Nov. 30, 1954 C. F. BAIER 2,695,788

TOOL RETAINER

Filed Dec. 30, 1950

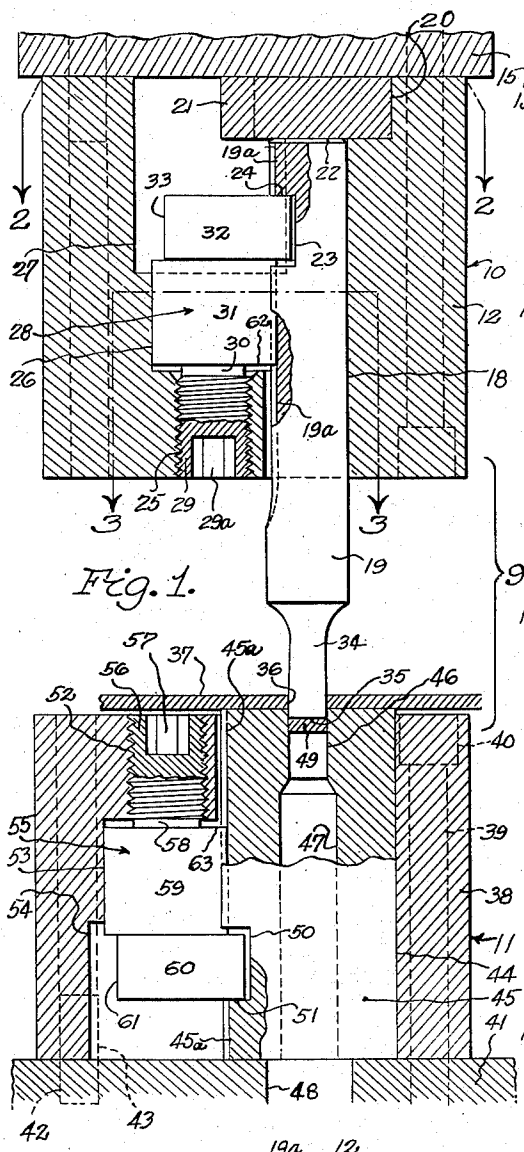


Fig. 1.

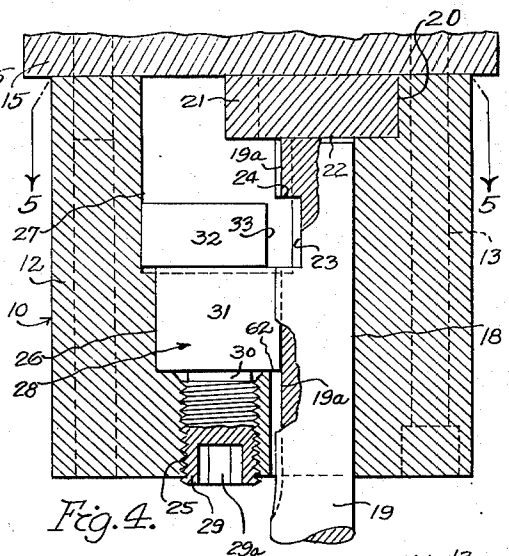


Fig. 4.

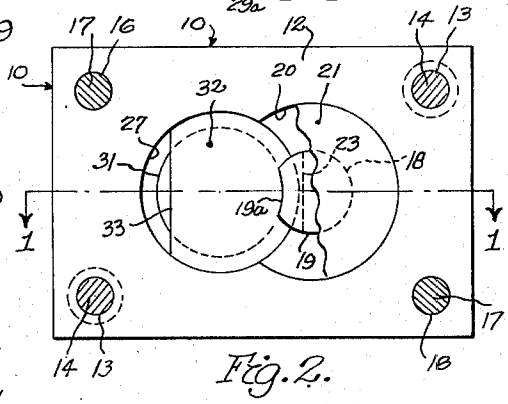


Fig. 2.

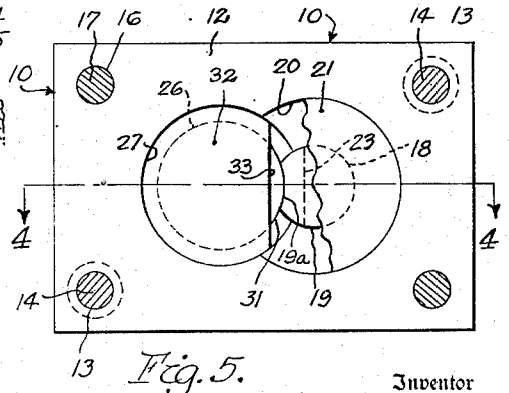


Fig. 5.

