

[54] **VERTICAL TYPE VENETIAN BLIND**
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 Jan. 17, 1972 Japan..... 47-7169

[52] **U.S. Cl.**..... 160/168, 160/172, 160/176
 [51] **Int. Cl.**..... **E06b 9/30**
 [58] **Field of Search**..... 160/166-178

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[57] **ABSTRACT**

An operating device for a vertical type venetian blind is set forth. A single control means is provided to feed and rotate slats of the blind. By operating the single control means, a travelling gear moves in axial direction, while rotating; and in a part of its axial movement it comes into engagement with a gear for rotating a slat rotating rod and at the ends of said axial movement it comes into means for rotating a slat feeding rod to initiate feeding of the slats.

12 Claims, 25 Drawing Figures

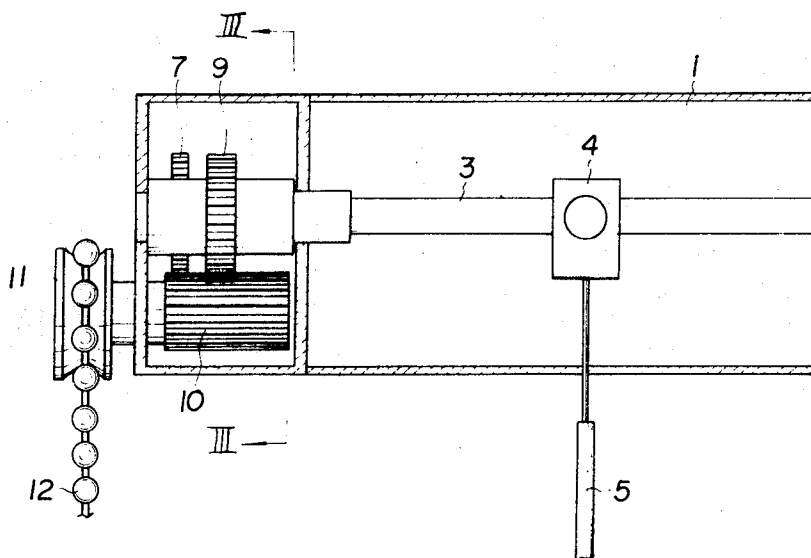


FIG. 1

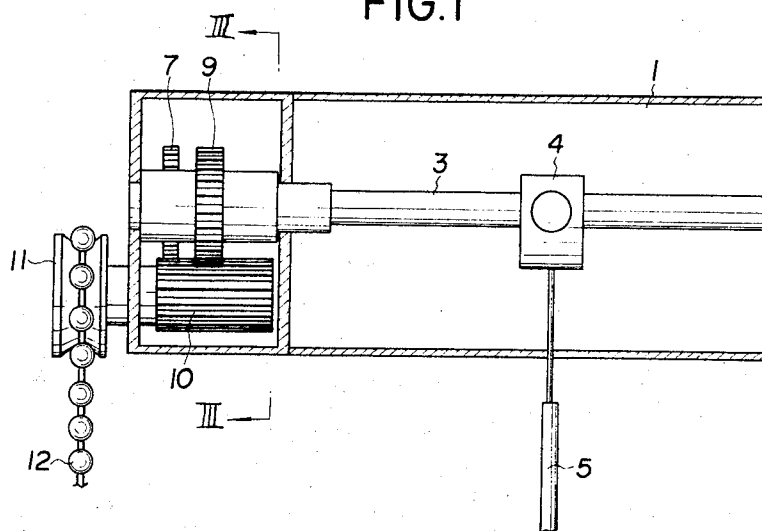


FIG. 2

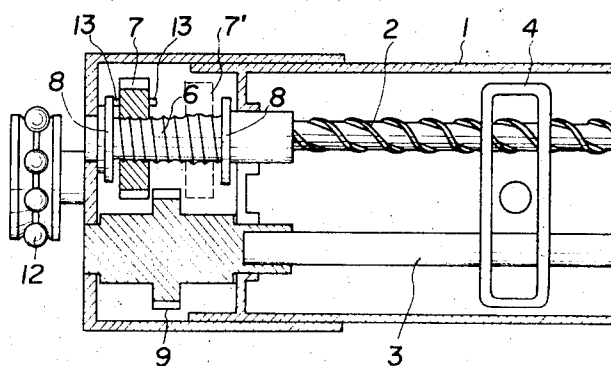
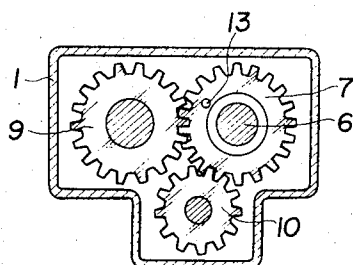


