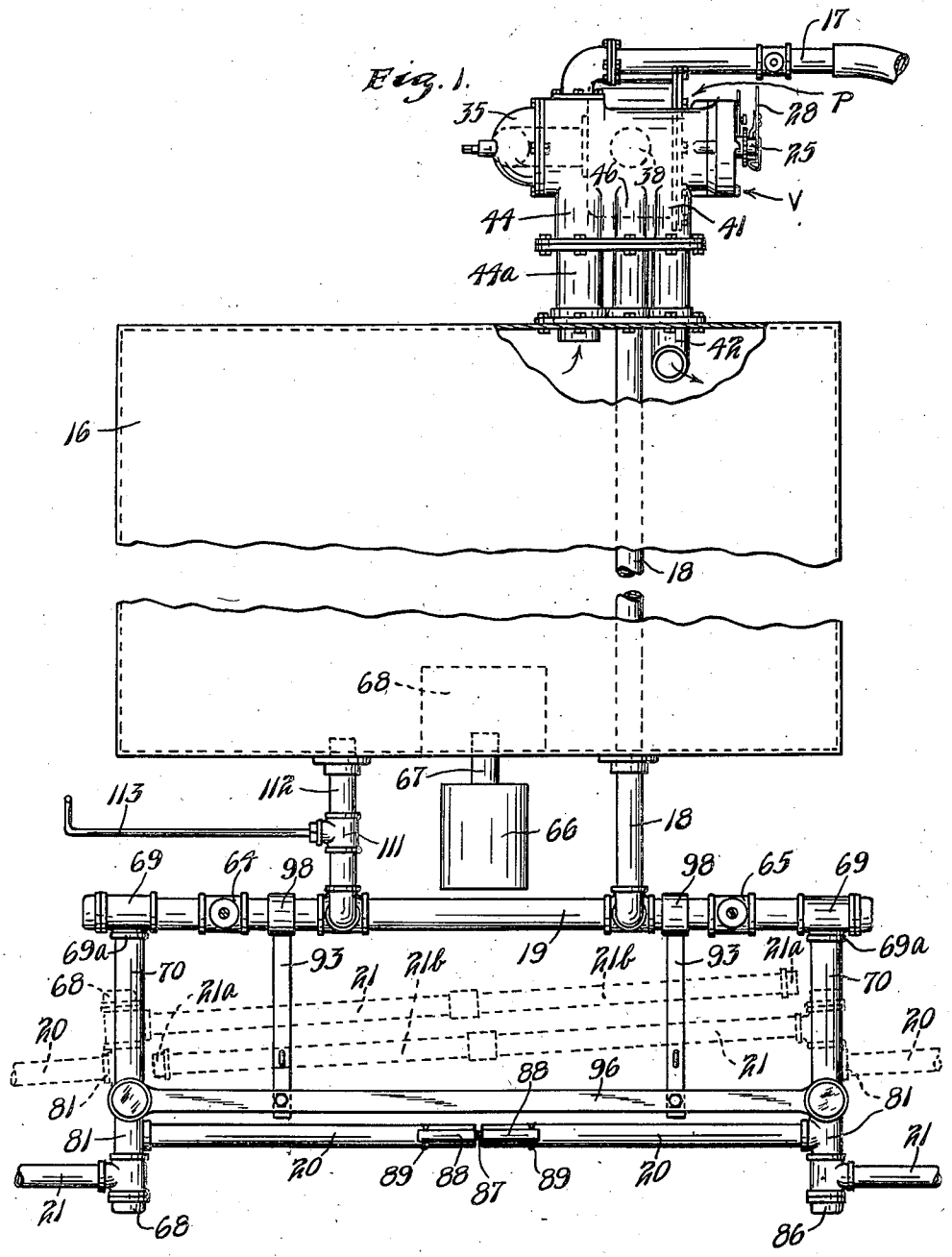
Feb. 10, 1942. H. A. CEDERSTROM 2,272,544

ROAD SPRAYING DEVICE

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Fig. 1.

