ACTUATOR FOR DOOR OPENING MECHANISMS

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This invention relates to door opening mechanisms and more particularly to such mechanisms as may be automatically actuated by the presence of a person in the vicinity of the door.

The principal object of the invention is the provision of an actuator for door opening mechanisms.

A further object of the invention is the provision of a relatively simple and inexpensive actuator for door opening mechanisms.

A still further object of the invention is the provision of an actuator for door opening mechanisms which may be easily installed in present door openings.

A still further object of the invention is the provision of an actuator for door opening mechanisms which will operate to open the door when a person steps on the actuating mechanism and which will operate to prevent the door from opening when a person approaches the door from the opposite side.

A still further object of the invention is the provision of a simple, inexpensive and easily formed actuator for door opening mechanisms.

The actuator for door opening mechanisms disclosed herein comprises a simple and efficient device for controlling an air piston and cylinder assembly which in turn applies motion to a door for opening and closing the same. The actuator disclosed herein is so formed that it may be easily positioned in existing doorway constructions without remodeling the said constructions or altering the structures thereof and may be removed from the doorway without necessitating expensive floor repairs or replacements.

The device includes a simple mechanism for utilizing the weight of a person approaching the door to open an air valve and thereby actuate the door and is so formed that it will hold the door open until the person passes therethrough and moves off of the device. The actuator for door opening mechanisms also includes mechanism for rendering the device inoperative when the door is approached from the wrong side to eliminate the possibility of accident.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed can be made within the scope of what is claimed without departing from the spirit of the invention.

The invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a perspective view with parts broken away of the actuator for door opening mechanisms applied to a hinged door in a doorway equipped with an air cylinder opening mechanism.

Figure 2 is a top plan view with parts broken away of the actuator for door opening mechanisms.

Figure 3 is a horizontal section on line 3—3 of Figure 2.

Figure 4 is an enlarged perspective detail of a portion of the mechanism shown in Figure 1.

Figure 5 is an enlarged perspective detail of a portion of the mechanism shown in Figure 2.

Figure 6 is a horizontal section taken on line 6—6 of Figure 5.

By referring to the drawings and Figure 1 in particular it will be seen that a door opening mechanism as defined by a frame 10 is illustrated and a door 11 is hinged therein for opening inwardly with respect to the frame 10, away from the point of view in Figure 1. The door 11 is hinged at the left edge, as viewed in Figure 1, and the door frame 10 supports a housing 12 enclosing an air piston and cylinder assembly 13 which is operatively connected by suitable crank arms 14 with an arm 15 secured by means of a plate 16 to the door 11. The air cylinder and piston assembly 13 is connected with a source of compressed air by means of a pipe 17 and the source of compressed air is controlled by a valve 18 cut into the pipe 17 and also located in the housing 12. A lever 19 is pivoted as at 20 in proximity to an operating plunger 21 of the air valve 18 which is arranged so that when the plunger 21 is moved upwardly, as seen in Figure 1 of the drawings, the air valve is opened and the air piston and cylinder assembly energized. A flexible cable 22 is connected as at 23 to the pivot lever 19 and enclosed in a guiding and protecting tube 24 which is preferably located within the space defined by the door frame 10.

The tube 24 enclosing the flexible cable 22 extends downwardly through the door frame 10 and outwardly beneath the door 11 where it is enclosed in a thin tread plate assembly which replaces the usual sill of the doorway opening and which extends outwardly away from the door on both sides thereof. The tread plate assembly includes a bottom plate 25, an entrance tread plate 26 and exit tread plate 27. The entrance tread plate is hinged as at 28 to one of the outermost ends of the bottom plate:
its inner end is supported on springs 29, in elevated relation to the tread plate 25. The exit tread plate 27 is hinged at its outermost edge by means of hinges 30 to the outermost opposite edge of the bottom plate 25 and is also supported in elevated relation to the bottom plate 25 by springs 31 located underneath its innermost edge. The springs 29 and 31 are intended to normally support the tread plates 26 and 27 in elevated relation to the bottom plate 25 and to permit the tread plates 26 and 27 to be depressed at such time as a person steps thereon.

