

[54] VERTICAL BLIND

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[58] Field of Search 160/166-178

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[57]

ABSTRACT

A window blind comprising a horizontal section carrying and guiding displaceable carriages each of which supports a slat by means of a pivotable hook connected to a vertical pinion arranged to mesh with a horizontal worm screw, wherein each said hook is connected to a circular pivotable member separate from the respective pinion and arranged and adapted to co-operate with the latter by means of cam surfaces disposed in a plane at right angles to the pivot axis, the pinion being urged by a spring towards the position in which it co-operates with and thus drives the said pivotable member, the latter having arrestor stops for co-operating with a stationary radial cog.

5 Claims, 4 Drawing Figures

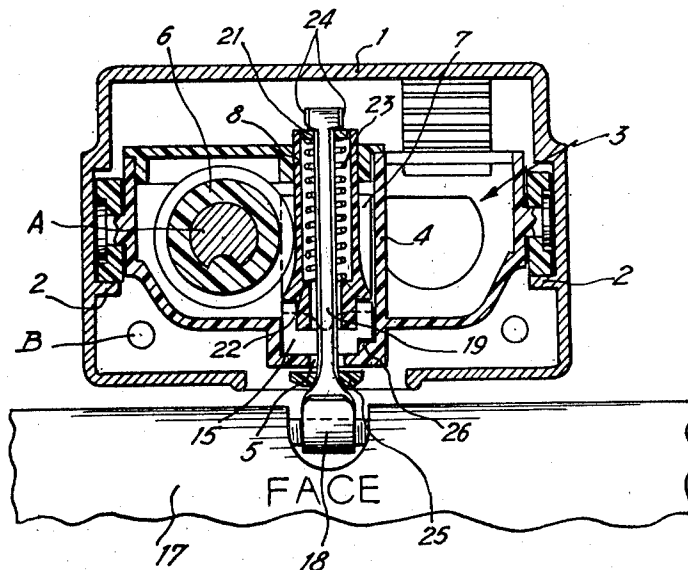


FIG. 1

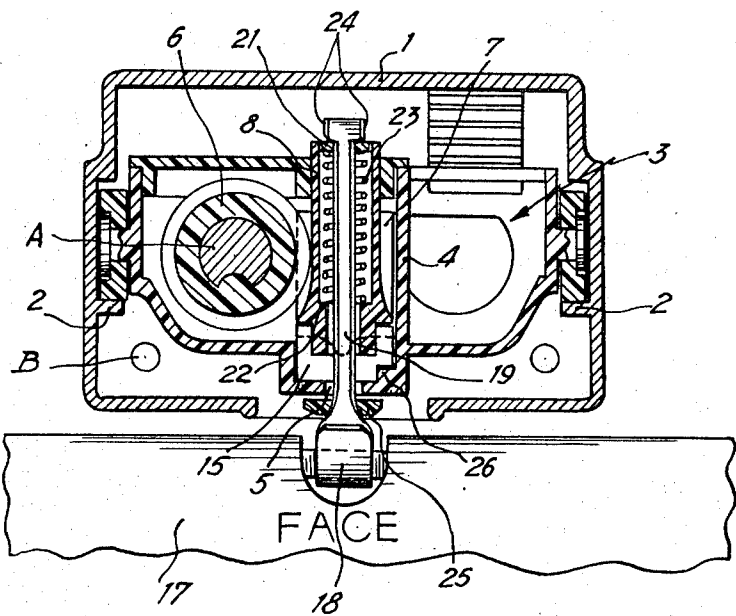


FIG. 2

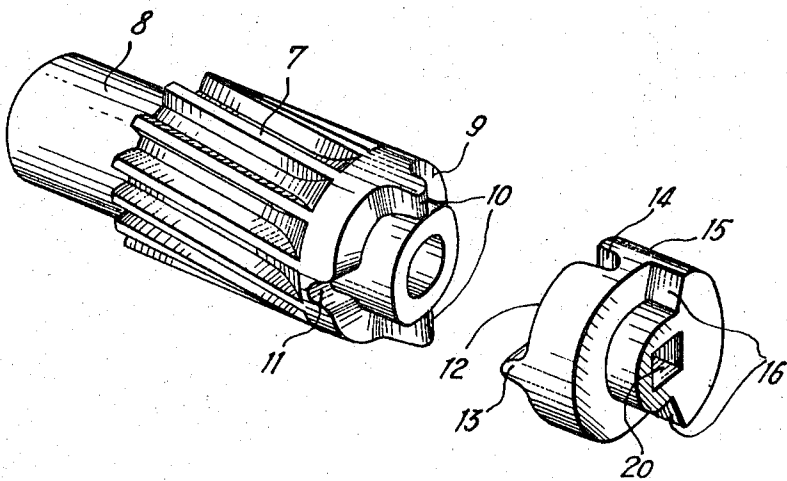


FIG. 3

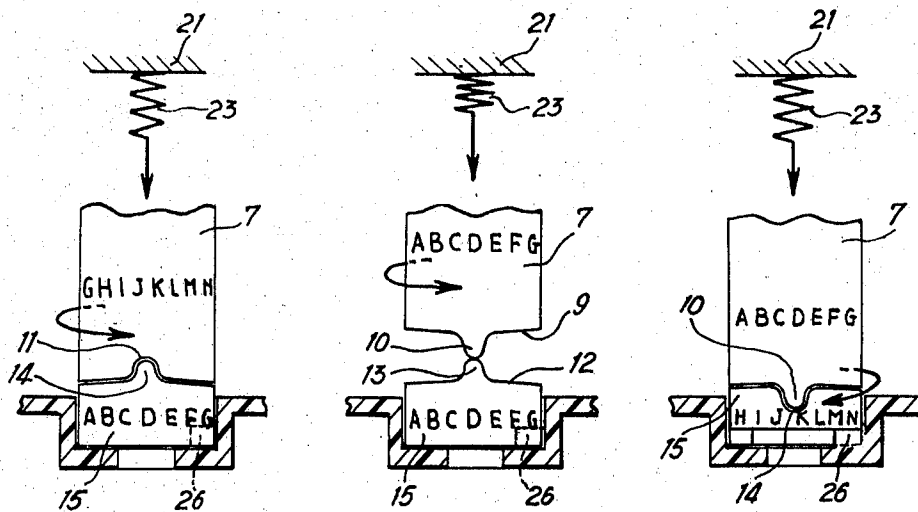
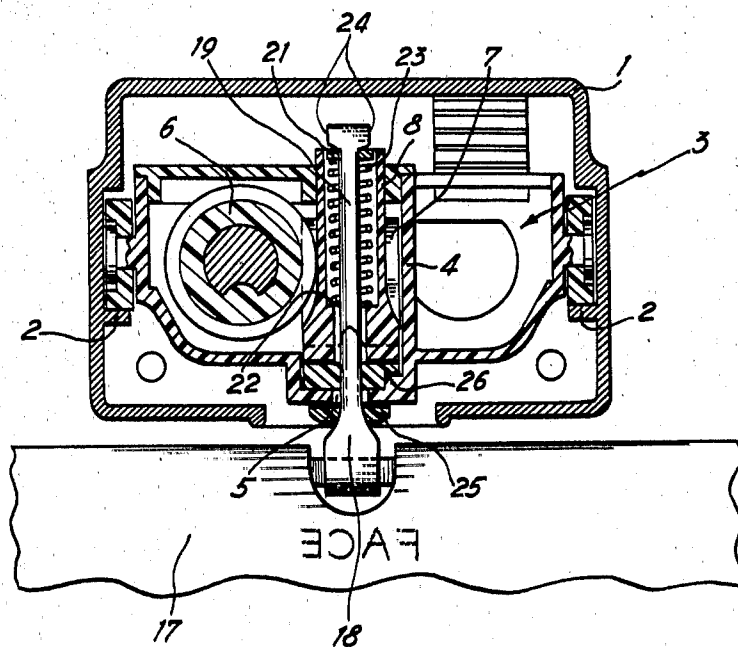


FIG. 4



VERTICAL BLIND

This invention relates to a window blind.

A window or so-called Venetian blind incorporating vertical slats is known which comprises a horizontal section acting as a guide for displaceable carriages each of which has a hook carrying a pivotally mounted slat. This blind may be adjusted by means of a single control element which causes individual pivoting of each slat and also the displacement of the carriages along the horizontal section to open or to close the blind.

When the blind is opened, all the carriages are brought against each other at one side of the section to completely uncover the opening adjacent which the blind is situated, and all the slats should be disposed at right angles to this opening so that they rest against each other whilst occupying the minimum possible space.

When the blind is closed, all the carriages are evenly spaced along the section. In this position it is possible to arrange the direction of the slats differently in order to secure a more or less complete screening of the opening. In the completely closed position, the slats are substantially disposed in a plane parallel to the section and overlap each other to prevent the passage of any light.

It is advantageous to be able to arrange the slats to point in one direction or another depending on whether the sun, for example, shines in one direction or another.

The sole control element automatically causes pivoting of the slats to bring the latter into a position at right angles to the plane of the opening before returning the carriages to their position which corresponds to opening of the blind.

