Oct. 12, 1943. W. J. PHANEUF 2,331,499

SECTIONAL PULL BROACH

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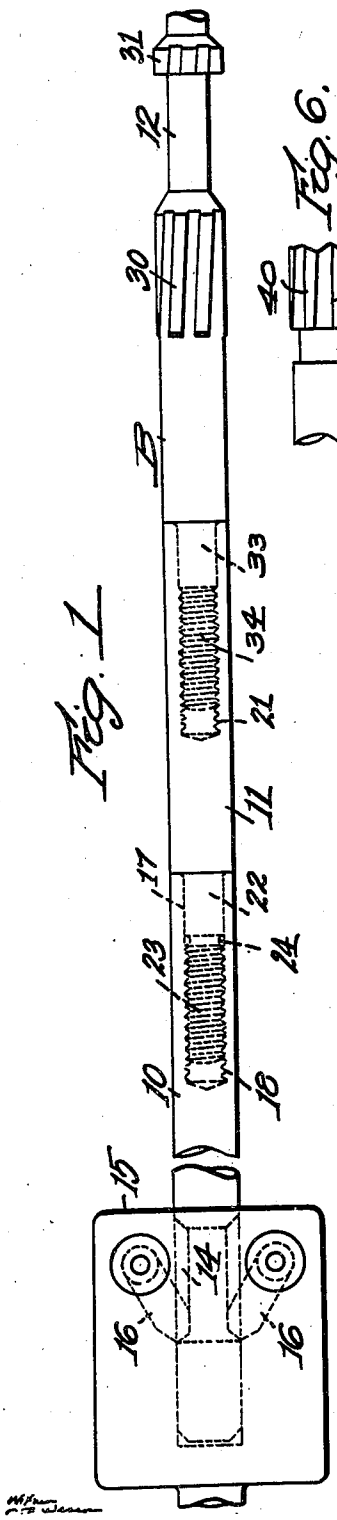


Fig. 1

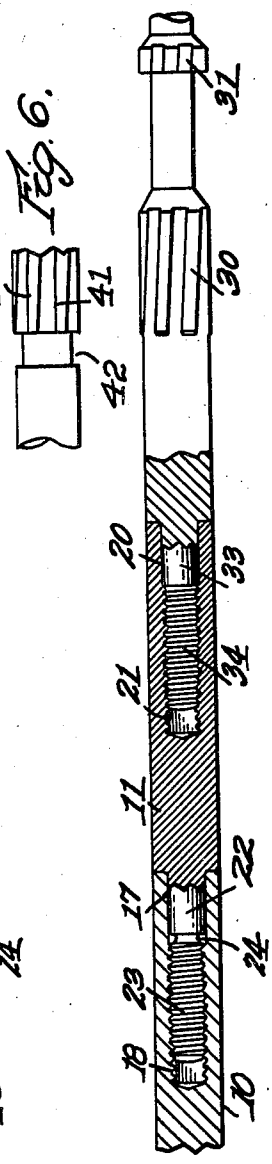


Fig. 2

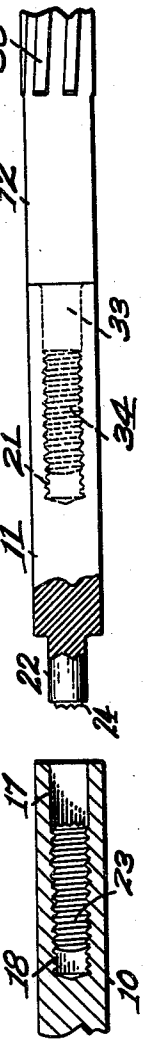


Fig. 3

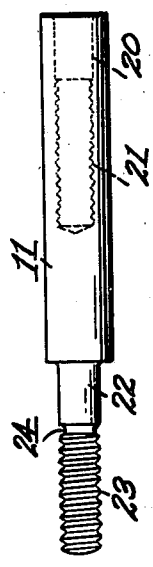


Fig. 4



Fig. 5

Fig. 6

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SECTIONAL PULL BROACH

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3 Claims. (Cl. 29—95.1)

This invention relates to a broach adapted to be pulled through a piece of work to produce an accurately sized slot or opening. For pull broaching, the broach must have a non-broaching pull portion long enough to reach entirely through the work and to be gripped in the broach holder of a puller head.

It has been commercial practice to make the entire pull broach, including the non-broaching pull portion, from a single piece of high-grade tool steel. This makes the broach an expensive tool and, if any part of the broach is broken, the entire broach becomes useless.

It is the general object of my present invention to provide a pull broach made up of a plurality of sections, of which only the section which does the actual cutting or broaching requires to be made of high-grade and expensive steel.

Another object of the invention is to provide a broach having an inexpensive safety member or breaking piece, which will give-way and protect the more costly broaching section, if a broaching operation is obstructed.

My invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawing, in which

Fig. 1 is a side elevation of my improved sectional pull broach, with certain parts broken away;

Fig. 2 is a similar side elevation but partly in section to show internal construction;

Fig. 3 is a view similar to Fig. 2 but showing the parts after the safety member has been broken and pulled apart;

Fig. 4 is a side elevation of the safety member;

Fig. 5 is a side elevation of the attaching end of the broaching section; and

Fig. 6 is a partial side elevation, showing a modification to be described.