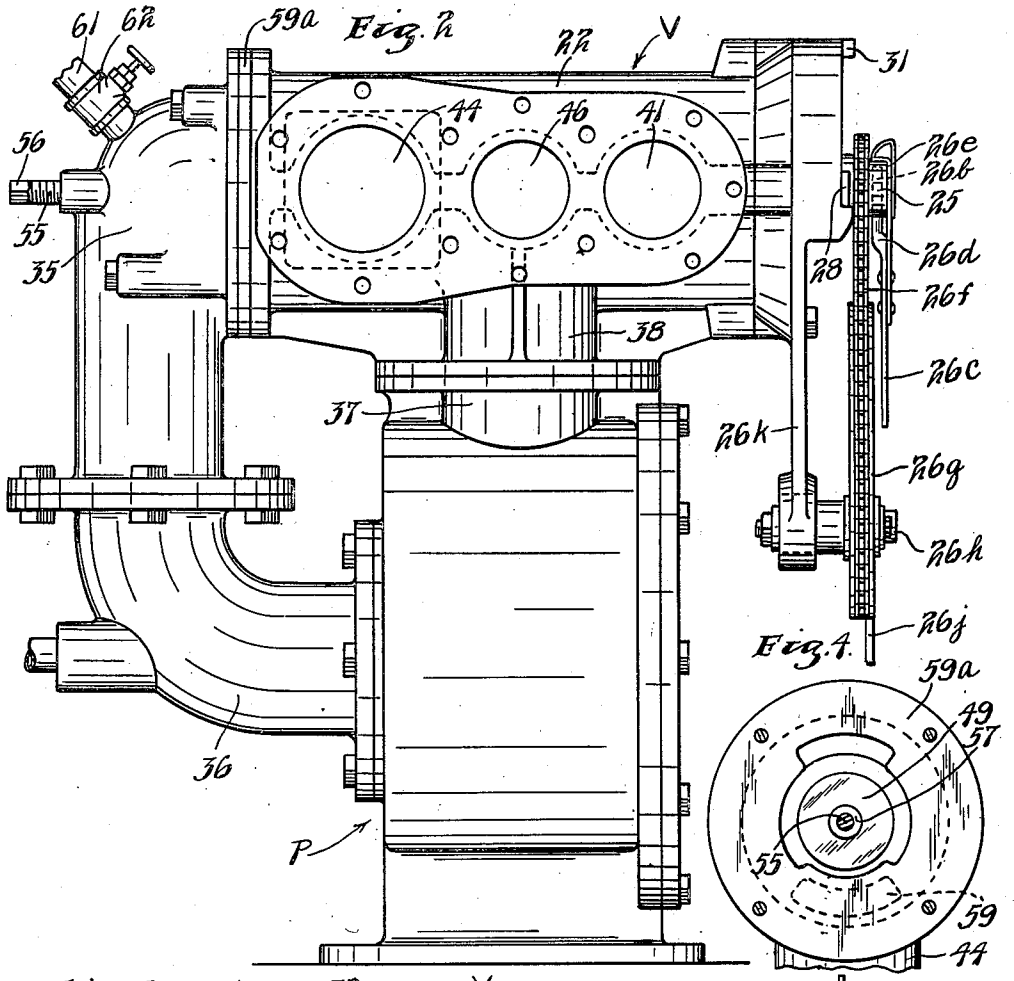


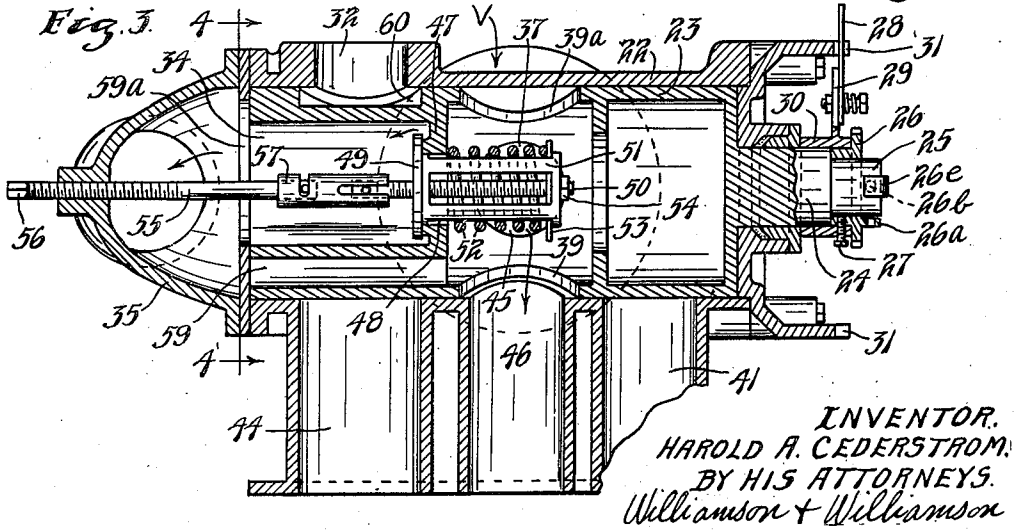
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ROAD SPRAYING DEVICE

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ROAD SPRAYING DEVICE

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Fig. 5.

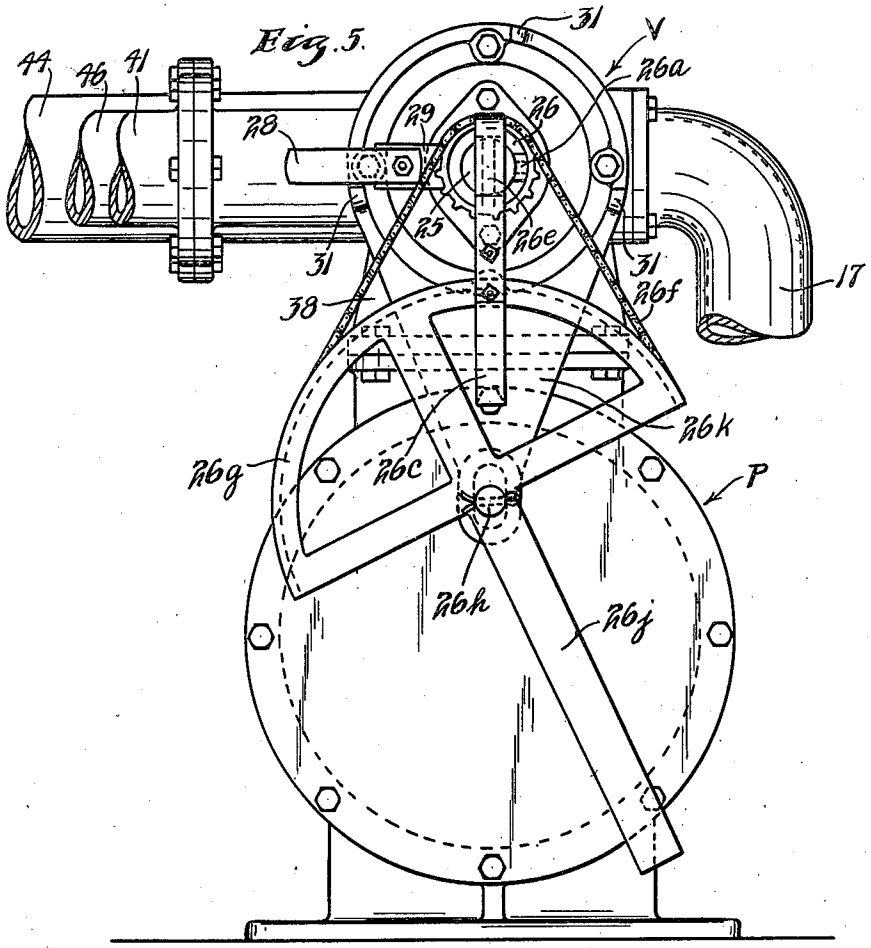
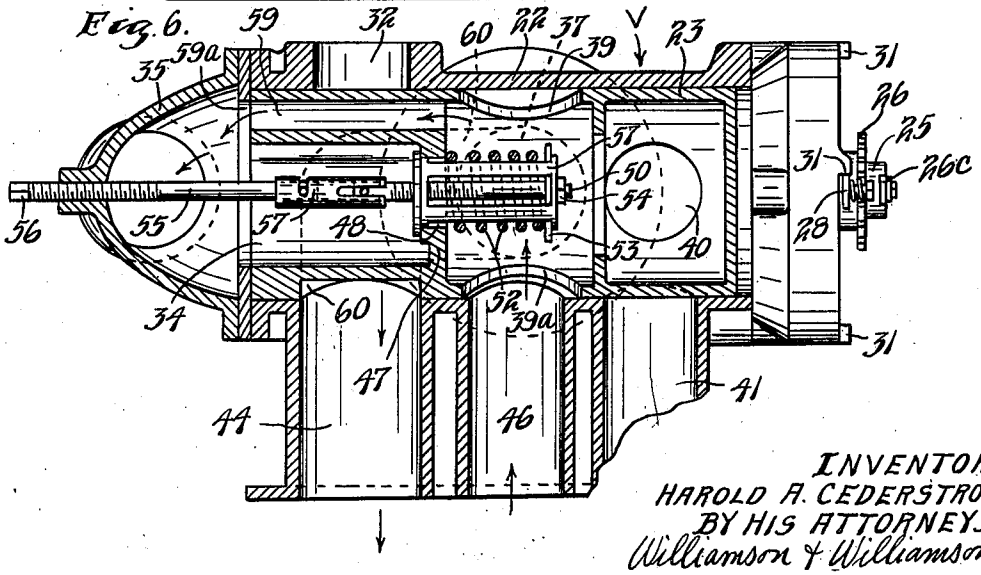


Fig. 6.



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Fig. 7.

