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(54) Benævnelse: **TREVEJS VENTILSTYRET SPRØJTESYSTEM**

(56) Fremdragne publikationer:
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DESCRIPTION

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims the benefit of U.S. Provisional Patent Application No. 62/976,892, filed February 14, 2020.

FIELD OF THE INVENTION

[0002] The present invention relates generally to valve controlled spraying systems, and more particularly, to an improved valve system for controlling the liquid flow to spray nozzles during operation and upon shutoff of a liquid supply.

BACKGROUND OF THE INVENTION

[0003] Agricultural sprayers typically have long spray booms with groups of spray nozzles that are selectively controlled by respective control valves, each of which is individually actuated to permit transmission or termination of liquid to the spray nozzles of the group. Termination of liquid to one or more groups of spray nozzles frequently is necessary, for example, near the ends of fields so as to prevent spraying on non-crop vegetation or the like. The control valves for such spraying systems commonly are mounted in ganged or manifolded side-by-side relationship with respect to each other and remote from the spray nozzles they control. Each control valve is provided with a valve element that is movable between open and closed positions to selectively control the flow of liquid to the spray nozzles of the respective group.

[0004] Control valves are known which includes a rotatable ball valve that is rotatable between a one position that enables the direction of pressurized liquid through the control valve to the liquid supply line to the spray nozzle or groups of spray nozzles and a second position which closes a liquid inlet port of the valve and redirects remaining downstream liquid in the line to a return line for recirculation to a liquid supply tank. During rotary movement of the ball valve to a closed position, however, the liquid inlet port does not completely close prior to opening of a port to the return line, which results in spurts of high pressure liquid through the control valve prior to complete closure of the inlet port. In sophisticated agricultural sprayers today, liquid directed in the field often is monitored by means of the quantity liquid directed to the spray nozzles, and the redirection of liquid to the return line prior to valve shutoff can affect accuracy in monitoring the liquid chemical usage. While proposals have been made for preventing such occurrence, such proposals have been relatively complex and expensive, requiring multiple valving mechanisms.

OBJECTS AND SUMMARY OF THE INVENTION

[0005] It is an object to provide a valve controlled spraying system which enables more efficient and accurate monitoring of liquid supplied to the sprayer based upon the liquid inlet feed.

[0006] Another object of the present invention to provide a valve controlled spraying system as characterized above that is operable for shutting off the liquid supply to the spray nozzles without unwanted bursts of liquid through the control valve that can affect the accurate monitoring of chemical usage.

[0007] A further object is to provide a valve controlled spraying system of the above kind having a liquid supply control valve operable for completely shutting of liquid supply to the spray nozzles prior to enabling the direction of downstream liquid in spray nozzle feed lines to a return line to the liquid supply.

[0008] Another object is to provide a valve controlled system of the above kind which is relatively simple in construction and operation and lends itself to economical manufacture and reliable usage.

[0009] Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

FIGURE 1 is a schematic diagram of an illustrative spraying system having control valves in accordance with the present invention;

FIG. 2 is an enlarged fragmentary section of one of the spray nozzle assemblies and its associated check valve included in the spraying system shown in FIG. 1, showing the check valve in a closed position;

FIG. 3 is an enlarged fragmentary section of the illustrated check valve, showing the check valve in an open position;

FIG. 4 is an enlarged vertical section of one of the illustrated control modules taken in a plane perpendicular to a central liquid port of the control module showing the valve stem thereof in an open position for communicating liquid from the central liquid supply port to an outlet port of the control valve;

FIG. 5 is a vertical section, similar to FIG. 4, but showing the valve stem in a lowered position which blocks the flow of liquid from the liquid supply port to an outlet port to the spray nozzles

while opening a flowback or return port communicating with a return line;

FIG. 6 is a vertical section of the control module shown in FIG. 5 taken in a plane perpendicular to that of FIG. 5;

FIG. 7 is a partial section of the control module, similar to FIG. 4, showing the valve stem in an open position permitting communication of liquid through an outlet port to spray nozzles;

FIG. 8 is a figure similar to FIG. 7, but showing the valve stem in an intermediate position blocking the flow of liquid to both the liquid outlet port to the spray nozzles and to the flowback or return port of the module;

FIG. 9 is a partial section similar to FIGS. 5 and 6, showing the valve stem in a lowered position blocking the flow of liquid through the inlet port and permitting the return flow of liquid to a flowback or return port;

FIG. 9A is an enlarged blow up of the lower valve stem in FIG. 9;

FIG. 10 is an enlarged perspective of the electric motor and valve stem drive of the illustrated control module;

FIG. 11 is an enlarged horizontal section of the control module taken in the plane of line 11-11 in FIG. 7;

FIG. 12 is a side elevational view of the electric motor and valve stem drive of the illustrated control module; and

FIG. 13 is a section of the motor and valve stem drive taken in the plane of line 13-13 in FIG. 12.

[0011] Hence, while the present invention will be described in connection with gang mounted control valves for an agricultural spraying system, it will be understood that the invention is equally applicable to control valves for other types of liquid spraying or transfer systems.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] Referring now more particularly to FIGURE. 1 of the drawings, there is shown an illustrative agricultural spraying system 10 which includes a supply tank 11 for containing a quantity of liquid to be sprayed, a plurality of spray sections 12 each having a plurality of spray nozzles 14 through which liquid is discharged, and a group of spray control valves 15 in accordance with the invention which are mounted in a ganged or manifolded side-by-side relationship with respect to each other and are adapted to control the flow of liquid from the supply tank 11 to the spray sections 12. Basically, the spraying system 10 is similar to that disclosed in the above referenced U.S. patent 6,036,107.

[0013] As is customary in agricultural sprayers, the spraying system 10 includes a supply line 18 between the supply tank 11 and the group of control valves 15 for transmitting liquid to the control valves 15, a discharge line 19 between each control valve 15 and a respective spray section 12 for delivering liquid to the spray section 12, a return line 20 that provides return communication between the control valves 15 and the supply tank 11, and a regulation line 21 having a regulation valve 22 between the group of control valves 15 and the supply tank 11 for facilitating regulation of the system pressure. See here also DE4407974.

