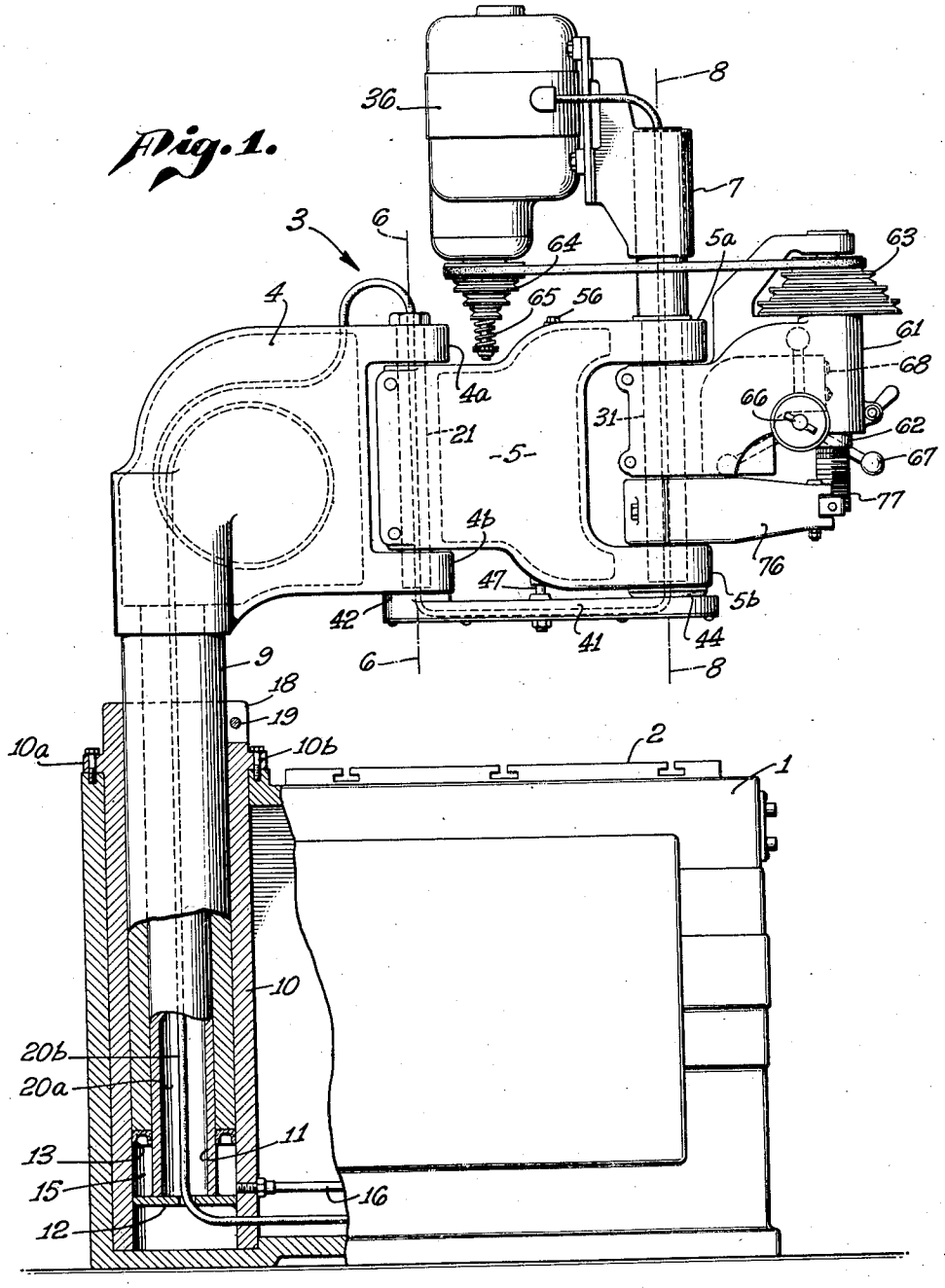
March 28, 1944. H. F. BAKEWELL 2,345,318

RADIAL PRECISION TAPPING MACHINE

Filed Oct. 10, 1942 4 Sheets-Sheet 1

Fig. 1.



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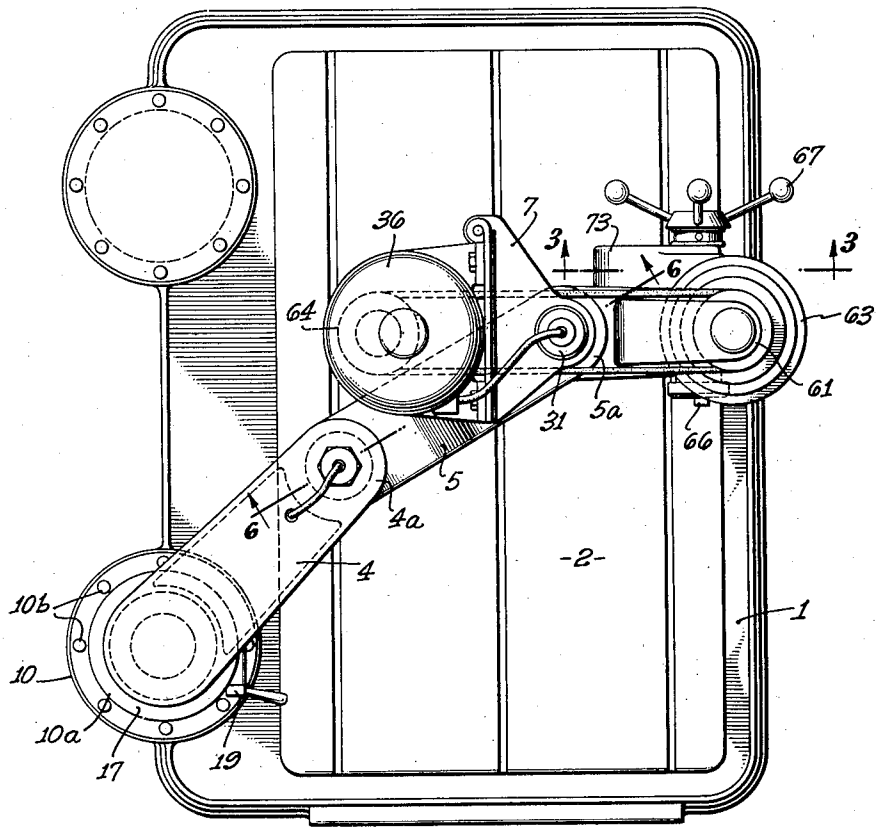
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RADIAL PRECISION TAPPING MACHINE

