

Nov. 17, 1931.

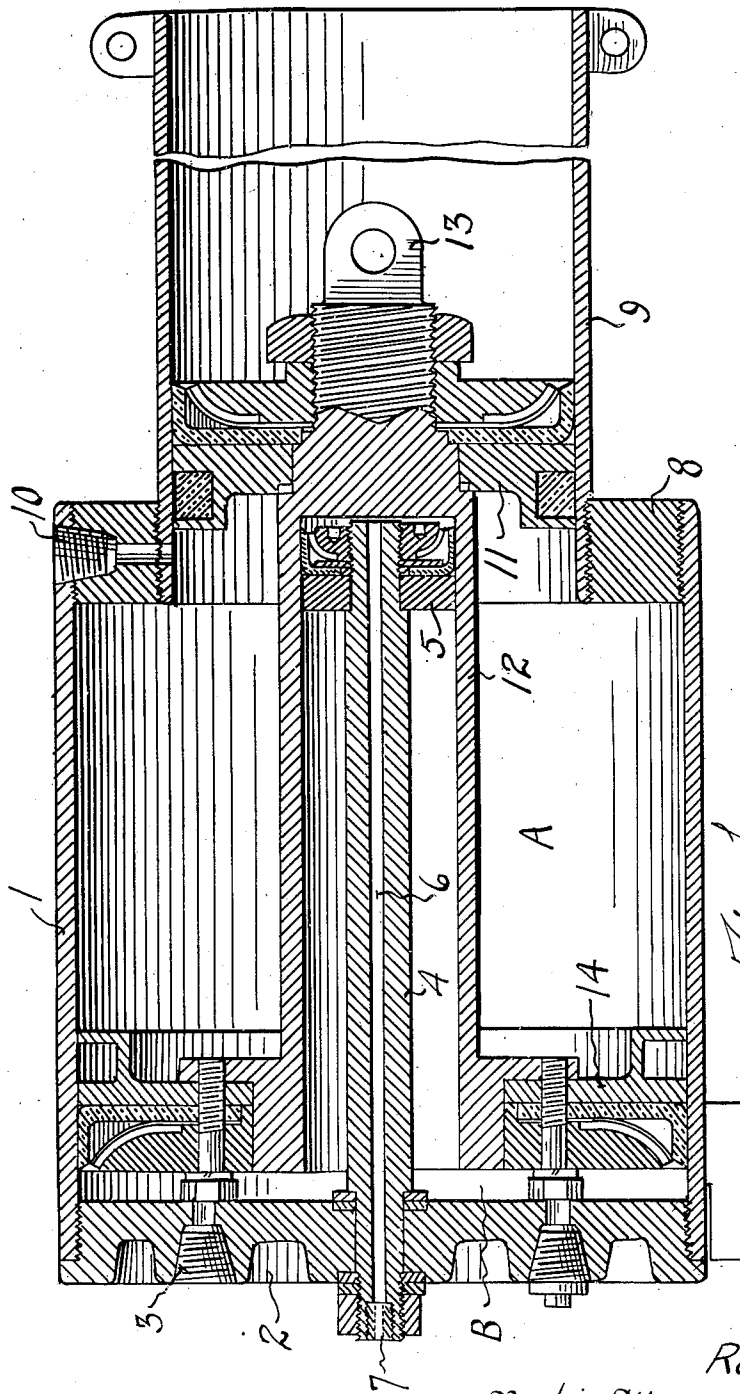
R. D. CONKLIN

1,832,618

VACUUM ENGINE' SYSTEM

Filed June 22, 1929

3 Sheets-Sheet 1



Inventor

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By his Attorneys Dury & Dury.

