This invention relates generally to doors and more particularly to a door of sliding type, such as are used in garages, and means to propel the door in two directions.

In brief, this invention includes means to move a member such as a sliding garage door, either horizontally or vertically into an overhead position, and to forcibly return the door to its original position. A cylinder with a piston and piston rod is used to propel a trolley along a track and this trolley carries a pair of pulleys through which the cables are entrained and the ends of the cables are secured to fixed structure and to opposite ends of the door in such a manner that movement of the trolley will force the door in either direction. The invention includes, of course, means to provide fluid under pressure to the said cylinder, at either end thereof so that a double acting piston in the cylinder will be driven in two directions so as to actuate the trolley.

The primary object of this invention is to provide means for opening and closing doors and the like quickly and positively, and to lock such doors in fully closed, fully open or partially open positions.

Another object of this invention is to provide a door controlling means which makes the operation of garage doors and the like very safe, the positive control of the door by the apparatus proposed by the instant invention preventing accidents which frequently occur due to the slamming and falling of hinged and gravity actuated doors.

Still another object of this invention, of a specific nature, is to provide means whereby jamming or inadvertent locking of a garage door in an unwanted position is prevented.

And a last object to be mentioned specifically is to provide means of the character mentioned above which is relatively inexpensive and practicable to manufacture, easy and simple, as well as completely safe, to operate and which will give generally efficient and durable service.

With these objects definitely in view, together with other objects which will appear hereinafter as this description proceeds, this invention resides in certain novel features of construction, combination and arrangement of elements and portions as will be hereinafter described in the specification, particularly pointed out in the appended claims, and illustrated in the accompanying drawings which form a material part of this application, and in which:

Figure 1 is a vertical sectional view of a portion of a garage, doorway and garage door and showing this invention incorporated therewith and illustrated in elevation;

Figure 2 is an enlarged fragmentary vertical sectional view of the track and cylinder and contiguous structure including the trolley;

Figures 3 and 4 are transverse vertical sectional views, taken on the section lines 3 and 4 in Figure 2;

Figure 5 is a similar view taken on the section line 5—5 of Figure 2;

Figure 6 is a transverse sectional view taken on the line 6—6 in Figure 1.

Similar characters of reference indicate similar or identical elements and portions throughout the specification and throughout the several views in the drawings.

Referring now to the drawings in detail, this invention is adapted to be used with an environment which is illustrated as an automobile garage having a front wall 10 with a doorway 12 therein and a roof structure indicated at 14. It will be understood that the illustrated garage is included in the drawings only by way of exemplification of a suitable environment for this invention, and it should be stressed that the hereinafter described construction may be used with a door which slides horizontally, or with a door which is rigid rather than sectionalized, all without material alteration in the structure of the elements described in this specification. Relocation of the means to guide the door and certain of the means used to guide the cables will, of course, be necessitated when this invention is used with a door which slides along a horizontal path.

Figure 1 illustrates a door 16 which is comprised of a plurality of sections having hinges 20 including hinge pins 22 which may be used, with or without rollers, to guide the door along a track 24, illustrated as of the character ordinarily located at each side of the door 16 and curved at the top so that a horizontal portion 26 of the track extends overhead for support of the door in open position.

A cylinder 28 and a trolley track 30 are supported by any suitable means illustrated by the bracket devices 32 and 34, these bracket devices being suspended on the roof 14 in the illustrated embodiment of this invention. The cylinder 28 is provided with a double acting piston 35 of any suitable design and a relatively long piston rod 38. The piston rod 38 is connected, as by means of a horizontally extending arm portion 37, to a four wheel trolley generally indicated at 39. The wheels 40 of the trolley 39 function as
anti-friction means and guide means for the main carriage portion of the trolley and a depending arm of the trolley 44 extends between the rail portions 42 of the track 30 and is hinged to a fork 45 which carries a pair of pulleys 48.

The means to drive the trolley 38 will now be mentioned. A motor 55 drives a compressor 52 which is connected through a valve 54 to a pair of pipes 56 leading to a pair of reservoir tanks 58. A pair of pipes 66 connect the ends of the cylinder 28 with the reservoirs 58, each pipe 66 having a portion 52 depending into the lower portion of the corresponding reservoir 58, as illustrated in Figure 6. The reservoirs 58 will be partially filled with liquid such as a suitable oil and the compressor 52 will supply air under pressure selectively to the upper portions of the reservoirs 58 forcing the liquid into either end of the cylinder 28, according to the manual disposition of the valve 54. An exhaust pipe 64 will be connected to the valve 54 so that air may be exhausted from one of the reservoirs 58 while air is being forced into the other reservoir, the exact construction of the valve means 54 being thought unnecessary to illustrate in this application. It is preferred that the exhaust pipe 64 should extend from the valve through the roof of the garage, as indicated in Figure 1.