[0014] The supply line 18 of the illustrated spraying system 10 includes a shut-off valve 24 which permits manual flow stoppage of liquid from the supply tank 11, a pump 25 which pressurizes liquid in the supply line 18, a strainer 26 for filtering debris from the supply line 18, and a throttling valve 28 which permits manual regulation of flow. The supply line 18 also includes a return line 29 which, in this case, branches off from the supply line 18 at a point downstream of the pump 25 and returns to the supply tank 11. As shown in FIG. 1, this return line 29 includes an agitator 30 located within the supply tank 11 which mixes the liquid within the supply tank 11 based upon the flow rate through the return line 29. A throttling valve 31 also is provided in the return line 29 which may be manually adjusted to regulate the flow rate through the return line 20 and to adjust the mixing rate of the agitator 30. The illustrated spraying system 10 is provided with a computer operated sprayer control 35 which is operatively connected to each of the control valves 15 of the group and the regulating valve 22, in a known manner.

[0015] The illustrated spray nozzles 14, as depicted in FIGS. 2 and 3, may be of conventional type, in this case each having a nozzle body 38 with a stem 39 supported in fluid communication with a liquid supply boom 40 of the spray section 12, which in turn is coupled to a respective supply line 19. The spray nozzles 14 each have a have a respective check valve 41, such as disclosed in commonly assigned US patent 4,660,598, the disclosure of which is incorporated herein by reference. When the pressure of liquid delivered to the spray nozzle 14 via the supply line 19 exceeds the force of a biasing spring 42, the pressurized liquid urges a diaphragm 45 away from an upstream end 46 of an inlet tube 48 as shown in FIG. 3, so as to enable liquid to flow through the inlet tube 48 and be discharged from the spray nozzle. Upon shutting off of pressurized liquid from the supply source, the spring 42 forces the diaphragm into sealing engagement with the upstream end of the tube 48 so as to prevent further liquid from discharging or dripping from the spray nozzle 14.

[0016] The control valves 15 of the spray sections 12 each have a modular construction and are mounted in ganged or manifold relation in a manner similar to that disclosed in the above referenced US patent 6,036,107. The control valves 15, as shown in FIGS. 4-6 each have a main valve body 50, a lower valve body 51 supported in depending relation to the main valve body 50, and an electric valve control motor 52 supported on top of the main valve body 50. The main valve body 50 in this case has an upwardly opening annular collar 54 that receives and supports an annular mounting section 55 of a housing of the motor 52 with an annular sealing rings 56 there in between, and the lower valve body 51 has an upwardly extending

reduced diameter hub section 58 supported within a lower end of the main valve body 50 with sealing O-ring 59 therebetween. The main valve body 50 includes a central transversely oriented main liquid supply port 60 for receiving liquid from the supply line 18, and the lower valve body 51 has a central vertical liquid passage 62 for communication with the liquid supply port 60. The central vertical passage 62 in turn communicates with a transverse passage 64 having a liquid outlet port 65 and a reduced downstream flowback or return port 66 adjacent a lower end of the valve body 51. The control valves 15 are ganged with the liquid supply ports 60 of the plurality of control valves communicating with each other and with the liquid supply line 18, and with each liquid outlet port 65 being coupled to a respective liquid supply line 19 to a spray section 12 and each liquid flowback or return port 66 coupled to the return line 20.

[0017] In accordance with an important feature of the present embodiment, each control valve 15 has a single valve stem 70 for controlling the flow of liquid from the main liquid supply port 60 to the outlet port 65 and respective supply line 19 and to the liquid flowback or return port 66 and return line 20. To this end, the valve stem 70 extends centrally through the main valve body 50, the liquid supply port 60, and the central liquid supply passage 62 of the lower valve body 51. The valve stem 70 in this case extends the length of the main and lower valve bodies 50, 51 with a lower end thereof being positionable through a lower flowback or return port 66. An annular seal 71 is supported about a lower end of the valve stem 70 (FIG. 9A) for sealing contact with the reduced diameter flowback or return port 66, as will become apparent. For ease of manufacture, the valve stem 70 in this case has an upper and lower sections 70a, 70b fixedly secured together by a threaded coupling 72.

[0018] For controlling the supply of liquid from the liquid supply port 60 to the central passage section 62 and outlet port 65 of each spray nozzle 14, an annular seal 75 is supported on the stem 70 within the main liquid supply port 60, as depicted in FIG. 4. The main annular seal 75 is biased downwardly against an E-clip 76 fixed to the stem 70 by a coil spring 78 interposed between a washer 79 on an upper side of the annular seal 75 and an upper E-clip 80 fixed to the stem a distance above the washer 79. An O-ring seal 81 in this case is mounted in surrounding relation to the valve stem 70 within the annular seal 75.

[0019] For raising and lowering the valve stem 70 between open and closed positions, the electric motor 52 is operatively coupled to the valve stem 70. To this end, the electric motor 52 may be a 12 V DC, reversible motor, having a drive shaft 85 coupled to a drive train 86 for rotating an output shaft 88 supported in depending relation to the drive train 86 above valve steam 70. To facilitate controlled raising and lowering the valve stem 70 as an incident to rotation of the output shaft 88, an optical switch flag 89 affixed to an upper end of the valve stem 70 is threadedly supported on a threaded section 90 the output shaft 88. The switch flag 89 is retained against rotation such that driven rotation of the output shaft 88 will cause that switch flag 89 and valve stem 70 coupled to the underside thereof to be raised or lowered relative to the valve bodies 50, 51. For guiding raising lowering of the switch flag 89, and hence the valve stem 70, a transverse leg section 89a on one side of the flag switch 89 is guided for movement within a guide track 92 fixed within the motor housing (FIG. 11).

