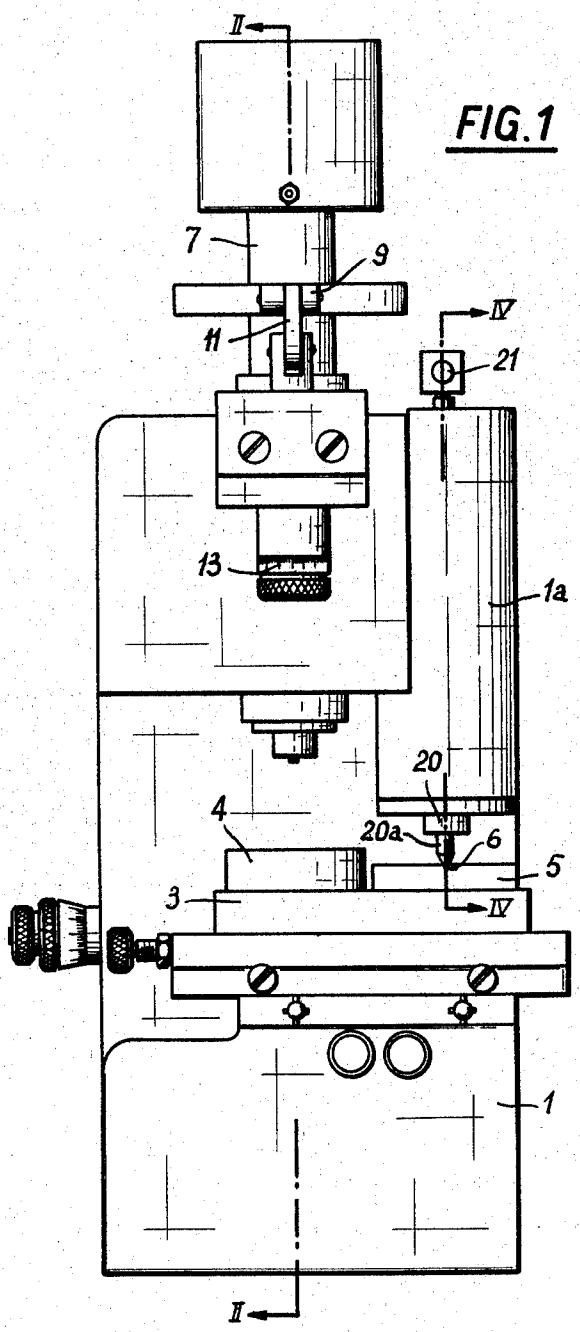
Feb. 17, 1959 A. FRAUTSCHI ET AL 2,873,629

