Aug. 6, 1968 E. A. SOUSEK ET AL 3,395,866

MATERIAL SPREADERS HAVING REMOTE CONTROLS

Filed March 28, 1966 3 Sheets-Sheet 1

Fig. 1

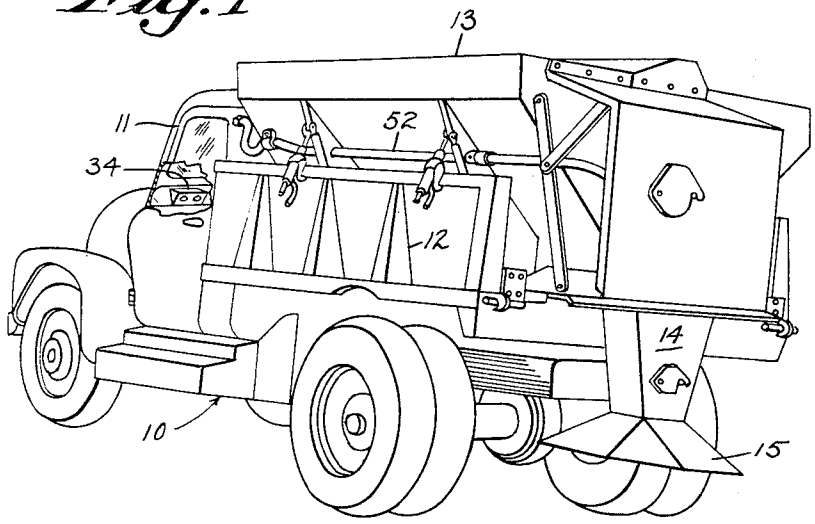


Fig. 5

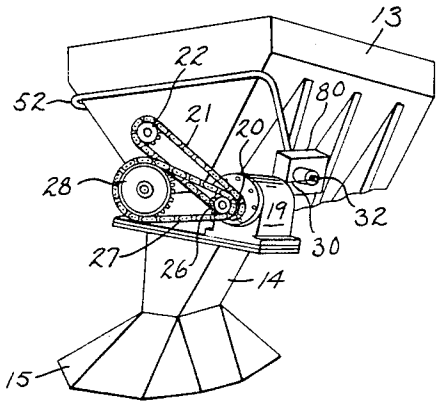


Fig. 2

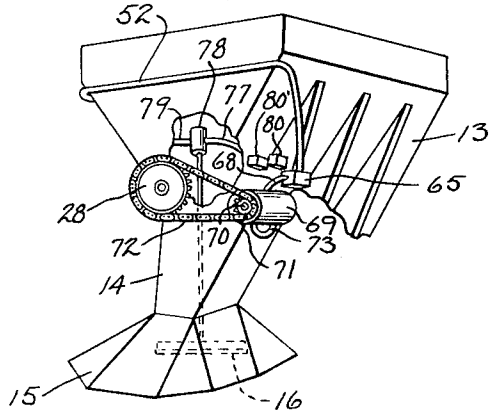
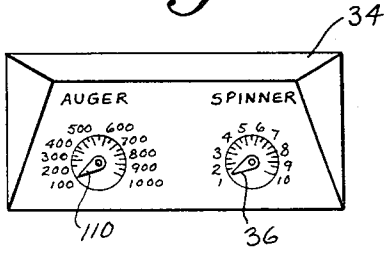