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Fig. 2.



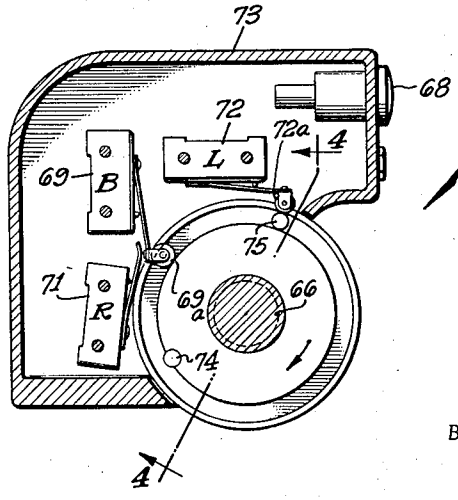


Fig. 3.

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RADIAL PRECISION TAPPING MACHINE

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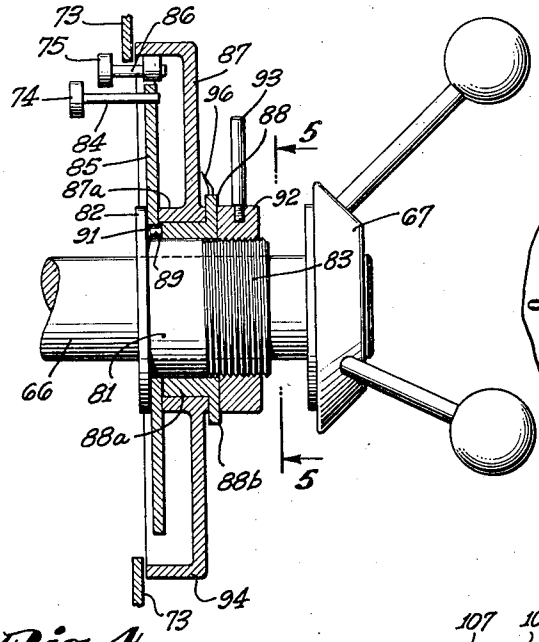


Fig. 4.

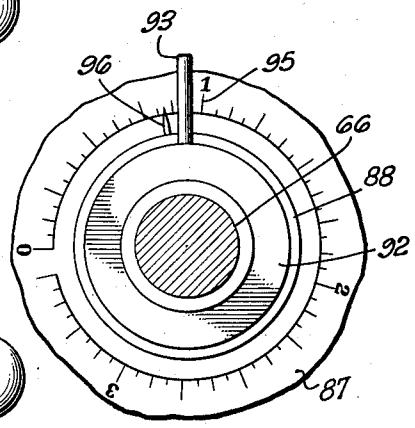


Fig. 5.

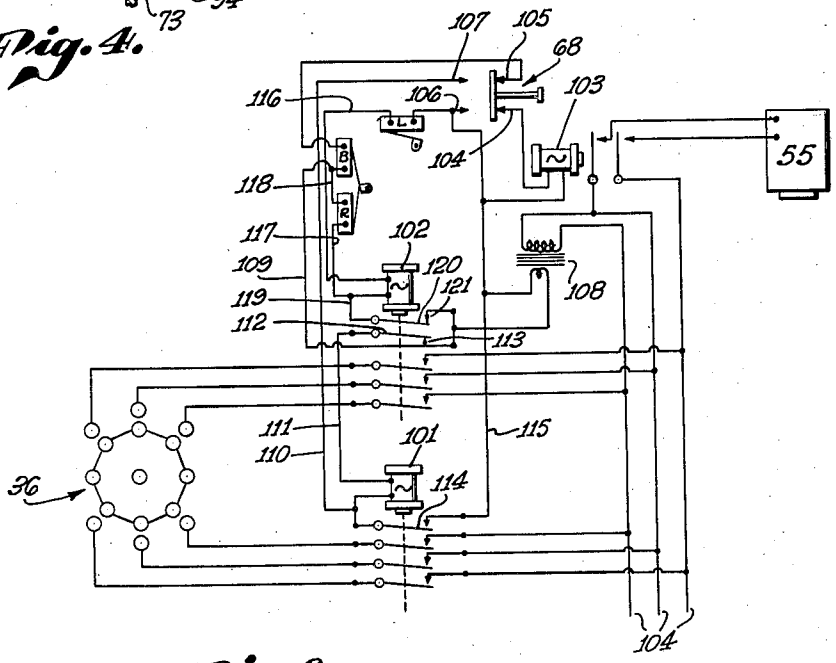


Fig. 8.

