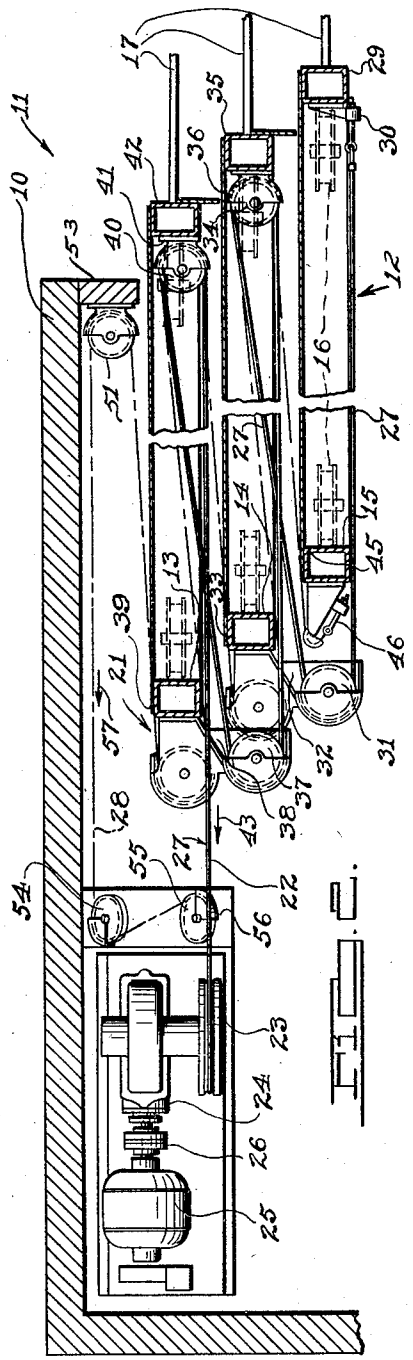
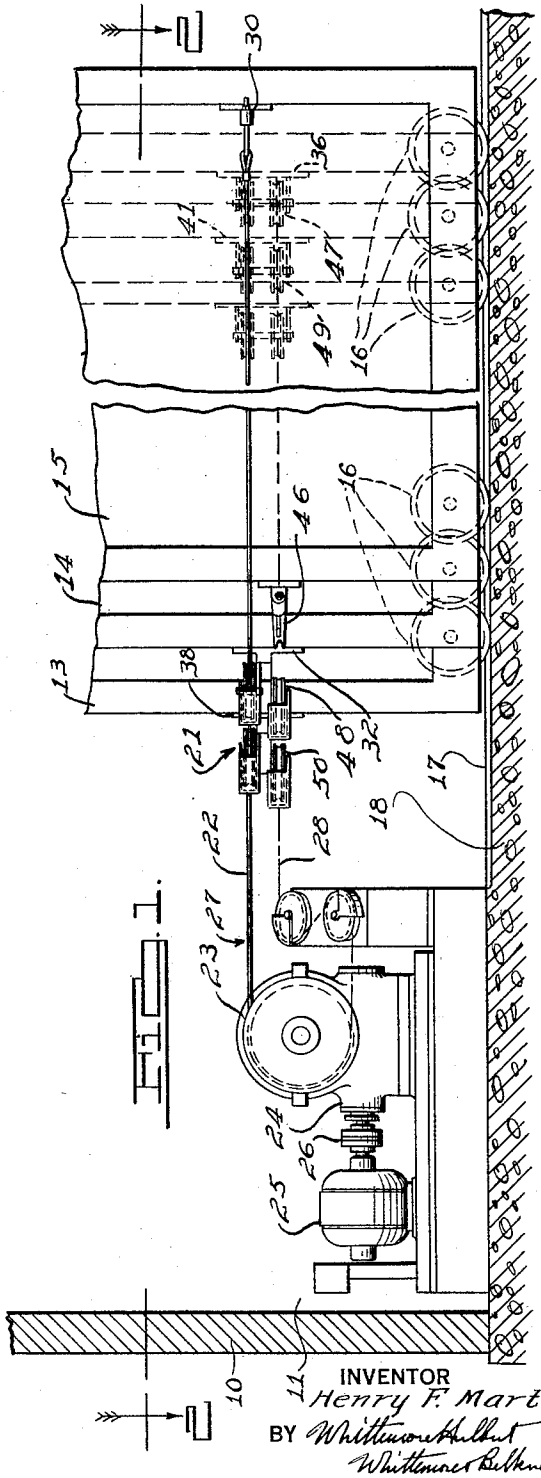
Dec. 29, 1931. H. F. MARTIN 1,838,491

