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DOOR OPERATING MECHANISM

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2 SHEETS—SHEET 1

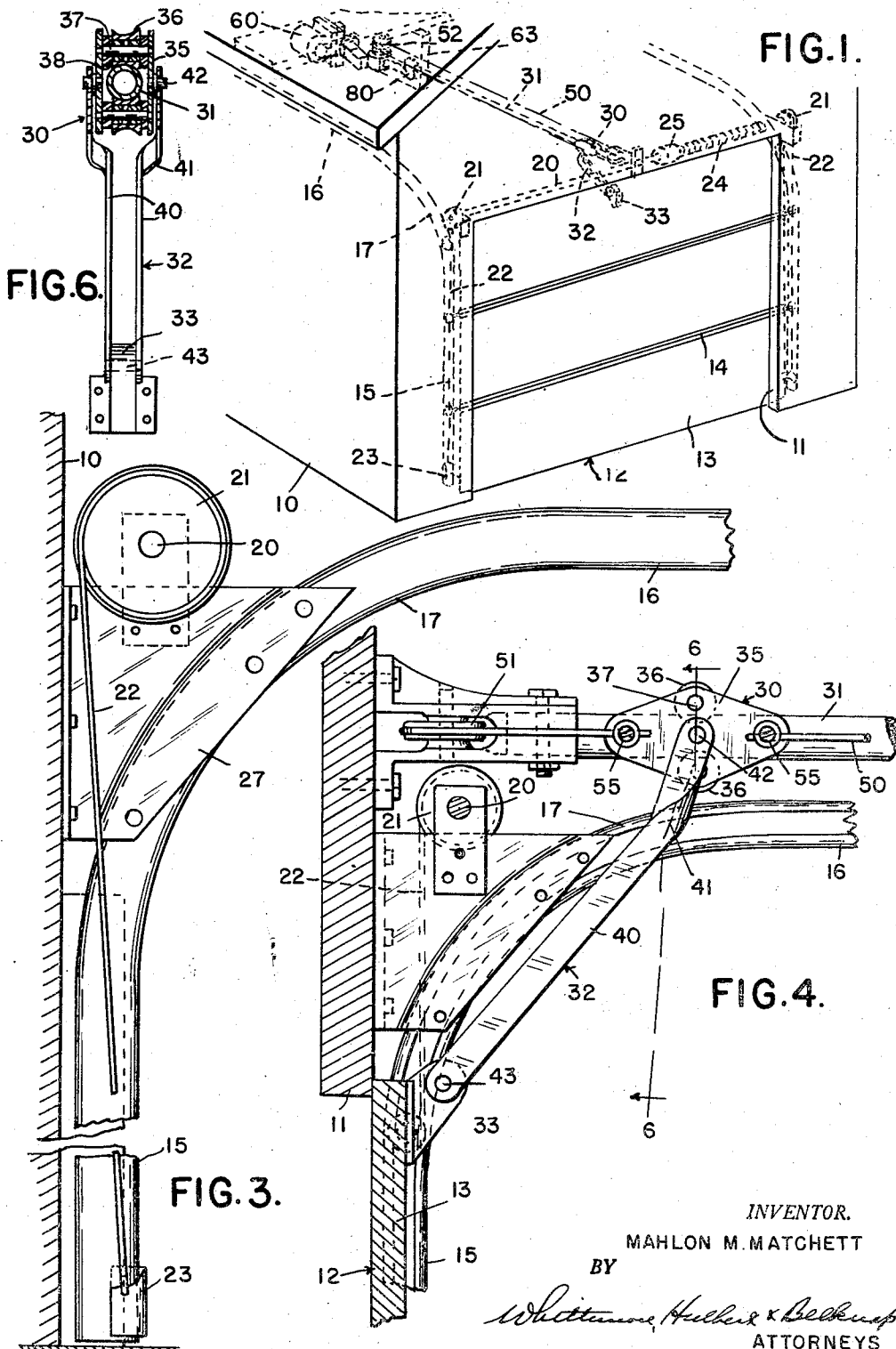


FIG. 4.

