4***a* extend through the rim. In a lengthwise direction, the slots extend generally radially between faces **3***a* and **3***b*. Depthwise, the slots extend generally axially inward from the face **3**. The inclination of the slots is chosen in accordance with the desired cutting and clearance angles. The slots **4***a* can be formed and finish ground by straight passes through the rim.

In each of the slots is a bit seat member **4** having a bottom edge surface **5** resting on a shoulder **6** at the bottom of the slot. The back surface **7** of the bit seat member rests against the trailing side **8** of the slot as regards the direction of rotation of the cutter. The surface **5**, shoulder **6**, surface **7** and side **8** are finish ground flat to insure precise fit of the interengaging surfaces. At the outer end of the bit seat member is an end seat **10** for a bit. At the inner end **11***a* of the bit seat member is an inclined edge seat **11** which cooperates with one edge of the bit to locate the bit on the seat **10**. The thickness of the bit seat member at the inner end is less than the width of the slot **4** so that there is a clearance indicated at **12** between the widest part of the bit seat member and the leading side **13** of the slot. In the bottom of the slot

4*a* and in front of the shoulder **6** and the end seat **10** is an edge seat **14** which cooperates with the edge seat **11** to position the bit on the seat **10**. The seat **14** is below the bit seat member so that the positioning of the bit seat member in the slot is not affected by engagement with the seat **14**.

The particular bit **15** as shown in FIGS. 7 and 8 is of hexagonal shape and has a bottom face **16** for resting on the end seat **10** and edges **17** arranged at a positive rake angle with reference to the top face **18** of the bit. Bits of other polygonal shapes and other rake angles may be used. When mounted in place on the bit seat member, one edge, for example the edge **21**, rests on the seat **14**, another edge, for example the edge **22**, engages the seat **11** and the edge **23** which is parallel to the edge **21** serves as the cutting edge. The runout of the bit is controlled by the seat **14** which can be accurately formed and finish ground because it is at the bottom of an open ended slot extending straight through the rim. The lead of the bit is controlled by the radial positioning of the bit. This is controlled by the positioning of the bit seat member along the length of the slot. The accuracy of the cut could further be affected by warping or tilting of the seat **10** which is part of the bit seat member. It is desirable that the bit seat member be precisely located in its slot. This is accomplished by three arc welds **24**, **25**, **26**. The arc weld **24** is positioned at the extreme outer end of the bit seat member and at the junction between the bit seat member and the shoulder **6** and the trailing side **8** of the slot. This location is remote from the seat **10** and serves to positively position the outer end of the bit seat member. The weld **25** is at the junction between the thickest section **11***a* of the bit seat member and the adjacent trailing side **8** of the slot. The weld **25** is remote from the edge seat **11** and is, of course, still more remote from the end seat **10**. The weld **26** is at the innermost end of the bit seat member and is at the junction between the bit seat member, the shoulder **6** and the trailing side **8** of the slot. The weld **26** is still more remote from the critical surfaces which locate the bit.

Before the welds are made, the bit seat member is accurately positioned and clamped against its supporting shoulder **6** and against the trailing side **8** of the slot. The welds are made while the bit seat member is so positioned. While the heat of welding may cause the steel to be blued a slight distance outside the welds, the blued areas do not extend to the critical locating seats. Since the bit seat members are positioned tightly against the shoulder **6** and slot side **8**, there is no possibility of shifting after the welds have been made. The shrinkage of the welds is in the direction to increase the contact pressure between the bit seat member and the shoulder **6** and side **8**. After welding the bit seat member is in effect integral with the cutter body.

If it should become necessary to replace a damaged bit seat, the damaged bit seat member can be pressed out of the associated slot in an arbor press. The force required to press the bit seat member out of the slot is many times that exerted on the bit seat member in normal use of the cutter. The welds may also break under abnormal conditions such as caused by broken bits, improperly held work, etc. When the welds are broken, the bit seat members come loose without damaging the cutter body and can be quickly welded back in place to restore the cutter to working condition. If the bit seat members were held in place by screws, there would usually be broken screws to be removed before the bit seat members could be replaced.

