

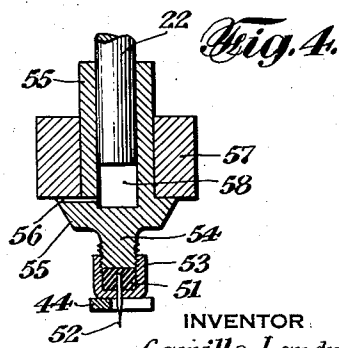
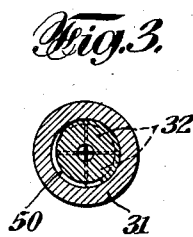
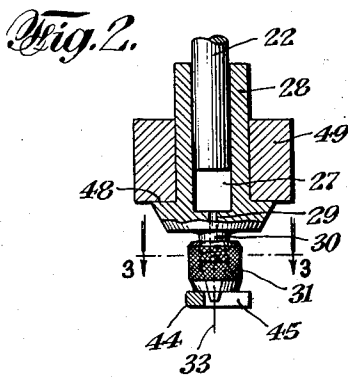
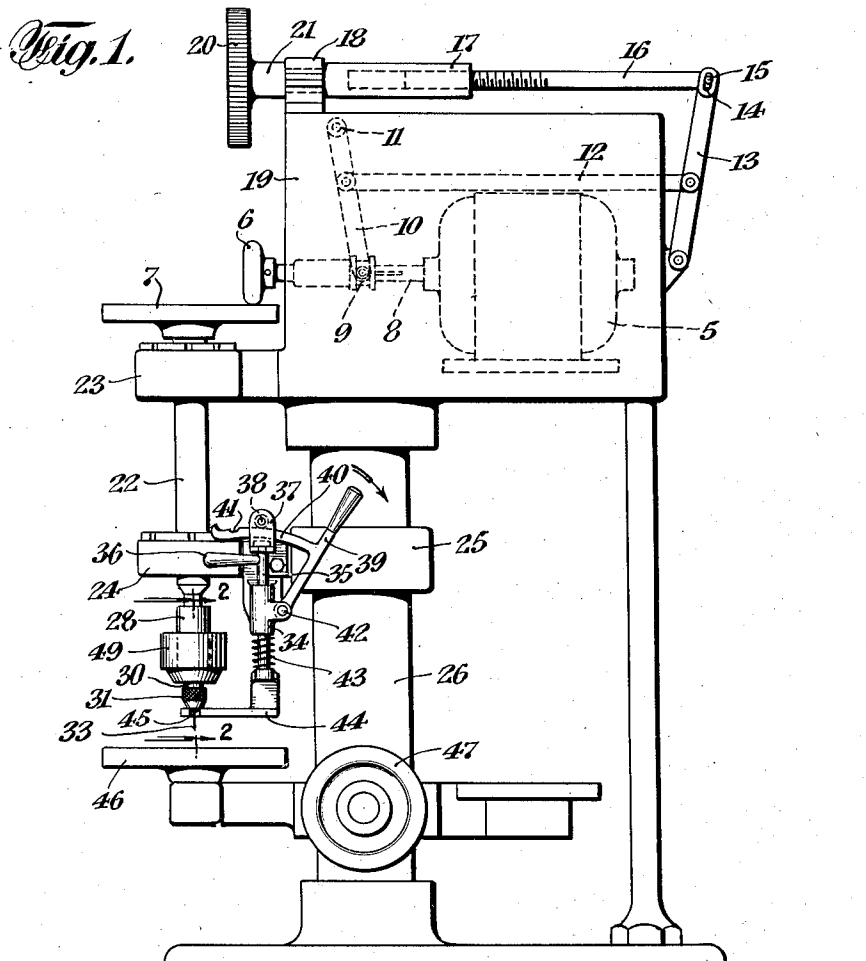
March 19, 1935.

C. LANDRIANI

1,994,772

DRILL PRESS

Filed Sept. 19, 1933



INVENTOR.
Camillo Landriani
BY *E. R. Posuack*
ATTORNEY

UNITED STATES PATENT OFFICE

1,994,772

DRILL PRESS

Camillo Landriani, Bronxville, N. Y.