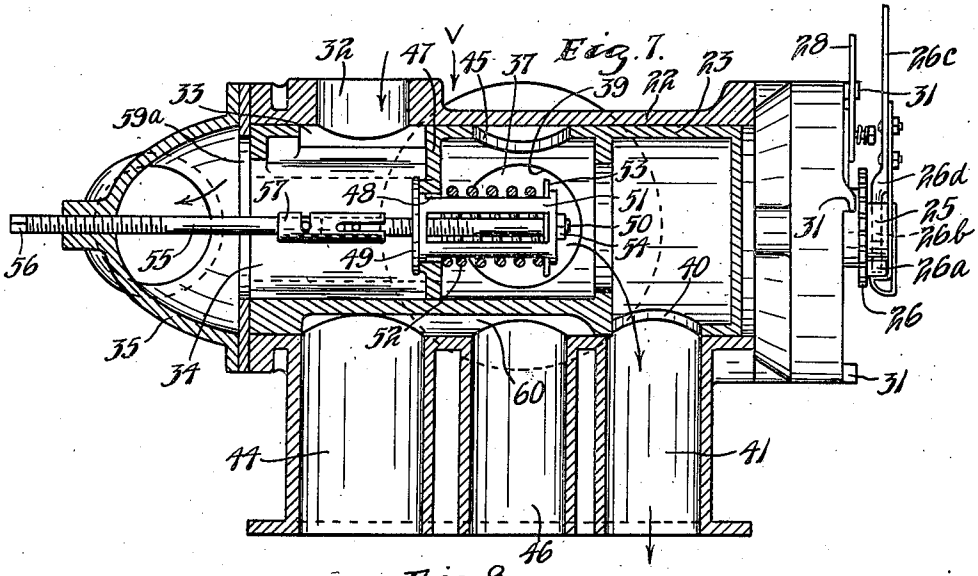


Fig. 8.

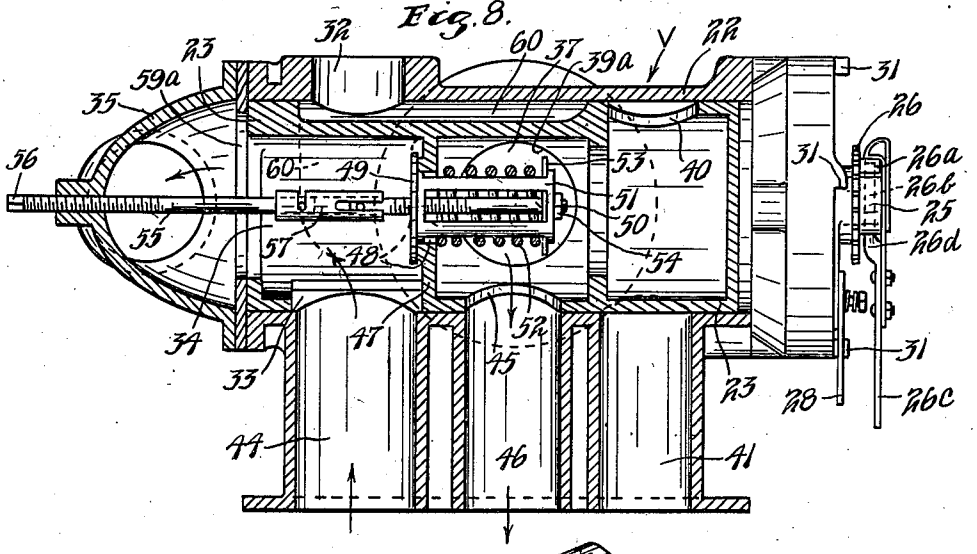
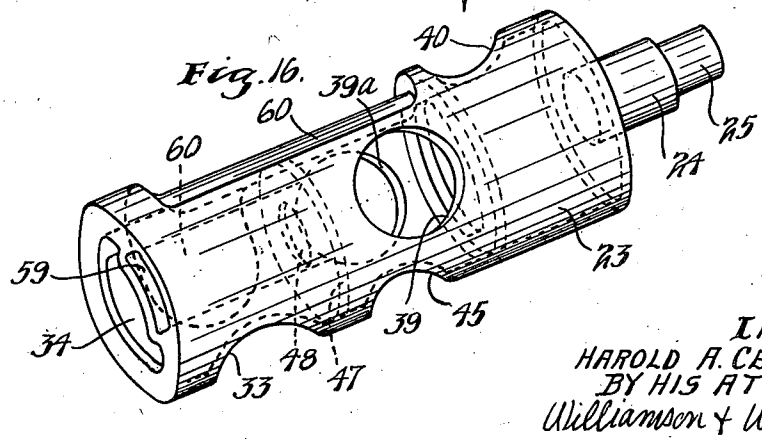


Fig. 16.



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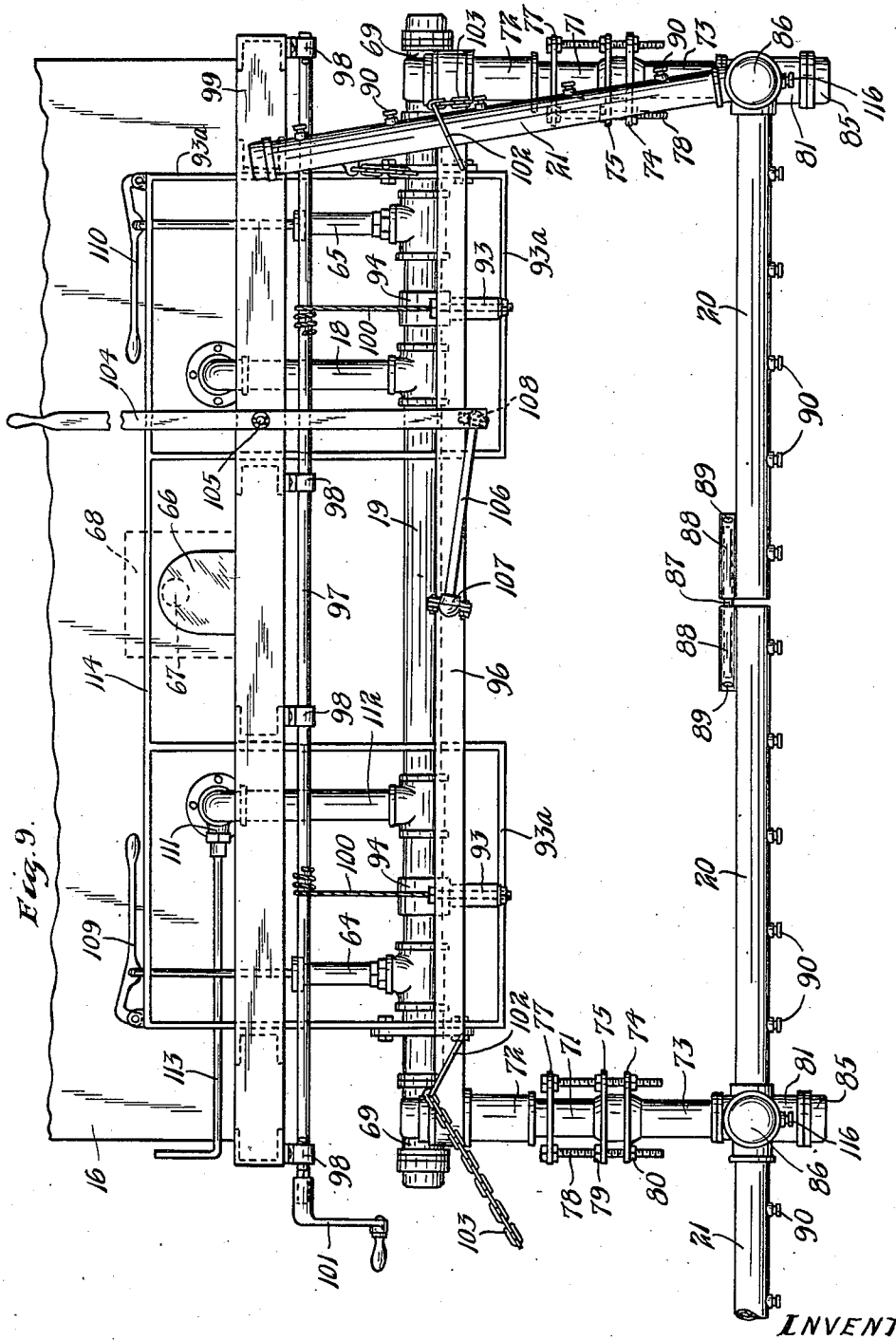


