United States Patent

Luby et al.

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[54] ROLL-TYPE DOOR

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[52] **U.S. Cl.** **160/133**

[51] **Int. Cl.** **E06b 9/08**

[58] **Field of Search** 160/133, 191, 303

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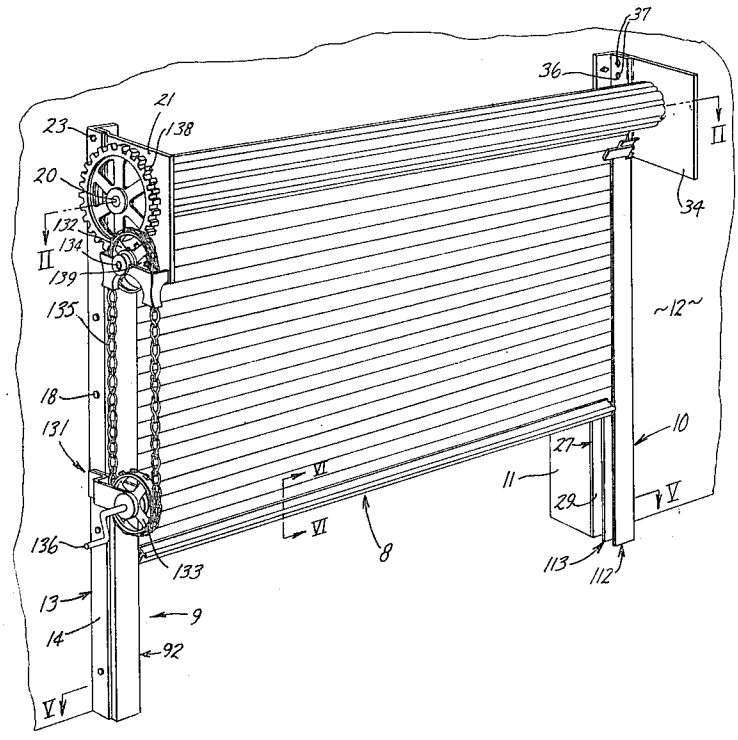
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[57] **ABSTRACT**

A roll-type door for closing an opening in a wall and having a plurality of horizontally hinged, relatively narrow slats, the lengthwise ends of which move along upright guide tracks mounted upon the wall adjacent the opposite sides of the opening. The door, when in opened position, is wound upon a plurality of flanged disks, some of which are secured to a shaft rotatably supported above the opening. Spring-biased counterbalance means yieldably resists downward unrolling movement of the door which can be effected manually, by a chain drive, or by a shaft and gear arrangement.

