July 17, 1934. E. R. BEEMAN 1,966,943

DOOR OPERATOR

Filed July 28, 1932 2 Sheets-Sheet 1

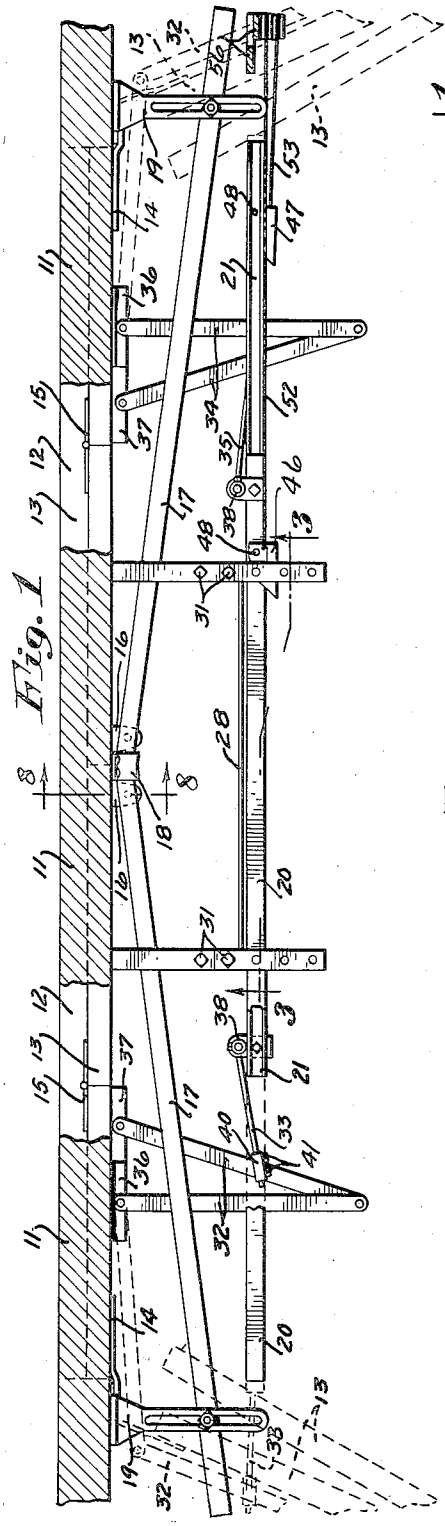


Fig. 1

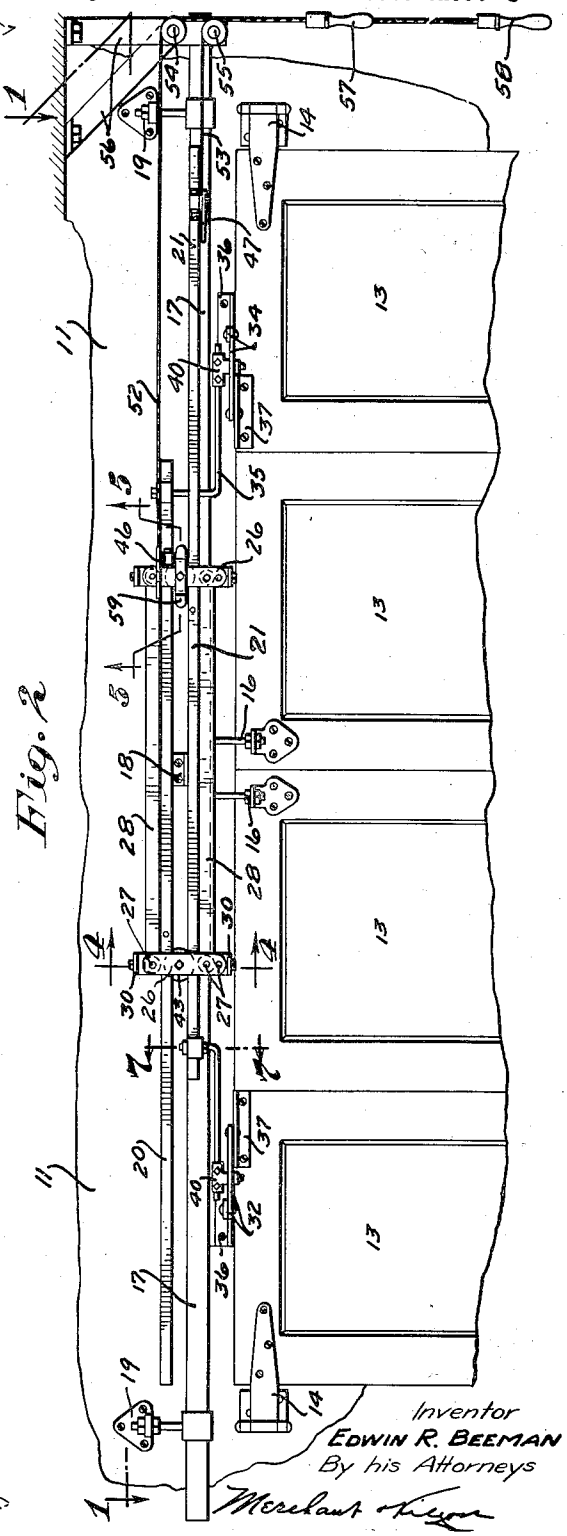


