March 6, 1951

R. B. DE REMER

2,543,958

AUTOMATIC DRILL CHUCK

Filed Feb 6, 1947

2 Sheets-Sheet 1

FIG. 2

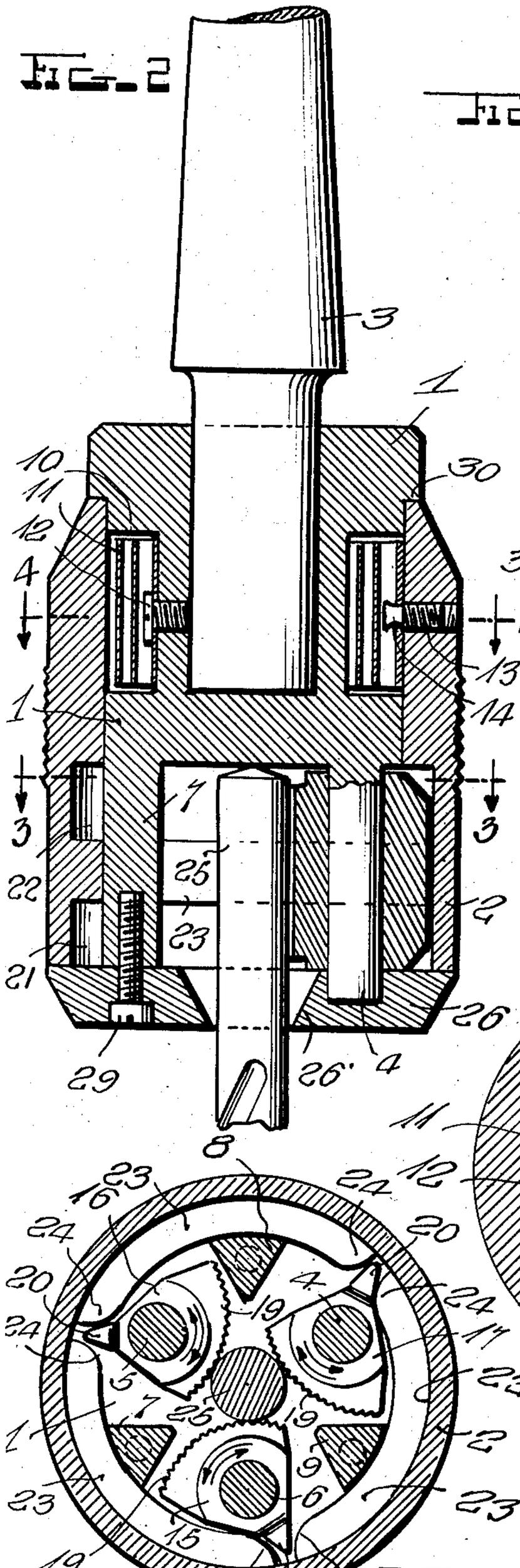


FIG. 1