Application September 19, 1933, Serial No. 690,063

3 Claims. (Cl. 77—5)

This invention relates to a rotary drive, particularly of the type adapted for use in a sensitive drill press, one of the main objects of this invention being to permit the safe transmission of a rotary driving motion to a tool of small and delicate construction.

In the drilling of very fine holes, the delicate drills employed for the purpose are easily subject to breakage,—a condition which is due to the fact that the drill, during its progress through the material being drilled, encounters portions of increased density or toughness, and inasmuch as the drill is generally actuated by positive driving means, the relatively constant driving force may be sufficiently great to cause a breakage of the tool upon encountering such increased resistance. To overcome this danger, I have conceived this invention whereby the driving means I employ is non-positive and of what might be considered a frictional nature, and yet capable of transmitting the necessary driving force,—the arrangement being such that when the drill encounters any such increased resistance, there will be a slippage between the driving shaft and the tool-carrying member, so that the resultant speed of the drill will be automatically and adjustably decreased to prevent any undue strain upon the drill at such point. Using a drill employing my invention, I have been able to drill holes twenty-five ten thousandths (25/10,000) of an inch in diameter, thereby making this device particularly applicable to the processes of drawing celanese and rayon threads, for atomizing devices, and for the manufacture of delicate instruments such as watches, etc.

In many industries where it is necessary to drill very fine holes, it has generally been the practice of fixing the position of these holes with punch marks,—a method which has frequently proven unsatisfactory due to the fact that the point of the punching tool was often too blunt for the purpose. Using my invention, however, small holes can readily be drilled to serve as piloting for larger holes without the use of punching tools.

Other objects, features and advantages will appear from the drawing and the description hereinafter given.

Referring to the drawing,

Figure 1 is an elevation of a drill press employing my invention.

Figure 2 is an enlarged fragmentary section taken along line 2—2 of Figure 1, showing a preferred form of the transmission mechanism actuating the drill.

Figure 3 is a sectional plan of Figure 2 taken along line 3—3, and

Figure 4 is a fragmentary section of a modified form of the transmission mechanism constituting my invention as used with a drill.

In the drawing, the motor 5 is connected to a variable speed drive comprising the driving wheel 6 in frictional engagement with and at right angles to the disk 7, the shaft 8 of the motor being attached to the shaft of the wheel 6 by the slidable coupling 9. Pivotaly attached to the coupling is the lever 10 which is pivotally mounted at 11. The link 12 is pivotally attached to the levers 10 and 13 intermediate the ends thereof, the free end of lever 13 containing the slot 14 therein which is in slidable and rotatable engagement with pin 15 attached to the end of the shank of the adjusting bolt 16, the latter being in threaded engagement with the hollow internally threaded boss 17 attached to the lug 18 of the casing 19 of the drill press. The adjusting bolt 16 is provided with the head or knob 20, adapted for manual manipulation, the hub 21 thereof being in engagement with the lug 18.

Attached to the disk 7 is the shaft or spindle 22 extending through the lug 23 of the casing 19 and supported by the bearing 24 which is attached to the bracket 25 mounted upon the post 26 of the drill press.

The bottom or free end of the spindle 22 is rotatably and slidably positioned by a running fit within the axial hole 27 of the cylindrical chuck-carrying member 28. In the preferred form of my device, the axial hole does not extend through the entire length of member 28, as appears from Figure 2. A channel 29 extends from the bottom of said axial hole 27 through the stud 30, which is preferably integral with the member 28. In threaded engagement with said stud is the chuck 31 which contains the chuck wedges 32 therein for detachably holding the drill 33 in its operative position.

Attached to the bracket 25 is the hollow guiding member 34 through which extends the rod 35 in slidable and rotatable engagement with the walls of the hole in said guide. The handle 36 is affixed to the said rod 35 the upper portion of which contains the bifurcated bracket 37, the two arms of which (only one being shown) support therebetween the roller 38. Pivotaly attached to the guide member 34 is the lever 39 intermediate the ends of which is the arcuate arm 40 containing the detent 41. The curvature of the arm 40 and its relationship to the lever 39 is such that the distance between the pivotal point

42 and the arm 40 increases for points farther removed from the lever 39; in other words, the distance between pivotal point 42 and detent 41 is greater than that from the point 42 to the juncture of arm 40 and lever 39, so that upon a moving of the lever 39 in the direction of the arrow, the arm 40 in rotatable engagement with the roller 38 will cause an upward movement of the bracket 37 and the rod 35,—the detent 41 representing the position of highest lift of rod 35. The helical spring 43 on the underside of the guide 34 and which is mounted over the lower portion of rod 35 normally exerts a downward pull upon the rod, so that the roller 38 is always in yieldable engagement with the arm 40.