FIG. 3



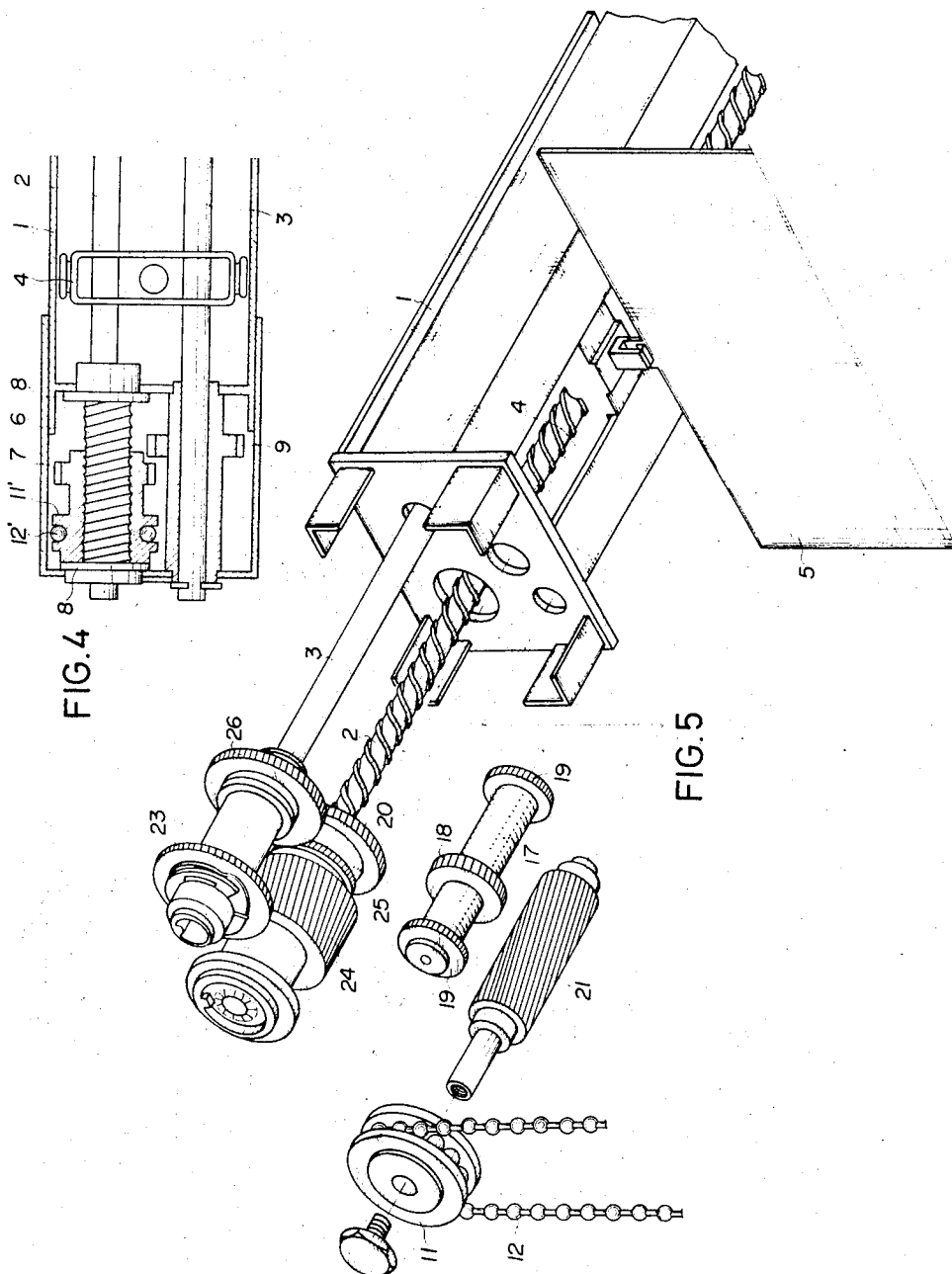


FIG. 6

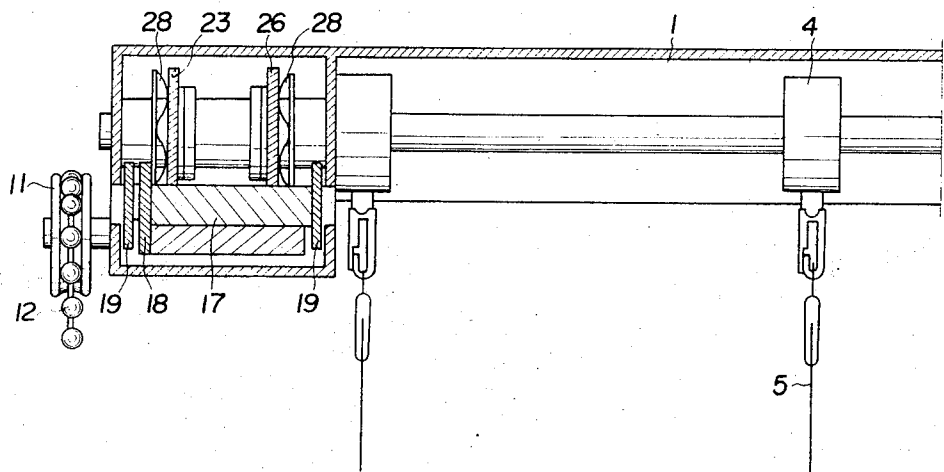


FIG. 7

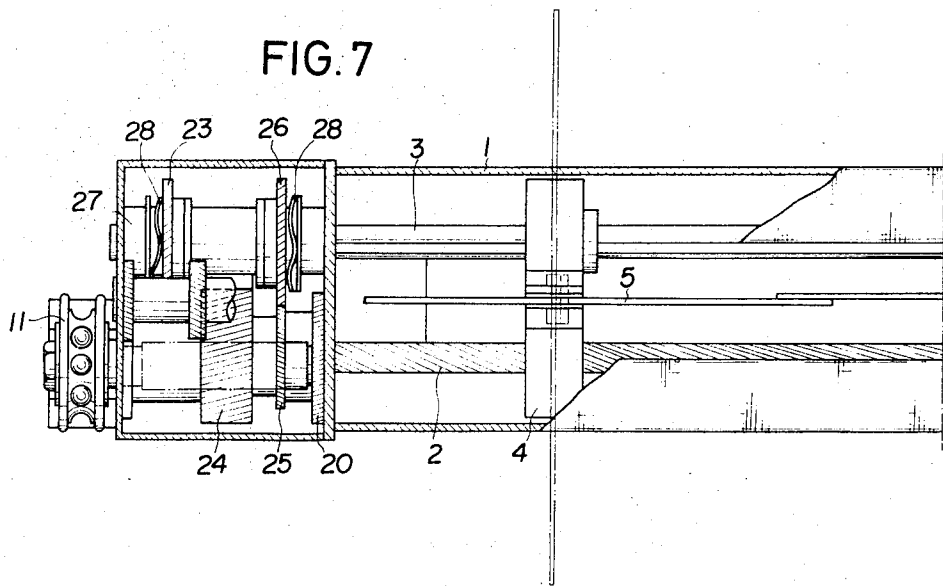


FIG. 8

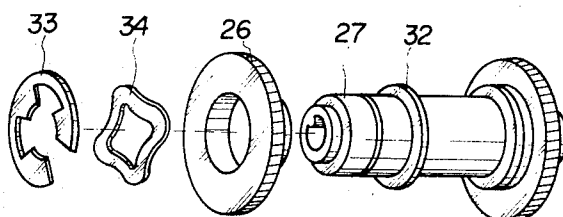


