

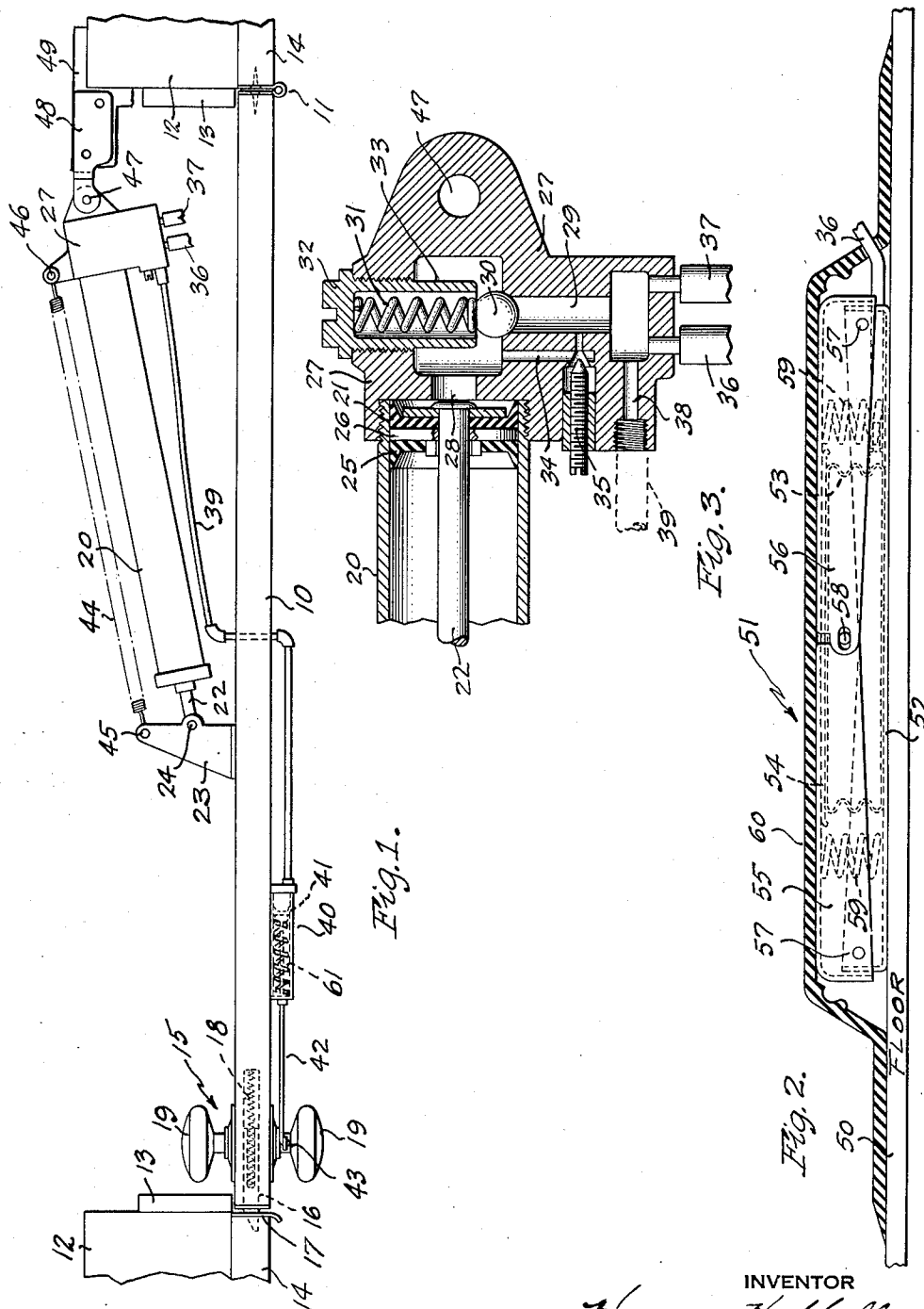
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FLUID OPERATED DOOR ACTUATING MECHANISM

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1

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FLUID OPERATED DOOR ACTUATING MECHANISM

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This invention relates to a fluid-operated door actuating mechanism, and has for an object to provide a simple and effective means for operating doors of a dwelling and other buildings, either of the screen door or closure door type, to permit treadle operation of the door by a person carrying bundles or packages or the like, or whose arms and hands are otherwise occupied.

It is also an object to provide such a door-operating mechanism for automatically closing the door after the person has passed through it.

Another object is to provide a door-operating mechanism of this type which will include means operated by the treadle for first releasing the latch of the door and then shifting the door to the open position.

A further object is to provide a construction and apparatus of a type which will permit free operation of the door to the open position but will have means for controlling the speed of the closing of the door to prevent too rapid shifting of the door to the closed position or slamming of the door.

With the foregoing and other objects in view, I have devised the construction illustrated in the accompanying drawing forming a part of this specification. It is, however, to be understood the invention is not limited to the specific details of construction and arrangement shown but may embody various changes and modifications within the scope of the invention.