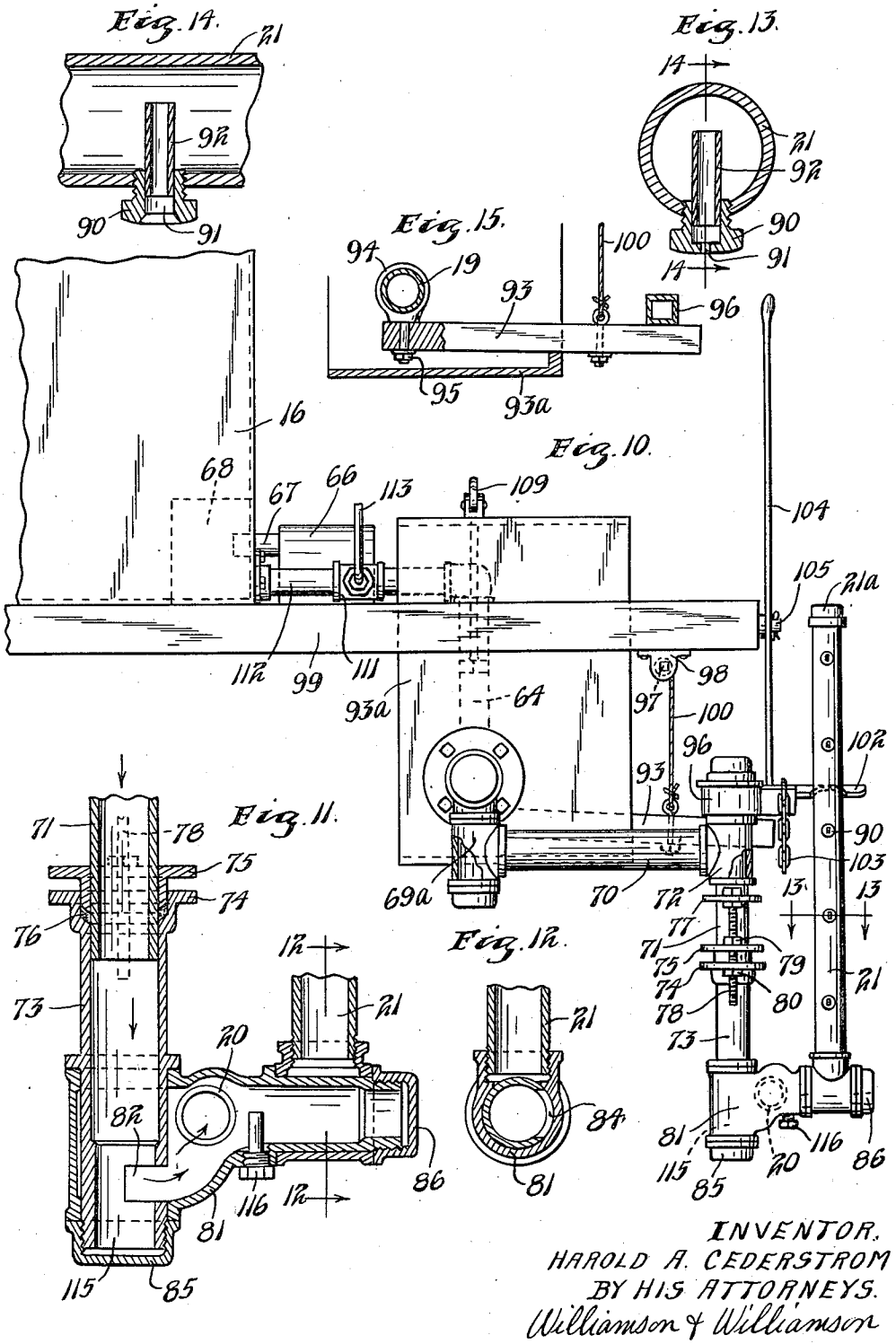
Fig. 9.

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ROAD SPRAYING DEVICE

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Patented Feb. 10, 1942 2,272,544

UNITED STATES PATENT OFFICE

2,272,544

ROAD SPRAYING DEVICE

Harold A. Cederstrom, Minneapolis, Minn., assignor to Rosco Manufacturing Company, Minneapolis, Minn., a corporation of Minnesota

Application August 8, 1938, Serial No. 223,642

5 Claims. (Cl. 137—78)

This invention relates to liquid distributing apparatus and more particularly to such apparatus as is used for spraying roadways with liquid surfacing materials such as heavy petroleum residues and cutback asphalt.

Many types of apparatus have been devised for distributing liquids on roadways, but one great disadvantage has been the inability to prevent the liquid discharge device from dripping after the pump and main control valve have been shut off. This is due to the fact that a considerable quantity of liquid is in the discharge device itself and dripping continues until the discharge conduit is substantially empty. Frequently liquid distributors of this general class are moved over surfaces where the dripping residue in the discharge device is undesirable and many states and other political subdivisions have strict regulations with regard to the dripping of surfacing materials where it is not desired.

Another problem in the handling of this type of apparatus is the necessity for keeping the liquid which is extremely viscous at ordinary temperatures in sufficiently fluid condition to permit proper distribution thereof.

In addition when surfacing a roadway it is extremely difficult to distribute the proper amount of surfacing material over a given area, this, of course, being dependent upon the speed of the distributing vehicle, the rate of discharge and the viscosity of the liquid.

It is, therefore, an object of my invention to provide a liquid distributing apparatus wherein the liquid can be maintained at a desirable degree of fluidity, where its flow from the discharge device can be accurately controlled both with respect to rate and volume and where the discharge device can be cut off and the dripping of residual liquid in the discharge device prevented.