Fig. 7



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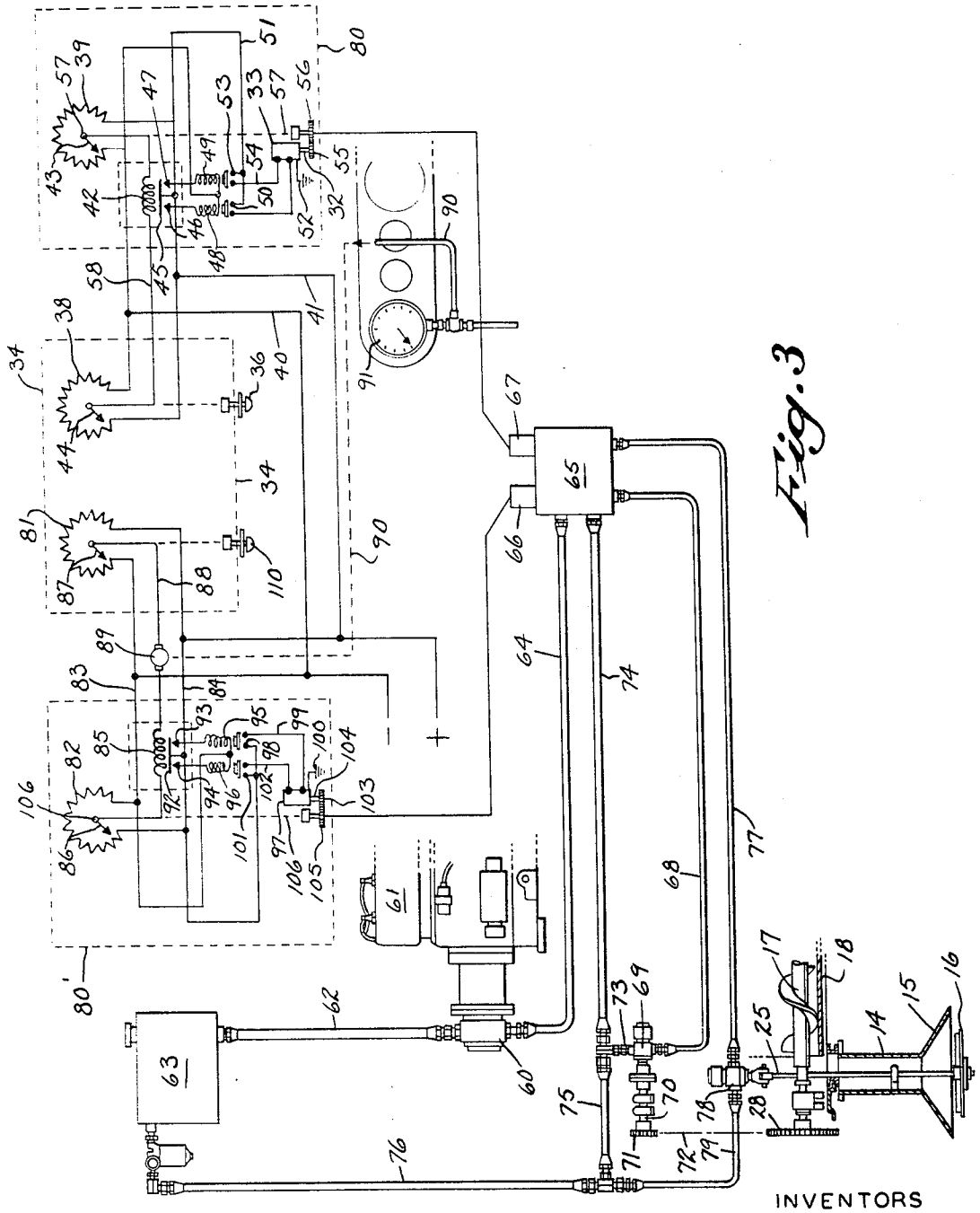


