W. L. PROCUNIER.

BIT AND TAP AND DIE CHUCK.

APPLICATION FILED JUNE 16, 1911.

1,037,796. Patented Sept. 3, 1912.

Fig. 1.

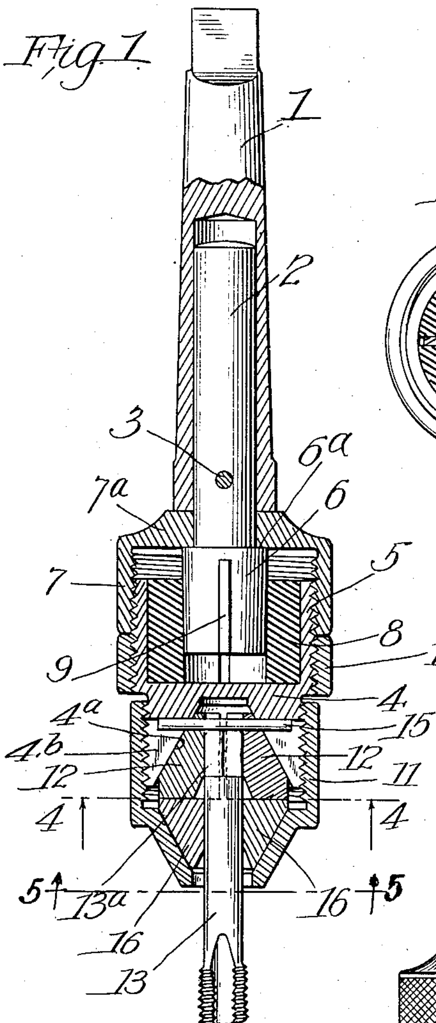


Fig. 3.

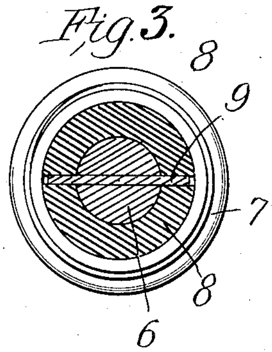


Fig. 2.

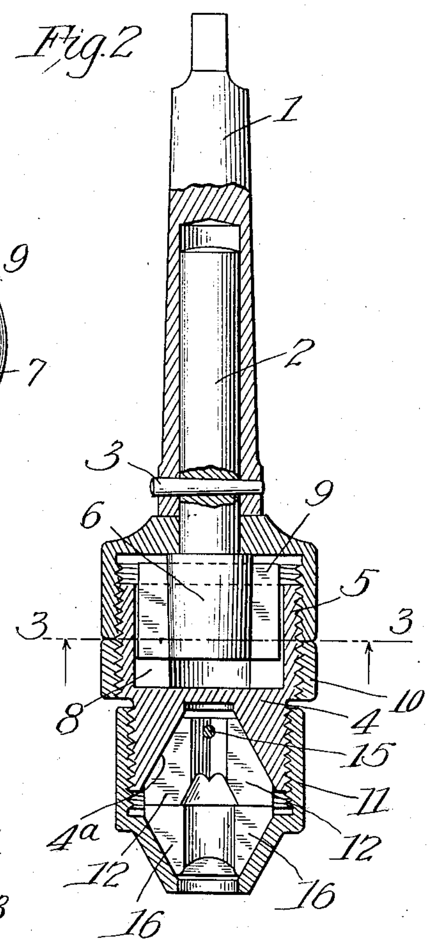


Fig. 6.

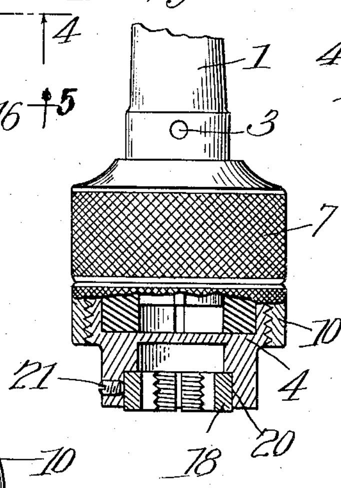


Fig. 4.

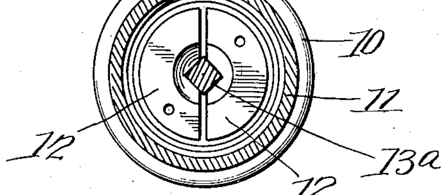
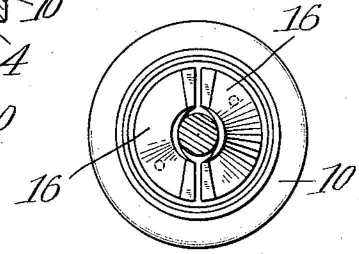


Fig. 5.