Another object of the invention is the provision of a master control valve which will permit flow of liquid through the discharge device, withdrawal of liquid therefrom, circulation of liquid through the supply tank and pump, and the circulation of a flushing liquid through the master control valve, pump and discharge device to remove the viscous surfacing liquid from those parts to prevent them from "freezing."

A further object of the invention is the provision of a master control valve which can be regulated to vary the supply to the discharge device, said valve including means for compensating for pressures built up by the pump when the discharge outlet is restricted.

Still a further object of the invention is the provision of a discharge device which may be shifted laterally with respect to the vehicle which carries the apparatus to assist the operator in properly following an established guide line during the spraying operation.

Another object of the invention is the provision of a discharge device in the form of a spray bar, the main portion of which extends substantially across the width of the carrier vehicle with spray bar extensions projecting laterally of the vehicle, the central spray bar portion being in sections with a break joint securing them to permit pivotal movement of said sections and their lateral extensions particularly when one of the extensions encounters a stationary object, such as a culvert or vehicle on the roadway.

A still further object of the invention is the provision of a discharge device which may be provided with attachments for converting said discharge device into a double spray bar.

Another object of the invention is the provision of a discharge device which may be simply and quickly elevated with respect to the roadway when desired.

These and other objects and advantages of the invention will more fully appear from the following description made in connection with the accompanying drawings, wherein like reference characters refer to the same or similar parts, and in which:

Fig. 1 is a more or less diagrammatical plan view of my apparatus with some of the parts broken away to present a suitable general arrangement of the various parts;

Fig. 2 is an enlarged side elevation of the pump and master control valve;

Fig. 3 is a horizontal section taken approximately through the center of said control valve in one of its operating positions;

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

Fig. 5 is an end elevation of the control valve and pump;

Figs. 6, 7 and 8 are horizontal sections through the control valve showing different operating positions than that illustrated in Fig. 3.

Fig. 9 is a rear side elevation of the discharge assembly;

Fig. 10 is an end elevation of said discharge assembly;

Fig. 11 is an enlarged vertical section through the lower portion of the assembly shown in Fig. 10;

Fig. 12 is a section taken on the line 12—12 of Fig. 11;

Fig. 13 is a section taken on the line 13—13 of Fig. 10;

Fig. 14 is a section taken on the line 14—14 of Fig. 13;

Fig. 15 is a fragmentary view in partial vertical section of a portion of the spray bar supporting and elevating mechanism; and

Fig. 16 is a perspective view of the core of the master control valve.

In Fig. 1 there is shown a tank 16 which is adapted to hold a quantity of liquid pumped in through the inlet pipe 17 from a storage supply through the master control valve V and the pump P. Through manipulation of the control valve liquid is pumped from the tank 16 through the control valve and the pump to a header supply pipe 18 for a header 19 to a spray bar which includes generally central spray sections 20 and extensions 21. This general layout of apparatus is adapted to be assembled on a vehicle for the spraying of the surfaces of roadways.

The core 23 of the control valve is shown in a complete view in Fig. 16. It comprises a hollow casting 23 with an open end 34 and with the opposite end closed. An operating shaft 24 having a reduced end portion 25 extends from the closed end of said hollow core. The open end 34 is adapted at all times to communicate with the conduit or end cap 35 regardless of the position of the valve core. The lefthand portion of said core has an opening 33 through the wall and said opening is adapted to communicate with either of the casing openings 32 and 44 which are shown to be oppositely disposed in the left-hand end of the valve casing 22. The central portion of the valve core is provided with three openings 39, 39a and 45. These openings are adapted to coincide with either the pump outlet which lies beneath the valve assembly and communicates through the lower central portion thereof or with the valve casing outlet 46 which is connected by suitable conduits to the discharge device. The right-hand end of the valve core 23 has an opening 40 which in one position of the core permits the flow of liquid into the valve casing conduit 41 from whence liquid is introduced in the tank 16 when the tank is being filled. Within the hollow core 23 and extending from the central portion thereof to the left-hand end of said core is a conduit defining a bypass 59 which is adapted to function in one of the positions of said core when liquid is being drawn back up from the discharge device and into the tank 16. A second bypass is shown in the form of a channel 60 which lies in the outer cylindrical wall of the core 23, said bypass 60 extending from adjacent the medial portion of the core to near the left-hand end of the core and thence at right angles as indicated by the dotted lines in Fig. 16.

The control valve assembly, as has been explained, includes a casing 22 which has rotatably mounted therein a core 23. The sprocket 26 is rotatable on the reduced end 25 of the stub shaft 24, and said sprocket has a lug 26a extending therefrom on its outer face. The lug 26a is provided with an aperture which coincides in one position of the sprocket 26 with a bore 26b which extends radially into the reduced shaft portion 25. A lever arm 26c has a pin-like end 26d which is adapted to slidably fit within the bore 26b in the shaft end and through said bore into the aperture 26a. The pin 26d locks the sprocket 26 against movement relative to the reduced shaft portion 25. The lever arm 26c carries a spring retaining element 26e which, as shown in Figs. 2, 7 and 8, fits over the end of the reduced shaft portion 25, over the lug 26a and in that position prevents withdrawal of the pin 26d from said shaft bore 26b. However, the spring element 26e can be sprung away from engagement with the lug 26a and the pin 26d can be slipped out of engagement with said lug. This disengages the sprocket 26 from any connection with the shaft end 25 and the valve core 23 can be moved with the lever 26c independently of the sprocket 26. A combined stop and indicator arm 28 is yieldably carried by an arm 29 which is mounted upon the flange of the sprocket 26 by means of a flange 30 which fits over said sprocket flange and is connected to the sprocket flange by means of a bolt 27. A plurality of stop elements 31, which are better shown in Fig. 5, both limit the movement and indicate the position of the indicator arm 28. The sprocket 26 is operated by a chain 26f, the ends of which are secured to opposite ends of an arcuate channeled element 26g, the latter being mounted on a pivot pin 26h and operable by a lever 26j. The pivot pin 26h is journalled to a bracket 26k which extends down from the end of the valve casing. In the position of the valve shown in Fig. 7 a port 32 which is connected to the loading pipe 17 is brought into registration with a port 33 in the core of the valve, and an end opening 34 in said core communicates with an end cap 35 which forms the end of the valve casing. The end cap 35, as best shown in Fig. 2, is connected to a pump inlet connection 36. The pump is preferably of any desired type of rotary pump. The pump outlet indicated at 37 in Fig. 2 and also in Fig. 7 communicates with a port 38 in the lower portion of the casing of the main control valve V and the valve casing port 38 is in registration with a port 39 in the central portion of the core 23, and liquid is pumped through said core to another core outlet 40 which is in registration with the valve casing outlet 41, which in turn connects with a tank inlet pipe 42, the latter terminating in the tank adjacent the top thereof.

