July 30, 1929. L. P. HYNES 1,722,920

PNEUMATIC DOOR MOTOR SYSTEM

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Fig. 1

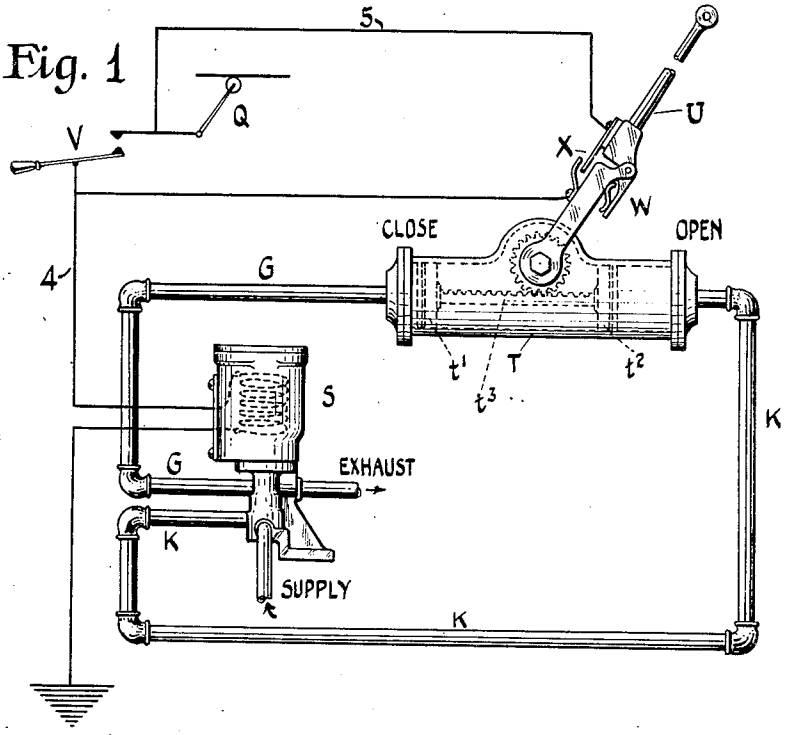
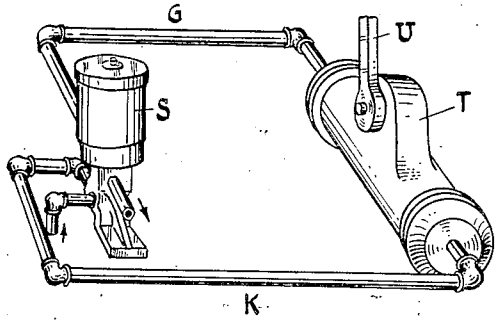


Fig. 4



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Fig. 2

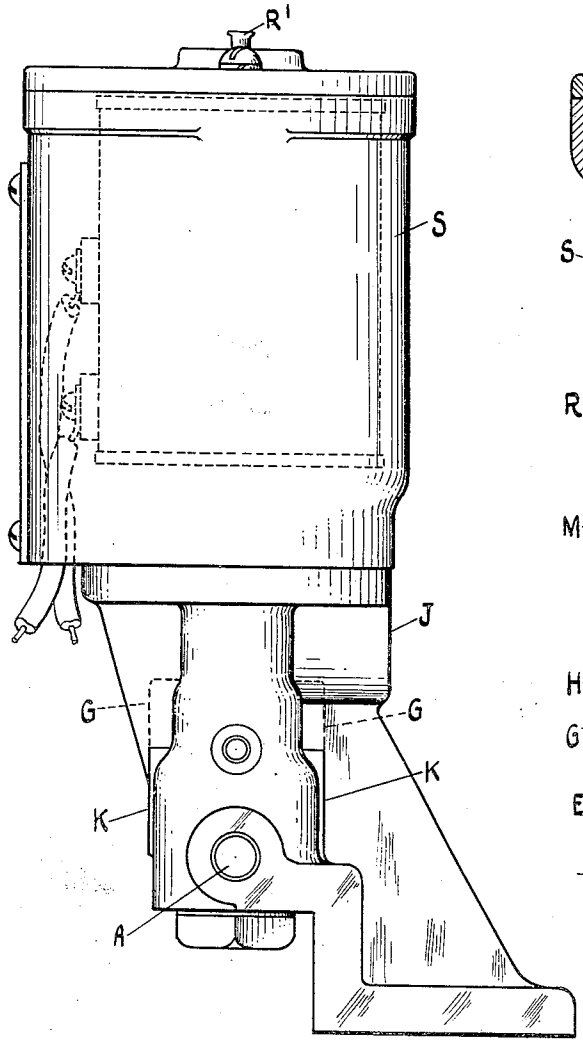
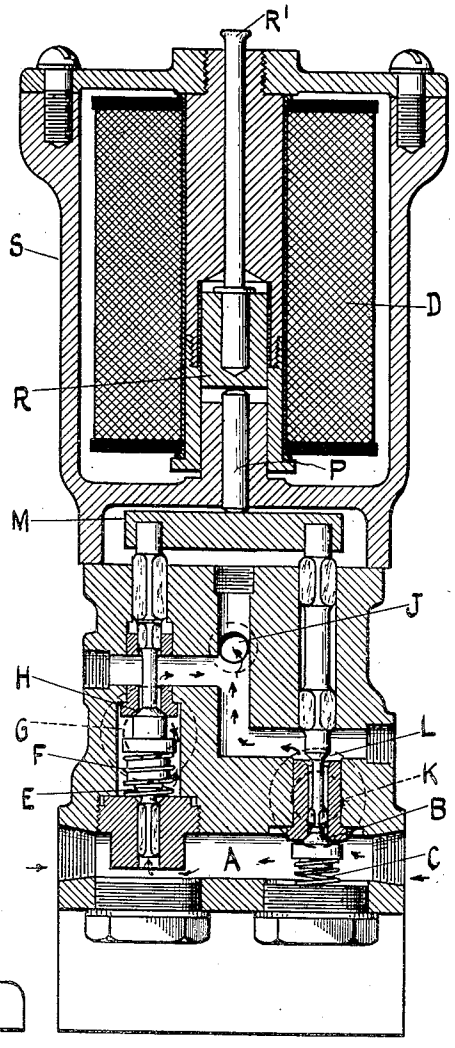