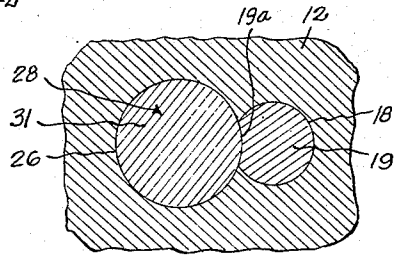


Fig. 3.

Inventor

Charles F. Baier

By

Barthel & Bugbee

Attorneys

United States Patent Office 2,695,788
Patented Nov. 30, 1954

2,695,788

TOOL RETAINER

Charles F. Baier, Detroit, Mich.

Application December 30, 1950, Serial No. 203,658

14 Claims. (Cl. 279—77)

This invention relates to punch or die retainers, inclusively designated tool retainers, for holding punches or dies or, more particularly, the die buttons of dies, in punch presses or other machines to which they may be applicable.

One object of this invention is to provide a punch or die retainer for punches or dies wherein the punch or die button may be instantly removed and replaced if it becomes dull, too short or damaged during its operational life.

Another object is to provide a punch or die retainer of the foegoing character wherein the punches or die buttons may be replaced in exactly the same relationship and position relatively to one another which they occupied before their removal, regardless of their cross-sectional shape, whether round, square, triangular or other cross-sectional shape.

A still further object is to provide a punch or die retainer for punches or dies wherein the punch or die button cannot be inserted and locked unless it is in the same positional relationship as it was when it was removed.

In the drawings:

Figure 1 is a vertical section, taken along the line 1—1 in Figure 2, of a tool retainer according to one form of the invention, in its tool holding position;

Figure 2 is a top plan view of the tool retainer of Figure 1, taken along the line 2—2 in Figure 1, showing the punch or die retainer in its tool-holding position;

Figure 3 is a horizontal section taken along the line 3—3 in Figure 1;

Figure 4 is a vertical section of the tool retainer alone, taken along the line 4—4 in Figure 5, showing the tool retainer in its tool-releasing position; and

Figure 5 is a horizontal section through the tool retainer of Figure 1, taken along the line 5—5 in Figure 4, showing the tool or die retainer in its tool-releasing position shown in Figure 4.

Referring to the drawings in detail, Figure 1 shows a die set, generally designated **9**, including a pair of tool retainers, according to the invention, namely a punch retainer, generally designated **10**, in use with a die retainer, generally designated **11**.

The punch retainer **10** includes a block-like housing **12** which is bored as at **13** to receive bolts or fasteners **14** securing it to the upper shoe **15** of the die set **9**, this upper shoe **15** being in turn secured to the reciprocable platen of a conventional punch press (not shown). The housing **12** is also bored as at **16** to receive dowel or locating pins **17** which will permit exact repositioning of the punch retainer **10** in the same orientation each time it is secured to the upper shoe **15** after removal therefrom. A bore **18** in the housing **11** is also provided to receive the punch **19**. The bore **18** opens into a counterbore **20** which receives a back-up plate or disc **21** against which the upper end **22** of the punch **19** rests and which in turn rests against the upper shoe **15**. The punch **19** is provided with a groove or flute **19***a* of arcuate cross-section (Figure 3). The upper portion of this groove **19** is interrupted by a transverse slot or notch **23** having an upper lip **24**.

The housing **11** is also furnished with a threaded bore **25** located adjacent the bore **18** with its axis parallel to that of the bore **18**. The threaded bore **25** opens into counterbores **26** and **27** of successively increasing diameters. Mounted in the bores **25**, **26** and **27** is a rotary locking member **28** having a threaded shank **29** threaded into the threaded bore **25** and provided preferably with a

hexagonal wrench socket **29***a* for receiving a conventional Allen wrench, namely an L-shaped rod of hexagonal cross-section. The threaded shank **29** is connected by a neck **30** to the other components of the rotary locking member **28**, these being cylindrical portions **31** and **32** of successively increasing diameters which fit snugly but rotatably in the bores **26** and **27** respectively. The cylindrical portion **31** has substantially the same radius of curvature as the bore **26** in which it revolves and the arcuate groove **19***a* in the punch **19**. The bore **26** intersects the bore **18**, so that the punch **19**, when placed in the bore **18** and properly aligned, receives the broad rim of the cylindrical portion **31** in its groove **19***a* (Figure 3). The cylindrical portion **32** has the same radius of curvature as the bore **27** in which it revolves.