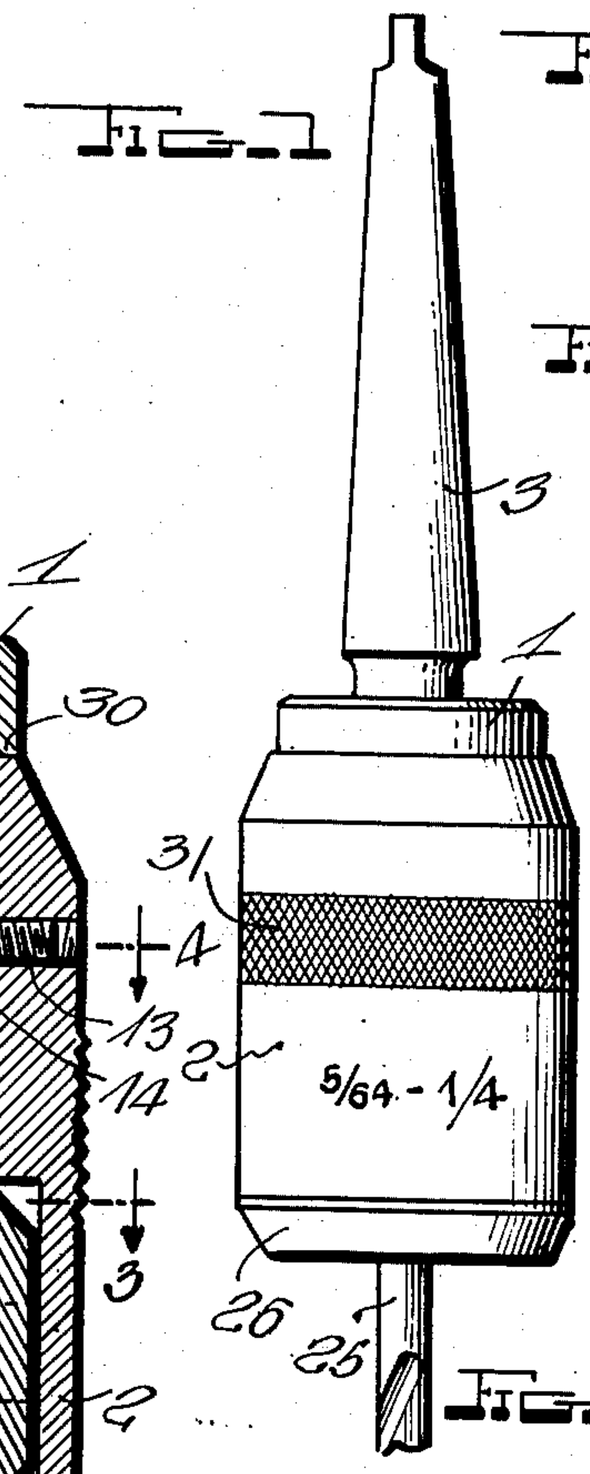


FIG. 14

FIG. 11

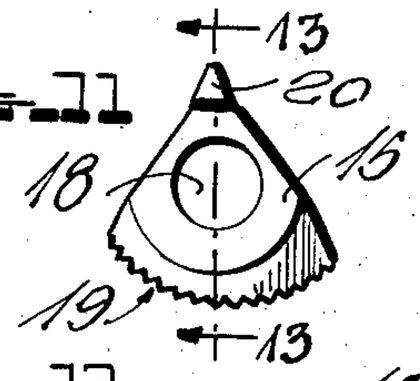


FIG. 12

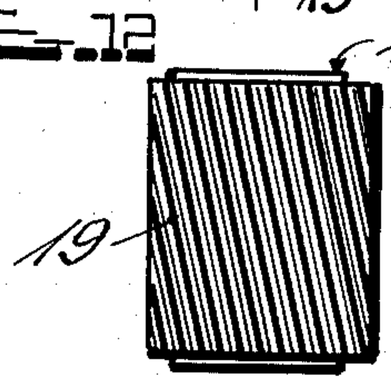
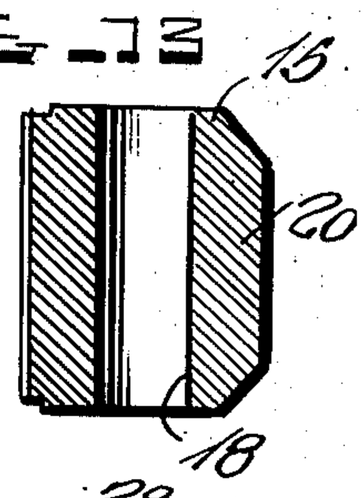


