Oct. 2, 1962 F. HAUSER 3,056,426

DISTRIBUTORS

Filed Oct. 21, 1960

FIG. 2.

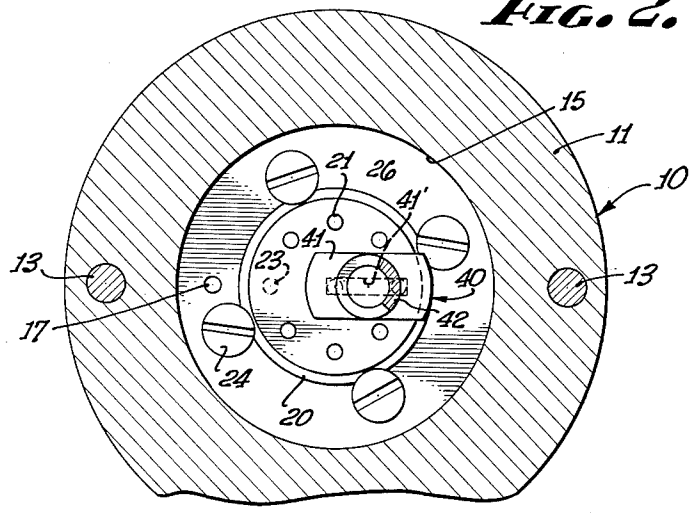


FIG. 3.

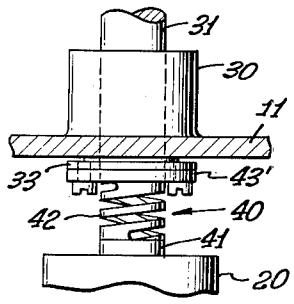


FIG. 1.

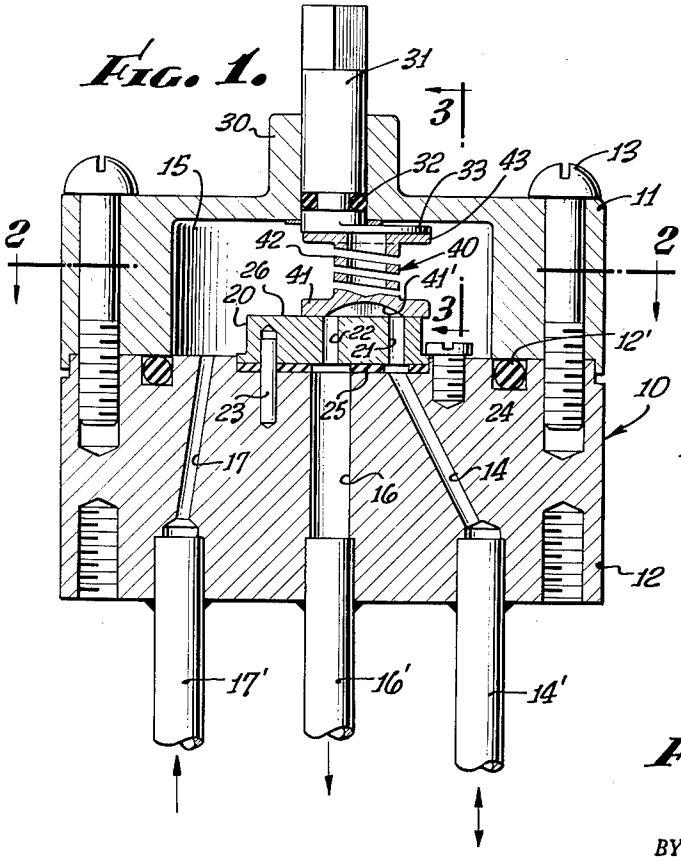
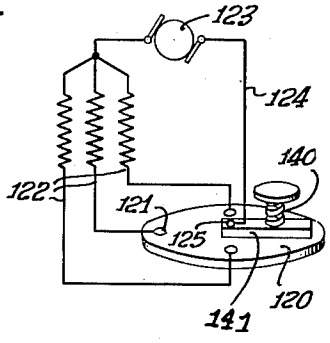


FIG. 4.



FRED HAUSER
INVENTOR.

BY Miketta and Glenny
ATTORNEY.

United States Patent Office 3,056,426 Patented Oct. 2, 1962

3,056,426

DISTRIBUTORS

Fred Hauser, 1544 Midvale Ave., Los Angeles, Calif.

