

Sept. 22, 1970

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3,529,772

SPEED COMPENSATED SPRINKLER APPARATUS FOR WATER TANK VEHICLES

Filed Sept. 27, 1968

2 Sheets-Sheet 1

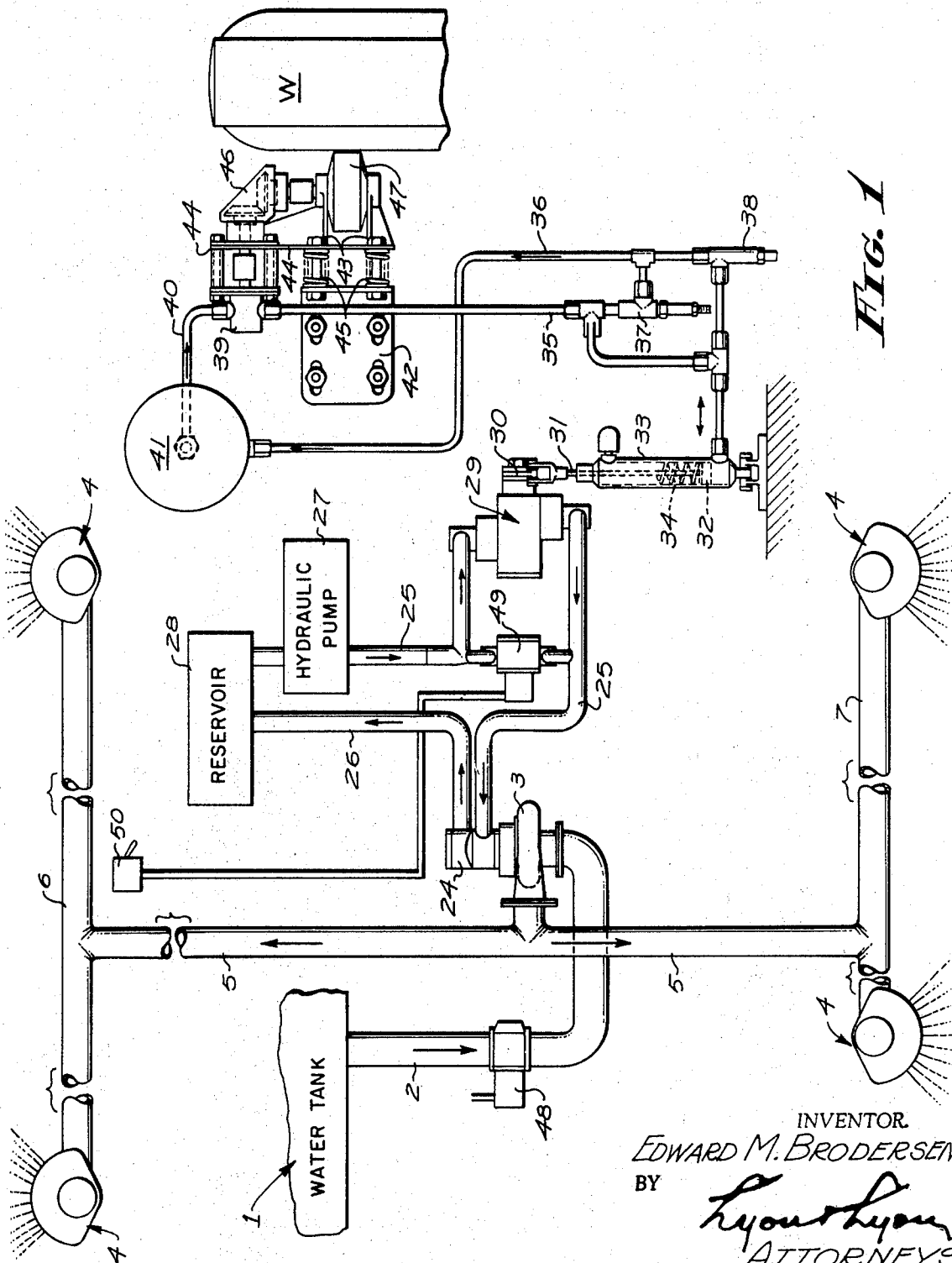


FIG. 1

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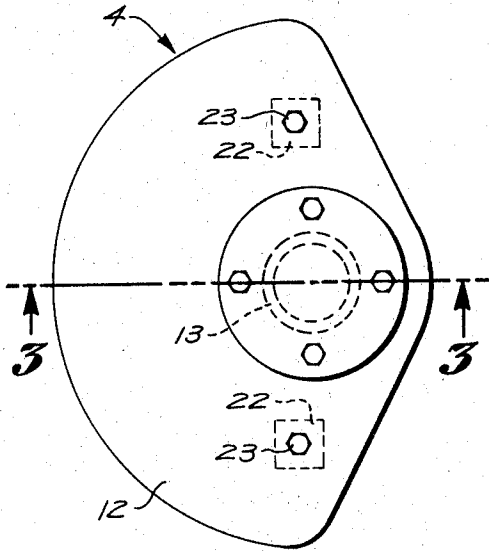


