Jan. 4, 1955 M. D. McSHURLEY ET AL 2,698,630

VALVE

Filed April 19, 1951

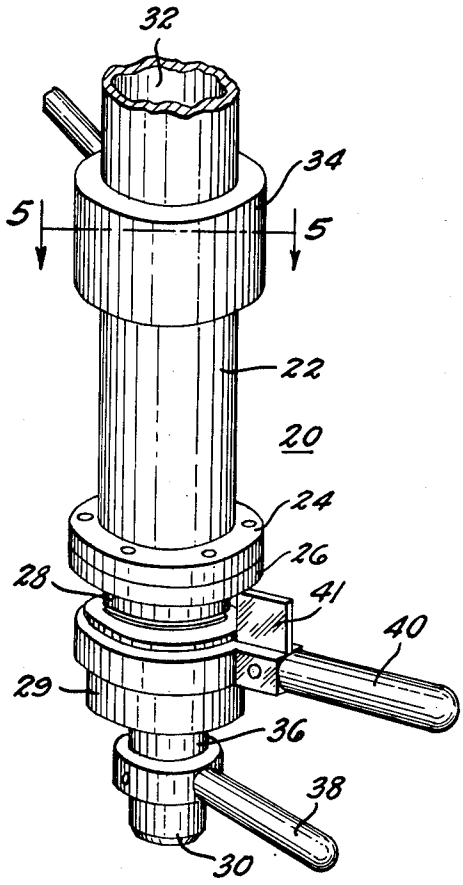


Fig. 1.

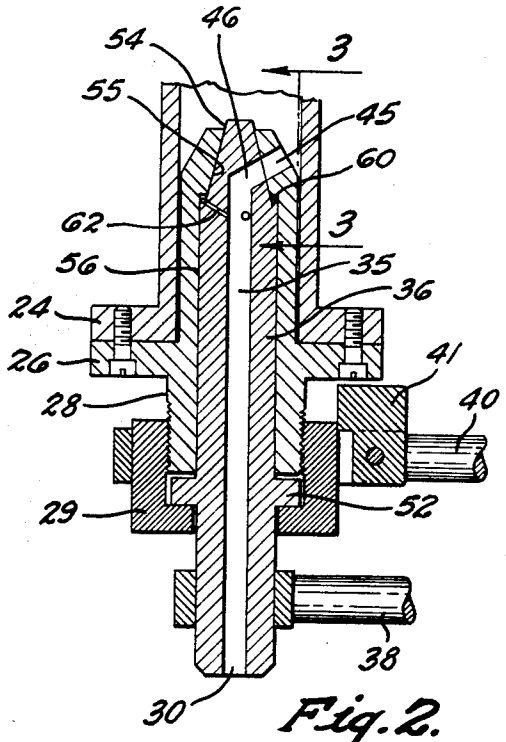


Fig. 2.

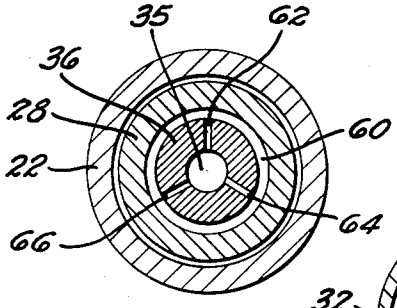


Fig. 4.

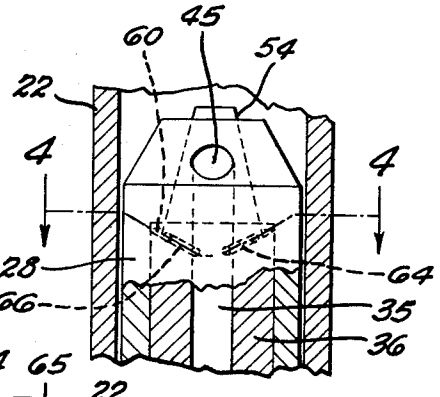


Fig. 3.

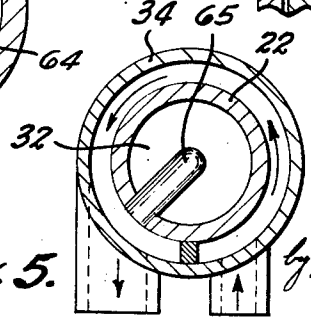


Fig. 5.