Filed Oct. 21, 1960, Ser. No. 64,167
3 Claims. (Cl. 137—624)

This invention relates generally to a device for providing uninterrupted sliding contact between two flat contacting surfaces, and more particularly to an improvement in distributors, such as hydraulic distributor pilot valves, whereby an effective contact between two flat surfaces is maintained during relative motion therebetween such as to prevent fluid being distributed by a hydraulic distributor pilot valve from leaking between said surfaces or to maintain good electrical contacts in an electrical distributing system.

Distributor pilot valves have long been employed to control associated pressure actuated fluid flow control valves as in automatic lawn sprinkling systems and as disclosed in my copending application, Serial No. 790,531, filed February 2, 1959 and now Patent No. 3,012,751, issued Dec. 12, 1961, on a "Diaphragm Actuated Valve." Individual fluid flow control valves may be provided at various desired locations in a sprinkling system and selectively operated by a single pilot valve. The individual control valves are normally connected through the pilot valve to a high pressure fluid source and are maintained in a closed position by the force of such fluid pressure. The pilot valve is adapted to successively and selectively vent each and any of the various pressure lines to the atmosphere relieving the fluid pressure on the corresponding control valve associated therewith and thereby opening such control valve as desired. In these pilot valves, the various pressure lines to the control valves normally enter the pilot valve body in a generally circular orbital array and a venting or pressure bleeding line is disposed in the center of the array. A wiper or channelled block element is eccentrically mounted within the pilot valve to orbit about the array of pressure lines along an inner surface of the pilot valve body in which the pressure lines terminate. The wiper element is thereby adapted to interconnect the centrally located bleeding or venting line, about which the wiper rotates, with each pressure line as desired. The various valves are normally held closed by the fluid pressure acting through the pilot valve on each control valve until the wiper element is moved over a pressure line termination within the pilot valve, closing off the pressure line from the high pressure fluid source and venting it to the atmosphere through the bleeder line. The individual control valves are thus individually and selectively operated by movement of the wiper element within the pilot valve.

In the past, the seal between the wiper element and the inner surface of the valve body, has been provided by grinding the contacting surfaces to virtual flats to obtain relatively smooth uninterrupted sliding contact therebetween. Accurate alignment of two contacting non-resilient metallic surfaces to effect a seal therebetween is practically impossible in commercial production. It was therefore determined that if a certain amount of resiliency in the wiper element was provided, it is possible to maintain an operable seal between the contacting surfaces and compensate for discrepancies in alignment and flatness of the contacting surfaces. This resiliency was provided in the past by slidably mounting the wiper on the lower end of the driving shaft and urging it toward the valve body by spring means associated with the shaft and wiper. A minute sliding action between the lower portion of the driving shaft and the wiper element was therefore present as the wiper moved about the valve body surface. It has been found, however, that in using such pilot valves in systems employing fluids which cause

corrosive and clogging effects on the apparatus (such as the existence of calcium deposits and effects of electrolysis and galvanic action in lawn sprinkling systems employing unsoftened water, etc.) that the built-in resiliency of the wiper element diminishes during use. When the wiper element freezes on the driving shaft due to corrosion, mineral deposits, etc., the necessary resilience is eliminated and the seal between the wiper and pilot valve body is no longer maintained.

It is therefore an object of this invention to disclose and provide a device for maintaining an uninterrupted sliding contact between two flat surfaces during relative motion therebetween when said surfaces are slightly out of parallel alignment and which employs a minimum of moving parts.

It is also an object of this invention to provide and disclose a device for effecting a seal between two substantially flat surfaces during relative motion therebetween which is easily and practically manufactured and does not become inoperable when exposed to a corrosive environment.

It is a further object of this invention to disclose and provide an improvement in a distributor pilot valve used in controlling the operation of pressure actuated valves which provides the pilot valve with a longer useful and operative life and which is susceptible of ready removal therefrom for replacement or repair.

It is a still further object of this invention to provide an improved hydraulic distributor pilot valve adapted for use in automatic lawn sprinkling systems which will not become partially inoperative because of corrosive and clogging effects of the water environment in which its elements must operate.

