

June 14, 1938.

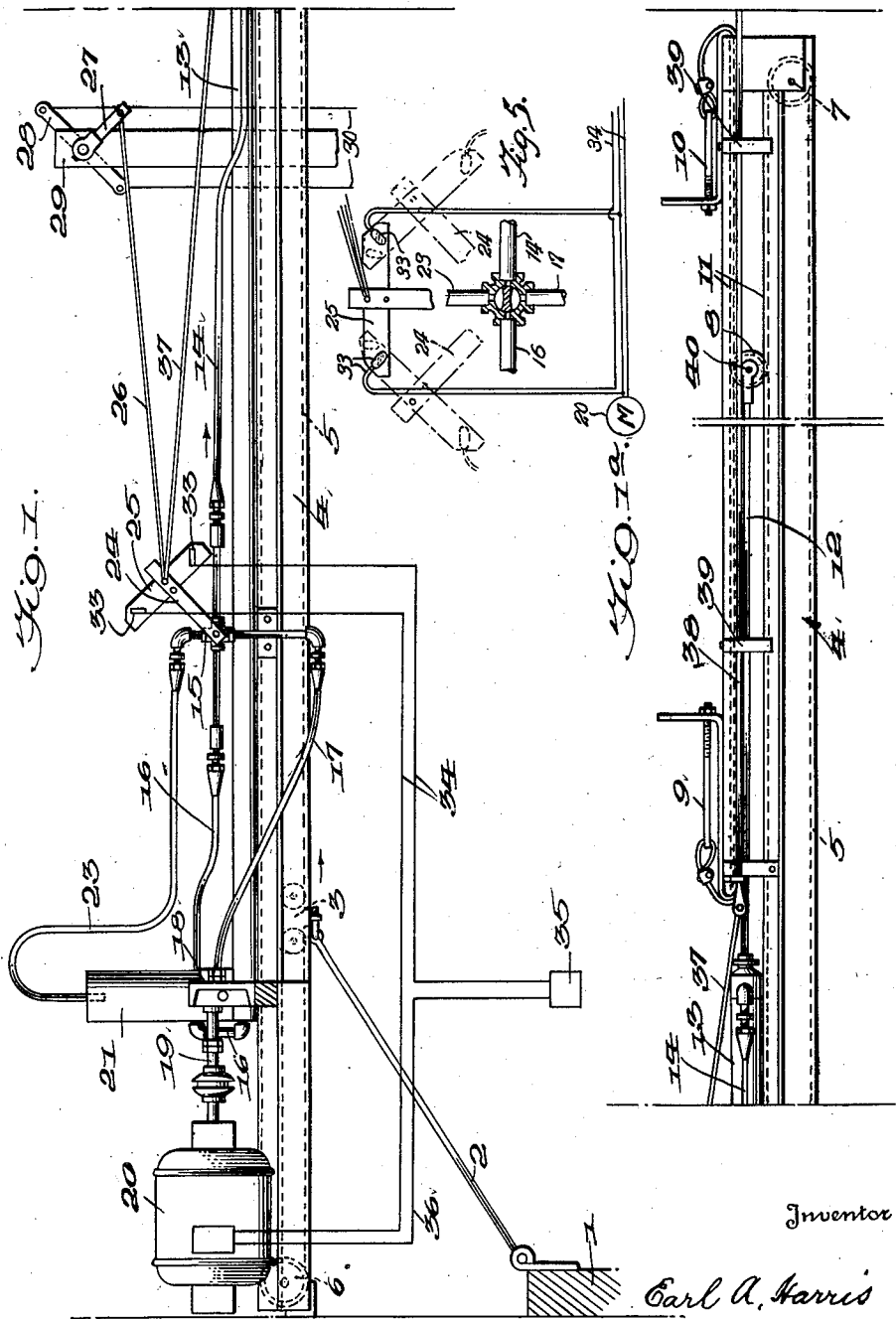
E. A. HARRIS

2,120,495

DOOR OPERATING DEVICE

Original Filed Feb. 5, 1931

2 Sheets-Sheet 1



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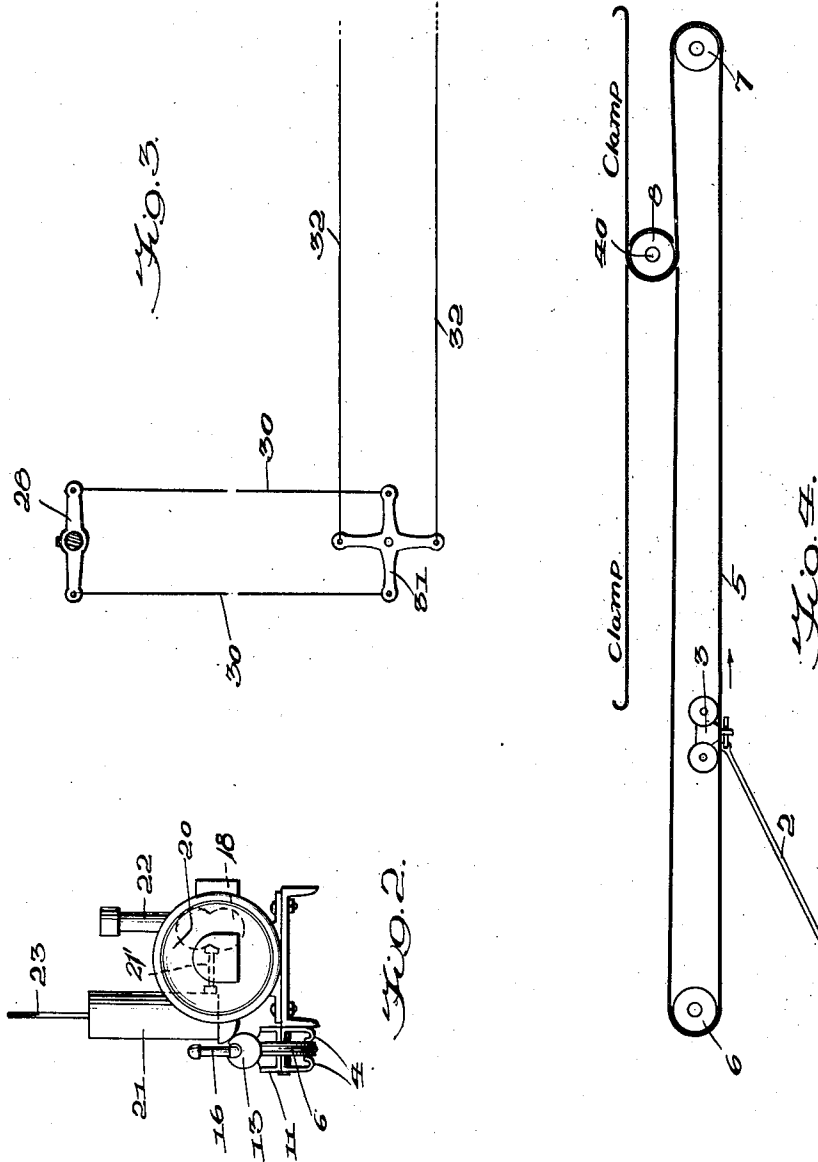
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DOOR OPERATING DEVICE

Original Filed Feb. 5, 1931

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,120,495

DOOR OPERATING DEVICE

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Original application February 5, 1931, Serial No.
513,718, now Patent No. 1,954,813, dated April
17, 1934. Divided and this application March
6, 1934, Serial No. 717,502

7 Claims. (Cl. 60—52)

This invention relates to an improvement in door operating devices and is intended more particularly for the opening and closing of garage doors or the like which are designed to be raised and lowered in the opening and closing operations.

This application is filed as a division of my application on Door operating devices, Serial No. 513,718, filed February 5, 1931, now Patent No. 1,954,813, granted April 17, 1934.

The object of the invention is to improve the character of the opening and closing mechanism for such doors to facilitate an entirely automatic manipulation of the doors.

The mechanism for opening or closing the doors is located in the upper portion of the garage or other building and is designed for raising and lowering the doors by electrically operated means. It utilizes a remote control for the door mechanism, permitting the controlling of the automatic opening or closing of the doors from some remote point.

This application is directed more particularly to the control of the electrically operated means whereby the electrical operating means is controlled synchronously with the hydraulic means responsive thereto.

The invention may be applied to the operation of any sliding doors or the like and is not limited to use on garage-doors.