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VALVE

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Application April 19, 1951, Serial No. 221,903

2 Claims. (Cl. 137—312)

This invention relates to valves and valve assemblies and is particularly concerned with valving mechanism for use with molten material, such as molten lead and lead alloys.

The basic object of the invention is, therefore, to provide a cut-off valve which may be used in a molten lead supply line for controlling the flow of lead or lead alloy therethrough.

In carrying out the above object, it is a further object to provide a rotatable cut-off valve of the packless type.

A still further object of the invention is to provide an annular duct in the valve plug which communicates with the outlet of the valve, said duct collecting any leakage through the plug and conducting said leakage into the outlet of the valve.

Another object of the invention is to provide a valve combination for use in connection with molten materials wherein a chill band is provided at the supply side thereof and wherein the valve mechanism per se is removable from the supply means whereby the valve mechanism may be removed when the chill band is in operation without draining the molten material from the supply means.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein preferred embodiments of the present invention are clearly shown.

In the drawing:

Fig. 1 is a view in perspective of a valve and chill band combination.

Fig. 2 is a view in section through the valve.

Fig. 3 is a fragmentary, sectional view on an enlarged scale taken on the line 3—3 of Fig. 2.

Fig. 4 is a view taken on the line 4—4 of Fig. 3.

Fig. 5 is a sectional view of the chill band taken on the line 5—5 of Fig. 1.

Many problems arise in the control of the flow of molten materials, particularly such materials as molten metal, for example, lead and lead alloys. These materials, due to their weight and temperature, have a strong eroding effect on valve mechanisms and further, it is difficult to seal valving mechanisms due to the great weight of the material passing therethrough. It is apparent that packing and similar expedients, used in connection with water valves and the like, cannot be used where molten materials are involved since said packing would burn out very quickly due to the high temperature that the valve attains.

Our invention is therefore directed to a packless type, vertically disposed valve wherein the plug member includes an annular duct at the upper end thereof which collects leakage around the valve plug and which communicates with the outlet of the valve whereby said leakage is brought back into the supply system.

Referring particularly to Fig. 1, a valve combination is shown at 20 which includes an annular tubular member 22 terminating in a flange 24 which is connected by screws to a mating flange 26 carried by a body member 28. The outlet of the valve is shown at 30 whereas the inlet is depicted at 32 which is formed by an extension of the member 22 and which includes a chill band 34 thereabout. The outlet 30 is at the lower end of a longitudinal bore 35 within the plug 36 of the valve. The valve 20 is operated to on and off positions by means of a handle 38 which grips the plug 36 adjacent the lower end thereof and turns the same. A second handle 40 is provided around an adjustable packing nut 29 which

is threadedly connected to the body member 28. The nut 29, through the attached handle 40, may be held in fixed position while the handle 38 is manipulated to turn the valve on and off. The body member 28 has an aperture 45 in its upper truncated conical surface which communicates with a mating aperture 46 in the plug 36. Adjacent the packing nut 29, the plug has an annular flange 52 which acts as a thrust bearing against the nut 29 when the valve is in assembled position as shown in Fig. 2. The upper end of the plug 36 has a truncated conical surface 54 which is ground into a mating surface 55 on the valve body portion. The plug 36 is a snug fit within the bore 56 of the valve body 28 but is not so snug as to bind when the two portions attain temperature. In this connection, it is desirable to fabricate the plug 36 from one material, such as nickel cast iron and the body from another material, such as silchrom steel. It will be noted that around the upper end of the plug 36 and at the base of its upper, truncated conical surface 54, there is an annular groove having a V-shaped cross section at 60. This groove 60, as noted in Fig. 4, has three radially extending apertures 62, 64 and 66 thereon which connect with the base thereof to the longitudinal bore 35 through the plug. Thus when any leakage occurs along the ground surfaces 54 and 55, material is forced by gravity into the groove 60 and then passes through the apertures 62, 64, 66 and into the bore 35, thence into the outlet 30. In this manner leakage is eliminated.

It will be noted that the flange 52 is of less dimension than the clearance between the nut 29 and the body portion 28. This clearance is provided so that the nut 29 can be drawn up to force the mating surfaces 54 and 55 into close contact with one another and wherein the entire bearing of the valve plug is on the thrust surface between the flange 52 and the nut 29. This reduces friction and makes it possible to easily operate the valve through handle 38. The handle 40 includes an indicator 41 thereon which may be set according to indicia not shown on the flange 26. In this manner it is a simple matter to reestablish the desired adjustment in the event that the nut 29 has been removed for any cause.