In Fig. 8 the valve casing port 32 which is connected to the loading supply line 17 is closed since the core 23 has been rotated to bring the core port 33 out of registration with said casing port 32. With the core in this position the port 33 is in registration with a conduit 44 in the valve casing, the latter being connected to the tank as shown in Fig. 1. When the pump is started, liquid will flow from the tank through the conduit 44 and the core port 33 and thence from the end of the core through the casing and cap 35 and into the pump. Liquid issuing from the pump will come up through the pump outlet 37 in through the core port 39a, out of the core port 45, and through the casing conduit 46 which connects to the header supply pipe 18 as shown in Fig. 1, and from the header 19 the liquid is supplied to the spray bar elements 20 and 21.

In order to insure a regulated pressure on the liquid delivered to the spray bars a partition 47 across the interior of the hollow core 23 is provided with an aperture 48 which has a shoulder as shown. This shoulder provides a seat for a valve element 49 which is threaded upon a valve rod 50. The valve rod extends in through the aperture 48 and into a cage-like spring carrier 51 attached to valve element 49. Carrier 51 carries a compression spring 52 which is held between the inner wall of the partition 47 and a spider 53 journalled on valve rod 50 and having arms slidably received in longitudinal openings in the

cage. A nut **54** on the inner end of the valve rod **50** retains the spider **53** on the rod. It will be noted that the valve rod **50** is threaded and adjustment of the tension of the spring **52** is provided through the medium of an adjusting shaft **55** which extends out of the end of the casing cap **35** and is provided with a square end **56** to receive a wrench. A slidable connecting element **57** connects the valve adjusting rod **55** with the valve rod **50**.

With the master control valve set in the position shown in Fig. 8 the pressure relief valve **49** can be set to any desired tension, and if the pump exceeds the pressure for which the relief valve is set, said valve will be unseated and certain of the liquid will be bypassed through the the relief valve from where it will flow out of the left-hand end of the valve core and through the valve casing end cap **35** and be recirculated through the pump P.

It should be noted that my control valve is so constructed that it is possible to adjust the volume of flow through said control valve and the pump to the spray bars. Slight adjustment of the valve core **23** from complete registration of the ports in the position shown in Fig. 8 will reduce the flow from the supply tank through the valve casing conduit **44**, will reduce the effective port opening from the pump outlet through the core inlet port **39***a*, and will, of course, also reduce the effective area of the opening between the core port **45** and the casing conduit **46** which connects with the pipe **18** running to the spray bar header **19**. Again in such an adjusted position of the valve during the spraying operation if pressure backs up from the spray bar sections, the pressure relief valve **49** will come into play to bypass liquid from the valve core and around to the pump. It will be seen that when the control valve assembly is in the spraying position and it is adjusted slightly to reduce the flow to the spray bars, this will also cause the valve assembly to be set partially in the reverse suction position shown in Fig. 6 and described below so that there is in effect a feed to the spray bars which is offset to some extent by the application of suction. The ability to set the valve in this position permits accurate control of the amount of liquid being discharged from the spray bars, and the operator of the apparatus can accurately determine just how much liquid is being sprayed over a given area to meet the particular requirements of each different surfacing operation.

In Fig. 6 the valve is set for what may be termed its reverse suction operation. Such an operation is utilized when spraying has been completed and the withdrawal of liquid from the spray bars is desired. In changing from spraying position to the reverse suction position the pump, as will be seen, need not be stopped nor reversed, but suction will be effected merely by manipulation of the valve core. In such suction position the central valve casing conduit **46** is in communication with a core port **39***a* which is in the medial portion of the core but which is 90° removed from the core outlet port **45** used in spraying. Liquid is drawn by the pump from the spray bar assembly through said casing conduit **46**, the core port **39***a* and thence through a bypass **59** in a segment of the left-hand end of the core from where the liquid flows through the casing end cap **35** and through the pump P. It will be noted, as best shown in Fig. 4, that the plate **59***a* which is located between the end of the valve core and the casing end portion **35** will maintain the bypass **59** closed except when the valve is in the position shown in Fig. 6 for the reverse suction operation. In that position the cut out portion of the plate **59***a* is in coincidence with the end of the bypass **59**, but at other times the bypass is obstructed by the remainder of the plate which is cut away. Liquid flowing from the pump outlet **37** is conducted through a second bypass **60** which is a channel formed in the outer surface of core **23** as shown in Fig. 6 and partially in Figs. 7 and 8, this bypass communicating with the valve casing conduit **44** and thence into the tank through what is normally the tank outlet connection **44***a*.

Frequently when apparatus of this type is left standing for a considerable time or even for a short time in low temperatures, the spraying liquid will congeal in the pump and valves as well as in the spray bars, and it is a difficult and tedious operation to heat the various parts so that liquid will again flow through them and the parts function properly. For that reason I have provided means for circulating a flushing liquid such as a light petroleum distillate through the pump, the master control valve V, and through the spray bars to thoroughly clean them. This flushing operation is accomplished with the master control valve in the position shown in Fig. 3.

Normally, except for the flushing operation, the control valve core **23** is movable through 180°. That movement is normally limited by the right and left-hand stops **31** shown on the valve casing in Fig. 5. Because of the fact that the arcuate segment **26***g* which carries the chain **26***f* which in turn operates the sprocket **26** and for another reason which will soon become apparent, the auxiliary valve core operating lever **26***c* is disengaged from the lug **26***a* on the sprocket **26** as previously described and said auxiliary operating lever **26***c* is moved to the downwardly extending vertical position shown in Fig. 5 to bring the valve core into flushing position. The reason for not constructing the valve operating mechanism so that the combined indicator and stop arm **28** can be rotated a full 360° so that it can be turned with the valve core to the flushing position, is that kerosene, a relatively highly volatile petroleum product, is generally used for the flushing operation, and if by any chance kerosene will run through the valve and pump when the pump should happen to be in communication with the supply tank **16**, kerosene might get into said tank and later on when the apparatus is being used the liquid in the tank would be subjected to heat to render it more fluid and any kerosene in the tank would be very likely to cause an explosion. For this reason with my arrangement the indicator and stop arm can be left in any position between and above the right and left-hand stops **31** on the valve casing and the auxiliary valve core operating lever **26***c* moved to its downward position shown in Fig. 5 to bring the valve core in proper position for flushing, such a valve operation being an unusual one and different from other movements of the valve so that the operator would naturally be on guard when bringing the valve to flushing position and will take more care in being sure that the valve is positively set in its flushing position before kerosene is introduced into the apparatus.

Kerosene is introduced after setting of the master control valve in flushing position as shown

in Fig. 3 through an intake conduit 61 in the upper portion of the valve casing end cap 35 from any suitable source of kerosene supply. A valve 62 may be used to cut off the conduit 61 when it is not in use. Kerosene or some other suitable flushing liquid when introduced in this manner will flow into the pump P, and when the pump is started the flushing liquid will be forced out of the pump outlet 37, out of the valve core port 39, and into the conduit 46 in the casing. The flushing liquid will be forced from the conduit 46 through the conduit 18, the spray bar header and finally through the spray bars themselves. The spray bars can then be cut off by closing the valves 64 and 65 which are indicated in Fig. 1, and the pump will then begin to build up pressure which will open the relief valve 49, and the flushing liquid will be circulated through the master control valve and the pump until those two units have been completely cleaned. The valves 64 and 65 on the spray bar header 19 may again be opened and the flushing liquid exhausted from the apparatus through the spray nozzles. When the flushing operation has been completed the pin 26*d* on the auxiliary operating lever 26c can be moved back up into the lug 26*a* whereupon the spring catch 26*e* will lock the sprocket 26 to the reduced end of the stub shaft 25. The valve is then in condition for loading, spraying or reverse suction operations.

