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(54) **Motorised sash window**

(57) A motorised sash window comprises a frame 10 and sashes 12, 14. The rear sash 14 is motorised by an assembly 50 which replaces the usual guide pulley of the window. The assembly includes an electric motor (54 in Figure 2; 64 in Figure 3) which drives the pulley by a gear chain. A motorised assembly can be provided at one or both sides of the window. The window can operate a limit switch to de-energise the motor which can be remote-controlled if desired. The motorised assembly can conveniently be post-fitted to an existing sash window.

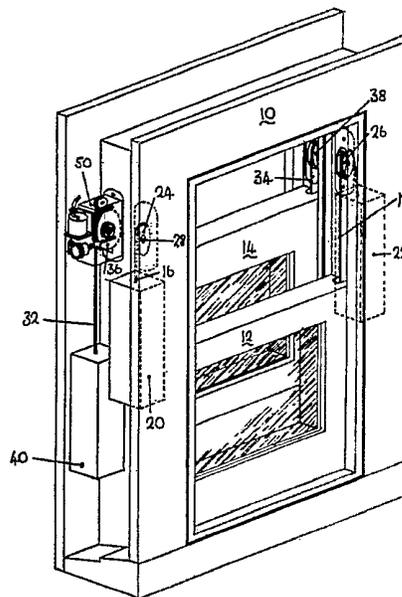
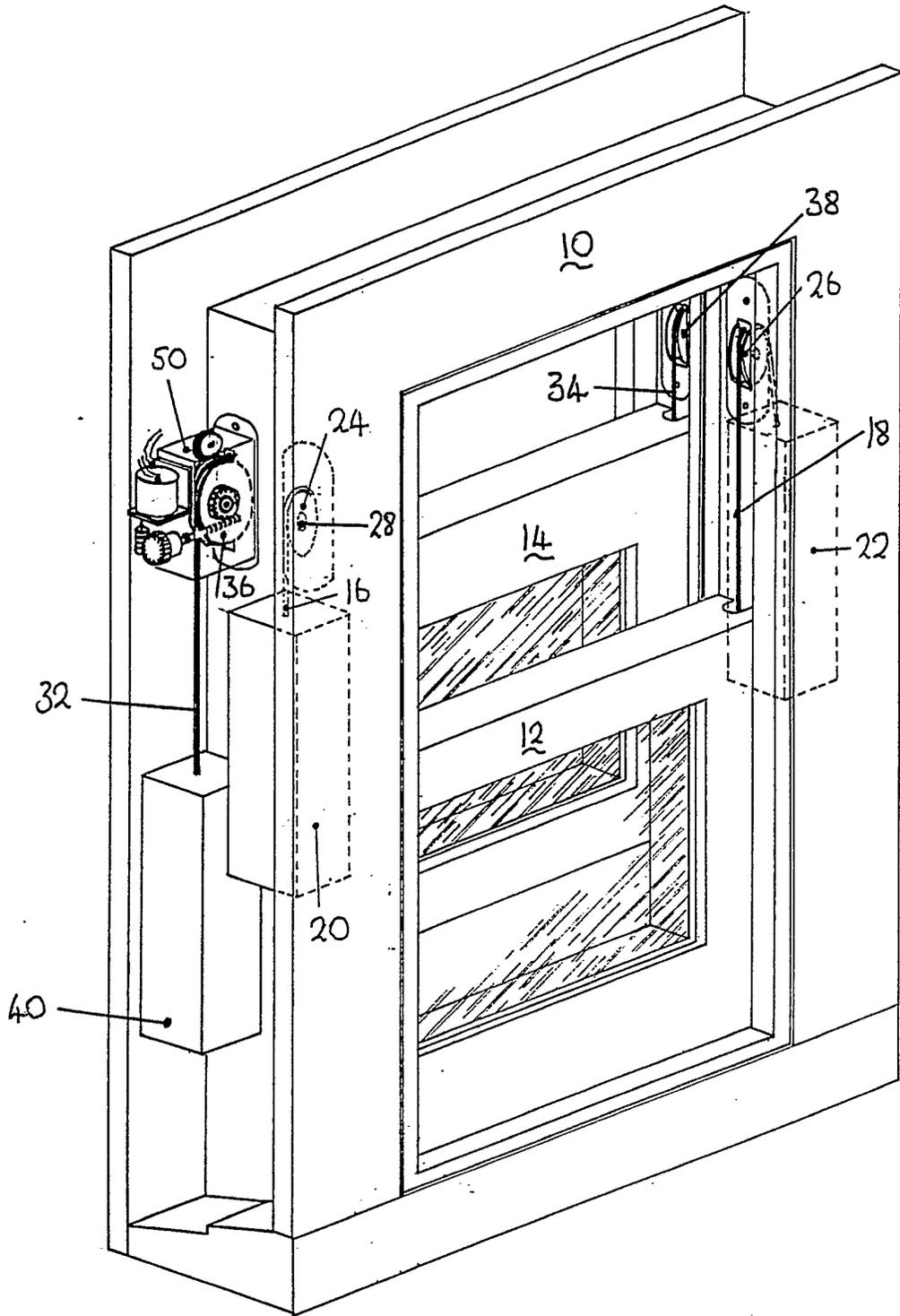