In order that the movement of the tread plates 26 and 27 may be utilized to actuate the valve 18, heretofore described, the tube 24 enclosing the flexible cable 22 is run beneath the bottom plate 25 to a point centrally with respect to the edges thereof and the flexible cable 22 connected to the vertical end of an L-shaped lever 32 which is pivoted between the arms of a bifurcated bracket 33 by a pivot pin 34 as best shown in Figure 4 of the drawings. The bifurcated bracket 33 is secured to the bottom of the bottom plate 25 and is located in a depression formed in the floor over which the bottom plate 25 is positioned (see Figures 1, 3, 4 and 5 of the drawings). An opening 35 is formed in the bottom plate 25 and a vertically positioned rod 36 is positioned therein with its lower end resting on the horizontal portion of the L-shaped lever 32, it being observed that the rod 36 passes between the arms of the bifurcated bracket 33. The upper end of the rod 36 is secured to the tread plate 26 as indicated by the numeral 37 so that the rod 36 moves vertically when the tread plate 26 moves.

It will thus be seen that when the entrance tread plate 26 is stepped upon, as by a person approaching the door 11, the coil springs 29 are compressed and the tread plate 26 moves downwardly, the movement being imparted to the vertically positioned rod 36 which in turn moves the L-shaped lever 32 and imparts movement to the flexible cable 22. This movement is in turn transmitted by the flexible cable 22 to the lever 19 which moves the plunger 21 of the air valve 18 and admits air to the air piston and cylinder thereby operating the door 11.

In order that the door 11 may remain open until the person actuating the mechanism has time to walk through the doorway defined by the door frame 10 and out of the way of the door 11, means is provided for locking the entrance tread plate 26 in depressed position so as to hold the air valve 18 open and such means comprises a series of levers interconnecting the entrance tread plate 25 with the exit tread plate 27 as best shown in Figures 2, 3, 6, and 7 of the drawings. By referring thereto it will be seen that such levers as the tread plate 25 is depressed, a depending bracket 38 secured thereto by fasteners 39 and movably positioned through a slot 40 in the bottom plate 25, engages and moves a secondary L-shaped lever 41 by reason of its engagement with a dovetailed slot 42 formed in the end of the horizontal portion of the secondary L-shaped lever 41. The lever 41 is pivoted between a pair of depending arms 43 by means of a pivot pin 44 and the vertical portion of the secondary L-shaped lever 41 is bifurcated and carries a pivot pin 45. A link 46 is pivoted at one end to the pivot pin 45 and hence to the upper end of the vertical portion of the secondary L-shaped lever 41 and the other end of the link 46 is pivoted by a pin 47 to a pair of spaced arms 48 on a slide piece 49 which in turn is reciprocally mounted in a body member 50 secured immediately beneath the bottom plate 25.

The bottom member 50 has an opening 51 therein centrally thereof and the slide piece 49 has an opening 52 therein in alignment with the opening 51 and normally out of registry therewith. The slide piece 49 also has a depression 53 therein spaced inwardly thereof with respect to the opening 52 and adapted to register with the rounded lower end of a locking pin 54 which is positioned below the exit tread plate 27 and secured thereto by suitable fasteners, as indicated by the numeral 55. It will thus be seen that at such time as a person steps upon the entrance tread plate 26, the previously described operation of the air valve takes place and causes the door to open. Simultaneously with the operation of the air valve and the downward movement of the tread plate 26, the bracket 33 moves downwardly and tilts the secondary L-shaped lever 41 causing it to move the lever 45 inwardly of the mechanism or to the left. As shown in Figures 3, 4 and 5 of the drawings when this occurs the slide piece 49 moves inwardly or to the left as shown in Figures 3, 5 and 6 and brings the opening 52 into registry with the opening 51 and the locking pin 54. As the person actuating the device steps across the threshold area of the entrance tread plate 26, the slide piece 49 is depressed by the weight of the person and the locking pin 54 moves downwardly into registry with the openings 52 and 51 in the slide piece 49 and body member 50, respectively, and prevents the slide piece 49 from returning to normal position, which action holds the link 46, the secondary L-shaped lever 41, and the depending bracket 33 and thereby holds the entrance tread plate 26 in depressed position until such time as the person steps off the exit tread plate 27.