FIG. 2

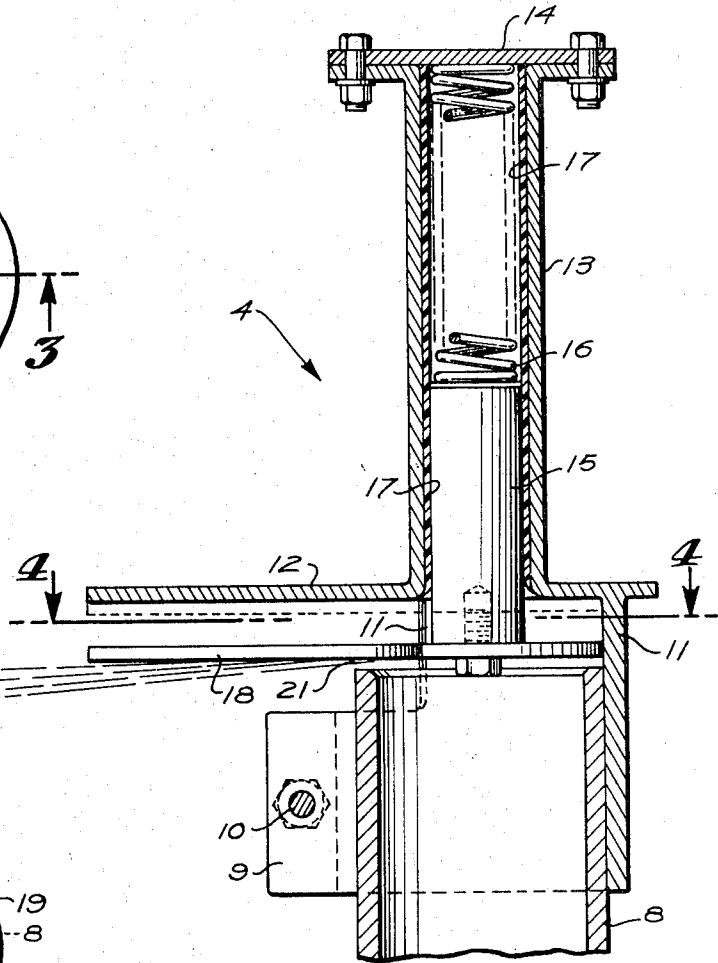


FIG. 3

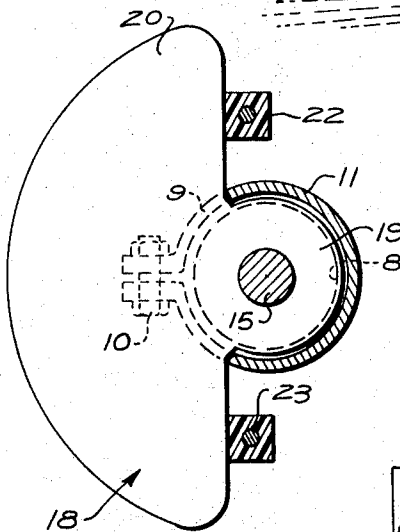


FIG. 4

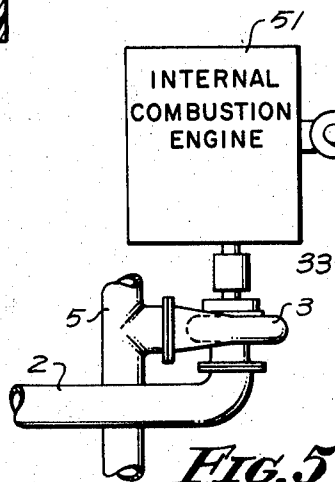


FIG. 5

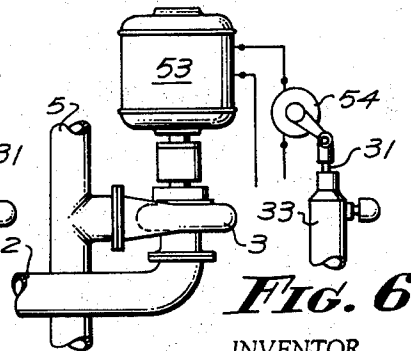


FIG. 6

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SPEED COMPENSATED SPRINKLER APPARATUS FOR WATER TANK VEHICLES

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Filed Sept. 27, 1968, Ser. No. 763,166