Fig 1

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Fig 1

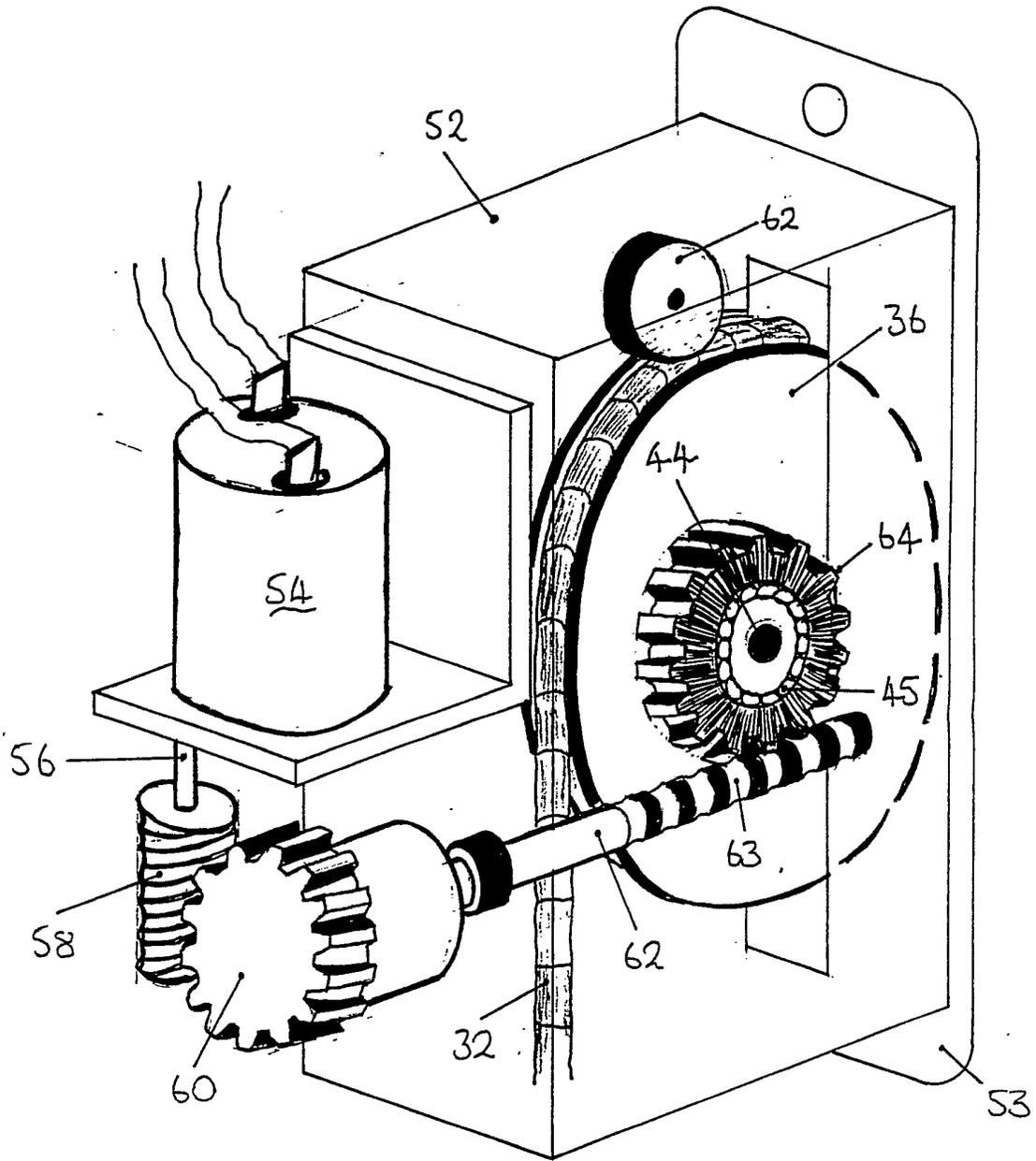


Fig. 2

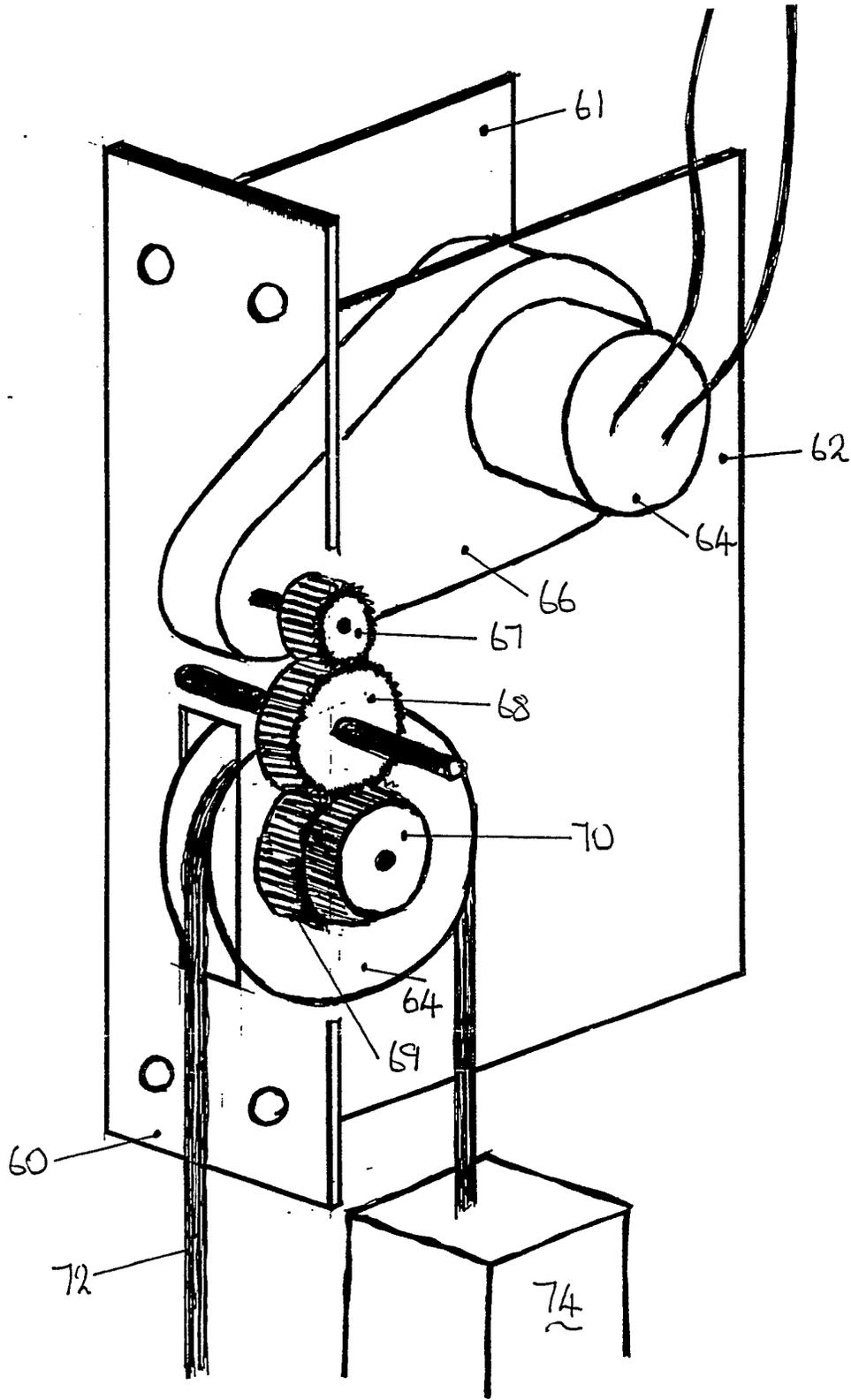


Fig 3

SASH WINDOWS

This invention relates to sash windows.

Sash windows are well known and consist of a glazed sash which is mounted in a window frame for
5 slidable movement in a vertical direction. The window
is usually double hung, that is to say a pair of sashes
each corresponding in height to approximately half the
window height are slidable in respective guideways in
the frame, so that the window opening can be closed by
10 the two sashes, one raised and one lowered, or the
window opened by any other combination of positions of
the two sashes.

It is conventional for the sash or sashes of the
window to be suspended in the frame on cords, usually
15 one at each side of the sash, each cord extending over
a pulley or other guide means into a cavity at the side
of the window frame in which a counterweight attached
to the cord is vertically movable in the opposite
direction to that movement of the sash. The mass of
20 each counterweight is chosen to be approximately half