When this occurs the spring 31 under the exit tread plate 27 moves the same upwardly and disengages the locking pin 54 from the openings 52 and 51 in the slid piece 49 and body member 50, respectively, which releases the interconnecting means and permits the entrance tread plate 26 to rise to normal position. It will thus be seen that the door is held open while the person passes therethrough and during such time as the person's weight is carried on the exit tread plate 27.

It will be obvious to those skilled in the art that it is desirable to protect persons who inadvertently approach the door from the wrong side as they would otherwise be injured by the door opening against them if the mechanism were actuated. Such protection is afforded by forming a depression 53 in the slide piece 49 immediately beneath the locking pin 54 when the slide piece 49 is in normal position in the body member 50. A person stepping on the exit tread plate 27 will cause the immediate engagement of the locking pin 54 in the depression 53 and thereby lock the slide piece 49 against movement with respect to the bottom 25 or the body member 50 in which it is positioned. Such action will hold the slide piece 49, the link 46, the secondary L-shaped lever 41 and the bracket 33 in stationary position and thereby hold the entrance tread plate 25 in elevated relation and thus prevents the operation of the air valve 18 and hence the opening of the door 11. In this connection it will be observed that when there is no weight on the exit tread plate 27, the springs 31 normally hold the locking pin 54 out of engagement with the depression 53 and there-
by render this automatic locking action inop-erative except at such times as weight is placed on the exit tread plate 21 prior to or simultaneously with the placing of weight on the entrance tread plate 25.

By referring now to Figures 1 and 3 of the drawings it will be seen that an envelope 56 is positioned about the entire actuator assembly including the bottom plate 23 and the tread plates 26 and 27, respectively, and spanning the transverse slot existing between the inner opposed edges of the tread plates 23 and 27. The envelope 56 is preferably provided with tapering nose sections 57 and 58 on the opposite ends and located adjacent the hinges 28 and 30, respectively, and is formed of flexible material such as rubber so that its elasticity permits the operation of the device enclosed therein and at the same time prevents the entrance of moisture or foreign materials which might interfere with the operation of the device. The tread plates 26 and 27 are preferably formed of cast aluminum properly ribbed to provide rigid structures.

It will thus be seen that the several objects of the invention are met by the device disclosed herein and that a simple and efficient actuator for door opening mechanisms has been disclosed which is usable with any of the conventional air piston and cylinder door operating mechanisms known in the art.

It will also be seen that the device operates the relatively remotely situated air valve by means of the interconnecting flexible cable 22 enclosed in the protective tubing 24 and it will occur to those skilled in the art that rods or suitable wire may be substituted for the flexible cable 22, if desired, without departing from the spirit of the invention.

Having thus described my invention, what I claim is:

An actuating device having a pair of tread plates positioned adjacent one another, each of which is independently and yieldingly supported, a device operatively connected with one of the said tread plates to enable downward motion thereof to be utilized in controlling a remotely located object and a locking device disposed beneath the said tread plates and connected with the other one of the said tread plates for temporarily supporting the first mentioned tread plate in elevated relation and rendering the said device inoperative when the last mentioned tread plate is moved in advance of the first mentioned tread plate, the said locking device comprising a body member disposed beneath said last mentioned tread plate, a slide piece movably positioned in said body member and means connecting said slide piece with said first mentioned tread plate for horizontal movement thereby, a vertical fixed pin on said last mentioned tread plate and openings in said body and said slide piece for vertical alignment and registry with said pin when said last mentioned tread plate is depressed while the said openings are in vertical alignment, the said openings being out of registry when the slide piece is moved.

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REFERENCES CITED

The following references are of record in the file of this patent:

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