The bore **27** intersects the bore **18** in which the punch **19** is received so that the broad rim of the cylindrical portion **32** overhangs or extends into the bore **18** and also into the notch **23** of the punch **19** when the punch is fully entered in the bore **18** with its end **22** seated against the back-up plate **21** (Figure 1). The cylindrical portion **32**, however, has a cutaway portion or flat spot **33** which, when the rotary locking member **28** is rotated into the position shown in Figure 4, provides clearance for the punch **19** to be freely withdrawn from the bore **18**, the cylindrical member **32** being moved out of engagement with the notch **23** of the said punch by the turning of the rotary locking member.

The punch **19** is provided with a narrowed working end **34** having a working face **35** of any desired cross-section which punches a hole **36** of corresponding cross-section in the work piece **37** placed upon the die retainer **11** beneath the punch in the operation of the invention, described hereinafter.

The die retainer **11** (Figure 1) upon which the workpiece **37** rests, is generally similar in form to the punch retainer **10** previously described, having a block-like housing **38** which is bored as at **39** to receive bolts or fasteners **40** which secure the housing to the lower shoe **41** of the die set, the lower shoe **41** in turn being secured to the bolster plate of the punch press (not shown). Like the housing **12** of the punch retainer **10**, the die retainer housing **38** is bored as at **42** to receive dowel pins or locating pins **43**, the purpose of which is to facilitate reorientation of the die retainer when securing it to the lower shoe **41** for re-use.

The housing **38** is provided with a bore **44** to receive the die or die button **45**. This die is hollow, having a die cavity **46** generally conforming in cross-section to the shape of the working face **35**, and cross-section of the working end **34** of the punch **19**. The die cavity **46** opens into a larger clearance passage **47** extending downward to an opening **48** in the lower shoe **41** of the die set, so that each punching **49** cut from the workpiece **37** may fall through to a pin (not shown) or other receptacle, and so not interfere with the operation of the device. The die **46** is cylindrical and has a vertical groove **45***a*, arcuate in cross-section, which is interrupted by a notch **50** having a lower lip **51**.

The housing **38** is also furnished with a threaded bore **52** adjacent the bore **44** and having an axis parallel to that of the bore **44**. The threaded bore **52** opens into counterbores **53** and **54** of successively increasing diameters (Figure 1). Mounted in the bores **52**, **53** and **54** is a rotary locking member **55** having a threaded shank **56** threaded into the threaded bore **52**. The threaded shank **56** is furnished with a hexagonal wrench socket **57**, like the socket **29***a* in the threaded shank **29** in the punch retainer **10** and also for receiving an Allen wrench.

The threaded shank **56** is joined by a neck or narrowed portion **58** to cylindrical portions **59** and **60** which constitute the remaining parts of the rotary locking member **55**. The cylindrical portions **59** and **60** fit snugly but rotatably in the bores **53** and **54** respectively, each cylindrical portion having approximately the same radius of curvature as the bore in which it turns. The bore **53** intersects the bore **44** so that the broad rim of the cylindrical portion **59** in the former bore is received in the groove **45***a* of the die **45**, when the said die **45** is properly aligned and located in the bore **44**, in a fashion similar to

the manner in which the broad rim of the cylindrical portion **31** is received in the groove **19***a* of the punch **17** (Figure 3).

The bore **44** is also intersected by the bore **54** so that the broad rim of the cylindrical portion **60** overhangs or extends into the bore **44** and also into the notch **50** of the die **45** when the said die is fully inserted, and seated upon the bed **41** at the bottom of the bore **44** (Figure 1). The cylindrical portion **60**, however, resembles the cylindrical portion **32** (the part of the punch retainer **10** to which it corresponds) in that it is cut away or flattened as at **61**, providing clearance for the die **45** to be withdrawn from the bore **44** by rotating the rotary locking member **55** and thus rotating the cylindrical portion **60** so that its broad rim swings out of engagement with the notch **50** of the die **45** as the flat spot **61** comes to face the said notch.

