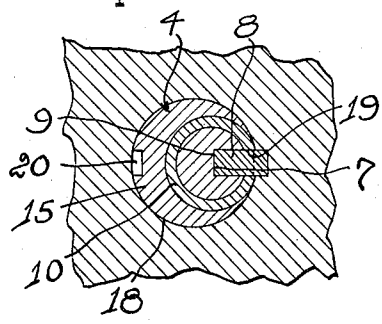
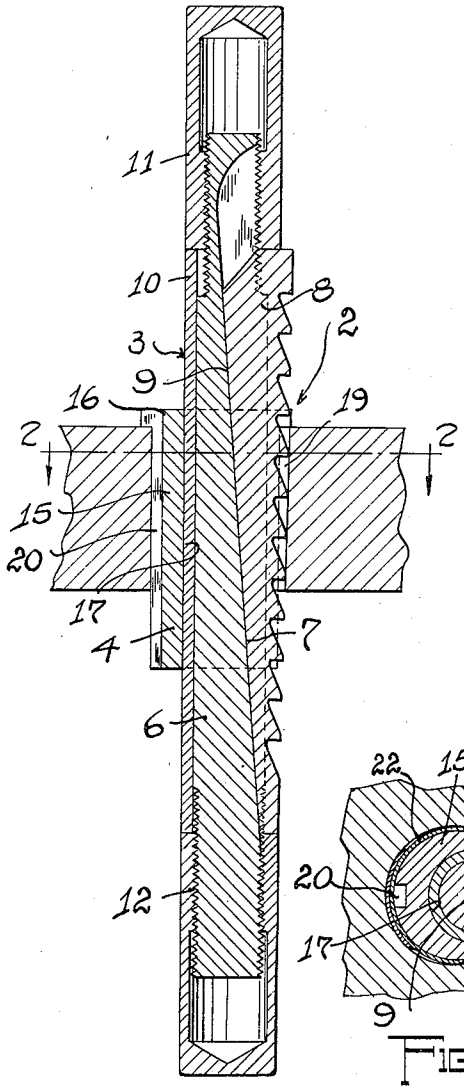
July 31, 1951 L. J. KASTELIC 2,562,668

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FIG. 2





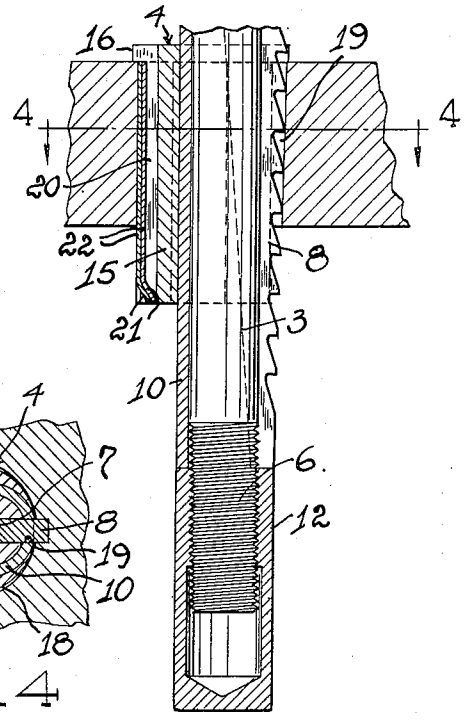


FIG. 4

FIG. 1

FIG. 3

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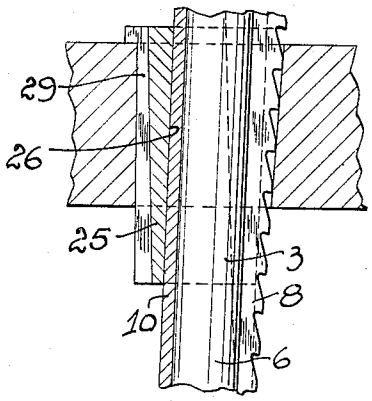