Fig. 3

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MATERIAL SPREADERS HAVING REMOTE CONTROLS

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Fig. 4

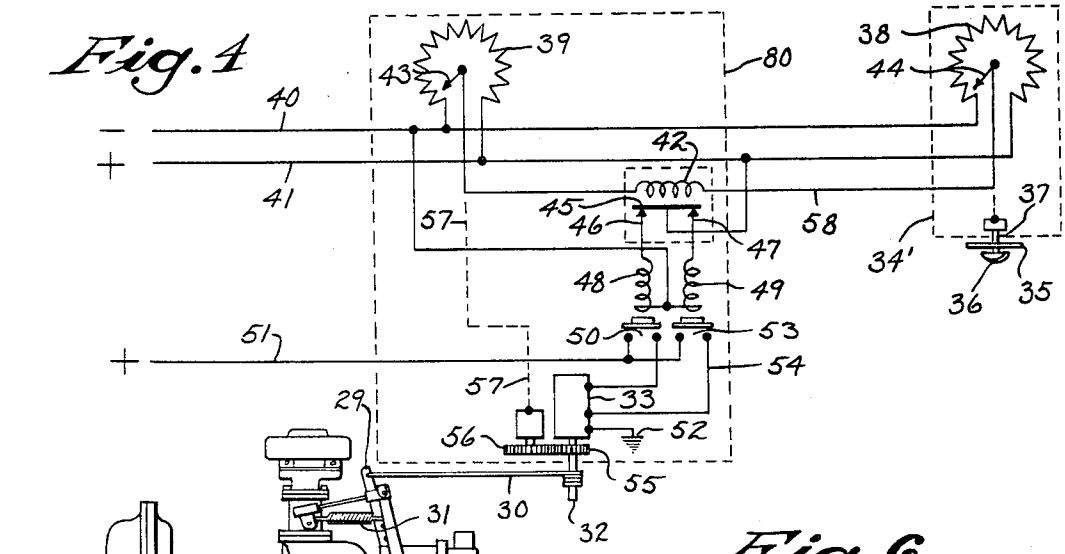


Fig. 6

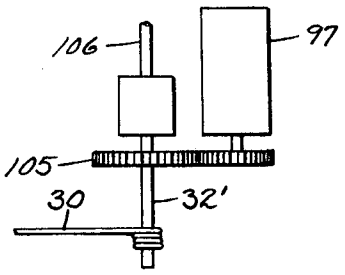
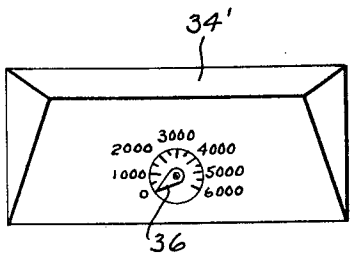
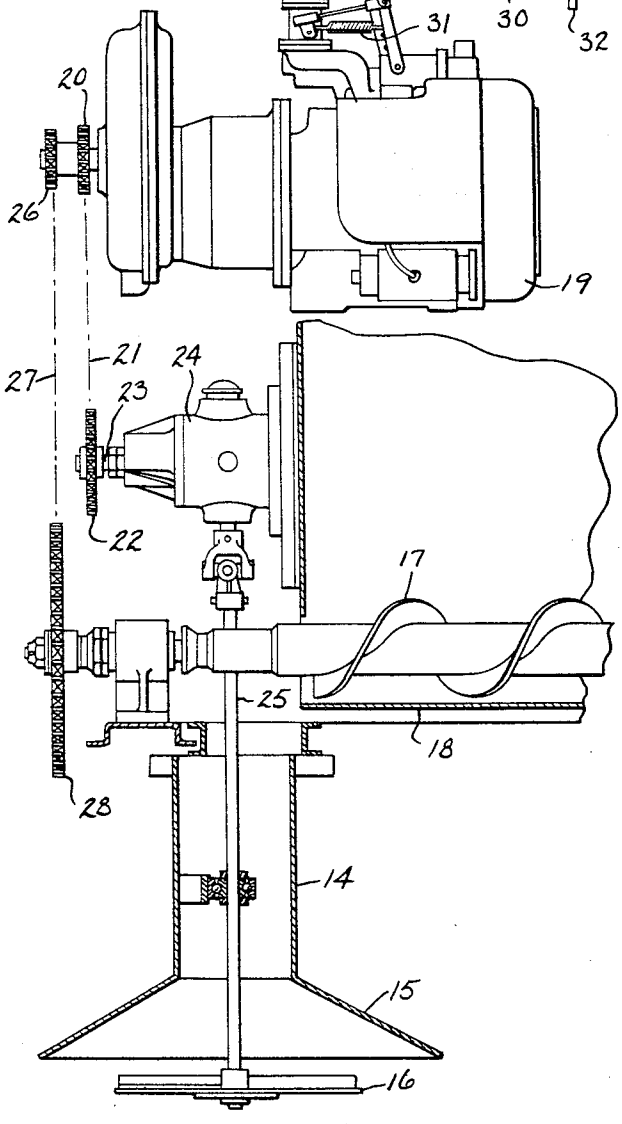


Fig. 8





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United States Patent Office 3,395,866 Patented Aug. 6, 1968

3,395,866

MATERIAL SPREADERS HAVING REMOTE CONTROLS

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Filed Mar. 28, 1966, Ser. No. 537,996
6 Claims. (Cl. 239—670)

This invention relates to improvements in material spreaders having remote controls.

