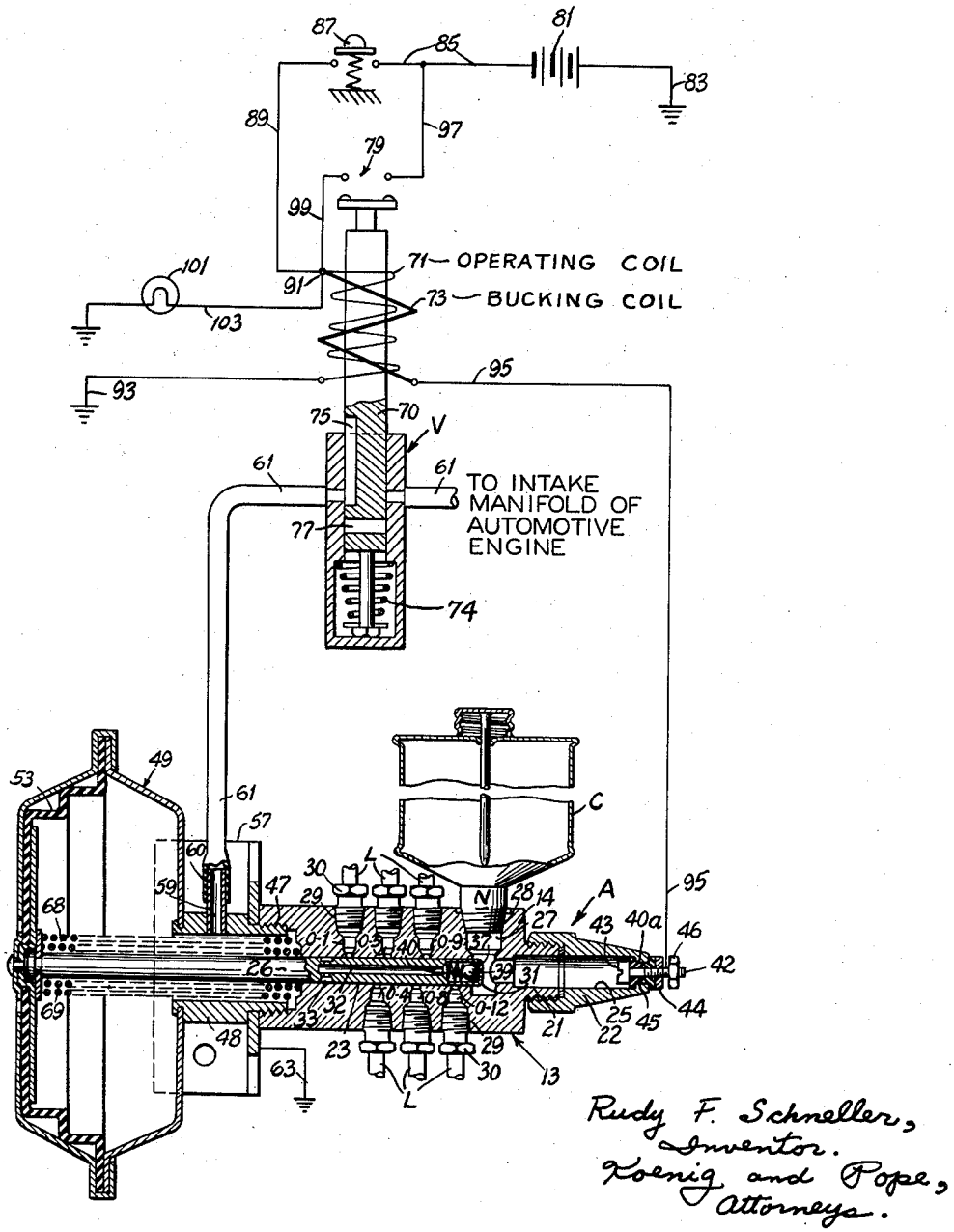
Aug. 19, 1958 R. F. SCHNELLER 2,848,067

LUBRICATING SYSTEM

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LUBRICATING SYSTEM

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12 Claims. (Cl. 184—7)

This invention relates to lubricating systems, and more particularly to a lubricating system for automotive vehicles.