In use, the bits are held in place by bit locks or wedges **27**, e.g., such as shown in my Pat. 2,842,233 or 2,996,-158, which are tightened after the bit has been located by engagement with the seats **10**, **11** and **14**. These bit

locks do not require tapping holes in the cutter body for the purpose of locking blades in place. This eliminates tap breakage and other expense in making the cutter. The bit locks are self contained and each only requires a drilled hole for application. The locks are immediately interchangeable without removing broken screws, etc. The cutting forces act in the same direction as the bit locks **27** and tend to hold the bits solidly against the end seats **10** and also to supplement the holding force of the welds in holding the bit seat members against the trailing sides of the slots. Vibration of the bit is minimized and accuracy of cut is increased. Also, the useful life of the bits is increased because of the rigidity of the support provided by the bit seat members. When using this type of round lock, not only are the blades more strongly supported as the lock puts pressure against the trailing side of the slots, but the body of the cutter is also stronger because the segments of the body between blades bridge around the individual locks due to the greater than semicircular extent of the lock receiving holes in the body. As disclosed in greater detail in my patents, the lock comprises two relatively movable wedge members, one of which is seated in the hole and the other of which projects out the open side of the hole into clamping engagement with the bit. When the cutting edges are worn, a new cutting edge can be exposed by loosening the locks **27** and repositioning the bit.

The thermal expansion during arc welding is substantially confined to the bit seat members and to the trailing sides of the slots. The spacing or clearance of the bit seat members prevents loss of accuracy during welding. Although the welds are light, the close contact of the bit seat members with the trailing sides of the slots results in adequate strength.

Carbide cutting bits have a manifold increase in life if rigidly supported on flat surfaces. In this cutter the bit is supported by the precision ground trailing side **8** and shoulder **6** of the slot, by ground surfaces **5** and **7** on the bit seat members which mate with the side **8** and shoulder **6**, by the seats **10**, **11** and **14** for the bit and by the welds which shrink to hold the bit seat member tightly against the side **8** and shoulder **6**. The wedge which clamps the bit against the seat acts in the same direction as the cutting thrust so the rigidity of support for the bits does not decrease during cutting. While the cutter behaves during normal cutting as though the bits were integral with the cutter body, under abnormal conditions the welds between the bit seat and the body break loose and do not cause irreparable damage to the body.

What I claim is:

1. A rotary cutter body having a rim with spaced faces, a plurality of angularly spaced open ended slots

in the rim, said slots being open at the top and extending between said faces, a bit seat member in each slot, said body having a shoulder on which the bit seat member rests, said shoulder being at the bottom and adjoining the trailing side of the slot as regards the direction of rotation of the cutter, said bit seat member resting against said trailing side of the slot and having a clearance between it and the leading side of the slot, an end seat for a bit on the bit seat member and spaced in front of said trailing side of the slot, said body having an edge seat for the bit in the bottom of the slot and in front of the shoulder, another edge seat for the bit on said bit seat member, said edge seats cooperating to position the bit on said end seat, means for clamping the bit against said end seat, and arc welds between said bit seat member and said rim for anchoring the bit seat member against said shoulder and said trailing side of the slot, said welds bridging junctions between the bit seat member and said trailing side of the slot and being remote from said end and edge seats.

2. The cutter of claim **1** in which the spaced faces of the rim are concentric inner and outer arcuate faces and the bottoms of the slots are in substantially radial planes.

3. The cutter of claim **2** in which the bits are polygonal, one side of which rests on the edge seat in the bottom of the slot and another side of which serves as a cutting edge.

4. The cutter of claim **3** in which the bits are hexagonal.

5. The cutter of claim **1** in which the clamping means comprises wedge means between the bit and the leading side of the slot.

6. The cutter of claim **1** in which the surfaces of the bit seat member and the trailing side of the slot and the shoulder are ground flat so as to mate when the bit seat member is welded to the body.

7. The cutter of claim **1** in which the means for clamping the bit against said end seat comprises a hole in the body of greater than semicircular extent intersecting the leading side of the slot so as to be open to the slot and relatively movable wedge members, one of which is seated in the hole and the other of which projects out the open side of the hole into clamping engagement with the bit.

References Cited

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HARRISON L. HINSON, Primary Examiner