In this connection, when the valve becomes fouled or commences to leak, due to excessive erosion or other cause, it is possible to remove the entire valve by removal of the screws associating flanges 26 and 24 to one another. Removal of the nut 29 permits disassembly of the valve barrel from its body. Thus the plug 36 may be removed from the body 28. In order to permit such removal and disassembly without discontinuing the lead line functions which the valve controls and which, in many instances, include a plurality of outlets, a chill band 34 is provided around the inlet 32. This chill band 34 is shown in detailed cross section in Fig. 5 with arrows indicating the direction of water flow. When it is desired to remove the valve mechanism per se, water is circulated through the band 34 until the lead in the inlet 32 is frozen. At this time, and while the water remains in circulation, the valve may be removed, repaired and/or replaced. In order to prevent the frozen slug of lead from shifting in the inlet 32, a pin 65 is provided which holds the slug stationary within the inlet.

After the valve mechanism has been reassembled and the system is ready for further operation, the water circulation is stopped in the chill band 34 and blast burners are turned on to heat inlet 32 sufficiently to melt the slug of frozen material whereupon the entire operation may be reestablished.

Valves of this character are used in a number of applications, one of which is shown in our copending application Serial No. 221,902, filed concurrently herewith. In this case, the valves are operated automatically by magnetic or mechanical means which are timed to move the handle 38 backward and forward to open and close the valve in coordination with other functions, for example, in the molding machines.

It is manifest from the description that we have provided a rugged valve mechanism which is packless and which is leak-free due to the annular groove at the upper end of the barrel, which valve mechanism in combination with the chill band, presents a control assembly that may be utilized in connection with pipe lines containing molten materials. The valve is easily adjusted for wear through

the nut 29 to keep the same in working condition without leaks.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A lead valve assembly to control the flow of lead in a molten lead supply line, the combination comprising; an elongate, vertically disposed, tubular body member having a flange adjacent the lower end thereof and adapted to connect into a supply line, a second flanged body member which includes an internal bore therethrough wherein the flange is disposed adjacent the center of said member, the outer diameter of said second body member being such that it may be inserted into the first mentioned tubular body member and sealed thereto by means of said flanges which, when in assembled position, abut one another, a longitudinally bored plug adapted to fit into the bore of the second body member, said plug having a tapered upper end which seats tightly into a tapered bore portion of the second mentioned body member, said second body member and said plug each having an aperture therethrough adjacent the tapered portions thereof, which apertures register in one position to permit lead to flow therethrough, said plug including an annular groove adjacent the lower end of the tapered portion thereof which is connected by means of a duct with the plug bore whereby any lead which leaks past the tapered portion of the plug may be brought back into the plug bore, means for turning the plug for controlling the flow of lead through said apertures and a packing gland for holding the plug in place within the second body member, said gland acting as a thrust bearing at one surface only thereof for said plug.

2. A cut-off valve for use in the control of flow of heavy molten materials, comprising in combination; a vertically disposed body member, an inlet port therethrough adjacent the upper end thereof, a rotatable plug member adapted to fit within said body member and having a longitudinal outlet bore therethrough, a tapered nose portion on said plug adapted to fit closely into a complementary portion in said body member, an inlet port at the tapered portion of said plug adapted to register with the body inlet port in one position of rotation of the plug, said plug including an annular groove at the base of the tapered portion thereof, which groove communicates through a duct with the plug bore whereby leakage past the tapered portion of the plug is trapped into the groove and returned through said duct to the plug bore, means for turning the plug into a non-registering position with the inlet port of said body, and a gland adapted to urge the plug into the body member and act as a thrust bearing for said plug member.

References Cited in the file of this patent

UNITED STATES PATENTS

829,524	Happ	Aug. 28, 1906
919,508	Williams	Apr. 27, 1909
1,128,982	Hogle	Feb. 16, 1915
1,511,760	Helldov et al.	Oct. 14, 1924
1,616,287	Stone	Feb. 1, 1927
1,654,298	Manison	Dec. 27, 1927
2,068,369	Brown	Jan. 19, 1937
2,090,277	Williams	Aug. 17, 1937
2,469,642	Grewe	May 10, 1949
2,510,513	Mueller	June 6, 1950