Among the several objects of the invention may be noted the provision of an improved lubricating system for an automotive vehicle which is carried by the vehicle and adapted properly to lubricate various points of lubrication of the vehicle in response to momentary operation of a switch such as a push button switch or the like; the provision of a system of this class which utilizes vacuum derived from the intake manifold of the vehicle for its operation; the provision of a system of this class which includes means for signalling the completion of delivery of lubricant; and the provision of a system of this class which is economical to install on a vehicle and reliable in operation. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawing, in which one of various possible embodiments of the invention is illustrated, the single figure is a wiring diagram with certain parts of the system shown in section.

Referring to the drawing, a lubricating system of this invention is shown to include a lubricant injector A for dispensing measured charges of lubricant from a supply to individual points of lubrication of an automotive vehicle (not shown). As illustrated, this injector A is the same type as shown in U. S. Patent 2,715,454, patented August 16, 1955. In general, it comprises a cylinder designated in its entirety by the reference character **13**. This cylinder **13** comprises an elongate cylinder block **14** made of suitable metal, being electrically conductive, and having an integral cylindrical extension **21** at one end constituting its forward end. Threaded on this extension **21** is a head **22**. The block **14** has a central longitudinal bore **23**. The head **22** has a bore **25** in extension of the bore in the block. A plunger **26** made of suitable metal is movable in the cylinder **13** toward and away from its forward end (its right end as viewed in the drawing). The plunger is dimensioned to have a sliding sealing fit in the bore **23**. It is electrically conductive and is in electrically conductive relation with respect to the block **14**.

The block **14** has a lateral inlet port **27** and a series of longitudinally spaced lateral outlet ports corresponding to the outlet ports **0–1** to **0–12** shown in U. S. Patent 2,715,454. Only the outlet ports **0–1**, **0–5**, **0–9**, **0–4**, **0–8** and **0–12** appear in the drawing. The inlet port **27** is located adjacent the forward end of the block leading into the bore **23**, and the outlet ports are located between the other end of the block (its rearward end) and the inlet port. Reference may be made to U. S. Patent 2,715,454 for details as to the disposition of the ports with respect to the periphery of the block. The inlet port at its outer end is formed as a threaded socket **28** for receiving the

screw-threaded neck N of a can C of lubricant. Each outlet port at its outer end is formed as an enlarged threaded socket **29** for receiving a compression nut **30** for connection thereto of a lubricant delivery line L leading to a point of lubrication of the vehicle in the same manner as shown in U. S. Patent 2,715,454.

The forward or working end of the plunger toward the forward or head end of the cylinder **13** is designated **31**. The plunger is made hollow for some distance from its working end **31** to provide a longitudinal passage generally designated **32** for communication from the space in the cylinder **13** ahead of the plunger to a lateral port **33** in the plunger spaced from its working end. The forward end of passage **32** is formed as a valve chamber and contains a check valve seat member **37** and a valve ball **39** adapted to engage the seat **37**. The ball **39** is biased toward the seat by a compression spring **40**.

The lateral port **33** in the plunger is formed as an annular peripheral groove with radial openings from the passage **32** to the groove. As in U. S. Patent 2,715,454, the intervals between the outlet ports are made equal to the width of the port or groove **33**, and the distance from the working end **31** of the plunger **26** to the right edge of the groove **33** is made equal to the distance from the right edge of the inlet port **27** to the left edge of the first outlet port **0–1**. Thus, when the plunger is moved forward from the retracted charging position shown in the drawing wherein it unblocks the inlet port **27**, the groove **33** comes into communication with the first outlet port **0–1** as the plunger reaches the position where it blocks off the inlet port. When the plunger is in its retracted position, lubricant may flow through the inlet port into the space in cylinder **13** ahead of the plunger to charge the injector. The groove **33** is then located to the left of the first outlet port **0–1** and is blocked.