FIG. 5

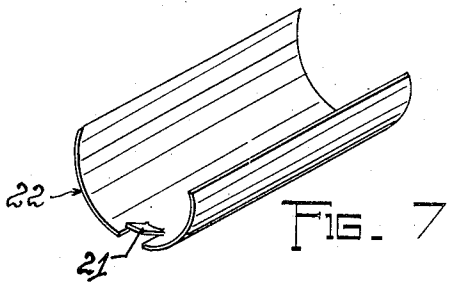


FIG. 7

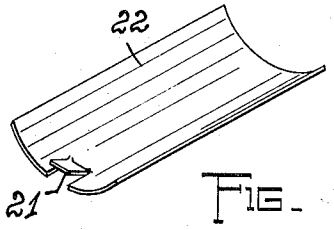


FIG. 8

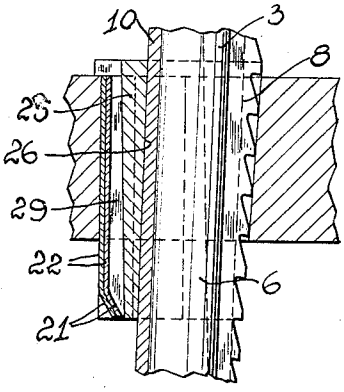


FIG. 6

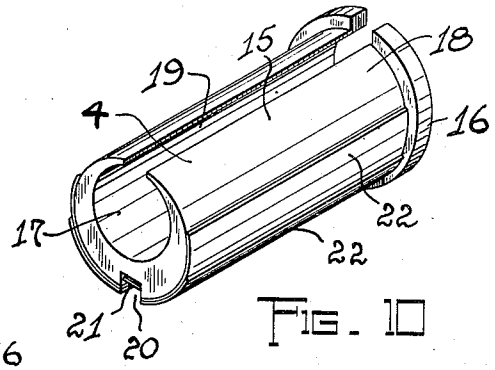


FIG. 10

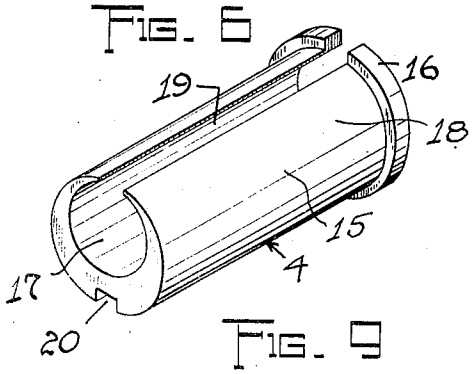


FIG. 9

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UNITED STATES PATENT OFFICE

2,562,668

BROACH

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Application February 7, 1948, Serial No. 6,898

2 Claims. (Cl. 29—95.1)

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This invention relates to a combined broach and bushing arrangement permitting cutting of keyways in work pieces having bores or holes larger in diameter than the broach. In presently used combined broach and bushing arrangements of this type the work-supporting bushings are sized to fit the bores or holes in work pieces and provided with an eccentrically arranged through passage sized to slidably receive the broach, the through passage being arranged out of center so that such passage intersects the peripheral wall of the bushing and forms same with a slot of sufficient width for the blade of the broach to pass therethrough.

The primary object of the present invention is the provision of an improved, combined broach and slotted bushing arrangement of the type referred to above which is adapted to be used for work pieces having differently sized bores or holes, the arrangement including a slotted bushing enlarged by substantially half-circularly shaped shim means encircling the bushing in symmetrical arrangement with respect to its slot.

Another object of the invention is the provision of an improved, combined broach and slotted bushing arrangement of the type referred to above, which is adapted to be used for work pieces having differently sized bores or holes, the arrangement including a slotted bushing provided with a channel-like longitudinal recess arranged diametrically opposite to the slot of the bushing and substantially half-circularly shaped shim means having inwardly extended tongue means, the shim means encircling the bushing and having tongue means extended into the channel-like recess of the bushing.

A further object of the invention is the provision of an improved, combined broach and bushing arrangement of the type referred to above, which is adapted to be used for work pieces having differently sized bores or holes, the arrangement including a slotted bushing provided with a channel-like, longitudinal recess arranged diametrically opposite to the slot of the bushing, and a plurality of nested, substantially half-circularly shaped shim members, each of which includes a tongue extended inwardly from its outer peripheral wall and formed by inwardly displacing such wall, which tongues in nested shim members extend into the recess of the bushing.

Still another object of the invention is the provision of an improved, combined broach and bushing arrangement of the type referred to above which is adapted to be used for cutting inclined or tapered keyways in differently sized bores or holes of work pieces, the arrangement

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including a slotted bushing provided with a through-passage inclined with respect to the axis of the bushing and arranged to intersect its peripheral wall to form the bushing with a slot of sufficient width for the blade of the broach to pass therethrough, furthermore including, diametrically opposite to the slot and in the outer wall of said bushing, an oppositely inclined channel-like longitudinal recess, and finally including one or more circularly curved shim members having tongue means extended inwardly from the outer walls of said members for non-rotatably interlocking the shim members with each other and the tapered recess of the bushing.

Additional objects and novel features of construction, combination and relation of parts by which the objects in view have been attained, will appear and are set forth in detail in the course of the following specification. The drawings accompanying and forming part of the specification illustrate a practical embodiment of the invention, but it will be apparent as the specification proceeds that the structure of the invention may be modified and changed in various ways without departure from the true spirit and scope of the invention.

In the drawings:

Fig. 1 is a sectional view through a combined broach and bushing arrangement embodying the features of the present invention, the arrangement being shown while cutting a keyway in a work piece.