5 Claims, 6 Drawing Figures



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SHEET 1 OF 2

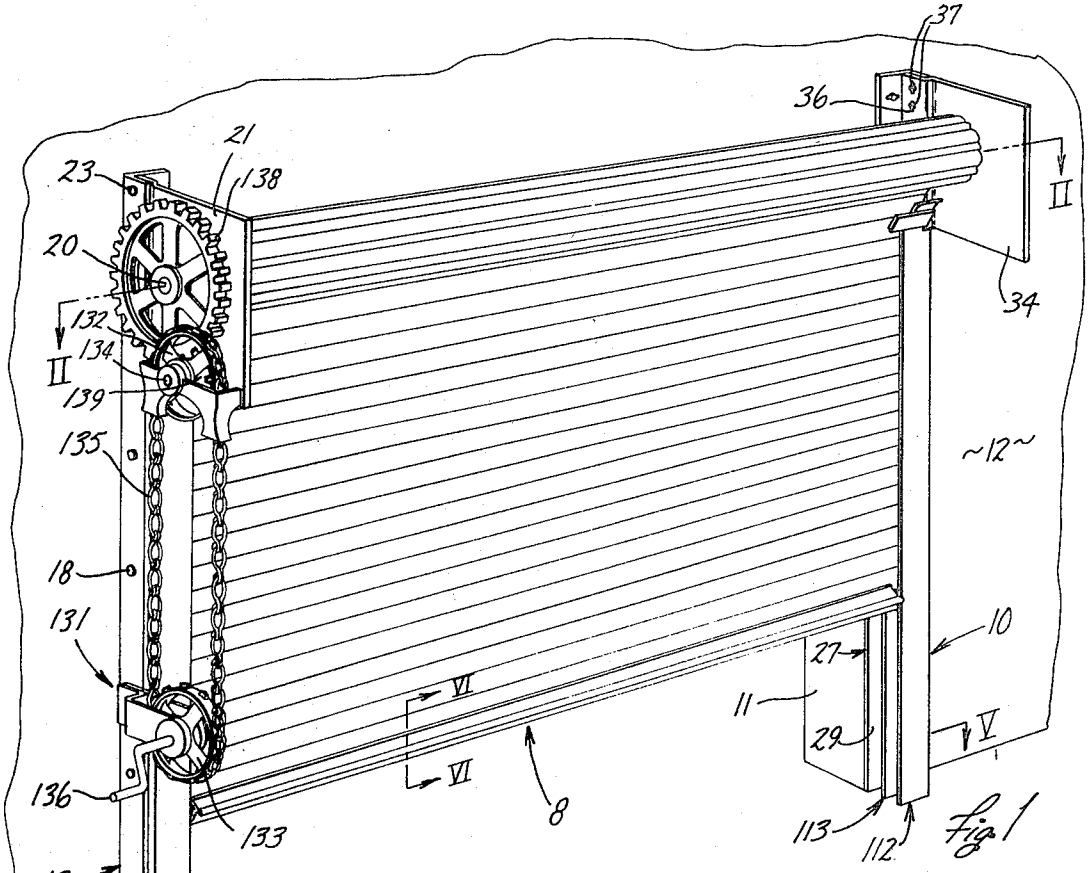


Fig. 1

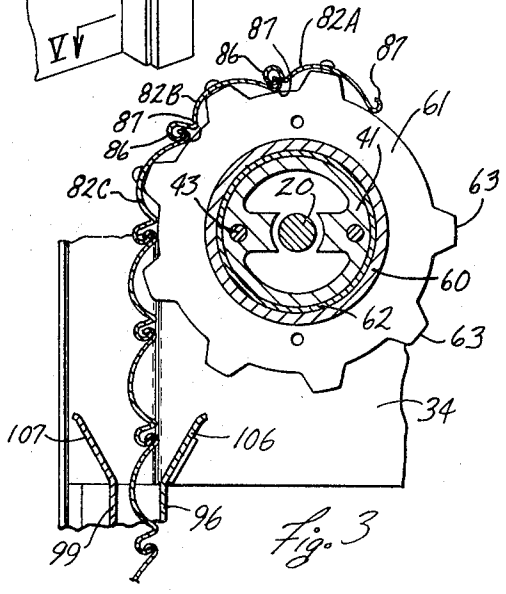


Fig. 3

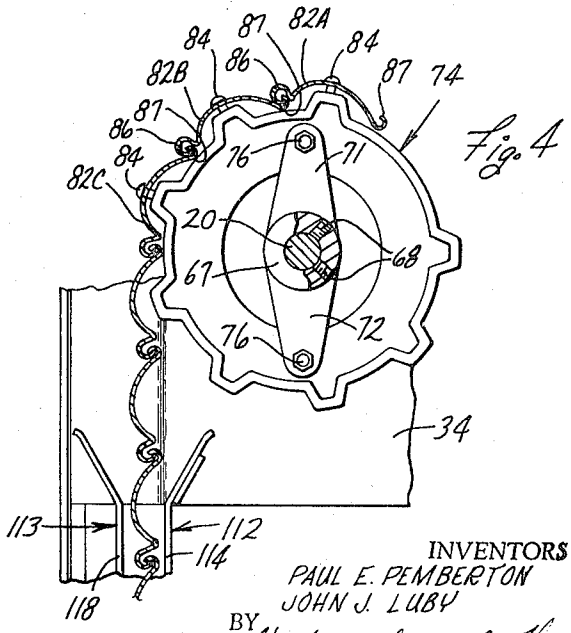


Fig. 4

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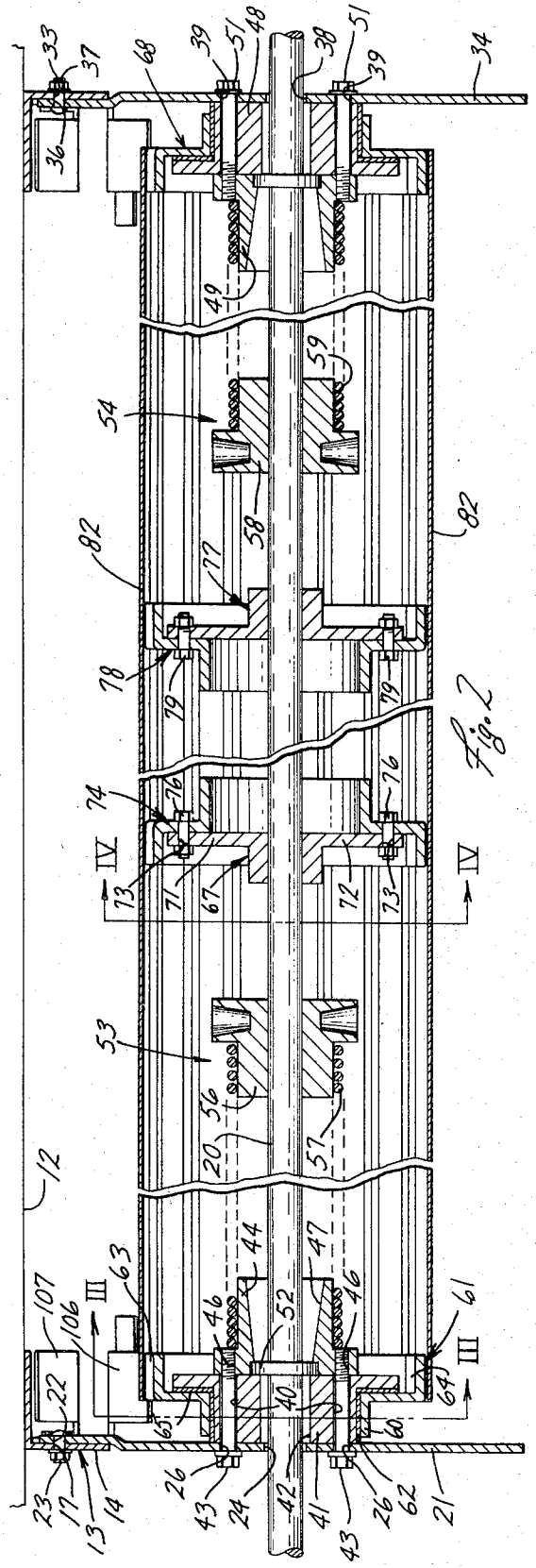


Fig. 2

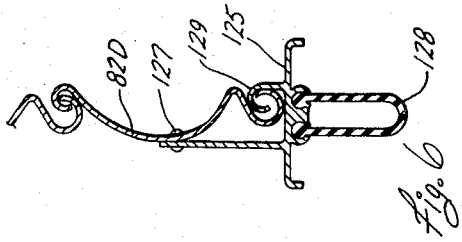


Fig. 6

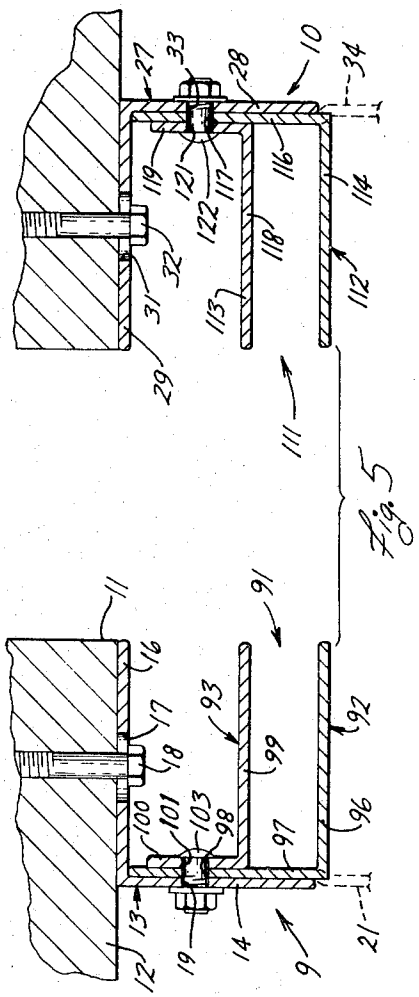


Fig. 5

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ROLL-TYPE DOOR

BACKGROUND OF THE INVENTION

This invention relates in general to a roll-type door assembly including a door having horizontally hinged slats and, more particularly, to a type thereof which is rolled in its opened position upon a plurality of coaxial disks which are in turn supported by a shaft rotatably mounted upon a wall and spring biased toward the opened position.