The head **22** has an opening **40***a* in its outer end smaller than bore **25**. An electrically conductive bolt **42** is received in the opening **40***a* with the bolt head **43** in the bore **25** and the shank of the bolt extending out of the head **22**. A nut **44** holds the bolt in place. The bolt is electrically insulated from the head **22** as indicated at **45**. A second nut **46** is threaded on the shank of the bolt outward of the nut **44** for wire-clamping purposes, as will appear.

The rearward end of the cylinder **13** (its left end as viewed in the drawing) is counterbored as indicated at **47**. Threaded in the counterbore **47** is a tubular fitting **48** for attachment to the cylinder **13** of a diaphragm-type vacuum motor generally designated **49**. The diaphragm of this motor is indicated at **53**. Details of the motor may be ascertained from U. S. Patent 2,715,454. An electrically conductive mounting bracket **57** is clamped between the fitting **48** and the rearward end of the cylinder **13** in conductive relation with respect to the cylinder. The fitting **48** has a lateral port **59** in which is provided a nipple **60** for connection of a vacuum line **61**. The plunger **26** extends rearward out of the cylinder **13** and through the fitting **48** into the motor **49** for engagement of its rearward end by the diaphragm. A pair of coil compression springs **68** and **69** bias the plunger and the diaphragm rearward to the retracted charging position illustrated in the drawing. In the retracted position of the plunger, its forward end is so positioned that the inlet port **27** is unblocked for flow of lubricant from the can C into the space in cylinder **13** ahead of the plunger. Upon evacuation of the motor chamber on the right side of the diaphragm via port **59**, atmospheric pressure on the left side of the diaphragm drives the diaphragm and the plunger to the right against the return bias of springs **68** and **69**. Forward movement of the plunger is limited

by engagement of its forward end 31 with the head 43 of bolt 42.

The mounting bracket 57 is attached to the vehicle at any convenient location where the bracket will be electrically grounded as indicated at 63. Lubricant delivery lines such as indicated at L lead from the outlet ports of the injector to points of lubrication of the vehicle in the manner shown in U. S. Patent 2,715,454. Means for connecting the vacuum motor 49 to the intake manifold of the vehicle is shown to comprise the line 61 and a special electromagnetically controlled valve V in the line 61. This valve, as illustrated, is a solenoid valve having a plunger member 70, an operating coil 71 and a bucking coil 73. When both coils are deenergized, the plunger member 70 occupies a retracted position for venting the vacuum motor while holding vacuum in the manifold. When the operating coil 71 is energized, the plunger 70 moves to an operative position in which it connects the vacuum motor and the manifold. When bucking coil 73 is energized, the effect of the magnetic field of operating coil 71 is neutralized to the extent necessary to permit the return of the plunger 70 to its retracted position in which it vents the vacuum motor while holding vacuum in the manifold. As illustrated, the valve may be of a type in which the plunger 70 is biased by a spring 74 to retracted position and formed with a passage 75 for venting the vacuum motor while blocking the motor from the intake manifold, and formed with another passage 77 for connecting the vacuum motor and the manifold when coil 71 is energized. Associated with the valve is a set of contacts 79 (insulated from the metal solenoid body). These contacts are open when the plunger 70 is in retracted position, as shown in the drawing, and close when the operating coil 71 is energized.

At 81 is indicated the battery of the vehicle. One terminal of the battery is shown grounded, as indicated at 83. The other terminal of the battery is connected by a line 85 to one terminal of a normally open push button switch 87. This switch is located on the dash of the vehicle in position for operation by the driver. A line 89 connects the other terminal of the switch to a common terminal 91 for the operating coil 71 and the bucking coil 73 of the solenoid valve. The other terminal of the operating coil 71 is connected to ground, as indicated at 93. The other terminal of the bucking coil 73 is connected by a line 95 to the bolt 42 of the injector A. A line 97 connects line 85 to one terminal of the set of contacts 79. A line 99 connects the other terminal of the set of contacts 79 to the terminal 91. Contacts 79 and lines 97 and 99 constitute a holding circuit for the solenoid operating coil 71. A signal lamp 101 is connected in a line 103 between the terminal 91 and ground. This lamp is located on the dash of the vehicle.

