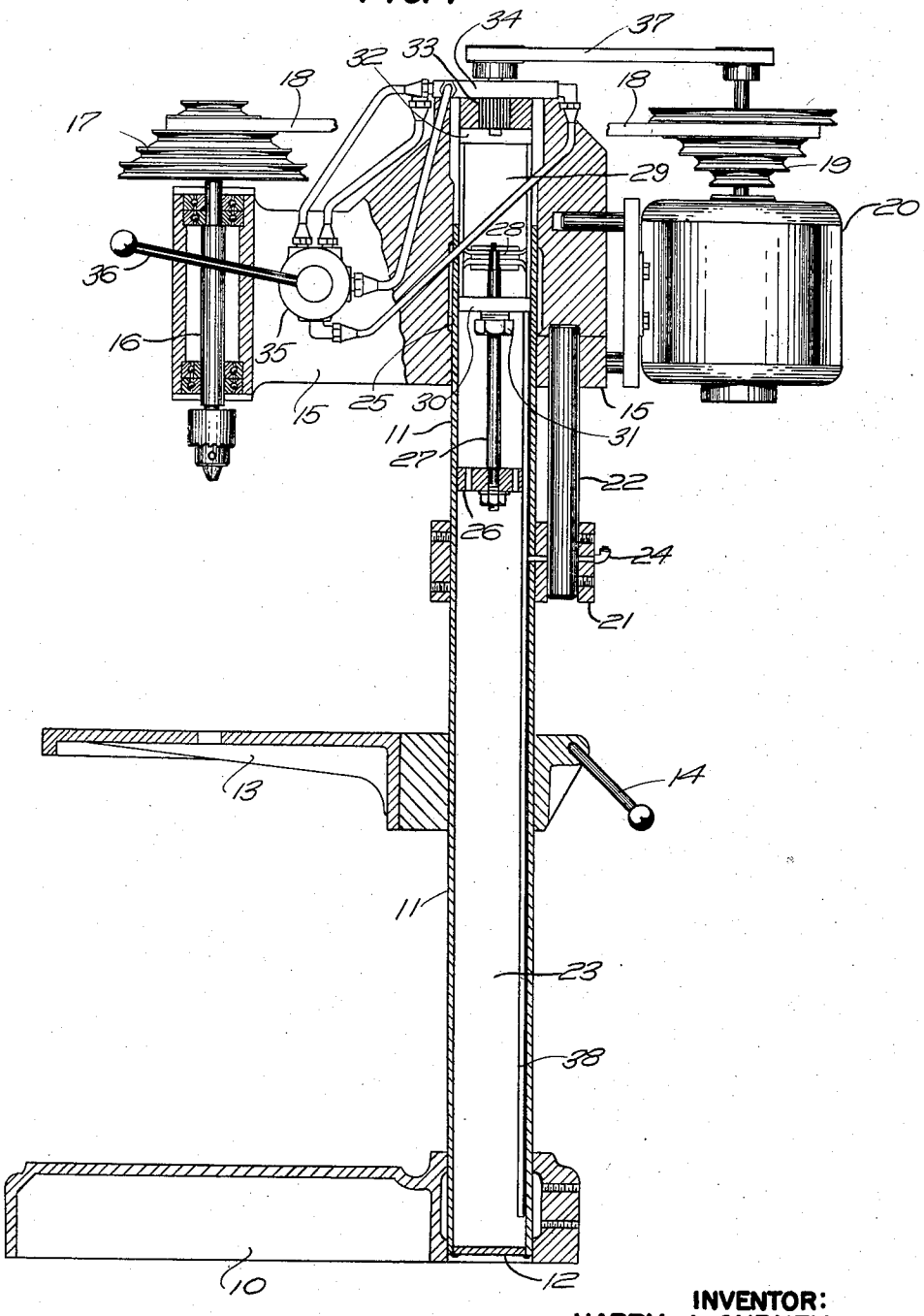
March 10, 1959 H. J. GURNEY 2,876,664

HYDRAULIC DRILL PRESS

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FIG. 1



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FIG. 2

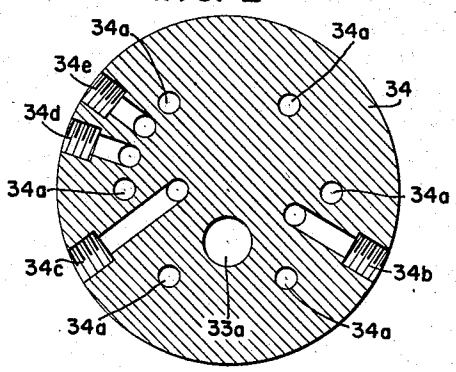


FIG. 3

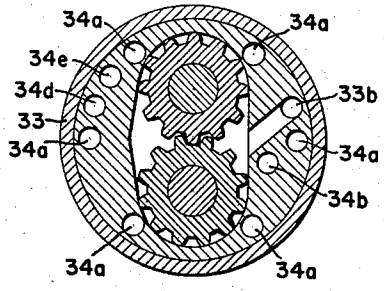
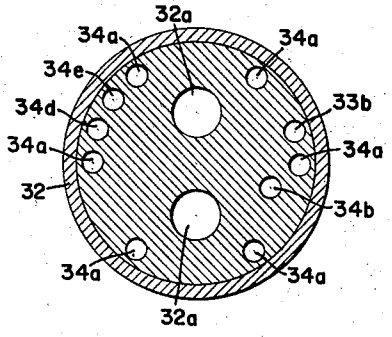


