Feb. 6, 1951 J. A. LANGER 2,540,742

ROLLING DOOR BARREL

Filed June 4, 1946

Fig. 1.

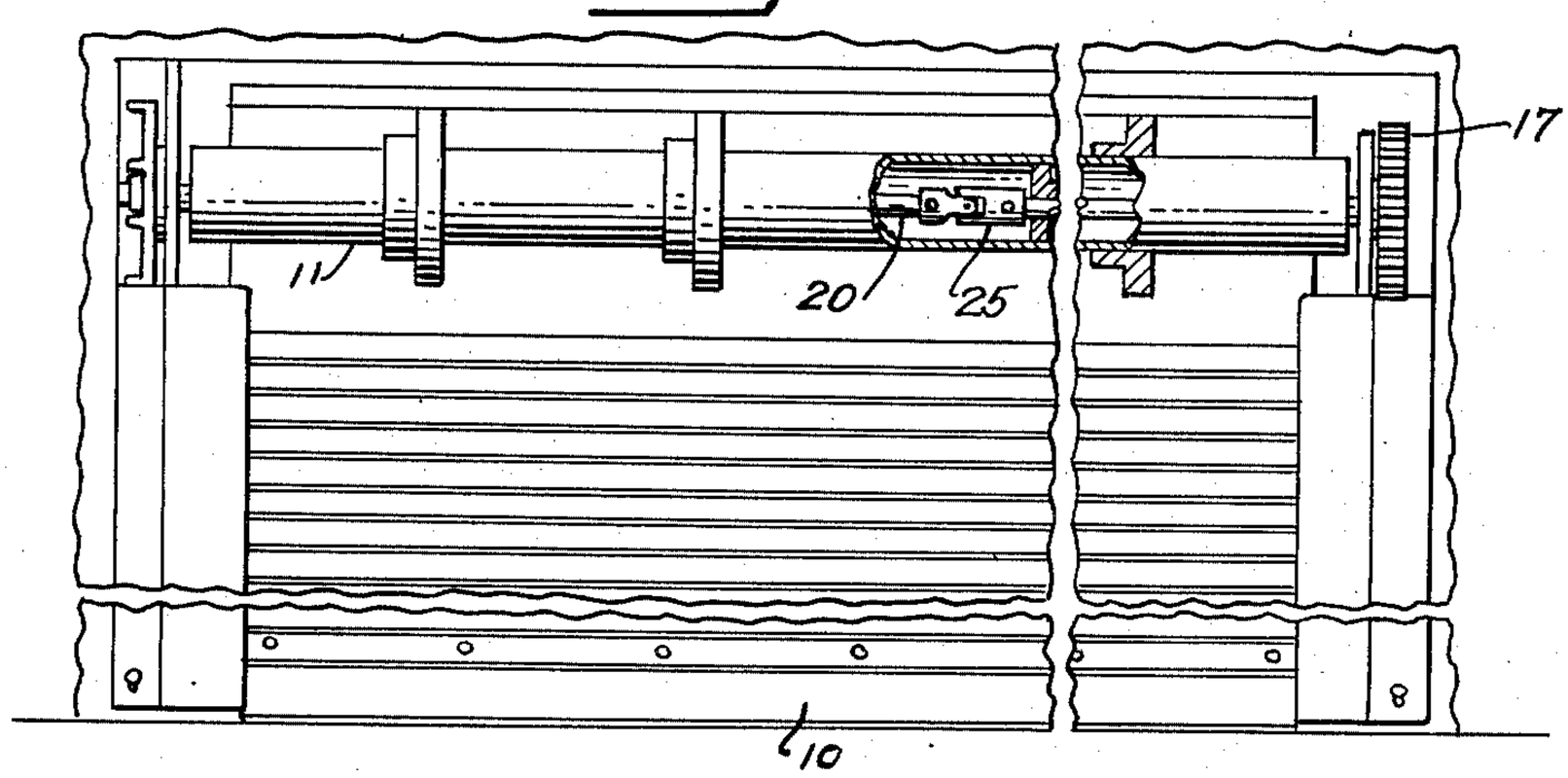


Fig. 2.