HARDING F. BAKEWELL,
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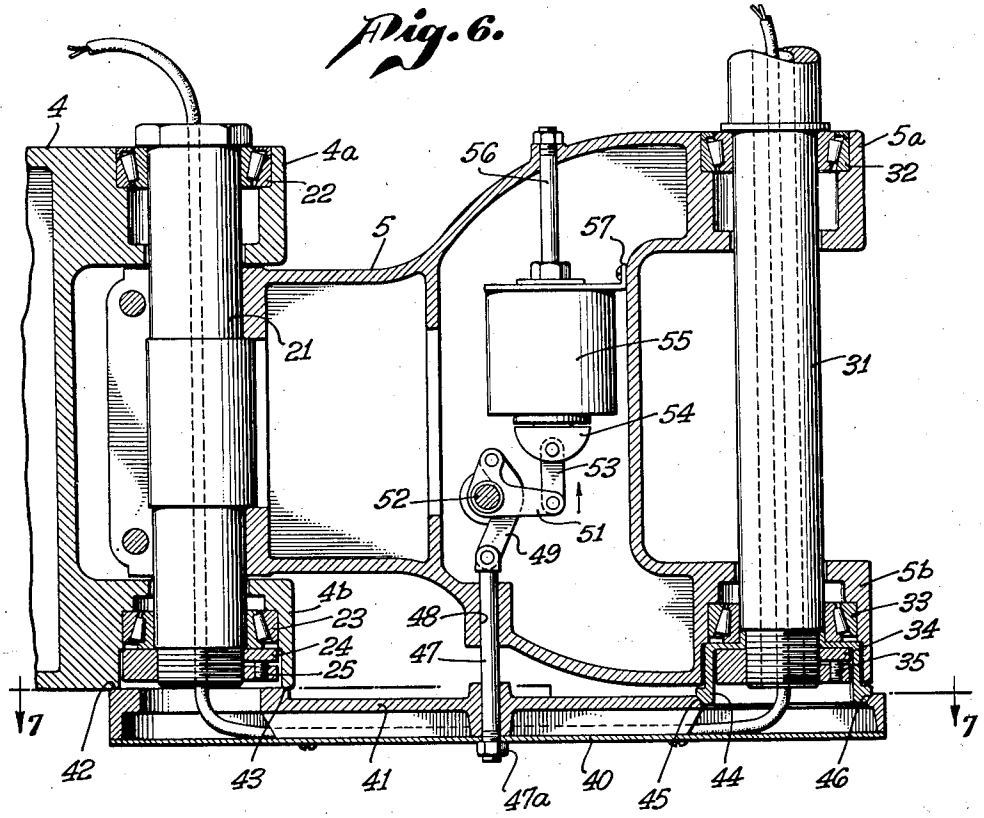
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March 28, 1944. H. F. BAKEWELL 2,345,318

RADIAL PRECISION TAPPING MACHINE

Filed Oct. 10, 1942 4 Sheets-Sheet 4

Fig. 6.



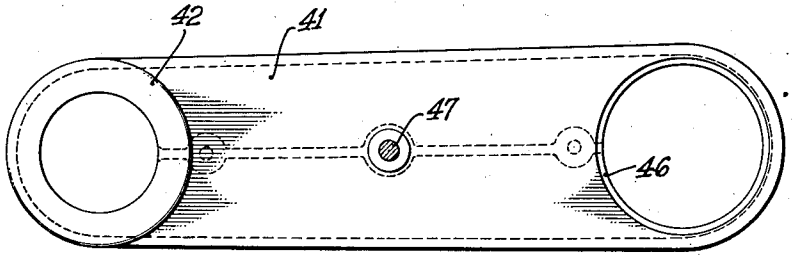


Fig. 7.

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Patented Mar. 28, 1944

2,345,318

UNITED STATES PATENT OFFICE

2,345,318

RADIAL PRECISION TAPPING MACHINE

Harding F. Bakewell, San Marino, Calif.

Application October 10, 1942, Serial No. 461,565

15 Claims. (Cl. 10—135)

This invention pertains to machine tools, and pertains particularly to a radial type of precision tapping machine such as is described and claimed in my issued Patents Nos. 2,253,492, 2,253,493 and 2,257,364.

Precision machine tools of the type set forth in the above named patents are adapted to effect the desired tapping operation, or the like, under conditions such that the work to be operated upon may be moved about relative to the power tool which is employed to effect the desired operation, which materially restricts the utility of the machine. The device of the present invention is of the so-called "radial" type, provided with a relatively large work-receiving bed or table portion, and in which the tool member is suspended above such table portion in such manner as to be capable of movement over substantially the full area of such table portion so that the desired operation may be carried out upon substantially any portion of the work which is mounted on such table. It is a common, and generally preferable practice, in such radial type machine tool, to mount the driving means (such as an electric motor or the like) in relatively fixed relation to the tool which is to be used in performing the desired operation, thereby rendering the drive mechanism of maximum simplicity.

In view of the above, therefore, one of the particular objects of this invention is to provide a radial type of precision machine tool provided with a work-supporting table member, and an overhead tool structure adapted for pivotal movement over a substantial proportion of the area of such work-supporting member.

