Dec. 24, 1940. M. A. PIXLEY 2,226,017

CLOSURE

Filed March 2, 1939

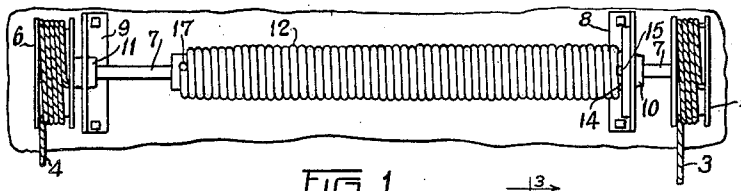


FIG. 2.

FIG. 1.

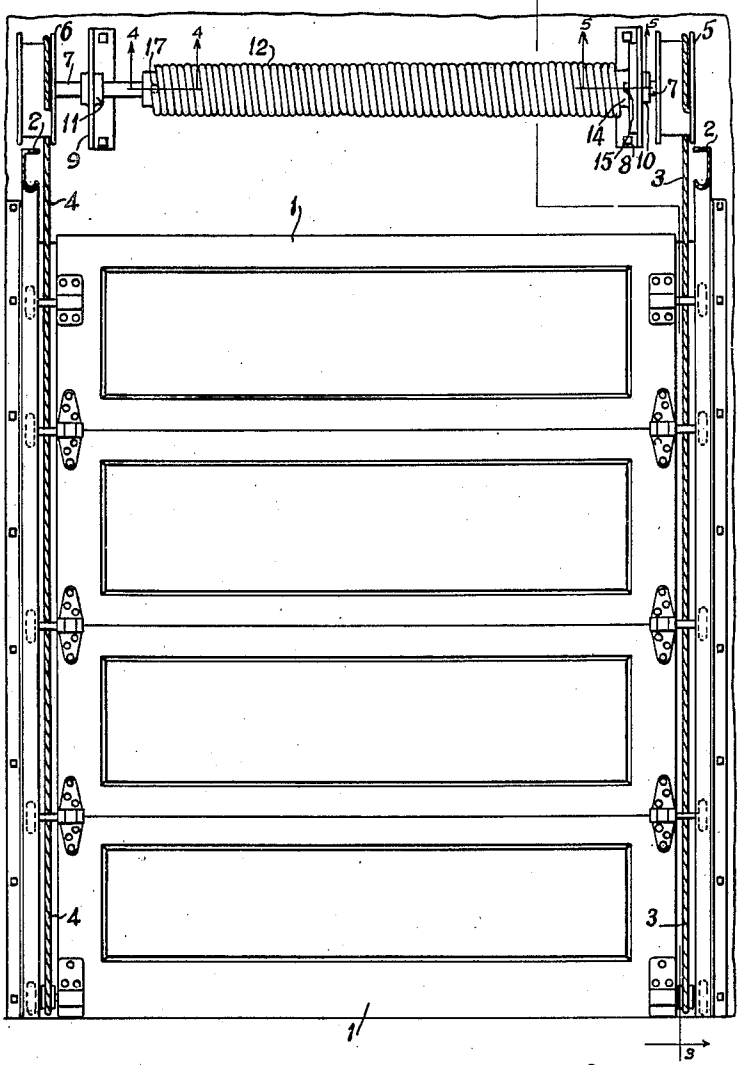


FIG. 3.

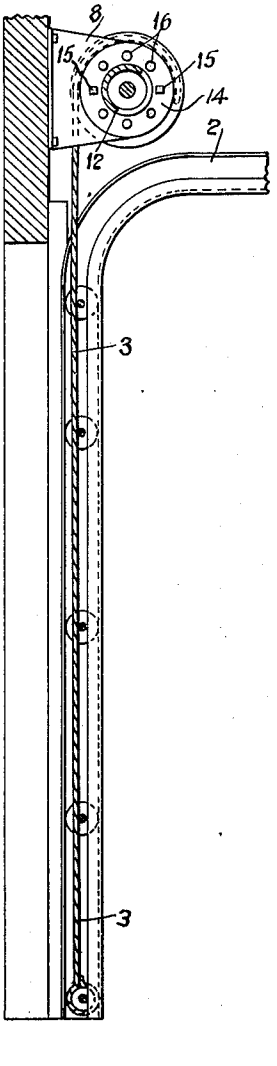


FIG. 4.

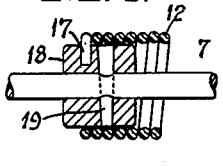
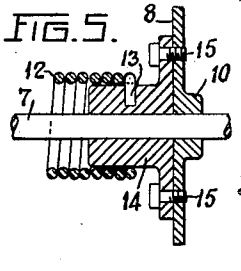


FIG. 5.



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2,226,017

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2,226,017

CLOSURE

Milton A. Pixley, Columbus, Ohio

Application March 2, 1939, Serial No. 259,400

4 Claims. (Cl. 16—198)

This invention relates to a closure and more particularly to a mechanism to be employed in conjunction with the opening and closing of said closure. Still more particularly it relates to mechanism for use in conjunction with an overhead door which comprises a series of hinged horizontal sections hinged to one another and disposed horizontally one above the other.