Trucks of the type which are used to spread sand, salt, chips, or the like on streets are customarily provided with a separate motor in the rear of the truck for driving a feeding device, such as an auger, and for driving a spreading device, such as a spinner. A device of this type is illustrated in Saiberlich Patent No. 2,954,982, dated Oct. 4, 1960, and in Saiberlich Patent No. 2,881,024, dated Apr. 7, 1959. In the devices of both of these prior patents there is a sand or chip spreading spinner at the rear of the truck body driven by an auxiliary internal combustion engine mounted at the rear. In addition, there is an auger in the bottom of the dump body for moving the material to be spread out of a discharge opening at the rear end of the body onto the spinner.

In the use of the apparatus of this type it is very desirable to have close control from the cab of the operation of the auxiliary motor. With the arrangement of the present invention it is possible to accurately control the speed of the engine and, hence, the speed of operation of the driven instrumentalities such as the material discharge conveyor and the spreading spinner. Heretofore there have been lever controls projecting from the front of the body near the cab which were connected to the linkage from the rear for controlling certain remote operations. These, however, have not given complete control and it has been necessary for the operator to dismount from the cab at frequent intervals.

It is a general object of the present invention to provide an improved sand spreading truck having a remote electric control for use with an axiliarly motor which is capable of giving variable speed with refinements of adjustment from such remote location. When used in conjunction with a sand and chip spreading device this enables the operator in the cab to have a variable control on the speed of the auger and a like control on the speed of the spreading spinner which throws the sand and chips onto the road.

A further object of the invention is to provide an improved device as above described which enables the operator to synchronize the speed of a remotely positioned motor for driving the auxiliary equipment with the ground speed of the vehicle. Thus the driver of the truck, while in the cab, can manually select a rate in pounds per mile at which material will be dispensed from a truck body onto the road.

A further object of the present invention is to provide a device as above described wherein the remote control includes a low-power electrical control circuit including two potentiometers, together with a discriminating relay in a novel circuit arrangement for accomplishing the desired purpose.

A further object of the invention is to provide a circuit as above described which may include a variable signal sender, which sender is adapted to create a voltage in the line leading through the discriminating relay. This signal sender may be a small generator driven off of the speedometer cable so that it is responsive to the speed of the vehicle.

With the above and other objects in view, the invention consists of the improved material spreader having remote controls, and all of its parts and combinations, as set forth in the claims, and all equivalent thereof.

In the accompanying drawings, illustrating one complete embodiment of the preferred form of the invention, in which the same reference numerals designate the same parts in all of the views:

FIG. 1 is a perspective view of a sand and chip spreading truck showing the remote control cable running from the cab to the rear of the spreader body of the truck;

FIG. 2 is a fragmentary perspective view of an auxiliary sand spreading body looking principally at the opposite side from that shown in FIG. 1;

FIG. 3 is a partially diagrammatic view showing the electrical circuit and operating connections with auxiliary hydraulic motors, the latter being drivingly connected with the delivery auger and spreading spinner of the truck;

FIG. 4 is a partially diagrammatic view showing a modification wherein an auxiliary internal combustion engine drives the delivery auger and spreading spinner;

FIG. 5 is a fragmentary perspective view of an auxiliary sand spreading body like FIG. 2 showing the use of an internal combustion engine as illustrated in FIG. 4;

FIG. 6 is a fragmentary diagrammatic view illustrating another modification;

FIG. 7 is a front elevational view of the control box for the principal form of the invention; and

FIG. 8 is a front elevational view of the control box used in connection with the form of the invention of FIG. 4.

While features of the invention have broad applicability to the remote control of various instrumentalities where a remote control is desirable, nevertheless the invention finds its greatest utility in the control of a remotely located motor and, particularly, in the control of hydraulic motors or of an internal combustion engine mounted on the rear of a sand or chip spreading truck.