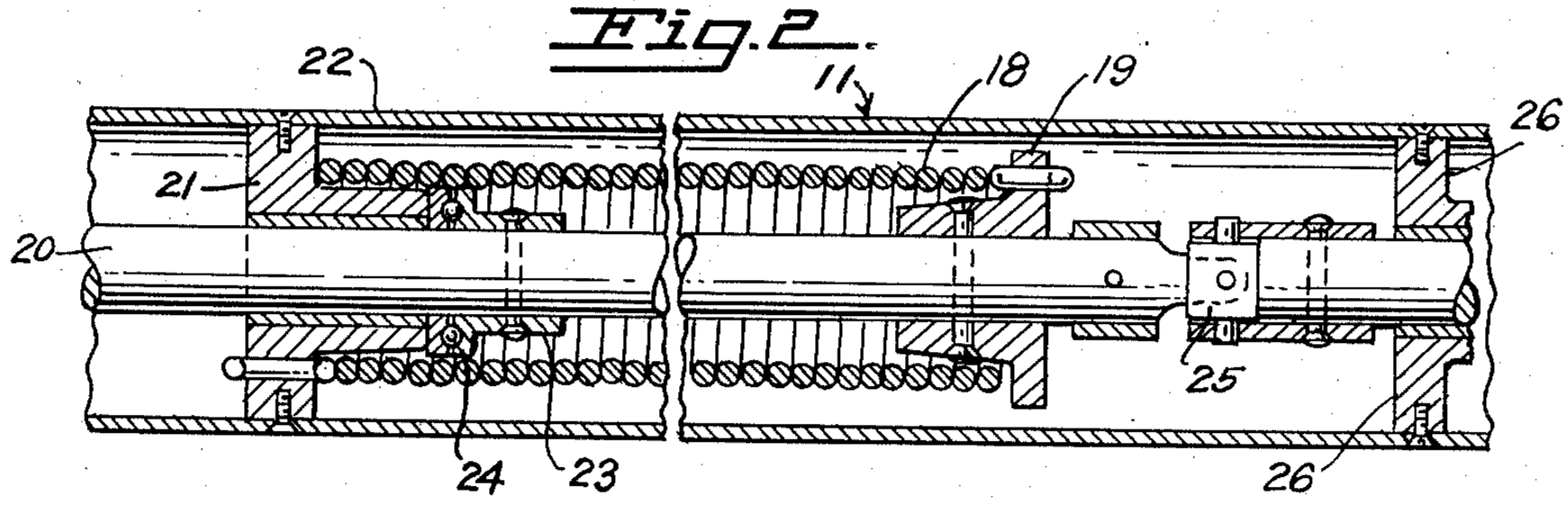


Fig. 3.

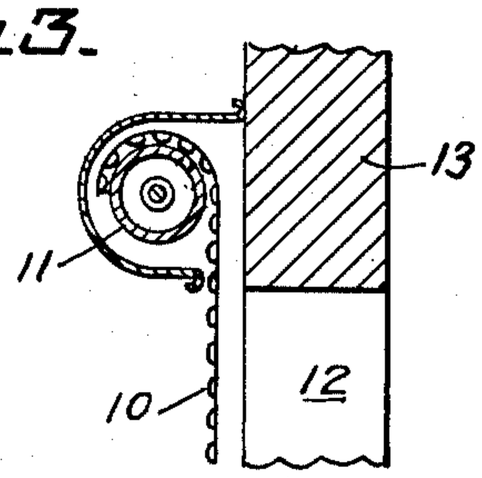
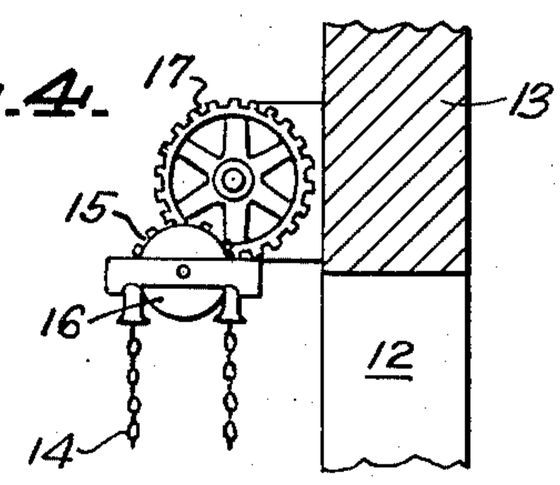


Fig. 4.