FIG. 9

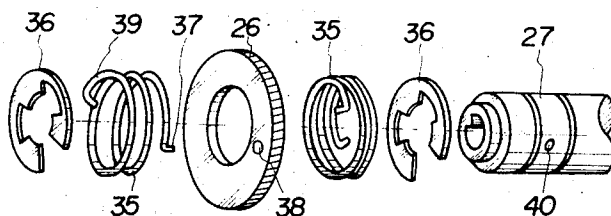


FIG. 10

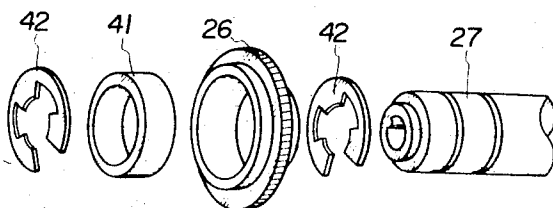


FIG. 11

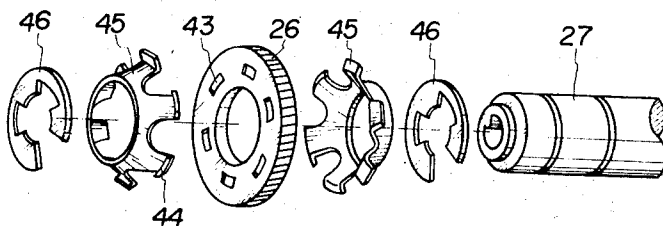


FIG.12

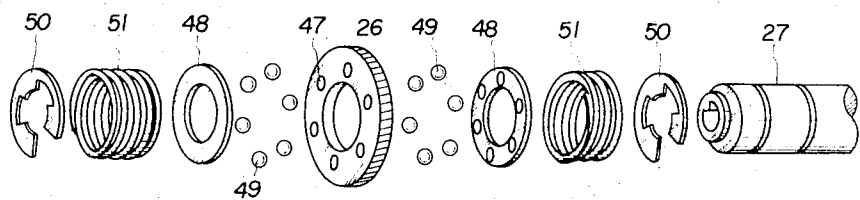


FIG.13