Referring more particularly to the drawings, the numeral **10** designates a truck of a standard type having a cab **11** and a body **12**. In the exemplification shown in FIG. 1 this is a standard dump body with the tailgate removed.

Mounted within the standard body **12** in any desired manner such as that described in Patent No. 2,881,024, dated Apr. 7, 1959, is an auxiliary body **13** which is adapted to convert the truck body **12** to a selected special use. The particular body illustrated in FIG. 1 is a spreader unit for spreading sand, salt, chips, calcium chloride, or other materials, on a street or highway.

The details of the operating mechanism unit form no part of the present invention. Unit **13**, however, includes a vertical spreader housing **14** at the rear having an open bottom spreader skirt **15** at its lower end, which skirt is over a rotatable spreading spinner **16**.

The auxiliary body is generally a truncated triangle in cross-section so that it has a trough-like bottom within which an auger or other material-moving device **17** is rotatably supported. The auger is rotatably driven in a manner to be hereinafter described, and is adapted to move material such as sand, chips, salts, or the like, from within the auxiliary body **13** out of its rear end (as shown in FIG. 3) into the housing **14**.

The rear end of the auger trough **18** extends to a position as shown in FIG. 3 so that discharged material will fall downwardly by gravity through the spinner housing **14**.

The auxiliary motor or motors may be mounted on the auxiliary body as shown in FIGS. 2 and 5. In the case of the hydraulic drive of FIGS. 2 and 3, there is an hydraulic system as illustrated more particularly in FIG. 3 which includes an oil pump **60**, usually in the front of the truck, driven by any suitable means such as the engine **61** which propels the truck. The oil pump has a suction line **62** connected with the oil reservoir **63** and has a high pressure line **64** which leads from the front of the vehicle to an hydraulic valve **65** mounted near

the rear of the auxiliary body, as shown in FIG. 2. This valve includes a rotatable spool 66 and a rotatable spool 67. The valve 65 is connected by a line 68 with an hydraulic motor 69 constituting an auxiliary motor which drives a shaft 70 carrying a sprocket wheel 71 which is connected by an endless chain 72 with a sprocket wheel 28 rigidly mounted on the projecting end of the shaft for the auger 17 to drive the latter. A return line 73 from the pump connects with a valve line 74 and with a branch line 75 connecting with a return line 76, the latter leading to the tank 63. The lines 76 and 64 may be accommodated in a conduit 52 leading from the front to the rear of the vehicle.

Another line 77 from the valve 65 leads to a second hydraulic motor 78 also constituting an auxiliary motor, also mounted at the rear of the auxiliary body over the spinner 16 and spinner shaft 25 to drive the latter. A return line 79 from the motor 78 connects with the line 76 leading to the tank 63.

Where an internal combustion engine is employed instead of the hydraulic motors, as shown at 19 in FIGS. 4 and 5, it has a sprocket wheel 20 which is connected by an endless chain 21 with a sprocket wheel 22 on a shaft 23 leading into a gearbox 24 to drive the shaft 25 for the spinner 16. The engine 19 also drives another sprocket wheel 26 which is connected by an endless chain 27 with a sprocket wheel 28 rigidly mounted on the projecting end of the shaft for the auger 17 to drive the latter. The internal combustion engine has a governor lever 29 which is adapted to be moved in one direction by a cable 30, and in the other direction by a spring 31. The remote end of the cable 30 is windable on a shaft 32 which is driven by and projects from an electric motor 33. The electric motor is mounted near the remotely positioned auxiliary engine 19.

Referring now to the wiring diagram of FIG. 3 showing one form of control apparatus and circuit therefor, and referring first to the control for the spinner, there are spaced potentiometers 38 and 39 of equal value. The potentiometer 38 may be termed the master positioner, and is located in a control box 34 in the cab. The potentiometer 39 is the slave positioner, and is located in a control box 80 in the rear on the auxiliary body. These potentiometers are wired with their resistances in parallel and connected at one end to a negative line 40 and at the other end to a positive line 41 leading from a suitable source of current.

