March 7, 1944. H. F. BAKEWELL 2,343,632

TAP CONSTRUCTION

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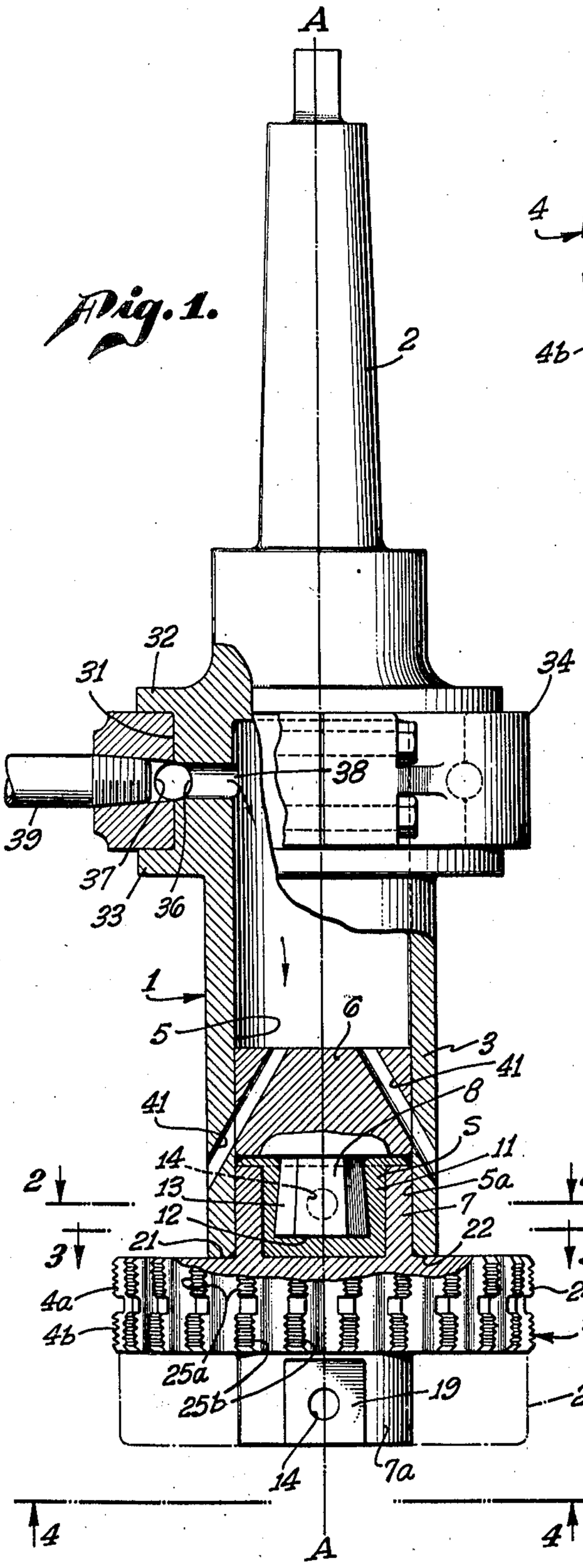

Fig. 1.