The principal object of the invention is to provide means for opening and closing a door which means comprises a mechanism for laterally shifting the drums upon which the cables which support the door are wound up, whereby the cables are maintained parallel to the edges of the door during the opening and closing of the door.

Another object is to provide in a door closure a shaft carrying drums upon which cables attached to the door are adapted to be wound, said shaft being freely laterally slidable with respect to its supporting means, and a spring adapted to store up energy during the closing of said door, and to release said energy to aid in the opening of said door, and also adapted to provide for lateral shifting of the drums as the door is opened or closed, whereby to maintain the vertical cables attached to the door in the same position throughout opening or closing of the door.

Another object is to provide in such a mechanism smooth drums thereby simplifying their manufacture and reducing the cost by reason of elimination of the necessity of employment of drums having a spiral groove formed thereon for guiding the cables as the door is moved.

Another object is to simplify the manufacture of door closure mechanisms wherein a laterally movable shaft carries the drums upon which the cables are wound, by the elimination of threads on the shaft and on the collar which supports the shaft.

Referring to the accompanying drawing:

Figure 1 is a front elevation of a door structure made in accordance with my invention, showing the door in closed position, showing the freely laterally slidable shaft and associated drums moved to the extreme left hand position, and showing the spring in its wound up position.

Figure 2 is a front elevation of the upper portion of the door structure of Figure 1, showing the freely laterally slidable shaft and drums associated therewith at the end of their movement to the right as the door is fully opened, and showing the spring in a relatively unwound position as compared with the spring of Figure 1.

Figure 3 is a section on line 3—3 of Figure 1, showing a portion of the horizontal portion of the track on which the rollers attached to the door travel as the door is opened, and showing in elevation the right-hand shaft support of Figure 1.

Figure 4 is a section on the line 4—4 of Figure 1, looking in the direction of the arrows.

Figure 5 is a section on the line 5—5 of Figure 1, looking in the direction of the arrows.

The present invention is an improvement in the closure disclosed in my United States Patent No. 2,032,951. By the present invention I have simplified considerably the structure necessary, and at the same time, have attained a number of advantages over the closure disclosed in said patent without sacrificing any of the advantages of said closure.

Reference numeral 1 designates a door of the usual overhead type made up of a plurality of horizontally superimposed sections, and adapted to be raised and lowered vertically and horizontally following track 2 of the usual type. The sections of the door are attached to the usual pintles and rollers at each side, which rollers are adapted to engage the track 2 and to thereby control the position of the various sections of the door as it is opened or closed.

Attached to the bottom of the door 1 in a suitable manner are the cables 3 and 4 which are adapted to support the weight of the door in the usual manner, these cables being vertically disposed parallel to the edges of the door and being adapted to be wound up on drums 5 and 6 respectively as the door is opened, and to be unwound from said drums as the door is closed. Associated with said drums is the mechanism embodied in the present invention for moving the drums laterally, whereby to maintain the cables 3 and 4 in a vertical position as the door is opened or closed, and to thereby prevent overlapping of the cables upon themselves on the drum.

Drums 5 and 6 are rigidly secured to shaft 7 in any suitable manner so that they rotate therewith. Shaft 7 is supported above the door opening by supports 8 and 9, which are fastened in any desired manner to the wall above the door opening. Supports 8 and 9 are provided with bearings 10 and 11 in which shaft 7 is freely slidable laterally. These bearings 10 and 11 are formed integral with supports 8 and 9 as is shown in the drawing, and are slightly larger in internal diameter than the outside diameter of shaft 7 so that shaft 7 is adapted to freely slide to the right or left relative to said supports.

Disposed in surrounding relationship with respect to shaft 7 is a steel helical torsion spring

12, which is adapted to be wound up as the door 1 is closed, and to thereby store up energy which is released by the unwinding of spring 12 as the door is opened, thereby aiding in the opening of the door. One end of spring 12 is rigidly secured to support 8 in any suitable manner, but preferably in the manner shown in the drawing. In the drawing the end 13 of spring 12 is inserted in a recess in circular flange 14 which is bolted by bolts 15 to support 8. Circular flange collar 14 is of such internal diameter that shaft 7 is freely slidable therein in the same manner as it is laterally slidable with respect to bearing 10. Collar 14 is preferably provided with a series of angularly disposed holes 16, so that it can be adjusted angularly of support 8 by rotating it with respect to support 8 and inserting bolts 15 through the desired holes 16, whereby to dispose the end 13 of spring 12 in the desired position.

It will be understood that by rotating collar 14 with respect to support 8, spring 12 may be wound up to any desired extent and secured in this preliminarily wound up condition to support 8. Such preliminary winding up is usually deemed desirable in order that spring 12 may be under some tension even when the door is in the fully opened position and spring 12 has assumed the position of Figure 2. The other end 17 of spring 12 is secured so as to rotate with and be rotated by shaft 7. This may be accomplished in any suitable manner as by insertion of the end 17 of spring 12 in a recess in a collar 18, said collar 18 being pinned to shaft 7 by pin 19.

