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H. C. BOSSERDET

DOOR OPERATING AND CONTROL MECHANISM

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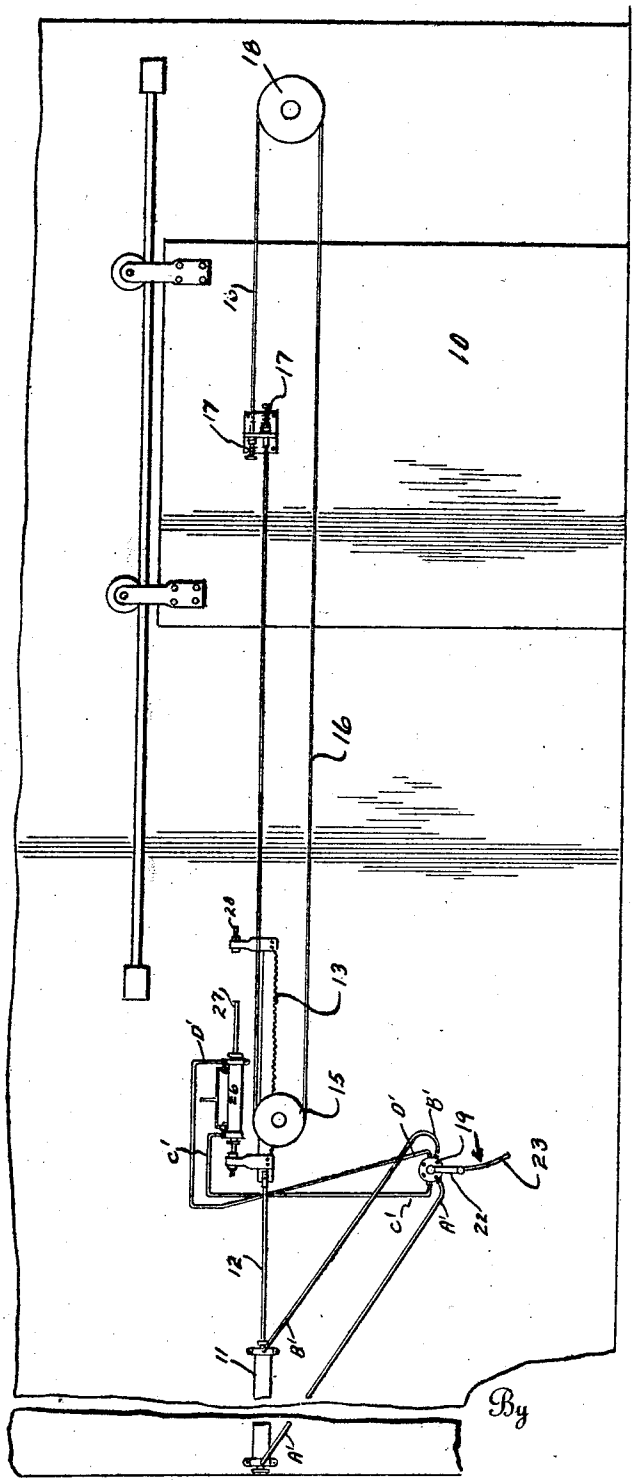