With the engine of the vehicle running so that there is vacuum in the intake manifold, operation is as follows:

To lubricate the vehicle, the driver simply actuates the push button switch 87, momentary contact of this switch being sufficient. Upon closure of switch 87, a circuit is completed through the operating coil 71 of the solenoid valve as follows: from the battery 81 through line 85, switch 87, line 89, coil 71 and ground connection 93. Upon energization of the operating coil 71, the solenoid valve is operated (its plunger is raised from the position 47. Threaded in the counterbore 47 is a tubular fitting 48 the intake manifold of the vehicle via the plunger passage 77. Energization of the operating coil 71 also results in closure of contacts 79 to establish the holding circuit for coil 71 so that the coil 71 remains energized when switch 87 is released. This holding circuit is as follows: from the battery 81 through line 85, line 97, contacts 79 (which are closed), line 99, coil 71 and ground connection 93. The signal lamp 101 is also energized and held energized via the holding circuit.

With the vacuum motor connected to the intake manifold via the line 61 and the opened valve, a vacuum is drawn in the motor and atmospheric pressure on the

motor diaphragm 53 drives the diaphragm and the injector plunger 26 forward (to the right as viewed in the drawing) through a pressure stroke against the return bias of springs 68 and 69. Upon such forward movement of the plunger from its retracted position illustrated in the drawing, equal charges of lubricant are forced out of the cylinder successively through the outlet ports one after another and delivered to the points of lubrication of the vehicle via the delivery lines L. Further details of the operation of the injector may be ascertained from U. S. Patent 2,715,454.

The plunger 26 moves forward until its forward end engages the head 43 of the bolt 42. Upon such engagement of the plunger with the bolt, a circuit is completed for the bucking coil 73 of the solenoid valve as follows: from battery 81 through line 85, line 97, contacts 79 (which are closed), line 99, coil 73, line 95, the bolt 42, the plunger, the cylinder block 14 and the ground connection indicated at 63. The effect of the magnetic field of coil 71 is thereupon neutralized, the plunger member 70 of the valve returns to retracted position to vent the vacuum motor (and hold vacuum in the intake manifold), and contacts 79 are opened. The springs 68 and 69 thereupon return the injector plunger 26 to its retracted charging position, and the injector is recharged with lubricant for the next operation, lubricant flowing through the inlet port 27 into the space in the cylinder ahead of the plunger 26 to fill this space. Upon the return of the plunger 26 to its retracted position, the end 31 of the plunger 26 is disengaged from the head 43 of the bolt 42. The signal lamp 101 is deenergized upon opening of contacts 79, to indicate that lubrication has been completed.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a lubricating system for an automotive vehicle, said vehicle having an engine, said engine having an intake manifold in which a vacuum is drawn when the engine is running, said system being of the class comprising a lubricant injector, a vacuum-operated motor for operating the injector, means for connecting the vacuum motor to the manifold including an electrically controlled valve having an operating coil and a member having a retracted position in which it vents the vacuum motor while holding vacuum in the manifold when the operating coil is deenergized, said member being movable to an operative position in which it connects the vacuum motor and the manifold when the operating coil is energized, said operating coil being connected in a circuit including means for closing the circuit to energize the operating coil, and a holding circuit for the operating coil, the improvement comprising the provision of the valve with a bucking coil, and means responsive to completion of the operation of the injector for energizing the bucking coil, said member returning to retracted position upon energization of the bucking coil to neutralize the effect of the operating coil.

2. In a lubricating system as set forth in claim 1, said means for closing the operating coil circuit comprising a manually operable momentary contact switch.

3. In a lubricating system for an automotive vehicle, said vehicle having an engine, said engine having an intake manifold in which a vacuum is drawn when the engine is running, said system being of the class comprising a lubricant injector, a vacuum-operated motor for operating the injector, and means for connecting the vacuum motor to the manifold including an electrically controlled valve

having an operating coil and a member having a retracted position in which it vents the vacuum motor while holding vacuum in the manifold when the operating coil is deenergized, said member being movable to an operative position in which it connects the vacuum motor and the manifold when the operating coil is energized, said operating coil being connected in a circuit including means for closing the circuit to energize the operating coil, the improvement comprising the provision of the valve with a bucking coil, an electric signal interconnected with said circuit, a holding circuit for the operating coil and signal, and means responsive to completion of the operation of the injector for energizing the bucking coil, said member returning to retracted position upon energization of the bucking coil to neutralize the effect of the operating coil.