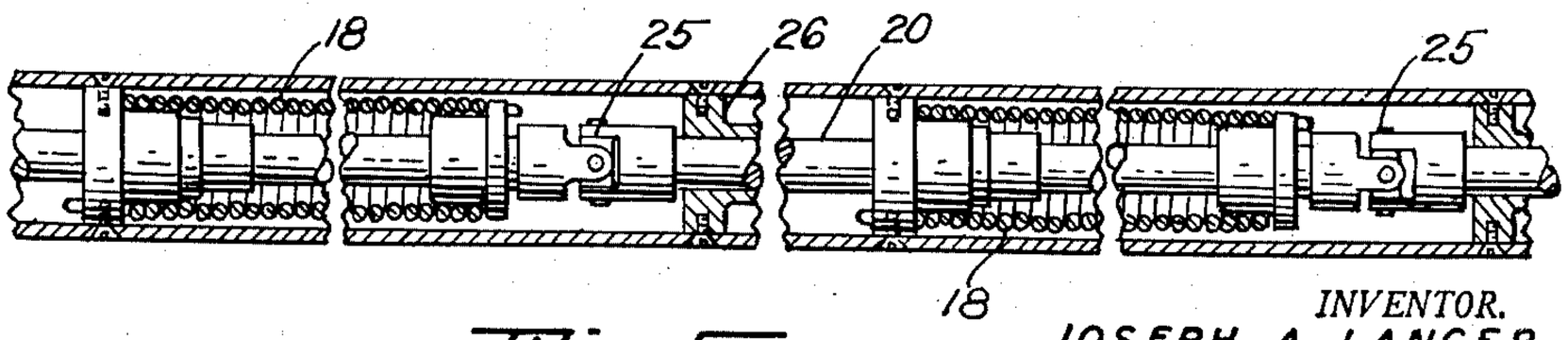


Fig. 5.

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Patented Feb. 6, 1951

2,540,742

UNITED STATES PATENT OFFICE

2,540,742

ROLLING DOOR BARREL

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Application June 4, 1946, Serial No. 674,360

7 Claims. (Cl. 160—317)

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This invention relates to improvements in the barrel mechanism of a rolling door.

Rolling doors as concerned in this invention, consist of a heavy curtain fabricated of interlocking slats and attached to a tubular steel shaft or barrel, which is placed over the doorway and around which the door rolls when it is raised. Within the barrel is a series of helical torsion springs for counterbalancing the weight of the curtain. One end of each spring is secured to an anchoring means such as a shaft head casting which in turn is rigidly attached to a tension shaft passing through the length of the barrel and through the center of the springs. The other end of each spring is secured to a barrel head casting or some similar anchoring means rigidly attached to the inside of the barrel casing, but free to rotate on the tension shaft. By turning the tension shaft the tension on the spring or springs can be adjusted so that the door may be raised and lowered with minimum or a predetermined effort. Wide doors made of heavy materials tend to sag in the center and thus impede the proper use of the tension shaft. Moreover, in any such rolling door, the spring will move the barrel head casting and the barrel longitudinally relative to the tension shaft unless provision is made for holding the barrel head casting in place on the shaft; and where there are a plurality of springs and barrel head castings, this tendency is aggravated. Ordinary means used to prevent this displacement result in great friction which both prevents easy operation of the door and causes great wear on the parts.

One object of this invention is to provide a sectional type of tension shaft which is particularly useful on wide doors which sag because it is not feasible to have center posts.

Another object of the invention is to provide means for reducing friction, prolonging the life of the parts and making the operation of rolling doors smoother and easier.

Another object of the invention is to provide means to enable manual operation in rolling doors without a reduction gear mechanism.

Other objects and advantages of this invention will appear from the following description.

In the drawing,

Fig. 1 is a front view of a rolling door with a barrel mechanism embodying a preferred treatment of this invention, with part of the barrel casing cut away to show the interior mechanism;

Fig. 2 is a view in section through a part of the barrel showing one of the torsion springs;

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Fig. 3 is a vertical sectional view of the top of the door illustrating the method in which the door rolls around the barrel;

Fig. 4 illustrates a reduction gear mechanism used for raising or lowering heavy doors; and

Fig. 5 is a broken section showing the interior of the barrel and illustrating the way in which the sections of the tension shaft are joined together.