[0020] For controlling upper and lower movement of the valve stem 70, the switch flag 89 has a thinner leg section 89b on a side opposite the guide flag section 89a and is movable with the valve stem 70 between optical sensors 95a, 95b that control the electric motor 52 and limit upper and lower movement of the switch flag 89, and hence the valve stem 70. The optical sensors 95a and 95b in this case are coupled to a circuit board 96 (FIG. 10) that effects operation of the electric motor 52, via an appropriate operator control, and movement of the valve stem 70 between the sensors 95a, 95b.

[0021] In keeping with a further important aspect of the present embodiment, each control valve 15 is operable such that the valve stem 70 completely closes and seals off communication between the main liquid inlet port 60 and the central flow passageway 62 to the outlet port 65 to the spray section 12 prior to enabling communication from the outlet port 65 and supply line 19 to the flowback or return port 66. As depicted in FIGS. 4 and 7, when the electric motor 52 has rotated the output shaft 88 to raise the flag switch 89 and valve stem 70 coupled thereto to an upper position with the flag switch section 89b in contact with the upper optical sensor 95a, the annular seal 75 carried by the valve stem 70 is raised to an open position permitting communication of liquid from the main inlet port 60 of the control module to the central and transverse passage sections 62, 65 and output port 65 to the spray system 12. The lower E-clip 76 carries and supports the annular seal 75 to such raised or open position. Simultaneously, the lower end of the valve stem 70 is raised and positioned in a closed position in the flowback or return port 66, with the annular seal 71 preventing passage of liquid from both the central passage 62 and outlet port 60 to the flowback or return port 66.

[0022] For preventing liquid communication to the outlet port 65 and spray section 12, the electric motor 52 is operated in the reverse direction under control for the circuit board 96, rotating the output shaft 88 in an opposite direction that lowers the optical switch flag 89 and valve stem 70 downwardly to an intermediate position that initially closes both the liquid inlet port 60 while flowback and return port 66 remains closed, as depicted in FIG. 8. In such intermediate position it can be seen that the annular seal 75 is biased into position closing the inlet port 60 while the lower valve stem 70 continues to close the flowback port 66. Continued operation of the drive motor 52 and rotation of the output drive shaft 88 further lowers the valve stem 70 a sufficient distance that the annular seal 71 at the lower end of the valve stem 70 is disposed beyond the reduced diameter flowback or return port 66. During such movement, the annular seal 75 remains biased by the biasing spring 78 in its closed position, while the valve stem 70 and the E-clip 76 that supports the annular seal 75 continue to move downwardly with the valve stem 70 (FIGS. 6 and 9). Upon lowering of the valve stem 70 and optical switch flag 89 to the level that the flag section 89b contacts the lower optical sensor 95b, the lower end of the valve stem 70 and annular seal 65 are disposed beyond the reduced diameter outlet or return port 66, thereby enabling communication of any downstream liquid to be drained back through the flowback outlet 66 to the return line 20. It will be appreciated that since the inlet port 60 is completely closed prior to opening of the flowback or return port 66, there are no bursts or any other communication of liquid from the inlet port 60 to the return port 66 and return line 15 during liquid shutoff to the spray section 12 or other appreciable loss of supply liquid that significantly affects reliable monitoring of the liquid chemical or the like.

[0023] To resume spraying, the drive motor 52 can be operated in reverse direction, raising the switch flag 89 and valve stem 70 to a position that first closes the flowback or return port 66 while the annular seal 75 remains biased in a position closing the inlet port 60 and then upon continued raising of the valve stem 70 and to the level that the optical switch flag section 89b engages the upper optical sensor 95a. Such further movement causes the E-clip 76 to lift the annular seal 75 and open the main liquid supply port 60, as depicted in FIG. 4, for communicating liquid to spray section 12.

[0024] From the foregoing, it can be seen that a valve control spraying system is provided that is operable for shutting off and turning on the liquid supply to the spray nozzles without unwanted bursts of liquid through the control valve that can affect accurate monitoring of liquid chemical usage. The valving system utilizes a single valve stem that is controlled for completely shutting off liquid to the spray nozzles prior to enabling drainage of liquid to a return line of the spraying system. It can also be seen that the valve control system is relatively simple in construction and operation and lends itself to economical manufacture and reliable usage.

REFERENCES CITED IN THE DESCRIPTION

Cited references

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US62976892 **[0001]**
- US6036107A **[0012]** **[0016]**
- DE4407974 **[0013]**
- US4660598A **[0015]**

Krav

1. Væskesprøjtesystem (10) til sprøjtning af landbrugskemikalier, der omfatter:

en væskesprøjtesektion (12) med mindst én væskesprøjtedyse (14);

en væskeregulator til styring af væskestrømmen fra en væsketilførsel (11) af et landbrugskemikalie til sprøjtesektionen med henblik på udledning fra mindst én sprøjtedyse (14);

en væskeregulator, herunder en væskereguleringsventil (15) med et ventilhus (50, 51) med en væsketilførselsport (60), en væskeudløbsport (65) og en tilbagestrømningsport (66);

en første væsketilførselsledning (18) til at lede væske fra væsketilførslen (11) til væsketilførselsporten (60); en anden væsketilførselsledning (19) til væsketilførselsporten (60) til sprøjtesektionen (12); en tilbagestrømningsledning (20) koblet til tilbagestrømningsporten (66) til at lede væske i den anden væsketilførselsledning (19) væk fra sprøjtesektionen (12) ved afslutning af tilførslen væske til sprøjtesektionen (12);