Fig. 3



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UNITED STATES PATENT OFFICE.

LEE P. HYNES, OF ALBANY, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CONSOLIDATED CAR-HEATING COMPANY, INC., OF ALBANY, NEW YORK, A CORPORATION OF NEW YORK.

PNEUMATIC DOOR-MOTOR SYSTEM.

Application filed December 27, 1924. Serial No. 758,482.

For a detailed description of the present form of my invention, reference may be had to the following specification and to the accompanying drawings forming a part thereof, wherein

Fig. 1 is a diagrammatic view of my system;

Fig. 2 is a side elevation and

Fig. 3 a vertical section of the controller, and

Fig. 4 shows the controller in connection with the motor.

My invention relates to a system for operating car doors wherein a single magnet is employed to control one or more pneumatic door motors and a single wire along one side of a car or train will suffice for the operation of all the doors on that side of such door or train. In particular I employ motors which are controlled by a pair of valves for each of the two cylinders and I have devised means whereby the valves are organized in a structure separate from the motor and the single magnet may control all of the four valves, being energized either by the trainman's switch or by the obstruction of the door in closing.

Referring to the drawings, T represents a door motor comprising two opposing cylinders having their respective pistons t^1 and t^2 connected by a rack-bar t^3 that meshes with a toothed wheel on the shaft of a door-operating arm U. Pipes G and K lead from the respective ends of the motor cylinders to a magnetic control device S, which is organized as a separate construction from the motor and may be located at any convenient point, such as the car floor near the motor, or at any available spot. By this means the motor itself is greatly simplified and cheapened since it contains no valves or ducts, while my controller S is a small compact device that can readily be applied independently to even an existing door motor of the pneumatic type. Such application involves the installation of the controller at any convenient point, connecting it with the motor by the small pipes G and K and with the source of current by wire 4 through the trainman's switch V or the emergency switch W that closes when the door meets an obstruction on its closing run.

The controller S is shown in Figs. 2 and 3. The upper part is formed by a casing of magnetic material containing the single coil D, within which is the armature R that is drawn downward whenever the coil is energized and may also be pushed down manually by the non-magnetic push-rod R^1 when desired. The armature rests on a short rod P, of non-magnetic material, that is free to move vertically, and that rod rests in turn on a horizontal yoke M. One the under side of yoke M are two sockets wherein are loosely seated the upper ends of two valve-stems. The stem at the left carries the valves H and E and is normally pressed upward by a spring F, while the stem at the right carries the valves L and B and is normally pressed upward by the spring C. The chamber containing valves H and E communicates with the aforesaid pipe G leading to the left hand end of the motor (which is the door-closing end) and the chamber containing valves L and B communicates with the aforesaid pipe K leading to the right hand end of the motor (which is the door-opening end). The top valves H and L control the communication with the exhaust chamber J while the bottom valves E and B control the communication with the air-supply chamber A. Chambers A and J both have openings on the two opposite sides of the controller base or casing and either opening may be used, as found most convenient, for the outside pipe-connection, the opening which is not used being closed by a plug. The aforesaid valves and chambers are contained in a separate casting, forming the lower half of the controller which is secured to the casting that contains the magnet-coil and armature and forms the upper half of the controller. The lower casting is provided with an offset foot which serves as its attachment base. The two valve stems with the valves are accurately lined up in the perforated cylindrical plugs on which the valve seats are formed and together with the said plugs and springs are inserted through holes in the floor of

