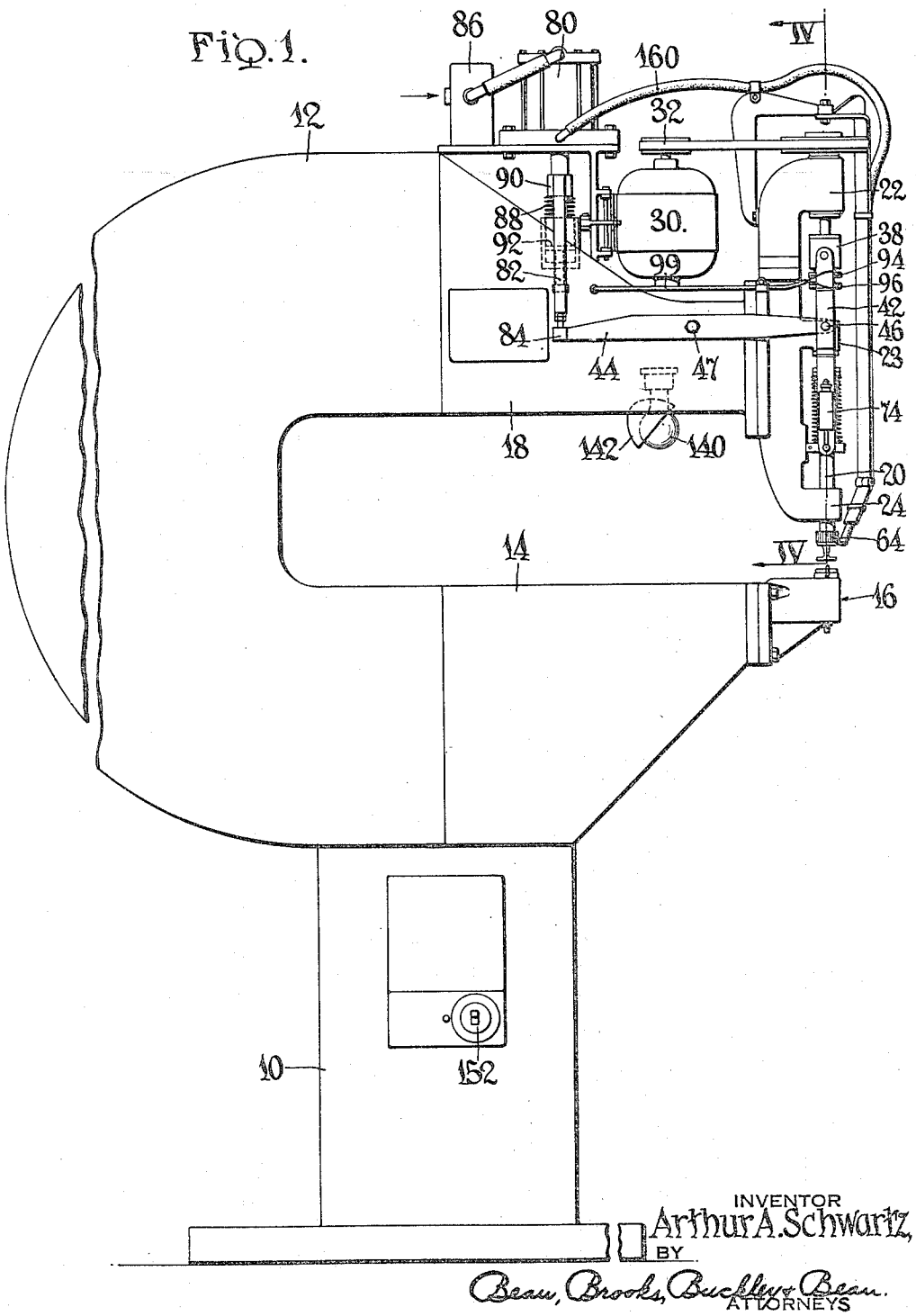
Feb. 3, 1942. A. A. SCHWARTZ 2,271,717

COUNTERSINKING AND BLIND DRILLING MACHINE

Filed Aug. 3, 1940 4 Sheets-Sheet 1

Fig. 1.



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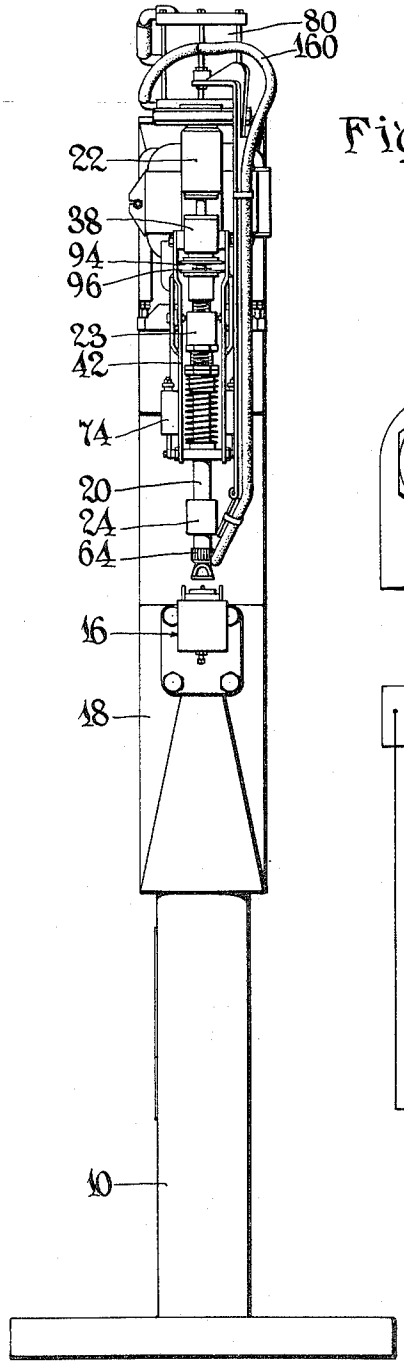


Fig. 2.