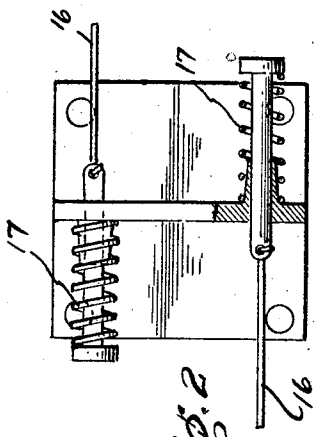

Fig. 2

Fig. 1

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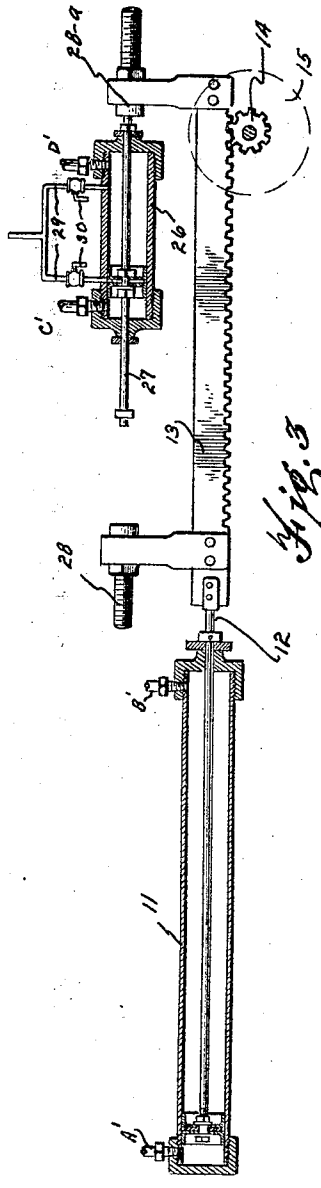


Fig. 3

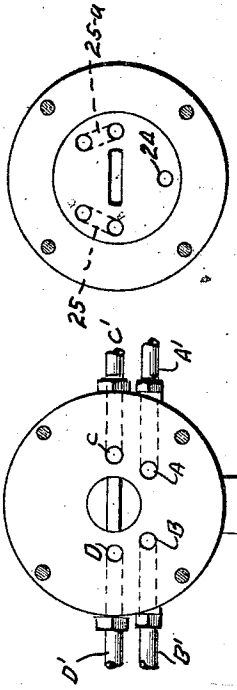
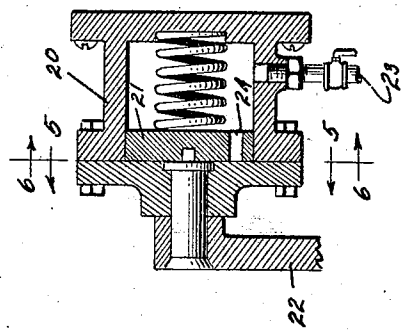


Fig. 4

Fig. 5

Fig. 6



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UNITED STATES PATENT OFFICE.

HENRY C. BOSSERDET, OF DETROIT, MICHIGAN.

DOOR OPERATING AND CONTROL MECHANISM.

Application filed November 4, 1922. Serial No. 599,163.

To all whom it may concern:

Be it known that I, HENRY C. BOSSERDET, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Door Operating and Control Mechanism, of which the following is a specification.

My invention relates to door operating and control mechanism.

An object is to provide a movably-supported door with control apparatus consisting of power-driven mechanism having connection with the door to operate the same and door-retarding mechanism driven by operating medium exhausted from said door-operating mechanism, which retarding mechanism has connection with the door to retard the movement thereof, cushioning shock and preventing slamming of the door. This result is particularly important in the operation of heavy doors such as are quite generally used in public garages or service stations.

A particularly meritorious feature of my door control apparatus is the provision of a cushioning or check device which is reversibly operated in opposition to the power medium supplied said device by the door to slow up the movement of the door before it arrives at its limit of movement.

An important feature of the door-control apparatus is that the door-operating mechanism and the door check mechanism are regulated by a single control and preferably by a single movement of the control.

To illustrate my invention I have shown in the drawing control devices in the form of air motors, one to operate the door and another to check the movement of the door, and in such a construction an important object is to provide the communication between said motors and with the source of supply of fluid pressure operating medium therefor with a single control device to regulate the admission of operating medium from the source of supply to the door-operating motor and the exhaust of operating medium from the door-operating motor to the door-check motor, and provide, in combination with a fluid motor having connection with the door to operate the same, a door check operating on the fluid exhausted from said motor to slowly arrest the movement of the door and prevent slamming thereof, and which door check is actuated by the exhausted operating medium from said door-operating motor to a position to retard the movement of the door upon being reversely operated by the door in opposition to the impulse of operating medium supplied to said check.