In describing the operation of the above device, it is assumed that the punch retainer **10** and upper shoe **15** of the die set **9** have been secured to the platen of the punch press, and that the die retainer **11** and lower shoe **41** have been secured to the bolster plate of the punch press. It is also assumed that the rotary locking member **28** occupies the punch-releasing position within the punch retainer **10** shown in Figure 4, wherein the cylindrical portion **32** does not extend into the bore **18**, so that the punch **19** may easily be inserted in the said bore. The same holds true of the corresponding parts of the die retainer **11**, namely that the rotary locking member **55** is turned so that the cylindrical portion **60** does not extend into the bore **44**, but presents its flat spot **61** to the said bore, so that the die **45** may be completely fitted into the bore.

The opertaor selects the punch **19** desired and inserts it into the bore **18** of the punch retainer, pushing it upward until the edge of the upper end **22** of the punch **19** is temporarily stopped by the lower edge **62** of the cylindrical portion **31**. In this event, the operator then rotates the punch **19** until the broad rim of the cylindrical portion **31** enters the groove **19***a*, whereupon the punch may be pushed upward, the said groove **19***a* sliding past the curved surface of the cylindrical portion **31**. The continued upward motion of the punch **19** eventually brings its upper end **22** into abutment with the back-up plate **21**. The punch halts in the position shown in Figure 4 with the notch **23** then facing the flat spot **33** of the cylindrical portion **32**.

Still holding the punch in position, the operator inserts a conventional Allen wrench (which, as previously stated, is a wrench in the form of an L-shaped rod of hexagonal cross-section) in the hexagonal socket **29***a* in the threaded shank **29** of the rotary locking member **28** and turns it so as to screw the said rotary locking member further into the housing **12**. As it moves gradually upward, the cylindrical portion **31** turns within the bore **26** and the groove **19***a*, but the punch is held firmly in a constant orientation by the said cylindrical portion, which engages the groove **19***a*. The rotating cylindrical portion swings into the notch **23** as it gradually rises until its upper edge contacts the upper lip **24** of the said notch and forces the punch **19** solidly against the backup plate **21**, where it is held firmly in position for use (Figure 1).

The preparation of the die retainer **11** for use is very similar to that described above for the punch retainer **10**. A die **45** having a die cavity **46** corresponding in shape to the working face **35** of the punch **19** is selected and inserted in the bore **44** and allowed to move downward until its lower edge strikes the upper edge **63** of the cylindrical portion **59**. The operator then turns the die until the groove **45***a* thereof is in registry with that portion of the cylindrical portion **59** projecting into the bore **44**. The die **45** may then descend to the bottom of the bore **44**, the groove **45***a* sliding downward over the rim of the cylindrical portion **59**.

When the die **45** halts by meeting the bed **41** at the bottom of the bore **44**, it is ready to be locked in place by the rotary locking member **55**. This is done by inserting an Allen wrench in the hexagonal socket **57**, in the manner previously described in connection with the punch retainer **10**, and turning the rotary locking member **55**, screwing the threaded shank **56** into the threaded bore **52**. This has the effect of gradually driving the rotary locking member downward as it revolves. The cylindrical portion **59** turns within the bore **53** and the groove **45***a* as it descends, but the die **45** is prevented from turning and so held in constant orientation with the punch **19** and punch press by the engagement of the said cylindrical portion **59** with the groove **45***a* of the die.

The cutaway cylindrical portion **60** also turns as it descends, swinging in and out of the notch **50** of the die **45**, but it finally contacts the lower lip **51** of the notch and forces the die firmly downward against the bed **41**, where it is held in the position shown in Figure 1. The die is now ready for use with the punch **11**.

The operator places the workpiece **37** upon the top of the housing **38** of the die, where it may be held in alignment by a clamp, a guide or any suitable means. The reciprocable platen **15** of the punch press is lowered so that the narrowed working end **34** of the punch **19** is forced down upon and punches through the work piece (Figure 1), making the desired cut in the said work piece. The working end **34** is received in the die cavity **46** and moves downward, forcing the punching **49** ahead of it until the punching **49** drops into the larger clearance passage **47**, or is forced into the said passage by succeeding punchings collecting above it, and down through the opening **48** in the bed **41** to any suitable receptacle. The platen **15** is then raised so that the punch **19** clears the die cavity **26** and the workpiece **37**. The latter may then be readjusted for a second operation and subsequent operations or else removed, as desired.

