July 11, 1967 V. V. KUBISIAK 3,330,071

WINDOW REGULATOR

Filed March 24, 1965

3 Sheets-Sheet 1

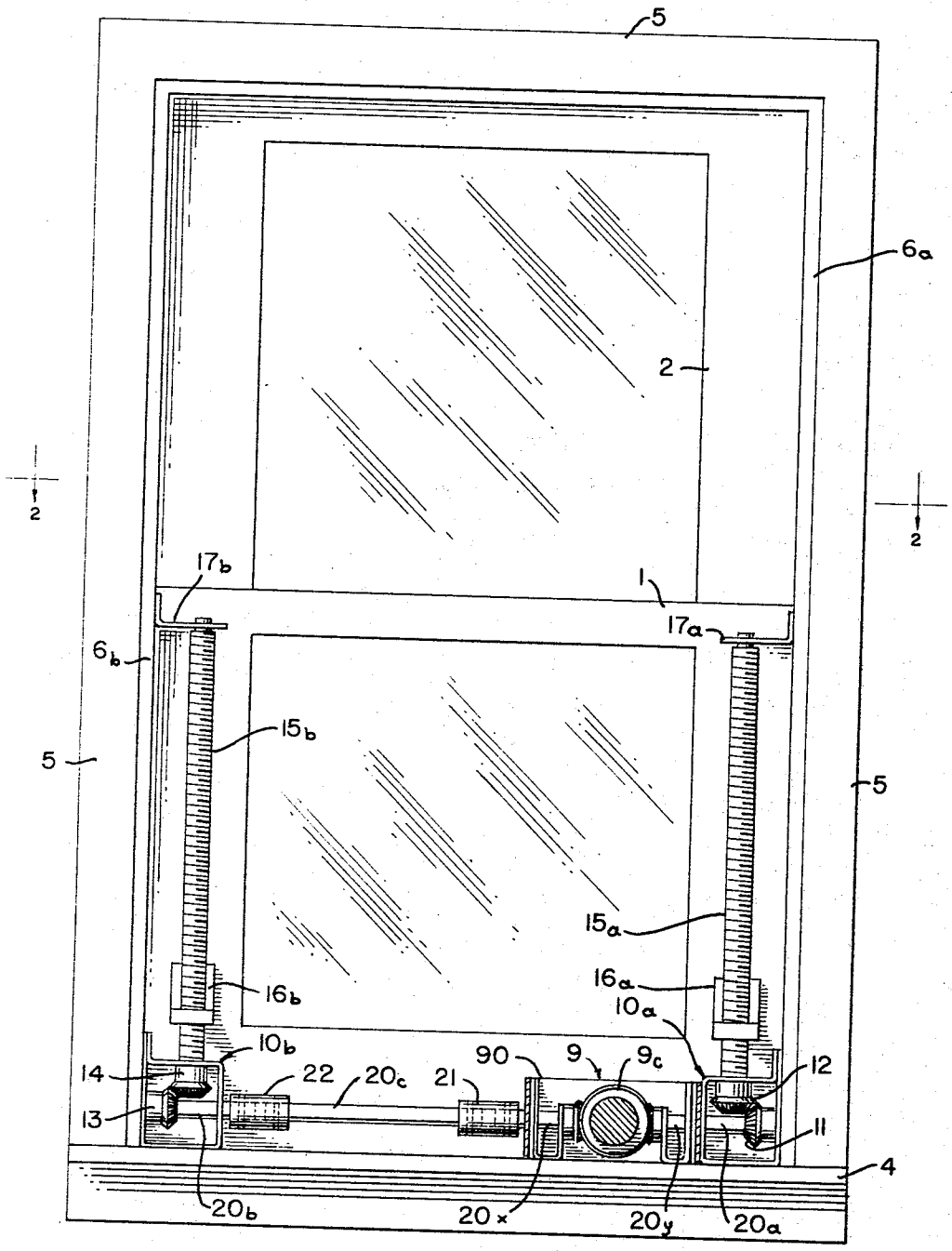


FIG. 1

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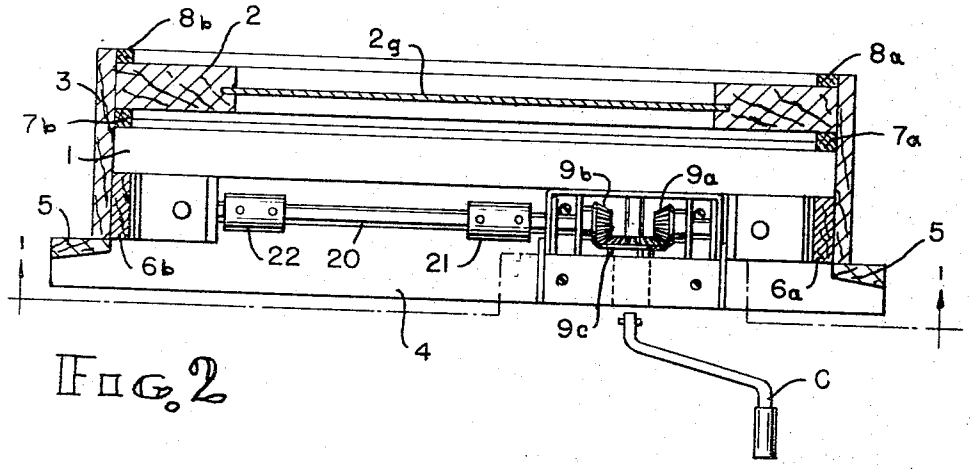


FIG. 2