en reguleringsventil (15) med en ventilspindel (70) **kendetegnet ved følgende:** reguleringsventilen (15) kan betjenes til at bevæge ventilspindelen (70) mellem (1) en første position, der åbner væsketilførselsporten (60) for at muliggøre væskens retning fra den første væsketilførselsledning (18) gennem væsketilførselsporten (60) og væskeudløbsporten (65) til den anden væsketilførselsledning (19) og væskesprøjtesektionen (12) til udledning fra som minimum den ene sprøjtestrømsdyse (12) under blokering af væske gennem tilbagestrømningsporten (66) til tilbagestrømningsledningen (20), (2) en anden position, der blokerer væsketilførslen fra den første væsketilførselsledning (18) gennem væsketilførselsporten (60) til væskeudløbsporten (65) og den anden væsketilførselsledning (19), mens den fortsætter med at blokere væskestrømmen gennem tilbagestrømningsporten (66) til tilbagestrømningsledningen (20), og (3) til en tredje position, hvor ventilspindelen (70) under bevægelse til den tredje position fortsætter med at blokere væskestrømmen fra den første væsketilførselsledning (18) gennem væsketilførselsporten (60) og væskeudløbsporten (65), mens den åbner tilbagestrømningsporten (66) for at tillade resterende væske i den anden

væsketilførselsledning (19) at strømme tilbage gennem tilbagestrømningsporten (66) og tilbagestrømningsledning (20), således at væskestrømmen fra den anden væsketilførselsledning (19) til tilbagestrømningsledningen (20) kun er mulig, når væsketilførselsporten (60) er lukket.

2. Væskesprøjtesystem ifølge krav 1, hvor ventilspindelen (70) strækker sig gennem både væsketilførselsporten (60) og tilbagestrømningsporten (60) og i den første position tillader væskestrøm fra gennem væsketilførselsporten (60) og væskeudløbsporten (65) til den anden væsketilførselsledning (19), mens den samtidig blokerer strømmen gennem tilbagestrømningsporten (66) og i den anden position samtidig blokerer væskestrømmen gennem både væsketilførselsporten (60) og tilbagestrømningsporten (66) og ved bevægelse af ventilspindelen (70) til den tredje position fortsætter med at blokere væskestrømmen gennem tilførselsporten (60) og under åbning af tilbagestrømningsporten (66) for at tillade resterende væske i den anden væsketilførselsledning (15) at strømme til tilbagestrømningsledningen (20).

3. Væskesprøjtesystem ifølge krav 1, karakteriseret ved at ventilspindelen (70) er understøttet med gevind i ventilhuset (50, 51) for relativ langsgående bevægelse og omfatter en motor (52) koblet til ventilspindelen (70) til selektiv drejning af ventilspindelen (70) for at bevæge ventilspindelen (70) mellem den første, anden og tredje position.

4. Væskesprøjtesystem ifølge krav 3, herunder en regulatorenhed til styring af motoren (52), idet styreenheden omfatter en afbryder (89) båret af ventilspindelen (70) til bevægelse med ventilspindelen (70) mellem første, anden og tredje position samt et par sensorer i længderetningen (95a, 95b) på ventilhuset (50, 51), der kan aktiveres af omskifteren (89) til styring af motorens funktion (52) og begrænsende bevægelse af ventilspindelen (70) mellem den første og den tredje position.

5. Sprøjtesystem ifølge krav 1, karakteriseret ved at ventilspindelen (70) indeholder et første tætningselement (75) til lukning af væsketilførselsporten (60), når ventilspindelen (70) befinder sig i anden og tredje position, og et andet

tætningselement (71) til lukning af tilbagestrømningsporten (66), når ventilspindelen (70) befinder sig i første og anden position.

6. Sprøjtesystem ifølge krav 5, karakteriseret ved at det første tætningselement er et ringformet tætningselement monteret på ventilspindelen (70) og fjederforspændt for relativ bevægelse, således at det første tætningselement (75) ved bevægelse af ventilspindelen (70) fra første position til den anden og tredje position lukker væsketilførselsporten (60), samtidig med at ventilspindelen (70) fortsat bevæges til anden og tredje position.

7. Sprøjtesystem ifølge krav 1, karakteriseret ved at ventilhuset (50, 51) har en aflang væskestrømspassage (62), der kommunikerer mellem væsketilførselsporten (60) og tilbagestrømningsporten (66); at ventilspindelen (70) er monteret til frem- og tilbagegående bevægelse i den aflange strømningspassage (62) mellem første, anden og tredje position; at den anden væsketilførselsledning (19), der kommunikerer med den aflange væskepassage (62) på et mellemliggende sted mellem væsketilførselsporten (60) og tilbagestrømningsport (66); og at ventilspindelen (70), når den er i den første position, tillader væskestrøm fra væsketilførselsporten (60) gennem den aflange væskestrømspassage (62) til den anden væsketilførselsledning (19), mens væskestrømmen blokeres gennem tilbagestrømningsporten (66) til tilbagestrømningsledningen (20), og når den i anden position blokerer væskestrømmen fra den aflange passage (62) gennem tilbagestrømningsporten (66), og som følge af bevægelse til tredje position åbner tilbagestrømningsporten (66) for at muliggøre kommunikation af væske fra den anden væsketilførselsledning (19) og gennem den aflange væskestrømningspassage (62) og tilbagestrømningsport (66) til tilbagestrømningsledningen (19), mens den fortsat blokerer væskestrømningen fra væsketilførselsledningen (18) gennem væsketilførselsporten (60) til den aflange væskestrømspassage (62).

8. Væskesprøjtesystem ifølge krav 1, karakteriseret ved at ventilhuset har en væskestrømspassage (62), der kommunikerer mellem væsketilførselsporten (60) og tilbagestrømningsporten (66), og den anden væsketilførselsledning (19) kommunikerer med ventilhusets væskestrømspassage (62) på et sted mellem væsketilførselsporten (60 og væskestrømningsporten (66).

9. Væskesprøjtesystem ifølge krav 8, karakteriseret ved at ventilspindelen (70) strækker sig gennem ventilhusets væskestrømspassage (62), og både væsketilførselsporten (60) og tilbagestrømningen (66) og i den første position tillader væskestrøm fra væsketilførselsporten (60) til væskeudløbsporten (65) og anden væsketilførselsledning (19) og samtidig blokerer strømmen gennem tilbagestrømningsporten (66) og i anden position samtidig blokerer væskestrømmen gennem både væsketilførselsporten (60) og tilbagestrømningsporten (66) og ved bevægelse af ventilspindelen (70) til den tredje position fortsætter med at blokere væskestrømmen gennem tilførselsporten (66) og derefter åbner tilbagestrømningsporten for at lade den resterende væske i den anden væsketilførselsledning (19) strømme til tilbagestrømningsledningen (20).

