April 24, 1962 L. S. GORDON 3,030,829

FINISHING AND ROUGHING BAR

Filed Sept. 12, 1958

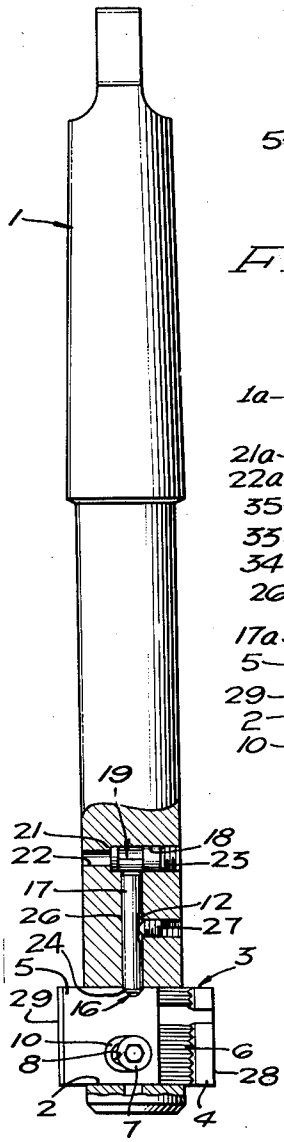


FIG. 1.

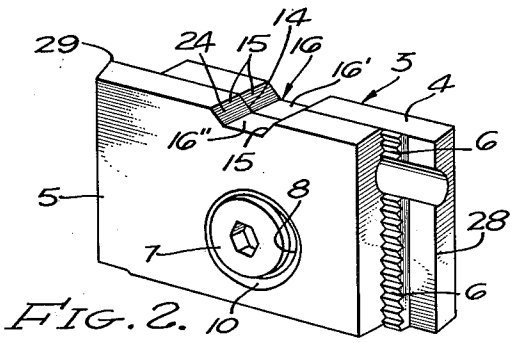


FIG. 2.

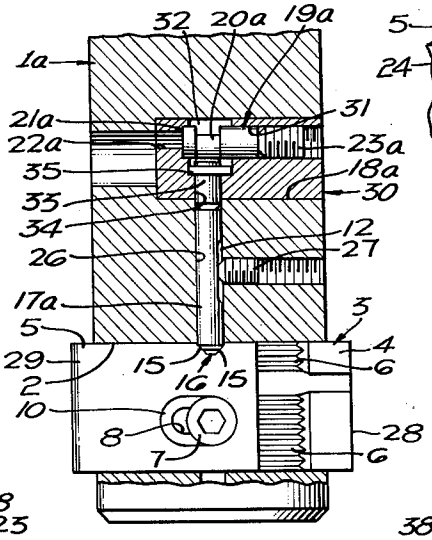


FIG. 5.

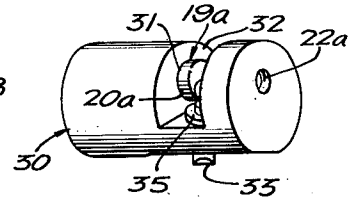


FIG. 6.

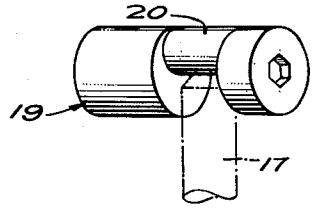


FIG. 4.

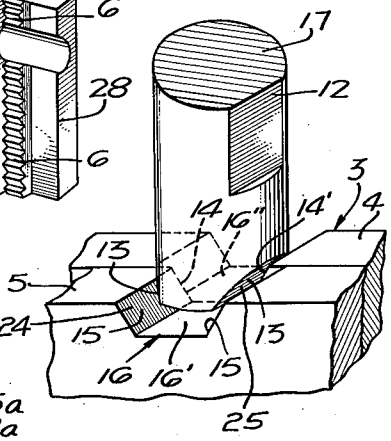


FIG. 3.

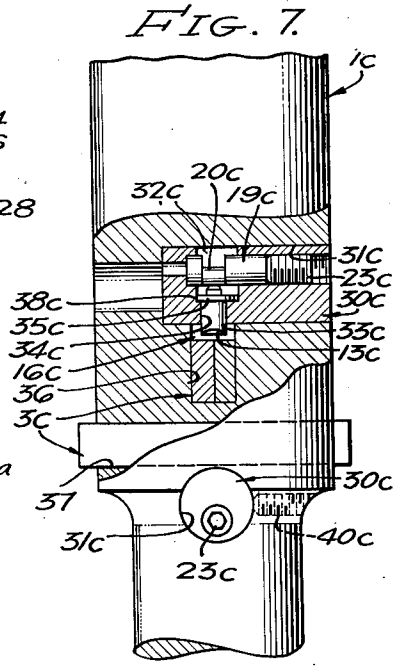


FIG. 7.