MECHANICAL DOOR OPERATING SYSTEM

Filed Oct. 27, 1930 2 Sheets-Sheet 1





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MECHANICAL DOOR OPERATING SYSTEM

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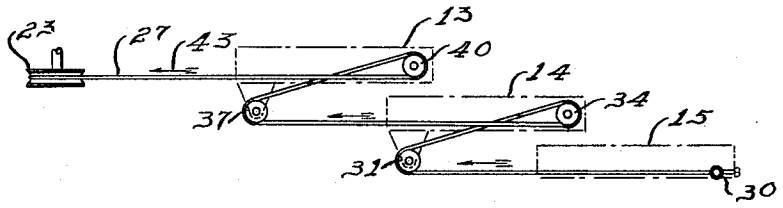
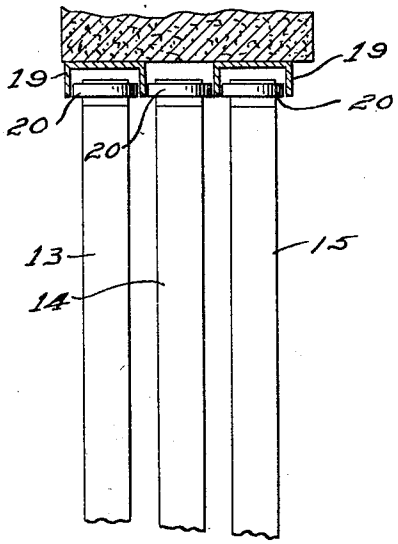


Fig. 4.



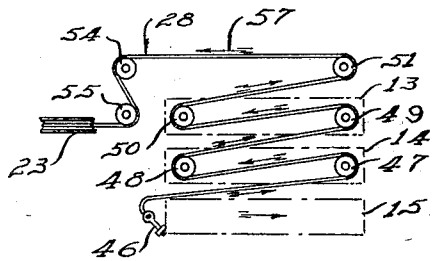


Fig. 3.

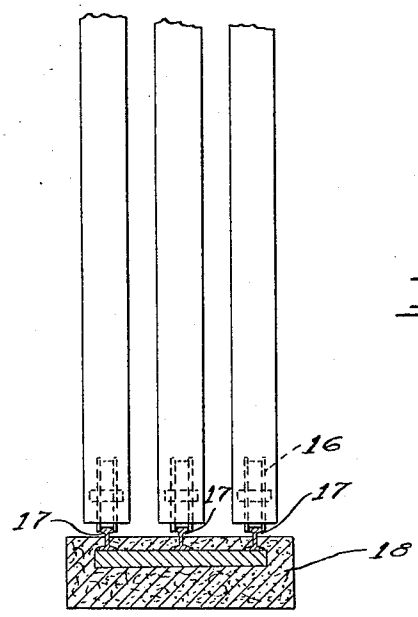


Fig. 5.

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UNITED STATES PATENT OFFICE

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MECHANICAL DOOR OPERATING SYSTEM

Application filed October 27, 1930. Serial No. 491,580.

This invention relates generally to door operating systems and more particularly to systems of this type especially designed for use in connection with doors composed of a plurality of relatively movable sections adapted to assume a position in overlapping relation to each other when in open position.

The invention contemplates the provision of improved mechanical means for automatically moving the door sections to either open or closed position and has as one of its objects to accomplish this result expediently and irrespective of weather conditions.

Another object of this invention is to provide a system of the type specified above employing a continuous cable reeved over suitable pulleys arranged in such a manner that when the door sections are in their open positions, the door opening is unobstructed.

A further advantageous feature of this invention resides in the provision of a door operating system so designed as to permit one or a plurality of the door sections to be moved to open or closed position independent of the other cooperating door sections.

