

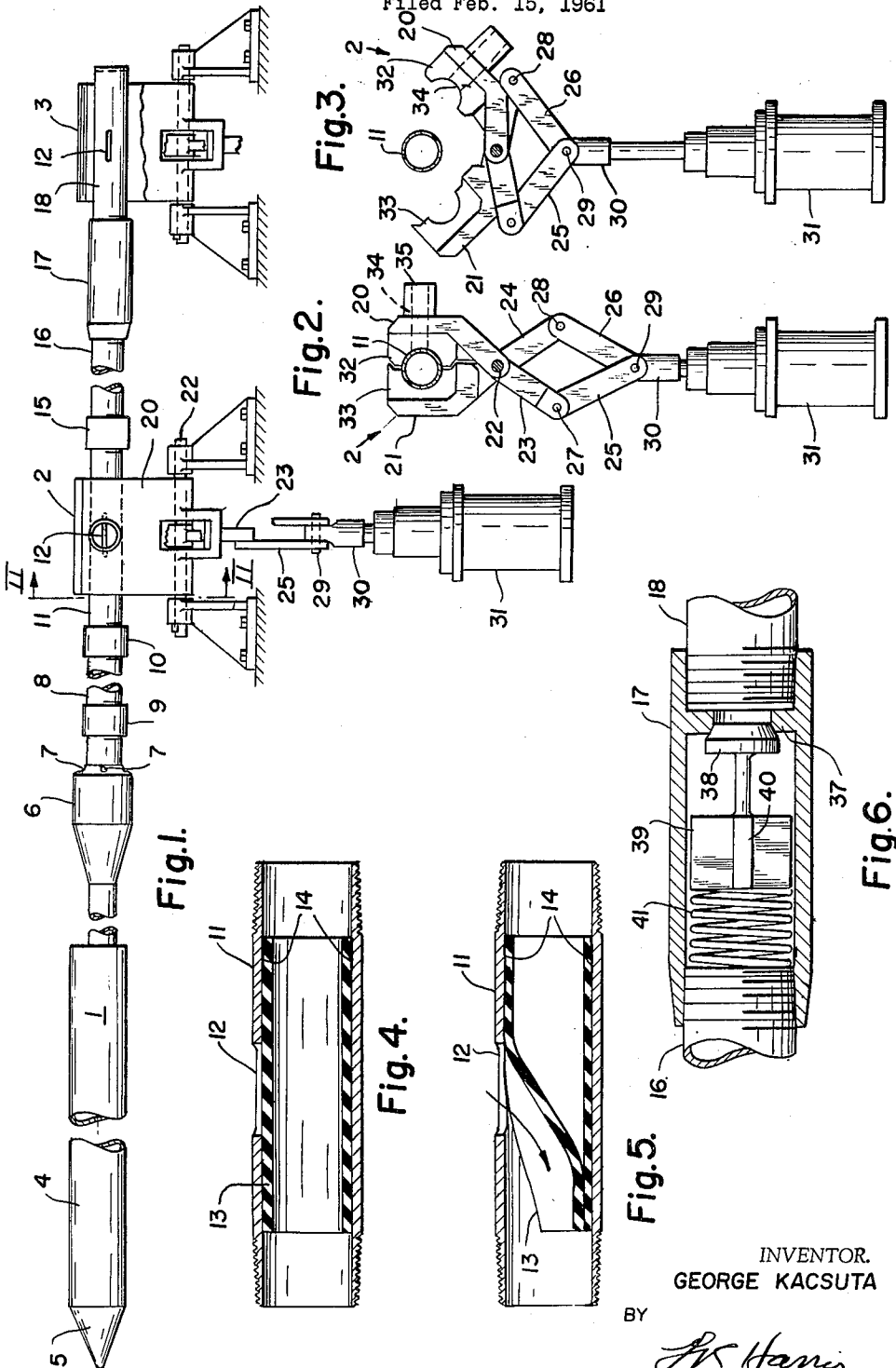
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APPARATUS FOR INTRODUCING FLUIDS INTO PIPES

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3,085,549 APPARATUS FOR INTRODUCING FLUIDS INTO PIPES

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This invention relates to apparatus for introducing fluids into pipes. It is more particularly concerned with apparatus for progressively applying fluid to the interior walls of a succession of pipe lengths, and to a novel valve structure especially useful with such apparatus.