FIG. 4



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2,876,664

HYDRAULIC DRILL PRESS

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Application September 28, 1956, Serial No. 612,758

14 Claims. (Cl. 77—33.5)

My present invention relates to the machine tool art, and more particularly to a hydraulically operated drill press.

The principal object of the present invention is to provide a drill press where hydraulic pressure is used to provide drilling pressure in place of mechanical leverage.

Another object of the present invention is to provide a hydraulic drill press construction requiring no external pump, motor, or oil tank.

A further object of the present invention is to provide a hydraulic drill press which forms a self-contained unit in which the hydraulic operating parts are mounted in the press.

Another object of the present invention is to provide a hydraulically operated drill press which is simple in construction and easy and economical to manufacture and assemble.

With the above and other objects and advantageous features in view, my invention consists of a novel arrangement of parts, more fully disclosed in the detailed description following, in conjunction with the accompanying drawings, and more particularly defined in the appended claims.

In the drawings,

Fig. 1 is a vertical section of a drill press embodying my invention.

Fig. 2 is a transverse section of the end cap.

Fig. 3 is a transverse section of the gear pump.

Fig. 4 is a transverse section of the closure block.

In my copending application Serial No. 612,757, filed September 28, 1956 entitled "Hydraulic Pump and Cylinder Unit," now abandoned I have described a self-contained pump and cylinder unit in which the pump and oil reservoir were incorporated into the hydraulic cylinder. The present invention utilizes the same principles in applying the invention to a drill press. In the conventional drill press, mechanical leverage is used to raise and lower the spindle. Since this is a manual operation, it varies as to speed and pressure with the individual operator. The present invention substitutes a hydraulic operation, valve controlled, which can provide uniform speed and high pressure regardless of the operator. The construction of the present invention readily permits semi-automatic or completely automatic operations.

Referring more in detail to the drawing embodying my invention, the drill press shown therein comprises a heavy base **10** in which the hollow supporting column **11** is mounted. The bottom end of the column **11** is sealed by a plate **12** which is welded in place permanently. The work table **13** is adjustably mounted on the column **11** in the conventional manner, the handle **14** providing the usual lock and adjustment.

Surrounding the upper end of the column **11** is the head **15**. The drill spindle **16** is mounted at one end of the head **15** and driven through a pulley **17**, belt **18**, and pulley **19** by a motor **20** mounted at the opposite side of the head **15**. This is the conventional drill press arrangement. To prevent radial movement of the drill about

the column **11** but permit free vertical motion, I provide a bracket **21** clamped to the column **11** below the head **15**. One or more rods **22** are mounted in the bracket **21** and extend upwardly into vertical openings in the head **15** to permit vertical sliding movement of the head **15** but prevent radial movement.

The lower portion of the column **11** serves as a reservoir **23**. At a point in the column **11** even with the bracket **21** I provide a combination oil filler line and vent **24** to fill the reservoir **23** and to prevent an air lock.

The driving action is provided by the assembly at the top portion of the column **11** and head **15** and constitutes a reverse hydraulic action in which the piston and piston head is fixed and the cylinder is movable. The head **15** is provided with a vertical bore **25** in which the top of the column **11** extends. A fixed block **26** is positioned in the column **11** and supports a fixed piston rod **27** extending upwardly to a point adjacent the top of the column **11**. The piston head **28** comprises the conventional flexible members and washers and fits snugly into a cylinder **29** which is slidable within the column **11**. The bottom of the cylinder **29** is closed by a block **30** having a packed and sealed bearing **31** which rides on the fixed piston **27**. The upper end of the cylinder **29** extends into the bore **25** in the head **15** and is provided first with a closure block **32** mounted on the top of the cylinder, a gear pump **33** mounted on the closure block **32**, and an end cap **34** mounted on the gear pump. The pilot valve **35** is mounted on the head **15** adjacent the spindle and is provided with an operating valve handle **36**. The gear pump **33** is driven through a belt **37** from the motor **20**. The gear pump draws oil from the reservoir **23** through the tube **38** extending to a point adjacent to the bottom of the column **11**.

The conventional four way hydraulic valve is shown, and as noted in my copending application, all connections are made in the end cap **34** with suitable passageways extending through the gear pump **33** and block **32** as shown in Figs. 2, 3 and 4. Referring to these figures, the end assembly is held together by bolts (not shown) extending through the openings **34***a*. The block **32** is provided with journal openings **32***a* for the gear pump shafts. The end cap **34** is provided with an opening **33***a* through which the drive shaft of the gear pump extends. Pressure is controlled from the valve **35** through the ports **34***b*, *c*, *d*, and *e*, and **33***b*, to the gear pump, cylinder and reservoir.