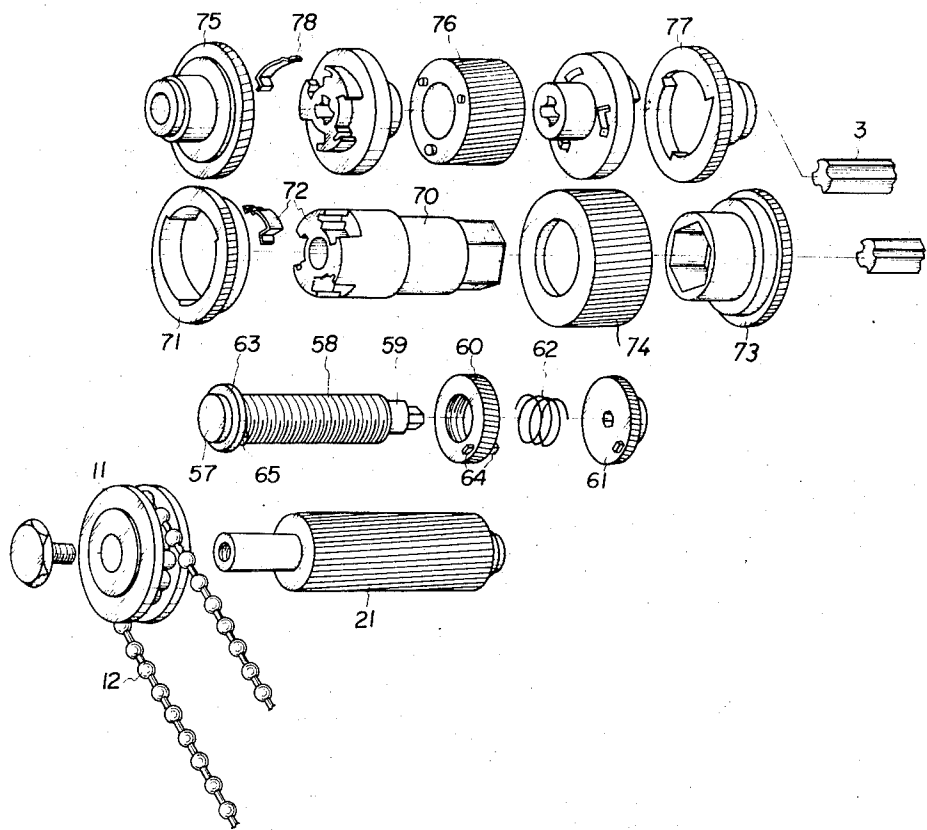
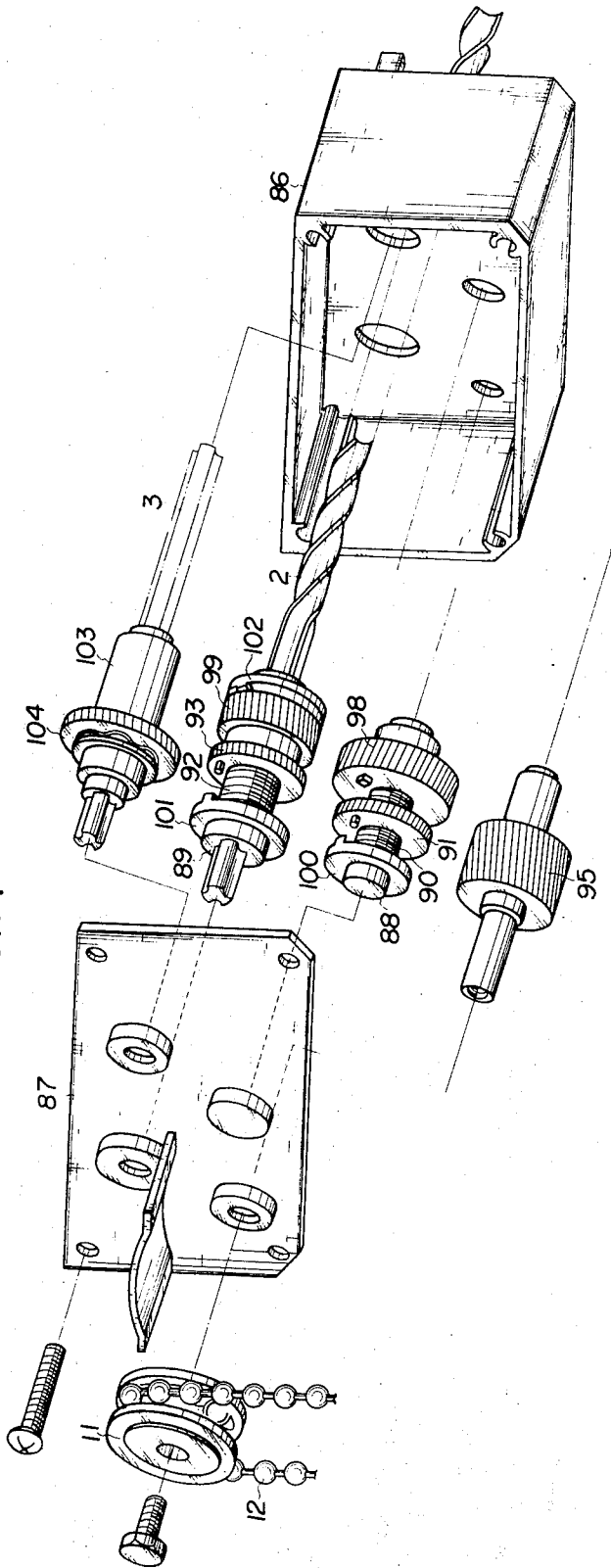
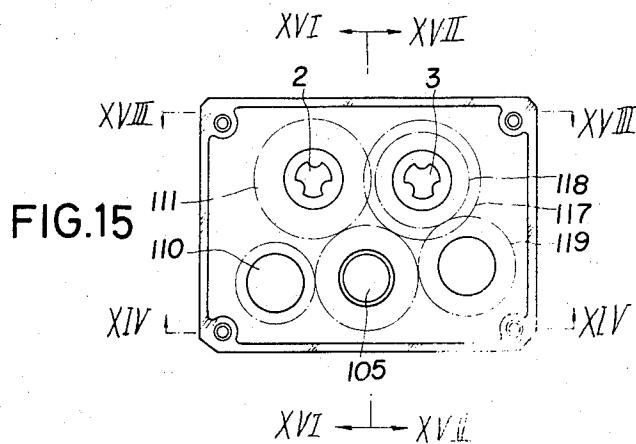
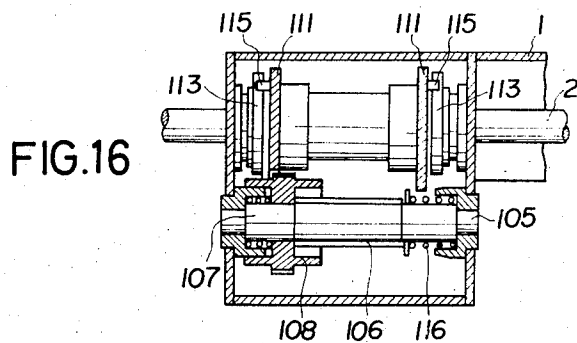
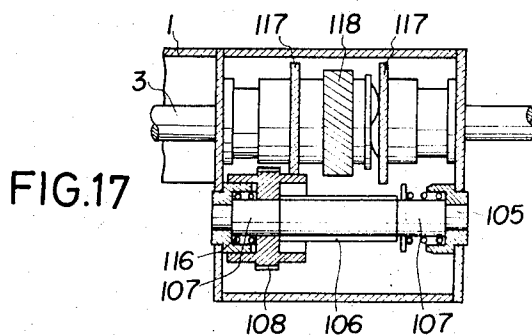