Roll-type doors having plural, horizontally hinged, metal slats, which are guided at their ends in upright tracks have been used, particularly commercially, extensively and for many years. Generally speaking, these doors have been ruggedly built to prevent unauthorized entry or to withstand severe weather and, accordingly, they have been heavy, costly, difficult to build, and difficult to install. Where the opening is large and/or the particular use requires such rugged construction, these doors have been worth the cost and difficulties involved in their manufacture and installation. However, for residential use or light commercial use, existing roll-type doors are unnecessarily rugged, costly and complicated. In short, they are overdesigned for many types of conventional uses.

Because of the substantial weight involved in existing roll-type doors, especially for relatively wide openings, it has been necessary to provide a heavy-duty shaft and counterbalance mechanism which has been particularly troublesome to adjust and repair, mainly because of the inexcessibility of the parts therein. More specifically, the existing counterbalance springs and shafts for this type of door are enclosed in coextensive, metal barrels or tubes. These barrels must be strong, hence heavy, to resist deflection of the door when it is in the raised position. Thus, the loading on the shaft support brackets is increased, accordingly, by said barrels.

Prior art doors of the slatted roll type have been custom built at the factory from special parts. Thus, most of these doors have required special installation instructions and, in many instances, special installers and special tools. However, it has been desirable to furnish a door of this type which can be built up from stock parts shipped to the installation site.

After existing roll-type doors are installed, it is extremely difficult, if not impossible, to replace broken parts of, or make adjustments in the counterbalance mechanism without removing the barrel. Thus, any malfunction in the counterbalance mechanism has usually required a dismounting of the entire door assembly from its supporting structure. This emphasizes the need for an easily accessible and easily repairable or adjustable counterbalance mechanism for a roll-type door, which need has not been previously filled.

In the course of examining the foregoing problem of accessibility, it was found that the functions of the barrel could be easily performed by several slats at the top of the door while, at the same time, providing the solution to the access problem and, at the same time, eliminating a substantial amount of weight. That is, in a relatively light-duty installation, only a few slats are secured to coaxial disks on the counterbalance shaft, whereby access to the counterbalance mechanism is immediately available upon lowering the door. If the installation requires a complete surrounding of the counterbalance mechanism by slats secured to the disks (thereby resembling a barrel) some of the slats can be easily and quickly released when necessary, to gain access to the counterbalance mechanism without removing the entire door assembly from its mounting upon the wall. The slat and disk combination provides the necessary rigidity for the counterbalance mechanism and door support with only a fraction of the weight found in existing doors using barrels.

Most existing roll-type doors have end locks and/or wind locks at the ends of the individual slats. These end locks help to guide the door in its vertical movement and also space the slats from the guide rails to avoid excessive drag and wear. However, the end locks are expensive and they must be installed at the factory. Thus, if an adjustment or trimming is found necessary in the door width at the installation site, the door must be returned to the factory to remove the end locks.

It was found that, by providing the vertical door guides with smooth slat-engaging flanges, by providing smooth entranceways for the slats at the upper ends of the door guides and by minimizing the spacing between said flanges on each door guide, it is possible to eliminate the end locks without increasing slat wear or the risk of disengagement of the door from the guides.

It is essential to provide a sealing element at the bottom of each roll-type door used to cover an access opening in an external wall. However, it was found that the sealing element can be just as effective if it and its support bar do not extend into the vertical door guides. Moreover, this arrangement greatly simplifies preparation and installation of the sealing element and its support bar.

Accordingly, a primary object of this invention is the provision of a roll-type door assembly for relatively light-duty installations in which the width of the opening to be covered by the door is in the small to medium range, in which the assembly is considerably less costly and less complicated than existing door assemblies for the same purposes, which assembly is provided with a counterbalanced support shaft mechanism relatively accessible for adjustment and maintenance and relatively easy to install.

A further object of this invention is the provision of a roll-type door, as aforesaid, which can be readily assembled and installed at the site of its use from stock parts by following simple instructions and using conventional tools, which can operate effectively and efficiently without end locks and/or wind locks on the ends of the door slats, and which has a lower edge seal that does not require special machining for installation, adjustment or use.

Other objects and purposes of this invention will be apparent to persons familiar with equipment of this type upon reading the following descriptive material and examining the accompanying drawings, in which:

FIG. 1 is a perspective view of a roll-type door assembly embodying the invention and as viewed from the exterior side of a wall on which the assembly is mounted;

FIG. 2 is an enlarged broken sectional view taken along the line II—II in FIG. 1;

FIG. 3 is a sectional view taken along the line III—III of FIG. 2 rotated 90° clockwise;

FIG. 4 is a sectional view taken along the line IV—IV in FIG. 2 and rotated 90° counterclockwise;

FIG. 5 is a sectional view taken along the line V—V in FIG. 1; and

FIG. 6 is a sectional view taken along the line VI—VI in FIG. 1.