The lower extremity of rod 35 is attached to the chuck-supporting member 44, the horizontal arm of which contains a recess 45, near the chuck extremity thereof, adapted to accommodate the drill 33 when the arm is in its operative or chuck-supporting position. The table 46, for supporting the material to be drilled, is movable in a vertical direction by manipulation of the wheel 47.

In operating this device as applied to the drill press shown, the spindle speed 22 is adjusted by manipulating the knob 20 of the adjusting bolt 16. By turning this knob, the bolt 16 will move in a horizontal direction and, through the linkage shown and described, will cause the wheel 6 to move in a horizontal direction, the position of this wheel with respect to the disk 7 determining the velocity of the spindle. Before the drilling operation is commenced, the lever 39 is swung to the right in the direction of the arrow until the detent 41 is in engagement with the roller 38, the arm 44 underlying and supporting the chuck in its raised and inoperative position. In this position, the spindle 22 actuated by the motor 5, is in rotation.

After the work to be drilled is properly positioned on table 46, the lever 39 is moved slowly towards the left, thereby gradually lowering the rod 35 and the arm 44. Inasmuch as the chuck and chuck-carrying member 28 are supported only by arm 44, a lowering of said last mentioned arm will cause member 28 and the chuck to move downwardly under gravitational influence, the member 28 slidably moving along the spindle 22. When the point of the drill 33 contacts with the work, the handle 36 is swung towards the machine, thereby removing the arm 44 from its chuck-supporting position, so that the drill 33 supports the member 28 and the associated parts and is able to perform its drilling operation.

It will be noted that the chuck-carrying member 28 contains an annular ridge 48 upon which is mounted the hollow cylindrical weight 49. For different sizes of drills, different weights are used, this weight serving the purpose of supplying sufficient pressure to effect the required drilling operation. Although in this preferred form a weight is shown, it is within the contemplation of my invention to use any other means, such as a spring in operative engagement with the chuck-carrying member 28, to supply the necessary drilling pressure.

With the construction disclosed and hereinbefore described, it has been found that the rotary motion of the spindle 22 is transmitted to the chuck-carrying member 28 to cause the operative rotation of the drill 33. My contention is that the frictional driving effect is greater than the resistance offered by the material to the drill, thereby enabling the drill actuated by the fric-

tional drive to cut through the material. Should the drill 33, during its progress through the material being drilled, encounter a portion of increased density or toughness,—that is, should the drill meet with a resistance greater than the force of the frictional drive, there will be a slippage between the member 28 and the spindle 22, resulting in an automatically adjusted decrease in the speed of the drill. In this manner, although slower progress is being made through the material at the point of increased resistance, no undue strain will be induced within the drill as would be the case with a positive drive of fixed and unvariable speed.

I have found that very satisfactory results can be obtained by coating the end of spindle 22 with a film of oil. In this case not only is the life of the transmission mechanism increased due to the natural effects of lubrication, but sufficient driving force is transmitted to the chuck-carrying member 28 to effect efficient drilling operation. It is my belief that this phenomenon is produced by the fluid drag resulting from the hydrostatic pressure induced within the film of oil.

When the spindle is so lubricated, no air can pass between the lateral surface of the spindle and the contiguous portion of the wall of the axial hole. When the chuck-carrying member 28 is lowered into its operative position, the space in the axial hole 27 beneath the spindle 22 is filled with air; and when the said member 28 is raised, upon the completion of the drilling operation, the air in said space will tend to be compressed, but due to the presence of the channel 29 and the space 50 adjacent the chuck wedges, the air will be forced out therethrough, thereby permitting an easy raising and lowering of the said member 28.