Int. Cl. B05b 9/06

U.S. Cl. 239—157

10 Claims

ABSTRACT OF THE DISCLOSURE

An apparatus which controls the discharge of water from the tank of a sprinkler vehicle by use of a vehicle wheel driven pump control, so that the water supply varies with vehicle speed; and, the water being discharged through horizontally directed sprinkler heads in which the discharge orifices vary with water supply so as to maintain a spray pattern of essentially uniform area and essentially constant volume of water per unit area irrespective of vehicle speed.

BACKGROUND OF THE INVENTION

Water sprinkler vehicles are used extensively in earth filling operations in which layers of earth are spread over the area being filled. Water is distributed by vehicle sprinklers and compactors are moved over the surface so that the fill has maximum density to minimize later settling. It is essential that the amount of water be applied uniformly and be sufficient to accomplish the desired result, yet, controlled to avoid runoff.

It is the general practice to provide such water sprinkler vehicles with fixed spray nozzles and to operate the water supply pump at a fixed speed; then, to drive the vehicle at a predetermined fixed speed in order to distribute the water uniformly. While attempts have been made to vary the pump speed with the vehicle speed, such use has been confined to spraying vehicles handling viscous materials such as binders for road surfaces which are discharged downwardly rather than horizontally, as disclosed in Pat. No. 2,765,196 and Pat. No. 2,031,262, so that variations in flow from the nozzles has little, if any, effect on distribution. Whereas, in the case of water sprinklers, which must discharge horizontally, the resulting change in water distribution has prevented the use of such controls.

In the use of water sprinklers in conjunction with grading operations, it is often difficult to maintain a uniform vehicle speed for there is often a high density of other equipment in the area, and the dimensions and shape of the area may require considerable maneuvering of the vehicle including change in speed.

SUMMARY OF THE INVENTION

The objects of this invention include:

First, to provide a sprinkler apparatus for water tank vehicles, which varies the supply of water to the sprinklers in proportion to vehicle speed, between predetermined minimum and maximum speeds.

Second, to provide an apparatus of this type having sprinklers adapted to discharge water horizontally in a wide arc and incorporating novel means for varying the sprinkler orifice in proportion to the volume and pres-

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sure of the water supply so that, within the desired speed range of the vehicle during its sprinkling operation, not only the pattern covered by the water, but also the density of the water applied to the ground, remains substantially constant.

DESCRIPTION OF THE FIGURES

FIG. 1 is a diagrammatical plan view of the speed compensated sprinkler apparatus for water tank vehicles.

FIG. 2 is an enlarged plan view of one of the sprinklers.

FIG. 3 is a further enlarged sectional view thereof, taken through 3—3 of FIG. 2.

FIG. 4 is a reduced transverse sectional view, taken through 4—4 of FIG. 3.

FIG. 5 is a fragmentary diagrammatical view, corresponding to FIG. 1, in which an internal combustion engine drives the sprinkler pump.

FIG. 6 is a fragmentary diagrammatical view, corresponding to FIG. 1, in which an electric motor drives the sprinkler pump.

SPECIFICATION

The speed compensated sprinkler apparatus is intended for installation on otherwise conventional vehicles having a water tank 1, indicated fragmentarily in FIG. 1. The water tank is connected by a pump supply line 2 to a pump 3. It is customary to equip water tank vehicles with sprinklers 4, arranged in pairs and located at the opposite sides of the vehicle at the forward end and at the rearward end, and directed forwardly and rearwardly. The present invention is adapted to any desired arrangement of sprinklers. For purposes of illustration, four sprinklers are shown and are connected to the pump 3 by a line 5 running longitudinally with respect to the vehicle and joined to a laterally extending forward distribution line 6 and a rearward distribution line 7. Valve means, not shown, may be provided in the lines so that selected sprinklers may be operated.

The distributor lines 6 and 7 terminate at each sprinkler in a vertical discharge tube 8, fitted near its end with a clamp sleeve 9, secured by a bolt 10. The sleeve is provided with a semicircular extension 11, which is welded or otherwise secured to a cover plate 12 overlying the upwardly open end of the tube 8.

Welded or otherwise joined to the cover plate 12 is a vertically extending guide tube 13, disposed in coaxial relation with the discharge tube 8. The guide tube 13 is provided with a cover plate 14. The guide tube 13 receives a plunger 15, which is urged downwardly by a spring 16 bearing against the cover plate 14. The guide tube 13 or the plunger 15 is provided with an anti-friction lining 17. A preferred lining is one of the polytetrafluoroethylenes, for example, the type known under the trademark Teflon.