The pipe 18 which runs from the master control valve to the spray bar header 19 is shown extending through the bottom portion of the tank 16. This is done to maintain the oil in heated condition so that it will flow more easily, the tank 16 being maintained in heated condition by a suitable burner 66 whose combustion nozzle 67 extends into a combustion space 68 which is built into the tank 16. The type of burner is unimportant and is merely indicated diagrammatically. As shown in Figs. 1 and 9 the pipe 18 connects with the header 19 between the two valves 64 and 65 adjacent the ends of said header. At each end of the header a sleeve 69 is journalled with suitable packing. The sleeve 69 is part of an assembly carrying another pivotal connection 69*a* which is normally on a vertical axis. This pivotal joint is in turn connected to a short section of pipe 70 which normally extends rearwardly at right angles of the header 19 and makes a pivotal connection with an upright 71 adjacent the upper end of said upright. The pivotal connection 69, the joint 69*a*, and the connection 72 between the short pipe section 70 and the upright are arranged to conduct the liquid which flows from the header to the upright pipe 71.

The vertical pipe section 71, as best shown in Figs. 10 and 11, telescopes into a lower vertical pipe section 73 with a sliding fit. The lower vertical pipe section 73 carries a flange 74, and a collar 75 on the upper pipe section 71 fits down inside the collar 74 to retain a suitable packing material 76. As shown in Fig. 11, the upper pipe section 71 carries another flange 77 which supports a bolt 78, said bolt having threaded thereon a pair of nuts 79 and 80 which are adapted to tightly hold the packed joint just described. When vertical adjustment of the spray bars which are supported by the lower pipe sections 73 is desired, the nuts 79 and 80 are loosened and the desired vertical adjustment made.

Each of the main or central spray bar sections 20 makes connection with the casting 81 as indicated in Figs. 10 and 11. The spray bar extensions 21 are also connected to the casting 81, as shown in Figs. 10 and 11. The connection of the main spray bar sections 20 is a rigid one with respect to said casting, but the spray bar extensions 21 are pivotally connected. The latter are pivoted to permit them to be swung up in an out of the way position so that they do not extend laterally of the apparatus and carrier vehicle, as shown in Figs. 9 and 10, and in that upwardly swung position the extensions are cut off so that liquid will not flow into them. This is accomplished by providing a lateral opening 84 in the outer portion of the casting 81, as shown in Fig. 12, and when the spray bar extensions 21*c* swing up to a more or less vertical position the openings 84 will be out of registration with the ends of said spray bar extensions. An end cap 85 on the lower end of the lower pipe section 73 and a similar end cap 86 on the outer portion of the casting 81 provide for simple disassembling and reassembling of the parts just described.

The central spray bar sections 20 are shown in Figs. 1 and 9 extending toward each other and they are held in this position by a rod 87 which is retained in adjacent sleeve-like receptacles 88 on the adjacent ends of the spray bar sections 20. Cotter pins 89 shown in Fig. 1 permit removal and replacement of the pin 87. The connecting pin 87 is preferably formed of cast iron to form a break joint between the central spray bar sections 20. This break joint is provided for the reason that the spray bar extensions 21 are adapted to be extended laterally from the sides of the carrier vehicle upon which the apparatus is mounted, and at times said extensions are likely to come into contact with some object along the roadway such as a culvert or another vehicle. In such an event a blow on either of the spray bar extensions 21 will snap the break joint pin 87 and prevent serious damage to the apparatus. A replacement pin can be quickly inserted and the spraying operation continued. When such a break occurs both the extensions 21 and the central spray bar sections 20 will pivot with the casting 81 on the lower vertical pipe section 73.

Both the spray bar central sections 20 and the extensions 21 are provided with spray nozzles 90, enlarged views of which are shown in Figs. 13 and 14. The nozzles are provided with elongated apertures 91 from which the liquid issues, and said nozzles are threadedly secured in the spray bar sections. Each of the nozzles is provided with a short section of tubing 92 which extends upwardly and inwardly into the spray bar a substantial distance above the bottom thereof. This construction prevents any small quantities of liquid which may remain in the spray bars after the reverse suction operation from dripping from the nozzles. While the application of suction on the spray bars withdraws most of the surfacing liquid from them and from the conduits supplying the spray bars, there will, of course, be a certain amount which will drain back into the spray bars after termination of the application of such. This residue is the liquid which is retained in the spray bars by the short pieces of tubing 92.

The spray bar assembly is capable of various adjustments and manipulations. One of these is a substantially vertical adjustment with the entire spray bar assembly pivoting upwardly on the pivotal connections 69 at the ends of the header 19. Referring to Figs. 1, 10 and 15 the

header 19 has a pair of brace elements 93 journalled with straps 94, said straps carrying pivot bolts 95 which go through the inner ends of the braces 93. Intermediate portions of the braces 93 rest upon portions of a housing 93a which are supported by some convenient portion of the carrier vehicle which need not necessarily be shown, and when said braces are pivoted laterally on the vertical pivot bolts 95, said intermediate portions of the braces will merely slide upon the up-turned lower edge portions of the housing 93a, as indicated in Fig. 15. Of course, the braces 93 may be supported in this manner or in any other suitable manner. The braces are connected by an elongated arm 96 which extends beyond the braces and is pivotally connected to the upper ends of each of the upper vertical pipe sections 71. Above the brace and bar construction a rod 97 is mounted in suitable journals 98 which are secured to a part of the frame work 99 of the carrier vehicle. Ropes or cables 100 are connected between the rod 97 and the braces 93, and one end of the rod 97 is adapted to receive a crank 101 so that when the rod 97 is rotated the cables will be wound therearound and the braces 93 and cross bar 96 elevated to lift the spray bar assembly. This adjustment is provided to permit the spray bars to be elevated when the vehicle is in movement and the spray bars are not in use, or to secure vertical adjustment with respect to the roadway when conditions require it.

The spray bar extensions 21, as has been explained above, can be swung up in inoperative position, as shown in Figs. 9 and 10, said extensions being supported in their upper position by brackets 102, as best shown in Fig. 10. When they are in their lowered position they can be held by any suitable means such as chains 103 which are connected to the cross bar 96 and to said spray bar extensions. The apparatus can be operated with either one of the spray bar extensions in their lowered position or in their upwardly swung inoperative position. In addition lateral adjustment of the entire spray bar assembly relative to the carrier vehicle may be obtained by pivoting said assembly on the pivotal connections 69a and 72. This lateral movement may be effected by means of a lever 104 which is pivoted at 105 to the carrier vehicle frame cross piece 99, the lower end of said lever having a link connection 106 with the cross bar 96. The link connection is preferably provided with ball joints 107 and 108. The lateral movement of the spray bars is particularly adapted for use to assist the operator in following a guide line or the edge of the road and still maintain the spray bars in their proper position relative to the roadway.