FIG. 3.

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DOOR OPERATING MECHANISM

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The present invention relates to door operating mechanism and more particularly to mechanism of the class described which cooperates with an articulated overhead sliding garage door.

It is an object of the present invention to provide positive acting means for effecting opening and closing movement of an articulated overhead sliding garage door.

It is a further object of the present invention to provide simplified means including a horizontally movable carriage for connection to the top of an articulated overhead sliding door.

It is a further object of the present invention to provide operating means for an articulated overhead sliding door characterized by the simplicity of the construction, the ease with which the mechanism may be installed and the efficiency of operation of the mechanism.

It is a feature of the present invention to provide a horizontally movable carriage in conjunction with an articulated overhead sliding garage door, a guide bar on which said carriage is mounted, rollers on said carriage engaging opposite sides of said guide bar, means for connecting the carriage to the top of the door and means for moving the carriage in opposite directions along the guide bar, both of said means being connected to the carriage at points intermediate said rollers.

Other objects and features of the invention will become apparent as the description proceeds, especially when considered in conjunction with the accompanying drawings, wherein:

Figure 1 is a fragmentary perspective view illustrating the general assembly of operating mechanism with a garage door;

Figure 2 is a horizontal section taken on a plane above the door operating mechanism and looking downwardly;

Figure 3 is an enlarged fragmentary end view looking in the direction of the arrows 3—3 of Figure 2;

Figure 4 is an enlarged fragmentary section taken on the line 4—4 of Figure 2;

Figure 5 is an enlarged fragmentary view looking in the direction of the arrows 5—5 of Figure 2; and

Figure 6 is a fragmentary section on the line 6—6 of Figure 4.

Referring now to Figure 1, there is illustrated a building such as a garage 10 having a door opening 11 therein. The door opening 11 is adapted to be closed by an articulated overhead sliding door indicated generally at 12, the door being composed of panels 13 articulated along horizontal lines 14.

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A pair of opposed tracks are provided on which the door is slidingly mounted and each of these tracks comprises a vertical portion 15 at each side of the door opening 11, a horizontal overhead portion 16 located above the plane of the door opening 11, the vertical portion 15 and the horizontal portion 16 being interconnected by an arcuate portion 17.

The door to which the improved operating mechanism is applied is or may be of well known construction and preferably includes counterbalancing mechanism which forms no part of the present invention. However, since this counterbalancing mechanism reduces the load which the operating mechanism has to overcome, the counterbalancing mechanism will be briefly described. Mounted above the vertical portions 15 of the trackways is a horizontal transverse shaft 20 having spools 21 on which cables 22 are wound. Cables 22, as best seen in Figure 3, extend downwardly from the spools 21 and are connected to brackets 23 adjacent the bottom of the door 12. A torsion spring 24 is provided surrounding the shaft 20, one end of which may be secured to a sleeve 25 rigidly carried by the shaft 20. The opposite end of the torsion spring is secured to a stationary support 26 carried by one of the track supporting brackets 27. The spring applies torque to the shaft 20 tending to rotate the same in a direction to wind up the cables 22 on the spools 21 and thus to counterbalance a substantial portion of the weight of the door 12.

The operating mechanism for the door comprises essentially a carriage 30, a guide bar 31 along which the carriage is movable, a link 32 connecting the carriage to a bracket 33 carried by the top of the uppermost door section 13, and means for effecting back and forth movement of the carriage 30 along the guide bar 31.

As best seen in Figures 4 and 6, the carriage 30 is illustrated as comprising a pair of diamond shaped plates 35 between which are journaled concave rollers 36 mounted on pivot pins 37 extending between the plates 35. Suitable spacers 38 are provided for supporting the concave rollers 36. The guide bar 31 as seen in these figures preferably is formed of a bar of circular cross section and may conveniently be of tubular construction. The concavity of the rollers 36 is of course such as to match the cross-sectional dimensions of the guide bar 31.