Secured to the lower end of the plunger 15 is a spray control and deflector plate 18, which includes an inner circular portion 19, conforming to the semicircular extension 11, and thus overlying the open upper end of the tube 8, and an extended semicircular outer portion 20. The deflector plate 18 forms with the upper extremity of the tube 8 a semicircular, horizontally directed spray orifice 21, bounded circumferentially by the edges of the semicircular extension 11. The cover plate 12 is preferably coextensive with the deflector plate 18 and extends rearwardly thereof. The rearward portion is provided with a pair of guides 22, preferably in the form of square

blocks of anti-friction material, such as polytetrafluoroethylene. The guides are secured by bolts 23 and are engaged by the rear edge of the deflector plate 18 to prevent the deflector plate from turning.

The pump 3 is driven by a hydraulic motor 24, connected by an intake line 25 and return line 26 to a hydraulic pump 27 and reservoir 28. The hydraulic pump 27 as well as the hydraulic motor 24 may be part of the conventional system provided on the vehicle for the operation of various hydraulic controls, or may be installed specifically for the operation of the sprinkler system. In either case, the hydraulic pump may be operated by a takeoff from the vehicle engine or by an independent power source.

Interposed in the intake line 25 is a control valve 29 to vary the hydraulic fluid delivered to the motor 24 and thereby vary the speed of the motor 24 and the pump 3. The control valve, per se, is conventional and is the type having a lever 30, movable in an arc to control the flow of hydraulic fluid. It has been the previous practice to operate the control valve 29 manually or set the control valve in a predetermined position. In the exercise of the present invention, the lever 30 is connected to a shaft 31 which in turn is joined to a plunger 32, slidable within a cylinder 33. A spring 34, within the cylinder, urges the shaft 31 and lever 30 in one direction; that is, in a direction tending to shut off flow of hydraulic fluid to the motor 24.

The cylinder 33 is connected to a pressure fluid supply line 35 and to a return line 36. The pressure fluid supply line and return line are interconnected by a relief valve 37 so that pressure fluid may bypass to the relief line when above a predetermined pressure. Also, the return line 36 is provided with a metering valve 38 so as to control the rate of backflow from the cylinder 33 and from the supply line.

A small pressure fluid pump 39 is interposed in the supply line 35. The intake side of the pump is connected by a line 40 to a pressure fluid reservoir 41. The return line 36 is also connected to the reservoir.

Suitably mounted on the water tank vehicle near one of the wheels W is a mounting bracket 42. The mounting bracket is connected by a set of tie bolts 43 to a plate 44. Springs 45 surround the bolts 43 to urge the plate 44 away from the mounting bracket 42.

The pump 39 is supported from the plate 44 and is connected by a bevel gear drive 46 to a drive wheel 47 rotatably supported from the plate 44 and urged by the springs 45 against the vehicle wheel W.

Operation of the speed compensated sprinkler apparatus for water tank vehicles is as follows:

The control valve 29 is adjusted so that when the vehicle is at a standstill, the hydraulic motor 24 is shut off as is also the pump 3. In addition, the supply line 2 may be provided with a shut off valve 48, preferably controlled by the vehicle operator. Still further, the hydraulic pump 27 may be shut off.

When ready to start a sprinkling run, the shut off valve 48 is opened and the hydraulic pump 27 is operated. This may be done when the vehicle is at a standstill or when the vehicle is in motion at the desired minimum sprinkling speed. As the vehicle is moved forward, the drive wheel 47 operates the pressure fluid pump 39 creating a pressure in proportion to the speed of the drive wheel which is applied against the force of the spring 34 so as to move the lever 30 to a corresponding position. Thus, the amount of hydraulic motor fluid supplied to the motor 24 corresponds to the rate of forward movement of the vehicle. Consequently, the water supplied to the sprinklers 4 varies in accordance with the vehicle speed.

In order for the sprinkler pattern of water from each sprinkler to be essentially the same, the effective opening of the spray orifice 21 should increase and decrease in proportion to the increase and decrease of the water supply; that is, regardless of the vehicle speed, within

pre-established limits, the water pressure at the orifice 21 is constant so that the water discharges the same distance although the volume changes.

It is sometimes desirable to increase the amount of water for a given vehicle speed. This may be done by a solenoid bypass valve 49 operated by a switch 50, located in the driver's compartment.

Reference is directed to FIG. 5 in which the water pump 3 is shown as driven directly by an auxiliary internal combustion engine 51, having a throttle valve 52 which is connected to the shaft 31.