FLUID-CONTROLLED BORING MACHINE

Filed May 3, 1955 3 Sheets-Sheet 1

FIG. 1

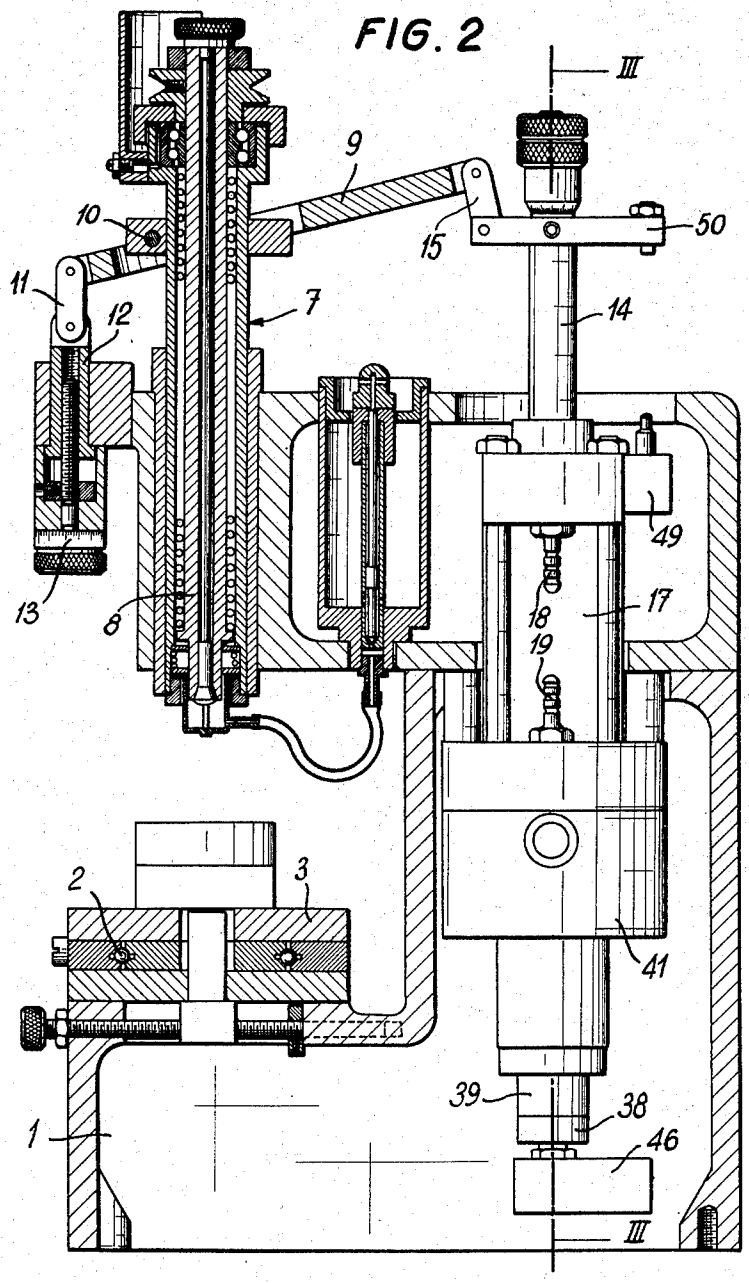


Feb. 17, 1959 A. FRAUTSCHI ET AL 2,873,629

FLUID-CONTROLLED BORING MACHINE

Filed May 3, 1955 3 Sheets-Sheet 2

FIG. 2

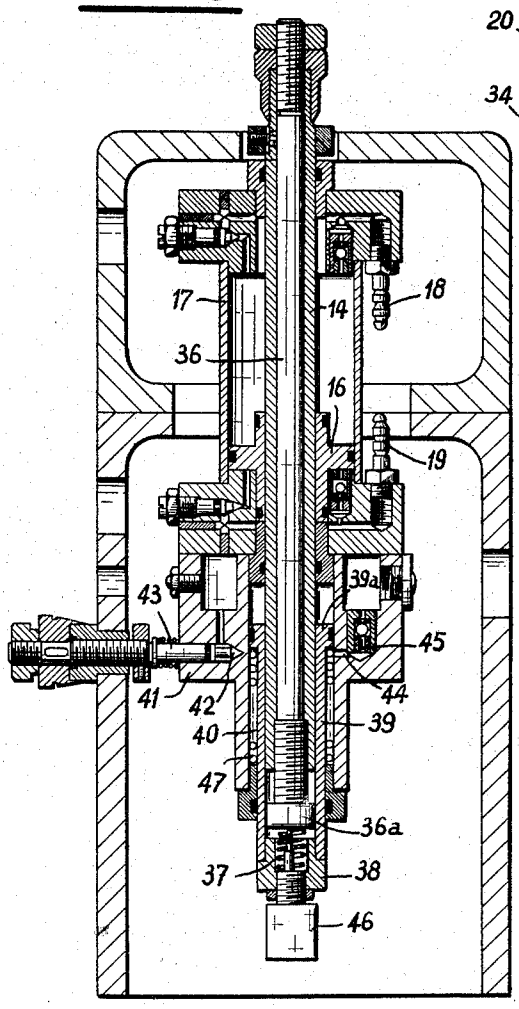


Feb. 17, 1959 A. FRAUTSCHI ET AL 2,873,629

FLUID-CONTROLLED BORING MACHINE

Filed May 3, 1955 3 Sheets-Sheet 3

FIG. 3



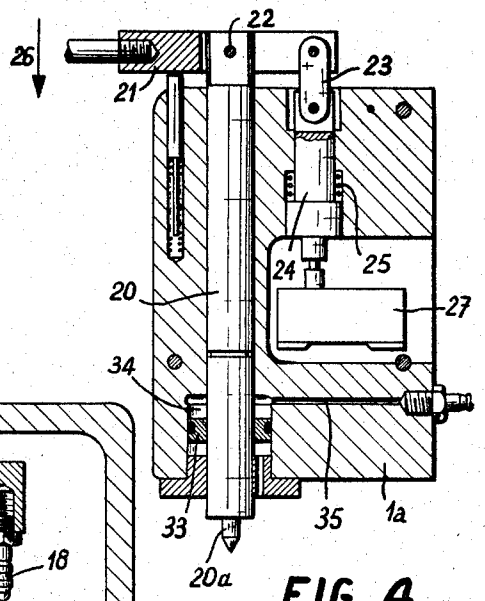


FIG. 4

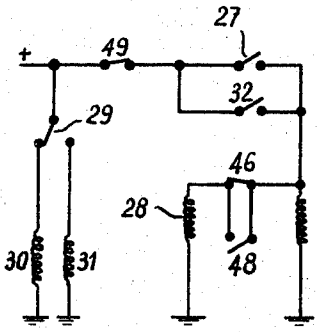


FIG. 5

United States Patent Office 2,873,629 Patented Feb. 17, 1959

2,873,629

FLUID-CONTROLLED BORING MACHINE

André Frautschi and Louis Monney, Bienne, Switzerland

Application May 3, 1955, Serial No. 505,593

Claims priority, application Switzerland May 8, 1954

4 Claims. (Cl. 77—32.2)

Our invention has for its object a fluid-controlled boring machine.

According to our invention, the movements of a feeler are adapted to control the admission of fluid into a pilot cylinder, the piston in which controls the longitudinal movements of the drill. Said feeler is adapted to engage a template carried by a horizontally shiftable platform to which the work to be machined is also secured. Various objects of my invention will appear in reading the following disclosure.

Accompanying drawings illustrate by way of example a preferred embodiment of the machine according to the invention.

In said drawings:

Fig. 1 is an elevational view of the machine.

Fig. 2 is a side view partly sectional of the same machine.

Fig. 3 is a cross-sectional view of a detail through line III—III of Fig. 2.

Fig. 4 is a sectional view of a detail through line IV—IV of Fig. 1.

Fig. 5 is a wiring diagram of the machine.

The boring machine illustrated includes a frame 1 carrying through the agency of balls 2 a table 3 adapted to move freely in any desired horizontal direction. Said table is adapted to carry at one end the work 4 to be bored and at the other end a template 5 provided with at least one opening 6 corresponding to the perforation to be executed in the work 4. Further means which are not illustrated are provided for defining accurately the relative position of the template 5 with reference to the work 4. The machine includes a quill or sleeve 7 (Fig. 2) carrying inside it and coaxially therewith a spindle 8 carrying the actual boring tool at its lower end. The axial movements