4. In a lubricating system as set forth in claim 3, said means for closing the operating coil circuit comprising a push button switch.

5. In a lubricating system for an automotive vehicle, said vehicle having an engine, said engine having an intake manifold in which a vacuum is drawn when the engine is running, said system being of the class comprising a lubricant injector, a vacuum-operated motor for operating the injector, means for connecting the vacuum motor to the manifold including an electrically controlled valve having an operating coil and a member having a retracted position in which it vents the vacuum motor while holding vacuum in the manifold when the operating coil is deenergized, said member being movable to an operative position in which it connects the vacuum motor and the manifold when the operating coil is energized, said operating coil being connected in a circuit including means for closing the circuit to energize the operating coil, the improvement comprising the provision of the valve with a bucking coil, a holding circuit for the operating coil including a set of contacts which are open when said member is in retracted position and which are closed by said member when it moves to operative position, said bucking coil being interconnected with said holding circuit in a bucking coil circuit, said bucking coil circuit being normally open and including means responsive to completion of the operation of the injector for closing the bucking coil circuit to energize the bucking coil, said member returning to retracted position upon energization of the bucking coil to neutralize the effect of the operating coil.

6. In a lubricating system for an automotive vehicle, said vehicle having an engine, said engine having an intake manifold in which a vacuum is drawn when the engine is running, said system being of the class comprising a lubricant injector, a vacuum-operated motor for operating the injector, and means for connecting the vacuum motor to the manifold including an electrically controlled valve having an operating coil and a member having a retracted position in which it vents the vacuum motor while holding vacuum in the manifold when the operating coil is deenergized, said member being movable to an operative position in which it connects the vacuum motor and the manifold when the operating coil is energized, said operating coil being connected in a circuit including a manually operable push button switch for closing the circuit to energize the operating coil, the improvement comprising the provision of the valve with a bucking coil, an electric signal interconnected with said circuit, a holding circuit for the operating coil and signal including a set of contacts which are open when said member is in retracted position and which are closed by said member when it moves to operative position, said bucking coil being interconnected with said holding circuit in a bucking coil circuit, said bucking coil circuit being normally open and including means responsive to completion of the operation of the injector for closing the bucking coil circuit to energize the bucking coil, said member returning to retracted position upon energization of the bucking coil to neutralize the effect of the operating coil.

7. In a lubricating system for an automotive vehicle, said vehicle having an engine, said engine having an intake manifold in which a vacuum is drawn when the engine is running, said system being of the class comprising a lubricant injector for dispensing measured charges of lubricant from a supply to individual points of lubrication on the vehicle, said injector comprising a cylinder having an inlet port and a series of longitudinally spaced outlet ports and a plunger working in the cylinder and adapted upon movement in one direction through a pressure stroke successively to force out individual charges through the successive outlet ports, said cylinder being recharged through the inlet port with lubricant from the supply upon movement of the plunger through a return stroke, said cylinder being electrically conductive and electrically grounded on the vehicle, and having an electrical contact at its forward end, said contact being insulated from the cylinder, the plunger being electrically conductive and in conductive relation to the cylinder, a vacuum-operated motor for operating the injector, means for connecting the vacum motor to the manifold including a solenoid valve having an operating coil and a member having a retracted position in which it vents the vacuum motor while holding vacuum in the manifold when the operating coil is deenergized, said member being movable to an operative position in which it connects the vacuum motor and the manifold when the operating coil is energized, said operating coil being connected in a circuit including means for closing the circuit to energize the operating coil, and a holding circuit for the operating coil, the improvement comprising the provision of the valve with a bucking coil, said bucking coil being interconnected with said holding circuit and connected to said contact whereby said bucking coil is energized when the plunger engages said contact upon completing a pressure stroke, said member returning to retracted position upon energization of the bucking coil to neutralize the effect of the operating coil.