The above and other objects together with details of construction and operation will more fully appear from the following description, appended claims and accompanying drawings, in which:

Fig. 1 is a side elevation of a door provided with my control mechanism.

Fig. 2 is a fragmentary elevation of the door showing the connection at the door of the operating mechanism.

Fig. 3 is a longitudinal sectional view through the air motor and door check showing the operating mechanism connected therewith in elevation.

Fig. 4 is a vertical sectional view through the control valve.

Fig. 5 is a sectional view taken on line 5—5 of Fig. 4.

Fig. 6 is a sectional view taken on line 6—6 of Fig. 4.

In the drawings, I have shown a movably supported door 10, adapted for operation by means of an air motor 11, the piston 12 of which motor drives a rack 13, which rack engages a pinion 14 to drive a sheave 15, over which sheave is run a flexible connection, which is engaged with the door by means of a shock absorbing member 17. Flexible connection 16 also travels over a second sheave 18 in reciprocally operating the door.

Air under pressure is admitted to this air motor 11, from a suitable source of compressed air supply, not shown in the drawings. The supply of air to the motor is regulated by a control valve indicated in assembly at 19.

This air valve comprises a casing 20, within which is mounted a movable member 21, controlled by means of a handle 22. Air enters the casing through an air conduit 23 from the source of supply, and the entrance of such air may be regulated as desired. The head of the casing is cored out to provide air passageways leading to the air conduits shown in Fig. 1 and lettered A. B. C. and D. The movable member is provided with an air passageway

leading therethrough which is normally closed by the head of the casing, the handle being in the position shown in Fig. 1.

When the handle of the air valve is moved in the direction of the arrow in Fig. 1, this aperture 24 is brought into registration with passageway A leading throught the casing to the air conduit A′ and air enters the corresponding end of the cylinder, and the piston is forced to the position shown in Fig. 1. The air in the air motor cylinder is forced out through conduit B′ and enters air passageway B in the head of the casing. This passageway B in the casing, by the previously described movement of the movable member 21 has been brought into registration with one end of a passageway 25 cored through the movable member, the other end of which passageway 25 is in registration with passageway D through the casing, which communicates with conduit D′ to lead the air to one end of the air cylinder 26 of a pneumatic door check mechanism. A piston 27 is disposed in this cylinder and with the entrance of air through conduit D′ is forced therethrough to the position shown in Fig. 3, to be engaged by the stop 28, when the rack 13 has moved along far enough under the impulse of the air motor operating the door to bring the stop in engagement therewith. This stop is adjustable so as to be threaded in or out to engage the piston early or late relative the movement of the door operating mechanism. In the operation of the door-control apparatus operating medium in the form of air is admitted from the source of supply to the air motor 11 to move the door in the direction desired. This is accomplished by actuation of the control valve 19. By the same movement of the valve which opens the door-operating motor to the admission of fluid under pressure from the source of supply, the exhaust end of the motor is placed in communication with the cylinder of the air check 26 to drive the piston of said air check motor to one end of its stroke so as to be in position to be engaged by the door stop to retard the movement of the door before it arrives at its limit of travel. Before the door reaches its limit of movement in either direction the stop 28 or stop 28ª, as the case may be, engages the piston 27 and drives such piston through the air check cylinder against the impulse of the operating medium contained in said cylinder, which operating fluid is exhausted from the cylinder through a small outlet 29. An outlet pipe 29 leads from near each end of this cylinder to a common discharge and the exhaust of fluid through each outlet pipe is regulated by a valve 30. The resistance offered to the movement of the piston through the cylinder by the air under pressure contained in said cylinder effectively retards the movement of the door and prevents slamming thereof.