Fig. 2

Inventor
EDWIN R. BEEMAN
By his Attorneys
Merchant & Gould

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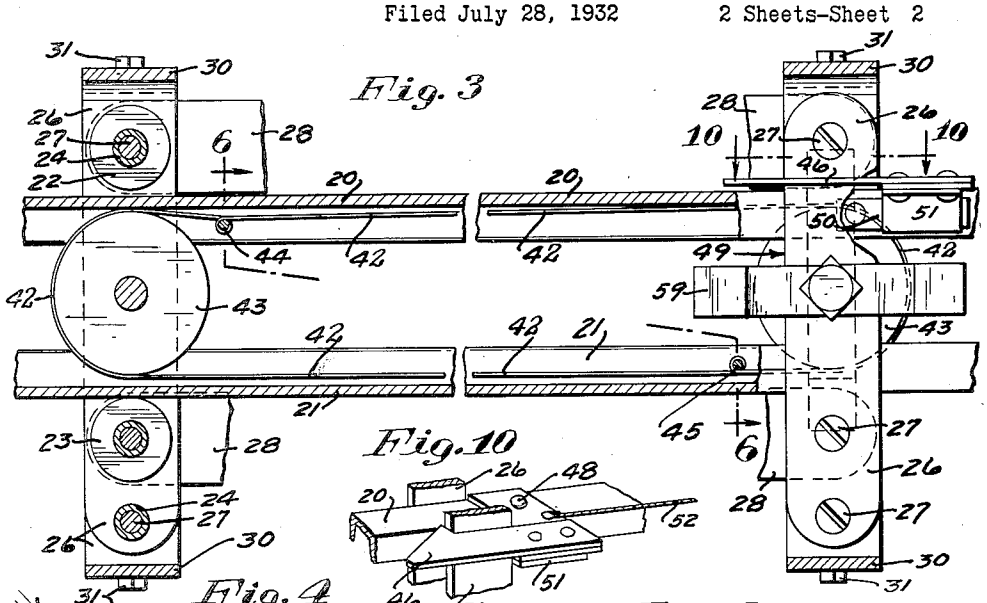