Figure 4 represents a modification of my invention, illustrating the use of a rubber chuck 51 supporting the drill 52, the cap 53, enclosing and supporting the rubber chuck 51, being in threaded engagement with the stud 54 of the chuck-carrying member 55. A channel 56, positioned underneath the weight 57, communicates between the lower portion of the axial hole 58 and the atmosphere, there being no other hole analogous to 29 of Figure 2. The member 55 is fitted over the spindle 22 by a running fit, similar to that of the structure disclosed in Figure 2. The transmission mechanism constructed in accordance with Figure 4 has similarly proven effective, the theory of operation, according to my understanding thereof, being based upon the fluid drag principle, the fluid in this case being air. In other words, it is my belief that due to the rotation of the spindle 22, air is drawn in around the driving portion of the spindle downwardly and into the space in the axial hole 58 below the spindle, and then out into the atmosphere through the channel 56. The constantly moving film of air between the spindle and the wall of the axial hole results in sufficient fluid drag to cause a rotation of the chuck-carrying member and the operative movement of the drill.

It is of course understood that my invention consists of the mechanical combination of parts and the cooperable relation of the elements as hereinbefore described, my beliefs as to the theory of the action as hereinbefore set forth being only explanatory and not being any part of nor affecting the invention proper.

Although this invention has been illustrated and described as applied to a drill press, it is

within my contemplation that this device, particularly the transmission mechanism, can be equally applied to other tools or apparatus for the transmission of rotary motion and particularly where it is necessary to adjustably decrease the speed of the tool in accordance with variable resistances offered the tool; and it is likewise understood that other forms and modifications of my invention may be employed within the scope of the appended claims.

What I claim is:

1. In a drill press, a vertical spindle, means to rotatably actuate the spindle, a cylindrical chuck-carrying member adapted to be driven by said spindle, said member having therein a vertical axial hole within which an end portion of the spindle is slidably and rotatably positioned, an annular ridge about the member, a cylindrical weight removably mounted over said member and supported by said ridge said weight being adapted to slidably actuate the member downwardly along the spindle, a chuck attached to the said member, a drill secured to said chuck, a swingably mounted and vertically movable arm underlying and supporting the chuck and the superposed parts, manually operated means associated with said arm for imparting vertical movement to the arm and the parts supported thereby, and for swinging the arm out of engagement with the chuck.

2. In a drill press, a transmission mechanism comprising a spindle, means to rotatably actuate the spindle, a chuck-carrying member adapted to be driven by said spindle, said member having therein an axial hole within which an end portion of the spindle is slidably and rotatably positioned, an air film between the lateral surface of said spindle and the adjacent wall portion of said hole, an air channel within said member and below said spindle and communicating between said air film

and the atmosphere, pressure-exerting means in operative engagement with said member to actuate it slidably along said spindle and longitudinally in the direction of the work to be drilled; a stud at the bottom of said member; a chuck of yieldable material at the lower extremity of said stud; a cap supporting and enclosing said chuck and in threaded engagement with said stud; and a drill extending into and secured to said chuck and extending outwardly through said cap.

3. In a drill press, a vertical spindle, means to rotatably actuate the spindle, a cylindrical chuck-carrying member adapted to be driven by said spindle, said member having therein a vertical axial hole within which an end portion of the spindle is slidably and rotatably positioned, an annular ridge about the member, a cylindrical weight removably mounted over said member and supported by said ridge, said weight being adapted to slidably actuate the member downwardly along the spindle, a chuck attached to the said member, a drill secured to said chuck, a horizontally disposed arm underlying and supporting the chuck and the superimposed parts, a vertical rod suitably affixed to said arm, means for slidably and rotatably supporting said rod, a pivotally mounted lever, an arcuate arm joined to said lever intermediate the ends thereof, said latter arm containing a detent which is farther from the pivotal point of the lever than the juncture of said arcuate arm and lever, a roller affixed to said rod, means for yieldably holding said roller in operative engagement with said arcuate arm and the said detent, a handle for operatively actuating said lever to cause said arcuate arm to vertically move said roller and the attached rod, and a handle for rotatably moving said rod.

CAMILLO LANDRIANI.