FIG.14





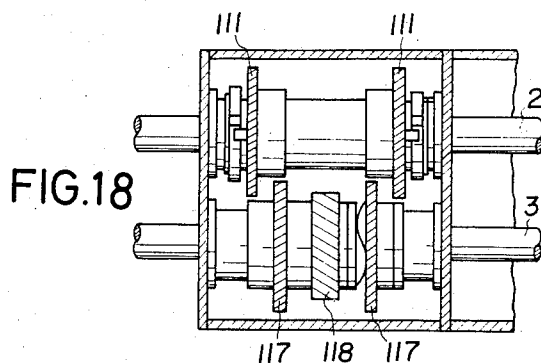
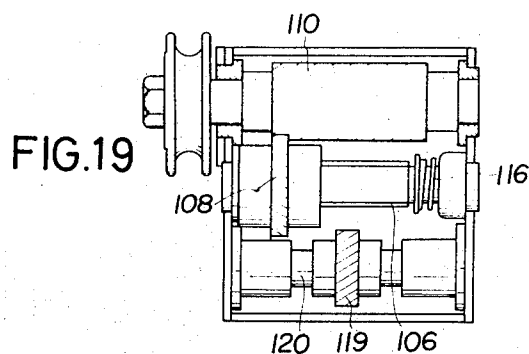
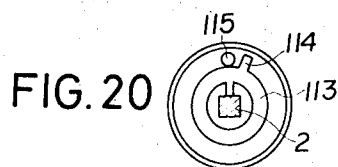
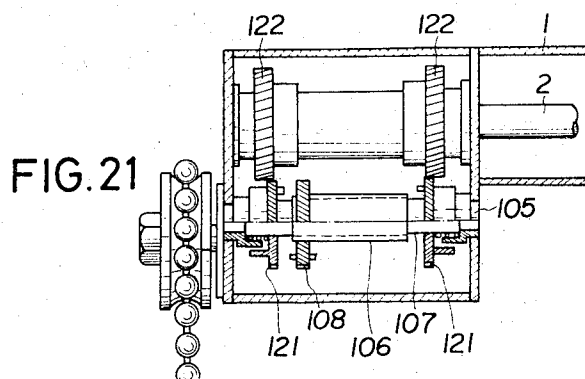


FIG. 22

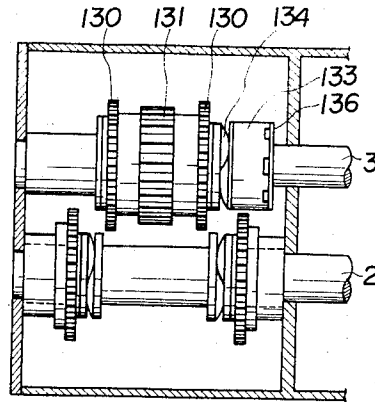


FIG. 23

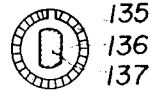


FIG. 24

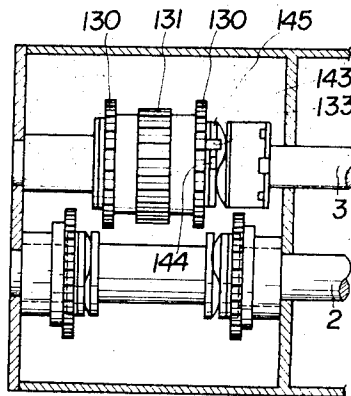
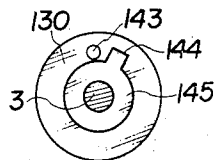


FIG. 25



VERTICAL TYPE VENETIAN BLIND

BACKGROUND OF THE INVENTION

The present invention relates to a vertical type venetian blind including a head rail, carriages movable along said rail, slats each suspended from each of said carriages, a slat feeding rod and a slat rotating rod journaled in said head rail, means for rotating said slat feeding rod to successively feed the carriages along the head rail to open or close the blind and means for rotating said slat rotating rod to rotate these slats about their vertical axes to adjust the shielding effect of the blind.