A still further object of this invention is to so arrange the door operating mechanism that the same in itself functions to limit movement of the respective door sections to one position, thereby eliminating the necessity of providing separate stops.

With the foregoing as well as other objects in view, the invention resides in the particular construction of the system which will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a front elevational view of a sectional door and my improved mechanism for actuating the same;

Figure 2 is a sectional view taken substantially on the line 2—2 of Figure 1;

Figure 3 is a diagrammatic view illustrating the manner in which the various door sections are moved to open position;

Figure 4 is a view similar to Figure 3 showing the doors in closed position;

Figure 5 is a vertical sectional view illustrating the manner in which the doors are assembled within the door opening.

Referring now more in detail to the drawings and with special reference to Figures 1 and 2, it will be noted that there is fragmentarily illustrated in these figures a building wall 10 having a door opening 11 therein of a width which would prohibit the practical use of a single or double door of conventional design. Accordingly, I have provided a door 12 for the opening formed of a plurality of sections, the number of which depending upon the width of the door opening. As shown herein for the purpose of illustration only, the door 12 is composed of three sections 13, 14 and 15. The door sections are preferably arranged within the building and are mounted for sliding movement across the door opening relative to each other. Each of the door sections are provided with rollers 16 at the bottom thereof adjacent the front and rear sides and adapted to engage suitable tracks 17 anchored in the building floor 18 as clearly shown in Figure 3 of the drawings. The upper portions of the door sections are guided throughout their travel by means of substantially inverted channel-shaped guide rails 19 and cooperating rollers 20 engaging within the guide rails 19. The tracks 17 and channel-shaped guides are arranged in juxtaposition to each other so that when the door sections are in their open position, they overlap each other as shown in Figure 2.

For mechanically moving the door sections either to open or closed position, I provide a plurality of sheaves or pulleys 21 suitably secured to the respective door sections in a manner to be presently described and connected by a continuous cable 22 which, in addition to being reeved over the pulleys, is extended around a power actuated winch 23 which is preferably of the conventional elevator type comprising a reducer 24 coupled to a prime mover 25 by means of a suitable coupling 26. The prime mover 25 is preferably an electric motor of the reversible type controlled by suitable switches (not shown) located at a convenient point where they may be manipulated by the operator. In general, the arrangement is such that rotation of the

winch 23 in one direction by the motor 25 causes the cable 22 to move the door sections to closed position and rotation of the winch in the reverse direction causes the cable 22 to move the doors to open position.

While in the foregoing description the cable 22 has been described as being continuous, nevertheless, for the purpose of illustration, the same will be described as comprising two parts 27 and 28 illustrated respectively in Figure 2 by the full and dotted lines. The part 28 will be hereinafter referred to as the cable for moving the door sections to closed position, while the part 27 will be referred to as the means for opening the door sections. With the above in mind, it will be seen that the part 27 is secured at its free end to the front door pillar 29 of the innermost door 15 by a suitable anchor 30. The part 27 is extended rearwardly from the pillar 29 around a pulley 31 arranged in a substantially horizontal plane and journaled upon a bracket 32 secured to the rear pillar 33 of the intermediate door section 14. The arrangement is such that the axis of the pulley 31 is arranged in the vertical median plane of the door section 15 a substantial distance in rear of the same. The cable part 27 is then extended forwardly, as shown in Figure 2, around the pulley or sheave 34 which in turn is secured to the inner surface of the front pillar 35 of the intermediate door section 14. The pulley 34 is arranged in substantially the same plane as the pulley 31 and is journaled in the bracket 36 carried by the door section 14 in the manner just described. The cable part 27 is then extended rearwardly, as viewed in Figure 2, around the pulley 37 which is also arranged in the plane of the pulleys 31 and 34 and is journaled upon a bracket 38 secured to the rear pillar 39 of the outermost door section 13 in any suitable manner. While the pulley 37 is secured to the outermost door section, it is to be noted that the axis thereof is arranged in substantially the vertical median plane of the intermediate door section 14 and the bracket 38 upon which the same is journaled overlaps the bracket 32 upon the intermediate section 14 in the same manner as the bracket 32 overlaps the innermost section 15. The cable part 27 extends from the pulley 37 forwardly around the outer side of the pulley 40 journaled in a bracket 41 secured to the inner surface of the front door pillar 42 of the outermost section 13. The pulley 40 is arranged in a common plane with the pulleys aforesaid, and like the pulley 34 is positioned so as not to interfere with movement of the sections. The cable part 27 is then extended around the winch 23 for operation thereby.