Fig. 3

Fig. 10

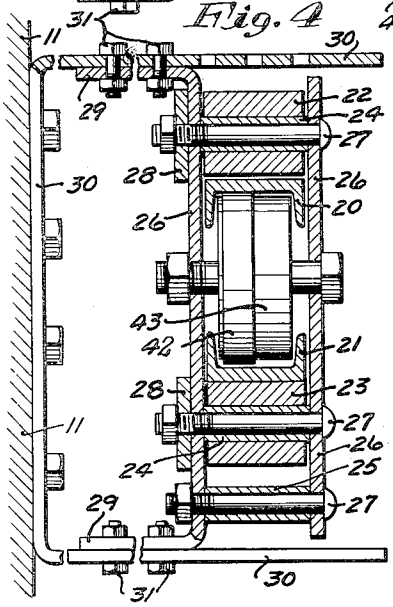


Fig. 4

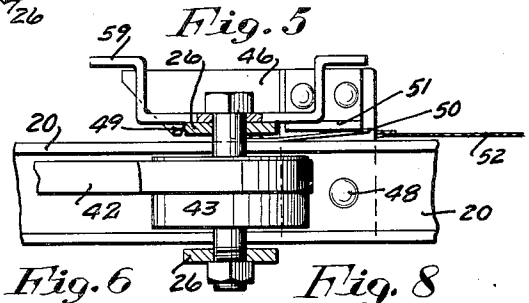


Fig. 5

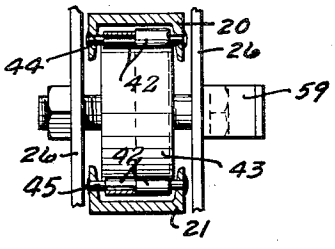


Fig. 6

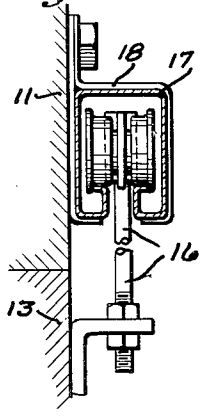


Fig. 8

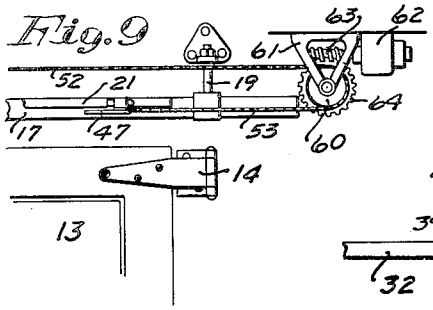


Fig. 9

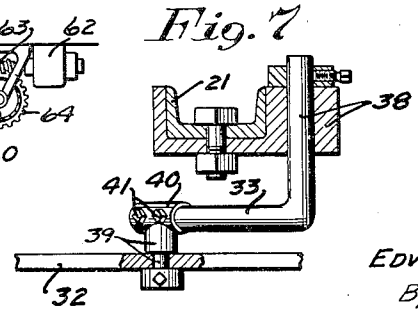


Fig. 7

Inventor
EDWIN R. BEEMAN
By his Attorneys

Patented July 17, 1934 1,966,943

UNITED STATES PATENT OFFICE

1,966,943

DOOR OPERATOR

Edwin R. Beeman, Minneapolis, Minn.

Application July 28, 1932, Serial No. 625,322

6 Claims. (Cl. 268—68)

My present invention relates to door operators and has for its object the provision of an extremely simple and highly efficient door operator intended for general use in connection with horizontal swinging doors of the double-fold type arranged in pairs with the doors of each pair hinged for reverse opening and closing movements and, when closed, meet at their inner edges.

To the above end, generally stated, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a fragmentary view partly in plan and partly in horizontal section taken on the line 1—1 of Fig. 2 with the doors shown closed by means of full lines and opened by means of broken lines;

Fig. 2 is an elevation of the parts shown in Fig. 1 looking at the same from the inside of the building;

Fig. 3 is a fragmentary view partly in elevation and partly in vertical section taken on the line 3—3 of Fig. 1, on an enlarged scale;

Fig. 4 is a detail view partly in elevation and partly in section taken on the line 4—4 of Fig. 2, on an enlarged scale;

Fig. 5 is a fragmentary detail view partly in bottom plan and partly in horizontal section taken on the line 5—5 of Fig. 2, on an enlarged scale;