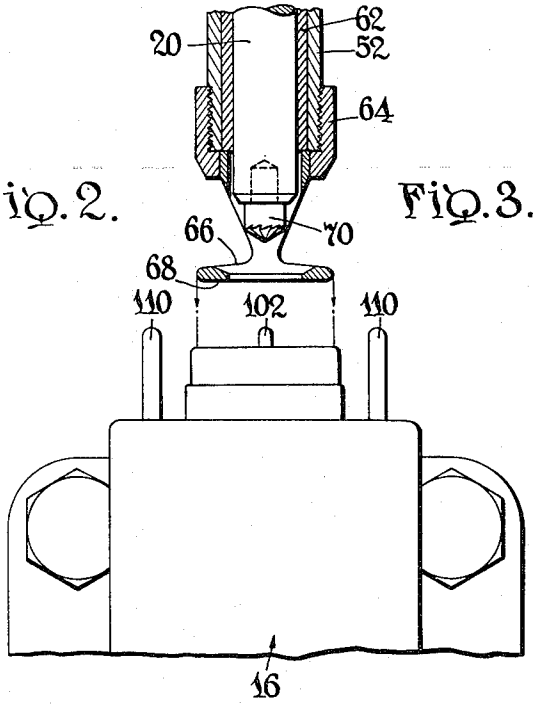


Fig. 3.

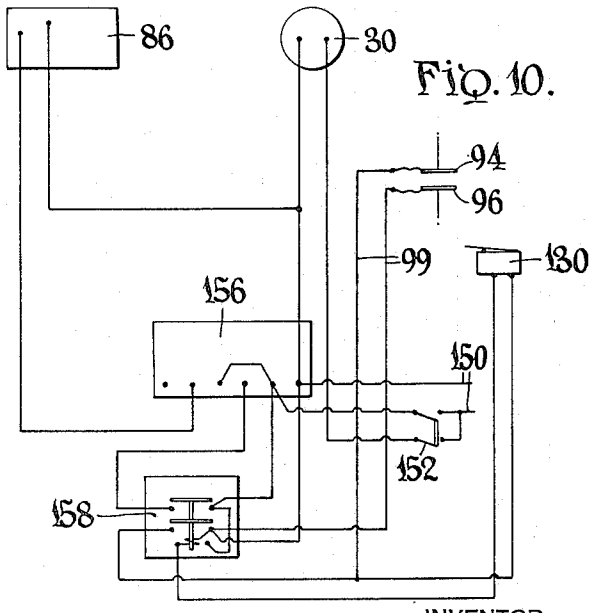


Fig. 10.

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COUNTERSINKING AND BLIND DRILLING MACHINE

Filed Aug. 3, 1940 4 Sheets-Sheet 3

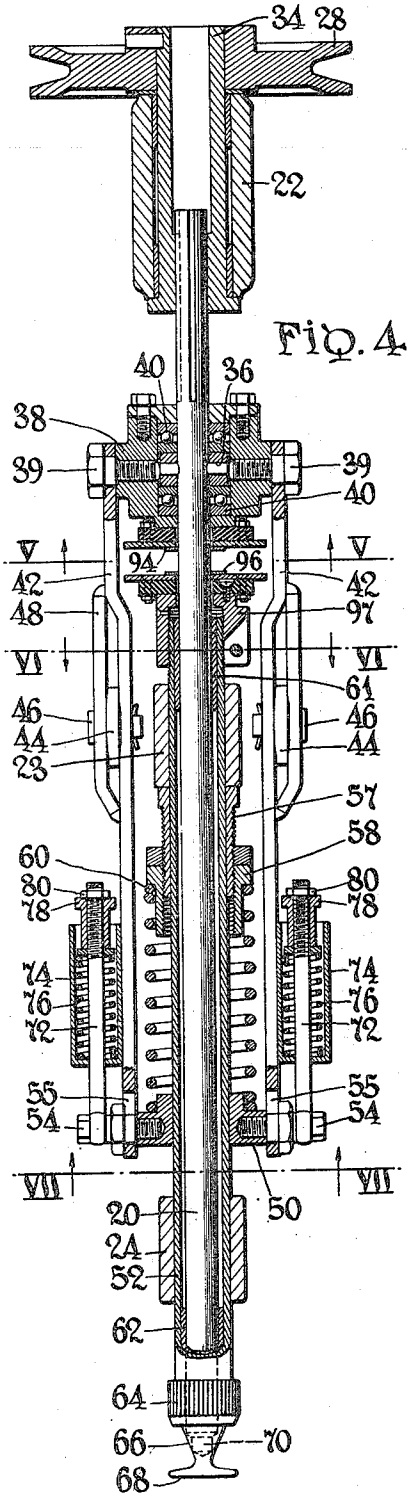


Fig. 4.

Fig. 5.