I have found that the foregoing and other objects and advantages may be obtained by providing a distributor pilot valve or the like with an easily removable unitary resilient wiper element and a removable multi-ported distributor plate associated with the various pressure lines and the venting or pressure bleeding line in the valve body, according to my invention. The wiper element is provided with a lower portion or wiper having a virtually flat contacting surface. The multi-ported distributor plate is also provided with a virtually flat surface facing inwardly of the valve body to be contacted by the wiper. Both the wiper element and the distributor plate are readily removable to be cleaned or reground or relapped as desired. The wiper element is further provided with an integral hollow mid-portion extending upwardly from the lower portion and at generally right angles to the flat surface thereon. An upper end may be provided with a flange integral therewith to removably mount the wiper element on eccentric driving means. The hollow mid-portion is helically cut to form a helix between the upper flange and the lower portion having the flat contacting face thereon. The helix portion is resilient in the direction of its axis and therefore the lower contacting face may respond in a direction generally perpendicular to the plane of its face in response to variations in the surface of a contacting distributor plate. The helix portion however, is resistant to lateral deflection and therefore propels the wiper along the distributor plate without undue bending or deforming which might effect the seal effected between the wiper and distributor plate. Such resistance to lateral deformation of the helix portion of the wiper may be further facilitated by providing the helix with a rectangular or rhomboid section, the longer sides lying in a plane more nearly perpendicular to the axis of the helix than parallel to it.

Additional resistance to lateral deflection may be further obtained by providing the helix with a multiple lead.

My invention therefore, eliminates sliding action between the wiper element upon a driving shaft and the

susceptibility to clogging prevalent in the prior art devices. The helix portion of the device, according to my invention, both drives the wiper contact surface along the distributor plate surface and provides resilience in the direction of its axis and such resilience is not susceptible to diminution due to calcium deposits thereon, electrolysis, etc. as in prior devices. Furthermore, the essential elements of the pilot valve, the wiper and distributor plate are both adapted to be removed for periodic cleaning.

My invention may also be employed, for another example, in an electrical distributing system wherein the distributor plate is provided with electrical contacts, rather than passageways for fluid flow, and a suitable electric circuit and source of electric potential is provided. The wiper element may then be employed to successively engage and close the electrical contacts on the distributor plate without undue lateral deflection but with a modicum of axial resilience to ensure a good electrical contact between the wiper and distributor plate contact points.

It is therefore also an object of this invention to disclose and provide a device for use in an electrical distributing system wherein an uninterrupted sliding contact is maintained between a wiper or brush element and a distributor plate having electrical contact stations thereon.

Further objects, advantages and improvements, according to my invention, will become apparent from the following more detailed description of an exemplary embodiment of my invention, reference being made to the following drawings in which:

FIG. 1 is a cross-sectional view of an exemplary embodiment of a hydraulic distributor pilot valve employing an improvement according to my invention;

FIG. 2 is a horizontal sectional view of the device of FIG. 1 taken along the plane 2—2;

FIG. 3 is a detail view of a portion of the device of FIG. 1 taken along the plane 3—3 and showing an alternative modification of a portion thereof, according to my invention; and

FIG. 4 is a schematic representation of an exemplary embodiment of my invention used in an exemplary electrical distributing system.

Referring now to the drawings, an exemplary embodiment of a device for providing uninterrupted sliding contact between two virtually flat surfaces, according to my invention, is shown employed in a hydraulic distributor pilot valve suitable for use in controlling a plurality of pressure actuated valves, as in a lawn sprinkling system. The pilot valve body **10** is provided with a chambered top portion **11** and a multi-ported bottom portion **12** adapted to be assembled together with a sealing ring **12'** therebetween and held by the interconnecting screws **13**. The lower or bottom portion **12** of the pilot body **10** is provided with a plurality of passageways **14** therethrough which interconnect the chamber **15** (between portions **11** and **12**) through pressure lines **14'** to a plurality of pressure actuated valves of generally known nature and not shown here. The passageways **14** and terminations thereof in chamber **15** are disposed in a circular orbital array. An additional passageway, a venting or pressure bleeding passageway **16**, is disposed centrally of the array of passageways **14** and is vented to the atmosphere through line **16'**. A fluid inlet passageway **17** is also provided through lower portion **12** and is connected to a source of high pressure fluid, such as a water main.

A removable multi-ported distributor plate **20** is provided, as shown in FIGS. 1 and 2, with ports **21** aligned with the pressure line passageways **14** and a central port **22** aligned with the venting passageway **16**. The distributor plate **20** may be mounted on the lower body portion **12** of the pilot valve **10** by means of the positioning dowel pin **23** and retaining screws **24** with a gasket **25** positioned therebetween to effect a seal between the underside of distributor plate **20** and body portion **12**. The upper surface **26** of the distrbutor plate is preferably ground and lapped to a virtual flat, i.e. optically flat, surface facing inwardly of the chamber **15**. Plate **20** may be made of any hard, corrosive resistant metal and is adapted for ready removal for resurfacing and/or cleaning as necessary.