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FINISHING AND ROUGHING BAR

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This invention relates to finishing and roughing bars and is more particularly related to such bars of the balanced type wherein a pair of cutters are mounted with relation to a bar to permit the cutters' free floating action laterally of the bar axis, and wherein, when desired, the cutters may be rigidly locked to the bar.

It is an object of this invention to provide a finishing and roughing bar having an improved form of cutter assembly lock.

It is an object of this invention to provide a finishing and roughing bar which is provided with a laterally mounted lock in which the lock assembly is positioned laterally of the bar and is housed in the bar and is operable to lock the cutter assembly with relation to the bar in such manner as to allow the cutter assembly to float transversely to the bar or to be rigidly locked to the bar.

Another object of this invention is to provide a cutter bar assembly in which a cam actuated lock is provided for the cutter assembly.

Another object of this invention is to provide a cutter bar having a transverse cutter assembly or assemblies and in which the cutter assembly is locked with relation to the bar by means of transversely mounted lock assemblies which permit locking of the cutter assemblies to the bar by rotation of a cam element of the lock.

Another object of this invention is to provide a roughing and finishing bar assembly wherein roughing and finishing cutter assemblies are mounted in a bar and provided with cam lock means for positioning the cutter assemblies in cutter assemblies ways formed in the bar and locking the cutter assemblies in rigid and floating relation to the bar.

Other objects and advantages of my invention it is believed will be apparent from the following description of the preferred form of my invention as it is illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a fragmental sectional view of a finishing and roughing bar embodying my invention and illustrating the cutter assembly and lock means in elevation.

FIGURE 2 is a perspective view of the cutter assembly.

FIGURE 3 is a partial view of the cutter assembly illustrating the cutter blades associated with a lock pin.

FIGURE 4 is a perspective view of the cam lock assembly embodying my invention.

FIGURE 5 is a fragmental view of a modified form of cutter embodying my invention.

FIGURE 6 is a perspective view similar to FIGURE 4 showing a modified form of cam lock assembly embodying my invention.

FIGURE 7 is an elevational view partially in section of the modified cam lock, roughing and finishing bar embodying my invention wherein the cam lock assemblies are mounted in the bar transversely to the cutter assemblies and in such manner as to retain the cutter assemblies in closely related positions with relation to the bar.

In the accompanying drawings I have preferred to illustrate my invention in a form of cutter wherein a balanced blade assembly is employed and in which the cutter assembly may be mounted to float with relation to a mounting bar or may be locked with relation to a mounting bar, as desired, for the finishing or roughing boring or reaming operations. In this form of tool a cutter assembly is employed which is adjustable to determine the

desired diameter of roughing and finishing operations and the cutter assembly is mounted transversely of the bar axis.

As illustrated in FIGURES 1 to 5 of the drawings, there is provided a bar 1 which may be formed either as a straight shank, step shank or may have the desired taper, as may be desired or required for mounting in different forms of a drill press, lathe, boring machine or the like. Formed in the bar 1 at the desired position of its length is a cutter assembly way 2 which is formed transversely of the axis of the bar 1 to receive the cutter assembly 3 so that the cutting blades 4 and 5 of said assembly project outwardly from the bar 1 into cutting position. When the cutter assembly 3 is mouned in the way 2 it may slide therethrough and float therein during the cutting operation or may be locked rigidly in position as desired.

The cutter assembly 3 may be of any suitable or desirable construction and is illustrated herein as a pair of blades 4 and 5 which are secured together in adjustable relationship so as to determine the limits of the diameter of the cut being formed, both during the roughing and finishing cutting operations. The cutter assembly 3 is of the balanced type. The cutter assembly of blades 4 and 5 may be of any desired form and this invention is not directed to the particular form of cutter assembly illustrated. The blades 4 and 5 are customarily equal in their formation and their mating surfaces are provided with serrations 6 which allow only expansion or contraction of the blades 4 and 5 to determine the diameter of the cut by maintaining two blades parallel at all times during operation. A clamp stud 7 is mounted in an enlarged and elongated opening 8 of the blade 5, and is threaded to the blade 4 and the stud 7 is shouldered to bear against the platform surface 10 formed around the elongated opening 8 permitting expansion and contractions to blades 4 and 5 through the limit of the length of the slotted opening 8.

Formed in the edge of the cutter assembly 3 is a lock recess 16 having inclined ends 15 which are engaged by the lock pin 17, as illustrated in FIGURE 3. The recess 16 is made up of the mating recesses 16' and 16'' formed at the edges of the blades 4 and 5. The two recesses 16' and 16'' may be misaligned due to adjustment of the blades 4 and 5 to the desired cutting diameter. This results in presenting exposed inclined edges 14 which would tend to peen the end of the lock pin 17 due to any sliding movement of the cutter assembly in its way 2. In order to overcome this peening action I provide the end of the lock pin 17 with flats 13 to provide a face contact between the flats and the inclined ends 15 of the lock recess 16. In order to maintain the lock pin against rotation and to thereby insure that the flats 13 will be parallel with the inclined ends 15 of the slot 16 the lock pin 17 is formed with a rotation flat 12 which is engaged by the lock screw 27.

