

Aug. 1, 1950

E. L. FOUSE

2,517,474

WINDOW CLEANING APPARATUS

Filed Oct. 28, 1946

7 Sheets-Sheet 1

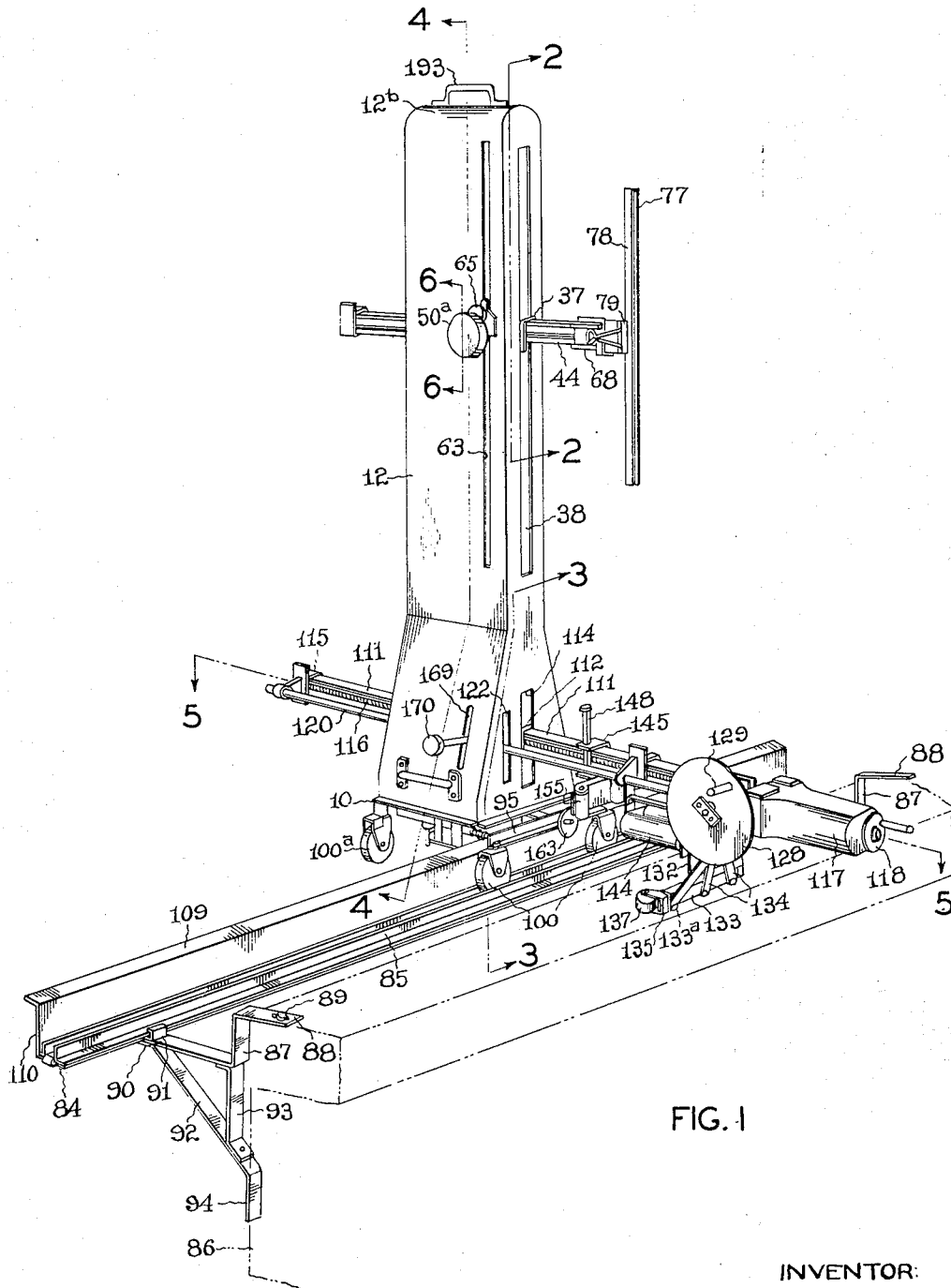


FIG. 1

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7 Sheets-Sheet 2

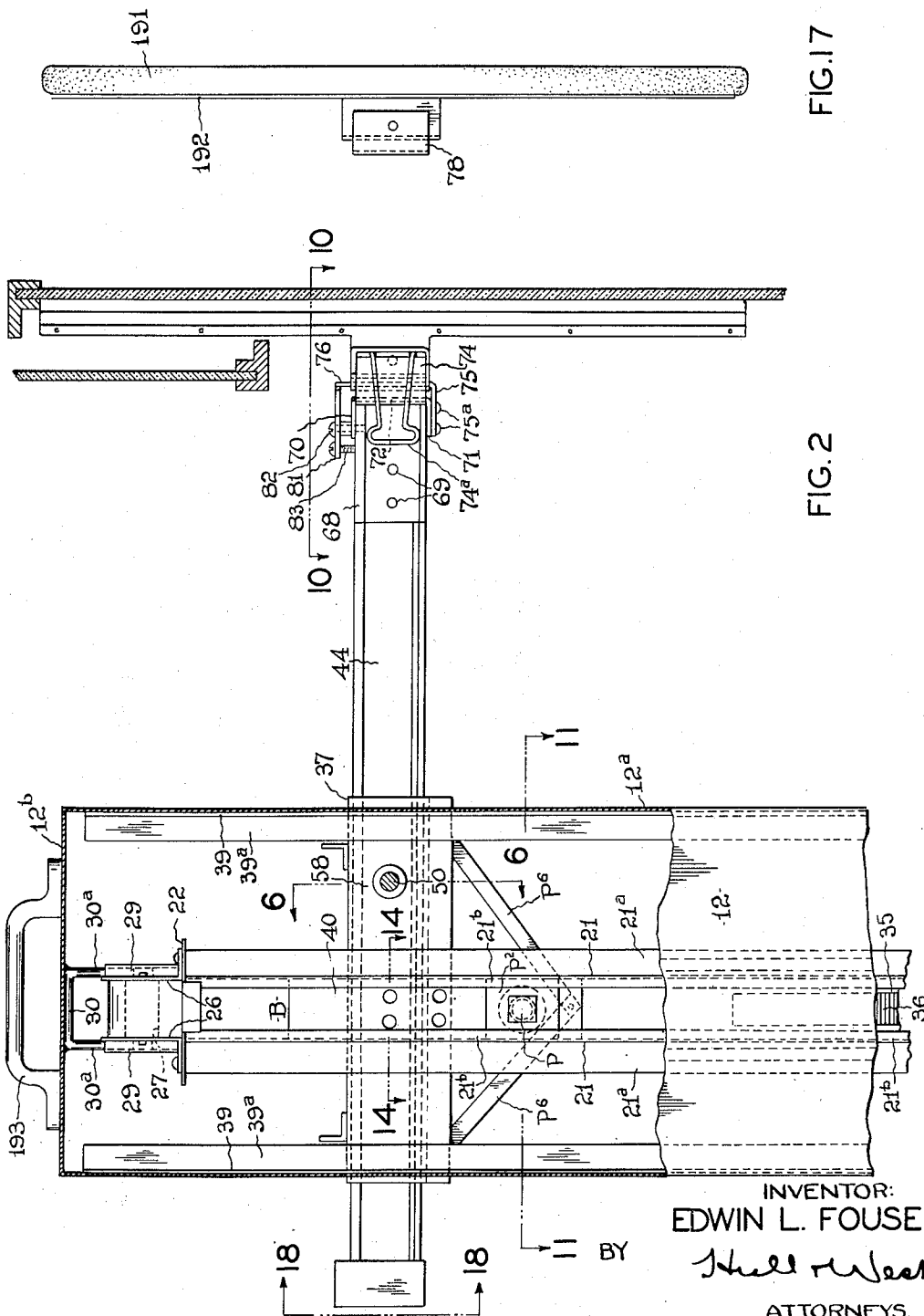


FIG. 17

