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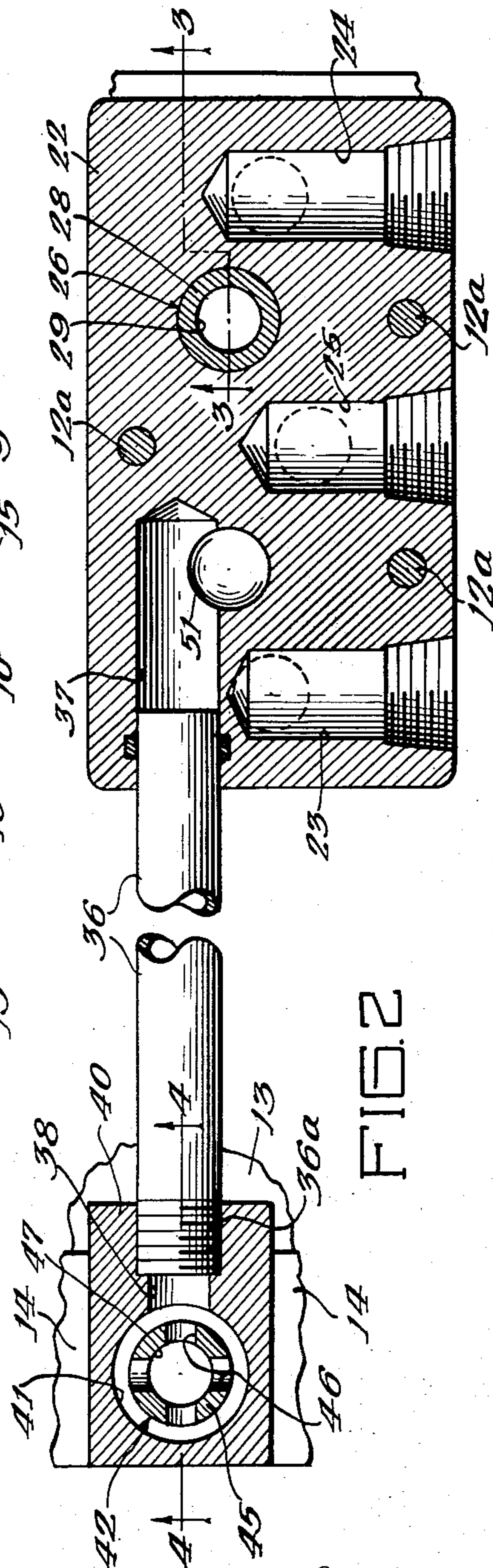
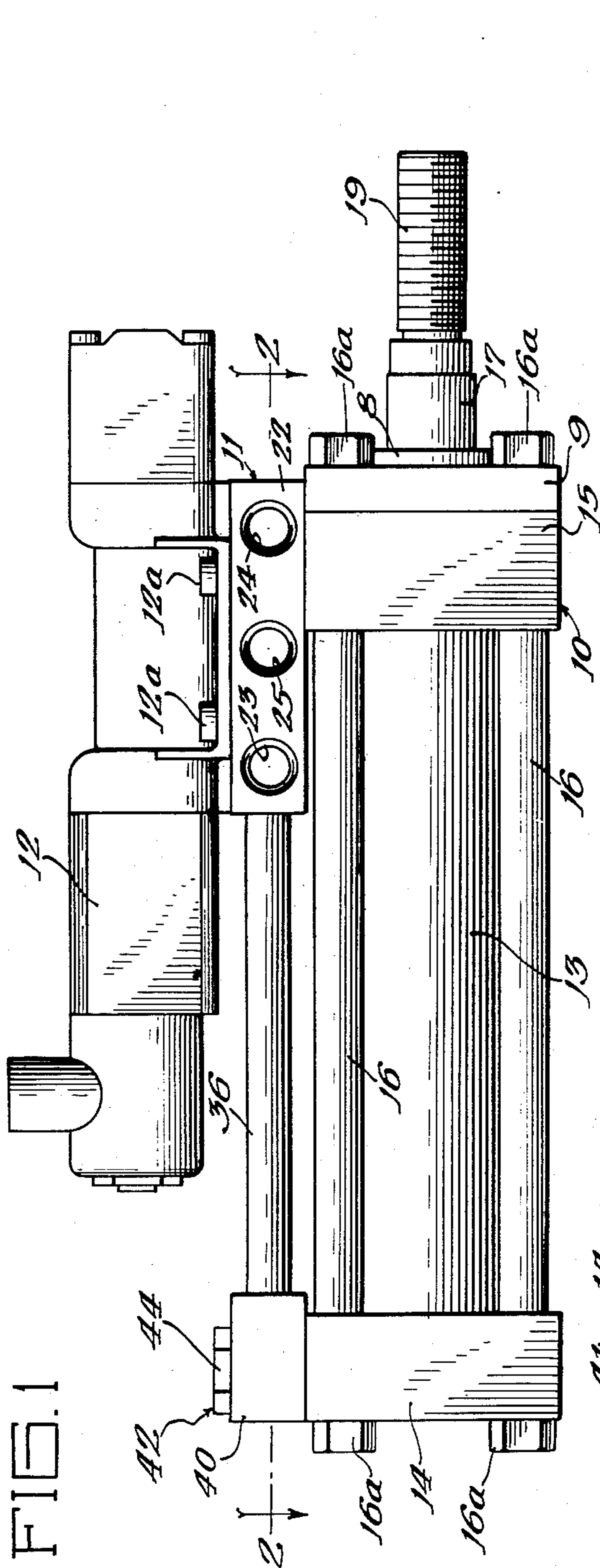
F. S. FLICK ET AL