The bracket 33 extends slightly above the upper edge of the upper door section 13 so that as the door reaches fully open position the link 32 does not interfere therewith. At the same time, when the door is in closed position the link 32

is completely housed within the garage. As best seen in Figures 4 and 6, the link 32 comprises a pair of straps 40 preferably twisted as indicated at 41 and secured at opposite sides of the carriage 30 by means of pivot pins 42. The axis of the pivot pins 42 is intermediate the axes of the rollers 36, thereby avoiding any tendency to cause binding of the carriage as it moves along the guide bar 31. The straps 40 are pivotally connected to the bracket 33 by a pivot pin 43.

Movement of the carriage 30 back and forth along the guide bar 31 is illustrated as accomplished by means of a cable 50 passing around a stationary sheave 51 mounted above the door opening and slightly above the plane established by the horizontal portion 16 of the door supporting trackway. A driving drum 52 for the cable is provided, and as best seen in Figure 5 the drum 52 is provided with helical grooves 53 for guidingly receiving the cable 50. A plurality of turns of the cable are on the drum 52 so that positive driving action of the cable is effected by rotation of the drum. As best seen in Figure 4, ends of the cable 50 are secured to the carriage 30 by clamp screws 55, these screws being located intermediate the axes of the guide rollers 36 so as to avoid any tendency for binding as driving force is applied to the carriage by the cable 50.

Referring now to Figures 2 and 5, there is illustrated the means for effecting positive rotation of the drive drum 52. This means takes the form of a motor 60 mounted on a supporting frame 61, the frame being supported on a bracket 62 bolted or otherwise secured to a supporting element 63. A worm shaft 65 is mounted in the frame 61 and carries a sheave 66 driven by a belt 67 from a driving sheave 68 connected to the motor shaft. A worm gear housing 70 is secured to the frame 61 and includes a worm gear 71 in meshing engagement with a worm 72 mounted on the worm shaft 65. The worm gear 71 is connected in driving relation to a shaft 75 upon which is mounted the drum 52. A supporting bracket 80 is connected to the housing 70 for supporting the front end of the motor and driving transmission, the bracket 80 including an arm 82 which is formed to provide a support for the innermost end of the guide bar 31. Inasmuch as the transmission between the motor 60 and the carriage 30 includes a worm and worm gear, the transmission is self-locking in the sense that when the motor 60 is deenergized, force applied directly to the door either in opening or closing direction will not result in movement of the door. This prevents accidental movement of the door from open to closed position when the motor is deenergized.

The door operating mechanism is effective to cause positive movement of the door from open to closed position, or vice versa, and due to the fact that the counterbalancing mechanism including a torsion spring 24 is retained, a minimum of power is required to open and close the door.

As will readily be understood, the motor 60 may be provided with automatic controls so that opening and closing movement of the door may be initiated by operation of a single switch or a photoelectric or electronic device, as desired. Furthermore, suitable circuit controlled means are provided to deenergize the motor when the door reaches opened or closed position.

The drawings and the foregoing specification constitute a description of the improved door operating mechanism in such full, clear, con-