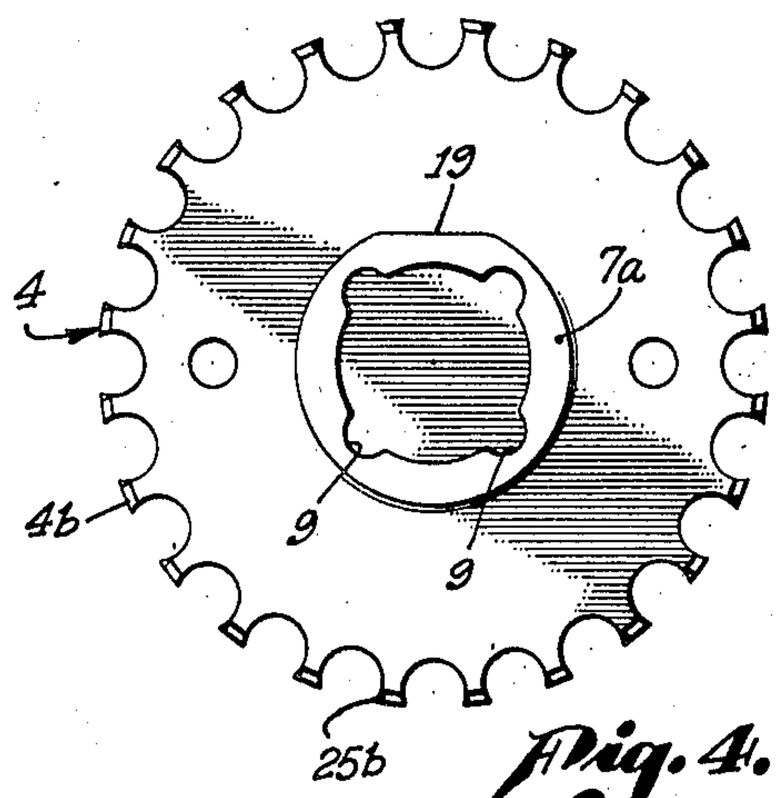

Fig. 4.

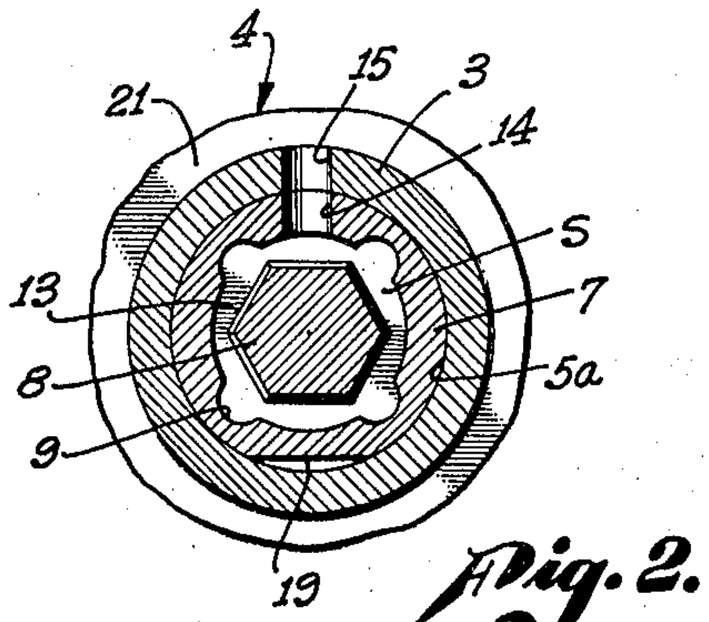

Fig. 2.

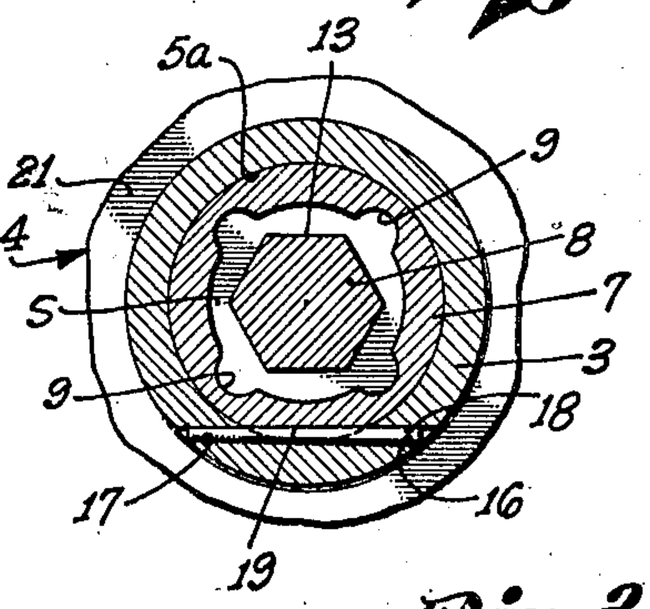

Fig. 3.

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Fig. 5.