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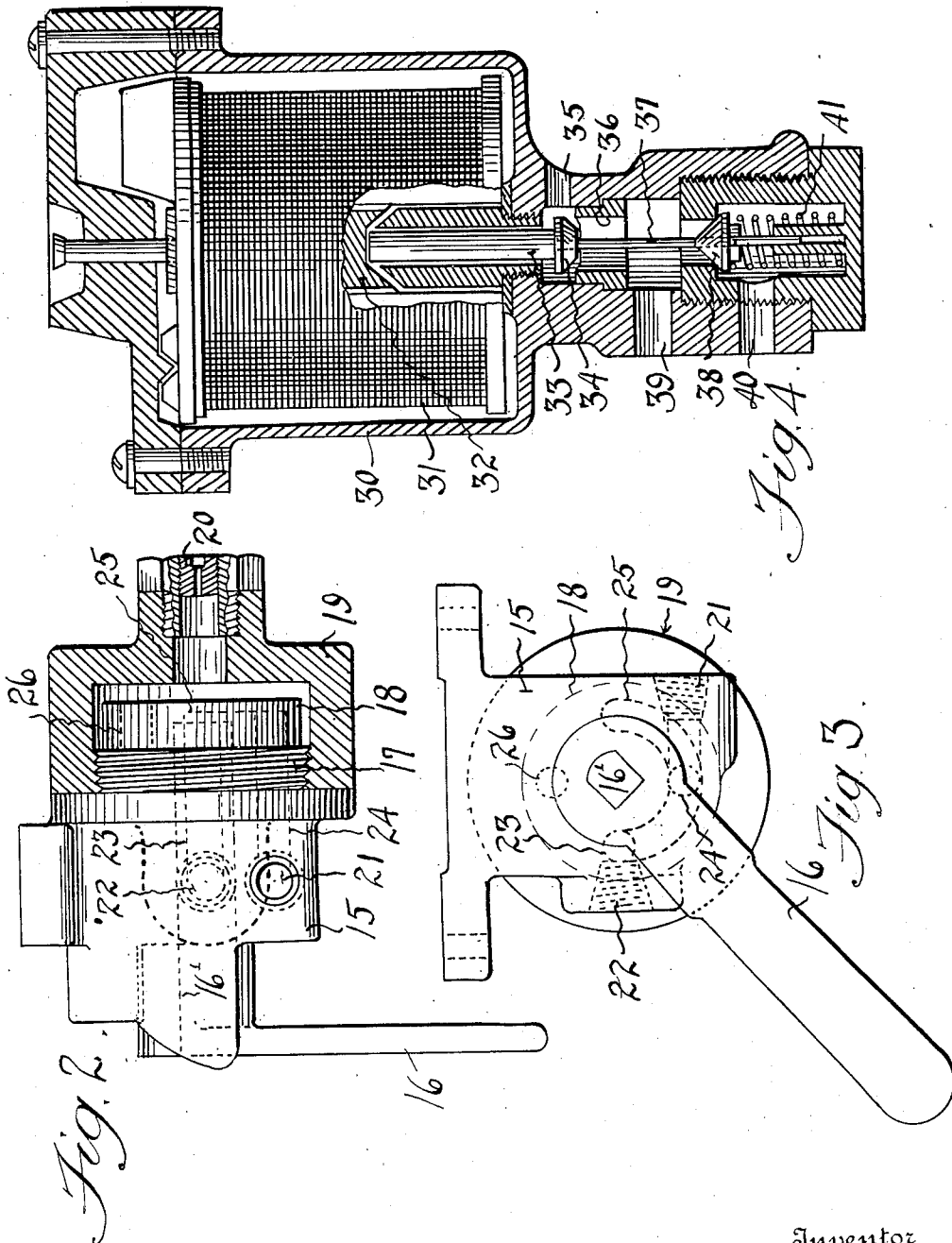
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

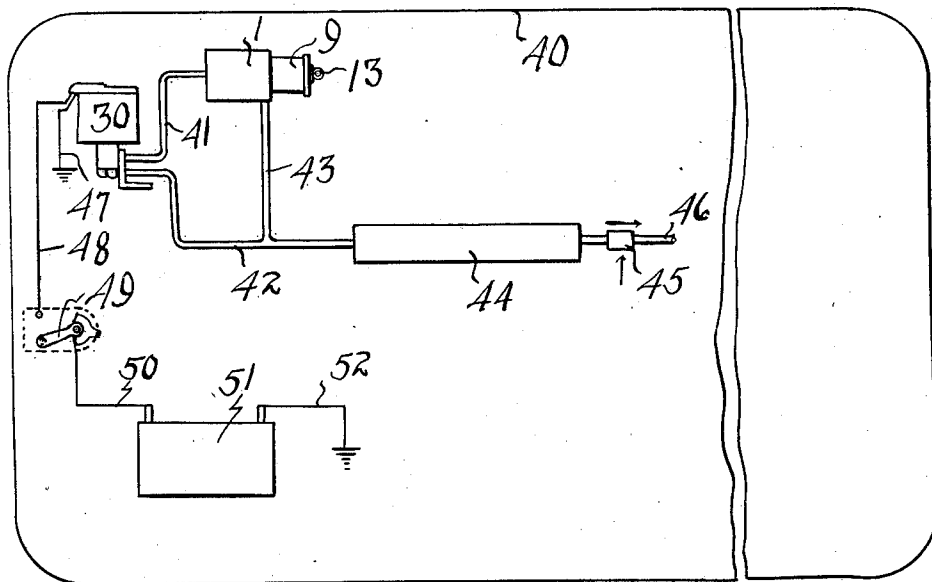


Fig. 5.

