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C. C. MOLER
SLACK CABLE TAKE-UP

3,412,780

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2 Sheets-Sheet 1

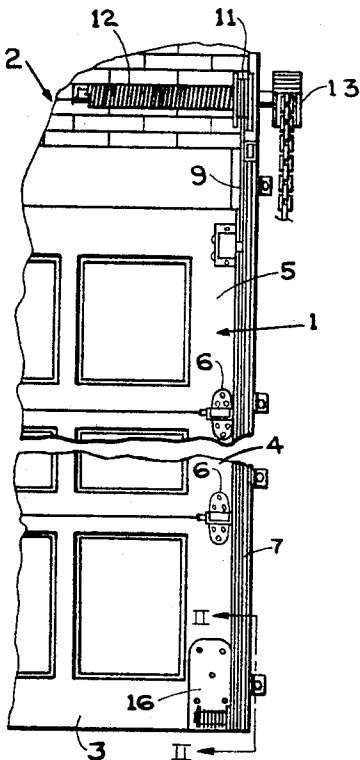


Fig 1

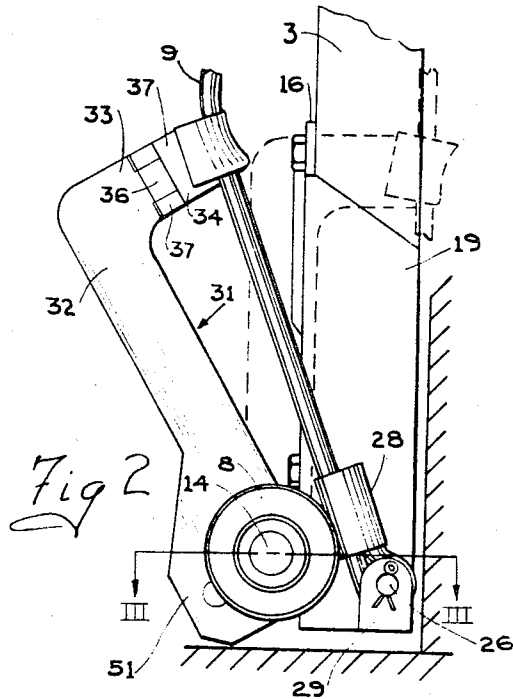


Fig 2

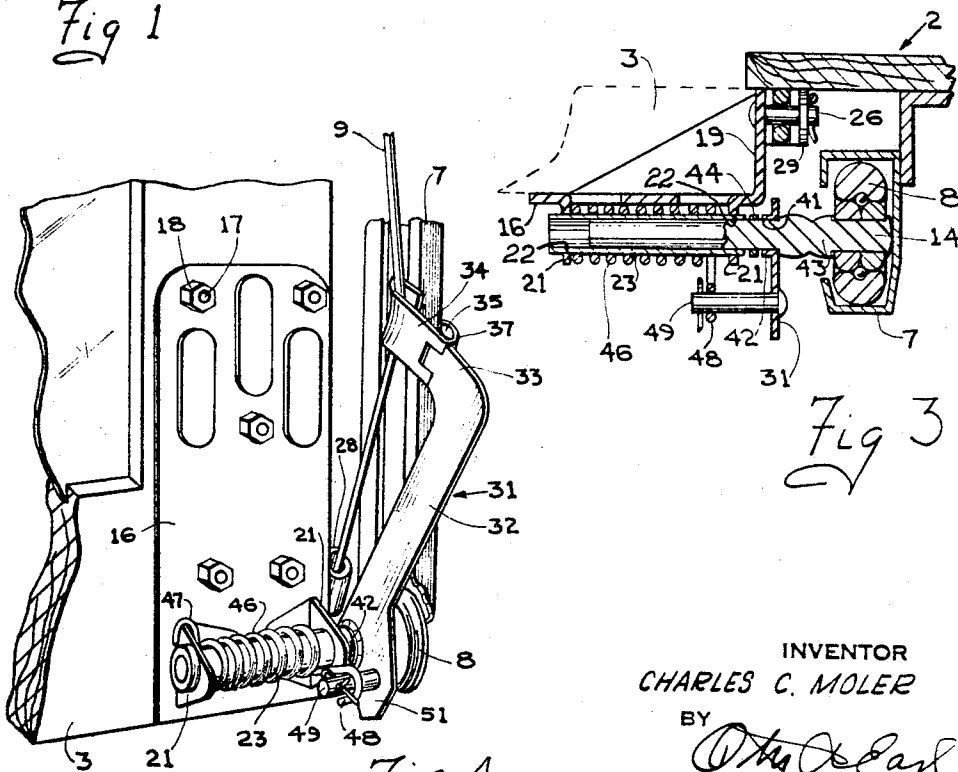


Fig 3

Fig 4

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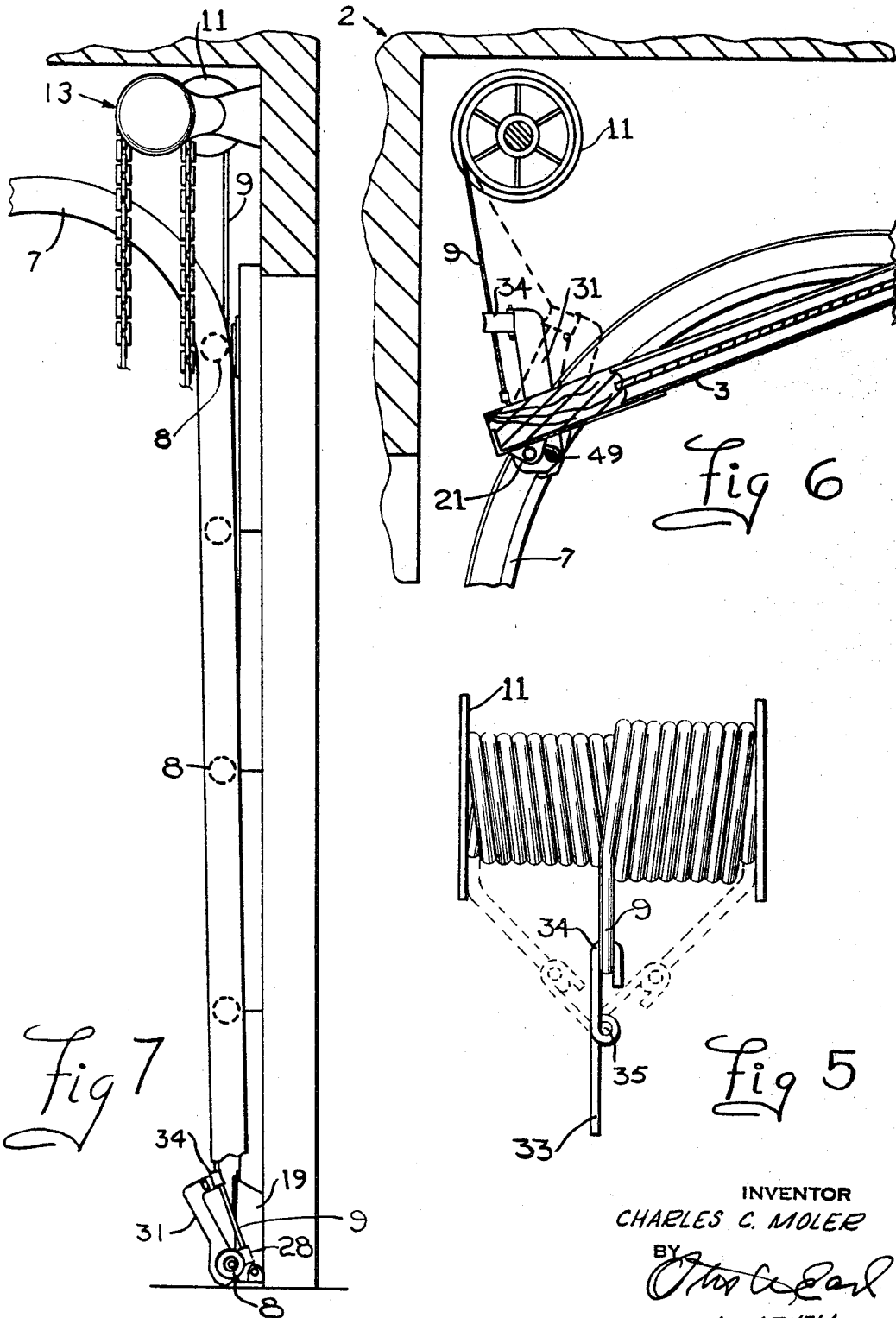
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SLACK CABLE TAKE-UP

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ABSTRACT OF THE DISCLOSURE

An upwardly acting door construction includes a door, track means by which the door is supported for a movement between open and closed positions, a cable connected to the lower end of said door and spring-biased take-up means connected to the cable and located above the door. A spring-biased arm is pivotally supported on the lower end of the door and engages the cable near its lower end whereby said cable is maintained in a taut condition at all times.

This invention relates to an automatic cable slack take-up mechanism, especially adapted for use on cable-operated upwardly acting doors.

The main objects of this invention are:

First, to provide an upwardly acting door having counterbalancing means with slack take-up coupling means for connecting a cable to the door.

Second, to provide counterbalancing means for an upwardly acting door in which the cable has slack take-up tension in all opening and closing positions of the door.

Third, to provide a unitary slack eliminating means for the lifting cable of an upwardly acting door.

Fourth, to provide a unitary cable coupling member for upwardly acting doors which may be attached securely to the door as a unit.