A discriminating relay 42 located in the rear control box 80 has its coil connected at one end with a movable wiper 43 for the slave positioner 39, the other end of the coil being electrically connected with a movable wiper 44 for the master positioner 38 in the control box 34 in the cab. The discriminating relay 42 has a switch element 45 which is adapted to be moved in one direction or the other to close contacts 46 or 47. The entire circuit thus far described is a low-power circuit. The contacts 46 or 47 of the discriminating relay are adapted to act through the coils 48 or 49 of a power relay controlling the relatively high-power circuit to the reversible motor 33, the latter also being located in the rear on the auxiliary body in box 80. When the coil 48 is energized, it closes the contacts 50 which completes the circuit through a line 51 leading from the positive side of a relatively high-power source to the motor, the motor being grounded as at 52. When the switch 50 is closed, the motor is driven in one direction. When the coil 49 is energized, it closes the switch 53 to act through the line 54 in driving the motor 33 in a reverse direction. A gear wheel 55 on the shaft 32 of the motor acts through another gear wheel 56 to drive the rotatable shaft 57 for the wiper 43 of the slave potentiometer 39.

This same control system, shown on the right hand side of FIG. 3, is also used in the form of the invention shown in FIG. 4 and the same reference numerals are applied to like parts in both FIGS. 3 and 4, the principal difference being that in the form of invention of FIG. 3 the motor 33 drives the spool 67 for the control valve of the hydraulic motor 78 for the spinner 16, whereas in FIG. 4 the motor 33 winds or unwinds the cable 30 which acts on the governor 29 for the internal combustion engine 19.

Referring now to the control system for the auger in the form of invention of FIG. 3, there are spaced potentiometers 81 and 82 of unequal value. The potentiometer 81 may be termed the master positioner and is located in the control box 34 in the cab. The potentiometer 82 is the slave positioner and is located in a control box 80' in the rear on the auxiliary body, as shown in FIG. 2. These potentiometers, of unequal value, are wired with their resistors in parallel and are connected at one end to a negative line 83 and at the other end to a positive line 84 leading from the low-power source.

A discriminating relay 85 located in the rear control box 80 has its coil connected at one end with a movable wiper 86 for the slave positioner 82, the other end of the coil being electrically connected with a movable wiper 87 for the master positioner 81 in the control box 34 in the cab. This connecting line is indicated by the numeral 88. In the line 88 is a small generator 89, hereinafter termed a "signal sender," which generator is capable of creating a small voltage in the line 88, depending upon the speed with which it is driven. The generator is driven by a flexible cable 90 connected with the transmission of the vehicle; that is, it is driven from the same source as the vehicle speedometer 91. Thus the speed of the generator is dependent upon the ground speed of the vehicle.

A discriminating relay has a switch element 92 which is adapted to be moved in one direction or the other to close a contact 93 or a contact 94. The entire circuit thus far described is a low-power circuit. The contacts 93 and 94 are connected with the coils 95 and 96 of a power relay, the latter controlling the relatively high-power circuit to a reversible electric motor 97, the latter also being located in the rear on the auxiliary body. When the coil 95 is energized it closes a switch for the contacts 98, which completes the circuit through a line 99, leading from the positive side of a relatively high-power source to the electric motor 97, the motor being grounded as at 100. When the switch 98 is closed, the motor is driven in one direction.

When the coil 96 is energized it closes a switch for the contacts 101 to act through the line 102 in driving the motor 97 in a reverse direction. A gear wheel 103 on the shaft 104 of the motor engages another gear wheel 105 also located in the rear of the auxiliary body to drive the rotatable shaft 106 for the wiper 86 of the slave potentiometer 82. All of the parts in the dotted square 80' of FIG. 3 are in the rear control box 80'.