In the accompanying drawings:

Fig. 1 is a side elevation of the invention applied;

Fig. 1a is a similar view of an end portion thereof;

Fig. 2 is an end elevation of the operating mechanism;

Fig. 3 is a diagrammatic view of the remote control system;

Fig. 4 is a diagrammatic view of the cable and pulley system; and

Fig. 5 is a partial diagrammatic and sectional view of the four-way valve and switches.

The invention is shown as applied to the raising and lowering of an overhead garage door or the like, although it may obviously be used for the operation of various types of doors, as may be found desirable.

The door is designated generally by the numeral 1 in Fig. 1 and is shown in a partially closed position. This door 1 has a connecting rod 2 pivotally connected with the upper end thereof and also pivotally connected with a trolley 3 mounted for movement longitudinally of and within a track 4 shown in Figs. 1 and 2. The trolley 3 is moved lengthwise of the track 4 in order to raise and lower the door.

A cable 5 is fixed to the trolley 3 and extends over stationary pulleys 6 and 7 at the opposite ends of the track 4 and in opposite directions around a double sheave 8, thence to adjustable

clamps 9 and 10, where the ends of this cable are anchored and held fixed, as shown in Fig. 1a.

Movement is imparted to the cable 5 and thence to the trolley 3 by moving the double sheave 8 lengthwise of its guide, formed by guide channels 11 arranged above the track 4. For this purpose, the double sheave 8 has a piston rod 12 connected therewith and extending to a piston within a cylinder 13, so that, as the piston and piston rod are moved back and forth within the cylinder 13, this motion is imparted to the double sheave 8.

The outer end of the cylinder 13 has a pipe 14 communicating therewith, which pipe extends to a four-way valve 15, see Fig. 5. A pipe 16 extends from the opposite end of the cylinder 13 to the opposite side of said four-way valve 15. Another side of said four-way valve 15 has a pipe 17 extending therefrom to a gear pump 18 operated by a drive shaft 19 of an electric motor 20. This gear pump 18 communicates at one side with a fluid reservoir 21 through connection 21' and at the opposite side with the pipe 17, said pump also having an air-dome 22 connected therewith, as shown in Fig. 2. A pipe 23 extends from the reservoir 21 to the other side of the four-way valve 15.

The four-way valve 15 is controlled by a lever 24 carrying a cross-arm 25. The lever 24 has a connecting rod 26 secured thereto and extending to an arm 27 of a lever 28 mounted on a post or support 29. The opposite ends of the lever 28 have flexible cables 30 extending to a cross 31, which also has cables 32 connected therewith, and which cables 32 extend to the hand controls at some remote point.

The arm 25 carries mercury switches 33 (see Fig. 5) adapted to electrically connect electric cables 34, one of which extends to a source of electric power designated generally by the numeral 35, while the other cable extends to the electric motor 20, and another cable 36 extends from the other side of the motor 20 to the source of power 35 to complete the circuit.

The valve lever 24 is adapted to be automatically moved to a neutral position by a control rod 37 attached thereto and to a slidable rod 38 carrying control stops 39 in position to be engaged by a pin 40 extending laterally from and carried by the double sheave 8.

In operating the invention, a pull on one of the cables 32, according to whether or not the door is opened or closed, is transmitted through one of the cables 30 to the lever 28 and through the connecting rod 26 to the valve lever 24, to swing said lever to the proper position, as for instance into the position shown in Fig. 1, which tilts the mercury switches 33 properly to close the circuit to the motor 20, starting the motor and the pump 18, which forces the fluid, oil being ordinarily used, from the reservoir 21 through the pipe 17, 60

four-way valve 15, and pipe 14 into the end of the cylinder 13, which forces the piston in the cylinder toward the opposite end and moves the connecting-rod 12 and the sheave 8 to the left in Fig. 1a.

This causes a movement of the cable 5 about the fixed sheaves 6 and 7 to move the trolley 3 in the direction of the arrow in Fig. 1 to complete the opening of the door, the latter following the connecting-rod 2. When the door has reached its completely open position, the pin 40 strikes the stop 39 at the left of Fig. 1a, moving the rods 37 and 38 lengthwise to return the valve lever 24 to its upright position, which automatically de-energizes the motor 20 and stops the pumping operation and likewise the movement of the piston in the cylinder 13.