FIG. 13



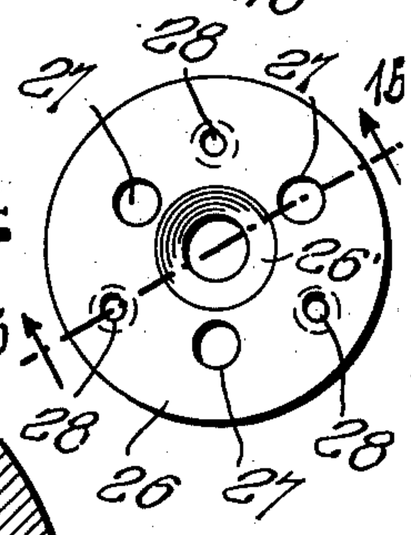


FIG. 4

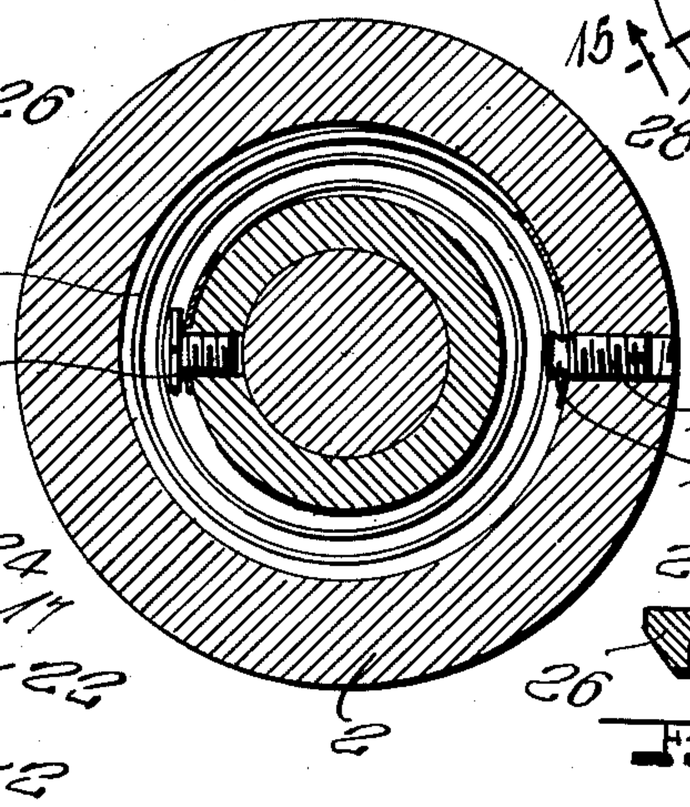


FIG. 15

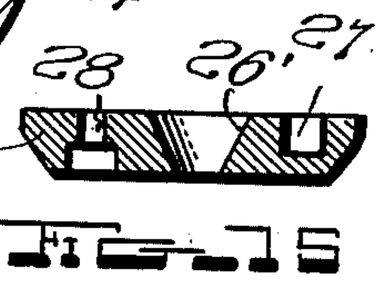


FIG. 3

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March 6, 1951

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2,543,958

AUTOMATIC DRILL CHUCK

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2 Sheets-Sheet 2

FIG. 5

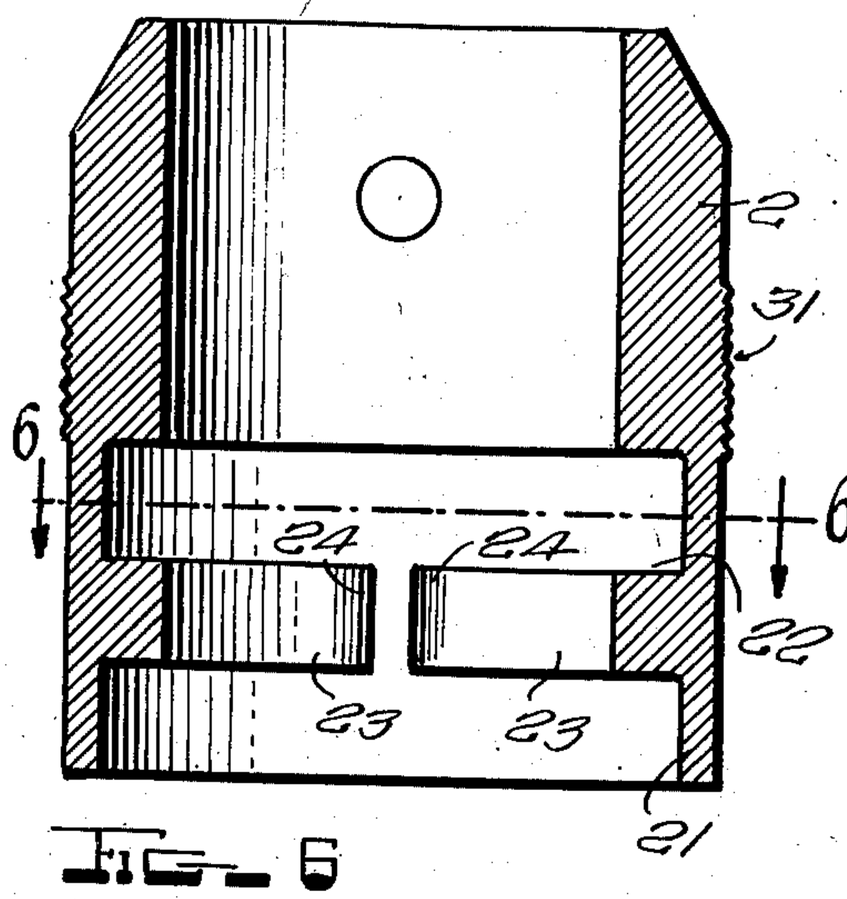


FIG. 6

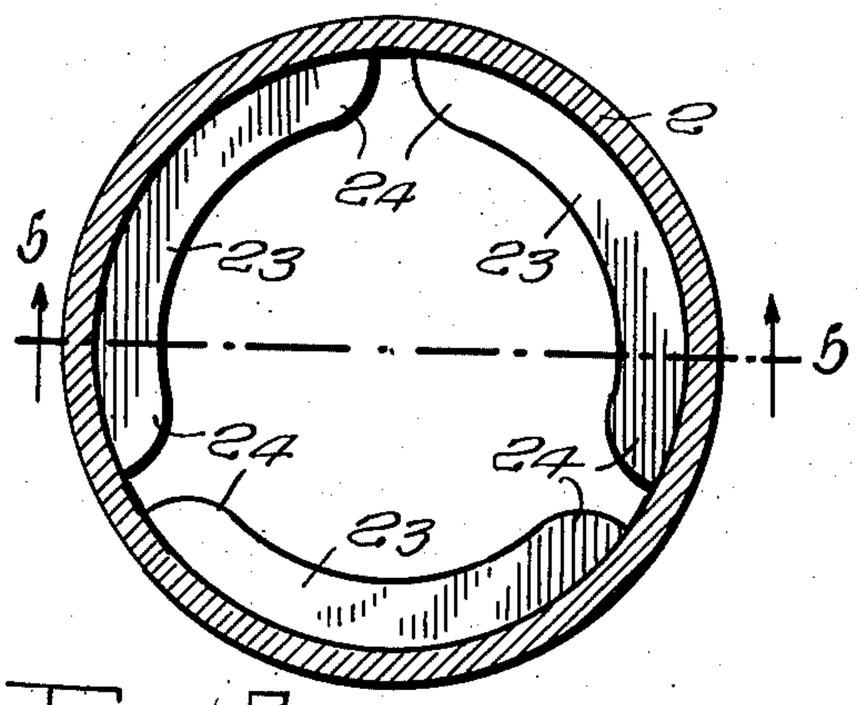


FIG. 7

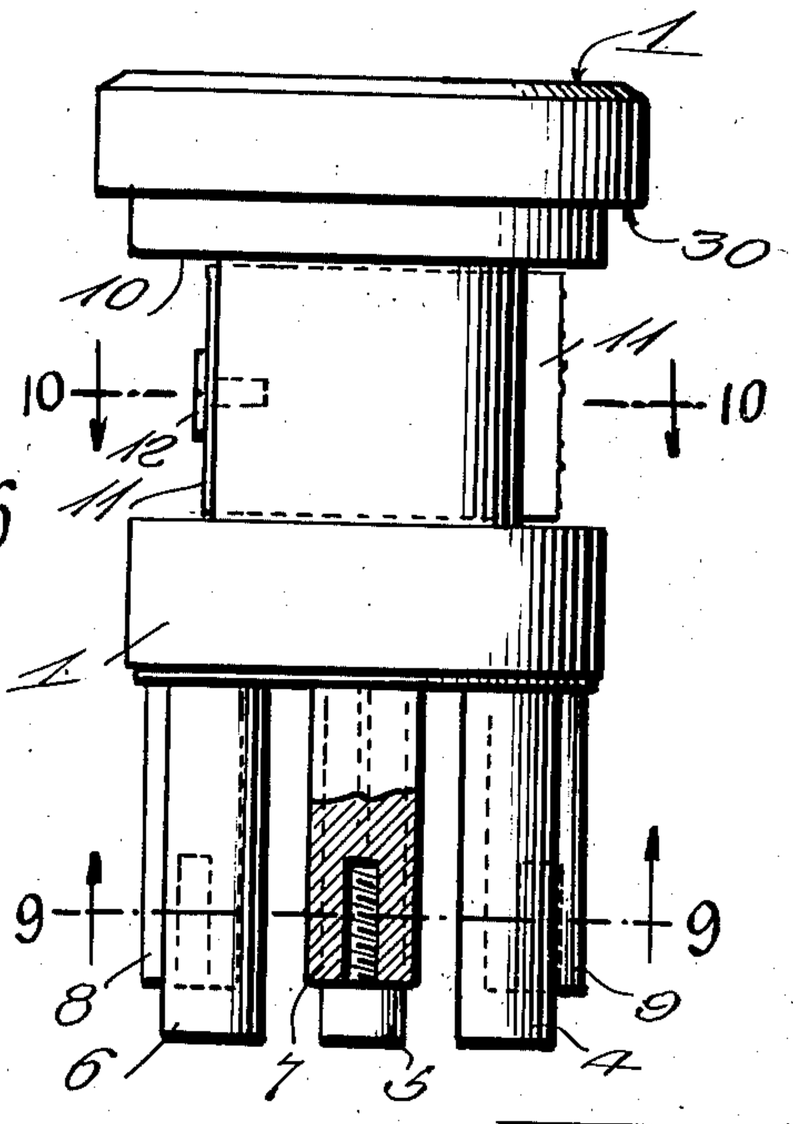


FIG. 8

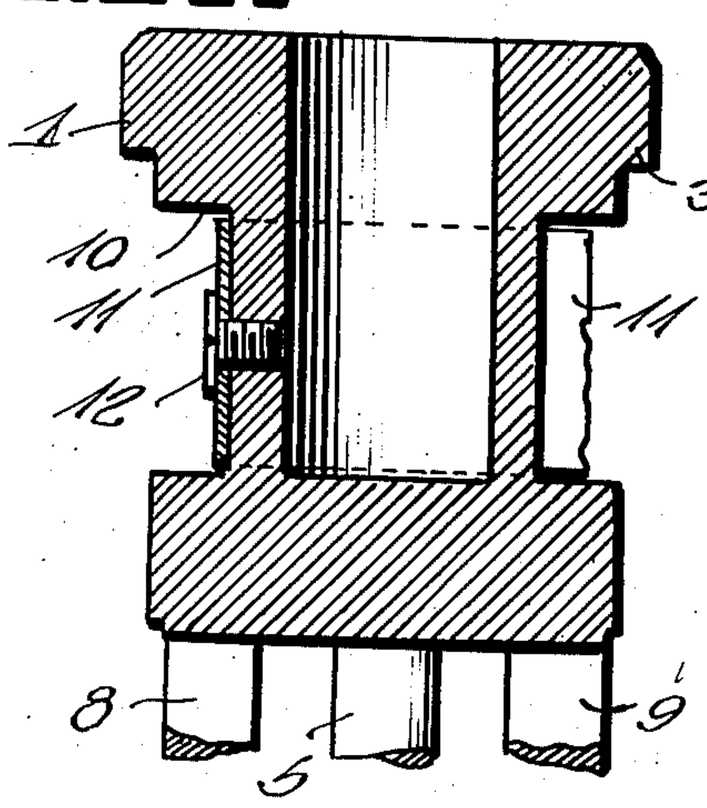


FIG. 9

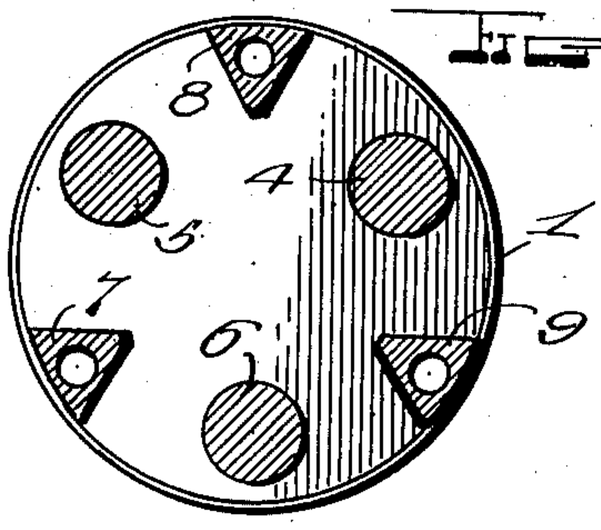
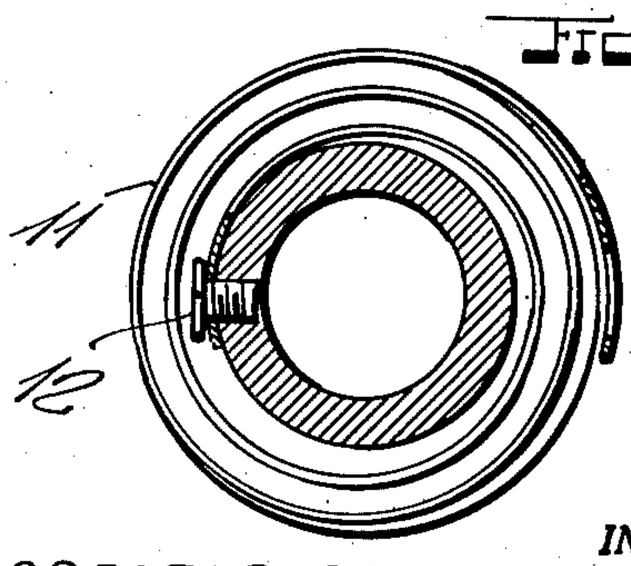


FIG. 10



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Patented Mar. 6, 1951

2,543,958