Fig. 6 is a fragmentary detail view with some parts sectioned on the irregular line 6—6 of Fig. 3;

Fig. 7 is a fragmentary detail view with some parts sectioned on the line 7—7 of Fig. 2, on an enlarged scale;

Fig. 8 is a view partly in elevation and partly in section taken on the line 8—8 of Fig. 1, on an enlarged scale;

Fig. 9 is a fragmentary view of certain of the parts shown in the upper right hand corner of Fig. 2, and illustrating power means for opening and closing the doors instead of manually-operated means, as shown in Figs. 1 and 2; and

Fig. 10 is a perspective view of the upper latch with some parts sectioned on the line 10—10 of Fig. 3.

The numeral 11 indicates a fragment of the wall structure of a building, such as a garage or the like, and has a door opening 12 normally closed by a pair of double-fold doors 13. The outer sections of the doors 13 are attached by hinges 14 to the door frame and the inner sections of the doors 13 are attached by hinges 15 to said outer sections. Said hinges 14 are arranged to cause the outer sections of the doors 13 to swing into the building, one on each side of the door opening 12, and the hinges 15 are arranged to cause the inner sections of said doors to fold onto the outer sections of the doors 13 at the outer faces thereof, as indicated by broken lines in Fig. 1.

The outer sections of the doors 13, at their inner upper corners, are held suspended by means of hangers 16 from a pair of horizontal tubular track rails 17. These rails 17 at their inner or adjacent ends are secured by a bracket 18 to the wall structure 11, above the door opening 12 at the horizontal center thereof. The rails 17 at their outer end portions are held suspended by brackets 19 from the wall structure 11. The two rails 17 from the bracket 18 are in inwardly diverging relation and the hangers 16 include swiveled carriages arranged to run in the track rails 17, see Fig. 8. The parts thus far described are of standard and well known construction.

Referring now in detail to the improved door operator the same includes a pair of bars 20 and 21 vertically spaced, the former above the latter, and above the door opening 12. These bars 20 and 21 extend parallel to the wall structure 11 and to each other and are mounted between two pairs of upper and lower guide rollers 22 and 23, respectively, for endwise movement. The guide rollers 22 and 23 are loosely journaled on spacing sleeves 24 which form certain of the transverse members of a pair of bearing brackets. Each bearing bracket, in addition to the sleeves 24, also includes a sleeve 25 below the rollers 23 and upright inner and outer plates 26 which are held laterally spaced by the sleeves 24 and 25 and rigidly connected by nut-equipped bolts 27 which extend through said sleeves and holes in the plates 26, see Fig. 4. The two bearing brackets are connected by upper and lower cross-tie bars 28 secured, by the bolts 27 in the sleeves 24, to the rear plates 26.

Formed with the ends of each inner plate 26 are horizontal arms 29 which project between the arms of a U-shaped bracket 30 and are adjustably but rigidly secured thereto by short nut-equipped bolts 31. The arms of the wall brackets 30 extend horizontally from the wall

structure 11 and the transverse or horizontal portions thereof are rigidly secured to said structure. The bars 20 and 21 are channel-shaped in cross-section with the flanges thereof in opposing relation and with the bar 21 resting directly on the rollers 23. The two wall brackets 30 are spaced equi-distances from the center of the door opening 12. The bars 20 and 21 are held by the plates 26 against lateral movement on the rollers 22 and 23, respectively.

The left hand end of the bar 21 is connected to the outer section of the left hand door 13 at its upper right hand corner by a toggle-lever 32 and a link 33 and the right hand end of the bar 20 is connected to the outer section of the right hand door 13 at its upper left hand corner by a toggle-lever 34 and a link 35. These two connections 32—33 and 34—35 are substantially identical, the one with the other, and each toggle-lever 32—34 is in the form of a pair of pivotally connected arms, one of which is pivoted at its outer end to a bracket 36 secured to the wall structure 11 just above the door opening 12 and the other of which is pivoted at its outer end to a bracket 37 on the outer section of the respective door 13.