FIG. 2

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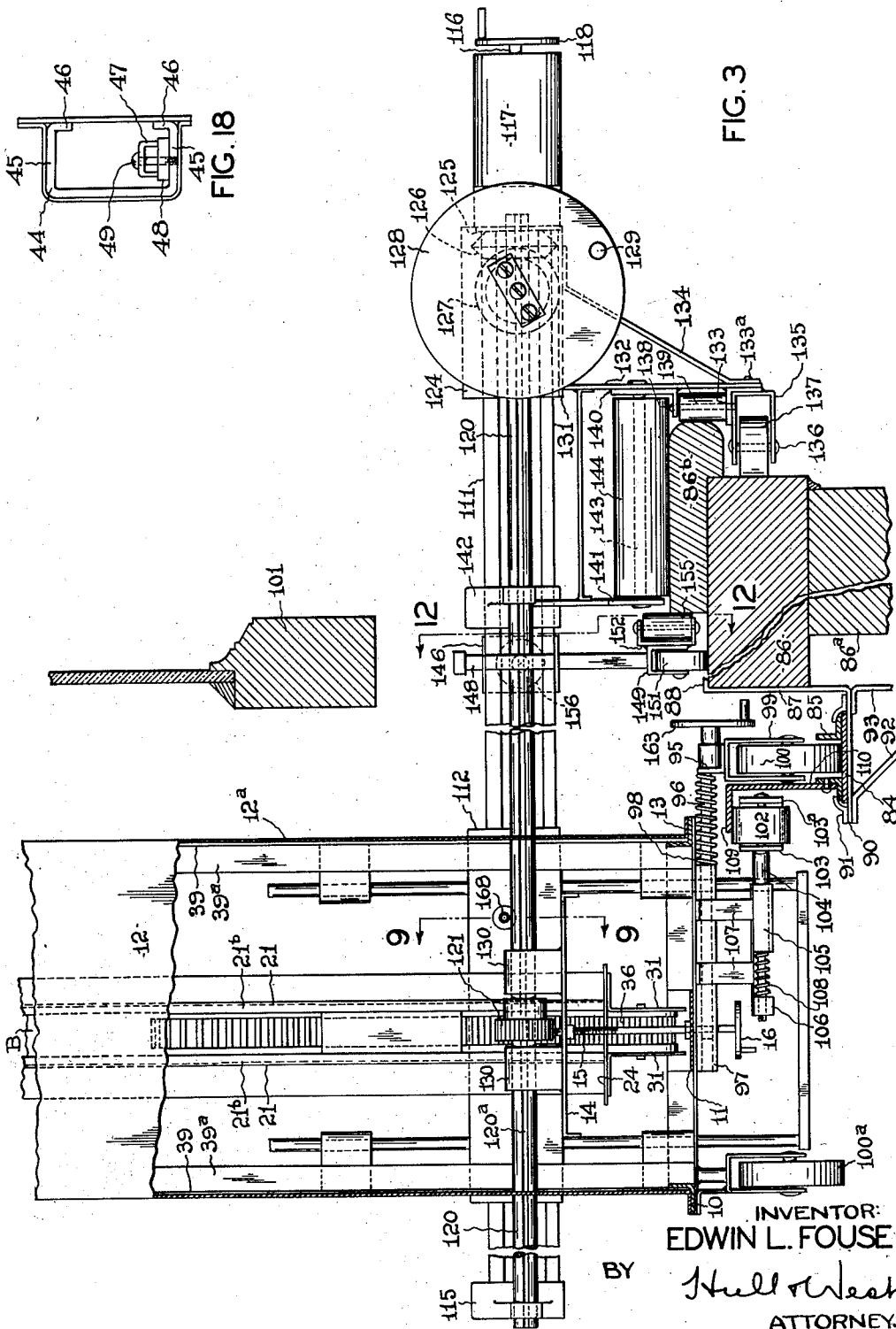
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7 Sheets--Sheet 3



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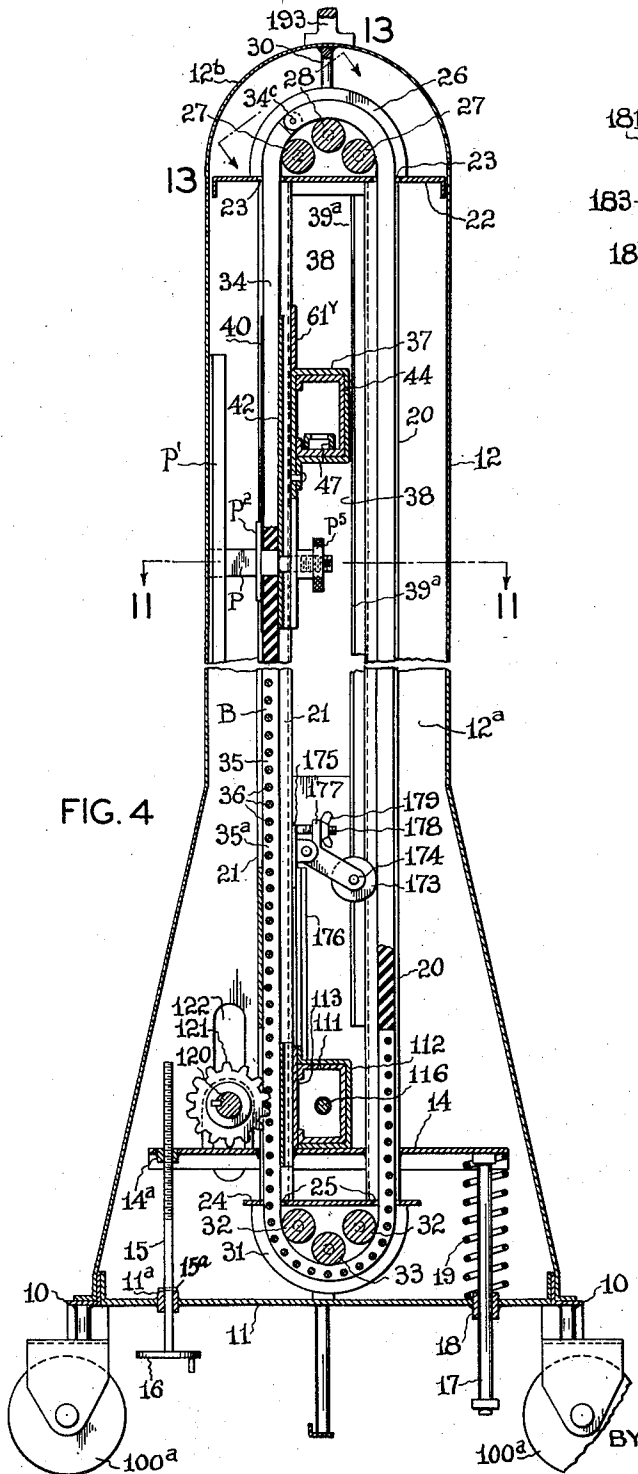


FIG. 4

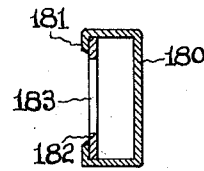


FIG. 16

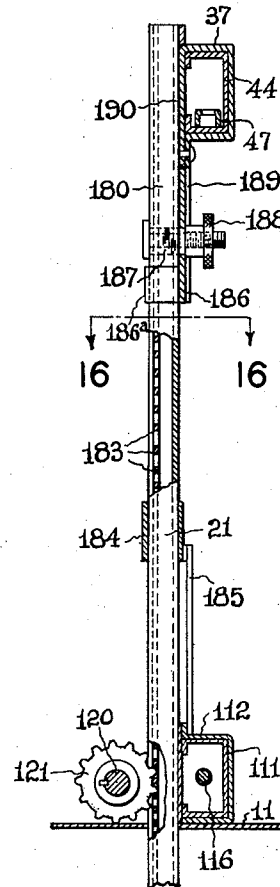


FIG. 15

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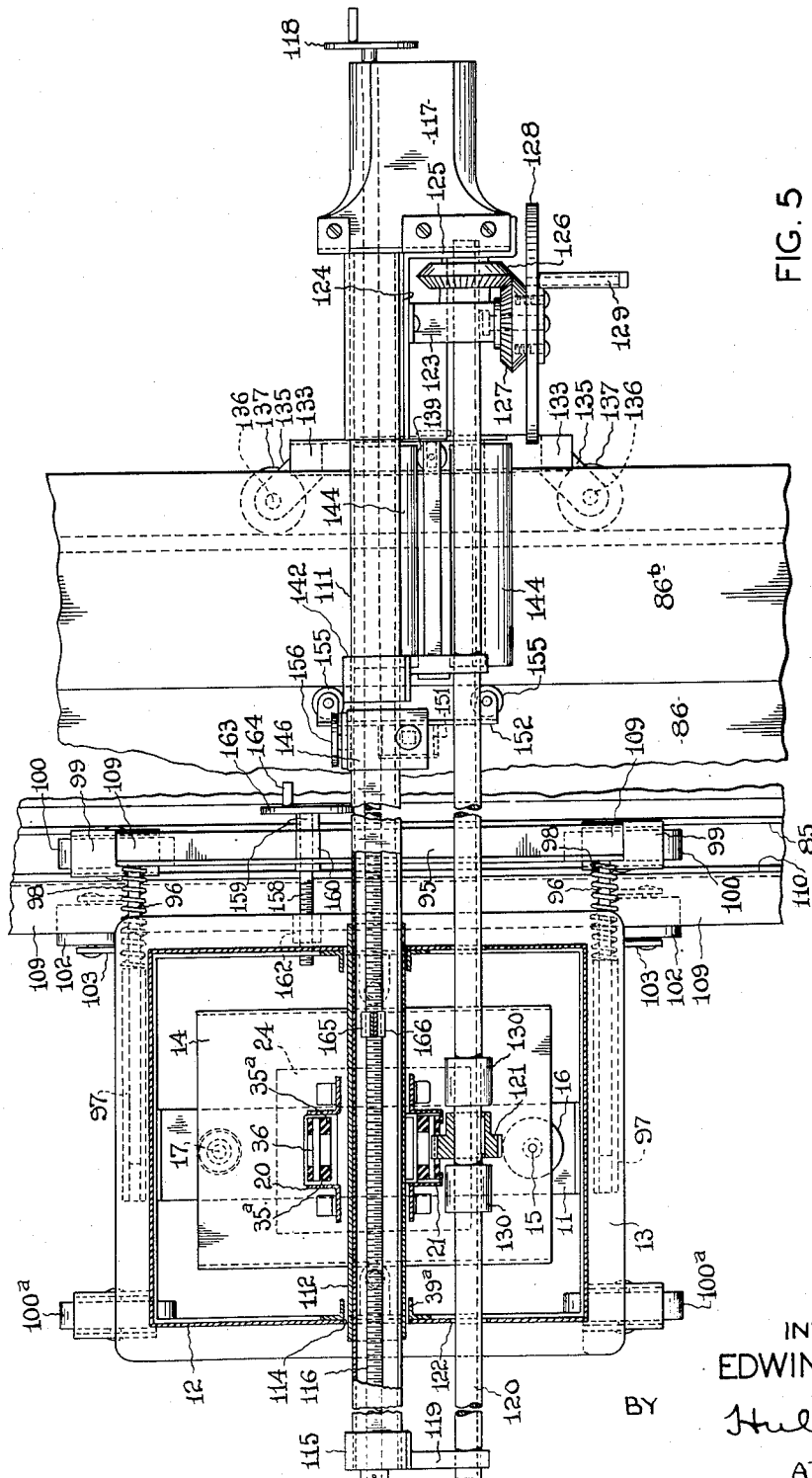
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7 Sheets-Sheet 5



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2,517,474

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7 Sheets-Sheet 6

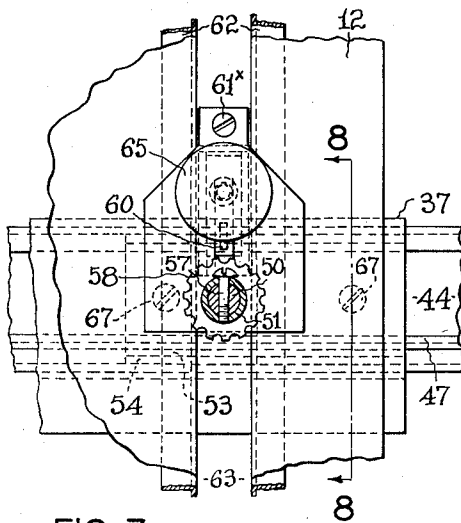


FIG. 7

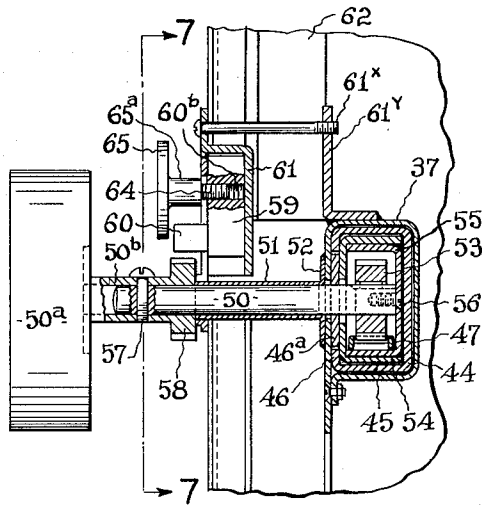


FIG. 6

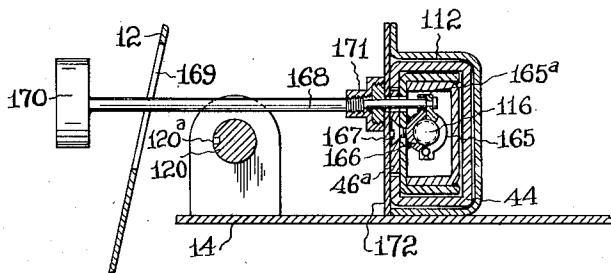


FIG. 9

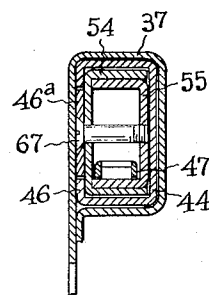


FIG. 8

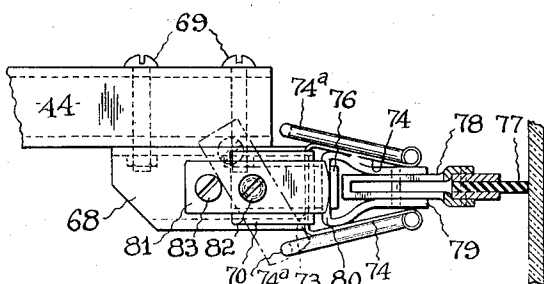


FIG. 10

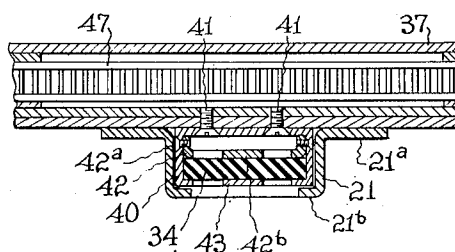


FIG. 14

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7 Sheets-Sheet 7

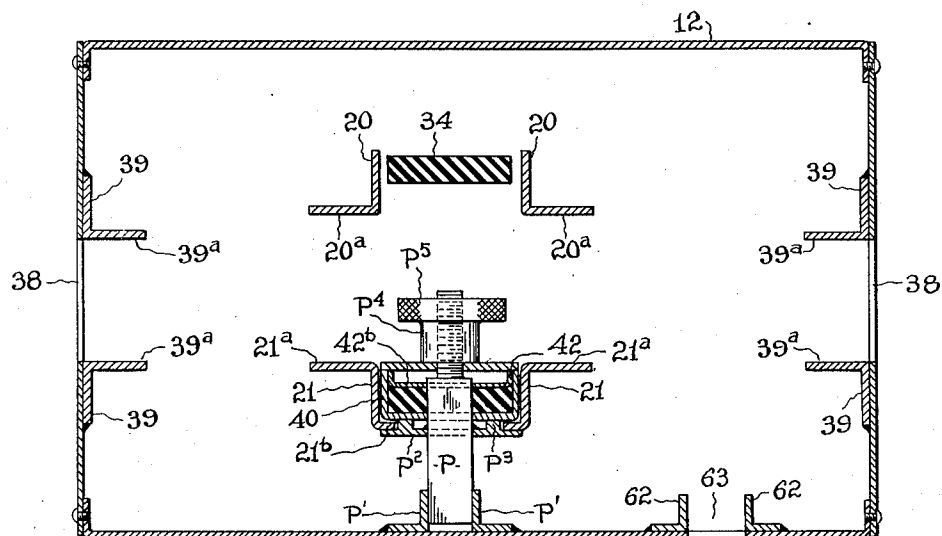


FIG. 11

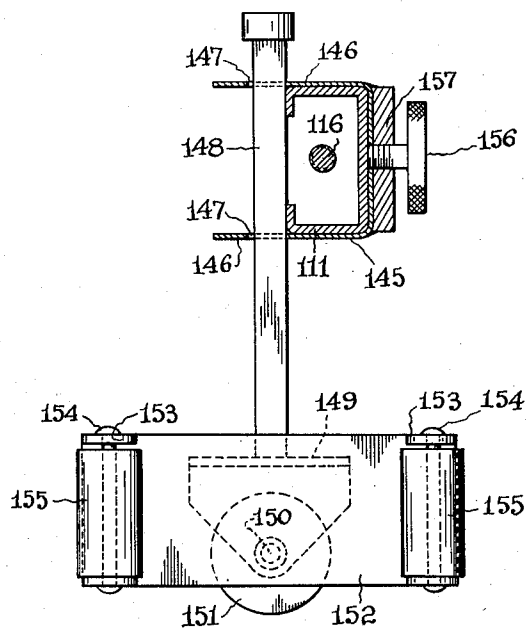


FIG. 12

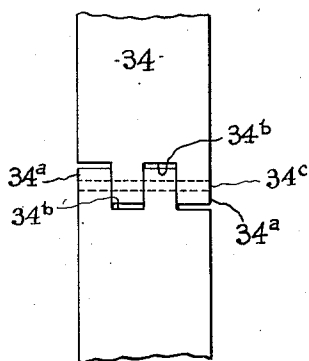


FIG. 13

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UNITED STATES PATENT OFFICE

2,517,474

WINDOW-CLEANING APPARATUS

Edwin L. Fouse, Cleveland, Ohio

Application October 28, 1946; Serial No. 706,223

15 Claims. (Cl. 15—250)

1

This invention relates to window-cleaning apparatus, and has for its general object to produce an apparatus for this purpose which will enable the exterior surfaces of the panes of glass in both upper and lower frames to be quickly and effectively cleaned.

A further object of the invention is to produce an apparatus of this character which can be applied to and operate upon different constructions of inner and outer sill members and which can be conveniently and detachably applied to the said sill members.

Further and more limited objects of the invention will be pointed out in the description of the embodiment of my invention as illustrated in the drawings hereof, wherein Fig. 1 represents a perspective view of my window-cleaning apparatus as the same appears when installed upon a window sill structure, a portion of the inner member of said structure being indicated in dot-and-dash lines and the outer member of said structure being omitted; Fig. 2 a sectional side elevational view of the upper portion of the aforesaid apparatus, showing the manner in which the window-cleaning supporting member is adjustably supported within the housing; Fig. 3 a view similar to Fig. 2 and showing the lower portion of the apparatus and illustrating more particularly the manner in which the apparatus is detachably and adjustably secured to a window sill structure; Fig. 4 an enlarged sectional view taken on the line 4—4 of Fig. 1, looking in the direction of the arrows; Fig. 5 an enlarged sectional view taken on the line 5—5 of Fig. 1, certain parts being shown in elevation for clearness of illustration; Fig. 6 an enlarged detail in section taken on the line 6—6 of Fig. 2, looking in the direction of the arrows; Fig. 7 a detail in elevation taken on the line 7—7 of Fig. 6, looking in the direction of the arrows; Fig. 8 a detail in section taken on the line 8—8 of Fig. 7, looking in the direction of the arrows; Fig. 9 a sectional view taken on the line 9—9 of Fig. 3, looking in the direction of the arrows; Fig. 10 a detail in elevation taken on the line 10—10 of Fig. 2, looking in the direction of the arrows; Fig. 11 an enlarged sectional view taken on the line 11—11 of Fig. 2, looking in the direction of the arrows; Fig. 12 an enlarged detail in section taken on the line 12—12 of Fig. 3, looking in the direction of the arrows; Fig. 13 a detail of the belt showing the manner in which the ends thereof are connected; Fig. 14 an enlarged detail in section taken on the line 14—14 of Fig. 2, looking in the direction of the arrows; Fig. 15 a detail in section, with

2

parts broken away, illustrating a modification of the construction by which the supporting arm for the window cleaning element can be raised and lowered; Fig. 16 a detail in section taken on the line 16—16 of Fig. 15 and looking in the direction of the arrows; Fig. 17 a view in side elevation of a different type of window cleaning element than that shown in Figs. 1 and 2; and Fig. 18 an elevational view of one end of the supporting arm for the window cleaning element.

The apparatus as shown and described herein comprises generally a base frame which constitutes the main support for the various parts of my apparatus and for the housing for the parts by which the arm carrying the window cleaning element may be raised and lowered and which is preferably provided with means for guiding the aforesaid arm in its vertical movements. In addition, it comprises means for supporting the apparatus upon the inner and outer portions of window sills of varying constructions and for enabling the apparatus to be conveniently reciprocated along the said sills to enable the cleaning element to operate transversely of the various panes of the upper and lower window frames.

Describing by reference characters the various parts shown in the drawings, and first by reference to Figs. 1, 3 and 4, 10 denotes light angle members assembled into rectangular shape and forming a base frame. 11 denotes a base plate which is secured to the bottom flanges of these angle members, the horizontal flanges forming a support for the flanges 13 on the bottom of a housing, the sides whereof are indicated generally at 12. 14 denotes a plate which is located within the lower portion of the housing and is supported by the base plate by means of a rod 15 threaded into a sleeve 14^a secured to and depending from the bottom of the said plate, with its lower end extending through a bushing 11^a carried by the base plate 11 and being provided therebelow with an operating hand wheel 16. A pin 15^a is engaged with the rod 15 after the rod is inserted through bushing 11^a and supports the rod 15 on the bushing 11^a. The purpose of the rod 15 is to impart a vertical adjustment to the plate 14 with reference to the plate 11, and in order to maintain the plate 14 in parallelism with the plate 11 during such adjustment, the end of the former plate which is opposite that to which the rod 15 is connected is yieldingly supported by a rod 17 which extends through a bushing 18 provided therefor in the plate 11, with its upper end connected to the lower side of the plate 14 and a coil spring 19

surrounding the said rod and interposed between the said plates.

20, 20^a denote the flanges of a pair of vertically extending angle members and 21, 21^a the flanges of a corresponding pair of vertically extending angle members, the tops of the said angle members being connected by a plate 22 extending across the housing 12 and having slots 23 therethrough adjacent to the flanges 20 and 21 of the angle members. The lower ends of these angle members extend through and are secured, as by welding, to the plate 14. The bottoms of the angle members are connected by a plate 24 which has slots 25 therethrough, directly beneath and symmetrically arranged with respect to the slots 23 in the plate 22. 26 denotes substantially semi-circular plates which are secured to and extend upwardly from the plate 22 and to and between which are journaled lower rollers 27 and an intermediate upper roller 28. Each of these plates has secured thereto a tube 29, the tubes receiving therewithin the legs 30^a of a yoke 30 which may be conveniently welded to the top member 12^b of the housing 12. Similar plates 31 are secured to the bottom of the plate 24 and support upper rollers 32 and a lower intermediate roller 33.

B denotes generally an endless belt which extends about the rollers 27, 28, and 32, 33. This belt is conveniently made from rubber or leather or similar suitable flexible material and comprises a section 34 which is constructed in the usual manner from said rubber, leather or webbing and which is connected (preferably integrally in the manner to be described) with the section 35, which is provided with cross pins 36 constituting in effect ratchet teeth. The section 35 is conveniently made by eliminating the central portion of the original solid belting material, leaving sides 35^a which serve as a mounting for the ends of the pins 36. The ends of the continuous strip from which the belt is made may be connected in any approved manner, as by means of alternating hinged lugs and recesses 34^a, 34^b and a hinge pintle 34^c (see Fig. 13).

The ends of the vertical plates 26 and 31 project beyond the looped ends of the belt which pass around the rollers 27, 28 and 32, 33 and are preferably semi-circular in outline to conform to the shape of the ends of said loops. The width of the belt is such that the sides are in proximity to and maintained against displacement by the flanges 20 and 21 of the vertical angle members.

37 denotes a transverse guide the ends of which extend through vertical slots 38 in opposite sides 12^a of the housing 12, the slots being provided with inwardly projecting guide members formed by inwardly extending flanges 39^a of angle members the other flanges 39 of which are secured to the sides of the casing on opposite edges of the slots therein (see Figs. 1, 2, 4 and 11). This transverse guide is shown as rectangular in section and is secured to the solid section 34 of the belt as by means of a box section member 40 having one of the walls thereof secured by screws 41 to the adjacent wall of the transverse guide 37, the said box section member being mounted within the flanges 21 and the inturned ends 21^b of the angle members 21, 21^a (see Figs. 2 and 14).

42 denotes the flanges of a backing channel member which is interposed between the belt section 34 and the base of the box member and which flanges are secured to the transverse guide 37, as by means of screws 42^a. By this construction, the belt section 34 is clamped between the web 42^b

and the outer web of the box section member 40.

The belt is clamped to the box section 40 by a pin P, preferably square in section (see Figs. 2 and 11), the outer end of which pin is slidably mounted in vertical angular guides P' secured to a wall of the housing, the body of the pin extending through and secured, as by welding, to a cover plate P² having guide rails P³ engaging the edges of the flanges 21^b, thence through the outer web of the box section member 40, the belt section 34, the web 42^b of the backed channel member and being provided with a reduced threaded end which projects through the inner web of the member 40 where it is provided with a sleeve P⁴ threaded thereonto and having a thumb nut P⁵. This assembly is movable, together with the transverse guide 37, by means of arms P⁶ connected at their upper ends to said guide and at their lower ends to the rear of the box section member 40 (see Fig. 2).

44 denotes the bar which supports the window cleaning implement and which is slidably mounted within the transverse guide 37. This bar is conveniently made from a channel comprising a web and flanges 45 having their ends inturned, as shown at 46, to provide a space therebetween. 47 denotes a rack the ends of which are secured to opposite ends of the bottom flange 45 of the channel, the rack being spaced from said flange 45 by means of suitable spacers 48 secured to said flange by screws 49—see Fig. 18.

For the purpose of moving the bar 44 within its transverse guide 37, I have provided a shaft 50 journaled in a sleeve 51 secured to the said guide by means of a flange 52 welded to the latter. This shaft extends through a filler plate 46^a supported between the inturned flange ends 46 and is provided with a pinion 53 meshing with the rack 47. Since the bar 44 is made of comparatively light stock, it is deemed advisable to provide suitable reinforcement for the same for the zone within which it is operated upon by the pinion. For this purpose, an outer short channel member 54 is mounted within the channelled bar 44 and a short channel member 55 is mounted within the latter channel member, the channel members 54 and 55 being shown as welded together and connected to the filler plate 46^a. The outer end of the shaft 50 is centered and supported by means of a screw 56 mounted in the web of the channel member 55 and threaded into the outer end of said shaft. The shaft 50 has a hand wheel 50^a secured thereto, as by means of the hollow hub 50^b and a screw bolt 57 extending through the outer end of the shaft 50 and the said hub. The hub is shown as formed at one end into a pinion 58, located beneath a blade 60 carried by a slide 59 which is mounted for vertical movement within a guide 61 provided therefor between the flanges of the angle members 62 which project inwardly from the sides of the vertical slot 63 in the appropriate side of the housing through which the shaft 50 extends. The guide is supported by a bolt 61^x extending through a flange thereof and a backing plate 61^y engaging the flanges of the angle members 62. The slide 59 is provided with a threaded bore 60^b for the reception of a threaded stud 64 which extends through the cover plate 61^a for the guide 61, the stud projecting from a hub 65^a operated by a hand wheel 65 and which hub is adapted, by operating the hand wheel, to hold the slide in any position to which it may be adjusted along its guideway. By lowering the slide, the blade 60 may be made to enter between any of the teeth

5

of the pinion 58, thereby to retain the composite implement supporting bar in any position to which it may be adjusted.

The cover plate 46^a is secured to the web of the inner channel member 55 by means of screws 57, one of which is shown in Fig. 8.

The outer end of the bar 44 has secured thereto a supporting member 68 for the cleaning implement (see Figs. 2 and 10), said support being shown as of channel shape and being secured to the bar 44 by means of bolts 69. 70 denotes the upper flange, 71 the lower flange and 72 the web of a channel member the flanges of which are secured to the top and bottom flanges of the supporting member 68 and the web whereof extends across the supporting end of the said supporting member. 73 denotes the base and 74 the arms of a spring clamp the base being secured to the web 72 in any approved manner and the ends of the arms being provided with the usual operating loops 74^a. 75 denotes one of the flanges of an angle member which is secured to the bottom flange of the supporting member by one or more screws 75^a and the vertical flange 76 of which angle member extends upwardly across the end of the supporting member 68 and through the arms of the spring clip and adjacent to but spaced from the base thereof. The particular cleaning implement shown in Figs. 2 and 10 is a squeegee comprising the blade 77 pivotally mounted in the usual manner in the outer end of a base member 78, which in turn is pivotally supported between the arms 79 of a clamp, the base 80 of which is inserted between the flange 76 and the base of the spring clamp.

The spring clamp and the supporting arms for the squeegee are detachably retained in place by means of a latch 81 which is pivoted on top of the supporting member 68 by means of a screw 82 and which, when swung to the full-line position shown in Fig. 10, will overlap the tops of the spring clamp and the base 80 of the supporting member for the squeegee. The latch is provided with an additional short screw 83 which is adapted to engage the top of the supporting member 68, when swung to the full line position in Fig. 10, thereby to frictionally retain the same in the position shown.

For the purpose of mounting the apparatus thus far described upon window sill structures varying in details and in dimensions, I have provided the following construction:

84 denotes the base of a track having upwardly projecting flanges 85 providing a guideway for wheels with which the housing is provided and which will be described hereinafter (see Figs. 1 and 3). This track is conveniently supported from the outer sill member or outer portion 86 of a window sill structure by means of composite brackets comprising each a vertical hanger portion 87 having a horizontal arm 88 by which it is secured to the upper surface of the outer portion of the sill structure, as by means of a screw 89 preferably extending through a slot provided therefor in each of the arms 88. 90 denotes a horizontal arm extending outwardly from each of the vertical hanger portions 87, beneath the base 84 of the track, and each provided with opposed clamping members 91 which overhang the outer edges of the track and support the same upon the arm 90. The track is further supported by means of arms 92, 93 secured to the outer and inner ends of each of the arms 90, each arm 93 being shown as extending vertically but spaced outwardly from the stone sill 86^a and each arm

6

92 being projected inwardly below its junction with the arm 93 and provided with a vertical extension 94 adapted to engage the said stone sill (see Fig. 1). Two such composite bracket supports 87-94 are provided for the track, as will appear by reference to Fig. 1, wherein only a portion of the right hand support is illustrated. The relative dimensions and arrangements of the parts of which the composite brackets are composed and by which they are secured to the top of the window sill and abut against the sill or masonry therebeneath will naturally be varied in accordance with the particular constructions of the sill structures with which different buildings will be provided.

95 denotes angle bars, each of which is supported from the base plate 11 by means of a rod 96 connected to the vertical flange of said bar and mounted in a sleeve 97 secured to the bottom of the said plate (see Figs. 3 and 5). A coil spring 98 surrounds each of the rods 96 between the vertical flange of the angle bar and the adjacent end of its sleeve. 99 denotes the sides of caster mountings for horizontally pivoted wheels 100, the tops of these caster mountings being united to the bar 95, as by means of welding. These wheels are adapted to travel in the groove provided by the base 84 and the guide rails 85, whereby they support a portion of the housing 12 and the mechanism therewithin located externally of the window, the lower portion of one of the frames thereof being indicated at 101 on Figs. 2 and 3.

Cooperating with and located adjacent to the rollers 100 are horizontally pivoted rollers 102, each of which is mounted in a caster frame 103, the base 103^a of each frame being connected to a rod 104 which is slidably mounted within sleeves 105 and 106 supported from the base plate 11 by hangers 107. A coil spring 108 surrounds each rod between the sleeves 105 and 106 and tends to hold the rollers in the positions shown more particularly in Fig. 3, wherein they engage the horizontal flange 109 carried by the vertical flange 110 of an angle plate which is conveniently secured at its bottom to the outer of the two rail members 85.

Cooperating with the means for supporting the apparatus from the outer side of the window to be cleaned is the following construction for clamping the same to and supporting the same upon the portion of the sill structure which is located interiorly of the window:

111 denotes a bar which is reciprocably mounted within a transverse guide 112 provided therefor in the housing and secured, as by welding, to the top of the base plate 14. This bar 111 is preferably of channel shape and the guide 112 is also preferably of channel shape having its open end closed by a plate 113 welded thereto. The guide and the bar 111 extend through vertical slots 114 provided therefor in the opposed sides of the housing 12 and the bar has secured to and within its outer end a bearing 115 for the outer end of the shaft 116, the inner end of which is mounted within and extends through an operating handle 117 and is provided at the latter end with a hand wheel 118. 119 denotes a bracket carried by the outer end of the bar 111 and which is provided with a bearing for supporting the outer end of a shaft 120 provided with a long keyway 120^a to which a pinion 121 is keyed and which pinion engages the pins 36 on the belt 34, 35. This shaft extends through vertical slots 122 in opposite sides of the housing and is supported at its inboard end by

means of a bearing member 123 secured to the horizontal flange of an angle bracket 124 secured to the bar 111 and at its extreme outer end by the vertical flange 125 of said bracket, being provided between the bearing 123 and the vertical flange with a beveled pinion 126 which meshes with a beveled pinion 127 journaled on the bottom of the bearing member 123 and connected to a hand wheel 128 having an operating handle 129 and by means of which the shaft 120 and the pinion 121 may be rotated, thereby to operate the belt 34, 35. During any transverse movements of the bar 111 and the shaft 120 with reference to the housing, the pinion is maintained in engagement with the belt pins 36 by means of the keyway 120^a and abutments 130 supported by the plate 14.

131 denotes a base plate which is conveniently secured to the underside of the bar 111. This base plate supports the vertical member 132 of a composite bracket (see Figs. 1 and 3), the lower end of said member in turn supporting an angle member 133, which is shown as supported in turn and braced by inclined bracket members 134 connected to the plate 131, to the bottom of the plate 132 and to the angle member 133 by bolts 133^a. Secured to the vertical flange of the angle member 133 (as by welding) are the bases of caster frames 135 which support vertical pivot pins 136 for laterally spaced rollers 137 which are adapted to engage the inner side of the window sill structure below the stool 86^b with which the sill structure shown herein is provided. The rollers 100 and 137 will cooperate to prevent tilting of the base plate and the housing and the parts within the latter, but the additional rollers (to be described) contribute further to the prevention of tilting and to the ease of moving the apparatus along the sill structure on which it is supported.

Also carried by the plate 132 and by the horizontal flange of the angle member 133 are bearings for the vertical pivot pin 138 of a roller 139 which is located above and substantially midway between the rollers 137 and is adapted to engage the inner surface of the stool. Also supported by the plate 132 is a plate 140 extending transversely of the latter and providing, in cooperation with a plate 141 supported by a bracket 142 carried by the bar 111, bearings for the horizontal pivot pins 143 for a pair of rollers 144 which are adapted to engage the top of the stool (see Figs. 3 and 5).

145 denotes a U-shaped bracket which is mounted upon the bar 111 and the legs 146 of which project beyond the flanges of the said arm (see Figs. 1, 3, 5 and 12). The legs are provided, beyond the said flanges, with aligned openings 147 through which a rod 148 extends. This rod is connected at its lower end to the back 149 of the caster frame which carries the horizontal pivot 150 for a roller 151 which is adapted to ride upon the top of the portion 86 of the sill structure. Secured to one of the sides of the caster frame 149 is a plate 152 extending parallel with the outer face of the stool 86^b and provided at opposite ends thereof with bearing plate 153 for the vertical pivot pins 154 of rollers 155 which are adapted to engage the outer vertical face of the stool. The positions of the rollers 151 and 155 may be varied by raising and lowering the rod 148, the rod being clamped in its various positions by means of a thumb screw 156 mounted in a bearing 157 on the base or web of the yoke and extending through said web and engaging at its inner end the web of the arm 111, thereby serving by its inward adjustment to bring the walls

of the openings 147 which are remote from the flanges of the arm into clamping engagement with the bar and to grip the bar between the walls and the ends of said flanges. This manner of mounting the bracket 145 on the bar 111 permits of an adjustment of the bracket and of the rollers 151 and 155 longitudinally with respect to said bar.

With the parts constructed and arranged as thus far described, the operation will be generally as follows: The base plate 11 and all of the parts supported thereby, including the housing and the bars 44 and 111, can be positioned in operative relation to the upper and lower frames of a window by means of the composite brackets comprising the parts 87-94 inclusive, the track comprising the base 84 and side rails 85, the externally located rollers 100, 102, 151, 155 and the internally located rollers 137, 139, 144. The adjustability of the rollers 151 and 155 along the bar 111 enables them to cooperate with the rollers 137, 139 and 144 in providing a non-tilting and easily reciprocable support for the apparatus upon the portions of the window sills located within window frames while the externally located rollers also cooperate in ensuring adequate protection against the tilting of the base plate 11 and all of the parts of the apparatus carried thereby.