The vertical blind of this kind usually employs two control means, such as ball chains, one for operating the slat feeding rod and the other for operating the slat rotating rod, and consequently in operating the blind two control means must be selectively operated to open or close the slats and to rotate them. Such an operation is troublesome and may cause erroneous movement of the slats which may result in damages of said slats.

SUMMARY OF THE INVENTION

It is an object of the present invention to eliminate such inconvenience in the heretofore used vertical type blind.

It is a further object of the present invention to provide an operating device for such a vertical type blind in which a single control means is provided to control the slat opening and closing operation and the slat rotating operation.

It is another object of the present invention in which smooth operation of the slats is obtained.

In accordance with the present invention there is provided an operating device for a vertical type blind including a head rail, carriages movable along said head rail, slats each suspended from each of said carriages, a slat feeding rod and a slat rotating rod journaled in said head rail, means for rotating said slat feeding rod to successively feed the carriages along said head rail and means for rotating said slat rotating rod to rotate the slats about their vertical axes, said operating device comprising a travelling gear for axial movement while rotating on an axis in parallel with said slat feeding and rotating shafts, a gear on said slat rotating shaft for meshing with said travelling gear on a part of its axial movement and means on said slat feeding shaft for engaging with said travelling gear at both ends of its axial movement.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings illustrate several embodiments of the present invention, in which:

FIG. 1 is a vertical section of a part of the vertical type venetian blind including the operating device according to an embodiment of the invention;

FIG. 2 is a horizontal section of the device shown in FIG. 1;

FIG. 3 is a cross section taken along line III—III in FIG. 2;

FIG. 4 is a horizontal section showing a modified form;

FIG. 5 is an exploded perspective view showing another embodiment of the invention;

FIG. 6 is a longitudinal section of FIG. 5;

FIG. 7 is a horizontal section;

FIGS. 8-12 illustrate several forms of an overload release clutch;

FIG. 13 is an exploded perspective view showing another embodiment of the invention;

FIG. 14 is an exploded perspective view showing a further embodiment of the invention;

FIG. 15 is a cross section showing another embodiment of the invention;

FIGS. 16-19 are sections taken along lines XVI—XVI, XVII—XVII, XVIII—XVIII and XIX—XIX, respectively;

FIG. 20 shows an annular ring for transmitting rotation of a gear to a slat feeding shaft;

FIG. 21 shows a modified form;

FIGS. 22 and 23 illustrate a form of adjustable connecting means for connecting gears to a slat rotating rod; and

FIGS. 24 and 25 illustrate a modification of the means shown in FIGS. 22 and 23.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1-3 illustrate the device according to the first embodiment of the present invention. Referring to the drawings, the vertical type venetian blind includes a head rail 1, a slat feeding rod 2 and a slat rotating rod 3 both journaled in said head rail, carriages 4 movable along said head rail and a series of slats 5 each suspended from each carriage 4. By rotating the rod 2, the carriages 4 are successively moved thereby along the head rail 1 to open or close the blind, while by rotating the rod 3 the respective slats 5 are rotated about their vertical axes on the respective carriages 4 to adjust the shielding effect.

The operating device in accordance with the embodiment as shown in FIGS. 1-3 for driving the slat feeding and rotating rods 2 and 3 comprises a travelling gear 7 mounted on a shaft 6 which is connected coaxially with one end of the slat feeding rod 2. In the form shown the shaft 6 is a male thread member and the gear 7 threadedly engages over said male thread member, so that the travelling gear 7 is moved in axial direction while it is rotated thereon.

A pair of flanges 8 are formed at both ends of said shaft and adapted to engage with the travelling gear 7 at the ends of its axial movement on said shaft 6.

A gear 9 is fixed on the corresponding end of the slat rotating rod 3. The gear 9 is engageable with the travelling gear 7 on a part of its axial movement, that is, when the travelling gear 7 is moved in axial direction by rotating it on the shaft 6 it comes into meshing relation with the gear 9 on the way of such axial movement to rotate the same.

In order to rotate the gear 7 an operating gear 10 constantly meshing with said gear 7 is disposed and operated by a ball chain 12 engaging over a sprocket wheel 11 fixed on the end of the shaft of said gear 10.

The gear 7 has pins 13 projecting from the opposite side surfaces which are adapted to engage with shoulders formed on the flanges 8 of the shaft 6.