For convenience in description, the terms "upper," "lower," "front," "rear," "left," "right" and words of similar import will have reference to the door assembly of the invention as appearing in FIG. 1 in which the front or exterior side of the door is exposed. The terms "inner," "outer" and derivatives thereof will have reference to the geometric center of the door and parts thereof.

SUMMARY OF THE INVENTION

The objects and purposes of the invention, including those set forth above, have been met by providing a roll-type closure assembly comprising a closure member having a plurality of relatively narrow, horizontally hinged slats which are rolled upon a counterbalanced shaft rotatably supported upon a wall above the area, usually an opening, to be covered by the closure member. A pair of spaced, upright guide tracks are mounted upon the wall for receiving and guiding the opposite lateral edges of the closure member as it moves between its opened and closed positions.

DETAILED DESCRIPTION

The rolling door 8 (FIG. 1), which illustrates a preferred embodiment of the invention, may be mounted for movement between open and closed positions across an opening 11 in a wall 12 of a building. While the door assembly of the invention will be disclosed hereinafter in association with, and for the purpose of closing, an opening in a wall, it will be recognized that the door assembly has other uses such as a movable partition or security wall within a building or a protective covering for a large window.

The rolling door 8 is guided in its movement by a pair of upright tracks 9 and 10 which are mounted on the wall 12 adjacent the opposite sides of the opening 11. The track 9, for example, is comprised of an upright mounting or angle member 13 having an L-shaped cross section with flanges 14 and 16. The flange 16 is provided with a plurality of vertically aligned and elongated openings 17 through which the screws 18 are received to secure the flange 16 to the wall 12 along one side of the opening 11. A plurality of vertically aligned openings 19 are provided in the flange 14 of the member 13.

A head plate 21 (FIG. 1) has a plurality of vertically aligned openings 22 along the inner edge thereof which are alignable with openings 19 in the flange 14 of the member 13. Bolts 23 are received through the openings 19 and 22 to secure the head plate 21 to the upper end of the flange 14. An enlarged opening 24 (FIG. 2) is provided in the plate 21 to receive the end of the shaft 20, and said opening is surrounded by spaced openings 26 through the head plate 21.

The track 10, which is preferably a mirror image of the track 9, includes an elongated angle or mounting member 27 having flanges 28 and 29.

A plurality of vertically aligned and elongated openings 31 are provided in the flange 29 to receive screws 32 therethrough for securing the flange 29 to the wall 12 on the opposite side of the opening 11 from the member 13. The flange 28 of the member 27 projects perpendicularly outwardly from the wall 12, as does flange 14. A plurality of vertically aligned openings 33 are provided in the flange 28.

A head plate 34 has vertically aligned openings 36 adjacent the inner edge thereof which are alignable with openings 33 in the flange 28. Bolts 37 are received through the aligned openings 33 and 36 to secure the head plate 34 to the flange 28 of the member 27. A vertically elongated slot 38 is provided in the head plate 34 and horizontally aligned with the slot 24 in the head plate 21 on the opposite side of the opening 11. The elongated slot 38 is surrounded by spaced openings 39 through the plate 34. It is preferable that the openings 39 be in the same relationship to slot 38 as the openings 26 in the head plate 21 are to the slot 24, to make the parts interchangeable.

The flanged, annular hub 41, which has a central opening 42, is secured to the inner side of the head plate 21 by a plurality of bolts 43 extending through axial openings 40 in the hub, and through the openings 26 in the head plate 21. The hub 41 is thus mounted on the head plate 21 so that the central opening 42 is axially aligned with at least a portion of the vertically elongated slot 24. The bolt openings 40 in the hub 41 are of a larger diameter than the bolts 43 to permit radial adjustment of the hub on the head plate.

An annular and flanged spring anchor plug 44 having a plurality of threaded openings 46 therein is mounted on the hub 41 adjacent the inner, flanged side thereof by the bolts 43 which extend through the openings 26 in the head plate 21, the bolt receiving openings 40 in the flange of the hub 41 and are threadedly engaged with the threaded openings 46 in the spring anchor plug 44. A central, axial opening 47 is provided through the spring anchor plug 44. A hub 48 and a spring anchor plug 49 are secured to the left side of the head plate 34 by a plurality of bolts 51 in the same manner that the hub 41 and the spring anchor plug 44 are secured to the head plate 21.