With the construction as thus far described, it will be observed that movement of the cable part 27 in the direction of the arrow 43 causes a pull upon the anchor 30 in a corresponding direction and since the cable is reeved over the pulleys 31, 34, 37 and 44 in the manner specified above, the door sections upon which these pulleys are attached will also be moved in the direction of the arrow 43 or in other words, will be moved to open position. Assuming that the doors are in their closed position and that the winch is operated to pull the cable part 27 in the direction of the arrow 43 to open the door sections, it will be observed from Figure 2 that the inner most door section 15 will be similarly moved rearwardly independent of the other two sections until the rear end portion of the door section 15 engages the overlapping part of the bracket 32 extending from the intermediate door section at which time the latter door section will also be moved rearwardly. The outermost door section 13 will remain substantially stationary until the bracket 32 engages the overlapping portion of the bracket 38 extending from the door section 13 at which time the three door sections will be moved to open position as a unit.

Referring now to the manner in which the door sections are moved to their closed position and with special reference to Figure 2, it will be noted that the cable part 28 represented by the dot-and-dash lines in the above figure, is provided for accomplishing this purpose. The free end of the cable part 28 is anchored to the rear pillar 45 of the door section 15 as at 46 and extends forwardly around the inside of the sheave 47 journaled in a bracket 36 below the sheave 34. The bracket 36, as previously described, is secured to the inner surface of the intermediate door pillar 35. The cable part 28 is then extended rearwardly over a sheave 48 journaled on the bracket 32 in rear of the rear door pillar 33 of the intermediate door. The cable part 28 is then again extended forwardly around a sheave 49 journaled in the bracket 41 below the pulley 40. From the pulley 40, the cable part 28 is extended rearwardly around the sheave 50 journaled on the bracket 38 at a point spaced outwardly from the sheave 37 immediately in rear of the outer door pillar 39. The cable part 28 is again extended forwardly from the pulley 50 around the sheave 51 journaled in a bracket 52 secured to the inner side of a frame member 53 which in turn is secured at the edge of the door opening. The cable part 28 is then reeved over the guide pulleys 54 and 55 secured to a stationary bracket 56 and operable to properly position the cable part 28 relative to the winch 23 around which it extends and forms a continuation of the cable part 27. Each of the pulleys, set forth above, is arranged in a common plane in the same manner as the pulleys around which the cable part 27 is reeved.

Assuming that the door sections 13, 14 and

15 are in the position shown in Figure 2 and that it is desired to close the door opening, the operator merely actuates the necessary switch (not shown) to cause rotation of the winch 23 by the electric motor 25 in a direction to effect a travel of the cable part 28 in the direction of the arrow 57 in Figures 2 and 3. Movement of the cable part in the direction of the arrow 57, causes the cable part to exert a forward pull against the anchor 46 in the direction of the arrow 58 in Figure 3. Movement of the inner portion of the cable part 28 in the direction of the arrow 55 causes the inner door section 15 to slide forwardly on the tracks 17 independent of the other door sections. The door section 15 continues to move independent of the remaining sections until the anchor 46 which is preferably in the plane of the pulleys around which the cable part 28 is reeved, assumes a position opposite the pulley 47. When this latter condition arises, the door section 15 is locked against movement relative to the intermediate door section 14 and continued movement of the cable in the direction of the arrow 57 will cause the door section 14 to move as a unit with the section 15 relative to the outer door section 13. The sections 14 and 15 continue to move relative to the section 13 until the pulley 48 assumes a position directly opposite the pulley 49, thereby causing the outer door section 13 to move as a unit with the sections 14 and 15. As soon as the pulley 50 of the outermost door section 13 assumes a position directly opposite the pulley 51, further movement of the door sections is prevented and operation of the winch is automatically discontinued by any suitable means not shown herein.