In the drawing the door 10 is affixed to the outer surface of a barrel 11 which is held above the doorway 12 and attached by some appropriate means, such as clamps, to the wall 13 above the doorway. If such a door is easy to raise it may be operated manually by lifting on the bottom of the door or by a chain or cord attached to the barrel. But if the door is too heavy to enable this type of manual operation, a reduction gear system such as that shown in Fig. 4 may be used. As the chain 14 is pulled, the gear wheel 16, to which the chain is attached, engages the gear 17 attached to the barrel 11, rotating the barrel and causing the door 10 to be raised or lowered.

The device thus far described would not be practical, due to the great weight of metal doors, except for a mechanism to counterbalance this weight. In the invention concerned the counterbalancing mechanism is placed inside the barrel and consists principally of torsion springs 18, the torque of the turning barrel being counterbalanced by the forces of the springs. One end of each torsion spring 18 is secured to a shaft head casting 19 or some similar anchoring means which in turn is rigidly pinned, i. e. secured against unwanted rotation, to a section of the tension shaft 20 passing through the center of the coil spring 18 and of the barrel 11. The other end of each spring 18 is secured to a matching anchoring means, such as a barrel head casting 21, which is rigidly attached, i. e., in such a manner as to prevent rotation, to the barrel casing 22 but is free to rotate on the tension shaft 20 which it surrounds, thus as each spring 18 is unwound and its length decreases, there exists a tendency for the barrel head casting 21 to move, relative to the tension shaft 20, toward the shaft head casting 19.

Heretofore, to maintain their proper relative positions and to prevent buckling of the springs, some device such as a pin through the shaft or a collar around the shaft was used to exert thrust on each barrel head casting 21. The force of friction caused by this thrust is what necessitates the reduction gear to raise and lower even small metal doors. In wide doors, where there are

many torsion springs, the friction is many times multiplied, and manual operation even with a reduction gear becomes difficult or impossible, and some form of power operation is required. This invention overcomes this difficulty.

This improvement will be described in connection with one spring and its cooperating parts, but it is to be understood that most doors have several sets of these parts.

Encircling the tension shaft 20 and rigidly pinned to it is a thrust sleeve 23. Between this thrust sleeve and the barrel head casting 21 is a thrust bearing preferably a type of ball or roller bearing 24. The thrust sleeve 23 should be made in such a shape as best to fit against the bearing, the actual shape being therefore dependent on the type of bearing employed. In the drawing accompanying this description a ball bearing 24 is illustrated. By this invention, when the door is raised and lowered and the spring contracts and expands, not only is the relative longitudinal position of the barrel head casting and the tension shaft maintained, but also the friction is reduced to a negligible quantity between the rotating barrel head casting and the thrust sleeve 23 by the thrust bearing 24. Steel doors having a curtain of 100 square feet can be made to operate manually without any reduction gear and this expensive piece of apparatus may be dispensed with.

Since the counterbalancing action of the torsion spring remains constant, unaffected by the position of the door, wide doors employing many torsion springs can by this invention be made to operate manually through a reduction gear with great ease.

The other feature of my invention relates to the fact that a wide door of this type is very heavy and sags in the middle. If the tension shaft is constructed in one piece, as heretofore, it bends to correspond to the sag in the barrel. This results in a binding action of the shaft in its several supports and sometimes shears the parts causing substantial repair trouble.

The present invention overcomes this difficulty by having the torsion shaft 20 made in short sections with a universal joint connection 25 between each section.

In Fig. 2 and also in Figs. 1 and 5 are shown a preferred embodiment of this type of flexible connection between the several shaft sections. In these drawings a universal joint 25 connects each two shaft sections, and a spacing member 26 rigidly attached to the barrel casing, and free to rotate on the shaft, supports the shaft and gives it sufficient play to enable a slight angular displacement to occur without bending the shaft, and at the same time prevents any sagging of the barrel from bringing the springs or the universal joints to bear against the interior wall of the barrel casing, so it would interfere with the free rotation of the barrel. The several sections of the shaft are joined with flexible universal joint connections as shown in Fig. 5 between sections where the springs are installed, and this allows the tension shaft 20 to perform its functions unaffected by the sagging of the barrel which supports a heavy door. In this way each torsion spring is individually suspended on its own short section of shaft and no matter how much the barrel sags the parts will turn freely.