In operation, the operating gear 10 is driven by the ball chain 12 to rotate the travelling gear 7 on the shaft 6 whereby the gear 7 is moved in axial direction, while rotating on the shaft 6, from the position shown in FIG. 2 toward the right. On the way of such axial movement the gear 7 comes into meshing relation with the gear 9

thereby rotating the slat rotating shaft 3, which serves to rotate the slats 5 about their vertical axes.

As the gear 7 is moved in axial direction, it comes out of engagement with the gear 9, which stops its rotation so that the slats are stopped at their rotated position in which the slats are directed in longitudinal direction, that is, the slat feeding direction.

When the travelling gear is moved to the end of its axial movement, shown in broken line 7' in FIG. 2, the pin at the right side of the gear 7 comes into engagement with the shoulder on the corresponding flange 8. Thus the continued rotation of the gear 7 serves to rotate the shaft 6, whereby the slat feeding rod 2 starts to rotate the successively feed the carriages 4 to close the blind.

When it is desired to adjust the rotating angle of the slats, the ball chain 12 is operated in the opposite direction so that the gear 7 is rotated in the reverse direction, whereby the gear 7 is moved from the position shown by the broken line 7' in FIG. 2 toward the left. The gear 7 comes into meshing relation with the gear 9 to rotate the slat rotating rod 3 in the opposite direction. Thus the slats 5 are rotated to the desired angle by the operation of the ball chain.

In order to open the blind, the ball chain 12 is operated in said opposite direction so that the gear 7 comes out of engagement with the gear 9 and then the pin 13 at the left side of the gear 7 engages with the shoulder on the corresponding flange 8 of the shaft 6 to drive the shaft 6 in the opposite direction. By the rotation of the shaft 6 the slat feeding rod is rotated in the opposite direction, thereby successively feeding the carriages 4 in blind opening direction.

It will be understood that the device according to the present invention can perform the blind opening and closing operation and the slat rotating operation by a single control means, such as a ball chain. Thus the rotating angle of the slats can be adjusted as desired by the same control means as used to feed the slats, and its full rotating angle depends on the length of the engagement of the gears 7 and 9 at the time of the axial movement of the gear 7. Accordingly, the full angle of rotation of the slats is determined by the selection of thickness of these gears. In general such angle is selected to 180°.

FIG. 4 illustrates a modified form of the device, which is substantially identical with that shown in FIGS. 1-3 except that the means for rotating the travelling gear 7 consists of a sprocket wheel 11' integrally formed with the gear 7 and a ball chain 12' engaging over the sprocket wheel 11'.

The operation of the form shown in FIG. 4 is substantially same as that of FIGS. 1-3, except that the ball chain 12' is displaced in the axial direction as it is operated to open or close the blind, owing to the sprocket wheel 11' being axially moved with the toothed wheel 7.

In the form of the apparatus as described above, when the blind is opened or closed, the slats are firstly rotated to their fully rotated positions where they lie in substantially parallel with longitudinal direction, that is, the feeding direction, so that they touch with each other at their side edges, and the slats are fed along the head rail in their fully rotated positions. Accordingly some resistance exists against the opening and closing operation of the blind and the slats are liable to be damaged. Such defects can be overcome by the apparatus

which is so arranged that the slats are fed along the head rail in their transverse positions with respect the feeding direction.

FIGS. 5-7 show a form of such device. In these figures the same parts as shown in the preceding figures are designated by the same numerals and the detailed description thereof is omitted.

The form shown in FIGS. 5-7 comprises a travelling gear 18 movable and rotatable on a shaft 17. The shaft 17 is a male thread member and the gear 18 threadedly engages thereon. A pair of gears 19 are fixedly formed at the both ends of the shaft 17 and constantly meshing gears 20 fixed on a slat feeding rod 2. An operating gear 21 is in meshing relation with the travelling gear 18 and is driven by a ball chain 12 engaging over a sprocket wheel 11 fixed to an end of a shaft of said operating gear 21.

A three gear trains are provided to transmit the rotation of the travelling gear 18 to the slat rotating rod 3 as the travelling gear moves in the axial direction on the shaft 17.

The first gear train includes the gear 18 and a gear 23 mounted on the slat rotating rod 3, the second gear train includes the gear 18, an intermediate gear freely rotatable on the rod 2 and including gear portions 24 and 25 and a gear 26 mounted on the slat rotating rod 3 and constantly meshing with said gear portion 25, and the third gear train includes the gear 18 and the gear 26. The first gear train is arranged to rotate the slats in one direction substantially 90°, the second gear train is arranged to rotate the slats in opposite direction substantially 180°, and the third gear train is arranged to rotate the slats in said one direction substantially 90°. Such a design is obtained by proper selection of relative thickness of the gears 23, 24, 26 and the travelling gear 18.

In order that the gears 23 and 26 may be self-adjusted to their proper angular positions on the slat rotating shaft if the slats are stopped at improper angle, these gears are mounted on a boss 27 fixed on the slat rotating rod and fixedly connected to said boss through springs 28, so that the gears may be rotated to proper angular position on the boss when undue force is applied thereto.