2,953,118

PORT FITTING

Filed April 5, 1956

2 Sheets-Sheet 1



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FIG. 3

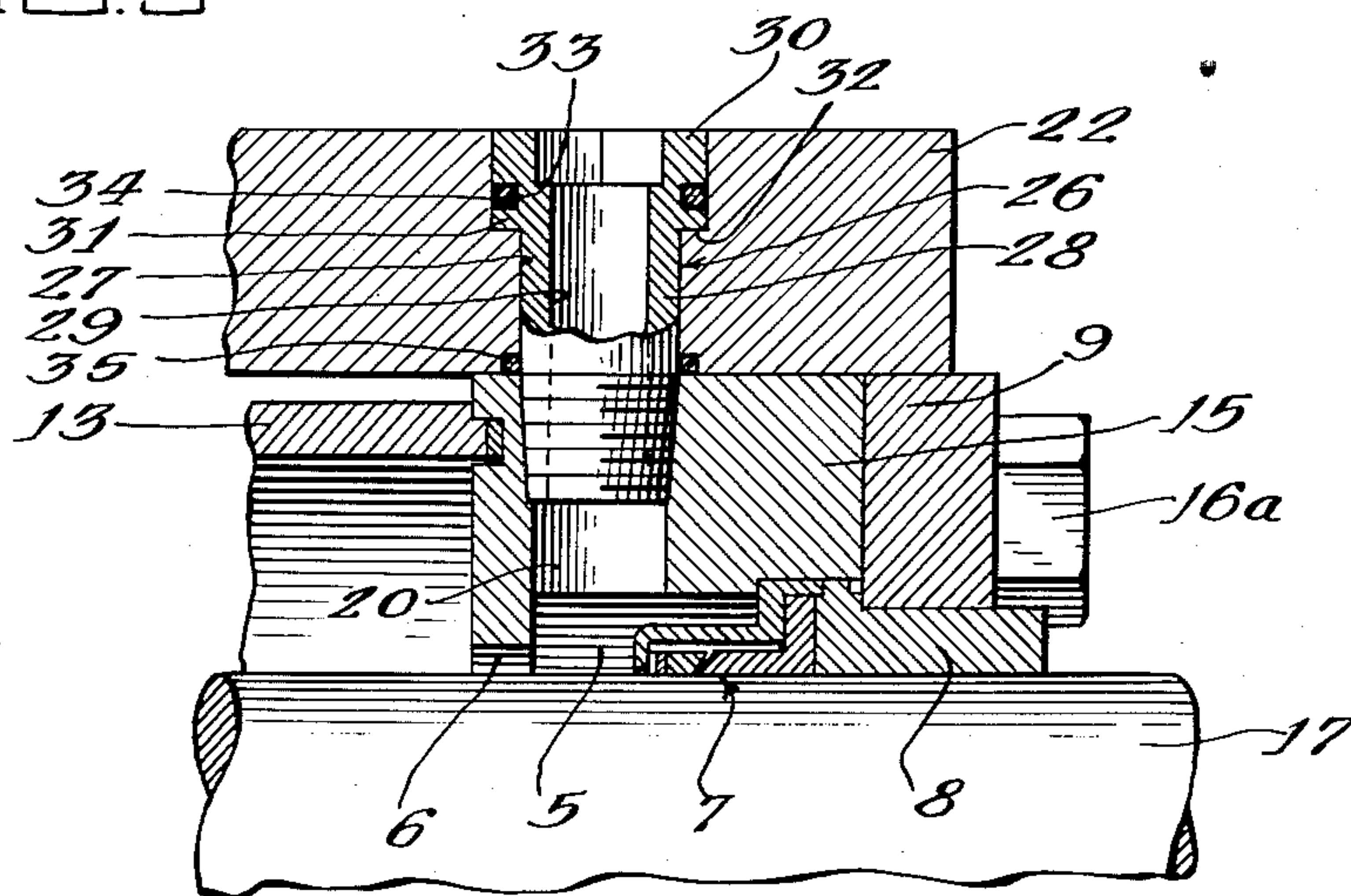
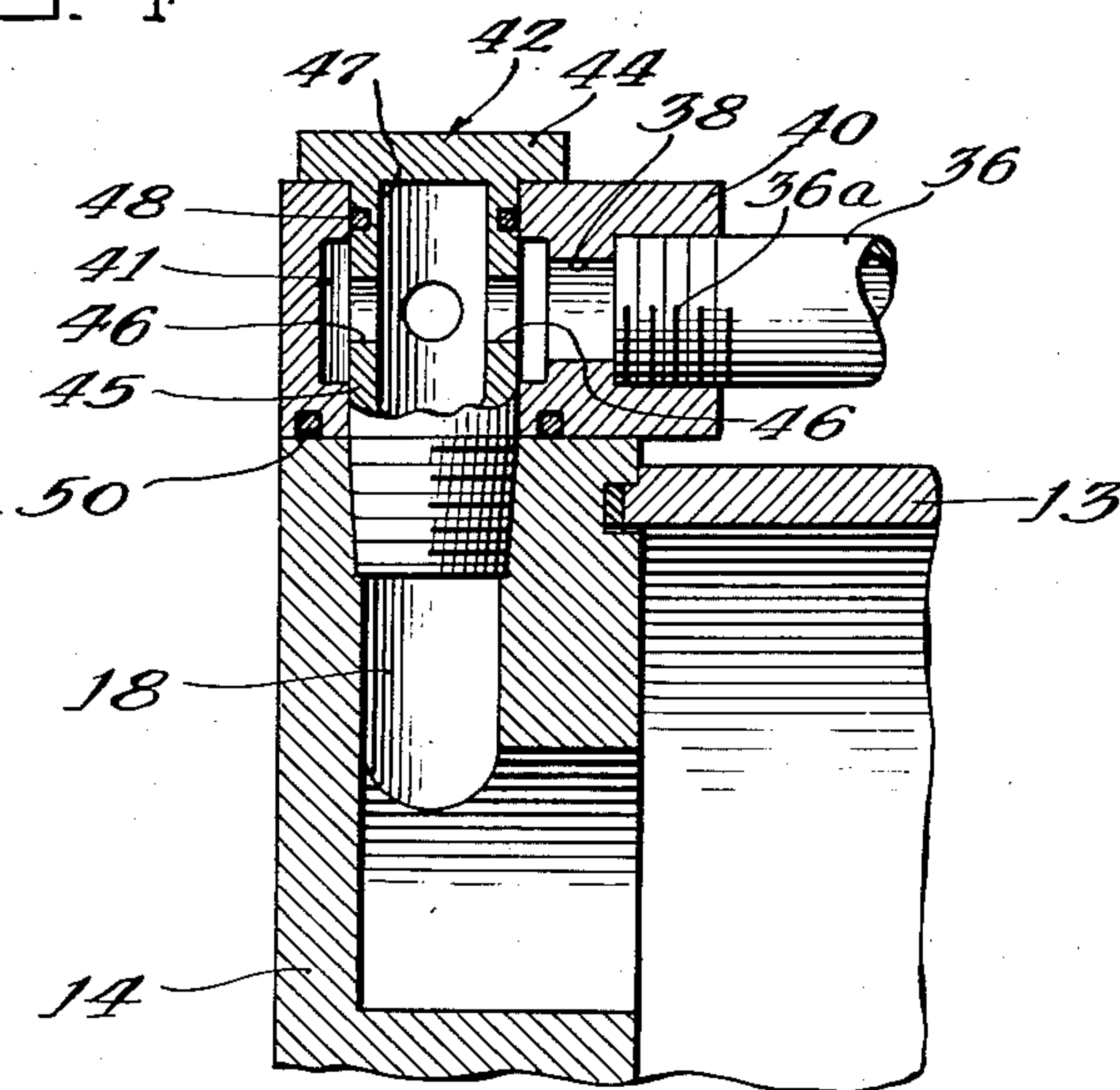