A further object of the invention is to provide a device of the character described, in which the work-performing member is mounted for pivotal movement with respect to a relatively fixed support arm, and is provided with a drive means adapted to effect the desired operation of the work-performing member, together with means for interlocking the pivotally movable part whenever such drive means is placed in operation, whereby the torque effect or the starting reaction of such drive means is prevented from reacting upon the work-performing member.

A further object of the invention is to provide a precision machine tool having a work-supporting table member and an overhead tool structure mounted on an improved form of hydraulic elevator means.

A further object of the invention is to provide a radial type of precision machine tool having a work-supporting table member and an overhead tool structure adapted for pivotal movement over a substantial proportion of the area of such work-supporting member, in which the overhead tool structure is comprised of a plurality of support portions which are pivotally interconnected and the structure is provided with an improved form of hydraulic elevator means, the hydraulic elevator means and the tool portions defining the axes of pivotal movement of the overhead tool structure being of tubular construction whereby electrical conduit means may be extended through the elevator construction and within the tubular members defining the pivotal axes from the base portion of the device adjacent the work-supporting table member to the machine tool carried by the overhead tool structure.

The above and other objects of the invention will be apparent from or will be brought out specifically in connection with the ensuing description of a preferred embodiment of the invention illustrated in the accompanying drawings, in which:

Fig. 1 is a partly broken away end elevation of a radial tapping machine according to this invention;

Fig. 2 is a plan view thereof;

Fig. 3 is a sectional detail of the device, as taken on line 3—3 in Fig. 2;

Fig. 4 is a transverse section taken on line 4—4 in Fig. 3;

Fig. 5 is a further section taken on line 5—5 in Fig. 4;

Fig. 6 is a vertical section taken along line 6—6 in Fig. 2, on somewhat enlarged scale;

Fig. 7 is a transverse detail thereof taken on line 7—7 in Fig. 6; and

Fig. 8 is a schematic wiring diagram which may be employed for operation of the above illustrated machine tool, utilizing the features of this invention.

Referring to the drawings, Figs. 1, 2 and 6 in particular, the device is shown as provided with a base portion 1 having a horizontal work-bed 2 and an elevated articulated tool-carrying structure 3 comprising a support arm 4 constituting a main frame member, a pivot arm 5 pivotally mounted to the support arm 4 for rotation about a vertical axis 6 and constituting a secondary frame member, and a combined spindle-frame and motor-carrying member 7 pivotally mounted at the forward end of the arm 5 for rotation about a vertical axis indicated at 8. The elevated structure 3 is provided with a downwardly extending tubular piston member 9 slidably mounted within a cylinder member 10 secured to the

base 1 in any suitable manner as through the agency of a flanged portion 10a and screws 10b. Interiorly of the tubular piston member 9 I provide a tubular internal cylinder wall 11 made integral with the outer cylinder 10 as by welding to a cross plate member 12. A suitable cup member, of annular shape, is provided as at 13 for the lower end of the tubular piston member 9, and fluid is supplied to or withdrawn from the cylinder space 15 through a line 16 communicating with a suitable fluid pressure device, such as a gear pump or the like, driven by an electric motor under the control of the operator. The fluid pressure supply means for the structure may be of any of the types which are well known in the art, and is not illustrated herein. It will be appreciated that the tubular piston member 9 may be freely rotated within the outer cylinder 10, so as to change the angular position of the support arm 4, and I preferably provide means for locking the assembly in any desired angular position, as by splitting the upper end 17 of the outer cylinder 10 as at 18, and extending a threaded bolt type of lock therethrough, as indicated at 19. The inner cylinder defined by the wall member 11 will define a passage 20a with the tubular piston member 9, through which passage an electrical conduit 20b may extend for supply of current to the tool driving means.

As shown more particularly in Fig. 6, the arm member 5 may be pivotally mounted upon the relatively fixed support arm or main frame member 4 through the agency of forwardly extending upper and lower arm portions 4a and 4b through which a shaft member 21 rigidly attached to the arm portion 5 is extended. Suitable upper and lower bearings are provided as at 22 and 23, and the shaft member 21 being secured in place through the agency of a lock nut 24 provided with a lock screw 25.

The spindle-frame and motor-carrying member 7 is similarly mounted on the forward end of the support arm or secondary frame portion 5 through the agency of a shaft member 31 mounted within upper and lower projecting arm portions 5a and 5b of the member 5 through the agency of upper and lower bearings 32 and 33 and lock nut 34, which is held in position through the agency of a lock screw 35. The shaft members 21 and 31 are preferably of tubular construction whereby the conduit 20b may be carried through the device up to the position of the drive motor, for example, to eliminate any tendency for the conduit to become twisted or entangled upon pivotal movement of the articulated tool-carrying structure.