The spray bar assembly may be shifted and with a simple alteration converted into a double spray bar, with spraying sections lying substantially parallel. This rearrangement is shown in dotted lines in Fig. 1. The spray bar extensions 21 have been swung inwardly and the inner main spray bar sections 20 swung outwardly, a movement permitted by the casting 81 which, as described above, pivots on a vertical axis. The spray bar extensions have end caps 21a which are removed to permit the coupling of additional sections of pipe 21b having nozzles as in the other spray bar sections. The added pipe sections 21b may, of course, be of such length as to extend out to the ends of the laterally extending main spray bar sections 20, if desired.

As shown in Fig. 1, when in the double spray bar position, the elements lie slightly off of a true transverse line, this positioning being necessary because duplicate parts of the spray bar assembly lie opposite each other and naturally cannot occupy the same space.

The valves 64 and 65 adjacent the ends of the header 19 may be controlled by levers 109 and 110, said levers being positioned somewhere near the same general level of the upper end of the lateral movement lever 104, and the rear end of the carrier vehicle which is suggested by the cross frame 99 may be provided with a platform so that the operator can easily reach any of the valves which he wishes to control as well as the spray bar shifting lever 104.

Sometimes it is desirable to maintain the liquid in the tank 16 in such condition that it will readily flow either before or after a spraying operation. Under these circumstances, of course, the spray bar assembly itself is not in use so the valves 64 and 65 in the header 19 will be closed and a valve 111 which is located in a short pipe 112 connecting the header directly with the tank 16 will be opened by movement of its handle 113. The master control valve V is set in the spraying position illustrated in Fig. 8, and the pump will circulate liquid through the master control valve, the pipe 18, the medial portion of the header 19, and through the short pipe section 112 to the tank. Of course, liquid heated by the burner 66 is under these conditions being constantly withdrawn from the tank and being pumped around to complete the circulatory action.

The aforementioned housings 93a that support the braces 93 and cover portions of the header and the valves therein are connected between adjacent upper corners by another housing portion 114 which connects housings 93a, and suitable side plates or doors may be secured to the entire housing unit to more completely enclose the valves 64 and 65.

Referring back to Fig. 11 it will be noted that the casting 81 and the lower vertical pipe section 73 are so associated and constructed that the lower end of said pipe section 73 is below the connections between said casting 81 and the spray bar sections 20 and 21. That portion of the pipe 73 which lies below these connections provides a sump 115 which is adapted to collect a considerable percentage of the liquid which may otherwise collect in the spray bars after a spraying operation and after the application of suction has been discontinued. As a matter of fact, the suction can be applied for a short period after liquid has had time to collect in the sump 115 and at least a portion of the liquid which has accumulated in the sump will be drawn up into the tank by the pump P.

A spray nozzle 116 similar to the nozzles in the spray bar elements is preferably placed in each of the castings 81, as shown in Figs. 9 and 11, so that there will be no gap between the last of the nozzles 90 in each of the spray bars 20 and the end nozzle in each of the spray bar extensions 21.

From the foregoing description it will be seen that I have provided a road spraying apparatus which is extremely flexible in operation and which, while comprising a number of parts, is actually capable of being simply controlled and wherein the master control valve can be quickly and easily moved to various positions to load the tank, feed liquid to the spray bar assembly, withdraw liquid therefrom, circulate heated liq-

uid when the spray bar is cut off, and permit the flushing of the pump, the master control valve itself, and the spray bars. In addition the spray bar assembly itself may be moved vertically or laterally, and it may be also manipulated so that at least the medial portions of the spray bar assembly can be converted into a double spray bar arrangement when desired. The provision of a break joint between the central spray bar sections is also of importance because of the great saving in repair work in the event one of the spray bar extensions should strike some object along the roadway.

The above described apparatus has been constructed in accordance with this disclosure and has been repeatedly and successfully operated.

It will, of course, be understood that various changes may be made in the form, details, arrangement, and proportions of the various parts without departing from the scope of my invention.

What is claimed is:

1. In a liquid distributing apparatus and the like, a tank, a pump, a discharge device and an adjustable valve assembly adapted to be connected with said tank, said pump and said discharge device in one position to cause a flow of liquid from said tank through said pump to said discharge device, said valve assembly being adjustable to a second position to cause withdrawal of liquid from said discharge device, said valve assembly including means for admitting a flushing liquid and being adjustable to a third position wherein the connection with said tank is closed and the connections with said pump and with said discharge device are opened to permit flushing liquid to be directed through said pump, said valve assembly and said discharge device, and means for closing said discharge device when said valve assembly is in said third position, and flushing and by-pass means associated with said valve assembly permitting circulation of flushing liquid through said pump and said valve assembly when said discharge device and tank connection are closed.

2. The structure in claim 1, and said by-pass means comprising a yieldable valve adapted to open under pressure when said discharge device is closed, to permit circulation of flushing liquid through said valve assembly from its connection with the outlet side of said pump to its connection with the inlet side of said pump and thence through said pump.

3. In a liquid distributing device and the like, including a tank, a pump and a discharge device, an adjustable valve assembly adapted to be interconnected with said tank, said pump and said discharge device, and including, in one position thereof, means for directing flow of liquid from said tank to said discharge device, said valve being adjustable to a second position connecting said tank, pump and discharge device, and having flow control means for producing withdrawal of liquid from said discharge device to said valve and pump while cutting off flow to said discharge device, and said valve being adjustable to positions intermediate said first and second positions to produce a variable flow of liquid to said discharge device, the withdrawal of liquid from said discharge device offsetting excess flow of said discharge device.

4. In liquid distributing apparatus, including a tank having an inlet and an outlet, a pump and a discharge device, a valve casing having ports connected to the inlet and outlet of said tank, to the inlet and outlet of the pump and to said discharge device, and an adjustable core in said casing having passages and ports adapted to, in one position thereof, establish communication with certain of the ports in said casing and in other positions thereof to establish communication with certain other ports of said casing, the arrangement of ports in the core and casing being such that communication can be established between said tank outlet, the inlet and outlet of said pump and said discharge device to effect discharge from said tank in one position of the core, in another position of the core affording communication between said discharge device and said pump inlet, and also between said pump outlet and said tank, whereby liquid can be supplied to or withdrawn from said discharge device, and the passages and ports in said core being so related to the ports in said casing that said core can be set at intermediate positions between said above mentioned positions to simultaneously vary the flow toward and away from said discharge device.

5. The structure in claim 4 and said valve means including a yieldable valve element connected between the outlet and inlet of said pump, said element being adjustable to a predetermined pressure resistance maximum whereby excess pressures will be relieved by bypassing of liquid through said yieldable valve from said pump outlet to said pump inlet.

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