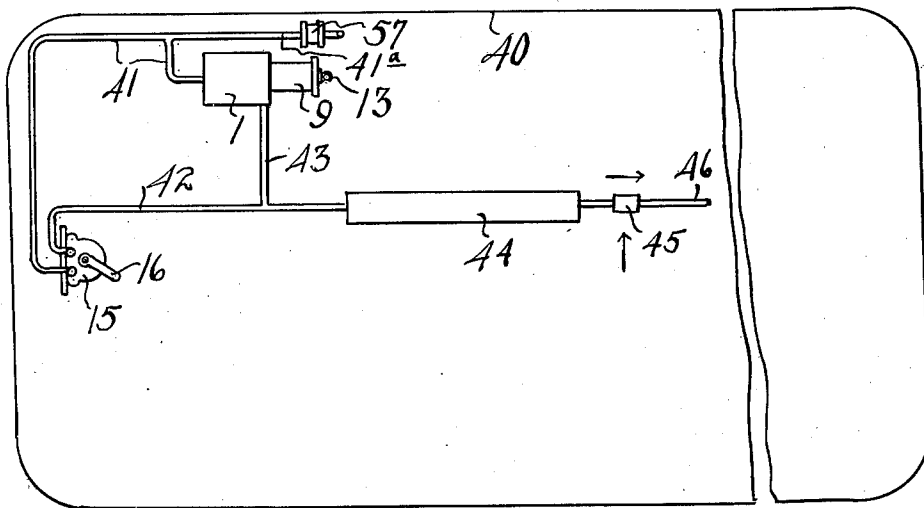


Fig. 6.

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UNITED STATES PATENT OFFICE

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VACUUM ENGINE SYSTEM

Application filed June 22, 1929. Serial No. 372,830.

This invention relates to vacuum engines for operating doors or gates and the like and control systems therefor.

One of the objects of this invention is the provision of door operating means including a vacuum engine therefor, adapted to be connected to any suitable vacuum creating means.

Another object of this invention is the provision of a control system for a vacuum engine by means of which it may be operated to effect the opening and closing of doors, gates and the like.

A further object of this invention is the provision of a system of this type particularly adapted for opening and closing the doors on buses which system is operated in conjunction with the intake manifold of the internal combustion engine driving bus.

Further objects of this invention involve systems employing such an engine which are either controlled by valves of the manual type or of the electro-magnetic type.

A still further object of this invention is the provision of cushioning means in connection with such an engine for preventing too rapid movement thereof in either direction.

These and other objects as will appear in the following disclosure are secured by means of this invention.

This invention resides substantially in the combination, construction, arrangement and relative location of parts all as will be particularly described in the following specification.

Referring to the drawings,—

Figure 1 is a longitudinal central cross-sectional view through the vacuum engine of this invention;

Fig. 2 is a side elevational view with some parts in cross section of a manual control valve;

Fig. 3 is a top plan view of this valve;

Fig. 4 is a sectional view through a magnetic control valve for use with the engine of this invention;

Figs. 5 and 6 represent the connections and associations of the elements of the system of this invention including the electro-magnetic valve and the manual valve respectively.

It is rather usual at the present time to

employ as one form of motive device for operating doors, gates and the like on public transportation vehicles and in buildings by means of so-called fluid pressure operating devices.

This invention is generally related to this field, but is characterized therefrom by the fact that the motive device employed is operated by the differential pressure resulting from the use of atmospheric pressure and a vacuum. The motive device itself is provided with cushioning means to prevent too rapid movement thereof in either direction.

The control system for this engine has been disclosed in two possible forms employing electro-magnetic or manual control valves. The vacuum creating means, of course, may be any suitable device; such as a vacuum pump or for example, the intake manifold of an internal combustion engine.

A clearer understanding of the invention will be had from a detailed consideration of the drawings.