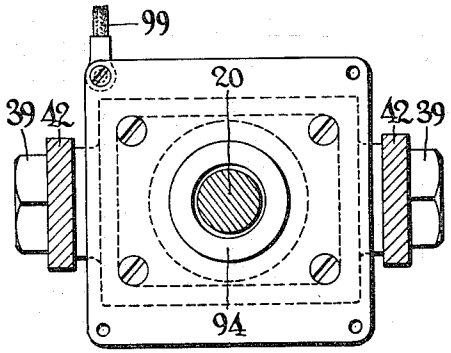


Fig. 6.

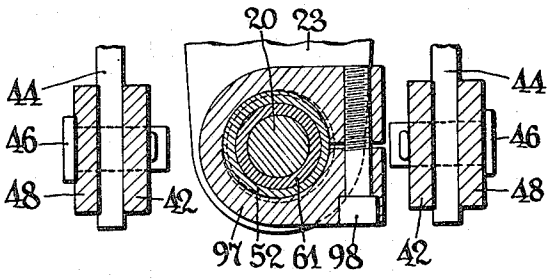
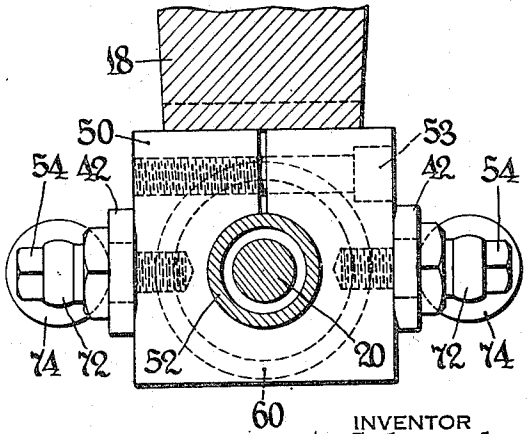


Fig. 7.



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Fig. 8.

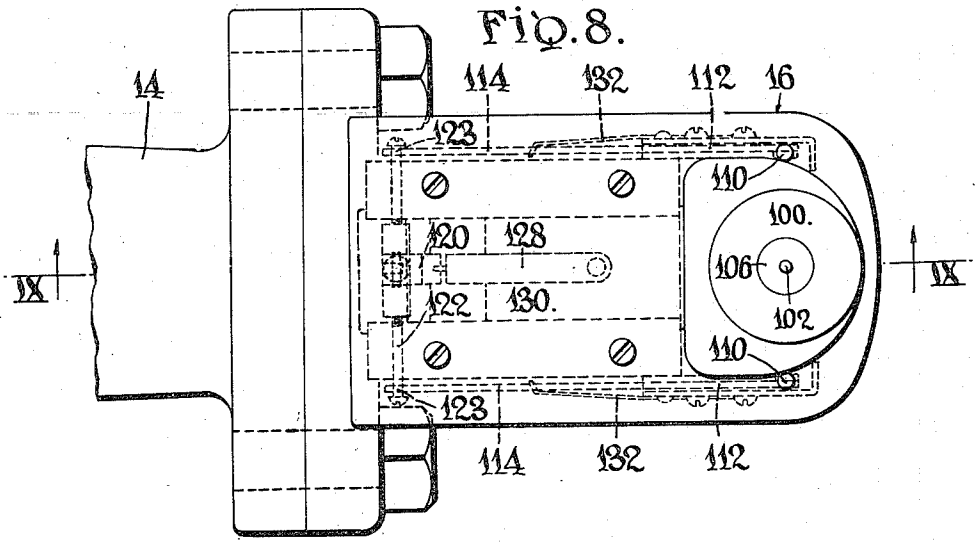
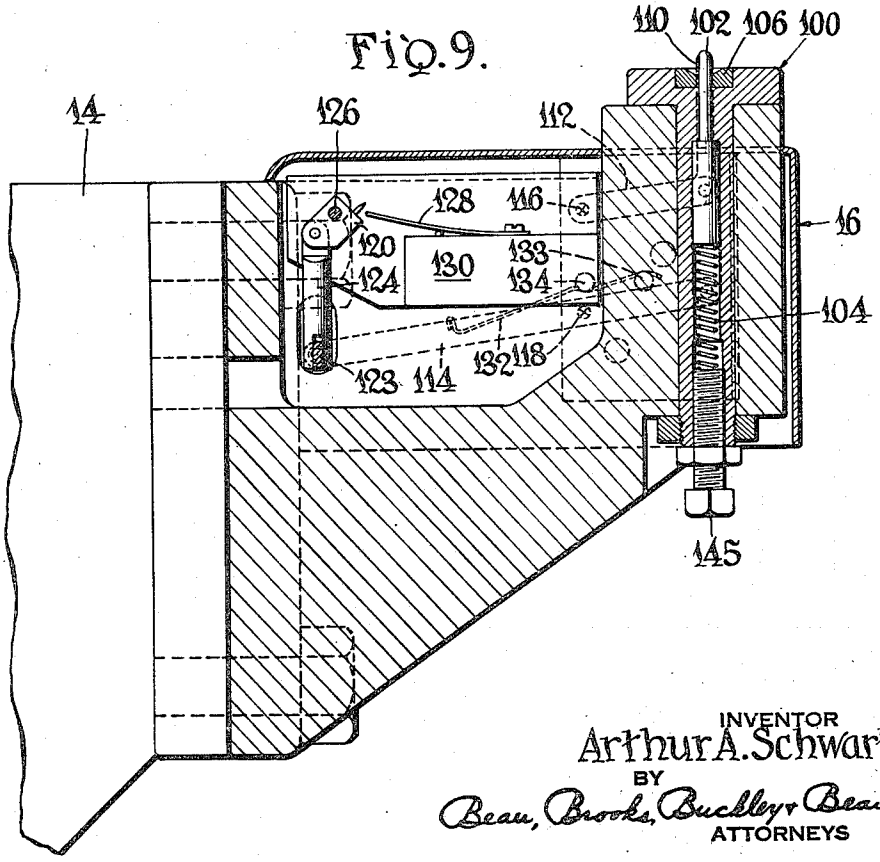


Fig. 9.