Thus, from the foregoing it will be observed that by reeving the cable part 28 in the manner outlined above, the latter automatically functions to respectively pick up the door sections and move the same to open position without the assistance of any cooperating engaging stops upon the respective door sections. It will further be apparent that the rear pulleys together with the anchor 46 are spaced rearwardly from the rear door section pillars a predetermined distance so that when the rear pulleys and anchor 46 are opposite the front pulleys, the rear pillar of each door section assumes a position directly opposite the front pillar of the next adjacent door section. The space between the door sections being weather-proofed by means of suitable weather strips 59 secured to the support 53 and door sections so as to overlap the latter.

While in describing the present invention particular stress has been placed upon the association of my improved door operating system in connection with a door composed of three sections, it is to be noted that the system may be used with equal facility in connection with doors formed of any number of sections and accordingly reservation is made to make such changes in the construction as may come within the purview of the accompanying claims.

What I claim as my invention is:

1. In a door operating system, the combination of a door having a plurality of sections slidable relative to each other, anti-friction elements arranged upon certain of said sections in predetermined relation to each other, a linear member having the free ends anchored to another of said door sections and having the intermediate portions reeved over the anti-friction elements aforesaid, and mechanical means connected to said linear member and operable to alternately move the latter in opposite directions for effecting movement of the door sections to open and closed positions.

2. In a door operating system, the combination of a door of the hanger type having a plurality of sections slidable relative to each other, anti-friction elements arranged in predetermined relation upon one of said door sections, a winch, a continuous linear member anchored to another of said door sections and reeved over the anti-friction elements and over said winch whereby rotation of the winch in one direction exerts a pull on one part of the linear member to move the doors to open position and rotation of the winch in the opposite direction exerts a pull on the other part of said linear member to move the door sections to closed position.

3. In a door operating system, the combination of a door of the hanger type having a plurality of sections slidable in a rectilinear path relative to each other, anti-friction elements mounted upon certain of said door sections in predetermined relation to each other, a winch, a linear member having the opposite ends anchored to another of said door sections and having the intermediate portions reeved over the anti-friction elements and over said winch whereby rotation of the latter in opposite directions effects a movement of the linear member in corresponding directions to open and close said door sections, and means for rotating said winch in either of said directions.

4. In a door operating system, the combination of a door of the hanger type comprising a plurality of sections slidable relative to each other and arranged in juxtaposition to each other when in open position, a plurality of anti-friction elements arranged in a common horizontal plane and secured to certain of said sections, a linear member reeved over said anti-friction elements and anchored to one of said sections, and means for moving said anti-friction elements in one direction to effect a movement of said door sections.

5. In a door operating system, the combina-

tion of a door of the hanger type comprising a plurality of sections slidable relative to each other, anti-friction elements journaled upon the front and rear end portions of certain of said door sections and arranged in a common horizontal plane, a second series of anti-friction elements mounted upon the front and rear end portions of the sections aforesaid in a common plane parallel to the plane of the first-mentioned anti-friction elements, a linear member having the free ends anchored to another of said door sections and having the intermediate portions thereof reeved over the said anti-friction elements, and means for alternatively moving said linear member in opposite directions.

6. In a door operating system, the combination of a door of the hanger type composed of a plurality of sections slidable relative to each other, a plurality of anti-friction elements journaled upon certain of the door sections adjacent the front and rear ends thereof and arranged in a common horizontal plane, a linear member anchored to another of said door sections in the plane of the anti-friction elements aforesaid and reeved over the said anti-friction elements, and mechanical means for actuating said linear member.

7. In a door operating system, the combination of a door of the hanger type comprising a plurality of sections slidable relative to each other, a series of anti-friction elements journaled upon certain of the door sections adjacent the front and rear ends thereof and arranged in a common horizontal plane, a second series of anti-friction elements also journaled upon the door sections aforesaid adjacent the front and rear ends thereof and arranged in a plane parallel to the plane aforesaid, a linear member having one end anchored to another of said door sections at a point disposed in the plane of one set of anti-friction elements and having the opposite end anchored to the said door section in the plane of the other set of anti-friction elements, said linear member having an intermediate portion reeved over said anti-friction elements for successively moving the above-mentioned door sections.