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BIT AND TAP AND DIE CHUCK.

1,037,796. Specification of Letters Patent. Patented Sept. 3, 1912.

Application filed June 16, 1911. Serial No. 633,531.

To all whom it may concern:

Be it known that I, WILLIAM L. PROCUNIER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Bit and Tap and Die Chucks, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide a bit and tap chuck adapted to be adjusted for its grip upon the tool so as to slip before the driving stress exceeds the strength of the tool, the specific purpose of the improvement being to produce a tool devoid of springs and more compact and of less dimensions for a given range of work than tools heretofore customarily employed for this purpose.

It consists of the elements and features of construction and their combinations shown and described, as indicated in the claims.

In the drawings: Figure 1, is an axial section of a chuck embodying this invention. Fig. 2, is an axial section in a plane at right angles to that of Fig. 1. Fig. 3 is a transverse section at the line, 3, 3, on Fig. 2. Fig. 4 is a section at the line, 4, 4, on Fig. 1. Fig. 5 is a section at the line, 5, 5, on Fig. 1, with the cap removed. Fig. 6 is an axial section of a modification of the device adapted for holding a die.

Heretofore, so far as I am aware, tap and bit chucks designed to slip to avoid breaking the tool and adjustable to adapt the driving grip to the strength of the tool, have accomplished such purpose by employing springs and means for tensioning them to vary the frictional engagement by which driving power is transmitted to the tool. In my present invention I avoid all such use of springs, by producing the pressure for frictional engagement by means of two engaged parts of very slow taper, so that the amount of movement in the direction of the taper may be very large relatively to the amount of crowding or pressure-producing movement in the transverse direction, and may thereby be very readily and accurately observable and divisible into sensibly large units corresponding to relatively small differences in the size of the tool; and by making these two slow tapered members of different material, one metal and the other preferably fiber, so that notwithstanding the slow taper by which the crowding is effected, such two members are not liable to become locked, as would be liable to happen with two equally slow-tapered members if both were metal. By use of fiber for one of the two members in question, I obtain also the advantage of a slight compressibility in excess of that which would be afforded by metal in the same situation.

In the drawings, 1 is an exteriorly tapered spindle, adapted to be frictionally held in the ordinary manner in the tool holding head of any drill press or lathe, said spindle having an axial bore to receive the spindle, 2, of the chuck, proper, said spindle, 2, being positively engaged with the spindle, 1, by the pin, 3. This spindle, 1, is the driving element and is adapted for frictional engagement as hereinafter described, with the driven and tool holding element, 4, which at its lower end is provided with means hereinafter described, for holding the tool. The upper end of the element, 4, is axially bored to form an upwardly open, cylindrical chamber or shell, 5, into which the lower, enlarged end portion, 6, of the driving element, 1, projects axially. Said enlarged end portion, 6, is made of very slow taper and terminates upwardly in an abrupt shoulder, 6^a, between which and the lower end of the spindle, 2, the centrally apertured head, 7^a, of the interiorly threaded cap nut, 7, is engaged and stopped against longitudinal movement, while free to turn on the spindle. The shell, 5, is exteriorly threaded for engagement with the cap nut, 7, which thus serves to move the element, 4, axially with respect to the slow tapered terminal, 6, of the element 1. In the chamber, 5, in the annular space around the slow tapered terminal, 6, there is lodged a plural-membered frictional transmitting element, 8. As illustrated, this element comprises two semi-annular members which when spread into contact with the cylindrical shell of the wall, 5, are separated by a sufficient distance to admit between them a driving wing piece or cross head, 9, with which the slow tapered terminal, 6, is provided so that the rotation of the said driving element, 2, with its tapered terminal, 6, positively rotates said terminal frictional transmitting element.