The upper chambered body portion **11** is further provided with a ported neck or collar **30** integral therewith through which a square ended drive shaft **31** is inserted. A sealing O-ring **32** is also provided between shaft **31** and neck **30** to seal the chamber **15** from the atmosphere. Shaft **31** is associated with suitable driving means such as the timing device of my co-pending application entitled "Timing Device," Serial No. 58,006, filed September 23, 1960, and now Patent No. 3,040,228, issued June 19, 1962. The lower end of shaft **31**, within the chamber **15**, is provided with an off-set flange **33** to eccentrically mount a wiper element, indicated at **40**, for orbital movement about the top surface **26** of the distributor plate **20**.

It may therefore be seen that normally the pressure fluid flows into the pilot valve **10** through the inlet **17'**, passageway **17** and fills the chamber **15**. The fluid thereafter flows through the ported plate **20**, passageways **14**, and pressure lines **14'** to the various pressure actuated valves employed. When the wiper element **40** is set so that it is over the dowel pin **23**, all the valves are held closed by the fluid pressure in chamber **15**. However, when wiper element **40** is moved in orbital fashion about the surface of the distributor plate **20**, it successively overlies each of the ports **21** closing off each passageway **14** from the pressure fluid chamber **15** and venting the pressure line through the central port **22** and the bleeding or venting line **16** to the atmosphere. Wiper element **40** may be selectively rotated to overlie any desired passageway and may be maintained there for any desired length of time to operate the flow control valve associated therewith in an open position. When wiper element **40** is moved on, the valve being so held open closes under the action of the pressure of the fluid maintained in chamber **15**.

It should be noted that while in the exemplary embodiment described herein, the distributor pilot valve is used to control "normally open" pressure actuated valves, it may also be used to control "normally closed" type valves. When the distributor pilot valve is so used to actuate a "normally closed" valve, then the "bleeding passageway **16**" becomes the fluid inlet passageway and the "fluid inlet passageway **17**" becomes the bleeding passageway. The chamber **15** is therefore always vented to the atmosphere, and the fluid pressure required to open a controlled valve is distributed from the "inlet **16**" by the wiper element **40** to the various pressure lines **14'**.

Wiper element **40**, as best seen in FIG. 1, is provided in one integral unit having three portions; a lower portion or wiper **41**, a middle portion or hollow driving element **42**, and an upper portion or flange **43** to form a unitary one piece wiper element. The wiper **41** is provided with a downwardly facing virtually flat contacting surface to slide upon the surface **26** of plate **20**. Wiper **41** is further provided with a recess or channel **41'** in a generally central zone of the downwardly facing surface and which overlies the venting passageway **16**. Channel **41'** may be successively and selectively brought into alignment with the various pressure line passageways **14** leading to various pressure actuated valves as wiper element **40** is rotated and thereby, successively vent each of them to the atmosphere.

The upper portion or flange **43** is adapted to be bolted onto the off-set flange **33** to removably mount the wiper element to the driving means associated with shaft **31** to provide orbital movement of the wiper **41** about the plate **20**.

Middle portion **42** is a hollow driving, axially resilient, element which transfers the driving force of shaft **31** (by way of the connected flanges **43** and **33**) to the wiper **41**. Hollow driving element or middle portion **42** extends

between the wiper 41 and flange 43 at generally right angles to the virtually flat contacting surface on the wiper 41. The element 42 therefore drives the wiper 41 in a given plane, such plane being generally perpendicular to the axis of the element 42 and to the axis of shaft 31, shaft 31 being axially parallel but off-set to the axis of element 42. The axes of shaft 31 and element 42 are preferably very accurately set perpendicularly to the virtually flat surface of distributor plate 20 so that the two contacting surfaces of the wiper 41 and plate 20 are as nearly parallel to each other as is possible under conditions of normal manufacturing tolerances. The resilience built into the middle portion 42 allows axial deflection to compensate for slight misalignment of the wiper 41 and plate 20.

Resilience in the direction of the axis of the middle hollow portion 42 is provided by helically cutting the hollow portion to form a helix, as shown in FIG. 1. There, the cut has been made on an angle to the axis of the hollow portion to provide the helix with a rhomboid section though the section could also be made rectangular. Providing a section of greater width than height, as in a rectangle or rhomboid section, is an aid in establishing resistance to lateral deflection of the helix. Further resistance to lateral deflection may be obtained by providing a modified embodiment of the wiper element 40', as shown in FIG. 3, wherein the middle hollow portion 42' is cut to form a helix having a multiple lead.