However, if it were necessary to arrange the slats at 180° to the position which is established automatically by the control element, the slats could jam since they would be constrained to pass from a position parallel to the plane of the window opening to a position at right angles to the plane of the opening despite the overlapping of the slats. To prevent this, which would either jam the pivot bearing the hooks or damage the slats themselves, the present invention aims to render it possible to ensure that the slats are automatically returned to the position which allows automatic operation of the single control element.

The invention provides a window blind comprising a horizontal section carrying and guiding displaceable carriages each of which supports a slat by means of a pivotable hook connected to a vertical pinion arranged to mesh with a horizontal worm screw, wherein each said hook is connected to a circular pivotable member separate from the respective pinion and arranged and adapted to co-operate with the latter by means of the cam surfaces disposed in a plane at right angles to the pivot axis, the pivot being urged by a spring towards the position in which it co-operates with and thus drives the said pivotable member, the latter having arrestor stops for cooperating with a stationary radial cog.

Preferably the cam surfaces each comprise a circular shoulder having two diametrically opposite projections and two diametrically opposite seats situated between the projections and offset by 90° with respect to the latter, the projections and seats on each pivotable member being arranged and adapted to engage and the seats

and projections respectively of the cam surface of the respective associated pinion.

The pivotable member conveniently is situated within a well or recess which forms part of the carriage and which acts as its pivoting guide, the cog being situated in the base of the well or recess, which has an axial passage for the hook.

The hook suitably comprises a vertical rod or shank of non-circular cross-section which passes through an axial hole of identical cross-section situated in the pivotable member and a circular axial passage in the pinion.

Preferably the pinion is externally equipped with an external barrel provided with an internal shoulder on which is supported a spring situated around the shank of the hook and compressed axially by a cap retained by means of lugs or the like integral with the upper extremity of the shank of the hook the hollow barrel being situated within a stationary well or recess integral with the carriage.

The invention will be further described by way of example only, with reference to the accompanying drawings, in which:

FIG. 1 is a cross-sectional view of a window blind, wherein the slat is shown in a first position at right angles to the horizontal section of the blind;

FIG. 2 is a perspective view showing the co-operation between the pinion and of the pivotable members of the blind shown in FIG. 1;

FIG. 3 is a schematic view, partly in section, showing the relative displacement between the pinion and the pivotable member; and

FIG. 4 is a cross-sectional view similar to FIG. 1 but showing the slat in a second position at right angles to the section.

The window blind shown in the drawings comprises a hollow horizontal section 1 provided with internal rolling tracks 2 for carriages 3 of any known type. Each carriage 3 has a circular well 4 in which is formed an axial circular hole 5 and provided with a lateral aperture through which a worm screw 6 may co-operate with the teeth of the pinion 7 inserted into the well 4.

The pinion 7 is situated outside a hollow barrel 8 having at its lower portion with a circular shoulder 9 situated in a plane at right angles to the axis of the barrel 8 and the pinion 7. The shoulder 9 forms a cam surface comprising two diametrically opposite projections 10 and two diametrically opposite seats 11 situated between the projections 10 and offset with respect to the latter by an angle of 90°. The shoulder 9 comprising the projections 10 and the seats 11 is adapted to co-operate with a shoulder 12 comprising projections 13 and seats 14 each situated on a pivotable member 15 provided with stops 16 and situated in the bottom of the well 4.

A slat 17 is suspended from a hook 18 carrying a rod or shank 19 of non-circular cross-section which passes into the circular hole 5, into an axial hole 20 of the same cross-section as the shank 19 in the member 15, into the axis of the barrel 8 the bore of which is circular, and finally into the axial hole of a cap 21.

Within the barrel 8 is situated a shoulder 22 on which is supported a compression spring 23 which is held by the cap 21 which is itself axially fixed by lugs 24 formed at the upper portion of the shank 19 which consists of a small plate folded upon itself except at this point. A washer 25 fitted around the shank 19 and it is situated

outside the well 4 to prevent any friction between the hook 18 and the well.

In the bottom of the well 4 is situated a radial arrestor cog 26 which may co-operate with the stops 16 as will be described below.

The window blind described above may be equipped with an electric motor which consecutively and automatically drives a splined rod A on which worm screws 6 are situated and a belt B. When the motor drives the splined rod A the worm screws 6 are rotated to axially pivot the hooks 18 and consequently the slats 17. When the electric motor drives a pulley which in turn drives the belt B, the latter drives the carriages along the section 1.

When the carriages 3 are evenly spaced along the section 1 all the slats 17 are parallel to each other and at right angles to the longitudinal direction of the section 1.