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Patented Feb. 3, 1942 2,271,717

UNITED STATES PATENT OFFICE

2,271,717

COUNTERSINKING AND BLIND DRILLING MACHINE

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Application August 3, 1940, Serial No. 350,221

15 Claims. (Cl. 77—5)

This invention relates to countersinking and blind drilling machines, and has for one of its objects the provision of a machine of simplified and improved construction that is particularly adaptable to semi-automatic production methods wherein the work pieces are to be drilled at multiple points accurately to prescribed depths. Another object of the invention is to provide in a machine of the character described improved means for automatically regulating the depth of the drilling into the work piece from the starting surface thereof. Another object of the invention is to provide, through automatically operating means, an improved cleaning of the drilled opening as a final step of the drilling operation, so that the work piece is accurately drilled to a smooth clean bore at all surfaces thereof. Another object of the invention is to provide in a machine of the character described an improved form of work piece locating device, whereby the operator is enabled to process work pieces requiring multiple drilling operations in accord with a simplified technique and with minimum time losses therebetween. Another object of the invention is to provide in a machine of the character described improved control means whereby an improved form of semi-automatic operation is obtained. Other objects and advantages of the invention will appear in the specification.

In the drawings:

Fig. 1 is a side elevation of a machine of the invention;

Fig. 2 is a front elevation of the machine of Fig. 1;

Fig. 3 is a fragmentary view, partly in section and partly in elevation, on an enlarged scale, of a detail of the work holding and drilling head portion of the machine;

Fig. 4 is a section taken substantially along line IV—IV of Fig. 1, on an enlarged scale;

Fig. 5 is a section taken along line V—V of Fig. 4, on an enlarged scale;

Fig. 6 is a section taken along line VI—VI of Fig. 4, on an enlarged scale;

Fig. 7 is a section taken along line VII—VII of Fig. 4, on an enlarged scale;

Fig. 8 is a plan of the work piece supporting base of the machine;

Fig. 9 is a fragmentary section taken along line IX—IX of Fig. 8; and,

Fig. 10 is a wiring diagram of the control mechanism of the machine.

The machine is particularly adaptable to drilling accurately to prescribed depths from the starting surface of the work piece, such as in connection with the countersinking of previously drilled relatively thin sheet metal stock preparatory to flush riveting the latter upon supporting structure. For example, in connection with the manufacture of airplanes of optimum aerodynamic characteristics, the finished outer surfaces thereof must be perfectly smooth and flush, and allowable tolerances for rivet head projections and/or depressions relative to the surface contour are often within one or two thousandths of an inch. Consequently, the form of the countersinks for receiving the rivet heads must accurately conform to that of the rivet heads, and the depths of the countersinks must be most accurate as measured inwardly from the starting surface of the work piece.

As illustrated in the drawings, the machine is mounted upon a base or pedestal 10 which supports a U-frame 12. The lower jaw 14 of the frame 12 mounts a work piece supporting base designated generally by the numeral 16, and the upper jaw 18 of the frame 12 carries the drilling spindle 20 by means of bearings at 22, 23 and 24.

A drive pulley 28 is operatively associated with the upper end of the spindle 20 by means of a keyed sleeve 34 supported by the bearing 22 and mounted in splined relation upon the spindle for rotation of the spindle through operative connection with a motor 30 through an endless belt 32. Thus the pulley 28 is permanently aligned with the motor pulley and belt 32. A thrust collar 36 is keyed to the spindle 20 to rotate therewith, and is substantially enclosed by a yoke member 38 having thrust bearings 40 above and below the collar 36. The yoke 38 is pivotally connected by opposite side pins 39 and through means of a pair of links 42 to a pair of corresponding rocker arms 44 by means of pivotal connections 46; the rocker arms 44 being pivotally mounted intermediately of their ends upon the machine frame at 47. Straps 48 are welded at their opposite ends to adjacent portions of the links 42 and are so arranged as to span the pivotal connections 46 with the rocker arms 44 so as to provide equalized loading at opposite sides of the rocker arm pivotal connections.

The links 42 extend downwardly beyond the points of pivotal connection 46 to carry at their lower ends a collar 50 bored concentrically of the spindle 20 and clampingly mounted upon a tube 52 disposed therebetween by means of a clamping stud 53 (Fig. 7). The links 42 are pivotally connected to the collar 50 through means of studs 54 which extend through open-

ings in the links elongated as at 55 to provide lost-motion connections. The tube 52 is slidably fitted into the bearing 23 adjacent its upper end; and a thrust sleeve 57 is slidably mounted upon the tube 52 and threaded into connection with a gland 58 which bears downwardly upon the upper end of a compression spring 60. The lower end of the spring 60 bears against the collar 50, and thus the tube 52 is normally urged downwardly by the spring 60 which simultaneously imposes downward pressure through the links 42 upon the spindle 20. A bushing 61 supports the spindle 20 relative to the upper end of the tube 52. The tube 52 is rotatably carried at its lower end by the bearing 24, and a bushing 62 is disposed between the spindle 20 and the tube 52 adjacent the lower ends thereof to transmit the bearing support of the member 24 to the lower end of the spindle 20. The tube 52 is provided at its lower end with a shoe 64 as an integral part thereof; said shoe being in the form of an open end pedestal provided at opposite sides thereof with inspection openings 66 and a lower work piece contacting face 68. The lower end of the spindle 20 is in the form of a chuck and adapted to have mounted therein the drill or countersinking bit 70 in such manner as to have its working end portion normally disposed slightly above the level of the work piece contacting face 68 of the pedestal.