My invention may be employed not only in hydraulic distributing pilot valves but may also be used in maintaining good electrical contacts in electrical distributor systems. The distributor plate 20 may be provided with a plurality of electrical contact points imbedded therein, rather than the ports or passageways shown in FIGS. 1 and 2. The wiper element may then be made of electrically conductive material and can either successively bridge or interconnect the various circularly disposed contact points with a centrally disposed electrical lead wire or may be otherwise associated directly with a lead wire running to the wiper element itself. The axially resilient but laterally non-resilient wiper element 40 may then be employed to distribute an electrical current through the various contact points as desired, maintaining very good contact therebetween. A schematic representation of an exemplary circuit employing my invention is shown in FIG. 4. A distributor plate 120 is shown with electrical contact points 121 which are associated with individual circuit lines 122. A source of electromotive force or generator 123 is shown providing current through a line 124 to the wiper element 140. Line 124 could lead to a contact point 125 in the non-electrically conductive plate 120 at a central zone to be contacted by the wiper 141 to bridge between each of the contact points 121 and point 125 to complete a circuit. As wiper element 140 rotates, it successively completes the individual circuits through the various circuit lines 122 as desired.

It should be noted that my invention is directed toward a device for maintaining contact between two surfaces engaged in relative motion to each other and that, accordingly, my invention may be employed not only in hydraulic and electric distributor systems but in any device wherein a constant contact between two surfaces engaged in relative sliding motion is desired and is defined by the following claims:

I claim:

1. In a distributor pilot valve adapted to regulate a plurality of fluid control valves by interconnecting pressure lines, the provision of: a multi-ported removable distributor plate having a generally flat surface and associated with a plurality of high pressure lines and one low pressure line; a wiper having a generally flat surface to contact said distributor plate surface, said wiper surface having a recessed area disposed therein; a hollow driving element integral with said wiper and extending therefrom at generally right angles to said contact face; and means associated with said driving element to propel said element in an orbital path above said distributor plate surface, said wiper surface contacting said distributor plate surface and said recessed area in said wiper successively interconnecting said low pressure line with each of said pressure lines as said wiper is propelled along said distributor plate surface.

2. A distributor pilot valve adapted to regulate a plurality of pressure actuated fluid flow control valves comprising: a chambered valve body having a circular array of passageways through a wall of said body to interconnect said chamber with a plurality of pressure actuated valves, said body further having a bleeder passageway therein disposed centrally of said circular array of passageways; a removable plate within said chamber having a plurality of ports aligned with said passageways and a virtually flat surface facing inwardly of said chamber; a removable wiper in said chamber having a virtually flat surface to contact said plate surface, said wiper surface having a recessed portion therein opposite a port in said plate associated with said bleeder passageway; a hollow driving element integral with said wiper and extending therefrom at generally right angles to said contact face, said hollow driving element being cut helically to form a helix; and means associated with said driving element through said valve body to propel said driving element relative to said ported plate in a generally circular orbital path about the port aligned with said bleeder passageway to successively align said recessed area of said wiper surface with each of said circularly arranged passageways to selectively interconnect each of them with said bleeder passageway.

3. A device providing uninterrupted sliding contact between a wiper element and a ported generally planar surface during relative motion therebetween, comprising: a wiper having a contact face; a hollow driving element integral with said wiper and extending therefrom at generally right angles to said contact face; and means associated with said driving element to propel said element generally parallel to a ported generally planar surface to be contacted by said wiper in orbital movement about an axis offset from a central portion of said wiper, said wiper being adapted to successively overlie ports in said surface during said orbital movement, said hollow-driving element being cut helically to form a helix axially resilient in a direction generally perpendicular to said surface and laterally resistant to deflection in a direction generally parallel to said surface.

References Cited in the file of this patent

UNITED STATES PATENTS

1,055,781	Mitchell et al.	Mar. 11, 1913
1,067,232	Adams	July 15, 1913
1,754,349	Bruhlmann	Apr. 15, 1930
2,367,319	Wahlberg	Jan. 16, 1945
2,433,757	Harmon	Dec. 30, 1947
2,477,590	Ferwerda et al.	Aug. 2, 1949
2,741,671	Schunemann et al.	Apr. 10, 1956
2,844,167	Griswold	July 22, 1958
2,874,237	Shlesinger	Feb. 17, 1959

FOREIGN PATENTS

227,101	Great Britain	Dec. 31, 1925