Operation

Referring first to the form of invention of FIG. 4, if the operator turns the pointer 36 on the control box 34' (see FIG. 8) in the cab to the 4000 r.p.m. marking this will rotate the wiper 44 and an unbalanced resistance condition will be created in the bridge circuit of the potentiometers 38 and 39. This creates a current flow through the line 58 between the potentiometers 38 and 39. The discriminating relay 42 determines which direction this current is flowing and closes a corresponding one of the contacts 46 or 47, thereby creating a signal to close one of the switches 50 or 53 of the booster relay. This then causes operation of the electric motor 33 in a first direction (to wind up the cable on the shaft 32 and pull the governor 29 to such a position against the tension of the spring 31 as to maintain the desired engine r.p.m.). At the same time the electric motor 33 acts through the gears 55 and 56 to rotate the wiper 43 of the slave potentiometer until it is moved to the identical position of the wiper 44 of the master potentiometer 38. This causes balancing of the control circuit and, as soon as this cir-

cuit becomes balanced, no current flows between the potentiometers. The discriminating relay **42** then returns contact member **45** to a position in which both of the switches **46** and **47** are open, and the operation of the motor **33** ceases. If the operator turns the pointer **36** to a lower r.p.m. reading, for example, 2000 r.p.m., the circuit response will be in the opposite direction and the electric motor **33** will be operated in an opposite direction.

As before mentioned, in the form of invention of FIG. 4 an internal combustion engine **19** is used in lieu of the hydraulic motors **69** and **78** (of FIG. 3). In FIG. 4 the electric motor **33** will act to wind up a cable **30** to move a governor lever **29** against a spring **31**. This will speed up the operation of the internal combustion engine to speed up the drive for the auger **17** as desired. The same engine **19** may also drive the spinner as shown in FIG. 4, and as before pointed out, the faster the drive, the greater the width of spread. Thus, in the form of invention of FIGS. 4 and 5, a desired r.p.m. of the internal combustion engine is maintained from the cab, the engine driving both the auger **17** and spinner **16**.

In the form of invention of FIG. 3, the operation of the circuit on the right hand side for controlling the spinner is the same as heretofore described in connection with FIG. 4, and the same reference numerals have been used. In FIG. 3, however, the motor **33** drives the spool **67** for the control valve of the hydraulic motor **78** for the spinner **16**. Thus, by setting the pointer **36** on the control box **34** in the cab, the operator in the cab can control the speed of the motor **78**, the speed of the spinner **16**, and thus the width of the spread, as the faster the drive, the wider the spread. The speed of drive is controlled by regulating the flow of fluid through the hydraulic valve **65**.

Referring now to the control for the auger, which control is shown on the left hand side of FIG. 3, if the operator turns the pointer **110** on the auger dial (see FIG. 7) on the control box **34** in the cab to read, for example, 400 lbs. per mile, this will automatically control the amount of material deposited on the road per mile of travel. If the truck is moved, for example, at a ground speed of 25 m.p.h., the combined signals from the master potentiometer **82** and the generator **89** which is driven from the speedometer cable of the truck will produce an unbalanced resistance condition in the bridge circuit between the potentiometers **82** and **81**. The discriminating relay **85** determines the direction in which the current is flowing and closes a corresponding set of the contacts **93** or **94**. This signal then closes the power relay **95** or **96** which operates the reversible electric motor **97**. Inasmuch as the motor is connected to the spool **66** of the hydraulic control valve, it will cause rotation of the valve and, therefore, control the flow of hydraulic fluid through the line **68** to the hydraulic motor **69** which, through the sprocket **71**, chain **72** and sprocket **28**, drives the auger **17**. The amount that the spool is turned depends upon the speed of the vehicle so that the valve is opened more when the speed of the vehicle is faster to rotate the auger faster and, therefore, feed more material out of the body to be thrown onto the road by the spinner **16**. This speed is, therefore, automatically proportional to the speed of the vehicle as it is controlled by the flow of hydraulic fluid through the control valve **65**. If more pounds per mile are desired, the auger pointer is merely moved to a position to call for more material.

The motor **97** not only drives the mechanism for rotating the auger spool, but it also acts through the engagement between the gears **103** and **105** to rotate the wiper **86** of the potentiometer **82** until the wiper is moved to a point where the resistance of the potentiometer **82** equals the combined resistances of the "signal sender" **89** and the resistance of the master potentiometer **81**. The control circuit then becomes balanced, no current flowing between the potentiometers, and the discriminating relay **14** returns the switches to open position and operation of the motor **97** stops until an unbalanced condition is again created either because of operation of the speedometer driven "signal sender" **89** or because the operator has moved the auger pointer **110** to change the desired rate of discharge of material.