In this drawing:

Fig. 1 is a top plan view showing somewhat diagrammatically this improved door-actuating mechanism applied to a door;

Fig. 2 is a partial section and partial side elevation of the treadle-operating mechanism, and

Fig. 3 is a section through a control means for the actuating mechanism.

A movable door is shown at 10 which may be of any suitable type, either a screen door or closure type of door, and it can be of the sliding or hinge type, that shown being of the hinge type supported by suitable hinges 11 on the usual type of door frame 12 having the usual stops 13 and trim 14. The door is also provided with any suitable type of latch 15 for retaining it in the closed position, that shown comprising any suitable type of bolt 16 to cooperate with a keeper 17 and normally shifted to the retaining position by any suitable spring 18, and releasable from either side of the door by the hand knobs 19.

Fluid operated means is provided for shifting the door to the open position, that shown comprising a cylinder 20 in which is a suitable piston 21 of suitable material such as neoprene, for example, connected by a suitable piston rod 22 to the door by any suitable means such, for example, as a bracket 23 secured to the door and to which the rod is pivoted at 24. The piston may also include a second piston 25 separated from piston 21 by a plate 26 and facing in the opposite direction to prevent entrance of air past the piston to the fluid pressure system, which may be of any suitable material, preferably

2

oil. The control means for the piston operation is an operating head or housing 27 connected to the opposite end of the cylinder provided with a fluid passage 28 leading to the cylinder communicating with another passage 29 controlled by a check valve 30. A spring 31 tends to hold this valve in the closed position, and this spring may be mounted in a removable plug 32 mounted in a wall of the housing and provided with a depending skirt 33 to enclose the spring. A reduced by-pass passage 34 by-passes the check valve and is controlled by an adjustable restricting valve 35 which may be adjusted to control the rate of flow of fluid through this passage to regulate the return speed of the door, as will later be described. One or more conduits 36 and 37 are connected to the passage 29, and another passage 38 leading from this passage 29 is connected by a flexible conduit 39 to an auxiliary fluid operating means, in this case a cylinder 40, including a piston 41 connected by a piston rod 42 to operating means 43 for the latch 16. Return means is also provided for the door to shift it to the closed position, preferably a spring either inside or outside the cylinder 20, in the present instance comprising a spring 44 connected at one end 45 to the bracket 23 and at its other end 46 to the housing 27. This housing is pivoted at 47 to a bracket 48 mounted by any suitable means 49 on the door jamb 12.

Means for operating the door comprises a treadle mechanism which may be mounted on a floor adjacent or associated with the door, and may be of different shapes as, for example, oblong or circular. The floor is indicated at 50 and the treadle mechanism at 51. The mechanism shown comprises a base member 52 which may be a cupped member or channel member resting on the floor and supporting a master cylinder of any suitable type, in the present case a flexible bellows type 53 preferably of molded neoprene fabric. Resting on top of this cylinder or bellows is a bridge plate 54 supporting a pair of inverted channel shaped levers 55 and 56 pivoted to the base member at their outer ends at 57, and pivoted together at their inner ends by a pin and slot connection 58. The base member 52 and these treadle members or levers 55 and 56 enclose the master cylinder of bellows 53 and also enclose return springs 59 which tend to shift the treadle members 55 and 56 to their upper positions and also to expand or return the master cylinder 53 to its expanded or normal position as it is connected to these levers. The treadle assembly may be covered by a flexible mat 60, which may be rubber or any other suitable type of mat. The master cylinder 53 is connected by a fluid conducting conduit 36 to the passage 29 in the control housing 27. This treadle mechanism may be placed either on the inside or outside of the door on a porch, for example, and if it is placed on the porch, and a second treadle-operating assembly is desired on the inner side of the door, a second fluid pressure conduit 37 may be led from the passage 29 to the second master cylinder and treadle assembly.

The operation is as follows:

The treadle containing the master cylinder 53 and the treadle means for transferring pressure to it may be set up on the floor at the proper distance from the door. It may be on the floor of a porch from which the door leads to the interior of the house, and another master cylinder and treadle operating means may be provided on the inside of the door if desired. Pressure on the treadle, as for example by the operator stepping on the mat 60 over the treadles 55 or 56, forces fluid under pressure from the master cylinder 53 through the conduit 36 and passages 29 and 28 to the work cylinder 20. This pressure forces the piston 21 and the push rod 22 outwardly or to the left as viewed in the figures of the