While I have shown one form of universal joint in the drawings, I do not wish to be limited thereby as there are many forms of universal joints. It is understood that the form of this invention as herein described is a preferred example, and that changes may be made in materials and in the size, shape and arrangement of parts without departing from the spirit of the invention or the scope or the subject of the subjoined claims.

I claim:

1. In a rolling door barrel adapted to receive around its periphery flexibly joined sections comprising the door, the combination of a barrel casing around which the door rolls; a plurality of shaft sections set end to end through the center of said barrel casing; a universal joint connection between successive shaft sections; anchoring means rigidly attached to each shaft section; matching anchoring means rigidly attached to said barrel casing and in which said shaft sections are freely rotatably supported; and helical springs severally connecting said anchoring means to their associated matching anchoring means.

2. In a rolling door barrel adapted to receive around its periphery flexibly joined sections comprising the door, the combination of a barrel casing around which the door rolls; a plurality of shaft sections set end to end through the center of said barrel casing; a universal joint connection between successive shaft sections; anchoring means rigidly attached to each shaft section; matching anchoring means rigidly attached to said barrel casing and in which said shaft sections are freely rotatably supported; and spring means severally connecting said anchoring means to their associated matching anchoring means.

3. In a rolling door barrel adapted to receive around its periphery flexibly joined sections comprising the door, the combination of a barrel casing around which the door rolls, a plurality of shaft sections set end to end through the center of said barrel casing; a universal joint connection between successive shaft sections securing them together for conjoint rotation; a shaft head casting rigidly attached to each shaft section; barrel head castings rigidly fastened to the interior wall of the barrel casing in rotatable relation to the several shaft sections; and helical springs severally connecting the shaft head castings on the shaft sections to their associated barrel head castings.

4. In a rolling door barrel adapted to receive around its periphery flexibly joined sections comprising the door, the combination of a barrel casing around which the door rolls, a plurality of shaft sections set end to end through the center of said barrel casing; a universal joint connection between successive shaft sections securing them together for conjoint rotation; a shaft head casting rigidly attached to each shaft section; barrel head castings rigidly fastened to the interior wall of the barrel casing in rotatable relation to each shaft section; and spring means severally connecting the shaft head castings on the shaft sections to their associated barrel head castings.

5. In a rolling door barrel adapted to receive around its periphery flexibly joined sections comprising the door, the combination of a barrel casing around which the door rolls; a shaft through the center of said barrel casing; an anchoring means rigidly attached to the shaft; a second anchoring means rigidly attached to the barrel casing in which means said shaft is free to rotate; a helical spring connecting the first anchoring means to the second anchoring means; and a friction reducing bearing means which

holds the second anchoring means in place relative to the shaft.

6. In a rolling door barrel adapted to receive around its periphery flexibly joined sections comprising the door, the combination of a barrel casing around which the door rolls; a plurality of shaft sections set end to end through the center of said barrel casing; a universal joint connection between successive shaft sections; anchoring means non-rotatably attached to each shaft section; matching anchoring means non-rotatably attached to said barrel casing and in which said shaft sections are freely rotatably supported; spring means severally connecting said anchoring means to their associated matching anchoring means; and friction reducing bearing means for each shaft section which holds said matching anchoring means in place axially relative to the shaft.

7. A raising and lowering mechanism for a rolling door comprising an exterior tubular shaft around which the door rolls; a series of interior shafts set end to end within said exterior tubular shaft; a universal joint connection connecting the interior shafts in end-to-end relationship whereby relative angular displacement of each interior shaft portion is facilitated; spacing members fastened to the inside of said exterior tubular shaft and within which said interior shafts are free to rotate, each said spacing member being placed near a connection between adjacent shaft sections; a plurality of anchoring means non-rotatably attached to the interior wall of said exterior tubular shaft, and each surrounding a portion of one section of said interior shaft and in which said interior shaft section is free to rotate; a plurality of anchoring means each non-rotatably fastened to an interior shaft section; a plurality of helical spring means, each connecting one of the first of said anchoring means to a second said anchoring means on the same shaft section; and a plurality of low-friction bearing means keyed to said shaft sections adjacent each first-mentioned anchoring means whereby the latter is held in place relative to its interior shaft section and as said first mentioned anchoring means rotates relative to the interior shaft section the friction between them is substantially negligible.

JOSEPH A. LANGER.

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