In the manufacture of certain types of pipe it is necessary or desirable to apply a fluid to the interior pipe wall. The fluid may be a varnish or other type of coating with which it is desired to coat the pipe interior. Some grades of steel pipe are heated and quenched to increase their tensile strength, and in such case the fluid may be water, air, or other quenching fluid, for it has been found desirable in some instances to quench the pipe from the inside rather than from the outside. In the manufacture of pipe provided with an exterior plastic coating which must be applied hot or while the pipe is hot it is found that the pipe cools much faster when it is quenched from the inside than when it is quenched from the outside. Other processes requiring the application of fluid to the interior of pipe will suggest themselves to those skilled in the art of pipe manufacture.

It is known to apply fluid to the interior wall of a pipe by inserting a hollow mandrel or tube into the pipe to be treated and discharging fluid from the mandrel. The pipe may be moved over the mandrel and then backed off, or the mandrel may be moved into and then out of the pipe, but in either case the operation is time consuming and not well adapted to the progressive treatment of successive lengths of pipe.

It is an object of my invention, therefore, to provide apparatus for progressively applying fluid to the interior walls of successive lengths of pipe by moving the pipes in succession over the mandrel unidirectionally. It is another object to provide valve means for such a mandrel which are rapidly connected to and disconnected from an external source of fluid. Other objects of my invention will appear from the description thereof which follows.

An embodiment of my invention presently preferred by me is illustrated in the attached drawings to which reference is now made.

FIGURE 1 is an elevation of a mandrel and associated apparatus of my invention.

FIGURE 2 is a section through my apparatus of FIGURE 1 on the plane II—II showing the means for introducing fluid connected to the mandrel.

FIGURE 3 is a section through the apparatus of FIGURE 1 on the same plane as FIGURE 2 but showing the means for introducing fluid disconnected from the mandrel.

FIGURE 4 is an elevation in section of the valve of my invention in its closed position.

FIGURE 5 is an elevation in section of the same valve in its open position.

FIGURE 6 is an elevation in section of a check valve adapted to the apparatus of my invention.

My apparatus comprises a mandrel indicated generally by reference character 1 and a pair of disconnectable coupling mechanisms 2 and 3 which are identical. Each coupling mechanism 2 or 3 alternately coats with other portions of my apparatus to be described to introduce fluid into mandrel 1.

Mandrel 1 has an entering end 4 provided with tapered

nose 5. End 4 is connected to spray head 6 formed with spray holes 7—7 inclined outwardly and away from end 4. Spray head 6 is connected through tube 8 and couplings 9 and 10 to a length of tube 11 which forms the body of the valve of my invention. As is best shown in FIGURE 4 valve body 11 is provided with a port 12 in its wall. Port 12 is elongated in the direction of the tube axis. Fitted snugly in valve 11 so as to underlie port 12 and extend both ways therefrom is a sleeve 13 of resilient flexible fluid-tight material, such as rubber. The end of sleeve 13 remote from entering end 4 of mandrel 1 is bonded to valve 11 with a suitable bonding substance 14. The bond extends around the full circumference of that end of sleeve 13 and stops short of port 12. The portion of sleeve 13 beyond the opposite end of port 12 is not bonded to valve 11. Valve 11 through coupling 15 and tube 16 is connected to a check valve 17, and to a valve 18 also having a port 12 as has been described. Valve 18 is closed at its uncoupled end.

Valves 11 and 18 are spaced from each other a distance greater than the longest length of pipe to be treated. Associated with valve 11 is disconnectable coupling mechanism 2 and associated with valve 18 is disconnectable coupling mechanism 3, which is identical with mechanism 2.

Coupling mechanism 2 includes a pair of elongated jaws 20 and 21 pivotally connected by pin 22. The lower portion of jaw 20 extends below pin 22 as arm 23 and the lower portion of jaw 21 extends in the same way as arm 24. Arm 23 is pivotally connected to link 25 through pin 27, and arm 24 is pivotally connected to link 26 through pin 28. Links 25 and 26 are pivotally connected at their other ends to piston rod 30 of air cylinder 31 by pin 29. Air cylinder 31 is connected to a source of air under pressure, not shown. Jaw 20 is provided with a liner 32 formed with a semi-cylindrical cavity in its mandrel-engaging face and jaw 21 is provided with like liner 33. A hole 34 extends through liner 32 and jaw 20 aligned with the bore of nipple 35 on jaw 20. The inner end of hole 34 is aligned with port 12 in valve 11. Nipple 35 is connected to a source of fluid under pressure through a hose or flexible conduit, not shown.