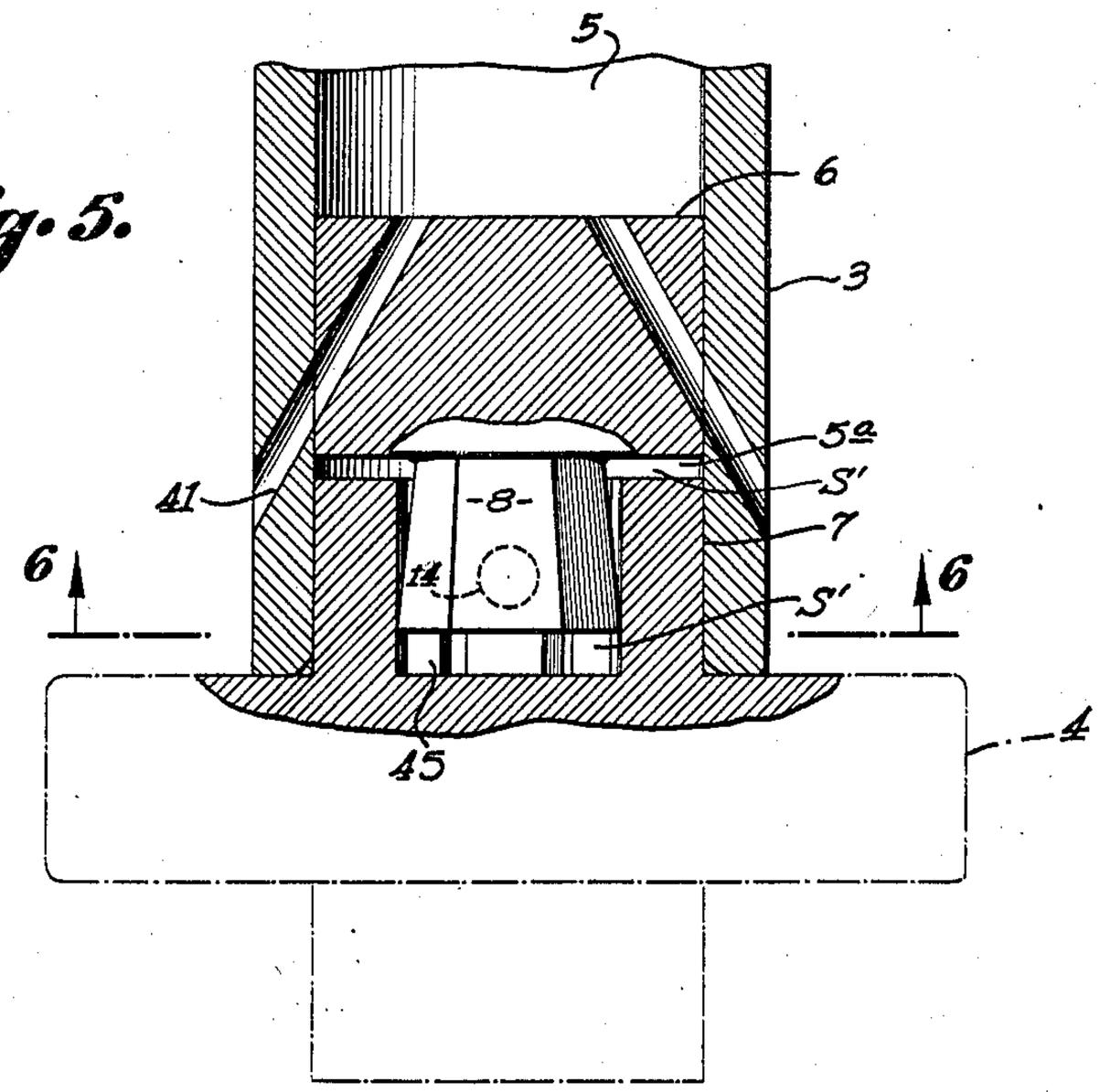
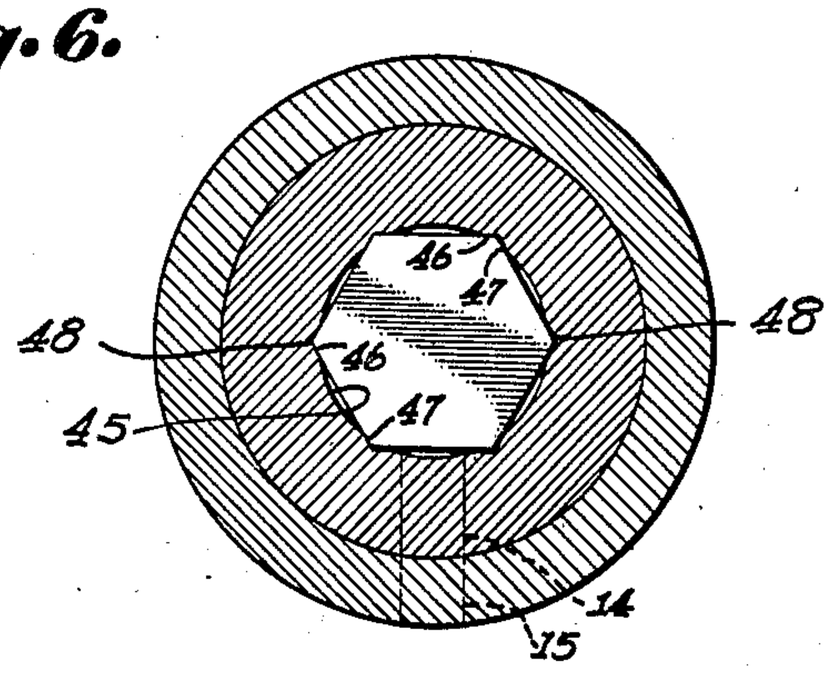