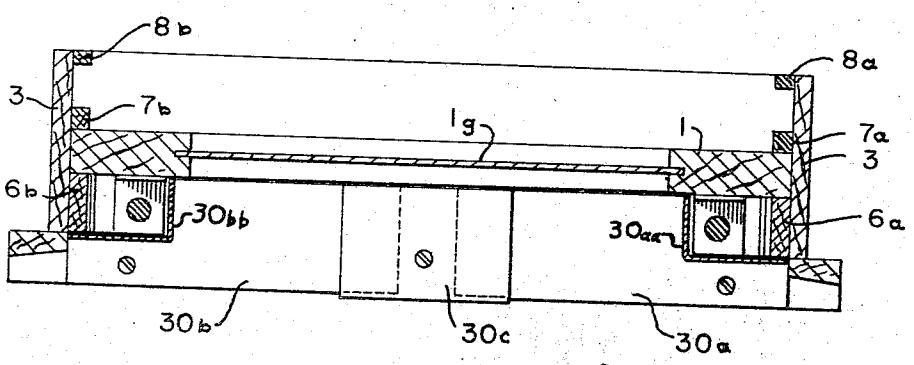


FIG. 3

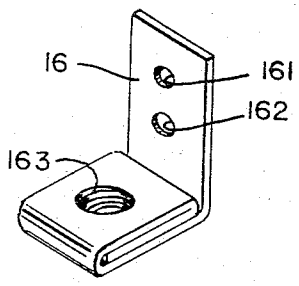


FIG. 4

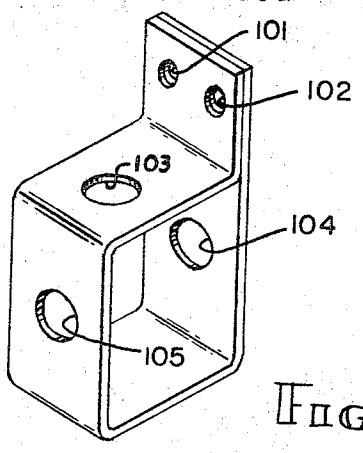


FIG. 5

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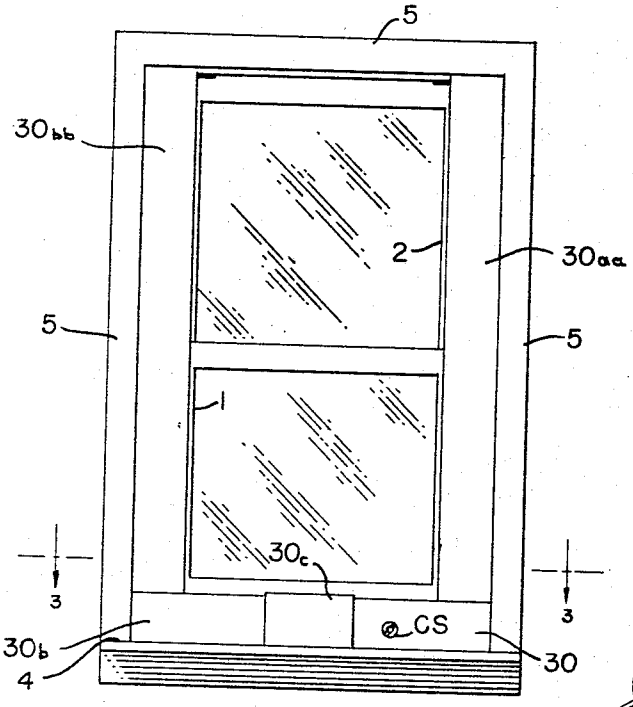