10. Væskesprøjtesystem ifølge krav 8, karakteriseret ved at ventilspindelen (70) er understøttet med gevind i ventilhuset (50, 51) for relativ langsgående bevægelse og omfatter en motor (52) koblet til ventilspindelen (70) til selektiv drejning af ventilspindelen (70) for at bevæge ventilspindelen (70) mellem den første, anden og tredje position.

11. Sprøjtesystem ifølge krav 8, karakteriseret ved at ventilspindelen (70) indeholder et første tætningselement (75) til lukning af væsketilførselsporten (60), når ventilspindelen (70) befinder sig i anden og tredje position, og et andet tætningselement (71) til lukning af tilbagestrømningsporten (66), når ventilspindelen (70) befinder sig i første og anden position.

12. Sprøjtesystem ifølge krav 11, karakteriseret ved at det første tætningselement (75) er monteret på ventilspindelen (70) og er fjederforspændt for relativ bevægelse således, at det første tætningselement (75) ved bevægelse af ventilspindelen (70) fra den første position til den anden position lukker væsketilførselsporten (60), mens ventilspindelen (70) fortsat bevæges til den anden og tredje position.

13. Sprøjtesystem ifølge krav 12, karakteriseret ved at ventilspindelen indeholder et andet ringformet tætningselement i længderetningen i forhold til det første tætningselement, der blokerer væskestrømmen gennem tilbagestrømningsporten til

tilbagestrømningsledningen, når ventilspindelen befinder sig i første og anden position, og ved bevægelse af ventilspindelen til den tredje position føres af ventilspindelen til en position, der åbner tilbagestrømningsporten for at tillade væskestrøm fra den anden væsketilførselsledning gennem væskeudløbsporten og tilbagestrømningsporten til tilbagestrømningsledningen.

14. Væskesprøjtesystem ifølge krav 1, omfattende en sprøjtebom, der definerer en væskestrømspassage og understøtter et flertal af sprøjtedyser, som hver har en udløbsåbning i væskekommunikation med sprøjtebommens væskestrømspassage og er en af reguleringsventilerne til styring af væskestrømningen fra en væsketilførsel til sprøjtebommens væskestrømspassage.

DRAWINGS

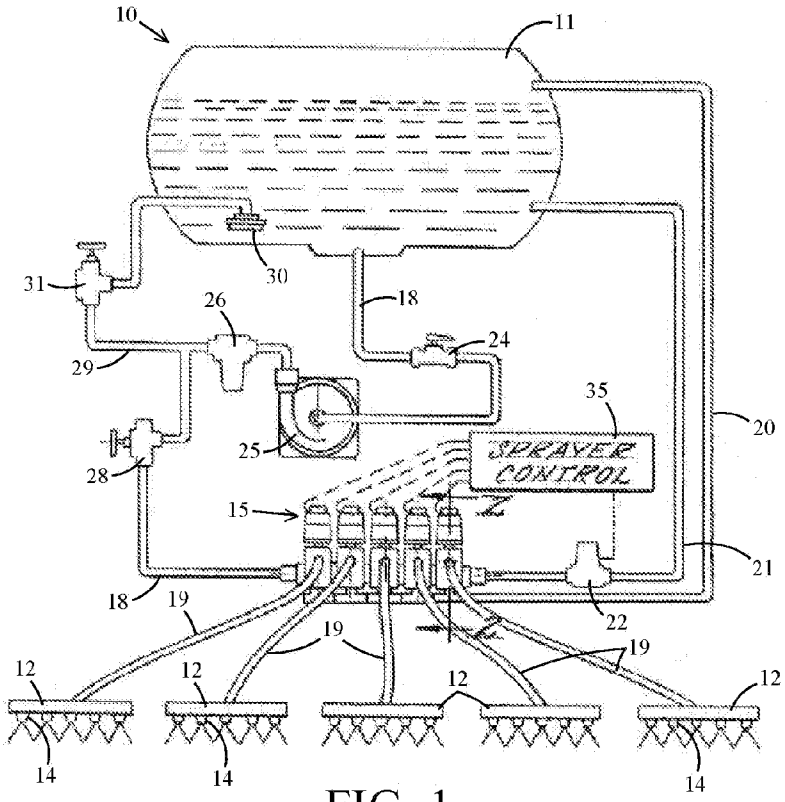


FIG. 1

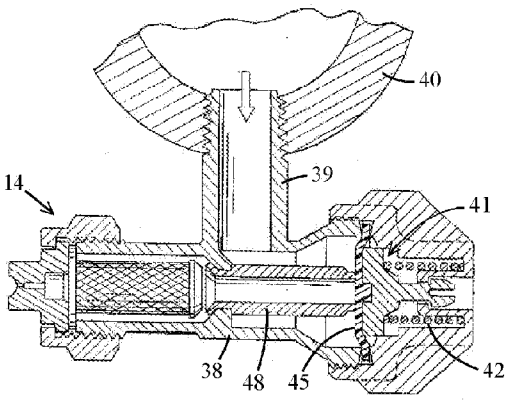
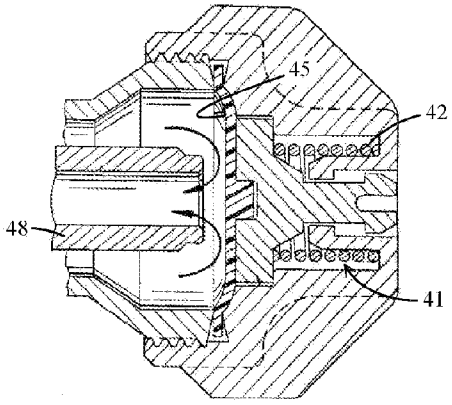