The shaft 20 has a diameter materially smaller than the diameters of the openings 42 and 47 through the hub 41 and the spring anchor plug 44, respectively. Said shaft is received through said openings 42 and 47, and through corresponding openings in the hub 48 and plug 49. The axial ends of shaft 20 project through the vertically elongated slots 24 and 38 in the head plates 21 and 34, respectively. A bearing 52 is provided in the opening 47 of the spring anchor plug 44 to support the shaft 20 for rotation relative to the head plates 21 and 34.

A flanged spring winding plug 56 (FIG. 2) is releasably secured to the shaft 20 by any convenient means, not illustrated, rightwardly or inwardly of the spring anchor plug 44. A spring 57 is secured at one end to the spring winding plug 56 and at its other end to the spring anchor plug 44.

A spring winding plug 58 is releasably secured to the shaft 20, by any convenient means not illustrated, leftwardly of the spring anchor plug 49. A spring 59 is secured at one end to the spring winding plug 58 and at its other end to the spring anchor plug 49. Thus, unwinding rotation of the shaft 20 is resiliently resisted by the two, independent counterbalance devices 53 and 54, which comprise the plugs 44, 56 and spring 57, and plugs 49, 58 and spring 59, respectively.

A flanged ring 61 has an integral, inner and annular flange 60 which is rotatably mounted upon the hub 41. If desired, a radial bearing 62 may be provided between the flange 60 and the hub 41 to facilitate rotation. In this particular embodiment, the ring 61 has an outer, integral and annular flange 64 with a plurality of radially projecting and spaced cogs or ribs 63 (FIG. 3) which are uniformly spaced along and around the periphery thereof. A thrust bearing 65 is provided between the ring 61 and the flange on the hub 41.

In this particular embodiment, the ring 66 is identical to the ring 61, and the ring 66 is rotatably mounted upon the hub 48 in the same manner as the ring 61 is mounted upon the hub 41. However, the ring 66 and hub 48 are in reversed positions by comparison with the ring 61 and hub 41.

A flanged hub 67 (FIG. 2) is secured to the shaft 20 between the devices 53 and 54 by any convenient means, such as set screws 68 (FIG. 4). The hub 67 has a pair of coplanar flanges 71 and 72 which extend radially outwardly in opposite directions from the hub 67. An opening 73 is provided adjacent the outer end of each of the flanges 71 and 72. A ring 74, which is preferably identical to the rings 61 and 66, is secured to the flanges 71 and 72 by bolts 76 received through the openings 73 in the ring 74. The ring 74 is, therefore, rotatable with the shaft 20.

Another hub 77 (FIG. 2) may be secured to the shaft 20 between the hub 67 and the spring winding plug 58 by set screws (not illustrated). A ring 78 is secured to the hub 77 by a plurality of bolts 79 in the same manner as the ring 74 is secured to the hub 67. The ring 78 is, therefore, rotatable with the shaft 20.

From the foregoing, it can be seen that the rings 61, 66, 74 and 78 are at least similar to sprockets, and the rings 61 and 66 act primarily as supports while the rings 74 and 78 act as driving sprockets because they are secured to the shaft 20. Additional rings and supporting hubs may be provided as desired.

The door 8 is comprised of a plurality of horizontally hinged slats 82 (FIGS. 3 and 4), and at least the uppermost slat is secured to the peripheral flanges of each of the rings 61, 66, 74 and 78. In this particular embodiment, and referring to FIG. 4, the uppermost slats 82A, 82B and 82C are secured to the ring 74 by a plurality of bolts 84.

The opposite elongated edges 86 and 87 of the slats 82 are reversely curved to interconnect and thereby provide horizontal hinges. In this particular embodiment, the width of each of the slats 82 is approximately one-half of the radius of the rings 61, 66, 74 and 78 to permit the door 8 to be rolled upon the rings. Thus, when the door is completely rolled upon the rings, which would place the door 8 in the opened condition, the plurality of hingedly connected slats 82 will define a spiral.

The uppermost slats 82A, 82B and 82C, being firmly secured to the rings 61, 66, 74 and 78, serve to reinforce the shaft 20 and rigidify the mechanism, including the shaft 20,

which supports the door in its closed position. Additional slats 82 may be secured to the rings to increase this rigidity as where the span of the opening 81 approaches the maximum capability of a given shaft and its support structure.