UNITED STATES PATENT OFFICE

2,543,958

AUTOMATIC DRILL CHUCK

Robert B. De Remer, Williamsport, Pa.

Application February 6, 1947, Serial No. 726,811

1 Claim. (Cl. 279—33)

1

My invention relates to chucks and more particularly to drill chucks having jaws that are actuated initially to a gripping position by a spring and retracted by manual operation.

It is an object of my invention to produce a simple, efficient gripping chuck comprising primarily two principal units, namely, a jaw supporting unit and a casing unit embracing the supporting unit and being co-axially and movably mounted thereon for limited rotative movement.

It is an object of my invention to provide in a chuck cooperating units having movable jaws therein actuated initially by a spring into gripping relation with a drill shank or any other similar shank, in combination with additional means in the chuck to enhance the gripping action of the jaws by the driving torque applied to the chuck, and the gripping action of the jaws being commensurate with the amount of the driving torque applied to the chuck.

It is also an object of my invention to provide a strong durable and lasting chuck construction, that is easily operated and is positively and effectively actuated to gripping and retracting conditions.

Other objects and advantages will be revealed in the written description of my drawings and the mechanical details thereof.

In the drawings:

Figure 1 is a side elevational view of my complete chuck assembly displaying a portion of a drill gripped thereby;

Figure 2 is a central longitudinal sectional view displaying the relation of the assembled units and attached parts;

Figure 3 is a transverse sectional view taken substantially on the line 3—3 of Figure 2, looking in the direction indicated by the arrows and displaying the mechanical relation of the pivoted jaws to the two principal units;

Figure 4 is a transverse sectional view taken substantially on the line 4—4 of Figure 2, and displaying the particular relation of the torsional spiral leaf spring to the two principal units;

Fig. 5 is a longitudinal sectional view of the casing unit taken substantially on the line 5—5 of Figure 6, looking in the direction indicated by the arrows;

Figure 6 is a transverse sectional view taken substantially on line 6—6 of Figure 5, looking in the direction indicated by the arrows;