While continuing to operate the motor by means of one control knob, the motor rotates the rod A which drives the worm screws 6 and the pinions 7 to position the slats 17.

By operating another control knob of the motor which causes the motor to rotate in the opposite direction, pivoting of the slats 17 in the opposite direction occurs, and if the motor continues to rotate in this direction, the motor rotates the splined rod A as soon as the slats 17 are positioned in a direction parallel to the section 1.

The starting position shown in FIG. 1 corresponds to the closure of the window blind, that is to the distribution of the carriages 3 along the section 1 but to positioning of the slats at right angles to the section 1. Equally the slats 17 are considered to have been brought to this position in a direction such that if the motor is operated to completely open the window blind then the surface of the slats 17 which is visible in FIG. 1 is that which is opposite to the surface required for the correct opening of the window blind.

Accordingly, it is necessary to cause the slats 17 to automatically pivot through 180°.

In this position, operation of the motor will rotate the splined rod A and consequently pivot the hooks 18 by means of the pinions 7. Under the action of the spring 23, the projections 10 are situated within the seats 14 of the member 15 while the projections 13 of the member 15 are situated within the seats 11 of the barrel 8.

Rotation of the pinion 7 accordingly causes rotation of the barrel 8, with which it is integral, and the co-operation of the projections and seats causes pivoting of the member 15 which drives the hook 18 through its shank 19 since the latter has a non-circular cross-section corresponding to the similar non-circular cross-section of the hole 20.

This rotation of the member 15 is however, prevented by the co-operation of one of the stops 16 with the radial cog 26 so that the rotation of the pinion 7 is possible only due to the resilience of the spring 23 which enables the projection 10 to ride over the cam surface 12 up to the tip of the projection 13, as illustrated in FIG. 3.

As shown by letters of the alphabet as illustrated in FIG. 3, rotation of the pinion 7 occurs in the direction of the arrow while the member 15 is immobilised, so that the pinion 7 has moved against the action of the spring 23 up to the position illustrated in the centre drawing of FIG. 3.

This position is clearly unstable and if the rotation of the pinion 7 continues in the direction of the arrow, the projection 10 will drop along the cam surface 12 and the spring 23 will cause the member 15 to pivot in the opposite direction, as illustrated in the right-hand drawing of FIG. 3.

This reverse rotation of the member 15 is obtained in a sudden manner until the other stop 16 comes into contact with the radial cog 26, which corresponds to another stable position of the member 15. In this new position, the projections and seats again cooperate which allows of the member 15 to be driven by the pinion 7 when this becomes necessary and in the same direction as before.

Rotation through 180° of the member 15 causes rotation of the slat 17 through 180°, as shown in FIG. 4. Complete opening of the window blind is possible in this position, and if the motor continues to operate it no longer drives the splined rod A but rather the pulley which drives the belt B which in turn returns all the carriages 3 to one of the end of the sections 1.

The slats may thus be positioned in one direction or the other without subsequently obstructing the automatic opening of the window blind by the motor, and the direction of rotation of the motor is always the same for opening the window blind and always the same in the opposite direction for closing the window blind.

I claim:

1. A window blind comprising a horizontal section carrying and guiding displaceable carriages each of which supports a slat by means of a pivotable hook connected to a vertical pinion arranged to mesh with a horizontal worm screw, wherein each said hook is connected to a circular pivotable member separate from the respective pinion and adapted to co-operate with the latter by means of cam surfaces disposed in a plane at right angles to the pivot axis, the pinion being urged by a spring towards the position in which it co-operates with and thus drives the said pivotable member, the latter having arrestor stops for co-operating with a stationary radial cog.

2. A window blind as claimed in claim 1, wherein each cam surface comprises a circular shoulder having two diametrically opposite projections and two diametrically opposite seats situated between the said projections and offset by 90° with respect to the latter, the projections and seats on each pivotable member being arranged and adapted to engage the seats and projections respectively of the cam surface of the respective associated pinion.

3. A window blind as claimed in claim 1 wherein the pivotable member is situated within a well which forms part of the carriage and acts as its pivoting guide, the said cog being situated in the bottom of the well, the said bottom of the well having an axial passage for the hook.

4. A window blind as claimed in claim 1 wherein the hook comprises a vertical shank of non-circular cross-section which passes through an axial hole of identical cross-section situated in the said pivotable member and through a circular axial passage in the pinion.

5. A window blind as claimed in claim 1 wherein the pinion is externally equipped with a hollow barrel provided with an internal shoulder on which is supported the said spring arranged around the shank of the hook and compressed axially by a cap retained by means of lugs or the like integral with the upper extremity of the shank of the hook, the hollow barrel being situated within a stationary well integral with the carriage.

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