8. In a lubricating system as set forth in claim 7, said means for closing the operating coil circuit comprising a manually operable momentary contact switch.

9. In a lubricating system as set forth in claim 7, an electric signal interconnected with said operating coil circuit and said holding circuit.

10. In a lubricating system as set forth in claim 9, said means for closing the operating coil circuit comprising a push button switch.

11. In a lubricating system for an automotive vehicle, said vehicle having an engine, said engine having an intake manifold in which a vacuum is drawn when the engine is running, said system being of the class comprising a lubricant injector for dispensing measured charges of lubricant from a supply to individual points of lubrication on the vehicle, said injector comprising a cylinder having an inlet port and a series of longitudinally spaced outlet ports and a plunger working in the cylinder and adapted upon movement in one direction through a pressure stroke successively to force out individual charges through the successive outlet ports, said cylinder being recharged through the inlet port with lubricant from the supply upon movement of the plunger through a return stroke, said cylinder being electrically conductive and electrically grounded on the vehicle, and having an electrical contact at its forward end, said contact being insulated from the cylinder, the plunger being electrically conductive and in conductive relation to the cylinder, a vacuum-operated motor for operating the injector, means for connecting the vacuum motor to the manifold including a solenoid valve having an operating coil and a member having a retracted position in which it vents the vacuum motor while holding vacuum in the manifold when the operating coil is deenergized, said member being movable to an operative position in which it connects the vacuum motor and the manifold when the operating coil is energized, said operating coil being connected in

a circuit including means for closing the circuit to energize the operating coil, the improvement comprising the provision of the valve with a bucking coil, a holding circuit for the operating coil including a set of contacts which are open when said member is in retracted position and which are closed by said member when it moves to operative position, and said bucking coil being interconnected with said holding circuit and connected to the contact at the forward end of the cylinder whereby said bucking coil is energized when the plunger engages said contact upon completing a pressure stroke, said member returning to retracted position upon energization of the bucking coil to neutralize the effect of the operating coil.

12. In a lubricating system for an automotive vehicle, said vehicle having an engine, said engine having an intake manifold in which a vacuum is drawn when the engine is running, said system being of the class comprising a lubricant injector for dispensing measured charges of lubricant from a supply to individual points of lubrication on the vehicle, said injector comprising a cylinder having an inlet port and a series of longitudinally spaced outlet ports and a plunger working in the cylinder and adapted upon movement in one direction through a pressure stroke successively to force out individual charges through the successive outlet ports, said cylinder being recharged through the inlet port with lubricant from the supply upon movement of the plunger through a return stroke, said cylinder being electrically conductive and electrically grounded on the vehicle, and having an electrical contact at its forward end, said contact being insulated from the cylinder, the plunger being electrically conductive and in conductive relation to the cylinder, a vacuum-operated motor for operating the injector, means for connecting the vacuum motor to the manifold including a solenoid valve having an operating coil and a member having a retracted position in which it vents the vacuum motor while holding vacuum in the manifold when the operating coil is deenergized, said member being movable to an operative position in which it connects the vacuum motor and the manifold when the operating coil is energized, said operating coil being connected in a circuit including a manually operable push button switch for closing the circuit to energize the operating coil, the improvement comprising the provision of the valve with a bucking coil, an electric signal interconnected with said circuit, a holding circuit for the operating coil and signal including a set of contacts which are open when said member is in retracted position and which are closed by said member when it moves to operative position, and said bucking coil being interconnected with said holding circuit and connected to the contact at the forward end of the cylinder whereby said bucking coil is energized when the plunger engages said contact upon completing a pressure stroke, said member returning to retracted position upon energization of the bucking coil to neutralize the effect of the operating coil.

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1,914,900 Tarbox ---------- June 20, 1933

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

August 19, 1958

Patent No. 2,848,067

Rudy F. Schneller

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 3, line 63, strike out "47. Threaded in the counterbore 47 is a tubular fitting 48" and insert instead -- shown in the drawing) to connect the vacuum motor 49 to --.

Signed and sealed this 28th day of October 1958.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents