Feb. 18, 1930. J. LEDWINKA 1,747,587

WINDOW REGULATING MECHANISM

Filed June 30, 1923 3 Sheets-Sheet 1

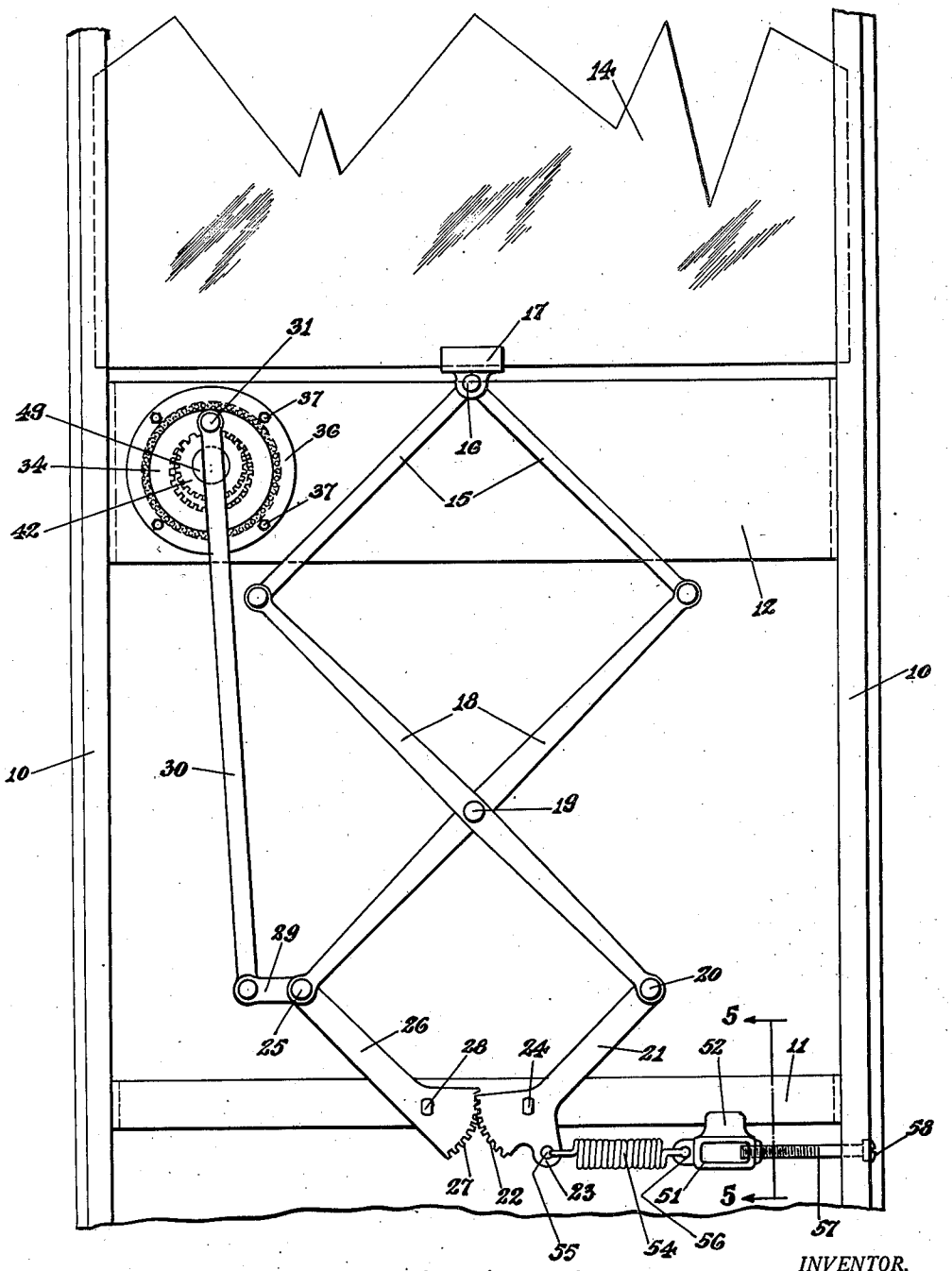


FIG 1

INVENTOR.
JOSEPH LEDWINKA.
BY C. B. Dey Jardine
ATTORNEY

WITNESS:-
Walter M. Trout

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WINDOW REGULATING MECHANISM

Filed June 30, 1923 3 Sheets-Sheet 2

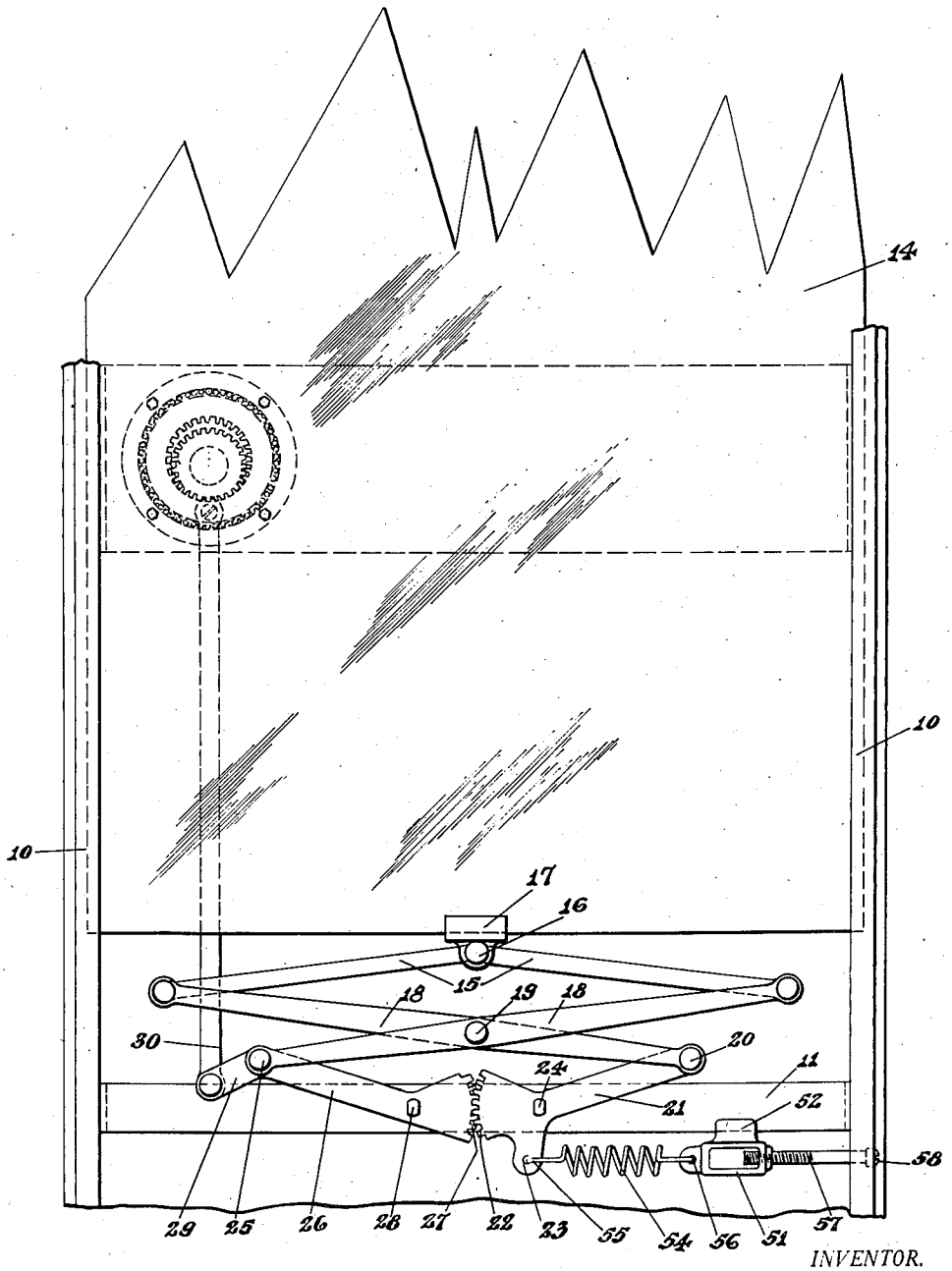


Fig 2

WITNESS:—
Walter M. Trout

INVENTOR.
JOSEPH LEDWINKA.
BY E. B. Middleton
ATTORNEY

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WINDOW REGULATING MECHANISM

Filed June 30, 1923 3 Sheets-Sheet 3

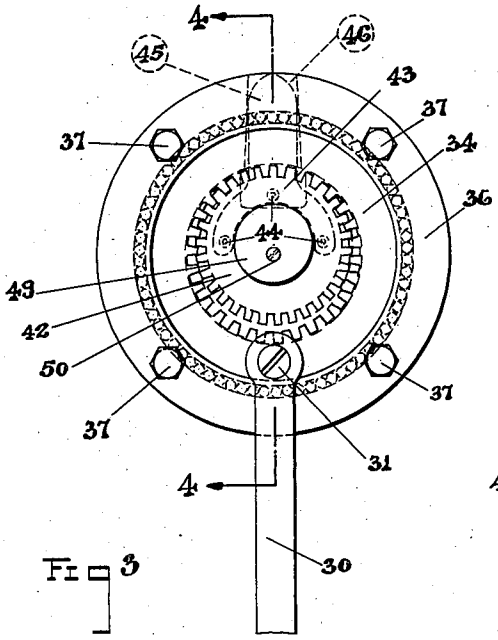


FIG 3

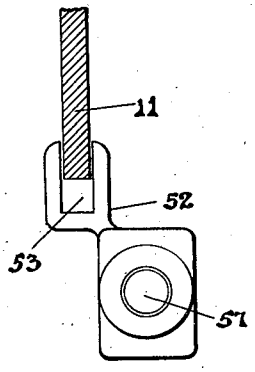


FIG 5

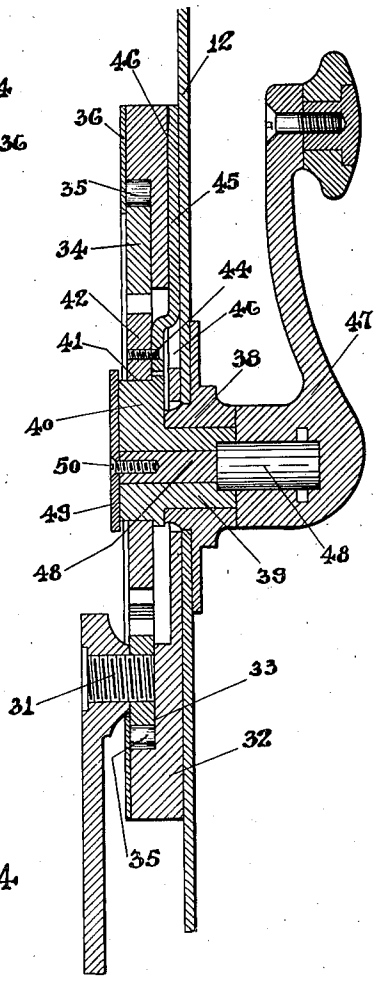


FIG 4

INVENTOR.
JOSEPH LEDWINKA
BY C. B. DeJardin
ATTORNEY

WITNESS:-
Walter M. Trout

Patented Feb. 18, 1930 1,747,587

UNITED STATES PATENT OFFICE

JOSEPH LEDWINKA, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO EDWARD G. BUDD MANUFACTURING COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

WINDOW-REGULATING MECHANISM

Application filed June 30, 1923. Serial No. 648,682.

My invention relates to window regulating mechanism and has to do, more particularly, with mechanism for raising and lowering sliding windows such as are used, for instance, in the doors of closed automobile bodies.

The principal object of my invention is to provide a window-regulating mechanism which is simple and compact in construction and particularly strong and durable.

A further object of my invention is to provide a window-regulating mechanism in which the window will be raised or lowered by turning the operating handle in either direction, the window moving in a continuous cycle, up to its highest position, then down to its lowest position, then up again, with a continuous turning movement of the operating handle, in either direction.

A further object of my invention is to provide a window-regulating mechanism such that the parts will not be strained or injured by turning the operating handle in the wrong direction.

A further object of my invention is to provide a window-regulating mechanism the parts of which are held under tension by spring means and in which the tension of such spring means may be easily adjusted from the exterior of the door or other frame in which the sliding window is mounted.

Further objects, and objects relating to details and economies of construction and operation, will definitely appear from the detailed description to follow. In one instance, I accomplish the objects of my invention by the devices and means described in the following specification. My invention is clearly defined and pointed out in the appended claims. A structure constituting a preferred embodiment of my invention is illustrated in the accompanying drawings, forming a part of this specification, in which:

Fig. 1 is a view in elevation of the inner side of an automobile door equipped with a window-regulating mechanism embodying my invention.

Fig. 2 is a view similar to Fig. 1, but with the window lowered.

Fig. 3 is an enlarged view in elevation of the operating mechanism.

Fig. 4 is an enlarged, sectional view, taken on the line 4—4 of Fig. 3 and,

Fig. 5 is a detail, sectional view, taken on the line 5—5 of Fig. 1.

In the drawings, the same reference numerals refer to the same parts throughout the several views and the sectional views are taken looking in the direction of the arrows at the ends of the section lines.

My invention consists in providing a rotating crank arm which is operated by a rotatable handle and connected to the means for supporting the window. The window is slidable in a frame, for instance, the door frame, in the usual manner. I propose to provide a rotating member which is rotated by the operating handle and to which one end of a link is eccentrically connected, the other end of said link being connected to the window supporting means. I find it desirable to provide reduction gearing between the operating handle and such rotatable member and, to this end, I propose to use an internal gear as the rotatable member and to mount within it an external gear, the teeth of which mesh with the internal gear and which is of less diameter. I propose to mount this external gear on an eccentric which is rotated by the operating handle and to provide means whereby the movement of this external gear is confined to a gyratory motion so that it rolls around the inside of the internal gear, giving a differential motion to the latter depending upon the difference in the number of teeth. My invention also consists in supporting the slidable window by a lazy-tong linkage, one end of which is connected to the sliding window, while the end links at the other end of the linkage are pivoted to the frame. In order to equalize the motion of both sides of the linkage, I propose to provide said end links with meshing toothed sectors. The mechanism may be tensioned by a spring connected at one end to one of said links and at the other end to a relatively fixed part. I propose to provide means for adjusting the point of connection of said spring, so as to vary the tension thereof, and, for this purpose, I find it

desirable to connect one end of the spring to a bracket which is adjustable from the exterior of the frame. I find it very desirable to connect the link extending from the operating mechanism to one of these end links of the lazy-tongs linkage.

Referring to the numbered parts of the accompanying drawings, in which I have illustrated an automobile door equipped with a window-regulating mechanism embodying my invention, the side members of the door frame, 10, are connected by the cross bars, 11 and 12, the latter being located just below the lower edge of the window opening in the door. The door panel is applied and secured to the frame and forms, with the frame, a well in which the window-regulating mechanism is located. The window, 14, is slidable in the frame and may be lowered into said well. The sliding window, 14, is supported by a lazy-tongs linkage, consisting of a pair of end links, 15, which are pivotally connected, at 16, to the bracket, 17, secured to the center of the lower edge of the window. The opposite ends of the end links, 15, are pivotally connected to the ends of links, 18, which cross each other and are pivotally connected at 19. The lower end of one of these links, 18, is pivotally connected, at 20, to an end link, 21, which is pivotally mounted, at 24, on the cross bar, 11, of the frame. The lower end of the other link, 18, is pivotally connected, at 25, to an end link, 26, which is pivotally mounted, at 28, on the cross bar, 11. The ends of these end links, 21 and 26, are provided with toothed sectors, 22 and 27, which mesh with each other. An ear, 23, projects from the end link, 21, near the toothed sector, 22, and provides a means for connecting the spring for tensioning the mechanism. The end link, 26, has an extension, 29, projecting laterally from the pivot, 25, to which the lower end of a link, 30, is pivotally connected.

A base plate, 32, is fastened to the cross bar or panel, 12, carried by the door frame. This base plate has a cylindrical recess, 33, formed therein, in which an internal gear, 34, is rotatably mounted. Cylindrical roller bearings, 35, are interposed between the periphery of the gear and the wall of this recess, so that the gear is anti-frictionally mounted on the base plate. The upper end of the link, 30, is connected to the pin, 31, carried eccentrically by the gear, 34. This constitutes, in effect, a crank arm to which the link is connected. A retaining ring, 36, is secured to the base plate by the bolts, 37, and overlaps the ends of the rollers, 35, and the periphery of the gear, 34, so as to hold the rollers and the gear in position. A central opening is formed in the base plate, 32, and a bushing and escutcheon plate, 38, extends through an opening in the cross bar, 12, and into the central opening in said base plate. A member having a cylindrical hub portion, 39, and a cylindrical portion, 40, eccentric to the axis of the hub portion, 39, is provided, the hub portion, 39 being journaled axially in the bushing, 38, An operating handle, 47, is provided with a stem, 48, which extends axially through and is fastened in the hub, 39, so that when the handle is rotated in either direction the hub, 39, and, with it the eccentric portion, 40, is likewise rotated. The eccentric portion, 40, is received in a central circular opening, 41, in the external gear, 42. The external gear, 42, is of slightly smaller external diameter than the internal diameter of the internal gear, 34, and fits within said internal gear in such relation thereto as to mesh therewith. The internal gear is provided with a greater number of teeth than the external gear. The external gear, 42, is held against axial rotation while permitted a gyratory movement due to the eccentricity of the eccentric portion, 40, on which said gear is mounted. This can be accomplished in various ways. A simple arrangement is shown wherein a forked member, 43, is fastened, at 44, to the face of the external gear and is provided with an arm, 45, which extends into a slot, 46, formed in the inner surface of the base plate, 32. The edge walls of this slot, as indicated by dotted lines in Fig. 3, are tapered to permit slight oscillatory movement of the arm, 45, during the gyratory movements of gear, 42. The gear, 42, may be retained in place in any suitable or convenient manner. For this purpose I have shown a plate, 49, secured by screw, 50, to the end of stem, 48, and having its peripheral edge extended beyond that of the eccentric portion, 40, on which the gear, 42, is mounted.

By reason of the structure described, when rotary movement is imparted to the handle, 47, such movement is transmitted to the eccentric portion, 40, thereby giving a gyratory motion to the gear, 42. By reason of the intermeshing of the gears, 34 and 42, rotations are thus imparted to the said gear, 34, but at a differential speed depending upon the difference in the relative number of gear teeth of gears, 34 and 42.

A bracket, 51, is provided with a channel, 52, which receives the lower edge of the cross bar, 11, as shown in Fig. 5. The position of this bracket with respect to the frame may be varied by means of the screw, 57, which projects through the side of the frame and screws into the end of the bracket, 51. The head of this screw is accessible from the exterior of the door, as shown in Fig. 2, so that it is a very easy matter to adjust this bracket. One end of the spring, 54, is connected, at 55, to the ear, 23, of the end link, 21. The other end of said spring is connected, at 56, to the bracket, 51.

In Fig. 1, the window, 14, is shown in raised position and it will be noted that the pin, 31, is at the uppermost point of its stroke.

As the operator rotates the handle, 47, in either direction, the eccentric, 40, is caused to rotate and this imparts a gyratory motion to the external gear, 42. Due to the difference in the number of teeth of the gears, 42 and 34 the internal gear, 34, will be rotated by this gyratory motion but at a much slower speed than that of the handle. As the internal gear, 34, rotates, in either direction from the position shown in Fig. 1, the pin, 31, moves downward and, since this pin is connected by link, 30, with end link, 26, the latter will be caused to turn on its pivot, 28, so that, when the pin, 31, reaches lower dead center, the lazy-tongs linkage will assume the position shown in Fig. 2. A continued rotation of the handle, 47, in either direction, will reverse the movement of the link and lazy-tongs linkage and lift the window, 14, to raised position. The meshing of the toothed sectors, 27 and 22, of the end links, 21 and 26, serves to equalize the motion of the two sides of the linkage, so as to prevent tilting of the window. The spring, 54, is put under tension by the lowering of the window, 14, as shown in Fig. 2 and the tension of this spring assists in raising the window and also serves to tension the mechanism so as to prevent rattling. The tension of this spring may be adjusted very easily from the outside of the door by adjusting the bracket, 51, through the screw, 57.

I am aware that the window-regulating mechanism illustrated in the drawings may be altered considerably without departing from the spirit of my invention, and, therefore, I claim my invention broadly, as indicated by the appended claims.

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

1. The combination with a frame and a window slidable therein, of lazy-tongs linkage supporting the window, two of the end links of said linkage being pivoted to the frame and provided with meshing toothed sectors, a bracket carried by said frame, means for adjusting said bracket from the exterior of the frame, and a spring connected to an ear projecting from one of said end links and to said bracket.

2. The combination with a frame and a window slidable therein, of a lazy-tongs linkage supporting the window, two of the end links of said linkage being pivoted on a cross-bar of the frame, a bracket slidable on said cross-bar, a screw projecting through the side of the frame and screwed into said bracket, a spring connected, at one end, to one of said links and, at the other end, to said bracket, and window-actuating means connected to said linkage.

3. The combination with a frame and a window slidable therein, of a lazy-tongs linkage supporting the window, two of the end links of said linkage being pivoted on a cross-bar of the frame and provided with meshing toothed sectors, a bracket slidable on said cross-bar, a screw projecting through the side of the frame and screwed into said bracket, a spring connected, at one end, to one of said links and, at the other end, to said bracket, and window-actuating means connected to said linkage.

4. The combination of a frame and a window slidable therein, of a lazy-tongs linkage supporting the window, an operating handle for continuous operation in either clockwise or counter-clockwise direction, a crank operated by said handle, and means connecting said supporting linkage and said crank whereby the window may be opened and closed by rotation of said handle in the same continuous direction.

5. A window regulator comprising an operating member adapted to operatively engage a sliding window to operate the same up and down, which operating member has a movement back and forth over a determinate path, together with a motor means to move said operating member back and forth at a mechanical advantage which motor means has a continuous rotary movement of operation in the same direction independent of the direction of movement of said operating member.

6. A window regulator comprising an operating member having a movement back and forth adapted to be connected with a sliding window to move the same from closed to open position and vice versa, and a motor means connected to move said operating member at a mechanical advantage, which motor means includes a rotatable crank having a total throw per revolution such that it imparts a total throw to said operating member not exceeding that required to move the window from closed to open position and vice versa, whereby the said crank of the motor means may be continuously rotated in the same direction to carry the said window successively from closed to open and from open to closed positions.

In testimony whereof, I affix my signature.

JOSEPH LEDWINKA.