of said quill 7 are controlled by a lever 9 pivotally secured at 10 to the quill: said quill is furthermore pivotally secured through a link 11 to a sleeve 12 adapted to be shifted axially by means of a micrometric screw 13 provided for adjusting purposes. The lever 9 is controlled in its turn by a tubular member 14 to which it is pivotally connected through the agency of an intermediate link 15. Said tubular member 14 carries a piston 16 moving inside a pilot cylinder 17 under the action of compressed air entering the cylinder selectively on one of the sides of the piston 16 through the pipes 18 and 19 respectively. The admission of compressed air is controlled by conventional valves which are not illustrated and which are controlled in their turn through electric means as described hereinafter.

The machine illustrated includes furthermore a feeler 20 adapted to move axially inside a section 1*a* of the frame 1 and terminating with a tip 20*a* which cooperates with the template 5. The axial movements of said feeler rod 20 are produced by a lever 21 controlled by hand and pivotally secured at 22 to the feeler rod 20, while it is also pivotally secured through the agency of a link 23 to a member 24 sliding inside the above mentioned section 1*a* of the frame 1; said member 24 is held in the position illustrated in Fig. 4 by a return spring 25. By exerting a thrust in the direction of the arrow 26 on the lever 21, the operator produces a downward shifting of the rod 20. When the operator feels that the tip 20*a* has engaged the perforation or opening 6 in the template, he should exert a more considerable pressure on the lever 21 so as to shift upwardly the member 24 against the action of its return spring 25. As it rises, the member 24 releases a switch 27 which closes; as it closes, the switch 27 provides for the feeding of a relay 28 (Fig. 5), the contact piece 29 of which controls selectively through the windings 30 and 31 the abovementioned valves distributing compressed air into the pilot cylinder 17. Energization of the relay sends compressed air into the upper part of the cylinder 17 so as to make the piston 16 and the tubular member 14 sink. The quill 7 is thus also shifted downwardly; a second contact piece 32 controlled by the relay 28 provides for the self-energization of the latter, even after the switch 27 has been allowed to open again.