In order to provide the desired breaking effect to render the members 4, 5 and 7 substantially rigid with respect to one another when the drive motor 36 is turned on or reversed in direction, I preferably provide a clamp member 41 mounted on the member 5 and adapted to immobilize and interlock the members 4, 5 and 7 against pivotal movement about the axes 6 and 8. For this purpose the clamp or braking member 41 is provided with a shoe portion 42 concentric with the shaft 21 and adapted to bear against the lower face of the arm portion 4b of the support arm 4, as at 43. The outer end of the arm 5 carries the rotatably disposed shaft 31, and the brake member 41 is adapted to engage the shaft 31 to immobilize the member 7. For this purpose I provide a circular sleeve member 44 at the lower end of the shaft 31 which is constrained to rotate with such shaft, the member 44 being provided at its lower end with a conical face 45 adapted to be engaged by a coactingly shaped seat 46 formed in the outer end of the brake member 41. The brake member 41, in the braking action, is required to be moved upwardly into engagement with the area 43 and the face 45 at the inner and outer ends of the support arm 5, respectively, and this movement is conveniently effected through the agency of a pull rod 47 slidably mounted as at 48 on the arm 5, the pull rod 47 being connected through links 49 and 51 to a pull link 53 connected to the movable armature 54 of a solenoid 55. The link 51 which is pivotally connected to links 49 and 53 is conveniently mounted for pivotal movement as at 52, whereby upon upward movement of the armature 54 to the position shown, the counterclockwise rotation of the link 51 will lift the link 49 and the thereto-connected pull rod 47, lifting the braking member 41 to the position illustrated in Fig. 6. The solenoid 55 may be secured to the arm 5 as at 56 and 57.

In Figs. 3, 4 and 5 I have illustrated a control mechanism which may be employed to control the operation of the solenoid 55 with respect to the operation of the motor 36. This control mechanism is mounted at one side of the spindle-frame 61 carrying a spindle 62 provided with a pulley 63 which may be belt-connected to a pulley 64 mounted on the drive shaft of the motor 36.

A suitable friction clutch means is indicated at 65 which acts as an overload release device in the event that the tool carried by the spindle 62 is overloaded for some reason, thereby preventing damage to the tool or the work.

The spindle-frame 61 is provided with a conventional rack-and-pinion elevating and depressing device, the pinion shaft 66 therefor terminating in a hand wheel 67. The control mechanism for operating the solenoid 55 comprises a plurality of switches which are in part under the control of the operator and in part directly actuated by rotation of the pinion shaft 66. Referring to Fig. 3 a thumb switch 68 is provided in convenient position for access by the operator for controlling the initial operation of the electric motor. Associated with the switch 68 are three switch members 69, 71, and 72, which may be of the so-called "micro-switch" type, mounted on a housing portion 73 forming a part of the spindle frame 61. As shown in Fig. 3, the switch 69 will be employed as a solenoid-actuating switch, the switch 71 will be employed as a reversing switch for the motor 36, and the switch 72 will be employed as a disconnecting or "limit" switch which will interrupt the operation of the motor 36 when the spindle has been returned to its upper or inoperative position. Actuating means for securing operation of the switches 69, 71, and 72 are provided on the pinion shaft 66, the actuating member for the switches 69 and 71 being indicated at 74, and the actuating member for the switch 72 being indicated at 75. The solenoid and reverse control mechanism for the motor 36 is adapted to energize the motor 36 in its normal or cutting direction at the start of an operation, after which the operation of the tool carried by the spindle 62 is carried to a complete cycle without further attention on the part of the operator. As described in connection with my above-mentioned patents, when the drive motor 36 is energized a clamp member 76 is closed upon a lead screw 77 which carries a tap member or the like not shown. The lead screw 77 has a lead thread upon it which corresponds to the

thread of the tap with which it is associated, and rotation of the lead screw 77 will carry the spindle 62 downwardly. When the tap or other tool has reached the bottom position the motor 36 should be reversed and the tap backed out of the work. When the motor 36 is originally started to rotate the tap downwardly into the work, the reaction resulting from the starting of the motor will tend to swing the arm assembly 3 to one side. For this reason the magnetic brake is applied immediately before the motor 36 is energized and released as soon as the motor is brought up to speed. Similarly, when the motor is reversed at the lowermost position of the tap, the stopping of the motor and re-starting in the reverse direction will tend to produce a swinging of the support arm assembly, and the magnetic brake is again actuated to render the structure rigid at this moment.

Referring to Fig. 3, when the shaft 66 is rotated in a clockwise direction the actuating member 75 will fall off the roller 72*a* of the switch 72 and the actuating member 74 will approach the position of the roller 69*a* which is mounted on the actuating arm of the switch 69. A single roller 69*a* may be employed to actuate both the switches 69 and 71, the switch 69 being adapted to operate first, followed by the operation of the switch 71. The actuating member 74 will be spaced angularly in such a position that it will operate the switch 69 when the tap is about one thread from the bottom of its lowermost position, and the reversing switch 71 will then be actuated immediately thereafter. The immediate reversal of the motor 36 then will rotate the shaft 66 in a counter-clockwise position, backing the actuating member 74 off the roller 69*a*, de-actuating the switch 69, and when the spindle 62 has been raised to its uppermost position, the actuating member 75 will engage the roller 72*a* and actuate the switch 72, stopping the motor 36. The switch 72 thus constitutes a limit switch and is for that reason marked L on the drawings. Similarly, the switch 69 is the braking switch and is marked B and the switch 71 is the reversing switch and is marked R.