A pair of tie rods 72 are pivotally connected at their lower ends to corresponding studs 54 and extend upwardly therefrom through spring boxes 74 which are fixed to the links 42 and contain preloaded compression springs 76. Abutments 78 are adjustably mounted upon the upper ends of the tie rods 72 by means of threaded nuts 80 to bear against the upper ends of the springs 76. Thus, the springs 76 function to resiliently urge the spindle 20 to move downwardly relative to the pedestal tube 52.

A fluid cylinder 80 is mounted upon the frame of the machine rearwardly of the spindle device thereof and is operatively associated with a piston rod 82 which couples at its lower end with the rocker arms 44 at 84. A solenoid operated valve 86 is provided in conjunction with the cylinder 80 for control of movement of fluid under pressure into and out of the cylinder 80 in such manner that admission of fluid into the cylinder forces the piston rod 82 downwardly to pivot the rocker arms 44 and to cause the spindle 20 and the pedestal tube 52 to be raised bodily against the action of the springs 60 and 76 away from the work piece. A compression spring 88 is arranged about the piston rod 82 in such manner as to bear at its upper end against an abutment 90 on the rod 82 and at its lower end against a fixed abutment 92 extending adjacent the piston rod 82 so as to resiliently urge the piston rod upwardly at all times, thus assisting in the return of the piston rod 82 to its upper position when fluid pressure within the cylinder 80 is released.

The yoke 38 is provided at its lower face with an insulated contact plate 94, and the upper end of the tube 52 is provided with an oppositely disposed similar contact plate 96. The plate 96 is mounted upon the tube 52 through means of a platform 97 which is adjustably mounted upon the tube 52 by means of a screwthreaded connection therewith and a clamping nut 98. The contact plates 94 and 96 are electrically connected to corresponding conductors indicated generally at 99 which lead to the control circuit for the solenoid valve 86 which will be described hereinafter.

A work support plate 100 is mounted upon the jaw 16 of the machine frame for bearing against the under side of the work piece; the plate 100 being vertically bored to carry a slide fitting pilot pin 102 as illustrated in Figs. 3 and 9. The pilot pin 102 is normally maintained with its outer end projecting beyond the face of the plate 100 by means of a spring 104 which permits the pin 102 to retreat under pressure, as when being pressed against by the drill bit 70. The pin 102 is located in line with the vertical movement of the bit 70, and the plate 100 is counterbored concentrically of the pin 102 and mounts therein a hardened steel countersunk die 106 to complement the end of the bit 70 in case the latter is accidentally moved into contact with the work supporting portion of the machine.

A pair of control fingers 110 are arranged to project upwardly beyond the plane of the work piece supporting plate 100 and at opposite sides of the pilot pin 102, and are adapted to be depressed by the weight of the work piece when disposed in operative position thereupon. The fingers 110 are mounted upon the jaw 16 by means of parallel links 112 and 114 which are pivoted thereto at 116 and 118 respectively, and the opposite ends of the links 114 are connected to switch operating finger 120 by means of a cross arm 122 and a rod 124.

The switch operating finger 120 is pivotally mounted upon the frame at 126 and is adapted to actuate the operating lever 128 of a micrometer type electrical switch 130 arranged adjacent thereto. Leaf springs 132 are mounted in cantilever fashion at 133 and 134 upon the frame and bear at their outer ends against the links 114 in such manner as to resiliently urge the control pins 110 upwardly, but to permit the latter to be depressed by the weight of the work piece when resting thereupon so as to elevate the rod 124 and to cause the operating finger 120 to pivot and momentarily depress the lever 128 of the micrometer switch. Particular attention is called to the fact that by reason of the spaced arrangement of the opposite pairs of parallel links connecting respective control fingers 110 and the swivable character of the connections at 123, the cross arm 122 transmits a differential movement to the switch control actuating rod 124, in accord with the degrees of the separate movements of the pins 110. Consequently, if both of the pins 110 are depressed by the work piece substantially equally and for a sufficient distance, the necessary switch control movement will be transmitted to the operating finger 120. However, for example, when only one of the control pins 110 is substantially depressed, as when the work piece is disposed upon the machine at an angle relative to the normal operative position thereof prior to final adjustment of the work piece into a position of readiness for the drilling operation, the differential action of the linkage connecting the opposite fingers 110 to the switch operating finger 130 will prevent the latter from being moved sufficiently to actuate the micrometer switch. Consequently, the arrangement provides an important safety feature.

A spot light 140 (Fig. 1) is mounted upon the machine frame and provided with a condensing reflector 140 for projection of a relatively brilliant spot of light upon the upper surface of the work piece at the point of first contact with the bit 70. Thus, the work piece may be first disposed between the jaws of the machine and then moved laterally in the required direction to bring the

portion thereof to be drilled into line with the bit 70 by simply moving the work piece until the point thereon to be contacted by the bit is directly under the spot of light projected by the light source 140. In connection with the countersinking of previously drilled holes, the work piece will be initially disposed between the jaws of the machine in a substantially horizontal attitude, and then simply moved in the direction required to bring the previously drilled hole under the spot of projected light at which time the pilot finger 102 will project upwardly under the action of the spring 104 into the drilled hole, thus fixing the work piece in alignment with the countersinking bit 70. During the countersinking operation the pilot finger 102 will retreat under the pressure of the bit 70, as explained hereinabove, thus avoiding damage to the pilot finger. An adjustment screw 145 is provided in connection with the pilot finger actuating spring 104, for varying the pressure applied by the spring to suit different operating conditions.