It will be observed that the rotation of the cap end, 7, in one direction will force the slow tapered terminal, 6, down between the members of the frictional transmitting element, 8, spreading said members and forcing them into frictional engagement with the shell, 5, and causing them to transmit the rotation of the driving element, 2, to the driven element, 4, with varying degrees of force, according to the degree of frictional engagement produced by the adjustment of the cap nut. A jamb nut, 10, is preferably provided on the exteriorly threaded shell, 5, below the cap nut, 7, for securing the said cap nut for any desired degree of frictional engagement of the parts. The plural-membered frictional transmitting element, 8, is preferably of fiber, and although I do not limit myself to any exact proportions, the taper of the terminal, 6, should probably not exceed 1/25 of an inch to the inch; and with such slow taper, it is practicable, after the slow tapered terminal has been forced axially between the members of the frictional transmitting element, 8, sufficiently to produce adequate frictional engagement between said element and the walls of the chamber, 5, of the driven element, 4, to drive a tap or drill of, say 1/32 of an inch, at the highest speed adapted for its strength without causing slipping between the frictionally engaged parts, to further force said slow tapered terminal axially down between the members of the frictional transmitting element, a distance corresponding to substantially two threads of the cap nut, 7,—a total circumferential movement of nearly six inches—without producing permanent set of the fiber transmission element, and without requiring more power than can be readily exerted by the hand of the operator upon the cap nut, 7; and at such maximum adjustment I find that the frictional engagement is adequate for driving a tap or drill of as much as $\frac{3}{8}$ of an inch diameter,—ten times the diameter of the smallest tool for which the chuck is adapted,—at the highest speed for which the strength of such $\frac{3}{8}$-inch tool is adequate, and that the frictional engagement adequate for driving such tool at such speed is still such that slipping will occur upon further increase of the resistance experienced by the tool. That is to say, with this device, adjustment can be made to adapt the same chuck for driving with safety from tools from 1/32 of an inch diameter up to as large as 7/16 of an inch diameter, by adjustments in steps of nearly $\frac{1}{3}$ of an inch at the circumference of the cap nut, and hence easily observable, for each 1/32 of an inch increase in the diameter of the tool.

Another feature of this invention consists in the means for holding the tool in the lower end of the driven member, 4. It is well known that absolute uniformity is not found in respect to the relative dimensions of the round shank of the drill or tap and the squared upper end for which it is positively engaged for driving. The tool is preferably centered by some engagement of the shank at its round portion, and is preferably driven by the positive engagement at its squared end; and it is important, therefore, that any device for engaging the tool should effect such engagement positively and definitely both at the round portion and at the squared portion, and that neither engagement should forestall or defeat the other. For this purpose I provide in the lower end of the member, 4, a conical, downwardly open cavity, 4^a. The lower end portion of said member, 4, containing said conical cavity is exteriorly threaded, and an interiorly threaded follower, 11, is screwed onto it, said follower having its cavity at the lower end conical, preferably with the same taper as the conical cavity, 4^a.

In the conical cavity, 4^a, there are lodged two jaws, 12, 12, exteriorly tapered conically to fit approximately the taper of the conical chamber, 4^a, and having their meeting faces notched to engage the square end, 13^a, of a tool shank, 13, of customary form. The two jaws, 12, 12, are engaged with the member, 4, for positive rotation thereby, by means of the cross pin, 15, which is inserted through the upper, smaller end of the jaws, and engages a diametrically positioned longitudinal rift, 4^b, in the said conically chambered lower end of the member, 4, as seen in Fig. 1. In the conical cavity of the follower, 11, there are lodged two semi-conical jaws, 16, 16, notched on their meeting faces for engaging the round portion of the tool shank, 13. With this construction, it will be observed that when the tool is inserted through the lower central aperture of the follower and up between the jaws, 16, and then on up between the jaws, 11, the rotation of the follower screwing it onto the member, 4, will cause the jaws, 16, whose upper bases rest up against the lower bases of the jaws, 11, to force said jaws, 11, up into their conical seat in the member, 4, until said jaws are closed upon the squared end of the tool, and that if when this happens, the jaws, 16, have not yet closely grasped the round shank of the tool, the follower can be still further screwed up until said round portion is thus firmly grasped by the lower jaws. On the other hand, if the jaws, 16, become closed firmly upon the round portion of the shank before the jaws, 11, have firmly grasped the squared end, the follower can be screwed up until the latter engagement is perfectly effected. Whenever, therefore, the operator finds the follower tight, he is thereby assured that the tool is not only grasped firmly at its squared end for positive driving, but also grasped firmly at its round shank for centering.

A modification of this chuck to adapt it for carrying thread cutting dies instead of taps and chucks, is shown in Fig. 6, the modification being merely in respect to the tool holding end of the driven element, 4, which for this purpose has its lower end sufficiently reduced in exterior diameter to permit the jamb nut, 10, to be passed on over it and is provided with a downwardly open cylindrical recess, 20, whose diameter is adapted to the standard size of dies intended to be held in it. Such die, 18, is shown in the recess, a retaining screw, 21, being set in through the periphery of said reduced end, intruding into the usual recess, 19, in the periphery of the die, 18 for holding the die in place.