In Figs. 4 and 5 I have illustrated the construction of a control mechanism which can be employed to position the actuating members 74 and 75 in the correct angular relation to the rollers 69*a* and 72*a* for a given operational problem, and referring thereto the shaft 66 and the hand wheel 67 are shown as provided with a sleeve portion 81 keyed or otherwise secured to the shaft 66, the sleeve 81 being provided with a shoulder portion at its inner end at 82 and being threaded at its outer end at 83. The actuating member 74 is mounted on pin 84 carried by a disc 85 rotatably mounted on the sleeve 81 and adapted to bear against the shoulder 82. The actuating member 75 is mounted on a pin 86 which is carried by a disc 87. Outwardly of the disc 85 I provide a locking sleeve 88 which is rotatably mounted on the sleeve 81 and is keyed to the disc 85 through the agency of a pin or the like 89 extending into an opening 91 of the disc 85. The locking sleeve 88 comprises a hub portion 88*a* and a flange portion 88*b*, and the disc 87 is provided with a hub portion 87*a* bearing on the exterior of the hub portion 88*a* of the locking sleeve 88. The axial length of the hub portion 87*a* is such that when the flange portion 88*b* of the locking sleeve 88 is forced inwardly, the hub 87*a* will be securely gripped between the inner face of the flange 88*b* and the outer face of the disc 85. The locking sleeve 88 is forced inwardly through the agency of a lock collar 92 threadedly mounted on the sleeve 81, and provided with an operating lever or handle 93. It will be apparent that if the lock collar 92 is backed off the threaded portion 83, the parts 85, 87*a* and 88 will be frictionally disengaged, whereupon the disc 85 or 87 may be rotated manually to any desired setting, after which the lock collar 92 is tightened and the parts are retained in their established position. The disc 87 is preferably provided with an outer cylindrical surface portion 94 which may conveniently be graduated in inches, centimeters or the like, and a suitable marker or index member (not shown) may be provided on the spindle frame 61. Similarly the outer face of the disc 87 may be provided with a scale such as indicated at 95 in Fig. 5, and a coacting pointer may be provided as at 96 on the locking sleeve 88, which is keyed to the disc 85. In adjusting the device the tap may be run down manually until it is just ready to enter the hole to be tapped, at which time the disc 87 may be set to zero on the first mentioned pointer or index member which is mounted on the spindle-frame 61. Assuming that the tap is to be run down into the hole a distance of 27/32", the pointer 96 will be set at the position indicated in Fig. 5. The locking collar 92 is then screwed up to establish discs 87 and 85 in close frictional engagement with one another, and the control device is adapted, when set as above, to actuate the switch B just before reaching the 27/32" position, followed by an actuation of the switch R, followed by a de-actuation of the switch B. When the spindle is raised up to the zero position corresponding to the top of the hole, the switch L will be actuated and the motor 36 deenergized.

I have illustrated in Fig. 8 a suitable electrical circuit which may be employed for the control of the electrical motor circuit and the solenoid circuit. The switches 69, 71 and 72 are indicated at B, R and L respectively, and the solenoid 55 is shown schematically. As above described, the motor 36 is of a reversing type, and is preferably one which operates at different speeds in the two directions. For example, during the work operation the rotation of the motor will be such as to rotate the tap downwardly into the work, and the motor will be driven at a desired operating speed; upon reversal, the motor may be driven at a materially higher speed in the return direction in order to expedite the withdrawal of the tap from the hole. For this reason the motor 36 is illustrated as being the three phase type, provided with separate windings for the two speeds and two directions of operation. Separate relays are provided for actuating the motor in its two directions of operation, as at 101 and 102, the relay 101 being adapted to connect the motor for downward movement of the spindle 62 and the relay 102 being adapted to energize the motor for upward or return movement thereof.

A third relay 103 is provided for control of the operation of the solenoid 55. The relays 101 and 102 are adapted to supply current to the respective fields of the motor 36 when they are energized, and the relay 103 is adapted to supply current to the solenoid 55 when it is deenergized. The main three-phase power supply lines are indicated at 104. The relay 101 may be a four-pole single-throw relay, three poles of which are connected to the respective leads of the power supply lines 104 and the fourth pole and armature member of which is employed to maintain

the relay in energized condition after its closing motion has been instituted through the agency of the thumb or finger switch 68. The finger switch 68 is a two-pole double-throw switch providing a normally closed circuit defined by the contacts 104 and 105 and a normally open circuit defined by the contacts 106 and 107. A transformer 108 is provided for the supply of local operating current for the relays 101, 102 and 103, and current is normally supplied to the coil of relay 103 from one side of this transformer through the contacts 104 and 105, thence through the switch B thence back through line 109 to the opposite side of the transformer 108. In this normally energized condition of relay 103 the contacts thereof are held in open position, interrupting the current supply circuit for the solenoid 55. With the switch 68 in the position illustrated in the drawings, which would be the normal or rest position of the switch, the relays 101 and 102 are deenergized, and the relay 103 is energized. In this condition the motor 36 is deenergized, and the circuit to the solenoid 55 is held open. When the operator pushes in the thumb button of the switch 68 the circuit between 104 and 105 is broken, deenergizing the relay 103 and allowing the associated contacts to close, closing the circuit to the solenoid 55. In this condition the magnetic brake 41 is brought securely up against the support arm 4 and the arm 5, locking the radial overhead arm assembly securely in the position which has been established by the operator. When the operator presses the thumb button of the switch 68, moving such switch to its inner position, shorting the contacts 106 and 107, current is supplied from the one side of the transformer 108 across the contacts 106 and 107 thence through line 110, through the coil of the relay 101 thence back through line 111 to armature 112 of the relay 102 thence through contact 113 to the other side of the transformer 108. The circuit for the coil of the relay 101 is thus closed, actuating this relay, energizing the motor 36 in one direction of rotation, and supplying current directly from the one side of the transformer 108 to the armature 114 from line 115 to the coil of the relay 101 thence through line 111 through armature 112, contact 113 to the other side of transformer 108. This serves to hold the relay 101 in actuated or energized condition, maintaining the current supply to the motor 36. Upon release of the switch 68 by the operator, the circuit for the coil of the relay 103 is again energized, and the solenoid 55 is deenergized, releasing the clamp member 41. In this condition the tool-supporting assembly may "float" as the tap or other tool progresses downwardly into the work.