The machine is semi-automatically controlled in its operation by means of an electrical system diagrammatically illustrated in Fig. 10 wherein the power inlet conductors are designated at 150. The motor 30 is connected in series with the conductors 150, and the circuit thereto is controlled by one blade of a double blade snap switch 152. The solenoid valve 86 is also connected in series with the conductors 150, and the circuit thereto is primarily controlled by the other blade of the snap switch 152. The circuit to the solenoid valve 86 includes a time-delay relay 156 and a magnetic contact switch 158 which in turn is actuated in response to actuation of the micrometer switch 130 and the contact plates 94—96. In operation, the switch 152 is manually closed, and thus the circuit to the motor 30 is completed and the circuit through the solenoid of the fluid valve 86 is closed. This opens the compressed air control valve 86 and compressed air is allowed into the cylinder 80 to force the piston rod 82 downwardly, thus lifting the spindle 20 and work holding shoe 64 to the position illustrated in Figs. 1, 2 and 3. The work piece is then placed between the jaws of the machine by the operator and shifted to the position required to align the bit 70 with the center of the countersink to be drilled, as explained hereinabove. The work piece is then allowed to rest its full weight upon the control fingers 110, and the latter then actuate the micrometer switch 130 as explained hereinabove to momentarily actuate the magnetic contactor 158. This closes the circuit to the time-delay relay 156 which instantaneously opens the circuit of the solenoid of the valve 86, thus discontinuing the pressure within the pneumatic cylinder 80 and allowing the springs 60 and 76 to force the work holding shoe 64 and the spindle 20 downwardly into operative contact with the work piece which is now firmly supported by the bearing block 100. As explained hereinabove, this spring action involves two separate phases; that is, the spring 60 forces the shoe 64 against the work piece with a predetermined pressure, and the spring 76 subsequently moves the bit 70 downwardly relative to the shoe 64 as the process of drilling the countersink proceeds. The contact plates 94 and 96 are so relatively arranged as to provide normally therebetween a gap of such dimension as to allow the spindle 20 to move relative to the shoe 64 a distance equal to the desired depth of the countersink to be drilled in the work piece before the members 94 and 96 come into bearing contact with one another. Thus, the contact members 94 and 96 function as positive stop devices for limiting the movement of the drill spindle relative to the work holding shoe, and in every case the depth of the countersink so produced will be identical with the depth of the rivet head to be received therein, as measured from the outer surface of the work piece. Thus, inequalities in the thickness of the work piece will have no effect upon the depth of countersinks drilled by the machine, as would otherwise be the case if the depth of the countersinks were regulated by a device employing the work supporting surface as a datum.

Simultaneously with the contacting of the members 94 and 96 at the end of the downward movement of the drill spindle, the circuit associated therewith and leading to the magnetic contactor 158 will be thereby closed and the time-delay switch of the device 156 will be closed, initiating a predetermined timing cycle during which the circuit of the solenoid of the valve 86 will be undisturbed, but at the end of which said circuit will be again closed. Consequently, during the predetermined time-delay cycle the bit 70 will continue to rotate at the bottom of the countersink previously drilled so as to clean out and polish the surfaces thereof in an improved manner, but without further deepening of the countersink. At the end of the time cycle the cylinder 80 will cause the spindle and work holding shoe to be elevated against the action of the springs 60 and 76 as explained hereinabove to the position illustrated in Figs. 1 to 3, thus enabling the operator to shift the work piece to the next position of drilling operation, whereupon the cycle of operation will be repeated in the manner described.

Thus, the machine embodies a work holding element adapted to efficiently clamp the work piece in operative position prior to and during the drilling operation, and simultaneously the work piece holding element functions as an accurate gauging device which controls the depth of the drilling operation as measured from the surface of the work piece at which the drilling operation is commenced. Also, the work piece supporting element of the machine functions simultaneously to operate as a contact device for initiating the drilling cycle of the operation thereof, and in conjunction with the time-delay relay allows the cutting bit to perform a second improved finishing operation upon the previously drilled surfaces before release of the work piece. It will be understood that in lieu of the time-delay relay device illustrated and described hereinabove, any other suitable delay mechanism may be employed, such as a cam actuated element or organization of elements, as will be understood by those skilled in the art. An air discharge conduit 160 (Figs. 1 and 2) is provided in communication with the air discharge port of the cylinder 80 and is so arranged as to convey the ejected air to a point of discharge in line with the countersinks drilled by the bit 70. Thus, it will be understood that upon closing of the valve 86 in conjunction with withdrawal of the drill spindle and holding shoe from the work piece, the air ejected by the cylinder 80 will be simultaneously sprayed into the drilled openings to effectively clear the latter of any shavings or dust, or the like.

It will be understood that in lieu of the arrangement of the contact plates 94 and 96 as previously described wherein the contact plates

function simultaneously as positive stop means and as electrical circuit closing means, any suitable form of separate electrical switch may be employed in conjunction with the relative movement of the spindle and the tube **52** so as to initiate the time delay cycle hereinabove described at the time of first contact of the plates **94** and **96**, or slightly in advance thereof or slightly in lagging relation therebehind, as may be preferred in any given case.