Fig. 6.



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2,343,632

UNITED STATES PATENT OFFICE

2,343,632

TAP CONSTRUCTION

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Application August 24, 1942, Serial No. 455,875

9 Claims. (Cl. 10—146)

This invention relates to thread-cutting taps and the like and pertains primarily to taps of fairly large diameter, being concerned particularly with a tapping device which embodies a minimum of expensive alloy tool steel in its construction. The device of the present invention is adapted to be used in connection with a so called "precision" tapping machine, such as that described in my issued Patent No. 2,257,364.

One of the particular objects of the invention is to provide a tap construction in which the tapping member, or tap proper, is made demountable from the shank portion of the device, providing for ready replacement of a worn or dulled tap and the continued reuse of the shank portion.

A further object of the invention is to provide a tap construction having a removable thread cutting portion secured to a main body portion through the agency of a fusible interlocking member, in which positive alignment of the cutting member with respect to the body portion of the tool is insured.

Other features and objects of the invention will be brought out in the ensuing description of a preferred embodiment of the device, or will be apparent from such description. Such preferred embodiment is illustrated in the accompanying drawings, in which:

Fig. 1 is a partly broken away vertical elevation of the complete tapping tool;

Fig. 2 is a transverse section thereon as taken on line 2—2 in Fig. 1, with the interlocking body of fusible material omitted;

Fig. 3 is a view corresponding to Fig. 2, taken on line 3—3 in Fig. 1;

Fig. 4 is a bottom view of the thread-cutting portion of the tool as taken on line 4—4 in Fig. 1; and

Figs. 5 and 6 are longitudinal and transverse sections, respectively, of a modified form of tool, Fig. 6 being taken on line 6—6 in Fig. 5.

Referring to Figs. 1–4 of the drawings, the tool may comprise a body portion 1 provided with a tapered shank portion 2 adapted to fit within a conventional taper chuck, and a cylindrical shank portion 3 adapted to receive a thread-cutting member 4 at its lower end. In order to conserve material and for the purpose of providing a supply of lubricating and cooling fluid to the thread-cutting member 4, as hereinafter described, the cylindrical shank portion 3 is preferably provided with a central bore 5. A plug member 6 is provided within the lower end of the bore 5, said plug member being secured to shank 3 and positioned above the lower end of the shank so as to define a cylindrical recess 5*a* at the outer or lower end of the bore 5, which recess is adapted to receive a recessed cylindrical hub 7 which forms a part of the thread-cutting member 4.