Further objects and purposes relating to the structural details of my invention will appear from the following description and the drawings in which:

FIGURE 1 is a fragmentary front view of an upwardly acting door embodying my invention, some of the parts being shown conventionally.

FIGURE 2 is a view on an enlarged scale taken along the line II-II of FIGURE 1 and showing a cable coupling unit embodying my invention with parts in slack take-up position shown in full lines and in lift position by dotted lines.

FIGURE 3 is a sectional view taken along the line III-III of FIGURE 2.

FIGURE 4 is a perspective view of the cable slack take-up mechanism.

FIGURE 5 is a diagrammatic view illustrating the positions that can be taken by the hook depending on the position of the cable on the drum.

FIGURE 6 is a fragmentary view of the door in an open position, the cable coupling means being illustrated in one position by full lines and in the slack take-up position by dotted lines.

FIGURE 7 is a fragmentary vertical section illustrating the relation of the door and the cable coupling means to the door frame, parts of the door and the frame being shown conventionally.

Summary of the invention

The objects and purposes of the invention are met by providing a door assembly which consists of a bracket and a cable, both of which are secured to the door near the lower edge thereof. The bracket supports a shaft which extends laterally beyond the edge of the door to support a track-engaging roller. An arm is pivotally mounted on the shaft and engages the cable near the lower end thereof. The cable is also connected to a spring-biased

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drum mounted above the door. Resilient means urges the arm against the cable which is thereby maintained in a taut condition at all times.

In the accompanying drawings the cable slack take-up means has been illustrated generally in slack take-up position. as it is believed that this is desirable for illustrating the structure and uses of the applicant's invention, but it should be understood that when the cable is under load the parts are in a position shown in dotted lines in FIGURE 2. The cables are not purposely installed with slack, but they are under considerable load and the cables which are conventionally illustrated in the accompanying drawings are formed of wire stock and can become slack in use.

In the accompanying drawings 1 indicates a door and 2 a door frame, these being shown conventionally. The door illustrated is comprised of a bottom section 3, a top section 5 and an intermediate section 4, these being connected by hinges 6. It is desirable to point out that a considerable number of patents have been issued to the applicant and others on what is commonly called "upwardly acting doors" provided with counterbalancing means such as is conventionally shown in the drawings.

However, to insure a complete understanding of the invention a brief description of a typical upwardly acting door will be given.

A pair of guide tracks, one of which is indicated at 7, are mounted on the frame 2 along the opposite ends of the door opening. Guide rollers, one of which is indicated at 8, are mounted on the door and received in the guide tracks so that opening and closing movement of the door is closely guided. A pair of cables, one of which is indicated at 9, are connected to the door close to the opposite lower corners thereof. The cables are wound on drums, one of which is shown at 11, which are rotatably supported on the door frame. A counterbalancing spring 12 is associated with each drum, to at least partially counterbalance the weight of the door. A chain hoist 13 is connected to effect rotation of the drum, although it will be understood that other devices can be used for this purpose. It will be understood that the structure illustrated in the drawings in association with one end of the door, will also be provided at the other end of the door. However, since the structures involved would ordinarily be substantial duplicates, it is believed that a detailed description of one such structure will be sufficient.

Bracket means in the form of a platelike body member 16 is secured to the inside surface of the door adjacent the lower corner thereof. The body member 16 is desirably formed of sheet metal and has a plurality of holes therein adapted to receive attaching bolts 17 which extend through the door and are provided with clamping nuts 18. As illustrated, the body member 16 has a transverse flange 19 on its outer edge which engages the edge of the door. The body member 16 has a pair of laterally spaced ears 21 stuck out therefrom adjacent the lower edge thereof. The ears have horizontally aligned holes 22 in which a tubular support member 23 is supportedly mounted. In the embodiment illustrated a horizontal shaft or spindle 14 for the lowermost track-engaging roller 8 is supportedly disposed in the member 23.

The cable 9 is conventionally illustrated, but is flexible and coilable as is illustrated. In this embodiment of my invention the cable is connected to the body member 16 by looping the end of the cable around a pin 26 and securing same by a clamp 28. The pin 26 is supported at its ends by the flange 19 and the L-shaped extension 29.

The cable slack take-up member 31 comprises arm means constructed as a plate-form member which is swingably mounted on the spindle 14. The member 31 has an upright portion 32 of substantial length and has

an arm 33 on its upper end which projects toward the door. A hooklike cable-engaging member 34 is connected to the arm 33 by the pivot pin 35. The arm 33 and the cable-engaging member 34 having interleaved pivot-receiving ears or knuckles 36 and 37, through which passes the pivot pin 35.