If it is desired to reverse the movement of the door, the operating handle is rotated reversely, air enters the opposite end of the air motor cylinder through conduit B′, exhausts therefrom through A′, through a cored out passageway 25ª in the movable member, through conduit C′ to the opposite end of cylinder 26, and stop 28ª carried by the other end of the rack bar 13 engages the adjacent end of the piston 27 and drives the same through the cylinder against the resistance of the air pressure therein, and the movement of the door in that direction is effectively retarded. If the door is halted at any point in its travel in either direction and the control mechanism operated to direct air into the opposite end of the air motor to reverse the movement of the door, automatically air enters the opposite end of the air cylinder 26 to retard the movement of the door in the new direction of travel. The piston is always in position therefore to check the travel of the door before it arrives at its limit of travel notwithstanding the direction in which it may be travelling.

An air cushion is always present to absorb the final shock as the air is never completely exhausted from cylinder 26, as the exhaust is from a port spaced from the end of the cylinder.

What I claim is:

1. In combination with a movably supported door, an air motor, operating mechanism connecting the motor with the door to operate the door, a pneumatic door check to retard the travel of the door, said door check connected with the motor to operate on air exhausted therefrom and adapted to act directly on the door operating mechanism to retard the movement of the door in either direction before the door arrives at the limit of its permitted travel.

2. In door operating and control mechanism, in combination, a movably supported door, an air motor, reciprocating door operating mechanism controlled by said air motor, an air check cylinder, a piston disposed in said cylinder for operation and extending beyond each end of the cylinder, a stop carried by said reciprocating door operating mechanism to engage said piston to force the same through the cylinder during the movement of the door, and means for controlling the admission of air to either end of said cylinder under pressure during the operating of the door.

3. In door operating and control mechanism, a movably supported door, an air motor to operate the door, pneumatic door check means comprising a cylinder and a piston reciprocably mounted therein, air

communicating means leading from a source of compressed air supply to each end of said air motor and air communicating means leading from said motor to each end of said door check cylinder, an air control valve to regulate the passage of air through said communicating means to admit air to one end of the air motor to move the door in a given direction and at the same time open the passageway leading from the exhaust end of the air motor to the required end of the door check cylinder to operate the piston therein to retard the movement of the door before it reaches its limit of permitted travel in such given direction.

4. In door operating and control mechanism, in combination, a movably supported door, an air motor, door operating mechanism connecting the motor with the door to operate the door, a pneumatic door check comprising an air cylinder, a piston disposed for reciprocation in said cylinder and extending beyond each end thereof, means for admitting air to said air motor to operate the same and coincident therewith admitting air to said door check cylinder to drive the piston to one end of its stroke, a stop adapted to engage the piston in said door check cylinder to force the same therethrough against the air pressure therein during the operation of the door.

5. In door operating mechanism, in combination with a movably supported door, a fluid motor having connection therewith to operate the same, and a second fluid motor adapted to be reversely operated in opposition to the impulse of its operating medium by the door when the door is under the control of the first motor and before such door arrives at its limit of movement.

6. In door operating mechanism, in combination with a movably supported door, a fluid motor having connection with the door to operate the same, a door check communicating with said motor to operate on fluid exhausted therefrom, said check adapted to be reversely operated in opposition to the impulse of the fluid furnished under pressure to said check from said door operating motor by the door when under control of its operating motor to retard the movement of the door before it arrives at its limit of movement.

7. In door operating mechanism, in combination with a movably supported door, power means having connection therewith to operate the door, power-operated retarding means having connection with the door to be reversely operated thereby and in opposition to the power medium supplied to said means to check the movement of the door.

8. In door control apparatus, in combination with a movably supported door, operating mechanism having connection with the door to operate the same, a source of fluid pressure, a fluid motor communicating with the source of fluid pressure to receive operating medium therefrom and having connection with the door to be reversely operated thereby in opposition to its received operating medium to slow up the movement of the door before it arrives at its limit of movement.