FIG. 6

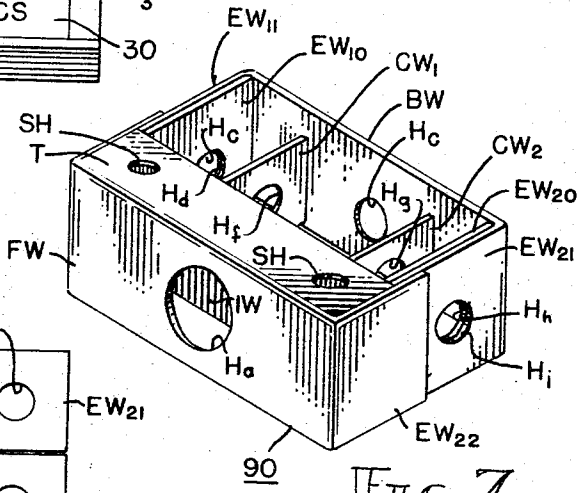


FIG. 7

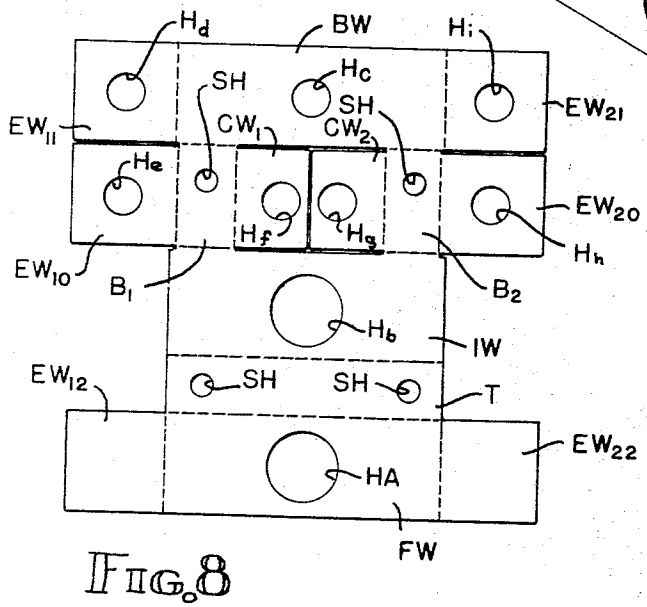


FIG. 8

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3,330,071

WINDOW REGULATOR

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7 Claims. (Cl. 49—362)

This invention relates in general to a window regulator for double hung windows, and in particular to a window sash operating and holding device.

Objects of the invention are to provide such a device which is easy to install both in existing buildings and in new structures, is easy to operate in opening and closing the window, is attractive in appearance and hides the working mechanism from view, is readily accessible for maintenance or repair, is reliable in operation, is strong, is free from binding, is light in weight, and is inexpensive and economical.

The foregoing and other objects will appear from the description of the invention which consists of certain novel details of construction and combinations of parts hereinafter described and claimed.

In the drawing:

FIG. 1 is a front elevational view, partly in section, illustrating a window unit with sliding window sashes, equipped with the mechanism of a device constructed in accordance with the invention, the cover trim members of the device being removed.

FIG. 2 is a sectional view taken on line 2—2 of FIG. 1.

FIG. 3 is a sectional view taken on line 3—3 of FIG. 6.

FIG. 4 is a perspective view of a threaded bracket member of the device.

FIG. 5 is a perspective view of the end gear box member of the device.

FIG. 6 is a frontal elevational view of the same window unit, showing the cover trim members in place.

FIG. 7 is a perspective view of the one-piece center gear box member of the device.

FIG. 8 is a plan view of the sheet piece from which said center gear box is made.