Figure 7 is a side elevational view of the jaw supporting unit, displaying a portion of one connecting stud in longitudinal section and a portion of the torsion spring broken away;

2

Figure 8 is a central longitudinal sectional view of the jaw supporting unit with portions thereof broken away;

Figure 9 is a transverse sectional view taken substantially on the line 9—9 of Figure 7, looking in the direction indicated by the arrows;

Figure 10 is a transverse sectional view taken substantially on the line 10—10 of Figure 7 and displaying a plan view of the torsional spiral leaf spring and the means for securing it to the jaw supporting unit;

Figure 11 is an end elevational view of one of the pivotal jaws displaying its eccentrically located ribbed arcuate gripping surface portion;

Figure 12 is a side elevational view of one gripping jaw displaying its ribbed gripping portion;

Figure 13 is a longitudinal sectional view of one of the gripping jaws taken substantially on the line 13—13 of Figure 11, looking in the direction indicated by the arrows;

Figure 14 is an elevational view of the inside of the circular cover plate for the two principal units; and

Figure 15 is a transverse sectional view of the cover plate taken substantially on the line 15—15 of Figure 14 and displaying a recess to receive one end of a jaw supporting stub shaft and a countersunk bolt hole portion to receive a lag bolt.

My drawings are merely illustrative of a preferred embodiment of my invention and are not definitive thereof except as claimed herein.

The reference characters merely identify the detailed parts and portions of my invention in both the drawings and written description thereof.

The jaw supporting unit 1 of my chuck assembly is telescopically received by the casing unit 2. These units are coaxial and are connected for limited angular movement. The unit 1 is co-axially recessed at one end to receive a torque and pressure shank 3 secured therein.

The unit 1 is preferably made of a single solid piece of suitable steel machined to provide stub shafts 4, 5 and 6 arranged in equally spaced relation to each other and also equally spaced from the circumference of the unit 1. The stub shafts are of equal length and are parallel to each other. The unit 1 is further machined to provide three equally spaced securing posts 7, 8 and 9 equally spaced from each other and located substantially flush with the circumference

of the unit 1. The posts are preferably substantially triangular in cross section and are of equal length but shorter than the stub shafts. The free ends of the posts are provided with screw threaded longitudinal recesses to receive securing bolts 29. The unit 1 is still further machined to provide an annular channel 10 to receive a torsion spiral leaf spring 11 having one of its ends secured in the bottom of the channel by a bolt 12. The other end of the spring 11 is attached to the unit 2 by a screw threaded stud 13 having a bottom shaped end portion 14 received by the other apertured end of the spring 11.

There are preferably three pivotal gripping jaws 15, 16 and 17 which are substantially duplicate constructions. Each jaw is provided with a longitudinal aperture constituting a bearing 18 whereby each jaw is journalled on one of the stub shafts 4, 5 and 6, as clearly shown in Figure 3. Each jaw is provided with a ribbed arcuate portion 19 arranged eccentrically of its bearing 18. Each pivotal jaw is also provided with a longitudinal radial projection 20.

The casing unit 2 is provided with spaced annular channels 21 and 22 thereby defining arcuate coplanar projections 23 located between said channels 21 and 22. The spaced projections 23 are provided with rounded corners 24 at their adjacent ends.

The jaws are mounted on the stub shafts 4, 5 and 6 and the radial projections 20 are located between the ends of the arcuate projections 23 and the rounded corners 24 thereof. The eccentric ribbed portions are now adapted to swing into gripping contact with the shank of a drill 25 as clearly shown in Figure 3.

The closure cap 26 for both units 1 and 2 is shown in a detached condition in Figures 14 and 15 and in an assembled or attached condition in Figures 1 and 2. The cap 26 is provided centrally thereof with a frustoconical opening 26' to receive a drill shank as 25 and is also provided with cylindrical recesses 27 to receive the free end portions of the stub shafts 4, 5 and 6. The cap 26 is furthermore provided with countersunk apertured portions 28 to receive bolts as 29 shown at the lower left hand portion of Figure 2.