cise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. A door operating mechanism for an overhead sliding articulated door of the type having door supporting trackways at opposite sides of the door opening, each of said trackways including a vertical portion adjacent the edges of the door opening, a horizontal portion extending inwardly from the door opening, and an arcuate portion interconnecting said horizontal and vertical portions, said mechanism comprising a horizontal guide bar of circular cross section supported at its ends, a carriage movable along said guide bar, said carriage comprising a pair of opposed concave rollers, said rollers being in vertical alignment and one of said rollers being an upper roller engaging the top surface of said bar, and the other roller being a lower roller engaging the under surface of said bar, a pair of side plates at opposite sides of said bar, and means extending between said plates on which said rollers are rotatably mounted, said carriage having its center of gravity located in the horizontal axial plane of said guide bar intermediate said rollers, reversible flexible drive means for moving said carriage in either direction on said rod, means connecting said flexible drive means to opposite ends of said carriage at points in the horizontal axial plane of said bar, the forces being applied to said carriage from said flexible drive means in horizontal alignment with the center of gravity of said carriage to prevent rotation of said carriage relative to said bar, a link for connecting said carriage to a sliding articulated door, said link having spaced ears to extend to either side of said carriage, pivot connections between each of said ears and the adjacent one of said plates, said pivot connections having a common axis located midway between the axes of said rollers in horizontal alignment with the center of gravity of said carriage and in horizontal alignment with the points of attachment of said flexible drive means to said carriage, the forces being applied to said carriage from said link through the center of gravity of said carriage to prevent rotation of said carriage relative to said bar, and a prime mover for said drive means, said link constituting the sole connection between said prime mover and said door, and said pair of rollers constituting the only members of said carriage in contact with said guide bar.

2. The combination with an overhead sliding articulated door of a door operating mechanism comprising a horizontal guide bar of circular cross section supported at its ends, a carriage movable along said guide bar, said carriage comprising a pair of opposed concave rollers, said rollers being in vertical alignment and one of said rollers being an upper roller engaging the top surface of said bar, and the other roller being a lower roller engaging the under surface of said bar, a pair of side plates at opposite sides of said bar, and means extending between said plates on which said rollers are rotatably mounted, said carriage having its center of gravity located in the horizontal axial plane of said guide bar intermediate said rollers, reversible flexible drive means for moving said carriage in either direction on said rod, means connecting said flexible drive means to opposite ends of said carriage at points in the horizontal axial plane of

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said bar, the forces being applied to said carriage from said flexible drive means in horizontal alignment with the center of gravity of said carriage to prevent rotation of said carriage relative to said bar, a link for connecting said carriage to a sliding articulated door, said link having spaced ears to extend to either side of said carriage, pivot connections between each of said ears and the adjacent one of said plates, said pivot connections having a common axis located midway between the axes of said rollers in horizontal alignment with the center of gravity of said carriage and in horizontal alignment with the points of attachment of said flexible drive means to said carriage, the forces being applied to said carriage from said link through the center of gravity of said carriage to prevent rotation of said carriage relative to said bar, and a prime mover for said drive means.

3. The combination with an overhead sliding articulated door of a door operating mechanism comprising a horizontal guide bar of circular cross section supported at its ends, a carriage movable along said guide bar, said carriage comprising a pair of opposed concave rollers, said rollers being in vertical alignment and one of said rollers being an upper roller engaging the top surface of said bar, and the other roller being a lower roller engaging the under surface of said bar, a pair of side plates at opposite sides of said bar, and means extending between said plates on which said rollers are rotatably mounted, said carriage having its center of gravity located in the horizontal axial plane of said guide bar intermediate said rollers, reversible flexible drive means for moving said carriage in either direction on said rod, said flexible drive means being disposed horizontally along said guide bar, means connecting said flexible drive means to opposite ends of said carriage at points in the horizontal axial plane

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of said bar, the forces being applied to said carriage from said flexible drive means in horizontal alignment with the center of gravity of said carriage to prevent rotation of said carriage relative to said bar, a link for connecting said carriage to a sliding articulated door, said link having spaced ears to extend to either side of said carriage, pivot connections between each of said ears and the adjacent one of said plates, said pivot connections having a common axis located midway between the axes of said rollers in horizontal alignment with the center of gravity of said carriage and in horizontal alignment with the points of attachment of said flexible drive means to said carriage, the forces being applied to said carriage from said link through the center of gravity of said carriage to prevent rotation of said carriage relative to said bar, and a prime mover for said drive means, said link constituting the sole connection between said prime mover and said door and said pair of rollers constituting the only members of said carriage in contact with said guide bar.

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