The interlocking means which securely mounts the thread-cutting member 4 at the lower end of the tool may comprise a shoulder member such as a boss 8 secured to and depending from the plug 6 within the recess 5*a*, interlocking shoulder means 9 formed on the inner periphery of the hub 7, and a filler 11 of fusible material which interlocks the boss 8 with the hub 7. The boss 8 is formed as a truncated pyramid having any desired number of sides, preferably from four to six or eight, the base 12 of which is directed downwardly toward the open end of the bore 5*a*, and the side faces 13 of which slope inwardly and upwardly from the base 12.

In this form of the invention it will be seen that the shoulder member or boss 8, being of polygonal cross-section, is formed externally to provide a plurality of longitudinally extending shoulders, while the hub portion 1 of the thread-cutting member is formed internally to provide a plurality of longitudinally extending shoulders 9. The body of fusible material 11 engages the longitudinally extending shoulders thus provided on boss 8 and thread-cutting member 4 to interlock these parts against relative rotative movement and provide for transmission of rotative driving force from the shank portion 3 to the thread-cutting member.

The thread-cutting member 4 is secured in place at the lower end of the tool by sliding the hub portion 7 into the recess 5*a*, aligning a radial passage 14 in the hub portion 7 with a corresponding radial passage 15 in the cylindrical shank portion 3 of the tool body, as shown in Fig. 2, the passages 14 and 15 being employed to admit the fusible filler material to the space S surrounding the boss 8. In order to maintain the hub 7 in place within the recess 5*a* pending the introduction and subsequent solidification of the filler material I may provide a taper pin 16 (Fig. 3) which is adapted to be passed into coactingly shaped openings 17 and 18 in the wall portion of the cylindrical shank 3, into engagement with a flat 19 formed on the outer periphery of the hub 7. With the hub properly positioned within the bore 5*a*, a quantity of fusible filler material of relatively low melting point, such as that obtainable under the trade name "Cerro-matrix" (having a melting point of 248° F.), is

poured through the aligned openings 14—15 into the space S within the hub 7 and surrounding the boss 8, and is allowed to cool and solidify in interlocking engagement with the shoulder means thereon as described above. I preferably form the upper face 4*a* of the member 4 with a flat portion 21 which is normal to the axis A—A of the tool, and the lower or outer end 22 of the cylindrical shank portion 3 of the tool is similarly shaped. The cooperating faces 21 and 22 are brought into engagement with each other and alignment of the member 4 with the tool is thereby insured.

It will now be appreciated that the thread-cutting member 4 may be provided with a hub member 7 at each axial end thereof, so that when the lower end of the tap (Fig. 1) becomes dulled or worn the lower end of the tool may be warmed to above the melting point of the"Cerromatrix," the filler material poured out through the openings 14—15, the member 4 withdrawn, reversed end-for-end, and again attached to the body portion of the tool in a repetition of the above described procedure, thus providing fresh thread-cutting surfaces.

In view of the fact that the respective hub portions 7 of the thread-cutting portions 4 are necessarily coaxial, the depending hub 7*a* may be employed to center a pilot 23 as indicated in dot-dash lines in Fig. 1. Inasmuch as the thread-cutting member 4 is double-ended in order to function equally well as a tap in either direction of placement on the body portion of the tool, I preferably form the ground thread-cutting portions 24 after the fashion of two separate taps 4*a* and 4*b*, relieving the rearward edges of the respective cutting members as 25*a* and 25*b* in each series. Inasmuch as the tapping device is intended for use with a "precision" tapping machine, as brought out above, the tapping portion of the tool may be comparatively short, with but one or two threads being chamfered to provide the desired cutting edges, as will be apparent to those skilled in the art.