The limited rotational movement of the principal units relative to each other is afforded by the particular structural contour of the pivotal jaws and their radial projection as related to their cooperation with the spaced ends of the segments 23 and the rounded corners 24 thereof. When a jaw as 17 and its radial projection 20, Figure 3, are mechanically contacted on opposite sides by two adjacent ends of segments 23 and their rounded corners 24 then the relative movement is limited in one angular or rotative direction. Apparently, it appears to be self-evident that movement in the opposite direction is stopped or limited in a similar manner.

In order to prevent undue telescopic movement of the principal parts or units 1 and 2, the unit 1 is provided with an annular shoulder 30 against which the unit 2 abuts. Movement in the opposite direction of unit 2 is prevented by the closure plate 26 as clearly shown in Figure 2.

In order to facilitate the retraction of the pivotal jaws 15, 16 and 17 by rotation of the unit 2 against the tension of the torsion spring 11, I have provided the unit 2 with a knurled zone 31 to enhance and facilitate the manual grip of unit 2.

When no tool shank or the like is in my chuck

the pivotal jaws will, of course, swing, at least, to some extent into the path of a tool shank that it is capable of holding. When my chuck is in this condition it is necessary to retract the jaws 15, 16 and 17 from the path of the entering shank by angular or rotative movement of the unit 2 against the tension of the torsion spring 11. When the tool shank is in place the unit 2 is manually released and then automatically the torsion spring 11 throws the jaws into initial gripping contact with the tool shank.

When the driving torque for my chuck is applied through the medium of shank 3, then the initial grip on the tool shank 25 is increased directly proportional to the amount of torque applied to my chuck. In observing the construction, as shown in Figure 3, it appears to be self-evident that clockwise torque of unit 1 would increase the grip on shank 25 because of the eccentric gripping portions 19 as arranged in my construction.

The angular driving torque and the gripping torque of the torsion spring 11 are both in the same direction, namely, clockwise.

It can now be clearly understood that the jaw gripping action of a tool shank is doubly automatic, that is, first, initial gripping produced by the spring 11; secondly, increased gripping by driving torque plus the torque produced by the spring 11.

The retraction of the gripping jaws is manual, that is, it is accomplished by rotation of the unit 2 in a counterclockwise direction manually, that is, by hand.

Since, one chuck will accommodate tool shanks within a particular range of sizes, I propose to provide chucks of different sizes comprising a set of chucks to accommodate all sizes desired.

From the foregoing description of the construction of my automatic drill chuck, the method of assembling same and operation thereof will be readily understood, and it will be seen that I have provided a comparatively simple, inexpensive and efficient means for carrying out the various objects of the invention.

While I have particularly described the elements best adapted to perform the functions set forth, it is apparent that various changes in form, proportion and in the minor details of construction may be resorted to, without departing from the spirit or sacrificing any of the principles of the invention.

Having thus described my invention, what I claim is:

A drill-holding chuck comprising an inner unit consisting of a block circular in cross section and formed with a circumferentially extending recess and at its lower end carrying a plurality of downwardly extending stub shafts spaced from each other circumferentially of the block and downwardly extending posts located between the stub shafts and spaced therefrom, a casing filling about said block and rotatable thereon, the block being formed above the recess with a shoulder against which the upper end of the casing abuts, said casing having its lower portion extending downwardly from the block and surrounding the posts and the stub shafts and formed internally with upper and lower recesses defining circumferentially extending aligned ribs having rounded ends spaced from each other and disposed substantially opposite the stub shafts radially of the block, said ribs bearing against transversely arcuate outer side portions of the posts, jaws rotatably mounted about said stub shafts, said jaws having trans-

versely arcuate inner side faces formed with gripping teeth and along their outer sides being formed with longitudinal lips tapered from opposite sides and fitting loosely into spaces between ends of said ribs for effecting movement of the jaws about the stub shafts when the casing is turned about the block, a coiled spring in the recess secured at its inner end to the block and at its outer end to the casing, and a cap secured to said posts and holding the casing and the jaws in place and formed with a central opening.

ROBERT B. DE REMER.

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The following references are of record in the file of this patent:

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