For the purpose of adjusting the rollers 100 to accommodate differences in the amount which the external parts of different window-sill structures project beyond the internal parts of the same, I have provided a shaft 158 having a hub 159 thereon adapted to engage a bearing sleeve 160 carried by a vertical flange of the angle bar 95 which supports the wheels 100 (see Fig. 5). The outer end of the shaft is threaded into a sleeve 162 secured to the under side of the horizontal flange of one of the frame members 13. The shaft is provided with a hand wheel 163 and a handle 164 by means of which the screw can be adjusted whereby the wheels 100 can be moved inwardly or outwardly with respect to the surfaces on the inner portion of the sill structure which are to be engaged by rollers supported from the bar 111 thereby to accommodate variations in the distances between such surfaces and the position which the track must occupy with reference to the outer portion of the said sill structure.

By adjusting the bar 44 by the pinion 53, the window cleaning implement can be placed in contact with the outer surface of the particular pane upon which it is to operate. However, if a finer adjustment is needed than can be obtained by this means, I have provided an additional adjusting means which comprises the shaft 116, which has been referred to hereinbefore, and which is provided with a thread adapted to mesh with the thread of a half nut 165 which is pivotally connected at its base to a support 166 which is secured to the web portion of the channel member 54 as by a screw 167 (see Figs. 5 and 9). When the threads on the shaft 165 are in engagement with the threads on the half nut, a further fine adjustment of the squeegee or other cleaning implement toward the pane can be made by rotating the shaft, such rotation imparting a minute movement toward the window of the base plate 11, the housing, and the parts supported thereby, this action being facilitated by the yieldable manner in which the rollers 100 are supported by the rods 96 and, if also necessary, by slacking off the screw 156 to permit the rollers 151 and 155 to be shifted to accommodate this slight motion.

A shaft 168, which extends through a vertical slot 169 in one of the sides of the housing and is provided outside the housing with a hand wheel 170, is threaded into a sleeve 171 carried by a plate 172 extending across and secured to the flanges of the guide 112, to which plate the filler plate 46^a is secured, as by welding. The inner end of the said shaft is connected with a lug 165^a on the swinging end of the half nut whereby, by turning the shaft in an appropriate direction, the half nut may be disengaged from the threads on the shaft and the bar 111 can be slid freely through the transverse guide 112. This enables the rollers 100 to be positioned in the track located exteriorly of the window and the bar to be moved so as to bring the rollers carried thereby into operative relation to the surfaces of the inner portion of the sill structure with which they cooperate.

Where a belt is employed as the means for raising and lowering the transverse guide 37 and the bar 44, it may be necessary or advisable to provide a belt tightener pressing against the portion of the belt not engaged by the pinion. Such a tightener is shown in Fig. 4 as comprising a roller 173 mounted in a yoke 174 which is pivotally connected to a plate 175 the lower ends of the sides of which are mounted in supports 176, one of which is shown in Fig. 4 as extending upwardly from the transverse guide 112. The yoke is provided with an arm 177 through which an adjusting screw 178 extends, which screw is adapted to abut against the plate 175 and the outer end of which is provided with a wing nut 179 by the adjustment of which the roller may be thrust with varying degrees of pressure against the section 34 of the belt.

In Figs. 15 and 16 there is shown a modification of the means for raising and lowering the guide 37 and the bar 44. This means comprises a channel shaped rigid rack 180 having the ends of its flanges intumed, as shown at 181 and having a rack bar 182 welded to said ends, the rack bar being provided in a portion of the length thereof with spaced rack teeth 183 similar to the pins 36 and adapted to be operated by the shaft 120 and pinion 121. The rack bar is braced immediately of the length thereof by a sleeve 184 supported by arms 185 extending upwardly from the transverse guide 112, one of which is shown in Fig. 15. The upper portion of the rack bar is not provided with rack teeth, thereby enabling it to support the transverse guide 37 and the bar 44 by means of a channel guide 186^a carried by a plate 186 which is secured to the transverse guide 37, there being a pin 187 extending through the said plate and the rack bar, the said pin being similar to the pin P in the preceding modification and having a clamping sleeve and a hand wheel 188 threaded thereon, which clamping sleeve engages the lower portion of the plate 186 and from the lower portion of which plate brace arms, one of which is shown at 189, extend upwardly and are connected at their upper ends to the transverse guide 37, in a manner similar to that in which the arms P⁶ are connected to the said guide in the preceding modification of the invention.

In Fig. 17 there is shown a modification of the squeegee cleaning implement which comprises a thin strip of material 191 which can be moistened, if desired, and which can be inserted between the bottom rail of the top frame and the overlapping portion of the top of the bottom frame thereby to gain access to the lower portions of the panes in the upper frame, and which is mounted on a

base 192 having a base support 78, similar to the support with which the squeegee is provided.

In operation, the bar 44 having been elevated to the desired extent to enable the cleaning implement to work upon the outer surfaces of the uppermost pane or panes in the upper window frame is moved back and forth across the panes by the handle 117, being lowered, as occasion may require, until the entire outer surfaces of the panes are cleaned. Thereafter the bar may be retracted, if necessary to enable the cleaning implement to clear the window bar, and lowered to the top of the next lower pane or panes and moved inwardly to bring the implement into engagement with the outer surfaces of said lower pane or panes, and the operation repeated for the latter pane or panes, and so on for all of the panes in the upper and outer frame. The upper portion of the implement can operate between the inner surfaces of the lower panes on the upper frame and the outer surfaces of the overlapping panes of the inner frame and the bar 44 will be operated for the purpose of cleaning the panes of the lower frame in the same manner as it is operated for cleaning the panes in the outer frame. For convenience of transportation along a floor, rollers 100^a, similar to the rollers 100, are supported by the base frame 10 at the opposite side of the housing from the rollers 100. For like reason the top of the housing is provided with a handle 193.

The apparatus shown and described has proved to be particularly adaptable for variations in the installations of window frames and their sills and to enable the cleaning of windows to be effected efficiently and expeditiously.

Having thus described my invention, what I claim is:

1. In a window cleaning apparatus comprising a base frame, a vertically movable and horizontally reciprocable bar for supporting a cleaning implement and itself supported from said frame and means for raising and lowering and reciprocating the said bar, a track and means for supporting the same upon a window sill structure externally of and substantially parallel with a window which is to be cleaned, the said window sill structure having a stool upon the top of the inner portion thereof and projecting inwardly beyond the portion of the inner sill structure therebeneath, outer rollers supported from said frame and arranged to traverse said track, cooperating inner rollers carried by said frame and adapted to engage the vertical surface of the inner portion of the window sill structure below said stool for movement therealong longitudinally of said structure, said inner rollers being adapted to engage with said stool for preventing arcuate movement of said base frame about said outer rollers, and means for effecting relative bodily movement between the inner and the outer rollers, the said frame being provided with means whereby it can be reciprocated longitudinally of the window sill structure.

2. In a window cleaning apparatus comprising a base frame, a vertically movable and horizontally reciprocable bar for supporting a cleaning implement and itself supported from said frame and means for raising and lowering and reciprocating the said bar, a track and means for supporting the same upon a window sill structure externally of and substantially parallel with a window which is to be cleaned, outer rollers supported from said frame and arranged to traverse said track, cooperating inner rollers carried by

a portion of said frame and adapted to engage an inner vertical surface of the window sill structure for movement therealong longitudinally thereof, means for effecting relative bodily movement between the outer rollers and the inner rollers, the said frame being provided with means whereby it may be reciprocated lengthwise of the window sill structure, additional rollers adjustably supported by a portion of said frame and located externally of the window and opposed to the inner rollers and adapted to engage the exterior vertical surface of the inner portion of the window sill structure for movement therealong longitudinally thereof, the window sill structure comprising a stool extending inwardly beyond the inner surface thereof which is engaged by the inner rollers, and a roller also supported by a portion of said frame and adapted to engage the inner surface of the said stool for movement therealong longitudinally of the window sill structure, the said frame being provided with means whereby it can be reciprocated longitudinally of the window sill structure.