The double-hung window unit is shown as having a front and lower sash **1** with a glass pane **1***g*, and an upper sash **2** with a glass pane **2***g*; each sash being in sash channels in window frame **3**. The channels are provided by the usual arrangement of stops or guide strips shown as front stops **6***a*, **6***b*, central stops **7***a*, **7***b* and rear stops **8***a*, **8***b*. The window unit also includes a stool **4** and casing trim **5**.

Mounted on the top of stool **4** intermediate the ends thereof is a gear box **90**. A gear arrangement **9** in gear box **90** has bevel gears **9***a* and **9***b*, each with ten teeth, driven by bevel gear **9***c* which has twenty teeth. On top of the stool, at each end thereof, attached to the front stop, is an end gear box. At one end, against front stop **6***a*, is gear box **10***a* housing mitre bevel gears **11**, **12**, each having twelve teeth; and at the other end, against front stop **6***b*, is gear box **10***b* housing mitre bevel gears **13**, **14**, each having twelve teeth.

A horizontal shaft **20**, made up of shaft portions **20***a*, **20***b*, **20***c*, **20***x*, **20***y*, and couplings **21**, **22**, carries gears **9***a*, **9***b* and gears **11** and **13**.

Gears **12** and **14** are mounted respectively on the lower ends of vertically extending threaded shafts **15***a*, **15***b* respectively.

Attachd to the front face of lower sash **1** are threaded brackets **16***a*, **16***b* which threadingly engage threaded shafts **15***a*, **15***b* respectively.

The upper ends of threaded shafts **15***a*, **15***b* are journaled in fixtures **17***a*, **17***b* respectively, which fixtures are secured to front stops **6***a*, **6***b* respectively, projecting out therefrom in front of lower sash **1**.

Gear **9***c* is driven by a crank C which fits a crank slot CS in the shank of gear **9***c*.

Lower sash **1** may thus be raised and lowered by the turning of crank C. The crank drives gear **9***c*, which through gears **9***a* and **9***b* rotates shaft **20**; the shaft **20** through gears **11**, **13** drives the gears **12** and **14** to thereby rotate threaded shafts **15***a*, **15***b* and drive threaded brackets **16***a*, **16***b* thereon either up or down to thus either raise or lower the window sash **1**.

The working mechanism is hidden from view by cover trim members. The horizontal shaft **20** and the gear boxes and associated gears are hidden by L-shaped cover trim members **30***a*, **30***b* and **30***c*; the center member **30***c* receiving the members **30***a*, **30***b* telescopically to enable easy adjustment to different window widths. The vertical shafts **15***a*, **15***b*, the threaded brackets **16***a*, **16***b* and the journal fixtures **17***a*, **17***b* are hidden by L-shaped cover trim members **30***aa* and **30***bb*.

Each of the threaded brackets, as shown in FIG. 4, may be easily, economically and advantageously made from one piece by bending a thin steel strip into an L-shaped bracket with one leg three layers thick, as shown, and forming threaded opening **163** through the three layer portion. Mounting holes **161**, **162** extend through the other portion.

Each end gear box, as shown in FIG. 5, may be easily, economically and advantageously formed from one-piece by: bending a thin steel strip into the b or d shape shown with the extending leg two layers thick; forming journal holes **103**, **104** and **105** therein as shown; and forming mounting holes **101**, **102** through the two layer legs as shown. Journal holes **104** and **105** are aligned, and rereive horizontal shaft **20** therethrough; the box thereby supporting and journaling the shaft. Shaft portion **20***a* is supported and journaled in box **10***a*. Shaft portion **20***b* is supported and journaled in box **10***b*. Hole **103** receives the lower end of one of the vertical threaded shafts on which, inside the box, is mounted its bevel gear.

The central gear box **90**, shown in perspective in FIG. 7, may be easily, economically and advantageously made by bending from a pre-cut one-piece sheet of thin steel. In FIG. 8 is shown the piece from which the box is made, the dashed lines indicating where bends are made.

Box **90** is formed with three walls parallel to the window panes; these three walls being: a front wall FW; a back wall BW; and an inner wall IW spaced from and intermediate said front and back walls. A top T is normal to and joins wall FW and wall IW at the generally forward portion of the box, and a pair of end walls EW_{12} and EW_{22} stand normal to both said top T and said walls FW and IW. At the generally rearward portion of the box there is: at one end thereof, a two-layer end wall made up of walls EW_{10} and EW_{11}; at the other end thereof, a two layer end wall made up of walls EW_{20} and EW_{21}; and spaced from said end walls and from each other are center walls CW_1 and CW_2 standing parallel to said end walls. Joining wall CW_1 and wall EW_{10} is a bottom B_1, and joining wall CW_2 and wall EW_{20} is a bottom B_2.