that of the sash, so that the sash can be readily moved
in either direction but will remain in any desired
position as a result of friction in the assembly.

Known sash window mechanisms are restricted to
25 direct manual operation by gripping and raising or
lowering the sashes. This can give rise to problems
where the windows are large in size or are located in
places where access is difficult.

The present invention provides a sash window
30 assembly comprising a sash slidably guided in a frame,
the sash being connected to at least one elongate
flexible element which cooperates with a drive means
which is operable selectively to move the flexible
element in such a way as to produce movement of the
35 sash in the frame in respective opposite directions.

Advantageously, the drive means is located in the frame and, preferably, adjacent a point where the elongate flexible element passes into the frame. A particularly convenient location is within a side cavity of the frame, in which cavity a counterweight is also accommodated.

The drive means preferably includes an electric motor but could alternatively be powered otherwise, for example by a pneumatic or hydraulic motor or by human means, for example by use of a crank handle.

The elongate flexible element is preferably a cord but could alternatively be a chain or other suitable element.

Conveniently, the drive means includes a rotatable element which is in contact with the elongate flexible element and is drivable to rotate by the drive means in respective opposite directions according to the desired direction of sash movement.

When the drive means includes a motor this is conveniently located adjacent the rotatable element.

The rotatable element may engage the elongate flexible element frictionally, as is the case of known windows using guide pulleys; positive engagement is however possible, for example by use of a chain and sprocket.

To enhance frictional engagement between the elongate flexible element and the rotatable guide element, the guide element can advantageously have its surface which contacts the guide element roughened.

Further, a resiliently-biased means acting on the elongate flexible element, for example a roller biased by a spring or weight, could be used to increase frictional adhesion between the guide element and the elongate flexible element.