Thus, the machine features a semi-automatic control system whereby it is impossible for the operator to start the drilling cycle of the machine operation unless the work piece is first disposed in proper position relative to the drill spindle. Also, the machine features a spindle feed device which is actuated by constant spring pressure, independent of the pressure in the fluid power system supplying power to the spindle **80** which is often subject to fluctuations. Hence, the drilling operation is of improved form, and the machine provides optimum performance both from the standpoint of the quality of the openings drilled and the speed of the operation of the machine.

Although only one form of the invention has been shown and described in detail, it will be understood that various changes may be made therein without departing from the spirit of the invention or the scope of the following claims.

I claim:

1. In a drilling machine, a drilling spindle carrying a work piece cutter, means for driving said spindle, means for moving said spindle axially toward and away from the work piece to be drilled, a work piece contacting shoe operatively associated with said spindle to move axially therewith into work piece contacting position, resilient means connecting said spindle and said shoe for resiliently urging said spindle to move axially relative to said shoe and to thereby move said cutter therebeyond into work piece drilling position, and positive stop means associated with said spindle and said shoe for limiting said relative movement therebetween within predetermined limits.

2. In a drilling machine, a drilling spindle carrying a work piece cutter, means for driving said spindle, spring means for moving said spindle axially toward the work piece to be drilled, a work piece contacting shoe operatively associated with said spindle to move axially therewith into work piece contacting position, resilient means connecting said spindle and said shoe for resiliently urging said spindle to move axially relative to said shoe and to thereby move said cutter therebeyond into work piece drilling position, and positive stop means associated with said spindle and said shoe for limiting said relative movement therebetween within predetermined limits.

3. In a drilling machine, a drilling spindle carrying a work piece cutter, means for driving said spindle, spring means for moving said spindle axially toward the work piece to be drilled, a work piece contacting shoe operatively associated with said spindle to move axially therewith into work piece contacting position, resilient means connecting said spindle and said shoe for resiliently urging said spindle to move axially relative to said shoe and to thereby move said cutter therebeyond into work piece drilling position, positive stop means associated with said spindle and said shoe for limiting said relative movement therebetween within predetermined limits, and means for simultaneously withdrawing said spindle and said shoe to remove said cutter and said shoe from work piece contacting position upon completion of the drilling operation.

4. In a drilling machine, a drilling spindle carrying a work piece cutter, means for driving said spindle, spring means for moving said spindle axially toward the work piece to be drilled, a work piece contacting shoe operatively associated with said spindle to move axially therewith into work piece contacting position, resilient means connecting said spindle and said shoe for resiliently urging said spindle to move axially relative to said shoe and to thereby move said cutter therebeyond into work piece drilling position, positive stop means associated with said spindle and said shoe for limiting said relative movement therebetween within predetermined limits, and hydraulic means for simultaneously withdrawing said spindle and said shoe to remove said cutter and said shoe from work piece contacting position upon completion of the drilling operation.

5. In a drilling machine, a drilling spindle carrying a work piece cutter, means for driving said spindle, spring means for moving said spindle axially toward the work piece to be drilled, a work piece contacting shoe operatively associated with said spindle to move axially therewith into work piece contacting position, resilient means connecting said spindle and said shoe for resiliently urging said spindle to move axially relative to said shoe and to thereby move said cutter therebeyond into work piece drilling position, positive stop means associated with said spindle and said shoe for limiting said relative movement therebetween within predetermined limits, means for simultaneously withdrawing said spindle and said shoe to remove said cutter and said shoe from work piece contacting position upon completion of the drilling operation, and means initiated into action upon operation of said stop means to actuate said spindle and shoe withdrawal means.

6. In a drilling machine, a drilling spindle carrying a work piece cutter, means for driving said spindle, spring means for moving said spindle axially toward the work piece to be drilled, a work piece contacting shoe operatively associated with said spindle to move axially therewith into work piece contacting position, resilient means connecting said spindle and said shoe for resiliently urging said spindle to move axially relative to said shoe and to thereby move said cutter therebeyond into work piece drilling position, positive stop means associated with said spindle and said shoe for limiting said relative movement therebetween within predetermined limits, means for simultaneously withdrawing said spindle and said shoe to remove said cutter and said shoe from work piece contacting position upon completion of the drilling operation, and means initiated into action upon operation of said stop means to actuate said spindle and shoe withdrawal means subsequent to lapse of a predetermined time delay.

7. In a drilling machine, a drilling spindle carrying a work piece cutter, means for driving said spindle, spring means for moving said spindle axially toward the work piece to be drilled, a work piece contacting shoe operatively associated with said spindle to move axially therewith into work piece contacting position, resilient means connecting said spindle and said shoe for resiliently urging said spindle to move axially relative to said

shoe and to thereby move said cutter therebeyond into work piece drilling position, positive stop means associated with said spindle and said shoe for limiting said relative movement therebetween within predetermined limits, means for simultaneously withdrawing said spindle and said shoe to remove said cutter and said shoe from work piece contacting position upon completion of the drilling operation, and means initiated into action upon operation of said stop means to actuate a time delay device adapted to control said spindle-shoe withdrawal means in such manner as to withdraw the latter from work piece contacting position subsequent to a predetermined time delay.