Operation of the device and the accompanying clockwise rotation of the shaft 66 as shown in Fig. 3 resulting from downward travel of the spindle 62 will bring the actuating member 74 upwardly into engagement with the roller 69a, as above described, when the tap is about one thread from the bottom of the hole. Actuation of the roller 69a will cause the circuit for the relay 103 to be broken at the switch B, the switch B being a "normally closed" switch. The deenergization of the coil of the relay 103 thus causes a reenergization of the solenoid 55, in the same manner as described in connection with the first part of the operation of the switch 68, and the magnetic brake 41 is clamped into position. As the motor 36 continues to rotate, rotating the actuating member 74 further ahead in a clockwise direction, the roller 69a will be pressed outwardly a sufficient distance to cause actuation of the switch 71 (indicated at R). The switch R is a "normally open" switch, and the actuation thereof will cause a completion of the circuit to the coil of relay 102 in the following manner: connection from the one side of the transformer 108 is made through the switch L (which is a "normally closed" switch) thence through line 116 to one side of the coil of the relay 102 thence to the switch R through line 117 thence to line 109 through lead 118 and through to the other side of the transformer 108. Upon operation of the relay 102 the circuit for the coil of relay 101 is immediately broken by separation of the armature 112 from the contact 113. The deenergization of the relay 101, breaking the circuit to the motor 36 precedes slightly the closing of the three-pole contact group of the relay 102 which supplies current from the leads 104 to the other field coil of the motor 36. The motor is thus immediately reversed upon completion of the operation of the relay 102, and the return circuit for the coil of the relay 102 which had gone through the switch R thence to the other side of the transformer 108 is now established directly through branch line 119, armature 120 and contact 121. As soon as the actuating member 74 is backed away from the roller 69a a sufficient distance to close the switch B, the circuit for the coil of the relay 103 is reestablished, opening the contact in the power circuit for the solenoid 55 thus releasing the magnetic brake 41. As the shaft 66 is rotated counter-clockwise, bringing the actuating member 75 toward the roller 72a of the switch L, the tap is backed out of the threaded hole which was previously formed. When the actuating member 75 actuates the switch 72, which is a normally closed switch, the current supply through switch L and line 116 to the coil of the relay 102 is interrupted, thus deenergizing the coil 102 and opening the circuit to the motor 36.

The above specific example of a wiring diagram for use in connection with the construction of the present invention will be appreciated as being given only by way of example. Other useful circuits will be visualized by one skilled in the art, and I do not choose to be limited to the specific arrangement of electrical parts and circuits which I have illustrated. Similarly the control mechanism illustrated in Figs. 3, 4 and 5 will not be considered as peculiar to the apparatus of this invention, but rather as illustrative of a suitable control means which is useful in connection therewith. For the above and other reasons, therefore, I do not choose to be limited to the specific embodiments of the invention herein delineated and described, but rather to the scope of the subjoined claims.

I claim:

1. A radial type machine tool which comprises: a base portion provided with a work-supporting table member; an articulated overhead tool-carrying structure pivotally mounted on said base portion and provided with a pivotally mounted outer frame portion carrying a tool member and rotative drive means therefor arranged in such relation to the axes of pivotal movement of said articulated structure as to inherently cause an inertia reaction tending to produce movement of said articulated structure and displacement of said tool member upon initiation of the rotation of said drive means, said rotative drive means

comprising an electric motor; brake means adapted to engage the articulated portions of said overhead tool-carrying structure including said outer frame portion and render the same rigid at the position of the axes of pivotal movement; brake actuating means operatively connected to said brake means; and control means adapted to cause operation of said actuating means to bring said brake means into such engagement immediately prior to the energization of said electric motor.

2. A radial type machine tool which comprises: a base portion provided with a work-supporting table member; an articulated overhead tool-carrying structure mounted on said base portion and comprising a main frame member, a secondary frame member pivotally mounted on said main frame member for movement about one axis, and an outer frame portion pivotally mounted on said secondary frame member for movement about another axis and carrying a tool member and rotative drive means therefor arranged in such relation to said axes as to inherently cause an inertia reaction tending to produce movement of said articulated structure and displacement of said tool member upon initiation of the rotation of said drive means; brake means mounted on said secondary frame member and movable into and out of position to engage said main frame member and said outer frame portion to thereby rigidly interlock said articulated structure against pivotal movement at both of said axes; and actuating means operable to move said brake means to said position.

3. A radial type machine tool as set forth in claim 2, said rotative drive means comprising an electric motor, and said tool comprising in addition control means adapted to cause operation of said actuating means immediately prior to the energization of said electric motor.

4. In a radial type power tool provided with a relatively fixed main frame member, a relatively movable secondary frame member pivotally mounted on said main frame member, and a frame portion pivotally mounted on said secondary frame member, said frame portion carrying a tool member and rotative drive means therefor arranged in such relation to the axes of pivotal movement of said tool structure as to inherently cause an inertia reaction tending to produce a displacement of said tool member upon initiation of the rotation of said drive means, a brake means adapted to render such pivotal mounting rigid, which comprises: a clamp member mounted on said secondary frame member and adapted for movement between two positions with respect thereto, said clamp member being provided with portions adapted to engage said main frame member and said frame portion when located in one of said positions with respect to said secondary frame member, and to move out of engagement with said main frame member and said frame portion when moved toward the other of said positions.