The sash will usually be moveable in a vertical

direction.

Often, there will be two flexible elements, one at each side of the sash, although the drive means need cooperate with only one of the flexible elements.

5 Conveniently, the drive means includes a worm and worm wheel drive, the rotational axis of the worm extending perpendicularly to the rotational axis of the guide element and the worm wheel and the worm wheel driving the guide element.

10 With such an arrangement, the worm can be driven directly by the drive means. Preferably however, the worm is driven indirectly, for example by a second worm and worm wheel drive. The use of first and second worm and worm wheel drives allows a particularly compact
15 arrangement to be used in which the drive axes of the guide element, the first worm and the second worm are mutually perpendicular and a drive motor is located in the window frame adjacent the rotatable drive element. One such location of the drive motor is alongside the
20 rotatable drive element and outwardly of the sash.

In another arrangement, the drive means comprises a train of meshing pinion gears with rotational axes parallel to a said rotational element.

25 Conveniently, the or each elongate flexible element is attached at its end opposite to the sash to a counterweight of similar type to that used in conventional sash windows.

30 The drive means can be arranged such that the window can be opened and closed by direct manual action on the sash, or, if desired, the drive means can act to prevent movement of the sash without operation of the drive means.

35 The invention can be readily put into effect by replacement of one or both guide pulleys of a sash window by a motorised assembly comprising a drive means

of the invention, the drive means including a said rotatable element, replacing the pulley, and, preferably, a drive motor positioned adjacent the rotatable element, preferably within a counterweight cavity of the frame.

The invention thus also provides a kit of parts for putting the invention into effect by adaptation of an existing sash window. In particular, the invention provides an assembly for motorising a sash window, the assembly comprising a mounting means for reception in the frame of a sash window, the mounting means including a rotatable element mounted for rotation in the mounting means and positioned for engagement with an elongate flexible element of a sash window, and a drive means for the rotatable element.

An embodiment of the invention will now be described by way of example with reference to the drawings, in which:

Figure 1 shows a double hung sash window in which the front sash is a conventional manually operable sash and the rear sash is a sash which has been modified to operate according to the present invention,

Figure 2 is an enlarged perspective view of one drive assemblies of the rear sash shown in Figure 1, and

Figure 3 is a view corresponding to Figure 2 of a modified drive assembly.

Figure 1 shows a double hung sash window, having a frame 10 and front and rear sashes 12, 14. The construction of the window frame 10 and the sashes 12, 14 is conventional, except as described hereinafter.

The front sash 12 is suspended on cords 16, 18 each of which is attached at one end to the sash 12 and at its other end to a respective counterweight 20, 22. The cords 16, 18 pass over respective pulleys 24, 26 so

that the counterweights 20, 22 are suspended in
respective cavities in the sides of the window frame
10. Each pulley 24, 26 is mounted in the frame for
rotational movement about an axis 28, 30 extending
5 perpendicularly to the direction of movement of the
sash 12.

The rear sash 14 is similarly suspended on cords
32, 34 which pass over pulleys 36, 38 to
counterweights, one of which has the reference numeral
10 40 and the other is not visible in Figure 1.

The rear sash 14 is electrically driven in
accordance with the present invention. The drive is
provided by a pair of electric drive assemblies 50
which act on respective ones of the pulleys 36, 38 and
15 one of which is shown in more detail in Figure 2. The
drive assembly acting on the pulley 38 cannot be seen
in Figure 1.

The drive assembly 50 comprises a housing 52 which
is mounted in the window frame 10 by means of an
20 apertured face plate 53. The pulley 36 is rotatably
mounted in the housing 52 on an axle 44 by way of a
ball bearing 45. A 12V electric drive motor 54 is
mounted on the housing 52 alongside the pulley 36. The
motor is reversible and is powered, by a battery or
25 from the mains via a transformer, and controlled by
means not shown. The control means include a control
switch which is conveniently located for user
operation. Remote control by infra-red, radio or other
wire-less means could be provided.