The track 9 includes a guide channel 91 defined by a pair of angle members 92 and 93. The angle member 92 has a pair of perpendicularly oriented flanges 96 and 97, the flange 97 having a plurality of aligned openings 98 therethrough. The angle member 93 has a pair of perpendicularly oriented flanges 99 and 100, the flange 100 having a plurality of vertically aligned openings 101 therethrough. The flanges 96 and 99 are horizontally spaced from each other to define the channel 91 therebetween. A plurality of bolts 103 are received through the axially aligned openings 19, 98 and 101 to secure the angle members 92 and 93 to the flange 14 of the mounting member 13. The upper ends 106 and 107 (FIG. 3) of the flanges 96 and 99, respectively, diverge upwardly to facilitate reception of the door 8 therebetween.

The track 10 includes a guide channel 111 defined by a pair of angle members 112 and 113. The angle member 112 has a pair of perpendicularly oriented flanges 114 and 116, the flange 116 having a plurality of vertically aligned openings 117 therethrough. The angle member 113 has a pair of perpendicularly oriented flanges 118 and 119, the flange 119 having a plurality of vertically aligned openings 121 therein. A plurality of bolts 122 are received through the axially aligned openings 33, 117 and 121 to secure the angle members 112 and 113 to the flange 28 of the mounting member 27. The flange 114 of the angle member 112 and the flange 118 of the angle member 113 are horizontally spaced to define the channel 111. The upper ends of the flanges 114 and 118 (FIG. 4) diverge upwardly to receive the door 8.

The opposite ends of the slats 82 are received within the guide channels 91 and 111 on opposite sides of the opening 11.

If desired, the lowermost slat 82D may be secured to a foot member 124 (FIG. 6) which includes an elongated, horizontal base plate 125 having an integral, upwardly extending flange 126 which is secured to the midportion of the slat 82D by a rivet 127. The foot member 124 has an integral cleat 129 on the upper surface of the base plate which grips the lower curved edge of slat 82D. The upper edges of a channel-shaped weather or sealing strip 128 are held in spaced recesses in the lower surface of the base plate 125. Thus, when the door is in the closed position, the weather strip 128 will be pressed against the threshold of the opening 11 to seal the door in a closed position. To minimize preparation, installation and operational problems, the foot member 124 and sealing strip 128 extend between, but not into, the guide channels 91 and 111. Thus, if they are found to be too long at the installation site, they can be easily and quickly trimmed as required.

If desired, a conventional drive mechanism 131 may be provided for rotating the shaft 20. In this particular embodiment, the drive mechanism is comprised of an upper sprocket 132 rotatably supported by shaft 134 on the head plate 21. A lower sprocket 133 is mounted below the sprocket 132 on the track 9 and is aligned for parallel rotation therewith. An endless chain 135 interconnects the sprockets 132 and 133. A crank 136 is secured to the sprocket 133 for driving same. It is recognized, however, that the chain 135 and crank 136 could be replaced by a manually operated chain or an electric motor. A pair of peripherally engaged reduction gears 138 and 139 are mounted upon the shafts 20 and 134, respectively, for rotation therewith.

OPERATION

Although the operation of the rolling door described above will be understood by persons skilled in this art from the foregoing description, a summary of such description is now given for convenience.

The door 8 may be opened and closed by an appropriate operation of the crank 136. The weight of the door is compensated for by the counterbalance devices 53 and 54 so that when the door is in the closed position, the springs 57 and 59 will serve to reduce the amount of force required by the operator to open the door. Rotation of the shaft 20 will effect rotation of the rings 74 and 78 to move the slats 82 in an upward direction. The rings 61 and 66 secured to the end portions of the uppermost slat 82A will follow the movement of the slat 82A which is urged by the springs 74 and 78 in the winding direction of rotation about the shaft 20.

Since the width of each slat is about half the diameters of the rings 61, 66, 74 and 78, the slats 82 will be wound upon the rings as illustrated in FIG. 4 to define a tight spiral which, due to its geometric nature, is rigid and requires no internal support other than the rings 61, 66, 74 and 78. This rigidity increases as the spiral increases in diameter and, accordingly, as the door approaches its opened position.