Fig. 2 is a cross-sectional view through Fig. 1, the section being taken on line 2—2 of said figure.

Fig. 3 is a sectional view, partly in elevation, similar to Fig. 1 showing the bushing of the broach and bushing arrangement diametrically enlarged by curved shim members for cutting a keyway in a work piece with a circular opening larger than the diameter of the broach and bushing arrangement.

Fig. 4 is a cross-sectional view through Fig. 3, the section being taken on line 4—4 of said figure.

Fig. 5 is a sectional view, partly in elevation similar to Fig. 3 showing a bushing having a through-passage and a channel-like recess, both of which are inclined with respect to the axis of the bushing and oppositely inclined with respect to each other.

Fig. 6 is a sectional view similar to Fig. 5 showing the bushing diametrically enlarged by shim members.

Figs. 7 and 8 are perspective views of curved shim members, the shim member shown in Fig. 8 snugly fitting the shim member shown in Fig. 6, which latter member is sized to snugly fit the bushing.

Fig. 9 is a perspective view of a bushing and Fig. 10 a similar view with the bushing diametrically enlarged by a plurality of curved nested shim members.

Referring now in detail to the exemplified form of the invention shown in the drawings, reference numeral **2** denotes a combined broach and bushing arrangement embodying an expansible broach **3** and a bushing or carrier **4** constructed to be diametrically enlarged by curved shim members **15**. The expansible broach which is constructed to center itself includes a broach body **6** having a longitudinally inclined slot **7** mounting a cutting blade **8** with a longitudinally inclined base **9**. This cutting blade is held in desired position by a split sleeve follower member **10**, sleeved upon the broach body so that the cutting edge of the cutting blade extends through the slit of the follower member, and clamping nut members **11** and **12** which are engaged with the opposite ends of broach body **6** and in clamping engagement with follower member **10** and the opposite ends of cutting blade **8**.

The expansible broach is slidably mounted in a bushing **4** to permit cutting of keyways in work pieces having a hole or bore larger in diameter than the broach. This bushing, which either fits the diameter of the hole or bore in the work piece or is built up to fit such hole as will be later described, consists of a cylindrical body **15** flanged at one end **16** and formed with a through-passage **17** arranged eccentrically through said body. Passage **17** which is sized to receive broach **3** is arranged out of center with respect to the axis of body **15** so that this passage intersects the peripheral wall **18** of body **15** and provides in said wall a slot **19** of sufficient width to permit passing of cutting blade **8** through said slot for proper cutting operations of the broach.

The body **15** of bushing **4** additionally includes a channel-like longitudinal recess **20** arranged diametrically opposite to slot **19**. This recess is engaged with the upwardly extended tongue **21** of a curved, substantially half-circularly shaped shim member **22** which is sleeved upon bushing **4** to permit its use for work pieces having a bore larger in diameter than the diameter of bushing **4**. Such a shim member is preferably die-shaped from thin material and when sleeved on bushing **4** snugly encircles same and nests its tongue in recess **20** of the bushing. Tongue **21** is formed by slitting the peripheral wall of the shim member at parallel lines and forcing the thus formed tongue inwardly.

If it is desired to cut a tapering keyway in a work piece the arrangement (see Figs. **5**, **6** and **11**) includes a bushing **25** with a through-passage **26** arranged at an angle to the axis of the bushing so that the broach **27**, during cutting operations, is guided at an angle to the wall of the hole in the work piece. In this case bushing **25**, which is perfectly straight, has arranged diametrically opposite to its slot **28** in the outside wall of such bushing a channel-like, longitudinally-inclined recess **29** inclined to the axis of the bushing at an angle which is the complement of the angle between the axis of through-passage **26** and the axis of the bushing.

The thus constructed combined broach and bushing arrangement can readily and quickly be adapted for use of cutting keyways in work pieces embodying bores or circular openings of different diameters by merely changing the number of curved, nested shim members sleeved upon and non-rotatably engaged with the body of the bushing and thus provides a practical and economic construction for varying applications.

Having thus described my invention, what I claim is:

1. The combination of a broaching tool including a longitudinal slotted cylindrical body and a cutting blade mounted in said body having its cutting edge extended through the outside of the peripheral wall of said body, with a cylindrical bushing flanged at one end and longitudinally slitted to form a slot equal in width to the width of said cutting blade and encircling said broach body, said bushing being provided with an eccentrically arranged through passage to symmetrically intersect said slot and effect in broaching operations guiding of the cutting blade and the body of the broaching tool in the slot and through the passage.

2. In the combination described in claim **1**, said bushing having in its peripheral wall diametrically opposite to said slot an elongated channel and substantially half circularly shaped shim means including at one end inwardly bent finger means, said shim means sleeved upon the bushing with said finger means extended into said channel to nonrotatably secure said shim means to said bushing.

LEONARD J. KASTELIC.

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