3. In the window cleaning apparatus set forth in claim 2, a vertically adjustable roller carried by a portion of said frame and located externally of and extending below the aforesaid additional rollers and adapted to engage the top of the outer portion of the window sill structure for movement longitudinally thereof.

4. In a window cleaning apparatus comprising a base frame, a vertically movable and horizontally reciprocable bar for supporting a cleaning implement and itself supported from said frame and means for raising and lowering and reciprocating the said bar, a track and means for supporting the same upon a window sill structure externally of and substantially parallel with a window which is to be cleaned, outer rollers supported from said frame and arranged to traverse said track, a bar reciprocably supported from said frame, an assembly of rollers secured to said bar some of which rollers are adapted for engagement with and movement longitudinally of and along the top and along the inner surface of a stool comprising part of the window sill structure and others of which rollers are adapted for engagement with and movement longitudinally of the portion of the structure which is located below the inner surface of said stool, the said frame being provided with means whereby it can be reciprocated longitudinally of the window sill structure.

5. In the window cleaning apparatus set forth in claim 4, the means supporting the outer rollers from the said frame including a coil spring that is yieldable to outwardly exerted pressure on the outer rollers.

6. In the window cleaning apparatus set forth in claim 2, the means whereby the said frame can be reciprocated comprising a bar adapted to extend inwardly from the frame across the window sill structure, a supporting member mounted upon and adjustable along said bar, and the third mentioned rollers being suspended from and vertically adjustable with respect to said supporting member, and an additional roller also suspended from and vertically adjustable with respect to said supporting member and adapted to ride upon the top of the outer portion of the window sill structure and longitudinally thereof.

7. In the window cleaning apparatus set forth in claim 2, a vertically adjustable roller carried by a portion of said frame and located exteriorly of

and extending below the third mentioned rollers and adapted to ride upon the top of the outer portion of the window sill structure and longitudinally thereof, rollers located exteriorly of the first mentioned rollers and a horizontal plate supported from the outer portion of the window sill structure and extending parallel with said structure and above the last mentioned rollers in position to be engaged by the latter throughout the reciprocatory movements of the frame.

8. A window cleaning apparatus comprising a base frame, a substantially horizontal plate located above and supported from said frame, a vertically extending rack member having its lower portion extending through said plate, means for supporting the portions of the said rack member above said plate against transverse displacement, a transversely extending guide member secured to a portion of said rack member, a cleaning-implement supporting bar slidably mounted on said transversely extending guide member and means for reciprocating the said bar thereon, means for locking said supporting bar in a given position, a shaft supported from the said frame and having a pinion thereon meshing with teeth on said rack member, and means for supporting the aforesaid parts from a window sill structure for longitudinal movement therealong.

9. A window cleaning apparatus comprising a base frame, a substantially horizontal plate located above and supported from the said frame, vertical guide members secured to and extending above said plate, a second and upper substantially horizontal plate to which the upper ends of the said vertical guide members are secured, a rack member extending through the said plates and between the guide members secured thereto, a transversely extending guide member secured to the rack member, a cleaning-implement supporting bar slidably mounted on the said transversely extending guide member and means for reciprocating the same thereon, a shaft supported by said frame and having a pinion thereon meshing with teeth on said rack member, and means for supporting the aforesaid parts from a window sill structure for longitudinal movement therealong, said last named means including rollers adapted to engage with the window sill and extended inwardly of the apparatus, means for controlling and gradually altering the extended position of said rollers with relation to said frame, and means for rendering said control means inoperative to make said rollers readily movable with regard to said frame.

10. In the cleaning apparatus set forth in claim 9, the means for supporting the first mentioned plate from the frame comprising a substantially horizontal base plate secured to the said frame below the first mentioned plate, and means carried by the base plate and engaging the first mentioned plate for varying the vertical distance between the said plates.

11. In the apparatus set forth in claim 9, the rack member comprising an endless belt, one portion of which is provided with pins constituting rack teeth adapted to be engaged by the teeth of the pinion, a base plate carried by the frame beneath the said rack member, said lower horizontal plate being located above and supported from the base plate and means for vertically adjusting the same from the base plate, said guide members extending through and below and being secured to the lower horizontal plate, the two said horizontal plates having slots therethrough between said opposed guide members for the pas-

13

sage of the belt, vertical supporting plates secured to the said horizontal plates, rollers supported by and between the vertical supporting plates and around which the upper and lower looped ends of the belt pass.

12. A window cleaning apparatus comprising a base frame, a base plate supported by said frame and a housing supported by and extending upwardly from said frame and means for supporting the frame, base plate and housing from a windowsill structure for longitudinal movement therealong, a vertically extending rack member supported within said housing from said base plate, a transversely extending guide member secured to a portion of said rack member and having its ends mounted in vertical slots provided in the housing and a cleaning-implement supporting bar slidably mounted on the said guide and provided with a rack, a pinion shaft extending through a vertical slot provided in the housing, at one side of the first mentioned rack member, a pinion on said shaft meshing with the rack on said bar, and a pinion shaft supported by said frame and extending through vertical slots provided therefor in the wall of the housing and having a pinion keyed thereto meshing with the toothed operating portion of the said rack member, and means located interiorly of the window sill structure for operating the last mentioned shaft.

13. A window cleaning apparatus comprising a base frame, a substantially horizontal base plate supported by said frame, a substantially horizontal plate supported by and located above the base plate and having openings therethrough, guide members secured to the second plate on opposite sides of each of the openings thereof and extending upwardly from said plate and having their lower portions projecting below said plate, a plate secured to the upper ends of the said guide members and having openings therethrough corresponding to and located vertically above the openings in the second mentioned plate and also located between the respective guide members, a rack comprising an endless belt the vertical stretches whereof extend through the openings in the said plates and between the guide members, and guiding means for the upper and lower

14

looped ends of the belt secured to and supported from the plates to which the upper and lower ends of the guide members are secured, a shaft supported by said frame and provided with a pinion meshing with rack teeth on said belt, a transversely extending guide member secured to a vertical stretch of said belt and a cleaning-implement supporting bar slidably mounted thereon, means for reciprocating said bar, means for supporting the guide carrying portion of the said belt during its movement by the rack teeth and pinion, and means for supporting the foregoing parts from a window sill structure for longitudinal movement therealong.

14. In the apparatus set forth in claim 13, the transversely extending guide member being of channel formation and having the ends of its flanges directed toward and spaced from each other and the implement supporting bar comprising a channel member mounted within the said guide member and having a rack secured to one of the flanges thereof, a shaft supported by the said guide member and having a pinion meshing with the said rack, and means for locking said shaft in a given position.

15. In the apparatus set forth in claim 13, a housing supported by said base frame and enclosing the plates and the parts supported thereby and provided with vertical slots for the accommodation of the transverse guide and the implement supporting bar and for the various operating shafts.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
893,231	Fluegelman	July 14, 1908
1,259,479	Bertolini	Mar. 19, 1918
1,395,280	Kahn	Nov. 1, 1921
1,416,280	Gazdzicki	May 16, 1922
1,561,250	Kunze	Nov. 10, 1925
1,661,236	Sebell	Mar. 6, 1928
1,922,078	Curry	Aug. 15, 1933
2,086,054	Swensen	July 6, 1937