Referring to Fig. 1, I have shown my improved sectional pull broach B as comprising a pull rod 10, a safety member 11, and a broaching or cutting section 12.

The pull rod 10 has a wide annular groove 14 near its outer end and is adapted to be inserted in the broach holder 15 of a pull broaching machine, where it may be detachably secured by dogs 16. The specific construction of the broach holder forms no part of my present invention.

The pull rod 10 is of such diameter that it can be passed freely through the opening to be broached and it is provided at its opposite or following end with an axial opening comprising an outer cylindrical portion 17 and an inner threaded portion 18.

The safety member 11 is similarly provided with an axial opening at its following end comprising a cylindrical outer portion 20 and a threaded inner portion 21. At its leading end, the safety member 11 is extended to provide a cylindrical portion 22 and a threaded portion 23, separated by an annular grooved portion 24 of reduced diameter.

The safety member 11 is adapted to be screwed firmly into the threaded end of the pull rod 10, as shown in Figs. 1 and 2, with the cylindrical portion 22 fitting the cylindrical opening 17, and with the threaded end 23 screwed into the threaded opening 18 of the pull rod.

The broaching section 12 may be of any desired broaching construction and is shown herein as having pilot or guide ribs 30 and as having broaching or cutting units 31, only one of which is shown in the drawing. Any desired number of additional guiding and cutting portions may be used. The specific construction of the broaching section 12 forms no part of the present invention and will vary widely for different broaching operations. The leading end of the broaching section is provided with an extension comprising a cylindrical portion 33 (Fig. 5) and a threaded portion 34, the portion 33 fitting the opening 20 in the safety member 11, and the threaded portion 34 screwing into the threaded portion 21 of the member 11. It will be noted that no annular groove separates the portions 33 and 34 which form the extension of the broaching section 12.

The parts are assembled as shown in Figs. 1 and 2, and are then tightened together, so that the three sections 10, 11 and 12 form in effect a single rigid broaching tool. It is clear, however, that only the broaching section 12 performs any cutting operation. Consequently, the pull rod 10 and the safety member 11 may be made of soft steel or of some other strong but comparatively inexpensive metal, while only the broaching section 12 requires high-grade and expensive tool steel.

When a broach is to be used in long tubular work, the combined length of the sections 10 and 11 may be two or more times the length of the broaching section 12 which does the actual cutting. Consequently, a most substantial saving in high-grade and expensive tool steel is effected.

Furthermore, if the broaching operation is obstructed in any way, so that an excessive strain

is placed on the broaching units, the safety member 11 will promptly give way at the annular grooved portion 24 by reason of its reduced diameter, as indicated in Fig. 3. The broaching section 12 will thus be freed from the puller head and may be removed from the work without injury. The broken threaded portion 23 is then removed from the end of the pull rod by any usual method, after which a new safety member 11 is inserted and the broach is again ready for use.

The safety member 11 contains only a small amount of inexpensive material and may be cheaply and easily made in quantity, so that the expense incurred by breakage is comparatively slight.

Consequently I have effected a double economy, first by forming a large part of the pull broach from inexpensive material, and second by providing means to protect the expensive broaching section and for quickly and easily reconstructing a broken broach.

It will be obvious that the safety member may be omitted and the pull rod connected direct to the broaching section, in which case a substantial saving in expensive metal will be effected but without the safety feature.

As a further protection of the broach, I may form the leading ends of the pilot ribs 40 (Fig. 6) with an axial bevel at one side, as indicated at 41. These beveled ends then enter easily into previously broached grooves and the abrupt ends of the beveled ribs perform a clearing action, when necessary, and are very effective in removing chips and dirt from the grooves as the pilot ribs enter the grooves. This is particularly desirable for the ribs of intermediate pilot portions, as the preceding cutting units sometimes clog the grooves. An annular groove 42 provides a space to receive the chips and dirt dislodged by the ribs.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:

1. A sectional pull broach comprising a pull rod, a broaching section, a safety-piece forming a connection between said pull rod and said broaching section, and means to detachably connect said parts to form a rigid broaching tool, said safety piece having a braking portion of definitely and substantially restricted diameter and of less tensional strength and more easily broken than any other part of the broaching tool.

2. In a broach, a pilot section having a plurality of guiding ribs, and each rib cut away on one side of its front end part to provide a circumferentially tapered entrance portion, with one side edge of the entrance portion of each rib parallel to the axis of said broach and rearwardly extended, and said ribs being thereby effective to perform a guiding and clearing action as the entrance portion of each rib enters a groove in the work.

3. In a broach, a pilot section having a plurality of guiding ribs, and each rib cut away on one side of its front end part to provide a circumferentially tapered entrance portion, with one side edge of the entrance portion of each rib parallel to the axis of said broach and rearwardly extended, and said ribs being thereby effective to perform a guiding and clearing action as the entrance portion of each rib enters a groove in the work, and said pilot section having an annular clearance groove adjacent the leading ends of said guiding ribs.

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