8. In a door operating system, the combination with a door having a pair of sections movable relative to each other, anti-friction elements journaled upon certain of said door sections adjacent the front and rear ends thereof and arranged in a common plane, a second anti-friction element journaled upon a stationary support in the plane of the anti-friction elements aforesaid, and a linear member anchored to another of said sections and reeved over the anti-friction elements aforesaid for actuating said door sections.

9. In a door operating system, the combination of a door of the hanger type having a pair of sections slidable relative to each other, anti-friction elements journaled upon one of said door sections adjacent the front and rear ends thereof and arranged in a common horizontal plane, a linear member anchored to the other door section at a point arranged in the plane of the anti-friction elements and reeved over the latter whereby movement of the linear member in one direction causes said last-mentioned section to move relative to the other section until the point of anchorage assumes a position opposite the anti-friction element at the front end of the adjacent section at which time both sections are caused to move as a unit.

10. In a door operating system, the combination of a door of the hanger type having a pair of sections slidable relative to each other, a pair of anti-friction elements journaled upon one of said door sections adjacent the front end thereof and arranged in parallel substantially horizontal planes, a second pair of anti-friction elements journaled upon said door section at the rear end thereof and arranged in substantially the same planes as said first-mentioned anti-friction elements, and a linear member having one end anchored to the other section adjacent the front end thereof in one of the above-mentioned planes and having the opposite end anchored to the rear end portion of the last-mentioned door section in the other of said planes.

11. In a door operating system, the combination of a door comprising a plurality of sections adapted to overlap each other when in open position and mounted for sliding movement to permit the same to be moved to an extended position wherein they cooperate to close the door opening, means for actuating the door sections for moving the same to both of the aforesaid positions, said means including a continuous linear member anchored to one of said sections and engaging the other sections whereby movement of the linear member in opposite directions successively moves the door sections to closed and open positions.

12. In a door operating system, the combination of a door comprising a plurality of sections adapted to overlap each other when in open position and mounted for relative sliding movement to permit the same to be moved to an extended position wherein they cooperate to close the door opening, means for actuating the door sections to move the same to both of the aforesaid positions, said means including anti-friction members journaled upon certain of the door sections, a linear member having the opposite ends fixed to one of the aforesaid door sections and having the intermediate portions thereof reeved over said anti-friction members.

13. In a door operating system, the combination of a door comprising a plurality of sections slidable relative to each other, pulleys journaled upon one section with the axes thereof arranged in a plane parallel to the

plane of movement of the sections, a continuous linear member anchored to another of said sections and reeved over said pulleys, and means for actuating said linear member to effect movement of said door sections.

14. In a door operating system, the combination of a door comprising a plurality of sections slidable relative to each other, a plurality of anti-friction elements journaled upon certain of the door sections adjacent opposite sides thereof and arranged in a common plane, a linear member anchored to another of said door sections in the plane of the anti-friction elements aforesaid and reeved over said anti-friction elements, and means for actuating said linear member.

15. In a door operating system, the combination of a door comprising a plurality of sections adapted to overlap each other when in open position and mounted for relative sliding movement to permit moving the same to extended position wherein they cooperate to close the door opening, a plurality of anti-friction elements journaled upon certain of the door sections adjacent opposite sides thereof and arranged in a common plane with the axes thereof disposed in planes parallel to the planes of movement of the sections, a linear member anchored to another of said door sections in the plane of the anti-friction elements aforesaid and reeved over the latter, and means for actuating said linear member.

16. In a door operating system, the combination of a door comprising a plurality of sections slidable relative to each other, means for actuating said sections to move the same to open and closed positions including a continuous linear member having the opposite end portions anchored to one of said sections adjacent opposite sides thereof at points arranged in different planes and having portions intermediate the ends thereof engaging the other of said door sections adjacent opposite sides thereof at points arranged in planes coincident with the planes aforesaid whereby movement of the linear member in opposite directions successively effects movement of the door sections to open and closed positions.

In testimony whereof I affix my signature.

HENRY F. MARTIN.