Aligned openings H_a and H_b in front wall FW and inner wall IW, respectively, receive the front and larger shank of the driving gear **9***c*, said shank being thereby journaled and supported in the box. Openings H_c in back wall BW is smaller than and aligned with said openings H_a and H_b, and receives the smaller shank of driving gear **9***c* to thereby journal and support said shank in the box.

Openings H_d, H_e, H_f in walls EW_{11}, EW_{10} and CW_1, respectively, and openings H_g, H_h, and H_i in walls CW_1, EW_{20} and EW_{21}, respectively, are aligned and are of equal size, and receive the horizontal shaft therein. Walls EW_{10}, EW_{11} and CW_1 support and journal shaft portion 20_y.

For conveniently mounting box **90** on the stool **4**, two

screw holes SH are provided in top T, and a screw hole SH is provided in each of the bottoms B_1 and B_2.

It has been found that steel rod of one-quarter of an inch diameter is excellent for shaft portions **20***a*, **20***b*, **20***c*, **20***x* and **20***y*; and that sheet steel of about 18 guage is excellent for the gear boxes **10***a*, **10***b*, and **90**, as well for threaded brackets **16***a*, **16***b* and journal fixtures **17***a*, **17***b*. The cover members **30***a*, **30***b*, **30***c*, **30***aa*, and **30***bb* are made of sheet steel of about 26 gauge. The vertical threaded shafts **15***a*, **15***b* are three-eighths of an inch in diameter with 16 threads to the inch, triple lead; and the threaded openings in brackets **16***a*, **16***b* of course have matching threads. Gear **9***c* is about one and one-sixteenth inches in diameter. Gears **9***a*, **9***b* are about one-half inch in diameter, and the gears **11**, **12**, **13**, **14** are about eleven-sixteenths inch in diameter.

This window sash operating and holding device is easy to install in any double hung window in existing buildings or in new construction. The gears and shaft portions are assembled with their associated boxes; then the end boxes are merely placed on the stool and screwed to the front stops, as shown. The central box **90** is then placed on the stool up against one of the end boxes and screwed to the stool. Shaft portion **20***c* is then selected, or cut, to the proper length to adjust for any variation in width, and assembled with couplings **21**, **22** to the shaft portions **20***b* and **20***x*. Fixtures **17***a*, **17***b* are screwed to the front stops, and the threaded brackets **16***a*, **16***b* are screwed to the sash **1**. The cover trim members are then merely screwed into place; members **30***a*, **30***b* and **30***c* to the stool, and members **30***aa* and **30***bb* to the front stops.

The entire device is thus easily installed and is very attractive. It has all working mechanism hidden from view; but provides easy access thereto for any repair or maintenance. The entire working mechanism is above the stool, between the front stops, and out in front of the lower and front sash in extremely convenient location. The crank slot is above and close to the stool, and off to one side of the center of the stool, and is thus very advantageously located for the convenience of the operator. The device operates quietly, easily and smoothly, without binding, in opening and closing the sash. It holds the window strongly in any position, thereby providing security against forced entry from the back side, i.e., from the outside or exterior.

Having described the invention, what is claimed is:

1. In combination with a double hung window unit having a frame including a stool along the bottom thereof, and a pair of front stops along the sides thereof, and having a sliding lower sash arranged therein, a sash operating device comprising: a first threaded bracket fixed to the front face of said sash at one side thereof; a second threaded bracket fixed to the front face of said sash at the other side thereof; a first vertically arranged threaded shaft disposed directly in front of said sash at one side thereof in driving engagement with said first bracket; a second vertically arranged threaded shaft disposed directly in front of said sash at one side thereof in driving engagement with said second bracket; the lower ends of each vertical shafts terminating above said stool; said first vertically arranged shaft having a bevel gear on its lower end; said second vertically arranged shaft having a bevel gear on its lower end; a horizontally arranged shaft assembly disposed between said stops above said stool and below said vertical shafts; said horizontal shaft assembly including at one end thereof a first bevel gear meshing with the bevel gear on said first vertical shaft, at the other end thereof a second bevel gear meshing with the bevel gear on said second vertical shaft; and a drive gear arrangement disposed above said stool and between said stops for imparting rotating movement to said horizontal shaft assembly to raise and lower said sash; said horizontally arranged shaft assembly having, between one of said bevel gears thereon and said drive gear arrangement, three shaft portions and two couplings connecting said portions; and removable cover trim means including a plurality of telescopically adjustable cover trim members extending over and along said stool covering said assembly and said drive gear arrangement; the entire device being within the inner boundary of said frame.