FIG. 2



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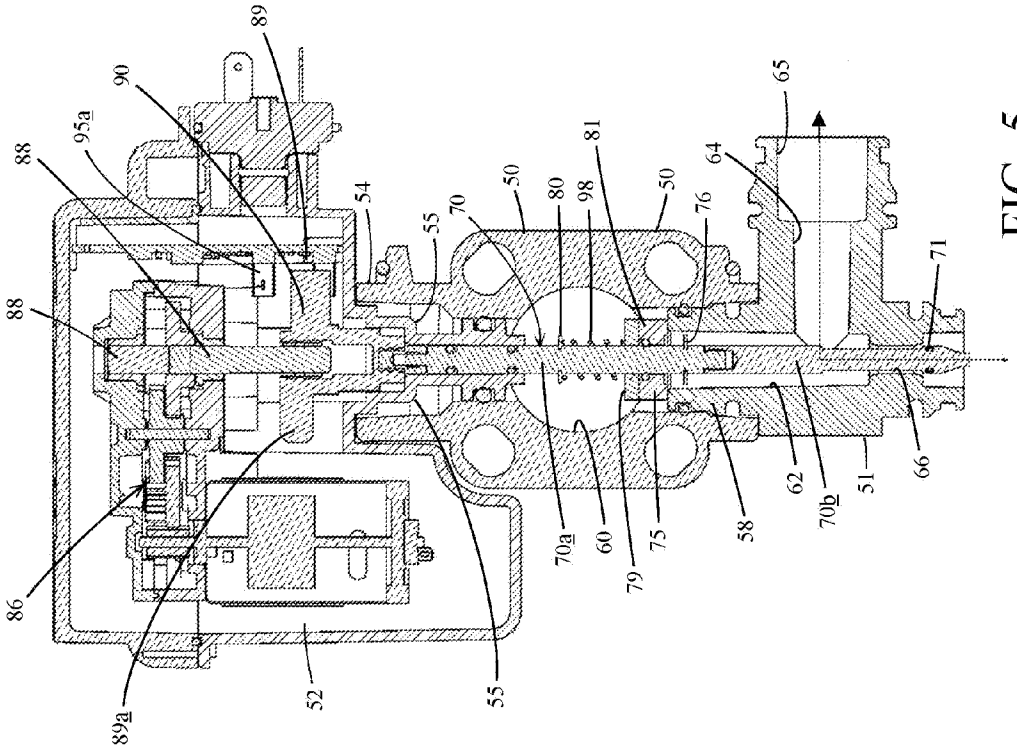
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FIG. 5

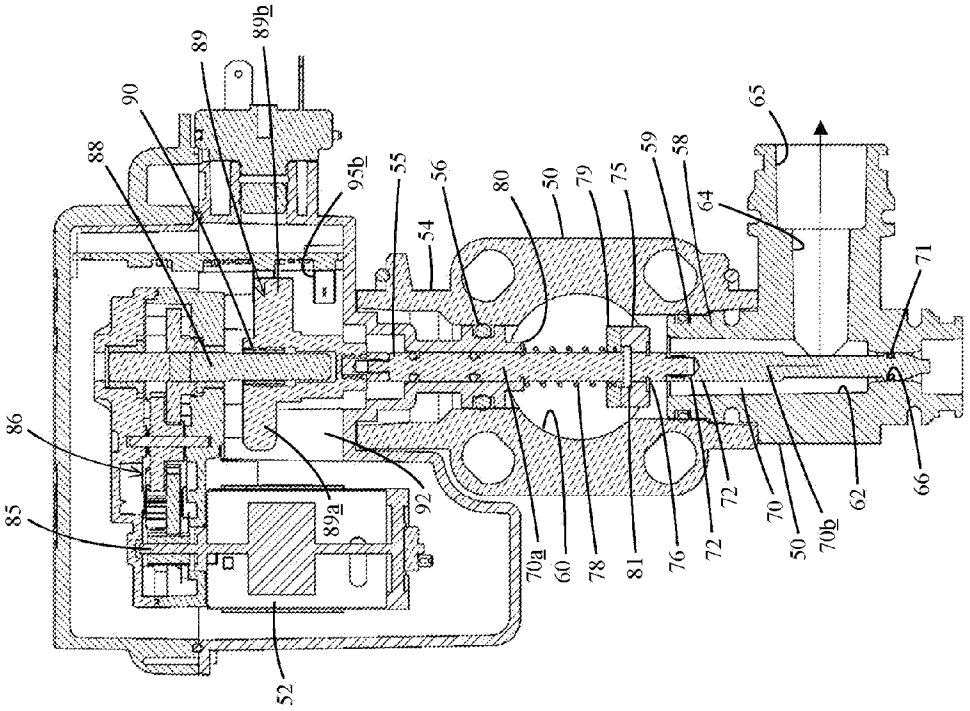
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FIG. 4

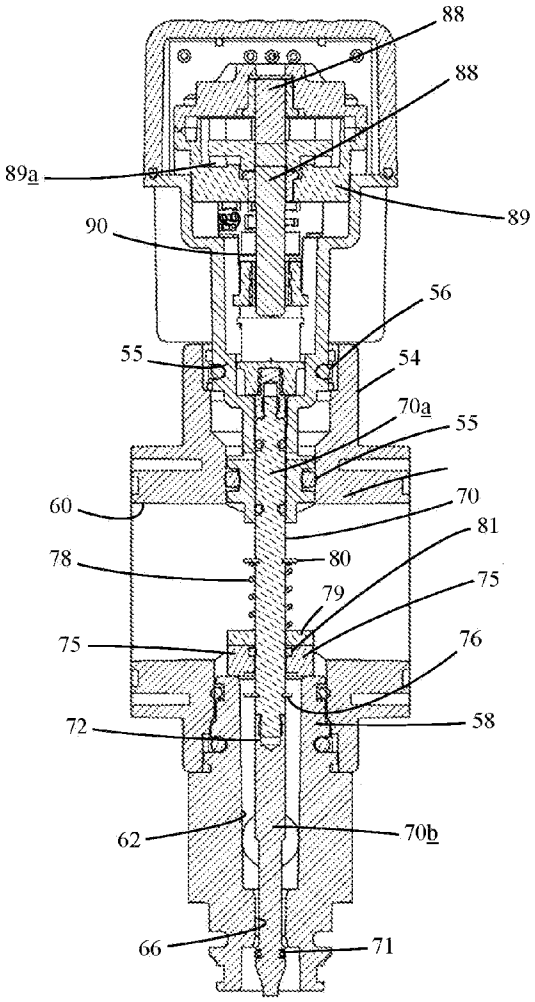
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FIG. 6