the casting at one side of the offset foot. The valve stems at their upper ends enter loosely into the seating holes for sockets in yoke M and are not dependent on the yoke for guidance. The springs C and F uphold the yoke M and also the armature R and rod P, keeping them, as well as the valves, in a normal elevated position. By the loose seating of armature R on rod P and of that rod on yoke M and the yoke on the valve stems, the downward pressure of the armature is equalized and both valve stems are independently worked simultaneously and with certainty by the one armature of the single coil.

In operation the doors will be closed so long as there is no current in coil D. The door-closing valve E will then be in position to admit pressure from supply chamber A to pipe G, and valve L in position to connect pipe K to exhaust J. Of the two door-opening valves, B will shut off pressure from A to pipe K and H will shut off pipe G from exhaust J. Conversely, when coil D is energized and armature R forced down, the door-opening valves H and B will be open and the door-closing valves E and L closed.

As appears in Fig. 1, the closure of the trainman's switch V will admit current from trolley Q to wire 4 and thence through coil D to ground, thus producing the door-opening action as above described, while if switch V is then opened there will be no current in coil D and the door-closing action will result. If, while the door is closing, switch V being then open and coil D inactive, the door should be obstructed, then the door-operating arm U (which is then turning in an anti-clockwise direction as viewed in Fig. 1) will bend at the spring-joint W and close the automatic switch X. Thereupon the current from trolley Q will flow by wire 5 and switch X to wire 4 and coil D. That will cause the door to start back toward its open position just as it would do if the current were admitted to coil D by the manual closing switch V. It will continue on its opening course so long as switch X remains closed, but when that switch opens, as by the drawing back of the door from the obstruction, switch X will open and the door will resume its closing movement. Then if the obstruction is found to be removed, the door will go on and close, or if not removed the reversing action will be repeated. I am aware that it has been attempted to secure a one-wire, one-coil system by applying valves to the door-opening side only of the motor, leaving the pressure constantly acting on the door-closing side which has a cylinder of smaller piston area, but I have found my present arrangement to be superior both in speed and reliability. This has led to its adoption on important installations such as those of the Illinois Central Railway in Chicago and the subway system of Brooklyn.

What I claim as new and desire to secure by Letters Patent is:

1. A pneumatic door operating system comprising a door motor, a separable controller structure including a casing having a supply chamber and an exhaust chamber both of which are connected with the respective cylinders of the motor, spring pressed valves in said casing, and a single magnet arranged to impart coincident movement to all of said valves in the same direction in opposition to the spring tension on said valves, said valves being so arranged that simultaneous movement of all of them in one direction will connect one cylinder with the supply chamber and shut it off from the exhaust chamber and will connect the other cylinder with the exhaust chamber and shut it off from the supply chamber and vice versa.

2. A pneumatic door operating system comprising a door motor, a separate structure including a casing having a supply chamber and an exhaust chamber both of which are connected with the respective cylinders of the motor, two sets of spring pressed valves controlling the communication between said chambers and the respective cylinders of the motor, each set of valves consisting of two valves carried by a single stem, and a single magnet arranged to impart coincident movement to both of said stems in the same direction in opposition to the spring tension on the valves, said valves being so arranged that simultaneous movement of both stems in one direction will connect one cylinder with the supply chamber and shut it off from the exhaust chamber and will connect the other cylinder with the exhaust chamber and shut it off from the supply chamber and vice versa.

3. A pneumatic door operating system comprising a motor, a separate controller structure containing a set of door opening valves and a set of door closing valves, said sets of valves being so arranged that they are coincidently moved in one direction to open the door and in the opposite direction to close the door, a single magnet, an armature for said magnet arranged to simultaneously move both sets of valves in the same direction, a manuel circuit closer controlling said magnet, and an automatic closer also controlling said magnet and dependent upon an obstruction to the door closing movement of the motor.