Reference is directed to FIG. 6 in which the water pump 3 is shown as driven directly by an electric motor 53, controlled by a rheostat or other speed changing device 54, connected to the shaft 31.

With either arrangement shown in FIGS. 5a and 6, the operation of the sprinklers is the same as the first described system; that is, the volume discharge from the sprinklers varies with vehicle speed, yet the spray pattern remains essentially constant.

I claim:

1. A pressure sensitive sprinkler for vehicle water tanks, comprising:

- (a) an upstanding outlet tube terminating in a horizontally directed outlet orifice;
- (b) a horizontal deflector plate, including a portion covering the upper end of said outlet tube and a semicircular portion extending through the orifice and radially beyond the outlet tube to direct issuing water into a fan shaped spray;
- (c) means for guiding said plate in an axial direction with respect to said outlet tube thereby to vary the height of said orifice;
- (d) and a spring for urging said plate downwardly to close said orifice, said spring being yieldable to water pressure against the underside of said plate whereby the height of said orifice varies with the pressure of water against said plate.

2. A sprinkler, as defined in claim 1, wherein said guide means comprises:

- (a) a mounting plate fixed with respect to said tube and covering said deflector plate;
- (b) a sleeve extending upwardly from said mounting plate;
- (c) and a shaft extending upwardly from said deflector plate and slidable in said sleeve, said spring being within said sleeve and bearing against said shaft.

3. A sprinkler, as defined in claim 2, wherein:

- (a) said mounting plate and deflector plate extend laterally in opposite directions from said outlet tube;
- (b) and a pair of spaced guide means depend from the mounting plate and restrain the deflector plate against rotation.

4. A sprinkler apparatus for sprinkler vehicles, comprising:

- (a) a water tank, variable orifice sprinkler and variable volume sprinkler pump interposed therebetween, all mounted on the vehicle;
- (b) a variable speed drive means for the sprinkler pump;
- (c) a roller engageable with one of the vehicle wheels;
- (d) a control means connected with the roller adapted to produce an output signal in proportion to vehicle speed;
- (e) and a regulator responsive to the signal for varying the speed of the motor and drive means in proportion to the vehicle speed thereby to cause the water discharged from the sprinkler to vary in proportion to the vehicle speed.

5. A sprinkler apparatus, as defined in claim 4, wherein:

- (a) the drive means is a hydraulic motor and pump therefor;
- (b) the output signal is a pressure signal;

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(c) and the regulator is a valve variable in response to the pressure signal.

6. A sprinkler apparatus, as defined in claim 4, wherein:

- (a) the drive means is an internal combustion engine;
- (b) the output signal is a pressure signal;
- (c) and the regulator is a speed control means for the internal combustion engine variable in response to the pressure signal.

7. A sprinkler apparatus, as defined in claim 4, wherein:

- (a) the drive means is an electric motor;
- (b) and the regulator is a speed control device for the electric motor.

8. A sprinkler apparatus, as defined in claim 4, wherein said variable orifice sprinkler head comprises:

- (a) an upwardly directed outlet tube;
- (b) means covering the outlet tube and forming therewith a horizontally directed semi-circular orifice;
- (c) a deflector plate covering the outlet tube, underlying the covering and extending radially through the semi-circular orifice;
- (d) spring means urging the deflector plate toward the outlet tube to restrict the orifice, the deflector plate being responsive to the force of water deflected through the orifice to open the orifice.

9. A sprinkler apparatus for water tank vehicles, comprising:

- (a) a water supply tank;
- (b) a variable orifice sprinkler head;
- (c) a variable volume sprinkler pump interposed between the tank and the sprinkler head;
- (d) a variable speed hydraulic motor for driving the sprinkler pump;
- (e) a variable speed hydraulic pump for driving the hydraulic motor;

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(f) a regulator valve interposed between the hydraulic motor and hydraulic pump for varying the speed of the hydraulic motor;

(g) a drive wheel engageable with a wheel of the vehicle;

(h) a control means connected with the drive wheel adapted to produce an output pressure in proportion to the speed of the vehicle;

(i) and means responsive to the output pressure of the control pump for adjusting the regulator valve in proportion to vehicle speed thereby to vary the hydraulic motor, and a sprinkler pump to discharge water from the sprinkler head in proportion to vehicle speed.

10. A sprinkler apparatus, as defined in claim 9, wherein:

- (a) a manually controlled valve is disposed in bypassing relation to the regulator valve thereby to permit a predetermined volume output from the sprinkler head irrespective of vehicle speed.

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U.S. Cl. X.R.

239—505