The cable slack take-up member 31 has an opening 41 adjacent its lower end and the spindle 14 passes through said opening whereby the member is supported for pivotal movement on said spindle. The member 31 has an annular boss 42 closely surrounding said spindle so that the member is prevented from tipping. The member 31 is confined between the enlarged portion 43 of the spindle and the tubular support member 23, there being a washer 44 between the boss 42 and the adjacent end of said tubular support member. Thus, the take-up member 31 is capable of only slight movement in a direction axially of the spindle.

A torsion spring 46 surrounds the support member 23 and one end 47 of said spring is hooked over the adjacent ear 21. The other end 48 of the torsion spring 46 is hooked over a spring stud 49 which is secured to the take-up arm 31. The stud 49 extends generally parallel with the support member 23 and is laterally offset from the opening 41. Thus, the torsion spring 46 normally urges the take-up member 31 away from the door into the inclined position shown in FIGURES 2, 4 and 7. However, the take-up member is free to pivot about the spindle 14 in response to a pulling force applied thereon by the cable 9 and which is sufficient to overcome the force of the torsion spring 46. The member 31 has a downwardly extending nose portion 51 which is engageable with the sill of the door opening when the door is in its closed position.

Operation

While the operation of the apparatus has been indicated in the foregoing description, the same will be set forth again to insure a complete understanding of the invention.

When the door is closed, the torsion spring 46 normally urges the cable slack take-up member 31 to the inclined position shown in FIGURES 2, 4 and 7 whereby if slack exists in the cable when the door is closed, the same will be taken up. Thus, when the cable is raised by rotation of the drum 11 during the initial opening movement of the door, the cable will be held under tension so that it will be hindered from jumping out of the grooves of the winding drum. The opening movement of the door can then be carried in a conventional well understood fashion. As the cable is raised, it will pivot the member 31 forwardly against the tension of the torsion spring 46. It is to be noted that when the door is in its fully open position (see FIG. 6) the cable is fully tensioned and the cable slack take-up member 31 will be held by the cable in a position in which it is almost perpendicular to the door and projects beyond the front side of the door.

When the door is to be closed, the drum 11 is rotated in a door closing direction, that is, counterclockwise in FIGURE 6. The door moves downwardly primarily under its own weight and it falls slowly at first. Thus, it is possible for the drum 11 to rotate so that its peripheral speed is greater than the speed of downward movement of the door so that some slack in the cable occurs. As soon as this happens the cable slack take-up member 31 will pivot rearwardly toward the door, as indicated in broken lines in FIGURE 6, to take up the slack in the cable.

Thus, the cable slack take-up mechanism of the invention keeps pressure on the cables at all times and prevents the cables from jumping out of the groove on the winding drums. This is particularly important during the initial stage of the closing movement of the door during which the cable may be played out by rotation of

the drum faster than the door moves downwardly. However, it is also important during the opening movement of the door in situations where one of the cables is too loose because of an installation error.

Referring to FIGURE 5, it will be noted that the pivotal mounting of the hook 34 of the take-up member makes it possible for that take-up member to function properly regardless of the axial position of the cable as it is wound on the drum.

I have illustrated and described a highly practical and desirable embodiment of my invention. I have not illustrated or described adaptations to doors of different structure and design to which it is believed that this disclosure will enable those skilled in the art to adapt my invention as may be desired.

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

1. In an upwardly acting door construction including a door, track means on which said door is supported for movement between open and closed positions, cable means connected to said door near the lower end thereof and extending upwardly, and spring-biased means connected to said cable means and thereby urging said door toward the open position, the combination comprising:

bracket means secured to said door near its lower end; arm means supported on said bracket means for pivotal movement around a horizontal axis, said arm means having an upper end adapted to engage said cable means above said axis when said door is in said closed position;

resilient means urging the upper end of said arm means around said horizontal axis and against said cable means whereby said cable means is maintained in a taut condition at all times; and

track-engaging roller means rotatably supported on said bracket means for engagement with said track means.

2. The upwardly acting door construction defined in claim 1, wherein said arm means includes an elongated element and a cable-engaging hook member pivotally mounted on the upper end of said element for movement around a second axis transverse of said horizontal axis.

3. An upwardly acting door construction including a door, track means on which said door is supported for movement between open and closed positions, cable means connected to said door near the lower end thereof and extending upwardly, and spring-biased means connected to said cable means and thereby urging said door toward the open position, the combination comprising:

bracket means secured to said door near its lower end and near said cable means, said bracket means having a pair of spaced ears projecting from said door; horizontal shaft means supported by said ears; arm means rotatably supported near one end on said shaft means, the other end of said arm means being adapted to engage said cable means above said shaft means when said door is in said closed position;

a coil spring sleeved on said shaft means between said ears and urging said other end of said arm means around said horizontal axis and against said cable means whereby said cable means is maintained in a taut condition; and

track-engaging roller means rotatably supported on said bracket means for engagement with said track means to control the movement of said lower end of said door.

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PETER M. CAUN, *Primary Examiner*.