Check valve 17 has an annular seat 37 which mates with valve head 38 to close off the fluid passage. Valve head 38 is connected to a pair of crossed arms 39 and 40 against which rests the end of compression coil spring 41 which is positioned coaxial with valve 17. The other end of spring 41 abuts the end of tube 16 which screws into valve 17.

The operation of my apparatus will now be described with reference to the foregoing description and the attached figures. Coupling mechanism 2 is clamped on valve 11 in the position shown in FIGURES 1 and 2. A pipe to be treated is passed over entering end 4 of mandrel 1. When the leading end of the pipe passes over spray head 6 fluid under pressure is admitted to nipple 35. The pressure of the fluid causes sleeve 13 to be pushed aside at port 12, and take the form shown in FIGURE 5. The unbonded end of sleeve 13 is collapsed, allowing the fluid to flow toward spray head 6. The collapsed sleeve 13 tends to act as a check valve preventing fluid from flowing toward the rear end of mandrel 1, and check valve 17 positively closes off mandrel 1 ahead of valve 18. It is clear from FIGURE 6 that when the pressure of the fluid acts in the same direction as the force of compression spring 41 check valve 17 is held closed. The fluid, therefore, must flow through spray head 6 against the inside of the pipe passing over it.

When the leading end of the pipe reaches coupling mechanism 2 the jaws of coupling mechanism 3 are clamped on valve 18, if they have not previously been so clamped, and fluid is supplied to coupling mechanism

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3. Air is then admitted to cylinder 31 so as to raise piston rod 30 and open jaws 20 and 21 of coupling mechanism 2 into the position clear of the pipe shown in FIGURE 3. At the same time the supply of fluid to nipple 35 is shut off. Fluid then flows into mandrel 1 through port 12 in valve 13. The check valve 17 is adjusted so that the pressure of the fluid is sufficient to compress spring 41 and open the valve. The fluid entering valve 11 from the end at which sleeve 13 is bonded to the wall thereof forces sleeve 13 against the tube wall, and closes off port 12. The fluid, therefore, continues to be discharged only from spray head 6 against the inner wall of the pipe as it passes over mandrel 1. When the trailing end of the pipe clears valve 11, coupling mechanism 2 is clamped against valve 11, coupling mechanism 3 is opened in the way which has been described for coupling mechanism 2, and the pipe is removed from mandrel 1 in the direction of its previous travel. Another pipe is passed over entering end 4 of mandrel 1, and the cycle is repeated.

If desired, valve 11 may be provided with two or more ports 12 disposed around its circumference and liner 33 and jaw 21 may also have a hole through them aligned with a port 12, and a nipple, such as nipple 35, connected to a source of fluid under pressure.

I claim:

1. A valve apparatus comprising a valve body, a port in the valve body wall, an internal seal therefor of resilient flexible fluid-tight material bonded to the wall on one side of the port and underlying the port so as to fit closely against the wall but unbonded to the wall on the other side of the port, and a pair of jaws pivoted together so as to open and close on the valve body and contoured to fit closely around the valve body and seal against it when closed, at least one of the jaws being provided with an opening and fluid conduit positioned to abut the port in the valve body wall.

2. A valve apparatus comprising an elongated valve body provided with a fluid passage extending therethrough from one end to the other, a port in the valve body wall intermediate the ends of the fluid passage, a generally tubular internal seal for the port of resilient flexible fluid-

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tight material bonded to the wall of the fluid passage in a region between one end thereof and the port, and underlying the port and a region between the port and the other end of the fluid passage so as to fit closely against the wall and close the port, and a pair of jaws pivoted together so as to open and close on the valve body and contoured to fit closely around the valve body and seal against it when closed, at least one of the jaws being provided with an opening and fluid conduit positioned to abut the port in the valve body wall and external means for introducing fluid into the port.

3. Apparatus for progressively applying fluid to the interior walls of successive pipe lengths comprising a hollow mandrel over which the pipe is caused to progress, the mandrel being longer than a length of pipe, fluid discharge openings in the mandrel adjacent to its entry end, a first port in the mandrel wall spaced from the fluid discharge means, a second port in the mandrel wall spaced from the first opening a distance greater than a length of pipe, an internal seal for the first port of resilient flexible fluid-tight material bonded to the mandrel wall on the side of its port remote from the fluid discharge openings and underlying the port so as to fit closely against the mandrel wall but unbonded to the mandrel wall on the other side of its port, and separate external disconnectable means for introducing fluid into each port.

4. Apparatus of claim 3 including a check valve between the ports adjusted to prevent fluid flow from the first port to the second port.

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