5. A radial type machine tool which comprises: a base portion provided with a work-supporting table member; means defining a hydraulic elevator secured to said base portion and provided with a movable piston member; a support arm secured to said piston member; a pivot arm pivotally mounted to said support arm for rotation about a vertical axis; a frame member carrying a tool member and rotative drive means therefor, said frame member being pivotally mounted on said pivot arm for rotation about a second vertical axis; a clamp member secured to said pivot arm and adapted for movement between two positions with respect thereto, said clamp member being provided with portions adapted to frictionally engage said support arm and said frame member when in one of said positions with respect to said pivot arm and to move out of engagement with said support arm and said frame member when moved out of said one position toward the other of said positions, and actuating means adapted to move said clamp member from said other position to said one position.

6. The construction set forth in claim 5, said rotative drive means comprising an electric motor, and said construction comprising in addition control means adapted to cause operation of said actuating means immediately prior to the energization of said electric motor.

7. The construction set forth in claim 5, said hydraulic elevator being defined by two concentric tubular members defining an annular hydraulic cylinder, and said piston member being of tubular shape and slidably disposed within said cylinder, the inner one of said two concentric tubular members defining with said tubular piston member an elongated passage extending from within said base member to a position exteriorly of said piston member.

8. The construction set forth in claim 5, said hydraulic elevator being defined by two concentric tubular members defining an annular hydraulic cylinder, said piston member being of tubular shape and slidably disposed within said cylinder, the inner one of said two concentric tubular members defining with said tubular piston member an elongated passage extending from within said base member to a position exteriorly of said piston member, said rotative drive means comprising an electric motor, and said construction comprising in addition conductor means providing current supply for said electric motor extending through said elongated passage from within said base member to said electric motor means.

9. The construction set forth in claim 5, said vertical axes being defined by tubular members and said hydraulic elevator being defined by two concentric tubular members defining an annular hydraulic cylinder, and said piston member being of tubular shape and slidably disposed within said cylinder, the inner one of said two concentric tubular members defining with said tubular piston member an elongated passage extending from within said base member to a position exteriorly of said piston member.

10. The construction set forth in claim 5, said pivot arm being mounted on said support arm by means of a tubular shaft and said frame member being mounted on said pivot arm by means of a second tubular shaft, said vertical axes being defined by said tubular shafts, and said hydraulic elevator being defined by two concentric tubular members defining an annular hydraulic cylinder, and said piston member being of tubular shape and slidably disposed within said cylinder, the inner one of said two concentric tubular members defining with said tubular piston member an elongated passage extending from within said base member to a position exteriorly of said piston member, and said rotative drive means comprising an electric motor, the construction further comprising conductor means defining current supply means for said electric motor extending from within said base member through said elon-

gated passage thence downwardly through the tubular member defining said first-named vertical axis thence upwardly through the tubular member defining said second-named tubular axis.

11. A radial type precision machine tool which comprises: a base member provided with a work-supporting table portion; two concentric tubular members secured to said base member and defining an annular hydraulic cylinder; a tubular piston member slidably disposed within said cylinder; an overhead tool structure secured to said piston member and provided with a tool member and rotative drive means therefor; and fluid pressure supply means associated with said cylinder.

12. A construction set forth in claim 11, said rotative drive means comprising an electric motor, and the inner one of said two concentric tubular members defining with said tubular piston member an elongated passage extending from within said base member to a position exteriorly of said piston member, and comprising in addition conductor means extending within said passage from within said base member to said electric motor means.

13. A radial type power tool which comprises: a relatively fixed main frame member; a relatively movable secondary frame member pivotally mounted on said main frame member; a frame portion pivotally mounted on said secondary frame member; a power tool provided with a rotative drive means therefor including electric motor means mounted on said frame portion; a clamp member movably mounted on said secondary frame member in position to engage said main frame member and said frame portion; electro-responsive actuating means adapted to effect movement of said clamp member into such engagement upon energization; first switch means associated with said drive means and adapted to cause energization thereof, and second switch means in cooperative relation to said first switch means and adapted to cause energization of said actuating means prior to the energization of said rotative drive means resulting from operation of said first switch means.

14. A radial type power tool which comprises: a relatively fixed main frame member; a relatively movable secondary frame member pivotally mounted on said main frame member; a frame portion pivotally mounted on said secondary frame member; a power tool mounted on said frame portion, said power tool including a rotatable and axially movable member; rotative drive means for said power tool including electric motor means mounted on said frame portion; a clamp member movably mounted on said secondary frame member in position to engage said main frame member and said frame portion to interlock the same against relative movement; electro-responsive actuating means adapted to effect movement of said clamp member into engaging position upon energization; cooperating switch means controlling the energization of said electric motor means and said actuating means, said switch means being adapted to cause energization of said actuating means slightly in advance of the energization of said electric motor means, and being further adapted to deenergize said actuating means slightly after the energization of said electric motor means.

15. The structure set forth in claim 14, said switch means further comprising reversing switch means adapted to cause rotational reversal of said electric motor means upon axial movement of said axially movable member to a given position, and being further adapted to cause energization of said actuating means slightly in advance of the reversal of such motor means, and to cause deenergization of said actuating means slightly after such reversal.

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