If one of the counterbalance devices 53 or 54 becomes damaged or inoperable, the other device will continue to provide partial support. These devices can be easily repaired by lowering the door so that only the attached slats 82A, 82B and 82C cover the devices 53 and 54. If more than three slats are attached to the rings, they can be quickly disconnected, if necessary, to adjust the devices 53 and 54 when required, without dismantling the door assembly.

The arrangement of disks 61, 74, 78 and 68, and the slats 82 attached thereto, provides a rigid door support which prevents excessive deflection of the shaft 20 when the door is in its raised position.

Although a particular preferred embodiment of the invention has been disclosed in detail for illustrative purposes, it will be recognized that variations or modifications of the disclosed apparatus, including the rearrangement of parts, lie within the scope of the present invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A roll-type door assembly mountable upon wall means and having a door movable between open and closed positions with respect to an opening in said wall means, comprising:

head means adapted to be mounted upon said wall means near the upper end of said opening;

horizontal shaft means rotatably supported by said head means, said head means including a pair of spaced head plates near the opposite ends of said shaft means and a pair of hub means mounted on said head plates, said hub means having openings through which said shaft means extends and in which said shaft means is rotatably supported;

a plurality of coaxial, annular members of substantially equal diameter, said members being nonrotatably supported relative to said shaft means and some of said members being rigidly secured to said shaft means at spaced intervals lengthwise thereof;

door means having a plurality of relatively narrow, relatively stiff and horizontally hinged slats, at least one of said slats being rigidly secured to said annular members whereby rotation of said shaft means effects rolling or unrolling of said door means around said annular members;

a pair of upright and spaced guide track means adapted to be secured to said wall means adjacent the opposite upright edges thereof defining said opening therein, said guide track means being arranged to slideably receive and guide the opposite, lateral edges of said door means as said door means is moved between its open and closed positions;

spring means adjacent said shaft means and connected between said head means and said shaft means for yieldably resisting rotation of said shaft means in the door unrolling direction, said spring means including a pair of spiral springs, one end of each being connected respectively to one of said hub means and the other end of each being connected to said shaft means; and

at least one of said annular members being rigidly secured to said shaft means between said spiral springs and two further said annular members being rotatably supported adjacent said hub means.

2. A roll-type door according to claim 1, wherein a plurality of said slats disposed adjacent the upper edge of said closure means are rigidly secured to said annular members.

3. A roll-type door assembly according to claim 1, including drive means connected to said shaft means for effecting rotation thereof; and

wherein each of said annular members has a peripheral, axially extending and integral flange having a plurality of spaced, radial projections, the circumferential centerline distance between each pair of adjacent projections being approximately equal to an even multiple of the distance between the hinge axes of a slat.

4. A roll-type door assembly according to claim 1, including a threshold sealing element secured to the lowermost slat in said door means, said sealing element extending between the adjacent edges of but not into, said track means.

5. A roll-type door assembly mountable upon wall means and having a door movable between open and closed positions with respect to an opening in said wall means, comprising:

support means adapted to be mounted upon said wall means near the upper end of said opening;

horizontal shaft means rotatably supported by said support means, said support means including a pair of spaced support members near the opposite ends of said shaft means on which said shaft means is rotatably supported;

a plurality of coaxial, annular members of substantially equal diameter, said annular members being concentric with and nonrotatably connected to said shaft means and being positioned relative to said shaft means at spaced intervals lengthwise thereof;

door means having a plurality of relatively narrow, relatively stiff and horizontally hinged slats, several of said slats adjacent the upper edge of said door means being rigidly secured to said annular members whereby rotation of said shaft means effects rolling or unrolling of said door means around said annular members;

a pair of upright and spaced guide track means adapted to be secured to said wall means adjacent the opposite upright edges thereof defining said opening therein, said guide track means being arranged to slideably receive and guide the opposite, lateral edges of said door means as said door means is moved between its open and closed positions;

spring means adjacent said shaft means and connected between said support means and said shaft means for yieldably resisting rotation of said shaft means in the door unrolling direction, said spring means including a pair of spiral springs disposed in surrounding relationship to said shaft means, one end of each spring being connected respectively to one of said support members and the other end of each spring being connected to said shaft means, and said plurality of slats as rigidly secured to said annular members partially surrounding said springs, said plurality of slats being the only wall structure surrounding said springs whereby said springs are easily accessible; and

at least one of said annular members being rigidly secured to said shaft means between said spiral springs and two further said annular members being disposed adjacent the opposite ends of said shaft means, said two further annular members being rotatably supported relative to and substantially adjacent said support member.

* * * * *