2. The invention defined in claim **1**, further characterized in having: a first removable cover trim member, fixed to and vertically extending along one of said stops, covering said first threaded shaft and threaded bracket; and a second removable cover trim member, fixed to and vertically extending along the other of said stops, covering said second threaded shaft and threaded bracket.

3. The invention defined in claim **1** wherein said drive gear arrangement includes a crank receiving gear and a pair of gears meshed therewith in driving engagement with said horizontal shaft assembly to rotate said horizontal shaft assembly twice in response to each rotation of said crank receiving gear.

4. In combination with a double hung window unit having a frame including a stool along the bottom thereof, and a pair of front stops along the sides thereof, and having a sliding lower sash arranged therein, a sash operating device comprising: a first threaded bracket fixed to said sash; a second threaded bracket fixed to said sash; a first vertically arranged threaded shaft in front of said sash in driving engagement with said first bracket; a second vertically arranged threaded shaft in front of said sash in driving engagement with said second bracket; a horizontally arranged shaft assembly disposed above said stool and below said vertical shafts and connected with said vertical shafts to rotate them upon rotation of said horizontal shaft assembly; gear means disposed above said stool and between said stops for imparting rotating movement to said horizontal shaft assembly to raise and lower said sash; said horizontally arranged shaft assembly having, between said gear means and one of said vertical shafts, a plurality of horizontal shaft portions and coupling means connecting said portions; and removable cover trim means extending over and along said stool covering said assembly and said gear means; the entire device being within the inner boundary of said frame.

5. In combination with a double hung window unit having a frame including a stool along the bottom thereof, and a pair of front stops along the sides thereof, and having a sliding lower sash arranged therein, a sash operating device comprising: a first threaded bracket fixed to said sash; a second threaded bracket fixed to said sash; a first vertically arranged threaded shaft in front of said sash at one side thereof in driving engagement with said first bracket; a second vertically arranged threaded shaft in front of said sash at the other side thereof in driving engagement with said second bracket; a driving arrangement disposed above said stool, between said stops and below said vertical shafts, and connected with said vertical shafts to rotate them for raising and lowering said sash; said driving arrangement including a horizontally arranged shaft assembly and a drive gear means; said assembly having, between said gear means and one of said vertically arranged shafts, a plurality of horizontal shaft portions and coupling means connecting said portions; and removable cover trim means extending over and along said stool covering said assembly and said drive gear means; the entire device being within the inner boundary of said frame.

6. In combination with a double hung window unit having a frame including a stool along the bottom thereof, and a pair of front stops along the sides thereof, and having a sliding lower sash arranged therein, a sash operating device comprising: threaded bracket means fixed to said sash; vertically arranged threaded shaft means in front of said sash in driving engagement with said bracket means; driving means disposed above said stool and between said stops engaged with said vertical shaft means

for raising and lowering said sash; said driving means including a horizontally arranged shaft assembly and a drive gear means; said assembly having, on one side of said gear means, a plurality of horizontal shaft portions and coupling means connecting said portions; and removable cover trim means extending over and along said stool covering said assembly and said drive gear means; the entire device being within the inner boundary of said frame.

7. In combination with a double hung window unit having a frame including a stool along one end thereof, and a pair of front stops along the side thereof, and having a sliding sash arranged therein, a sash operating device comprising: threaded bracket means fixed to said sash; threaded shaft means disposed completely within the inner boundary of said frame and in front of said sash in driving engagement with said bracket means; driving means disposed on said stool and completely within

the inner boundary of said frame in driving engagement with said threaded shaft means for opening and closing said sash; said driving means including a shaft assembly and a drive gear means; said shaft assembly having, between said drive gear means and said threaded shaft means, a plurality of shaft portions and a coupling means connecting said portions; and removable cover trim means extending along said stool covering said driving means; the entire device being within the inner boundary of said frame.

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J. K. BELL, *Assistant Examiner.*