If the operator turns the pointer **110** on the auger dial to a position for a lower rate of flow, the circuit response will be in the opposite direction from that previously described.

It is thus apparent that with the circuit shown on the left hand side of FIG. 3 that the amount of material spread will be automatically controlled in accordance with the speed of the truck and/or the desires of the operator, and with the circuit shown on the right hand side of FIG. 3 the operator in the cab may manually control the width of spread from the spinner **16** by manipulating the pointer **36** on the spinner dial.

It is obvious that with the circuits of FIG. 3, in lieu of having the hydraulic motors **69** and **78**, the electric control motor **33** may operate the governor of an internal combustion engine, as in FIG. 4, for driving the spinner, and the electric control motor **97** may similarly operate the governor of another internal combustion engine for driving the auger.

It is also obvious, as shown in FIG. 6, that the electric motor **97** of FIG. 3, controlled in the manner illustrated and described in connection with the left hand portion of FIG. 3, may be employed to wind or unwind the governor cable **30** on the motor shaft **32'**, which cable may connect with the governor lever **97** of the internal combustion engine **19** of FIG. 4 so that the speedometer driven "signal sender" **89** of FIG. 3 will serve to permit both the auger and spinner of FIG. 4 to be controlled in accordance with ground speed just as is the auger only of FIG. 3.

Various other changes and modifications may be made without departing from the spirit of the invention, and all of such changes are contemplated as may come within the scope of the claims.

What we claim is:

1. In a vehicle having an operator's station, a first motor for propelling said vehicle, an auxiliary driven device on said vehicle, auxiliary motor means on said vehicle remote from the operator's station for driving said auxiliary driven device, a speed control for said auxiliary motor means, a reversible electric control motor, mechanical means between said electric control motor and the speed control for said auxiliary motor means for controlling the operation of the latter and hence the operation of said auxiliary device in accordance with the operation of said electric control motor, a first electric circuit for said electric control motor, a reversing switch in said first circuit, an electric bridge circuit, a master variable resistance means with a movable wiper in said bridge circuit and located in the operator's station, a slave variable resistance means in said bridge circuit and having its resistance in parallel with the resistance of said master means and having a movable wiper, conducting means including a discriminating relay electrically connecting said wipers, electric means between said discriminating relay and the reversing switch in said first electric circuit for causing operation of said electric control motor in a selected direction in accordance with the action of said discriminating relay when the bridge circuit is unbalanced due to a change in the position of the wiper of the master variable resistance means, and means between said electric control motor and wiper of the slave variable resistance means for changing the position of the latter to bring the control circuit back into balance whereby movement of the wiper of the master variable resistance means will control the operation of the speed control for the auxiliary motor means, there being a variable signal sender which is responsive to the ground speed of the vehicle in series with the discriminating relay.

2. A device as claimed in claim 1 in which the auxiliary driven device is a material delivery conveyor of a material spreader.

3. A device as claimed in claim 1 in which the auxiliary motor means for the auxiliary device is an internal combustion engine and in which the speed control is a governor on said engine, and in which the mechanical means between the electric control motor and the speed control is a mechanical operating connection between the electric control motor and said governor.

4. A device as claimed in claim 1 in which the auxiliary motor means for the auxiliary device is a fluid pressure operated motor and in which there is a fluid circuit for said fluid pressure operated motor, and in which the speed control for the auxiliary motor means is a fluid control valve in said fluid circuit, and in which the mechanical means between the electric control motor and the speed control is a mechanical operating connection between said electric control motor and said fluid control valve.

5. A device as claimed in claim 1 in which there are two auxiliary driven devices driven by the auxiliary motor means, one being a material delivery conveyor and the other being a spinner to which the conveyor is adapted to deliver material to be spread.

6. A device as claimed in claim 5 in which there is an electric control motor with its associated control means including a bridge circuit with a discriminating relay for each auxiliary driven device, and in which the variable signal sender is in series with the discriminating relay in the bridge circuit for the electric control motor of the material conveyor.

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