Means are provided for operating the lock pin 17 to and from locking position in the recess 16 and which means are operable to maintain the lock pin 17 within the recess 16 to permit the blade assembly 3 to float within the way 2 to the limits provided by the length of the lock recess 16. In the operation of the bar embodying my invention, the blade assembly 3 is locked within the way 2 against the floating operation during roughing operations. When the roughing cut is formed or a rough bore has been formed and it is desired, the position of the lock pin 17 may be adjusted to permit the cutters to float within the way 2 which then compensates for spindle misalignment of the operating machine so that the finished bore may be formed with true alignment.

In order to adjust the position of the lock pin 17, I provide a cam lock which is mounted in a lock bore 18 formed transversely of the bar 1 and is preferably of the following construction and mode of operation.

The cam lock is preferably formed as including a lock shaft **19** fitted within the bore **18** to rotate therein and includes a lock eccentric **20**, the axis of which is offset from the axis of the lock shaft **19** providing a cam eccentric which engages the pin **17** so that on rotation of the cam shaft **19** the pin **17** may be forced downwardly into this slot **16** of the blades **4** and **5** or may be permitted to recede therefrom. The lock bore **18** is stepped down to provide a stop shoulder **21** for the cam shaft **19** and provide a bore **22** through which a wrench or other tool may be inserted to rotate the cam shaft **19**. I prefer to form the end of the lock shaft **19** with a hexagonal aperture suitable to receive an "Allen" wrench so as to provide a more positive driving connection for rotating the lock shaft **19**. The end of bore **18** is preferably threaded to receive a lock nut **23** so that when the lock shaft is rotated to the desired locking position with reference to the blade assembly **3** it may be locked in position by threading the lock screw **23** against the end of the lock shaft **19**.

I prefer to form the ends of the slot **16** within the blades **4** and **5** with innerlined ends **24** to approximately the same taper as the end chamfer **25** of the lock pin **17** to aid in retraction of the lock pin **17** so that the cutter assembly **3** may be easily moved within the way **2** when the lock shaft **19** is rotated to permit the pin to retract in its longitudinal axial bore **26** formed in the bar **1**.

The lock screw **27** in addition to holding the lock pin **17** in the desired position of rotation will act to hold the pin **17** in retracted position when the cutter assembly **3** is removed from the way **2** for adjustment, sharpening or the like.

Edges **28** and **29** of the blades **4** and **5** are sharp to provide cutting edges or as is common in cutting tools of this type, the diameter of the cut formed by the balanced blade assembly is determined by measuring across the cutting edges **28** and **29** with a micrometer or the like.

In FIGURES 5 and 6 I have illustrated a modified form of my invention particularly applicable for tools of larger diameter in which the cam lock assembly is mounted in a lock cylinder **30** which is mounted in a lock cylinder bore **18***a* of the bar **1***a*. In this structure the lock cylinder is drilled eccentric to its axis to provide a lock shaft bore **31** in which the lock shaft **19***a* is rotatably mounted. The drill bore **31** is stepped down to form a limit shoulder **21***a* and a bore of reduced diameter **22***a* for reception of the adjustment tool or "Allen" wrench as in the previous modification of my invention. A cam lock screw **23***a* is threaded in the bore **31** to hold the lock shaft **19***a* in adjusted position of rotation. The lock cylinder **30** is provided with a thrust pin aperture **32** for reception of the thrust pin **33** which passes through a drilled hole **34** to project from the lock cylinder **30** and engage the lock pin **17***a*. The thrust pin **33** is provided with a stop shoulder **35** to maintain the thrust pin **33** in position in the lock cylinder **30**. The upper end of the thrust pin **33** is formed to engage the cam eccentric **20***a* of the cam shaft **19***a*. This modified form of my invention illustrated in FIGURES 5 and 6 provides a unitary assembly of cam lock which may be removed as a unit or positioned as desired in any transverse bore forming in any desired position of the length of bar **1***a* to lock any cutter assembly positively as desired, and a series of cutter assemblies with their associated cam lock cylinder are mounted above the length of a cutter bar.

While I have illustrated in FIGURE 5 the lock cylinder modification of my invention as adapted to the lock bar of the form of FIGURE 1, it has greater utility as illustrated in FIGURE 7 wherein the lock pin **33** is directly engaged in the lock recess **16***c* of the cutter assembly **3***c*.