FIG. 4



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PORT FITTING

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This invention relates to fluid operated devices, and more particularly to a port fitting used for making a fluid connection with such a device.

Piston and cylinder devices have been conventionally provided with a manifold plate secured to one head and a solenoid or fluid operated control valve to regulate the actuation of the device. The manifold plate is normally secured to the cylinder head, and the control valve is mounted on the manifold to control the flow of fluid through the passages in the manifold to the piston and cylinder device.

Heretofore, such a manifold plate has been secured to the cylinder head by separately machined holes in the plate and head in which a machine bolt is inserted and tightened to secure the plate in position. The present invention obviates the necessity of separately tapping these holes for the machine bolts by providing a port fitting adapted to pass through a port or passageway in the manifold and be received in a port in the cylinder head.

A fluid connection to the opposite end of the cylinder has usually been accomplished with a pipe threaded coupling sometimes presenting difficulty in obtaining both fluid tightness and an elbow facing the proper direction to tie into the manifold plate. The present invention also provides a port fitting obviating these difficulties.

The primary object of the present invention is to provide a new and improved port fitting structure.

Another object is to provide a novel port fitting which maintains fluid tightness and at the same time permits attachment of a fluid line in any preselected position extending radially of the port opening.

Another object is to provide a novel port fitting adapted to secure a manifold to a cylinder head so that fluid tight passageway is formed through the manifold to the cylinder head.

A further object is to provide a novel port fitting which will substantially lessen the cylinder head and manifold machining costs in the manufacture of piston and cylinder devices.

The invention is illustrated in a preferred embodiment in the accompanying drawings, in which:

Figure 1 is a side elevational view of a piston and cylinder device having a manifold and control valve secured to the rod end of the device;

Figure 2 a sectional view taken as indicated on line 2—2 of Figure 1;

Figure 3 a sectional view taken as indicated on line 3—3 of Figure 2; and

Figure 4 a sectional view taken as indicated on line 4—4 of Figure 2.

In the embodiment illustrated, and as shown in Figure 1, a fluid operated piston and cylinder device, generally designated 10, is provided with a manifold assembly, generally designated 11, to which is secured a solenoid controlled valve 12 by machine bolts 12a. The valve 12 makes a fluid-tight connection with the manifold assembly 11 and may be a fluid operated pilot valve

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or a valve of any other type conventionally used for this purpose.

The piston and cylinder device 10 does not of itself form a part of this invention. The device includes a cylinder tube 13 having a cylinder head or cap 14 at one end and a cylinder head 15 at the rod end which are secured together by tie rods 16 and nuts 16a to form a fluid-tight connection with opposite ends of the cylinder tube 13. A piston rod 17 having a threaded end 19 for making a connection with a member to be driven is shown projecting from the rod end of the piston and cylinder device (Fig. 1).