The links 33 and 35 are swivelled at one of their ends to the respective bars 20 and 21, as indicated at 38, and their other ends are swivelled at 39 to the anchor arms of the toggle-levers 32 and 34. It is important to note that the swivel connections 39 have sleeves 40 through which the links 33 and 35 extend for endwise adjustment and are rigidly secured thereto by pairs of set-screws 41. It will be noted, by reference to Fig. 1, that the toggle-levers 32 and 34 are buckled when the doors 13 are closed and that said doors are opened by the straightening movements of said levers.

To adjust the links 33 and 35 in the sleeves 40 of the swivel connections 39 the screws 41 are loose and the doors 13 closed which causes said links to automatically adjust themselves in the sleeves 40 and in which adjustment the screws 41 are tightened to rigidly connect the links 33 and 35 to the sleeves 40.

The bars 20 and 21 are connected for reverse endwise movement by a pair of flat steel tapes folded upon themselves around a pair of pulleys 43 with their end portions extending toward each other. These pulleys 43 are journaled one on each of the bearing brackets between the two bars 20 and 21 and are held by the flanges of said bars against axial shifting movement on their journals, see Fig. 4.

The tapes 42 are edgewise spaced and have their upper ends secured to the bar 20 by an anchor pin 44 and their lower ends are secured to the bar 21 by an anchor pin 45. By the connections, to wit: the tapes 42 and pulleys 43, when one of the bars 20—21 is moved endwise, a reverse endwise movement is imparted to the other of said bars. This reverse endwise movement of the bars 20 and 21 by the connections 32—33 and 34—35 will either open or close the doors 13 depending on which way said bars are moved. The bar 20 is supported from the pulleys 43 and rests directly on the tapes 42. The roller 22 prevents lifting movement of the bar 20 from the pulleys 43. In place of the tapes 42 it is of course understood that chains, cables or any other suitable means may be substituted therefore.

To lock the doors 13 either open or closed there is provided an upper latch 46 and a lower latch 47, the former of which is on the right hand end portion of the upper bar 20 and the latter of which is on the same end portion of the lower bar 21. Each latch 46—47 has a body in the form of a right angle, one arm of which is relatively long and the other arm of which is relatively short. The short arms of the latches 46—47 are pivoted at 48 to the respective bars 20—21 at the outer faces of their webs and extend in planes substantially parallel to said faces. Formed with the long arms of the latches 46—47 are hooks arranged to alternately engage the inner vertical edge of the inner plate 26 of the right hand bearing bracket and hereafter referred to as the latch plate 49. The latches 46—47 are yieldingly held in operative positions by leaf springs 50 anchored one to each of the bars 20—21 and held under compression by an angle block 51 on each latch 46—47 at the elbow thereof, see Figs. 3 and 5.

The latches 46—47, of course, alternately engage the latch plate 49, the former to hold the doors 13 closed and the latter to hold said doors open. To release either latch 46—47, at will, a cable 52 is attached at one end to the latch 46 at its elbow and a cable 53 is attached at one end to the latch 47 at its elbow. These cables 52 and 53 are arranged to run over guide sheaves 54 and 55, respectively, journaled on a ceiling bracket 56. The cables 52 and 53 between the bars 20—21 and the sheaves 54—55 are substantially parallel to said bars and outward of said sheaves the cables 52 and 53 hang down and have on their lower ends handles 57 and 58, respectively.

To positively hold either one of the latches 46—47 so that it can not be released and thereby lock the doors 13 either open or closed, depending on which latch is interlocked with the latch plate 49, there is provided a turn button 59 mounted on the bolt forming the journal for the right hand pulley 43. This turn button 59 is constructed and arranged to be turned transversely over either one of the latches 46—47, depending on which one is in engagement with the lock plate 49, and positively hold the same interlocked therewith.

Obviously, the cables 52 and 53 may be extended any desired distance from the doors 13 and provided with branch cables and handles for operating the cables at different places in the building.