In Fig. 1 the vacuum engine is shown in the form known as a differential engine, that is, it employs cylinders and pistons of different areas. The engine is shown comprising a large cylinder 1, having a closure cap 2 at one end in which is provided a passage 3 having internal threads to receive a pipe. Secured to the closure member 2 at the center thereof and projecting into the cylinder is a piston rod 4, having a longitudinal central passage 6 all the way therethrough.

The outer end of the rod is provided with a plug 7 having a restricted passage therethrough in communication with the passage 6. The other end of the rod 4 is provided with a suitable piston structure 5. The other end of cylinder 1 is closed by the closure member 8 and has secured thereto a smaller cylinder 9 projecting centrally thereof. A passage 10 extends through the wall of cylinder 1 through a part of the closure member 8 and the wall of cylinder 9 and is internally threaded to receive the pipe. A piston structure 11 of suitable form is provided for cylinder 9 and has secured thereto and extending into cylinder 1, a small cylinder 12 within which the piston 5 operates. Cyl-

inder 12 is provided with a suitable piston structure 14 for operation in cylinder 1. The space between pistons 11 and 14 has been designated by the reference character A. The space to the left of piston 14 between it and closure member 2, has been designated by the reference character B. It is apparent from the drawings that one face of piston 11 is open to the atmosphere.

Two forms of control valves will be described in connection with Figs. 2, 3 and 4 for purposes of illustration only. The manual control valve in Figs. 2 and 3 comprises a main body member 15 having a valve seat on the face of the threaded projection 17. A movable valve 18 operates on the face of this seat through the agency of the valve stem 16' and the control handle 16. A hollow cap 17 encloses the movable valve 18 and is secured to the valve body on the threads of projection 17. The cap 19 is provided with a passage therethrough in which is secured the plug 20 having a restricted passage.

The valve body is provided with a threaded passage 21 which extends through the body and forms the port 24 on the face of projection 17. Similarly, a threaded passage 22 extends through the valve body and forms the port 23 on the face of projection 17. The movable valve 18 is provided with an arcuate groove 25 which does not extend all the way therethrough. The valve 18 is also provided with a passage 26 extending all the way therethrough. When the valve is in the position shown in Fig. 3 threaded passages 22 and 21 are in communication through the groove 25. When the valve is in its other position this connection is broken and passage 22 is in communication with the atmosphere through passage 26, the space in cap 19 and the passage in plug 20.

The magnetic valve comprises a casing 30 having a solenoid winding 31 therein. Within the solenoid is a movable plunger 32 which contacts with the valve stem 33 arranged for vertical movement. Mounted on the valve stem is a valve 34 which cooperates with the seat on the member 36. A passage 35 is provided open to the atmosphere. A rod 37 extends from the valve stem 33 downwardly into a guiding projection. A valve 38 is secured thereto for operation with a fixed seat. A spring 41 holds valve 38 seated and valve 34 unseated when the solenoid is deenergized in which condition it is shown in Fig. 4. The passage 40 is adapted to receive the pipe connected to the vacuum creating means which is pipe 42 in Fig. 5. The passage 39 is connected by a pipe to the engine which is pipe 41 of Fig. 5.

The system of Fig. 5 employs the valve of Fig. 4. The vacuum engine is shown by the reference numerals 1 and 9. At 40 has been diagrammatically illustrated the outline of a bus, street-car or similar transportation

vehicle. The pipe 41 is connected to magnet valve 30 and leads to port 39. See Fig. 4. Pipe 42 is connected to passage 40. See Fig. 4, and to the vacuum tank 44. The vacuum tank 44 is connected by pipe 46 through a check valve 45 to the vacuum creating means such as a pump or the intake manifold of an internal combustion engine. Pipe 41 connects to passage 3 of Figure 1. Pipe 43 connects pipe 42 with passage 10 of Figure 1. It will be apparent then that space A of the engine of Figure 1 is always maintained under a vacuum. One of the terminal wires of solenoid magnet 31 is grounded with wire 47 and the other terminal is connected by wire 48 to one contact of a single pole, single throw switch. This switch is provided with a movable switch blade 49 which is connected by wire 50 to one terminal of the current source 51. The other terminal of this source is grounded through wire 52.

The system of Fig. 6 employs the manual control valve 15. The connections here are substantially as before with the exception that the control valve 15 is connected to pipes 42 and 41 instead of the magnet valve. An extension 41a of pipe 41 is provided with a door lock 57 of any suitable construction which is adapted to lock the door closed.