One flexible cable 65 is connected to the bottom of the door 16, as indicated at 68, the cable being extended upwardly parallel to the door in closed position and entrained over a pulley 70 mounted on the bracket 34, thence and one of the pulleys 48 and returned around still another pulley 72 which is illustrated as mounted upon the bracket 34, and finally secured to a coiled spring 74 having one end fixed to adjacent structure such as the front wall 10 of the garage.

A second cable 76 has one end secured to an angularly disposed arm 78 on the upper end of the door 16, and is entrained over the other of the pulleys 48 carried by the trolley 38, and secured to one end of a coiled spring 80 which has its other end secured to fixed structure such as the cylinder 28, as indicated in Figure 1. It will be clear that many refinements or structure, such as the piston buffer springs 82 may be added to this invention without departure from the spirit thereof and that the different elements may be varied considerably in form without materially altering the method of operation of this invention. The method of operation of this invention will be clearly understood from the foregoing description of the mechanical details taken in conjunction with the drawings and the above related objects.

Accordingly the scope of this invention should be limited only in accordance with a proper interpretation of the sub-joined claims.

Having described the invention, what is claimed as new is:

1. A door operating device for moving a door frame from a vertical to a horizontal position comprising an articulated door, a pair of tracks, said tracks being disposed at each side of said door, means at the articulations of the door engaging said tracks, a portion of said track extending vertically, another portion of said track extending horizontally, a curved portion connecting said vertical and horizontal portions, a trolley track substantially parallel to said horizontal section, a trolley mounted on said trolley track, a pair of pulleys mounted on said trolley, a flexible cable secured to the bottom of the door, a pulley supporting said cable in line with the vertical position of said door and in the path of travel of the trolley, said cable extending around one of said pulleys mounted on said trolley and being anchored in proximity to and above the vertical portion of the track, an angled attachment secured to the top of said door, a second cable, one end of said second cable being joined to said angled attachment, said second cable extending over another pulley on said trolley and extending in parallel relation to said trolley track, said second cable being anchored at a point adjacent the path of travel of the trolley and beyond the limit of travel of said trolley, a resilient means connected between said second cable and the anchor point, a fluid motor for propelling said trolley along said trolley track.

2. A door opening device for an articulated door movable on a track from a vertical to a horizontal position comprising a trolley track substantially parallel to and adjacent to the horizontal position of said door, a trolley mounted on said trolley track, a pair of pulleys mounted on said trolley, a flexible cable secured to the bottom of the door, a pulley supporting said cable in line with the vertical position of said door and in the path of travel of the trolley, said cable extending around one of said pulleys mounted on said trolley and being anchored in proximity to and above the vertical portion of the track, an angled attachment secured to the top of said door, a second cable, one end of said second cable being joined to said angled attachment, said second cable extending over another pulley on said trolley and extending in parallel relation to said trolley track, said second cable being anchored at a point adjacent the path of travel of the trolley and beyond the limit of travel of said trolley, a resilient means connected between said second cable and the anchor point, a fluid motor for propelling said trolley along said trolley track.

3. A door opening device for an articulated door movable on a track from a vertical to a horizontal position comprising a trolley track substantially parallel to and adjacent to the horizontal position of said door, a trolley mounted on said trolley track, a pair of pulleys mounted on said trolley, a flexible cable secured to the bottom of the door, a pulley supporting said cable in line with the vertical position of said door and in the path of travel of the trolley, said cable extending around one of said pulleys mounted on said trolley and being anchored in proximity to and above the vertical portion of the track, an angled attachment secured to the top of said door, a second cable, one end of said second cable being joined to said angled attachment, said second cable extending over another pulley on said trolley and extending in parallel relation to said trolley track, said second cable being anchored at a point adjacent the path of travel of the trolley and beyond the limit of travel of said trolley, a resilient means connected between said second cable and the anchor point, a fluid motor for propelling said trolley along said trolley track.

4. A door opening device for an articulated door movable on a track from a vertical to a horizontal position comprising a trolley track substantially parallel to and adjacent to the hori-
zontal position of said door, a trolley mounted
on said trolley track, a pair of pulleys mounted on
said trolley, a flexible cable secured to the bottom
of the door, a pulley supporting said cable in line
with the vertical position of said door and in the
path of travel of the trolley, said cable extending
around one of said pulleys mounted on said
trolley and being anchored in proximity to and
above the vertical portion of the track, an angu-
lated attachment secured to the top of said door,
a second cable, one end of said second cable being
joined to said angulated attachment, said second
cable extending over another pulley in said
trolley and extending in parallel relation to said
trolley track, said second cable being anchored
at a point adjacent the path of travel of the
trolley and beyond the limit of travel of said
trolley, a resilient means connected between said
second cable and the anchor point, a double act-
ing fluid motor including a cylinder, a piston in
said cylinder, a piston rod extending from said
cylinder and connected to said trolley, a pair of
reservoirs, pipes connecting the lower portions of
said reservoirs with the ends of said cylinders,
an air compressor, other pipes connecting the
reservoirs with said air compressor, and valve
means selectively connecting the compressor to
said reservoirs and simultaneously venting air
from that reservoir not connected to said comp-
pressor.

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