To open the doors 13 a downward pull on the handle 57, acting through the cable 52, will first move the latch 46 on its pivot 58 and thereby release the same from the latch plate 47. A further pull on the handle 57 will draw the bar 20 endwise to the right and thereby straighten the respective toggle-lever 32 to open the right hand door 13. This endwise movement of the bar 20 will impart a reverse endwise movement to the bar 21 through the left hand tape 42 and thereby straighten the respective toggle-lever 32 and open the left hand door 13. To close the doors 13 a pull on the handle 58 will release the latch 47 from the latch plate 49 and draw the bar 21 to the right and impart a reverse endwise movement to the bar 20 through the right hand tape 42 and thereby buckle the toggle-levers 32 and 34 and close said doors.

In case it is desirable to actuate the door operator by power various different means may be employed, one of which is diagrammatically illustrated in Fig. 9. In this illustration the

cables 52—53 are reversely wound on a drum 60 journaled in a ceiling bracket 61 and driven from an electric motor 62 through connections which include a worm 63 and a cooperating worm gear 64.

The drawings illustrate a commercial form in the invention, but it will be understood that the same is capable of certain modifications as to details of construction, arrangement and combination of parts within the scope of the invention herein disclosed.

What I claim is:

1. In a device of the class described, a pair of bearing brackets, a guide roller journaled on each bracket, a lower horizontal bar supported on the rollers for endwise movement, a pulley journaled on each bearing bracket above the bar, an upper horizontal bar supported on the pulleys for endwise movement, means, selective at will, for moving either one of the bars endwise, and a pair of cables arranged to run, one over each pulley and with the ends of each cable attached one to each bar, and connections actuated by each bar for opening and closing a door.

2. In a device of the class described, a pair of bars mounted for endwise movement, means, selective at will, for moving either one of the bars endwise, means connecting the bars and operable when one of the bars is moved endwise to impart reverse endwise movement to the other of the bars, connections actuated by each bar for opening and closing a door, a latch for holding one of the bars against endwise movement to prevent the doors when closed from being opened and a second latch for holding the other bar against endwise movement to prevent the doors when open from being closed, and means for positively holding either latch when in an operative position.

3. In a device of the class described, a pair of bars mounted for endwise movement, means connecting the bars and operable when one of the bars is moved endwise to impart reverse endwise movement to the other of the bars, connections actuated by said bars for opening and closing a door, a relatively fixed latch member and two latches, one on each bar, said latches being arranged to alternately interlock with the latch member, during reverse endwise movement of the bars, and hold the doors either open or closed depending on which latch is interlocked with the latch member, and an operating connection for each latch operable, at will, to first release the respective latch and thereafter move the connected bar endwise.

4. The structure defined in claim 3 which further includes means for positively holding either latch in an operative position.

5. In a device of the class described, a pair of bars mounted for endwise movement, means connecting the bars and operable when one of the bars is moved endwise to impart reverse endwise movement to the other of the bars, connections actuated by said bars for opening and closing a door, a relatively fixed latch member and two latches, one on each bar, said latches being arranged to alternately interlock with the latch member, during reverse endwise movement of the bars, and hold the doors either open or closed depending on which latch is interlocked with the latch member, and a cable attached to each latch and operable from a distant point for first releasing the respective latch and thereafter moving the connected bar endwise.

6. In a device of the class described, a pair of substantially parallel channel bars the side flanges of which are aligned and in opposing relation, a pair of radially spaced pulleys between the flanges of the two bars, a pair of cables arranged to run one over each of the pulleys with the end portions of the two cables extending toward each other between the pulleys and the flanges of the bars, the ends of each cable being attached one to each of the bars, connections selective, at will, for moving either of the bars endwise, said flanges being closely associated with the ends of the drum thereby holding the bars against lateral shifting movement relative to the pulleys, and connections actuated by each bar for opening and closing a door.

EDWIN R. BEEMAN.