In order to provide for the introduction of cooling and/or cutting fluid, I may provide an enlarged bearing portion 31 at the upper end of the cylindrical shank portion 3 of the tool, provided with upper and lower shoulders 32 and 33 and adapted to receive relatively rotatable split bushing or external bearing 34. The bearing 31 and the bushing 34 are provided with complementary grooves 36 and 37, the groove 36 being placed in fluid communication with the bore 5 through the agency of one or more passages 38, and the groove 37 being placed in communication with a fluid inlet line 39. The fluid introduced at 39 into the bore 5 is passed outwardly of the bore through the agency of a plurality of diagonal passages 41 provided in the plug 6 and the side walls of the shank portion 3, and adapted to direct the cooling and/or cutting fluid downwardly onto the upper edge of the thread-cutting member 4 at the position of the fluted peripheral portion thereof. It will be observed that the passages 41 are provided above the lower edge of the plug 6 so that there will be no possibility of the filler material 11 entering such passages when it is being cast in place.

The specific embodiment of my invention herein delineated and described is intended to be illustrative only, and not limitative upon my invention, the scope of which is set forth in the subjoined claims. For example, the boss 8 and shoulders 9 herein provided on the shank 3 and hub 7 may be relatively reversed, if desired, without departing from the spirit and scope of my invention. As an additional example, I may modify the construction in such manner that the boss 8 attached to the cylindrical shank 3 is brought into direct mechanical engagement with the hub portion 7 of the thread-cutting member 4, whereby direct and positive rotational driving from the shank 3 to the member 4 is secured. Referring to Figs. 5 and 6, wherein such a modification is illustrated, the box 8 attached to the plug 6 secured to the shank 3 may be of the same general characteristics as that shown in Figs. 1–4, i. e., a truncated hexagonal pyramid. The recess 45 in the hub portion 7 is provided with a plurality of reentrant shoulders 46 and 47 adapted to mate with the salient corner portions 48 of the hexagonal boss 8, in sliding engagement therewith. The shoulders 46, 47, and 48 thus form inter-engaging shoulder means on the driving and driven portions 3 and 4 of the device.

The reentrant shoulders 46 and 47 are conveniently formed in the wall surface of the recess 45, which recess is conveniently of cylindrical shape, concentric with the outer diameter of the hub portion 7. The recess 45 is preferably of a diameter intermediate the maximum and minimum transverse dimensions of the boss 8.

Upon insertion of the hub portion 7 within the space 5*a*, with the shoulders 48 of the boss 8 mating with the shoulders 46 and 47 on the hub portion 7, the interlocking material such as "Cerromatrix" may be poured through the alined openings 14 and 15, as above described, filling the space S' and interlocking the members 3 and 4. During use of the tap construction ,the rotational effort imparted to the shank portion 3 will thus be directly transmitted to the member 4 through the direct mechanical connection at the shoulders 46, 47, and 48, the interlocking material serving to prevent longitudinal displacement of the respective parts.

I claim:

1. A tap construction which comprises: an elongated body portion defining a shank, said shank being provided at one end with a longitudinally extending cylindrical recess, a thread-cutting member adapted for attachment to said shank at said one end, said member being provided with a thread-cutting portion and an axially central projecting cylindrical hub-portion at each side of said thread-cutting portion, said hub portions being coactingly dimensioned with respect to said recess and concentric with said thread-cutting portion; and attachment means cooperating with said thread-cutting member and said shank, said attachment means comprising shoulder means on each of said hub portions and on said shank and a fusible interlocking member formed of material of relatively low melting point positioned for interlocking engagement with the shoulder means on said shank and the shoulder means on one of said hub portions when such one hub portion is disposed within said recess.

2. A tap construction which comprises: a cylindrical body member defining a shank; said member being provided with a coaxial cylindrical recess in one end thereof; a thread-cutting member adapted for attachment to said body member, said thread-cutting member being provided with a circular thread-cutting portion and an axially projecting hub portion concentric therewith, and said hub portion being provided with a cylindrical recess and being externally dimensioned for mating relation to said recess in said shank; a

boss member secured within said shank and disposed within said first-named recess; shoulder means on said hub portion; and a fusible interlocking member of relatively low melting point positioned within said recess in molten condition and solidified in said hub portion and mechanically engaging said boss member and said shoulder means when said hub portion is mated within said first-named recess.