When the lever 24 is moved in the opposite direction, the operation is reversed. As the fluid is forced out of either end of the cylinder 13, it is forced through the pipe 23 into the reservoir 21.

The remote control of the four-way valve is very effective and inexpensive. In a long garage, the cables may extend along the long wall, and a pull of either of them at any point will operate the door. The movement imparted to the valve lever 24 to automatically stop the flow of current to the motor also closes the four-way valve 15 and moves the cables to a neutral position. The motor may be stopped at any point to hold the door in the described position, where it is effectively locked by the mechanism.

I claim:

1. In a device of the character described, the combination of fluid power means, a valve arranged to control the fluid supply to the power means, motor driven means for supplying fluid power for said fluid power means, the valve being arranged in a fluid circuit between the motor driven means and the fluid power means, control means for the motor driven means associated and synchronized with the valve for simultaneous operation of the fluid power means and the motor driven means, and means operatively connected with the valve and arranged for operation by the fluid power means on extreme movements thereof in opposite directions for controlling said valve and control means.

2. In a device of the character described, the combination of fluid power means, a valve arranged to control the fluid supply to said power means, electric-motor driven means for supplying fluid power for said fluid power means, the valve being arranged in a fluid circuit between the electric-motor-driven means and the fluid power means, control means for the electric-motor-driven means associated and synchronized with the valve for simultaneous operation of the fluid power means and the electric-motor-driven means, and means operatively connected with the valve and arranged for operation by the fluid power means on extreme movements thereof in opposite directions for controlling said valve and control means.

3. In a door operating device of the character described, the combination of fluid power means, a valve arranged to control the fluid supply to said power means, electric-motor driven means for supplying fluid power for said fluid power means, the valve being arranged in a fluid circuit between the electric-motor-driven means and the fluid power means, control means for

the electric-motor-driven means connected to the valve and responsive to the operation thereof, and means operatively connected with the valve and arranged for operation by the fluid power means on extreme movements thereof in opposite directions for controlling said valve and control means.

4. In a door operating device of the character described, the combination of a fluid motor, a valve arranged to control the supply of fluid to the fluid motor, an electric-motor driven pump for supplying fluid for the fluid motor, the valve being arranged in a fluid circuit between the electric-motor-driven means and the fluid power means, control means for the electric-motor-driven pump connected to the valve and responsive to the actuation thereof, and means operatively connected with the valve and arranged for operation by the fluid power means on extreme movements thereof in opposite directions for controlling said valve and control means.

5. In a hydraulic power unit, the combination of a hydraulic motor, means for supplying fluid selectively to opposite sides of said motor and including a reservoir, a pump and a valve in series with means extending from the valve to opposite sides of the hydraulic motor, the pump being arranged to supply fluid in a single direction to the valve for selective delivery to either side of the motor, an electric motor for driving the pump, controlling means for said electric motor connected with the valve and actuated in synchronism therewith, and means in position to be actuated by an extreme movement of the hydraulic motor in either direction and connected with the valve for moving the valve to a neutral position and simultaneously shift the electric motor controlling means to stop the electric motor.

6. In a hydraulic power unit, the combination of a hydraulic motor having a power member, means for supplying fluid selectively to opposite sides of said motor and including a pump and four-way valve in series with means extending from different sides of said valve to opposite sides of the hydraulic motor, the pump being arranged to supply fluid to the valve for selective delivery to the hydraulic motor, an electric motor for driving the pump, a lever for the four-way valve, electrical switch means carried by said valve lever for controlling the electric motor in synchronism with movement of the valve, and means in position to be engaged and actuated by the hydraulic motor power member in each extreme position and connected with the valve lever for shifting said lever to move the valve to a neutral position and stop the motor.

7. In a hydraulic power unit, the combination of a hydraulic motor having a power member, means for supplying fluid selectively to opposite sides of said hydraulic motor, including a four-way valve, conduits leading from said valve to opposite sides of the motor, a pump having a single conduit leading therefrom to the four-way valve, an electric motor for driving the pump, a lever for the four-way valve, switch means connected with the lever for actuation thereby to control the electric motor in synchronism with movement of the valve, and means actuated by extreme movement of the power member in each direction and connected with the lever for shifting the lever to move the valve to a neutral position and stop the motor.

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