30 The output shaft 56 of the motor carries a worm 58
which is engagement with a worm wheel 60 fast on a
second shaft 62 having a worm 63 which is in engagement
with a second worm wheel 64. The second worm wheel 64
is fixed to the pulley 36 which is thus driven to turn,
35 at a much slower speed than the motor, by the worm

wheel 64. The pulley 36 is thus driven by the motor 54. A pressure wheel 62 is mounted on the housing 52 and biased by a spring (not shown) into contact with the cord 32 where it passes around the pulley 36.

5 An identical motor assembly drives the pulley 38, the two motors being connected in parallel to a common power supply and control means. The control means cause the motors to rotate simultaneously in opposite directions.

10 The modified drive assembly shown in Figure 3 will now be described. This assembly has a face plate 60 and a pair of parallel side plates 61, 62. A 12V electric motor, powered and controlled as the motor 54, is mounted between the side plates 61, 62 and drives a pulley 64, mounted between the side plates 61, 62, by way of an enclosed gearbox 66 and a train of meshing pinion gears 67, 68, 69, the latter of which forms part of the pulley 64. A spacer 70 maintains the pulley 64 at an appropriate distance from the side plate 62. A corresponding spacer (thicker because of the absence of a gear such as gear 69) is located between the pulley 64 and the side plate 61. As in the first drive assembly described, a cord 72 passes around the pulley 64 and is attached to the window sash and to a counterweight 74 at its respective ends.

25 The operation of the sash window assembly shown in the drawings will now be described.

30 The front sash 12 operates in exactly the same way as a conventional sash window in that the sash 12 can be raised or lowered manually and will remain approximately in its desired position when released.

35 The rear sash 14 operates according to the invention. For downward, opening movement of the rear sash 14, the control switch is operated to cause the motor 54 to be energised to rotate in a first direction

and cause the drive train consisting of elements 56, 58, 60, 62, 63, 64 to rotate and to rotate the pulley 36 in a clockwise (as seen in Figure 2) direction. The other motor rotates anticlockwise. The rotation of the
5 motors lets the cords 32, 34 out from the window frame and the sash 14 to be lowered correspondingly. Rotation of the motor 54 in the opposite direction causes rotation of the pulley 36 in an anticlockwise
10 direction (as seen in Figure 2) to draw the cord 32 into the frame and raise the sash 14 in the upward, closing direction, the other motor again rotating in the opposite direction.

When the rear sash 14 reaches its upper or lower limit position, the frame 10 prevents its further
15 movement. In this condition, continued rotation of the motors simply results in slippage between the cords 30, 32 and the pulleys 36, 38 until the motors are de-energised. Alternatively a limit switch can be provided to de-energise the motors.

20 The modified drive assembly shown in Figure 3 operates in an exactly corresponding manner.

The frictional adhesion between the cords 32, 34 or 72 and the pulleys 36, 38 or 64 can be chosen such that the rear sash 14 can be raised or lowered manually
25 despite the presence of the electric drive arrangements. Alternatively, the adhesion can be such that manual movement of the rear sash 14 without energisation of the drive arrangements is not possible.

If desired, the drive assembly for one of the
30 pulleys of a sash window can be omitted and the sash powered by a single drive assembly.

The rear sash 14 shown in the drawings can be manufactured as a motorised sash or can be motorised by
35 adaptation of an existing sash. In the latter case, the drive assembly 50 replaces the conventional pulley

and its mounting bracket, if necessary after enlargement of the corresponding opening in the frame 10. The same applies to the modified drive assembly.

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CLAIMS

1. A sash window assembly comprising a sash
slidably guided in a frame, the sash being connected to
at least one elongate flexible element which cooperates
5 with a drive means which is operable selectively to
move the flexible element in such a way as to produce
movement of the sash in the frame in respective
opposite directions.