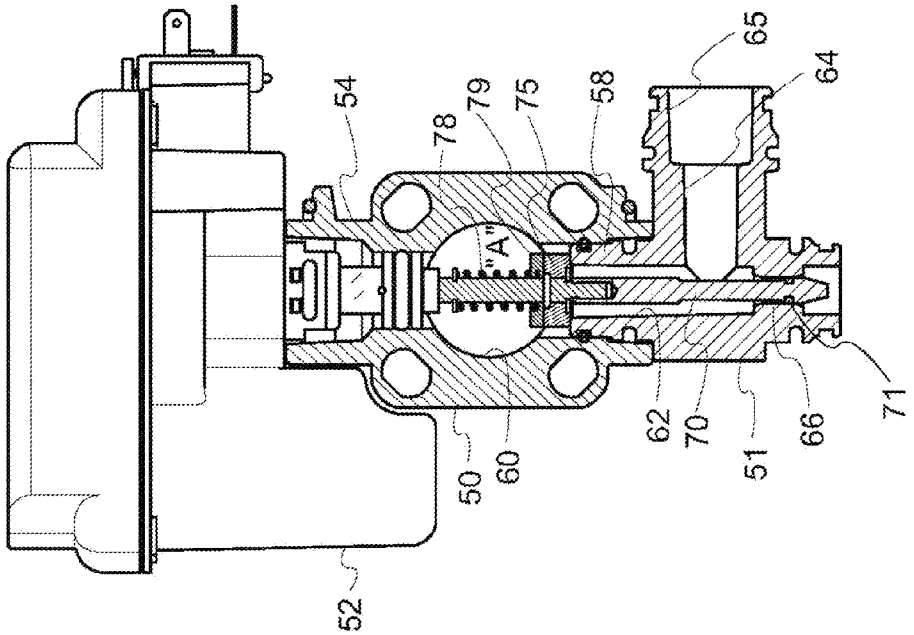
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FIG. 8

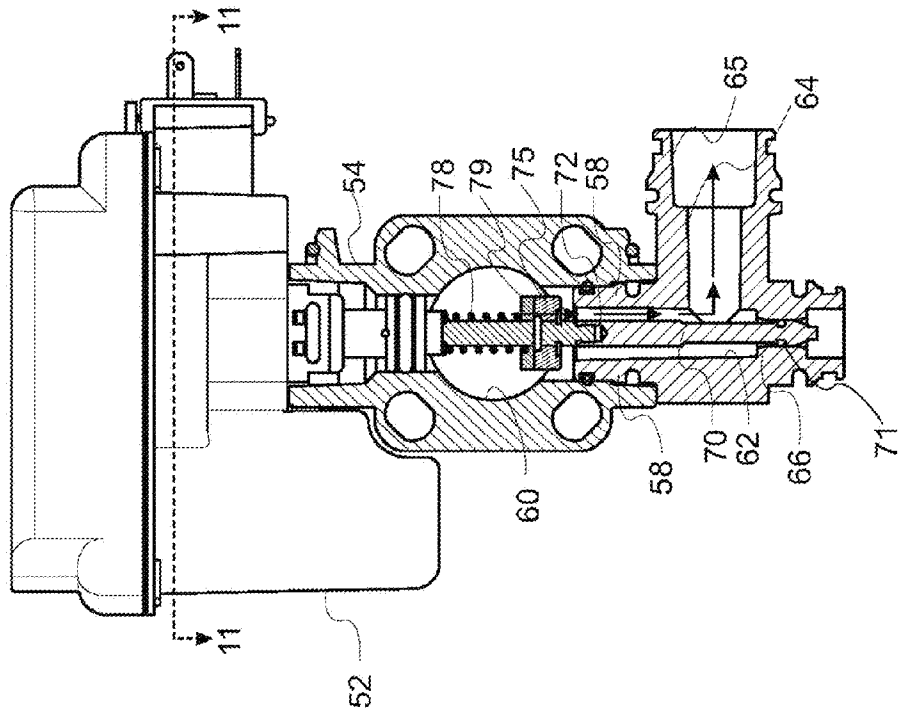
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FIG. 7