As shown in the drawing, spring 12 is a cylindrical helical spring of circular cross-section wound in such manner that its convolutions touch each other. This spring may have a cross-section other than circular as for example rectangular (or flat) or square. The convolutions of spring 12 are maintained in contact with each other in the relatively unwound position of Figure 2, in the wound up position of Figure 1, and in intermediate positions. As explained above, spring 12 is provided with an initial tension in the relatively unwound position of Figure 2. Spring 12 causes the shaft 7 to move to the right or to the left, as may be appropriate, when spring 12 is wound up or unwound. This is accomplished in the following manner:

When the door is opened the spring 12 unwinds to the position of Figure 2 and contracts in length as its tension is reduced. Each revolution of the end 17 of the spring 12 causes said end 17 to move to the right or to the left carrying with it the shaft 7 and drums 5 and 6. Each revolution of the end 17 of spring 12 changes the length of spring 12 by a distance equal to the diameter of the wire from which spring 12 is made. Thus in closing the door, each revolution of shaft 7 causes a corresponding revolution of the end 17 of spring 12 and adds to its length a distance equal to the diameter of the wire from which spring 12 is made, thereby causing the drums 5 and 6 to move to the left the same distance. The reverse of this occurs as the spring unwinds in opening the door, the shaft 7 moving to the right with each revolution of the same, a distance equal to the diameter of the wire from which spring 12 is wound. Consequently in opening the door, shaft 7 is moved a distance equal to the product of the number of revolutions through which it rotates and the diameter of the wire making up spring 12. When the door has been opened, spring 12 assumes the position shown in Figure 2, in which position it has the initial tension referred to above, which is always maintained so as to keep the door in its raised position.

Since the drums 5 and 6 have a smooth face, the lateral movement of the drums, relative to cables 3 and 4, is equal to the diameter of wire in the counterbalance spring 12 for each revolution of the drums. Since cables 3 and 4 have a greater strength than the spring 12, cables 3 and 4 will usually have a smaller diameter than the wire from which the spring 12 is made, and there will be a space between each convolution of the cable on the drum equal to the difference between the diameter of the cable and the diameter of the spring wire. This prevents overriding of the cable upon itself on the drums.

As will be understood, helical spring 12 maintains its cylindrical shape at all times by reason of its disposition with respect to the other parts employed in the closure. Also the change in length of spring 12 is accompanied by corresponding change in diameter of the cylinder which it forms. Thus, as it is wound up, it increases in length and decreases in diameter and as it unwinds it decreases in length and increases in diameter.

If desired, cables 3 and 4 may be equal in diameter to the spring wire of spring 12 although it will be apparent that they should not be larger in diameter than said spring wire.

It will be understood that I desire to comprehend within my invention such modifications as will be necessary to adapt the same to varying conditions and uses.

It is also to be understood that the invention may be employed with doors other than the overhead type shown in the drawing, and that invention is deemed to reside not only in the combination with a door as shown, but also in the subcombination of the spring and freely laterally slidable shaft which may be adapted to other uses than the opening and closing of a door.

Having thus fully described my invention, what I claim is new and desire to secure by Letters Patent is:

1. A counterbalance for balancing the opening and closing of a door comprising means for windingly receiving a flexible member connected to the door, a torsional counterbalancing spring, and laterally slidable means interconnecting said receiving means and said spring for causing said spring to shift said receiving means laterally as said spring is wound and unwound and to thereby maintain the flexible member wound upon said receiving means against lateral displacement.

2. A counterbalance for balancing the opening and closing of a door comprising a shaft, supporting means therefor, said shaft being freely axially slidable with respect to said supporting means, a winding drum fixedly mounted upon said shaft and which is adapted to have wound upon its surface a flexible member connected to the door, and means for counterbalancing the door and for laterally shifting said shaft and winding drum to maintain the unwound portion of said flexible member against lateral displacement comprising a helical torsion spring surrounding said shaft, one end of said spring being immovably secured and the other end being fixedly secured to said shaft so as to rotate therewith.

3. A counterbalance for balancing the opening and closing of a door comprising a shaft, supporting means therefor, said shaft being freely axially slidable with respect to said supporting means, a winding drum fixedly mounted upon

said shaft and which is adapted to have wound upon its surface a flexible member connected to the door, and means for counterbalancing the door and for laterally shifting said shaft and winding drum to maintain the unwound portion of said flexible member against lateral displacement comprising a closely wound cylindrical helical spring having its convolutions touching each other and surrounding said shaft, one end of said spring being immovably secured and the other end being fixedly secured to said shaft so as to rotate therewith.

4. A counterbalance for balancing the opening and closing of a door comprising rotatable means, supporting means therefor, said rotatable means being freely laterally slidable with respect to said supporting means, a winding drum fixedly connected to said rotatable means and which is adapted to have wound upon its surface a flexible member connected to the door, and common means for counterbalancing the door and for laterally shifting said shaft and winding drum to maintain the unwound portion of said flexible member against lateral displacement comprising a helical torsion spring one end of which is immovably secured and the other end of which is movable laterally and rotatably as said rotatable means rotates and is fixedly connected to said rotatable means.

MILTON A. PIXLEY.