3. The construction set forth in claim 2; said thread-cutting member being provided with a centrally disposed axially projecting hub portion at each axial end thereof, and each of said hub portions being dimensioned and adapted for alternative mating with said first-named recess.

4. A tap construction defined by two separate parts adapted to be interlocked by a fusible member, and comprising: (*a*) an elongated shank member adapted for rotation about a longitudinal axis; said shank member being provided with a cylindrical bore at one end thereof concentric with said axis, a shoulder member secured within said shank member and extending within said bore in spaced relation to the side walls thereof, and a passage extending from the exterior of said shank member into communication with said cylindrical bore; and (*b*) a thread-cutting member having a cylindrical section provided with a plurality of peripherally arranged thread-cutting elements and an integral axially projecting concentric cylindrical hub portion; said hub portion being provided with a central recess of greater diameter than said shoulder member defined under (*a*) and with shoulder means located within said recess, an outer diameter coactingly dimensioned with respect to said cylindrical bore defined under (*a*) for sliding fit therewith, and a passage extending from the exterior of said cylindrical hub portion into communication with said central recess at a position such as to be in substantial alignment with said passage defined under (*a*) when said hub portion is disposed within said cylindrical bore; said separable parts (*a*) and (*b*) being adapted to be interlocked by fitting said hub portion into said cylindrical bore in a position such as to place said passages in alignment, whereby a quantity of fusible material may be poured through said passages into the space within said central recess surrounding said shoulder member, said fusible material being one having a relatively low melting point and which is adapted to solidify and become a rigid solid at the normal operating temperature of said tap construction.

5. The construction set forth in claim 4, said shoulder member defined under (*a*) comprising a truncated pyramid having its larger base directed outwardly of said cylindrical bore and provided with a plurality of inwardly sloping side faces.

6. The construction set forth in claim 4, said thread cutting member being provided with a centrally disposed axially projecting hub portion at each axial end thereof, and each of said hub portions being dimensioned and adapted for alternative mating with said cylindrical bore and being each provided with a central recess and shoulder means as set forth in claim 4 and with a passage extending from the exterior of said cylindrical hub portion into communication with said central recess thereof at a position such as to be in substantial alignment with the passage defined under (*a*) when one of said hub portions is disposed within said cylindrical bore.

7. A tap construction which comprises: a cylindrical body member defining a shank; said member being provided with a coaxial cylindrical recess in one end thereof; a thread-cutting member adapted for attachment to said body member, said thread-cutting member being provided with a circular thread-cutting portion and an axially central projecting hub portion concentric therewith, and said hub portion being provided with a cylindrical recess and being externally dimensioned for coaxial mating relation to said recess in said shank; a shoulder member secured within said shank and disposed within said first-named recess; shoulder means on said hub portion, said shoulder member and said shoulder means comprising interengaging means in axial sliding engagement with one another and positioned to provide direct rotative driving engagement between said body member and said thread-cutting member; and a fusible interlocking member formed of material of relatively low melting point positioned within said recess in said hub portion and mechanically engaging said shoulder member and said shoulder means when said hub portion is mated within said first-named recess.

8. A tap construction which comprises: an elongated body portion defining a shank, said body portion being provided with a coaxially disposed cylindrical recess at one end; a member secured within said body portion and formed to provide longitudinally extending shoulder means; a thread-cutting member removably secured to said body portion at said one end and provided with a cylindrical hub portion adapted to slidably fit within said recess, and formed to provide longitudinally extending shoulder means; and a fusible interlocking member formed of a material having a relatively low melting point and positioned in interlocking engagement with both of said shoulder means.

9. A tap construction which comprises: an elongated body portion defining a driving member and provided with a coaxial recess at one end thereof; a member secured within said body portion and formed to provide longitudinally extending shoulder means; a thread-cutting member defining a driven member removably secured to said body portion at said one end and provided with a portion formed to provide longitudinally extending shoulder means in axial sliding engagement with the first-mentioned shoulder means to provide direct rotative driving engagement of said driving member with said driven member; and a fusible interlocking member formed of a material having a relatively low melting point and positioned in engagement with both of said shoulder means and securing said driving and driven members against axial displacement.

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