4. A controller for a pneumatic door motor comprising a set of valves for the door opening and another set of valves for the door closing movements of the motor, each set of valves consisting of a supply valve and an exhaust valve, means normally acting to coincidently move both sets of valves

in one uniform direction, a magnet, valve actuating means energized by said magnet and movable in a line parallel with the lines of movement of said valves so as to operate the valves in opposition to the first mentioned valve moving means, and an equalizing connection between said armature and the respective sets of valves.

5. A controller for a pneumatic door comprising two valve stems each provided with a supply valve and an exhaust valve, springs normally acting to coincidently move said valves in one and the same direction, a magnet provided with means for moving both of said valves simultaneously in one and the same direction in opposition to said springs, and an equalizing connection between said valve stems and said magnet.

6. A controller for a pneumatic door motor comprising two valve stems each of which is provided with a supply valve and an exhaust valve, the valves on one stem being reversely positioned with respect to the valves of the other stem, means normally acting upon said stems to coincidently move both sets of valves in one and the same direction, an equalizing connection between said valves, and a magnet for moving said valves simultaneously in one and the same direction in opposition to the first mentioned valve moving means, so that the valves on one stem will operate reversely with respect to the valves on the other stem.

7. A controller for a fluid pressure door motor comprising a casing provided with supply and exhaust chambers both of which communicate with the respective motor cylinders, oppositely disposed valve seats in each chamber, a pair of valve stems each provided with valves for the seats of the respective chambers, springs acting upon adjacent ends of both stems so as to apply a spring tension normally acting to move said stems in one and the same direction, and a magnet for moving said stems simultaneously in a direction opposed to the tension of said springs, so that the valves on one stem will close communication from one chamber to a motor cylinder and open communication from the other chamber to said motor cylinder, and reversely connecting said chambers with respect to the other motor cylinder.

8. A controller for a pneumatic door motor comprising two parallel valve stems each provided with a set of valves, means for separately guiding each stem, springs acting upon both valve stems and normally tending to simultaneously move them in one and the same direction, a single magnet for simultaneously moving both valve stems in a common direction opposed to the tension of said springs, an armature for said magnet, means for guiding the armature of the magnet independently of the said valve stems, and a loose connection between said armature and the respective valve stems.

9. A controller for a pneumatic door motor comprising a recessed base, separable valve seat carriers mounted in the recesses of said base, a spring pressed valve stem extending through the respective valve seat carriers, each stem having a set of valves for engaging contiguous valve seats, an equalizing member cross connecting said stems, and a magnet acting on said equalizing member in opposition to the spring pressure on said valve stems.

10. A controller for a pneumatic door motor comprising a set of valve stems, a yoke connected to said valve stems, springs normally acting upon said valve stems to move them in one and the same direction, a magnet provided with an armature, means for guiding said armature, and means interposed between the yoke and the armature so that the valve stems may be moved in a common direction in opposition to the springs when the magnet is energized.

11. A controller for a pneumatic door motor comprising valve stems each provided with an admission valve and an exhaust valve, a magnet provided with an armature, a slidably mounted rod engaged with the armature, and means interposed between said rod and the valve stems for moving said valve stems simultaneously in the same directions.

12. A controller for a pneumatic door motor comprising a magnet, a pair of valve stems each provided with oppositely disposed admission and exhaust valves, a magnet provided with an armature, a yoke connecting said valve stems so that simultaneous movement may be imparted to said valve stems in the same common directions, and a rod interposed between the yoke and the armature of said magnet.

13. A controller for a pneumatic door motor comprising valve stems each provided with a supply valve and an exhaust valve, means having positive engagement with said valve stems to insure movement thereof in unison in the same common directions, a magnet, and actuator means operated by said magnet and engaging said stem moving means.

14. A controller for a pneumatic door motor comprising valve stems each provided with a supply valve and an exhaust valve, means having positive engagement with said valve stems to insure movement thereof in unison in the same common directions, a magnet, actuator means operated by said magnet and engaging said stem moving means, and means for operating said actuator means manually.

15. A controller for a pneumatic door motor comprising a casing, parallel valve stems slidably mounted in said casing each provided with a supply valve and an ex-

haust valve, means normally tending to move said valves in one and the same direction, an equalizer member positively engaging the ends of said valve stems, a magnet provided with an armature, a casing for said magnet, and an actuator member guided by said casing and interposed between the armature of the magnet and said equalizer member so that both valves will be simultaneously moved in a common direction in opposition to the first mentioned valve moving means when the magnet is energized.

Signed at Albany, county of Albany and State of New York, this 24th day of December, 1924.

LEE P. HYNES.