A discussion of the engine will first be given. The pipe connected to passage 3 is adapted in one position of the control valve to connect the space B of the engine with a vacuum creating means. It may be pointed out that the engine is in a position it would take when a vacuum is created in space B. Space A of the engine is always in a condition of vacuum being connected to the vacuum creating means. Thus, the atmospheric pressure acting on piston 11 has forced the two pistons which are united by cylinder 12 to the left. The device to be operated is connected to the member 13 in the engine and if it be a door, the door would be open with the engine in the position shown. When space B is open to the atmosphere by moving the control valve to its other position, the piston structure including both pistons moves all the way to the right and a door connected thereto would be closed. It is again pointed out that space A is under a condition of vacuum. Referring to Fig. 5 with the switch in the position shown, the door connected to the engine would be closed. The end 13 is shown projecting beyond the end of cylinder 9. Under these conditions the magnet valve is in the position shown in Fig. 4. When the switch is closed, the magnet valve is energized through the simple circuit shown in Fig. 5. When this occurs, plunger 32 causes valve 34 to seat and valve 38 to unseat. The connection through pipe 41, passage 39 and passage 35 to the atmosphere is closed and a connection is estab-

lished from the vacuum tank 44 through pipe 42 through passage 40, past valve 38, through passage 39, through pipe 41 and through passage 3 of the engine to the space B. The air in this space is therefore withdrawn creating a vacuum and the piston moves to the left of Fig. 1 opening the door. When the switch is opened the magnet 9 therefore is deenergized and the parts of the valve returned to the position shown in Fig. 4 connecting space B to the atmosphere as a result. As a result, the piston moves to the right of Fig. 1 closing the door.

The operation of the system in Fig. 6 is similar except that the valve is manually controlled. With valve 15 in the position shown in Fig. 3 the vacuum source 44 is connected through pipe 42, passage 21, port 24, groove 25, port 23, passage 22, pipe 41 and passage 3 to space B of the engine. The pistons thus move to the left to the position shown in Fig. 1. When the valve is moved to its other position, atmospheric pressure is admitted through the restricted passage in plug 20 to the space in cap 19 through passage 26 to port 23, (which are now in alignment) passage 22, pipe 41 and passage 3 to space B. The pistons thus move to the right of Fig. 1. It will be noted that in view of the restricted passage in plug 20, the flow of atmospheric pressure will not be too rapid and hence, the pistons cannot move too rapidly.

An additional cushioning arrangement is provided by cylinder 12, piston 5, rod 4 and plug 7 with its restricted passage. As pistons 14 and 11 move back and forth, air is admitted through the restricted passage in plug 7 in either direction depending upon the movement of the pistons and through passage 6 to cylinder 12 to further cushion the movement of the pistons. It may be pointed out that an additional cushioning arrangement may be provided in connection with the magnet valve similar to plug 20 of the manual valve. The lock 57 is connected to pipe 41 by pipe 41a. It is of the well known piston operated type and is intended to engage the door and hold it locked in closed position at which time atmospheric pressure will be in pipe 41a.

I am of course well aware that many changes in the details of construction, and relative arrangement of parts will be obvious to those skilled in the art. These departures I deem however within the spirit and scope of this invention and they do not depart from the principles of construction and operation employed. I wish it to be understood, therefore, that I do not wish to be limited by the disclosure given by purposes of description but to the scope of the appended claims.

What I seek to secure by United States Letters Patent is:

1. A vacuum engine of the type described

comprising two cylinders secured together in longitudinal alignment, said cylinders being of different diameters and a piston in each cylinder and means for rigidly uniting them together, said larger cylinder having a pressure and exhaust passage in one wall thereof and another passage in the wall thereof opening into the space between the pistons and cushioning means comprising a piston and cylinder for preventing too rapid movement of the engine in either direction, the piston of the cushioning means being fixed to the end wall of the large cylinder by a rod, and the means for uniting the pistons in said two cylinders itself comprising a cylinder in which the cushioning piston operates, said rod having a restricted bore entirely there-through.

2. In a vacuum engine of the type described, a combination comprising two cylinders of different diameters secured together in longitudinal alignment, one end of the smaller cylinder being open to atmosphere, means for closing the other end of the larger cylinder, a piston in each of said cylinders, a hollow piston rod connecting said pistons, a hollow rod secured to the means for closing the larger cylinder projecting into the hollow piston rod, a piston on said hollow rod for operating in said hollow piston rod and means for restricting the passage in the hollow rod.

In testimony whereof I have hereunto set my hand on this 19th day of June, A. D. 1929.

ROSCOE D. CONKLIN.