The operation of the drill press is simple. When the motor **20** is started it will drive the spindle **16** through the belt and pulley arrangement. At the same time, the belt **37** will drive the gear pump **33**. Oil will be drawn by the gear pump from the reservoir **23** through the tube **38** and will be delivered to the pilot valve **35**. With the handle **36** in neutral position, the oil is returned through the return line to the reservoir **23**. When the handle **36** is depressed to the "down" position, oil is delivered from the pump **33** through the valve **35** to the bottom of the internal cylinder **29**. Pressure of the oil against the fixed piston head **28** will force the cylinder downwardly along the fixed piston **27** bringing the head **15** downwardly. When the valve handle **36** is raised to the up position the oil is delivered to the top of the cylinder **29** and will drive the head upwardly on the fixed piston. Motion may be stopped at any point in the up or down travel by returning the valve handle **36** to neutral.

Thus the vertical motion of the head **15** along the column **11** is accomplished by the piston rod **27** being secured to the fixed block **26** to cause pressure in the cylinder to move the head up or down to the fixed block. The rate of movement and the pressure applied are easily controlled by the valve handle **36** and the skill of the operator. I have thus provided a drill press in

which the supporting column houses a complete hydraulic drive system. The manually operated pilot valve 35 may easily be replaced by any of a large variety of commercial hydraulic or electro-hydraulic control valves. Thus the press can be made semi-automatic or completely automatic in its operation and lends itself to automation. For a more efficient and refined control of the drilling operation a conventional pressure relief valve and an adjustable flow control valve may be included in the circuit.

The construction is simple and economical to manufacture and assemble. Many other advantages will be readily apparent to a person skilled in the art.

I claim:

1. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle, and means for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head.

2. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle, and means for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head, said means being driven by said motor.

3. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle, and means for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head, said means including a gear pump.

4. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle, and means for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head, said means including a gear pump driven by said motor.

5. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a piston rod immovably mounted in said column and extending into said cylinder, a piston head on said rod engaging the walls of said cylinder, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle, and means for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head.

6. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a piston rod immovably mounted in said column and extending into said cylinder, a piston head on said rod engaging the walls of said cylinder, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle, and means for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head, said means being driven by said motor.

7. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a piston rod immovably mounted in said column and extending into said cylinder, a piston head on said rod engaging the walls of said cylinder, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle, and means for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head, said means including a gear pump.

8. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a piston rod immovably mounted in said column and extending into said cylinder, a piston head on said rod engaging the walls of said cylinder, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle, and means for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head, said means including a gear pump driven by said motor.

9. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a block sealing the bottom of said cylinder, a block sealing the top of said cylinder, a gear pump mounted on said top block, an end cap mounted on said gear pump, a fluid control valve mounted on said head and connected to said end cap, said cap, pump and top block having fluid passageways connecting said pump, cylinder and fluid reservoir, a vertical spindle mounted in said head over said table, and a motor mounted on said head for driving said spindle and said gear pumps for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head.

10. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower por-

tion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a block sealing the bottom of said cylinder, a block sealing the top of said cylinder, a gear pump mounted on said top block, an end cap mounted on said gear pump, a fluid control valve mounted on said head and connected to said end cap, said cap, pump and top block having fluid passageways connecting said pump, cylinder and fluid reservoir, a piston rod immovably mounted in said column and extending into said cylinder, a piston head on said rod engaging the walls of said cylinder, a vertical spindle mounted in said head over said table, and a motor mounted on said head for driving said spindle and said gear pump for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head.

11. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle, means for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head, and means for preventing radial movement of said head about said column.

12. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle, means for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head, said means including a gear pump driven by said motor, and means for preventing radial movement of said head about said column.

13. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end of said column, a cylinder mounted in said head bore and slidable within said column, a piston rod immovably mounted in said column and extending into said cylinder, a piston head on said rod enaging the walls of said cylinder, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle, means for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head, and means for preventing radial movement of said head about said column.

14. A drill press comprising a base, a hollow supporting column vertically mounted on said base, a work holding table adjustably mounted on said column, the bottom end of said column being sealed whereby the lower portion of said column constitutes a fluid reservoir, a head having a central bore slidably mounted over the upper end or said column, a cylinder mounted in said head bore and slidable within said column, a block sealing the bottom of said cylinder, a block sealing the top of said cylinder, a gear pump mounted on said top block, an end cap mounted on said gear pump, a fluid control valve mounted on said head and connected to said end cap, said cap, pump and top block having fluid passageways connecting said pump, cylinder and fluid reservoir, a vertical spindle mounted in said head over said table, a motor mounted on said head for driving said spindle and said gear pump for selectively supplying fluid under pressure from said reservoir to said cylinder to raise or lower said head, and means for preventing radial movement of said head about said column.

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