It will be understood that the die set **9** may include more than one pair of aligned punch retainers **10** and die retainers **11**. In many interchangeable dies used in making stampings or punched parts in several different slight modifications, such as where the same part must be adapted to slightly varying machines, for example to different makes or models of automobiles, a single die set will be provided with a punch retainer **10** and a die retainer **11** in each place where there is to be a hole in the part, regardless of whether each part has all of the holes provided by the die set. Where one part has a pair of holes for the same purpose but in a different location, the punches for the holes in other modifications of the part will be removed from their respective punch retainer, so that no punching will take place at that location. The same arrangement is used for producing right-hand parts and left-hand parts of symmetrically opposite design from the same die set, the punches for the holes peculiar to the right-hand parts being omitted when the left-hand parts are being punched, and vice versa. Frequently, also, the left-hand part, such as a fender used in a motor vehicle, may have holes for wires, conduits or the like which are not found in the corresponding right-hand part and vice versa. The present invention enables the provision of a single die set for parts varying in this manner, the temporarily unused punches being temporarily removed.

While the invention as illustrated is primarily applied to the punch retainer **10** shown in the upper half of Figure 1, it is equally well applied to the die retainer shown in the lower half of Figure 1. Accordingly, the generic term "tool retainer" has been employed herein and in the claims hereof to include both the punch retainer **10** and the die retainer **11**.

What I claim is:

1. A tool assembly comprising a tool having a shaft portion with a longitudinal groove of arcuate cross-section extending lengthwise therealong from approximately one end thereof and a transverse recess extending laterally into said shaft portion from said groove, and a tool retainer having a housing with a pair of intersecting bores, one bore being configured to receive said tool shaft portion, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion engageable with said groove and an offset portion rotatable into and out of said recess in response to the rotation of said rotary member.

2. A tool assembly comprising a tool having a shaft portion with a longitudinal groove of arcuate cross-section extending lengthwise therealong from approximately one end thereof and a transverse recess extending laterally into said shaft portion from said groove, and a tool retainer having a housing with a pair of intersecting bores, one bore being configured to receive said tool shaft portion, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion engageable with said groove and an offset portion

rotatable into and out of said recess in response to the rotation of said rotary member, said other bore having a threaded portion and said rotary member having a correspondingly threaded part threadedly engaging said threaded portion.

3. A tool assembly comprising a tool having a shaft portion with a longitudinal groove of arcuate cross-section extending lengthwise therealong from approximately one end thereof and a transverse recess extending laterally into said shaft portion from said groove, and a tool retainer having a housing with a pair of intersecting bores, one bore being configured to receive said tool shaft portion, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion engageable with said groove and a partially-cylindrical portion rotatable into and out of said recess in response to the rotation of said rotary member, said partially-cylindrical portion having a cutaway part disposed outside said recess in one position of said rotary member.

4. A tool assembly comprising a tool having a shaft portion with a longitudinal groove of arcuate cross-section extending lengthwise therealong from approximately one end thereof and a transverse recess extending laterally into said shaft portion from said groove, and a tool retainer having a housing with a pair of intersecting bores, one bore being configured to receive said tool shaft portion, the other bore having a plurality of coaxial bore portions of different diameters, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion positioned in one of said bore portions and engageable with said groove and an offset portion positioned in another of said bore portions and rotatable into and out of said recess in response to the rotation of said rotary member.

5. A tool assembly comprising a tool having a shaft portion with a longitudinal groove of arcuate cross-section and a transverse recess, and a tool retainer having a housing with a pair of intersecting bores, one bore being configured to receive said tool shaft portion, the other bore having a plurality of coaxial bore portions of different diameters, one of said bore portions being threaded, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion positioned in a second one of said bore portions engageable with said groove and an offset portion positioned in a third one of said bore portions and rotatable into and out of said recess in response to the rotation of said rotary member, and said rotary member having a correspondingly threaded portion threadedly engaging said threaded bore portion.

6. A tool assembly comprising a tool having a shaft portion with a longitudinal groove of arcuate cross-section and a transverse recess, and a tool retainer having a housing with a pair of intersecting bores, one bore being configured to receive said tool shaft portion, the other bore having a plurality of coaxial bore portions of different diameters, one of said bore portions being threaded, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion positioned in one of said bore portions and engageable with said groove and an offset portion positioned in another of said bore portions and rotatable into and out of said recess in response to the rotation of said rotary member, and said rotary member having a correspondingly threaded portion threadedly engaging said threaded bore portion.

7. A tool assembly comprising a tool having a shaft portion with a longitudinal groove of arcuate cross-section and a transverse recess, and a tool retainer having a housing with a pair of intersecting bores, one bore being configured to receive said tool shaft portion, the other bore having a plurality of coaxial bore portions of different diameters, one of said bore portions being threaded, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion positioned in one of said bore portions and engageable with said groove and an offset portion positioned in another of said bore portions and rotatable into and out of said recess in response to the rotation of said rotary member, and said rotary member having a correspondingly threaded portion threadedly engaging said threaded bore portion.