It should be remarked that the tip 20*a* of the feeler rod 20 is conical and consequently, when it engages the opening 6 in the template 5, the feeler finishes centering the latter, since the table 3 is adapted to move freely in a horizontal plane. The feeler rod 20 carries a piston 33 moving inside a cylindrical chamber 34 formed in the section 1*a* of the frame 1. Compressed air is sent through a channel 35 into said chamber 34 above the piston 33 so as to hold through action on last mentioned piston the tip 20*a* of the feeler rod in engagement with the template 5.

The downward movement of the tubular member 14 is first produced at high speed and then after the head 36*a* of the rod 36 rigid with the tubular member 14 compresses a coil spring 37 housed inside a socket formed by a plug 38 secured to a sleeve 39. The latter is now shifted downwardly together with the tubular member 14; said sleeve is provided with a flange shaped part 39*a* forming a piston moving in a chamber 40 formed inside the support 41 carrying the pilot cylinder 17. Said chamber 40 is filled with oil which is driven outwardly when the piston 39 sinks so that said oil passes into a channel 42 the cross sectional area of which is adjusted by a needle valve 43. The downward movement of the tubular member 16 is thus braked so as to produce a slow progression of the quill as required for the actual boring operation. During the upward return movement of the tubular member 14, the oil which has entered an auxiliary chamber reenters freely the chamber 40 through a channel 44 provided with a non-return valve 45.

When it is desired to execute deep bores, an arrangement operates so as to make the quill reciprocate and to thus further the removal of the shavings. To this end, the plug 38 is provided with a switch 46; furthermore a coil spring 47 acts on the auxiliary piston 39*a* in the oil

chamber so as to urge it upwardly, said coil spring being housed inside the oil chamber **40**. This spring **47** is less resilient than the spring **37**. However, when said spring **47** is fully compressed, the rod **36***a* as it continues moving downwardly compresses in its turn the spring **37** and actuates the switch **46**. The latter as shown in Fig. 5 breaks the circuit of the relay **28** whereby the contact-piece **29** is shifted and reverses the direction of movement of the tubular member **14**. The latter begins rising under the action of the spring **47** so that the switch **46** closes again, which initiates a further downward movement of the tubular member **14**. Said reciprocation of the latter is repeated during the boring as will be readily understood.

Lastly, the machine is provided with a hand operable switch **48** also illustrated diagrammatically in Fig. 5 and with a switch **49** (Figs. 2 and 5) which is controlled by a stop **50** rigid with the tubular member **14** so as to produce a stoppage of the machine as soon as the quill has entered its lowermost allowed position.

What we claim is:

1. In a boring machine comprising a frame, a table moving freely in a horizontal plane with reference to the frame and adapted to carry a template provided with a centering recess and a work, the combination of a vertical quill shiftably carried by the frame to move vertically with reference to a point of the table within the location of the work, a boring spindle revolubly mounted in said quill, a fluid-operated system including a pilot cylinder, a piston in said cylinder and a piston rod on the piston, a lever, three pivotal connections of which two include an intermediate arm, pivotally connecting the lever with a point of the frame, with the quill and with the piston rod respectively, the piston rod controlling through the lever the vertical movement of the quill with reference to the work, a feeler rod shiftably carried by the frame above a point of the table within the location of the template for engagement with the recess in the template upon a shifting of the table bringing said recess into accurate vertical register with the feeler rod, a hand operable control lever pivotally connected with the feeler rod and controlling the vertical position of the latter, and electric means through which the operative movement of the control lever produces operation of the fluid-operated system and therethrough a downward shifting of the quill and of the boring spindle therein.

2. In a boring machine comprising a frame, a table moving freely in a horizontal plane with reference to the frame and adapted to carry a template provided with a centering recess and a work, the combination of a vertical quill shiftably carried by the frame to move vertically with reference to a point of the table within the location of the work, a boring spindle revolubly mounted in said quill, a fluid-operated system including a pilot cylinder, a piston in said cylinder and a piston rod on the piston, a lever, three pivotal connections of which two include an intermediate arm, pivotally connecting the lever with a point of the frame, with the quill and with the piston rod respectively, the piston rod controlling through the lever the vertical movement of the quill with reference to the work, the pivotal connection with the frame being located outside the two other pivotal connections and the relative amplitude of movement of the piston rod and of the quill being defined by the ratio between the distances of the pivotal connection with the frame and the two other pivotal connections respectively, means for shifting adjustably the location of the point of the frame pivotally connected with the lever to define the maximum depth of the opening to be bored in the work by the machine spindle, a feeler rod shiftably carried by the frame above a point of the table within the location of the template for engagement with the recess in the template upon a shifting of the table bringing said recess into accurate vertical register with the feeler rod, a hand operable control lever pivotally connected with the feeler rod and controlling the vertical position of the latter, and electric means through which the operative movement of the control lever produces operation of the fluid-operated system and therethrough a downward shifting of the quill and of the boring spindle therein.