9. In door control apparatus, in combination with a movably supported door, a fluid motor having connection with a source of fluid pressure to receive operating medium therefrom and having connection with the door to be reversely operated thereby to retard the movement of the door.

10. In door control apparatus, the combination of a movably supported door, a fluid motor operable to actuate the door, a second fluid motor operable to retard the movement of the door, said second motor communicating with the first motor to be operated by the exhaust therefrom.

11. In door control apparatus, in combination with a movably supported door, a fluid motor having connection therewith to operate the same, a second fluid motor having connection with the door to retard the movement thereof, said first motor having an exhaust port communicating with the second motor to furnish operating medium thereto.

12. In door control apparatus, the combination with a movably supported door, of a source of fluid pressure, a fluid motor to operate the door communicating with the source of fluid pressure to receive operating medium therefrom, a second fluid motor operable to retard the movement of the door communicating with the first motor to receive operating medium therefrom, and means for regulating the admission of operating medium to said motors.

13. In door control apparatus, a movably supported door, a source of fluid pressure, a fluid motor to operate the door communicating with such source of fluid pressure to receive operating medium therefrom, a second fluid motor to retard the movement of the door communicating with the first motor to receive operating medium exhausted therefrom, and unitary control mechanism operable to regulate the admission of operating medium to said first motor to actuate the door and to control the exhaust of operating medium therefrom to the second motor to retard the movement of the door.

14. In door control apparatus, in combination with a movably supported door, power means having connection therewith to operate the door, additional power means having connection with the door to retard the movement thereof, said additional power means communicating with the first power means to receive power therefrom.

15. In door control apparatus, in combination with a movably supported door, power mechanism to operate the door, means for controlling the operation of said power mechanism, power mechanism to independently retard the movement of the door, said last mentioned power mechanism connected with the first mentioned power mechanism to receive power therefrom.

16. In door control apparatus, in combination with a movably supported door, power actuated mechanism to operate the door, power actuated mechanism to retard the movement of the door, said last mentioned mechanism communicating with the first mentioned mechanism to operate on power medium exhausted therefrom, and a unitary control to regulate the operation of said operating mechanism and retarding mechanism.

17. In door control apparatus, in combination with a movably supported door, a source of power, door actuating mechanism communicating with the source of power to receive operating medium therefrom, door retarding mechanism communicating with the door operating mechanism to receive operating medium discharged therefrom, and control devices to regulate the admission of operating medium from the source of power to the door operating mechanism and operable by the same movement to control the discharge of operating medium therefrom to the door retarding mechanism.

18. In door control apparatus, in combination with a movably supported door, power means having connection therewith to operate the same, additional power means under the control of said first power means adapted to retard the movement of the door, said additional power means adapted to be reversely actuated by the door in opposition to the power impulse of said means to retard the movement of the door.

19. In door control apparatus, in combination with a movably supported door, power mechanism to operate the door, power mechanism to retard the movement of the door, said last mentioned mechanism communicating with the first mentioned mechanism to operate on power medium discharged therefrom and adapted to be reversely actuated by the door in opposition to the power impulse of said means to retard the movement of the door.

20. In door control apparatus, the combination with a movably supported door, of a source of power, door actuating mechanism communicating therewith to receive operating medium therefrom, door retarding mechanism communicating with the door actuating mechanism to receive operating medium discharged therefrom and associated with the door to be reversely operated thereby in opposition to the supplied power medium to retard the movement of the door.

21. In door control apparatus, a movably supported door, a source of fluid pressure, a fluid motor to operate the door communicating with the source of fluid pressure to receive operating medium therefrom, a second fluid motor to retard the movement of the door communicating with the first motor to receive operating medium discharged therefrom and associated with the door to be reversely operated in opposition to the supplied operating medium to check the movement of the door.

HENRY C. BOSSERDET.