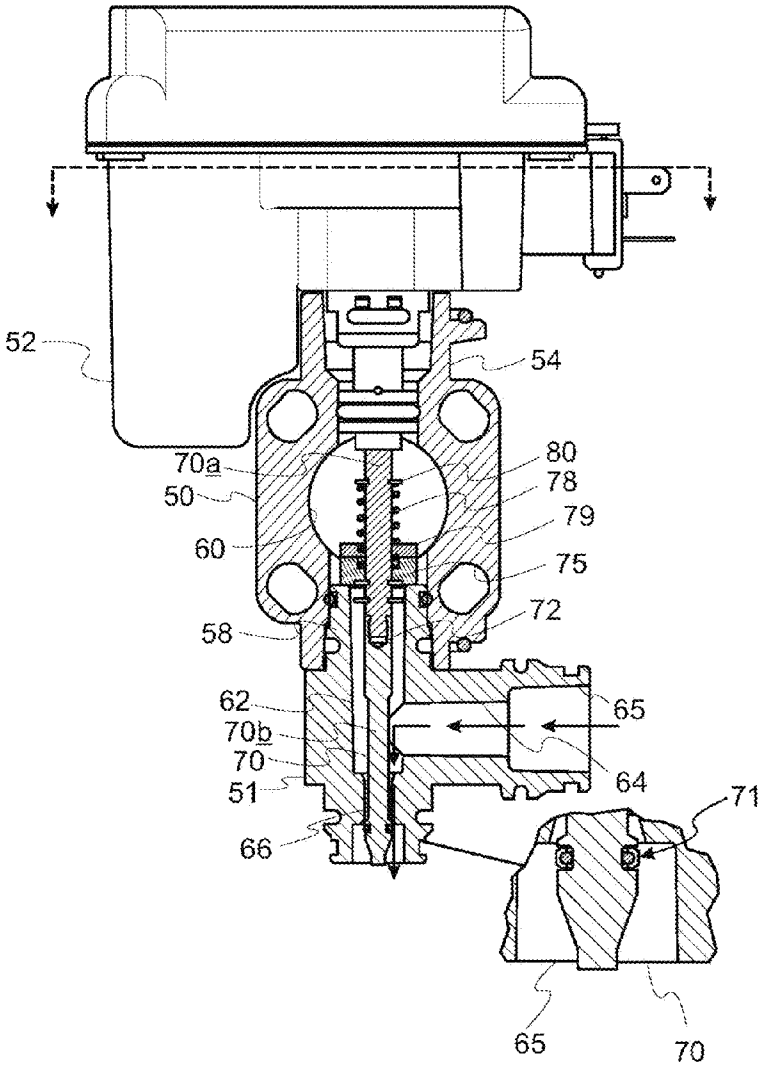

FIG. 9A

FIG. 9

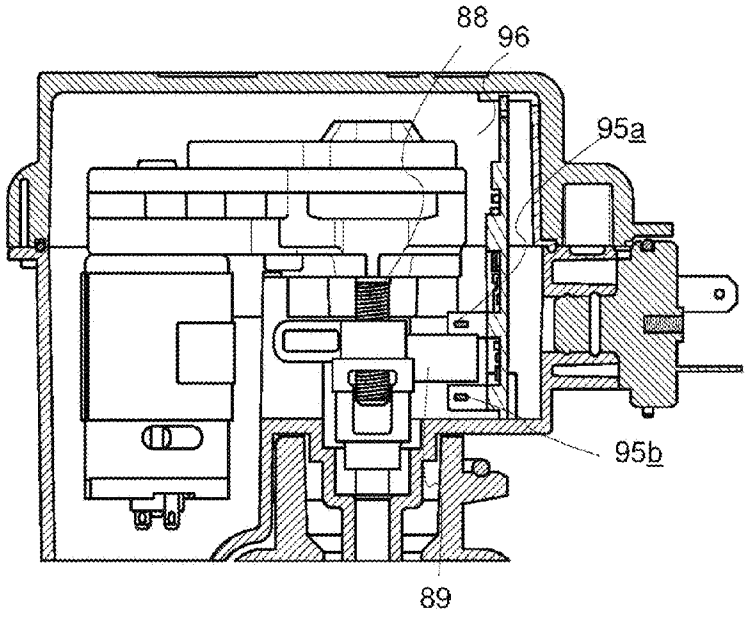

FIG. 10

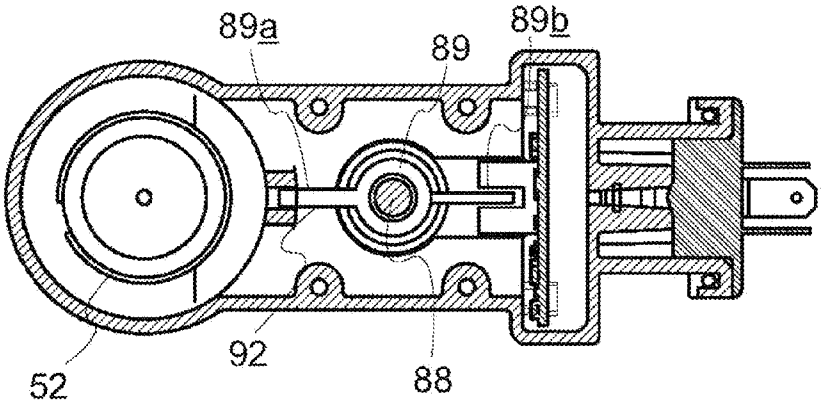

FIG. 11

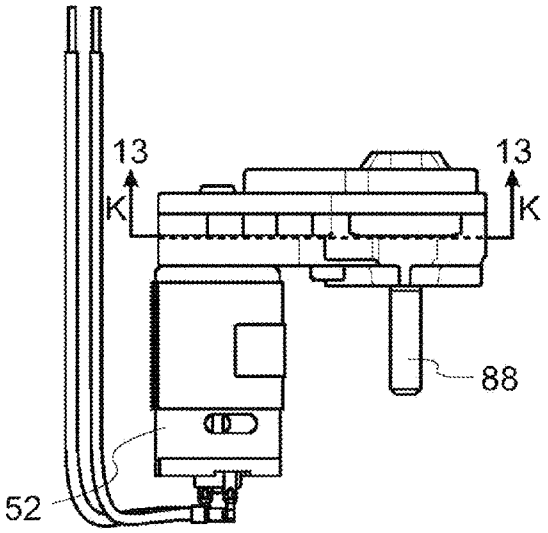

FIG. 12

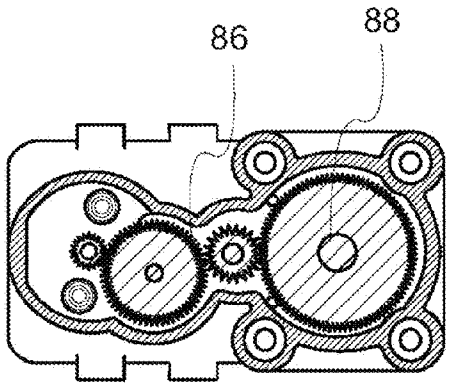

FIG. 13