The valve 12, through the manifold assembly 11 and piping, shown in Figure 1, is connected with a port 18 in the head 14 of the cap end of the cylinder and directly through the manifold with a port 20 in the head 15 at the rod end of the cylinder. The port 20 preferably opens into an enlarged annular chamber 5 which communicates with the interior of the cylinder through an annular channel 6 encircling the piston rod 17. A sealing structure, generally designated 7, may be provided within the head 15 about the piston rod 17, and the sealing structure 7 and a rod bushing 8 are secured in position by a retainer plate 9 held in place by tie rod nuts 16a.

The manifold assembly 11 at the rod end of the piston and cylinder device is provided with a manifold plate 22 which has a pair of fluid pressure inlet ports 23 and 24 and an exhaust port 25. The manifold plate 22 may be secured to either the cap end or the rod end of the cylinder. As herein shown, it is secured to the rod end by a port fitting, generally designated 26, which passes through a transverse opening 27 in plate 22 and is threadably received in the head port 20, as best seen in Fig. 3. the manifold plate forms a housing for the connecting member or fitting 26.

The port fitting 26 preferably includes a threaded hollow shank portion 28 and a hollow head portion 30 having a recessed hex head adapted to receive an Allen head wrench. The head portion 30 preferably has laterally extending shoulders 31 adapted to fit within the manifold opening 27 and rest against an annular seat 32 in the manifold plate 22. When the port fitting 26 is threaded into the head port 20, the port fitting will hold the manifold plate 22 in position upon the cylinder head 15 and also provide a passageway 29 between the valve 12 and cylinder head 15. Thus the need for machining openings for machine bolts to secure the manifold and head of the cylinder together is eliminated, and the outer head face supporting the adjacent manifold 22 may be substantially reduced in area if desired. The head portion 30 may also be provided with an annular groove 33 for receiving an O-ring 34, and the O-ring 34 together with a second O-ring 35 cooperate to assure a fluid tight seal between the cylinder head 15 and the manifold plate 22.

A fluid passageway is also provided from the manifold plate 22 to the cap end 14 of the cylinder. As herein shown, a length of hollow tube 36 may have a threaded end portion 36a engaging cooperating threads in a passage 38 of a port fitting housing 40, while the opposite end portion of the tube 36 is provided with an O-ring, as illustrated in Fig. 2, for sealing engagement with a manifold plate opening 37. The inner end of the passage 38 in the housing 40 preferably terminates in an enlarged annular chamber 41.

The housing 40 may be held in position without bolts upon the cap end of the cylinder by a threaded connecting member of the port fitting, generally designated 42 which completes the fluid connection from the tube 36 through the housing 40 to the port 18 in the cap end of the cylinder. The connecting member 42 is also pro-

vided with a head portion 44 and a threaded shank 45 adapted to be received in the cap port 18. The shank portion 45 is preferably provided with a plurality of apertures 46, each of which opens into a central channel 47 extending axially outwardly through the free end of the shank portion 45. When the connecting member 42 is inserted through the housing 40 of the fitting and drawn up tight in the threads of the cylinder cap port, the head portion 44 bears against an outer face of the housing 40 securing it to the cap end of the cylinder with part 38 facing any selected direction. As shown in Fig. 4, O-rings 48 and 50 may be provided to assure a fluid tight seal between the connecting member 42 and the housing 40 and between the housing and cylinder head 14 at the cap end of the cylinder.

To illustrate the operation of the device, assume that fluid pressure is to be admitted to the rod end of the cylinder through the inlet port 24. At this time, the solenoid valve 12 is arranged so that the cap end of the cylinder is connected to the exhaust port 25 through the port fitting on the cap 14, the tube 36, a passage 51 in the manifold plate, and passages in the solenoid valve 12. Actuating fluid pressure then enters the port 20 through the port fitting 26 and drives the piston to the cap end of the cylinder forcing fluid on the cap end side of the piston out through the exhaust port 25.