8. A tool comprising a body having a shaft portion of partially-cylindrical configuration with a longitudinal groove therein of arcuate cross-section extending lengthwise therealong from approximately one end thereof, said shaft portion having therein a shouldered transverse recess extending more deeply into said shaft portion from said groove, said transverse recess extending laterally entirely across said shaft portion from side to side thereof beyond the lateral edges of said groove.

9. A tool comprising a body having a shaft portion of partially-cylindrical configuration with a longitudinal groove therein of arcuate cross-section extending lengthwise therealong from approximately one end thereof, said shaft portion having therein a shouldered transverse recess disposed near said one end and intersecting said groove, said transverse recess extending more deeply into said shaft portion from said groove and extending laterally entirely across said shaft portion from side to side thereof beyond the lateral edges of said groove, said lateral edges of said transverse recess being disposed in said shaft portion below the level of the lateral edges of said groove.

10. A tool retainer for use with longitudinally-grooved and transversely-recessed tools, comprising a housing having therein a pair of intersecting bores, one bore being configured to receive said tool, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion substantially coaxial with the axis of rotation thereof and engageable with said tool groove, said rotary member also having an offset portion rotatable into and out of said recess in response to the rotation of said rotary member, said offset portion extending transversely outward beyond and overhanging said cylindrical portion.

11. A tool retainer for use with longitudinally-grooved and transversely-recessed tools, comprising a housing having therein a pair of intersecting bores, one bore being configured to receive said tool, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion substantially coaxial with the axis of rotation thereof and engageable with said tool groove, said rotary member also having an offset portion rotatable into and out of said recess in response to the rotation of said rotary member, said offset portion extending transversely outward beyond and overhanging said cylindrical portion, said other bore having a threaded portion and said rotary member having a correspondingly threaded part threadedly engaging said threaded portion.

12. A tool retainer for use with longitudinally-grooved and transversely-recessed tools, comprising a housing having therein a pair of intersecting bores, one bore being configured to receive said tool, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion substantially coaxial with the axis of rotation thereof and engageable with said tool groove, said rotary member also having a partially-cylindrical portion rotatable into and out of said recess in response to the rotation of said rotary member, said partially cylindrical portion extending transversely outward beyond and overhanging said cylindrical portion, said partially-cylindrical portion having a cutaway part disposed outside said recess in one direction of said rotary member.

13. A tool retainer for use with longitudinally-grooved and transversely-recessed tools, comprising a housing having therein a pair of intersecting bores, one bore being configured to receive said tool, the other bore having a plurality of coaxial bore portions of different diameters, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion substantially coaxial with the axis of rotation thereof and positioned in one of said bore portions and engageable with said tool groove, said rotary member also having an offset portion positioned in another of said bore portions and rotatable into and out of said recess in response to the rotation of said rotary member, said offset portion extending transversely outward beyond and overhanging said cylindrical portion.

14. A tool retainer for use with longitudinally-grooved and transversely-recessed tools, comprising a housing having therein a pair of intersecting bores, one bore being configured to receive said tool, the other bore having a plurality of coaxial bore portions of different diameters, one of said bore portions being threaded, and a rotary member disposed in the other bore, said rotary member having a cylindrical portion substantially coaxial with

the axis of rotation thereof positioned in a second one of said bore portions and engageable with said tool groove, said rotary member also having an offset portion positioned in a third one of said bore portions and rotatable into and out of said recess in response to the rotation of said rotary member, said offset portion extending transversely outward beyond and overhanging said cylindrical portion, and said rotary member having a correspondingly threaded portion threadedly engaging said threaded bore portion.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
Re. 18,395	Richard	Mar. 22, 1932
1,516,602	Hill	Nov. 25, 1924
1,785,495	Richard	Dec. 16, 1930
1,806,694	Markson	May 26, 1931
1,899,326	Harrington	Feb. 28, 1933
2,039,855	Stone	May 5, 1936
2,107,581	Parsons et al.	Feb. 8, 1938
2,348,380	Graham	May 9, 1944
2,364,733	McCollum	Dec. 12, 1944
2,393,986	Gullberg	Feb. 5, 1946
2,420,146	Mueller	May 6, 1947