3

drawing, and as this cylinder and piston 20, 21 expands, the door is pushed to the open position. However, the hydraulic or fluid pressure is first applied through the conduit 39 to the fluid pressure operated device 40, in this case the cylinder, to shift the piston 41 and release the latch 16. Pressure from the master cylinder opens the check valve 30 to permit free passage of the fluid under pressure to the work cylinder 20. Thus pressure on the master cylinder by someone, for example, stepping on the treadle mechanism first releases the catch 16 and then shifts the door to the open position, permitting the person to pass through the door without the necessity of using the hands for in any way operating it. Upon removal of pressure from the treadle mechanism and the master cylinder 53, this cylinder and the treadle mechanism are returned to their original or normal positions by the springs 59. This tends to draw the fluid in the system back to the master cylinder, and reduced pressure in the passage 29 closes the check valve 30. The spring 44 starts to swing the door back to the closed position, and to prevent too rapid closing of the door the fluid returning from the work cylinder 20 to the master cylinder must flow through the by-pass 34 and the restricting or control valve 35, this valve being adjusted or positioned to regulate the flow of the fluid, such as oil, for example, back to the master cylinder and therefore control the closing of the door to prevent too rapid movement or slamming of the door. Reduction of pressure in the passage 29 also reduces the pressure on the auxiliary fluid operated means 40 for the latch, permitting the latch to assume its retaining position in the usual manner, by operation of the spring 18, or if desired a spring 61 could be provided in the cylinder 40 to return the piston 41 to the retracted position.

It will be clear from the above that this provides a very simple and effective device for controlling operation of the door without the use of the hands and merely by stepping on a treadle mechanism which may be placed on the top of a floor adjacent the door, either on the inside or outside of the door, without requiring reconstruction or changing the floor in any way, and the release of the door latch and operation of the door are automatically controlled from this treadle mechanism, and after pressure on the treadle mechanism is released the door and the latch are returned to their normal positions.

Having thus set forth the nature of my invention, I claim:

1. In combination with a door actuating mechanism, a movable door, a cylinder having a fluid operated piston connected to the door for shifting it to the open position, return means tending to shift it to the closed position, a master cylinder and means for operating it mountable as an assembled unit on a floor associated with the door, said unit comprising a base member adapted to rest on the floor, a pair of levers above the base member pivoted to the base member at their outer ends and pivotally connected at their inner ends, the master cylinder comprising a flexible bellows between the levers and the base member, and compression springs between the levers and the base member; a fluid conduit connection from the master cylinder to the first cylinder, said levers forming a treadle for operating the master cylinder to supply fluid under pressure to the first cylinder to open the door, and a control means in the connection from the master cylinder to the first cylinder comprising a check valve arranged to open to permit free flow of fluid to the first cylinder and close to prevent flow in the opposite direction, and a by-pass passage around the check valve provided with a control valve to control return of fluid from the first to the master cylinder and control speed of closing of the door.

2. In combination with a door actuating mechanism,

4

a movable door provided with a latch to retain it in the closed position, a work cylinder having a fluid operated piston connected to the door for shifting it to the open position, return means tending to shift the door to the closed position, an auxiliary cylinder having fluid operated means connected to the latch for releasing it, a base member mountable on a floor associated with the door, a master cylinder comprising a flexible bellows mounted on the base member, a fluid conduit connection from the master cylinder to the work and auxiliary cylinders, a treadle for operating the master cylinder to supply fluid pressure to the other cylinders to first release the latch and then open the door, said treadle comprising a pair of levers above the base member pivoted to this member at their outer ends and pivotally connected at their inner ends, said master cylinder being located between the levers and the base member, compression springs between the levers and the base member, and a control means in the connection from the master cylinder to the work cylinder comprising a check valve arranged to open to permit free flow of fluid from the master to the work cylinder and close to prevent flow in the opposite direction, and a by-pass passage around said valve provided with a control valve to control return of fluid from the work cylinder to the master cylinder and control speed of closing of the door.

3. In combination with a door actuating mechanism, a movable door provided with a latch to retain it in the closed position, fluid operated means connected to the door for opening it, return means tending to shift the door to the closed position, auxiliary fluid operated means connected to the latch for releasing it, a base member mountable on a floor associated with the door, a master cylinder comprising a flexible bellows mounted on the base member, a fluid conduit connection from the master cylinder to the fluid operating means for the door and the latch, a treadle for operating the master cylinder to supply fluid pressure to said operating means to first release the latch and then shift the door to the open position comprising a pair of inverted channel shaped levers pivoted at their outer ends to the base member and pivotally connected at their inner ends, said master cylinder being located between the levers and the base member, and means for returning the treadle and master cylinder to their original positions to permit closing of the door and return of the latch to retaining position comprising compression springs in the levers between the levers and the base member.

4. In combination with a door actuating mechanism, a movable door, a fluid pressure operated means connected to the door for shifting it to the open position, return means tending to shift the door to the closed position, means for controlling the action of said fluid operated means comprising a treadle assembly adapted to be located on a floor associated with the door comprising a base member, a control member in the base member comprising a flexible bellows connected to the fluid operated means, a pair of levers pivoted to opposite sides of the base member with free ends extending toward each other and connected together, said levers being located over the control bellows to operate it by foot pressure applied to the levers, and resilient means comprising compression springs between the levers and the base member for returning the levers to their normal positions after removal of the foot pressure.

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