As the piston reaches the cap end of the cylinder, on the left as shown in Fig. 1, the solenoid valve 12 reverses the port connections so that the rod end of the cylinder is connected to the exhaust port 25, the manifold inlet port 24 is closed, and the cap end of the cylinder is connected to a source of fluid pressure through the manifold inlet port 23. The piston is then moved once more to the rod end of the cylinder after which the cycle may be repeated.

The fittings of the present invention provide a quick and easily made means for attaching a valve and its manifold to a cylinder or other fluid motor. All that is necessary is the presence of the usual tapped ports in the fluid motor. No pattern for drilling either the manifold or cylinder head is needed since the assembly may be secured to the cylinder entirely with the fittings of this invention.

The port fitting on the cap end of the cylinder permits a fluid tight connection to be made between the port and tubing 36 regardless of the angular position of the tube relative to the port. In the past, elbows and similar fittings relied upon the tightness of the threads in the port to seal against leakage which also presented difficulty in obtaining the desired directional facing of the connecting piping. This port fitting may be faced in any direction with equal facility and will insure fluid tightness at the same time.

The foregoing detailed description is given for clearness of understanding only and no unnecessary limitations should be understood therefrom, for some modifications will be obvious to those skilled in the art.

We claim:

1. In a piston and cylinder device having a threaded port through the cylinder head, and a manifold plate having an outer surface and an inner surface with a passage extending through the manifold plate between said surfaces and having a step forming a seat in the passage adjacent the outer surface of the manifold plate said manifold plate being positioned with its inner surface abutting the cylinder head surface containing said threaded port, an integral fitting lining said passage and securing the manifold plate to said cylinder head to maintain the abutting surfaces in sealing engagement, said fitting having a headed portion and an externally threaded shank, the shank extending through the passage in said manifold plate and engaging the threaded port in said cylinder head, said headed portion having laterally ex-

tending shoulders engaging the seat within the manifold passage, said fitting having an axial fluid passage through the shank and headed portion to provide a connection for fluid flow through the manifold plate to the port in the cylinder head, said headed portion being provided with a tool engaging surface to facilitate turning the fitting for interengagement of the threaded shank with the threaded port in the cylinder head, said fitting when fully seated being positioned to adapt said outer surface of the manifold plate for mounting a control valve.

2. A device of the character described in claim 1, wherein the tool engaging surface of said fitting is below the outer surface of said manifold plate when the fitting is fully seated in said passage.

3. In a piston and cylinder device having a cylinder head with a threaded port opening outwardly of a flat surface of the cylinder head and providing a fluid passageway to the device, a fluid control assembly, comprising: a manifold plate having a flattened outer surface and a flattened inner surface with a passage extending through the manifold plate between said surfaces and having a step forming a seat in the passage adjacent the outer surface of the manifold plate, said manifold plate also having an inlet passageway extending therethrough and opening on said flattened outer surface, the manifold plate being positioned with its inner surface abutting the cylinder head surface containing said threaded port; an integral fitting lining the passage and securing the manifold plate to said cylinder head to maintain the abutting surfaces in sealing engagement, said fitting having a headed portion and an externally threaded shank, the shank extending through said passage in the manifold plate and engaging the threaded port in said cylinder head, said headed portion having laterally extending shoulders engaging the seat within the manifold passage to adapt the outer flattened surface for receiving a control valve, said fitting having an axial fluid passage through the shank and headed portion to provide a connection for fluid flow through the manifold plate to the port in the cylinder head, said headed portion being provided with a tool engaging surface to facilitate turning the fitting for interengagement of the threaded shank with the threaded port in the cylinder head; and a control valve having a mounting surface positioned on said flattened outer surface of the manifold plate in sealing engagement therewith, said control valve having a pair of connected fluid passageways opening in said mounting surface, the first of said passageways being aligned with said inlet passageway in the manifold plate and the second of said passageways being lined with the axial fluid passage through said fitting whereby fluid operating pressure may pass successively through said inlet passageway of the mounting plate, said first and second passageways of the control valve, said axial fluid passage of said fitting and said threaded port of the cylinder head to operate the device.

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