3. In a boring machine comprising a frame, a table moving freely in a horizontal plane with reference to the frame and adapted to carry a template provided with a centering recess and a work, the combination of a vertical quill shiftably carried by the frame to move vertically with reference to a point of the table within the location of the work, a boring spindle revolubly mounted in said quill, a fluid-operated system including a pilot cylinder, a piston in said cylinder and a piston rod on the piston, a lever, three pivotal connections of which two include an intermediate arm, pivotally connecting the lever with a point of the frame, with the quill and with the piston rod respectively, the piston rod controlling through the lever the vertical movement of the quill with reference to the work, a feeler rod shiftably carried by the frame above a point of the table within the location of the template for engagement with the recess in the template upon a shifting of the table bringing said recess into accurate vertical register with the feeler rod, a hand operable control lever pivotally connected with the feeler rod and controlling the vertical position of the latter, an auxiliary member pivotally secured to the control lever and controlled thereby in unison with the feeler member, elastic means urging said auxiliary member and control member into the position corresponding to an inoperative raised position of the feeler rod, a switch controlled by the auxiliary member when urged by the control lever into a position corresponding to the operative depressed position of the feeler rod, a circuit controlled by said switch, valves adapted to control the distribution of fluid into the hydraulic system, a relay controlled by the switch-controlled circuit to operate the valves in the fluid-operated system to make the piston produce, through said mechanical means, a downward shifting of the quill and of the boring spindle therein.

4. In a boring machine comprising a frame, a table moving freely in a horizontal plane with reference to the frame and adapted to carry a template provided with a centering recess and a work, the combination of a vertical quill shiftably carried by the frame to move vertically with reference to a point of the table within the location of the work, a boring spindle revolubly mounted in said quill, a fluid-operated system including a pilot cylinder, a piston in said cylinder, and a piston rod on the piston, mechanical means through which said piston rod controls the vertical movements of the quill, a socket slidably fitted over one end of the piston rod, a spring inserted between the bottom of the socket and the end of the piston rod, an oil-filled chamber inside which said socket is adapted to slide fluidtightly, an auxiliary chamber communicating with the first mentioned chamber, means for adjusting the cross-sectional area of the connection between the two chambers, the two chambers forming together with the socket a damping system adapted to slow down the progression of the spindle carried by the quill during the boring operation, a feeler rod shiftably carried by the frame above a point of the table within the location of the template for engagement with the recess in the template upon a shifting of the table bringing said recess into accurate vertical register with the feeler rod, a hand operable control lever pivotally connected with the feeler rod and controlling the vertical position of the latter, an auxiliary member pivotally secured to the control lever and controlled thereby in unison with the feeler member, elastic means urging said auxiliary member and control member into the position corresponding to an inoperative raised position of the feeler rod, a switch controlled by the auxiliary member when urged

by the control lever into a position corresponding to the operative depressed position of the feeler rod, a circuit controlled by said switch, valves adapted to control the distribution of fluid into the fluid-operated system, a relay controlled by the switch-controlled circuit to operate the valves in the fluid-operated system to make the piston produce, through said mechanical means, a downward shifting of the quill and of the boring spindle therein, an auxiliary switch carried by the socket and controlling the electric circuit to be actuated, upon sufficient progression of the socket under the action of the piston rod against the spring cooperating with the socket, to deenergize the relay and allow a transient return movement of the piston rod and quill, the switch being closed again through this return movement to allow operation of the relay to be resumed and so on repeatedly.

References Cited in the file of this patent

UNITED STATES PATENTS

447,014	Prybil	Feb. 24, 1891
1,069,995	Anderson	Aug. 12, 1913
2,389,653	Turchan et al.	Nov. 27, 1945
2,488,992	Taylor	Nov. 22, 1949

FOREIGN PATENTS

281,777	Great Britain	Dec. 12, 1927