In this modification (FIGURE 7) of my invention I have illustrated a fragment of a bar **1***c* in which two cutter assembly ways **36** and **37** are formed in desired positions to receive cutter assemblies **3***c*. The ways **36** and **37** may

be as illustrated at right angular relation or in such other relation as desired, and the two cutter assemblies **3***c* may be roughing and finishing boring or reaming cutter assemblies. In this modification the lock cylinder bores **31***c* may be as illustrated, transverse to the cutter ways **36** and **37** permitting direct entry of the lock pins **33***c* into the lock recesses **16***c*. As in the previously described modification of my invention the lock pin **33***c* is held from rotation as is provided with lock flats **13***c*. To hold the lock pin from rotation the retention flange **35***c* is flattened at **38***c* and engages the side wall **39***c* of the thrust pin aperture **32***c*.

The lock cylinders **30***c* are rotatable in their bores **31***c* to adjust the flats **13***c* parallel with the inclined ends of the lock recesses **16***c*, and when adjusted are retained by means of retention nuts **40***c* threaded in the bar **1***c*.

Having fully described my invention and modified forms thereof, it is understood I do not wish to be limited to the details set forth which are for the purposes of illustrating my invention which is defined in the appended claims.

I claim:

1. A cutter, comprising: a body structure defining a cutter way, a lock pin bore intersecting said cutter way, and a cam pin bore intersecting said lock pin bore; a cutter assembly mounted in said cutter way and defining a lock slot having diverging faces confronting said lock pin bore; a lock pin slidable in said bore and including bearing faces mating with the diverging faces of said cutter assembly slot; a cam pin rotatably mounted in said cam bore and having an eccentric cam element confronting said lock pin bore for engagement with said lock pin, thereby to force the bearing faces of said lock pin against the diverging faces of said cutter assembly thereby to lock said cutter assembly against displacement in said cutter way; said cam pin bore having a stop shoulder engageable by one axial end of said cam pin, and screw-threaded at its end remote therefrom; and a set screw adapted to be screw-threaded into bearing contact with said cam pin to lock said cam against rotation.

2. A cutter, comprising: a body structure defining a cutter way, a lock pin bore intersecting said cutter way, and a cam pin bore intersecting said lock pin bore; a cutter assembly mounted in said cutter way and including a pair of cutter elements having cutting tips protruding from opposite ends of said cutter way, and portions occupying complementary parts of the projected area of said lock pin bore, said portions defining cooperative relatively diverging faces, and means for adjusting the spacing between the cutting tips of said cutter elements and whereby corresponding adjustment of the spacing between said diverging faces is effected; a lock pin slidable in said bore and including flat converging bearing faces engageable with said cooperative diverging faces as adjusted by said means; a cam pin rotatably mounted in said cam bore and having an eccentric cam element confronting said lock pin bore for engagement with said lock pin, thereby to force the bearing faces of said lock pin against the diverging faces of said cutter assembly thereby to lock said cutter assembly against displacement in said cutter way; said cam pin bore having a stop shoulder engageable by one axial end of said cam pin, and screw-threaded at its end remote therefrom; and a set screw adapted to be screw-threaded into bearing contact with said cam pin to lock said cam against rotation.

3. A cutter, comprising: a body structure defining a cutter way, a lock pin bore intersecting said cutter way, and a cam pin bore intersecting said lock pin bore; a cutter assembly mounted in said cutter way and defining a lock slot having diverging flat faces confronting said lock pin bore; a lock pin slidable in said bore and including flat bearing faces mating simultaneously with both the diverging faces of said cutter assembly slot and clearing the bottom thereof; a cam pin rotatably mounted in said cam bore and having an eccentric cam element confronting said lock pin bore for engagement with said lock pin,

thereby to force the bearing faces of said lock pin simultaneously against both the diverging faces of said cutter assembly thereby to lock said cutter assembly against displacement in either direction within said cutter way; said body structure further including a removable lock pin cylinder defining said cam pin bore and at least a portion of said lock pin bore.

4. A cutter, comprising: a body structure defining a cutter way, a lock pin bore intersecting said cutter way, and a cam pin bore intersecting said lock pin bore; a cutter assembly mounted in said cutter way and defining a lock slot having diverging flat faces confronting said lock pin bore; a lock pin slidable in said bore and including flat bearing faces mating simultaneously with both the diverging faces of said cutter assembly slot and clearing the bottom thereof; a cam pin rotatably mounted in said cam bore and having an eccentric cam element confronting said

lock pin bore for engagement with said lock pin, thereby to force the bearing faces of said lock pin simultaneously against both the diverging faces of said cutter assembly thereby to lock said cutter assembly against displacement in either direction within said cutter way; said body structure further including a removable lock pin cylinder insertable into a bore intersecting said cutter way, said lock pin cylinder defining said cam pin bore and at least a portion of said lock pin bore.

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