8. In a drilling machine, a drilling spindle carrying a work piece cutter, means for driving said spindle, spring means for moving said spindle axially toward the work piece to be drilled, a work piece contacting shoe operatively associated with said spindle to move axially therewith into work piece contacting position, resilient means connecting said spindle and said shoe for resiliently urging said spindle to move axially relative to said shoe and to thereby move said cutter therebeyond into work piece drilling position, positive stop means associated with said spindle and said shoe for limiting relative movement therebetween within predetermined limits, hydraulic means for simultaneously withdrawing said spindle and said shoe to remove said cutter and said shoe from work piece contacting position upon completion of the drilling operation, and conduit means leading from said hydraulic means and adapted to convey the fluid ejected therefrom and to discharge the latter against the work piece in the region of the drilling operation.

9. In a countersink drilling machine, a frame, a drilling spindle rotatably mounted upon said frame and adapted to move axially thereon, means for rotating said spindle, a tubular member slidably mounted upon said spindle and having an end portion adjacent the cutter end of said spindle for contacting the work piece to be countersunk, a thrust collar integral with said tubular member, a second thrust collar integral with said spindle, a link member extending between and connecting said thrust collars with a lost motion connection therebetween, a rocker arm pivotally mounted upon said frame and having a moving end portion connected to said link in such manner as to be adapted to move said spindle and said tubular member axially, spring means operatively connecting said spindle and said tubular member in such manner as to normally urge the cutter end of said spindle to extend beyond the work piece contacting end of said tubular member, spring means acting between said frame and said tubular member in such manner as to resiliently urge the latter to move toward the work piece, and means associated with said rocker arm for actuation of the latter to withdraw said tubular member and said spindle from work piece contacting position against the action of said springs.

10. In a countersink drilling machine, a frame, a drilling spindle rotatably mounted upon said frame and adapted to move axially thereon, means for rotating said spindle, a tubular member slidably mounted upon said spindle and having an end portion adjacent the cutter end of said spindle for contacting the work piece to be countersunk, a thrust collar integral with said tubular member, a second thrust collar integral with said spindle, a link member extending between and connecting said thrust collars with a lost motion connection therebetween, a rocker arm pivotally mounted upon said frame and having a moving end portion connected to said link in such manner as to be adapted to move said spindle and said tubular member axially, spring means operatively connecting said spindle and said tubular member in such manner as to normally urge the cutter end of said spindle to extend beyond the work piece contacting end of said tubular member, spring means acting between said frame and said tubular member in such manner as to resiliently urge the latter to move toward the work piece, means associated with said rocker arm for actuation of the latter to withdraw said tubular member and said spindle from work piece contacting position against the action of said springs, and additional spring means operatively associated with said rocker arm in such manner as to substantially balance the weight of the actuating elements of the device about the pivotal mounting of said rocker arm upon said frame.

11. In a countersink drilling machine, a countersink cutter mounted upon a spindle for countersinking an opening drilled through the work piece to be countersunk, a work piece supporting plate adapted to support said work piece under said cutter, a pilot pin slidably mounted within said supporting plate and spring pressed so as to be adapted to project upwardly beyond the plane of said work piece supporting plate when free to do so and adapted to project itself into the drilled opening of said work piece when the latter is moved into proper position under said countersink cutter.

12. In a countersink drilling machine, a countersink cutter mounted upon a spindle for countersinking an opening drilled through the work piece to be countersunk, a work piece supporting plate adapted to support said work piece under said cutter, a pilot pin slidably mounted within said supporting plate and spring-pressed so as to be adapted to project upwardly beyond the plane of said work piece supporting plate when free to do so and adapted to project itself into the drilled opening of said work piece when the latter is moved into proper position under said countersink cutter, and a pair of control fingers mounted within said supporting member adjacent said pilot pin and spring-pressed to normally extend above the plane of said supporting member and adapted to be moved inwardly thereof under the weight of the work piece when disposed thereon in operative position under said countersink cutter, said control fingers being operatively coupled by means of a transverse connecting link operatively associated intermediately of its connections with said control fingers with a control device for controlling said means for moving said spindle axially in accord with a composition of the separate movements of said control fingers.

13. In a blind drilling machine, a rotating spindle, constant pressure means operatively associated with said spindle to apply the latter against the work piece, positive stop means associated with said spindle and with the surface of said work piece in the region of the opening to be drilled therein, control means operatively associated with said stop means and fluid actuating means for causing said spindle to be retracted from contact with said work piece subsequent to lapse of a predetermined time delay, and a disappearing spring-loaded pilot pin adapted to project into a previously formed opening in

said work piece to locate said work piece in proper position relative to said spindle.

14. In a blind drilling machine, a rotating spindle, constant pressure means operatively associated with said spindle to apply the latter against the work piece, positive stop means associated with said spindle and with the surface of said work piece in the region of the opening to be drilled therein, control means operatively associated with said stop means and fluid actuating means for causing said spindle to be retracted from contact with said work piece subsequent to lapse of a predetermined time delay, a disappearing spring-loaded pilot pin adapted to project into a previously formed opening in said work piece to locate said work piece in proper position relative to said spindle, and a spot light device adapted to project a focused beam of light upon said work piece at a position thereon corresponding to a position of alignment of said retreating pin and said previously drilled opening.

15. In a blind drilling machine, a work piece supporting plate, a pair of control fingers mounted within said supporting plate and normally extending thereabove in spaced relation from one another, spring means associated with said control fingers for permitting the latter to retreat into said supporting plate under the weight of said work piece when disposed thereupon, said control fingers being connected by a transverse link operatively extending therebetween, and machine control means operatively connected with said transverse link intermediately of the ends thereof so as to transmit a composition of the movements of said control pins to said machine control device.

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