I claim:—

1. A chuck comprising two elements, one being a driving and the other a driven element, the driven element having tool-holding means; a third element for frictional transmission of rotary movement from the driving to the driven element, one of said first-mentioned two elements having a chambered terminal which centrally receives a terminal of the other, one of said terminals being slow-tapered, said third element being radially expansible and contractible and interposed in said chamber between the wall thereof and the other terminal therein, the tapered terminal being positively engaged for rotation without rotary slipping with said radially expansible and contractible third element, and means for forcing said tapered terminal in axial direction with respect to said third element.

2. A chuck comprising two elements, one being a driving and the other a driven element, the driven element having tool-holding means; a third element for frictional transmission of rotary movement from the driving to the driven element of different material from the other two elements; one of said first-mentioned tool elements having a chambered terminal which centrally receives a terminal of the other, one of said terminals being slow-tapered, said third element being radially expansible and contractible and interposed in said chamber between the wall thereof and the other terminal therein, the tapered terminal being positively engaged for rotation without rotary slipping with said radially expansible and contractible third element, and means for forcing said tapered terminal in axial direction with respect to said third element.

3. A chuck comprising two elements, one being a driving and the other a driven element, the driving element having a slow-tapered terminal and the driven element having tool holding means; a third element for frictional transmission of rotary movement from the driving to the driven element, the driven element having a cylindrical or non-tapered chamber into which the tapered terminal of the driving element extends, said third element being pluralmembered and having its members interposed in the chamber at opposite sides of the tapered terminal, and means for positively forcing said tapered terminal into said chamber.

4. A chuck comprising two elements, one being a driving and the other a driven element, the driving element having a slow-tapered terminal and the driven element having a cylindrical or non-tapered chamber which centrally receives said terminal and having tool holding means; a third element which is radially expansible for frictional transmission of rotary movement from the driving to the driven element, interposed in the annular interval in said cylindrical chamber around the tapered terminal therein and stopped on the bottom thereof, and means for positively forcing the tapered terminal inward with respect to said chamber.

5. A chuck comprising two elements, one being a driving and the other a driven element, the driven element having tool-holding means, one of said elements having a chambered terminal which centrally receives the terminal of the other, one of said terminals being slow-tapered; a third radially expansible element of fiber for frictional transmission of rotary movement from the driving to the driven element interposed in the annular interval in said chamber around the terminal therein, and stopped on the bottom of said chamber; means for positively engaging the tapered terminal with said third element for rotation without rotary slipping of the one upon the other, and means for positively forcing such tapered terminal inward with respect to said chamber.

6. A chuck comprising a driving member, having a stem and a slow-tapered terminal and a driven member having a cylindrical or untapered chamber which centrally receives such terminal, and having tool holding means; a third element which is radially expansible for frictional transmission of rotary movement from the driving to the driven element, said third element being interposed in said chamber around said slow tapered terminal therein; means by which said slow-tapered terminal positively engages the third element for rotation without rotary slipping; a cap nut screwed onto the chambered end of the first element, having its head apertured for the stem of the driving element, and means for securing said cap nut.

7. A chuck comprising a driving element, having a stem and slow-tapered terminal, a driven element, having a chamber which centrally receives the slow-tapered terminal and having tool-holding means below said

chamber; a plural-membered and radially expansible element for frictional transmission of rotary movement from the driving element to the driven element, interposed in the chamber around said slow-tapered terminal, said terminal having means engaging between the members of said expansible element for positively rotating said element with the driving element, and means for positively forcing the tapered terminal axially with respect to the radially expansible element.

8. A chuck comprising a driving element, having a stem and an enlarged slow-tapered terminal, having an abrupt shoulder; a driven element, having a chamber which centrally receives the slow-tapered terminal and having tool-holding means below said chamber; a plural-membered and radially expansible element for frictional transmission of rotary movement from the driving element to the driven element, interposed in the chamber around said slow tapered terminal, said terminal having means engaging between the members of said expansible element for positively rotating said element with the driving element, said chamber being exteriorly threaded at its centrally apertured cap nut, through whose aperture the stem of the driving element protrudes and whose thread engages the exterior thread of the chamber for positively forcing the slow tapered terminal axially into said expansible element.

In testimony whereof, I have hereunto set my hand at Chicago, Ill., this 10th day of June, 1911.

WILLIAM L. PROCUNIER.

Witnesses:

CHAS. S. BURTON,
LUCY I. STONE.