2. A sash window assembly according to claim 1,
10 in which the drive means is located in the frame.

3. A sash window assembly according to claim 2,
in which the drive means is located adjacent a point
where the elongate flexible element passes into the
frame.

4. A sash window assembly according to any
15 preceding claim, in which the drive means includes a
rotatable element which is in contact with the elongate
flexible element and is drivable to rotate by the drive
means in respective opposite directions according to
20 the desired direction of sash movement.

5. A sash window assembly according to claim 4,
in which the elongate flexible element engages the
rotatable element frictionally.

6. A sash window assembly according to claim 5,
25 in which the surface of the rotatable element
contacting the elongate flexible element is roughened
to enhance frictional adhesion therebetween.

7. A sash window assembly according to any of
claims 4 to 6, including a resiliently-biassed means
30 acting on the elongate flexible element to increase
frictional adhesion between the rotatable element and
the elongate flexible element.

8. A sash window assembly according to any
preceding claim, in which the sash is moveable in a
35 vertical direction and has a said elongate flexible

element at each side and a said drive means at at least one side of the sash.

5 9. A sash window assembly according to any preceding claim, having two said drive means driving respective rotatable elements contacting respective first and second elongate flexible elements of the sash, and means for controlling the drive means to operate in unison.

10 10. A sash window assembly according to any preceding claim, in which the or each drive means comprises an electric motor.

15 11. A sash window assembly according to claim 10, including limit switch means operable by the sash to de-energise the motor(s) at one or both limits of the movement of the sash.

20 12. A sash window assembly according to any preceding claim, in which the drive means comprises a worm and worm wheel, the worm wheel being coaxial with the rotational element and the axis of the worm extending perpendicularly to the axis of rotation of the rotational element.

25 13. A sash window assembly according to claim 12, in which the worm is driven by a further worm and worm wheel, the axes of the worms being mutually perpendicular.

30 14. A sash window assembly according to any of claims 1 to 11, in which the drive means comprises a train of meshing pinion gears having their rotational axes parallel to the axis of rotation of the rotational element.

35 15. An assembly for motorising a sash window, the assembly comprising a mounting means for reception in the frame of a sash window, the mounting means including a rotatable element mounted for rotation in the mounting means and positioned for engagement with

an elongate flexible element of a sash window, and a drive means for the rotatable element.

5 16. An assembly according to claim 15, in which the drive means comprises an electric motor mounted on the mounting means.

17. An assembly according to claim 15 to 16, in which rotatable element is a pulley.

10 18. An assembly according to any of claims 15 to 17, sized for reception in the counterweight cavity of a sash window.

15 19. A method of modifying a sash window for motorised operation, the method comprising removing from the frame of the window at least one guide means for an elongate flexible element of the window and replacing the guide means by a motorising assembly according to any of claims 15 to 18.

20 20. A motorising assembly for a sash window, the assembly being substantially as hereinbefore described with reference to Figure 2 or 3 of the drawings.

21. A motorised sash window substantially as hereinbefore described with reference to the drawings.

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Relevant Technical Fields

- (i) UK Cl (Ed.M) E2M (MPPV, MPRVC)
 (ii) Int Cl (Ed.5) E05F (15/08, 15/16)

Search Examiner
 MR S CHURCH

Date of completion of Search
 3 JANUARY 1995

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE: WPI

Documents considered relevant following a search in respect of Claims :-
 1 TO 21

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- A:** Document indicating technological background and/or state of the art. **&:** Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2242225 A (IRELAND) see Figures 5 and 6 and page 4 line 34 to page 5 line 25 in particular	1, 2, 4-8, 8-11, 15, 16, 18 and 19
X	GB 1128392 A (TURNER & BROWN) whole of document	1, 2, 8 and 9
X	GB 1108133 A (ARENS CONTROLS) whole of document	1, 4, 8, 10, 11, 12 and 14
X	GB 1038956 A (HENERY HOPE & SONS) see page 2 lines 72 to 79 in particular	1, 4, 8 and 15

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