The device according to the embodiment shown in FIGS. 5-7 operates in substantially similar manner as that shown in FIGS. 1-3. In this case, however, when the operating gear 21 is rotated by the ball chain 12, the travelling gear 18 moves in axial direction on the shaft 17 and successively comes into meshing relation with the three gear trains to rotate the slat rotating rod 3. Firstly the gear 18 acts through the first gear train 18 and 23 to rotate the slats for 90° in one direction into their longitudinal position, then through the second gear train 18, 24, 25 and 26 to rotate the slats for 180° in opposite direction into their opposite longitudinal position and then through the third gear train 18 and 26 to rotate the slats in said one direction into their transverse position. After the slats are rotated to their transverse position, the travelling gear 18 comes into engagement with the gear 19 to rotate the same therewith. The rotation of the gear 19 is transmitted to the gear 20 to rotate the slat feeding rod 2, thereby feeding the slats along the head rail. Thus the slats are successively fed in their transverse positions to open or close the blind. After the slats are fed to the desired position,

the angle of the slats can be adjusted by operating the ball chain in opposite direction.

It will be understood that in the form as shown in FIGS. 5-7 the slats are fed in their transverse positions with respect to the feeding direction, so that the slats do not contact with each other during their feeding movement and therefore smooth operation can be obtained during opening and closing operation of the blind.

In the form as shown in FIGS. 5-7, if the gears 23, 26 are fixedly mounted on the rod 3, and the travelling gear comes into contact with improper angular position of these gears on the way of its axial movement, the slats may be rotated to improper angle so that rotating force may be applied to the slats after they have rotated into contact with the adjoining slats at their edges, which results in damages of the slats.

In order to prevent such defect, an overload release clutch is provided which connects the travelling gear with the gear train.

FIGS. 8-12 illustrate examples of such clutch. FIG. 8 shows a construction in which the gear 26 is positioned between a flange fixed on the boss 27 and a ring 23 and an annular spring 34 is disposed to resiliently urge the gear against the flange to frictionally fix the gear on the boss. FIG. 9 shows a construction in which coil springs 35 are disposed at the opposite sides of the gear 26 and held by the rings 36. The spring 35 has a hook portion 37 at one end which fits in a hole 38 formed in the side of said gear and a hook portion 39 at the other end which fits in a hole 40 formed in the boss 27. These coil springs permit some free motion of the gear 26. FIG. 10 shows a construction in which a friction ring 41 is disposed between the gear 26 and the boss 27 and held in position by rings 32. FIG. 11 shows a construction in which a pair of rings 45 are disposed at opposite sides of the gear, each ring 45 having radial detents 44 engaging in recesses 43 formed in the surface of the gear 26. FIG. 12 shows a construction in which a pair of rings 48 are arranged at the opposite sides of the gear 26 and a plurality of balls 49 are interposed between the side surface of the gear and the rings 48. The rings 48 are resiliently urged toward the gear by means of springs 51 held by rings 50. The gear has a plurality of recesses 47 to receive said balls.

FIG. 13 illustrates another embodiment which comprises a shaft 57 having a thread portion 58 substantially along the length thereof and a short land portion 59, and a travelling gear 60 threadedly engaging over the head portion 58. Accordingly, upon the rotation of the gear 60, it advances, while rotating, on the thread portion and then, upon reaching the land portion 59 it starts to freely rotate thereon. A gear 61 is fixed at the end of the shaft 57 and a spring 62 is disposed between the gear 61 and the travelling gear to urge the travelling gear 60 toward the thread portion, so that upon the reverse rotation of the gear it comes into engagement with the thread portion 58 to start reverse movement. At the end of the reverse motion, the travelling gear contacts with a flange 63 so that a projection 64 comes to engagement with a projection 15 of the flange 63 to initiate the rotation of the shaft 57. The travelling gear can be operated through an operating gear driven by a ball chain 12, as in the preceding embodiment.

A boss 70 is fixed on one end of the slat feeding rod 2 and bears at its one end an actuating gear 71 which meshes with the operating gear 21. The gear 71 is con-

nected to the boss 70 through a one-way clutch 72 which acts to transmit the rotation of the gear 71 to the boss 70 upon the rotation of the gear 21 to forwardly move the travelling gear but freely rotate the gear 71 upon the opposite rotation of the gear 21.

A gear 73 is fixed to the opposite end of the boss 70 and meshes with the gear 61. An intermediate gear 74 is rotatably fitted around the boss 70 and is adapted to engage the travelling gear on a part of its axial movement.

The slat rotating rod 3 bears gears 75, 76 and 77 which form three gear trains as in the preceding embodiments, but these gear trains freely rotate when the travelling gear 60 moves in the forward direction while they transmit the rotation to the slat rotating shaft 3 through a one-way clutch 78.

Upon rotation of the operating gear 21 in the forwardly direction the slat feeding rod 2 is rotated through the one-way clutch 72 by the gear 21 to feed the carriages successively to close the blind. The travelling gear 60 moves forward along the thread portion 58 so as to drive the gear trains 60-75, 60-74-76 and 60-77, but the rotation of the gear trains is not transmitted to the slat rotating rod. At the end of the forward movement, the travelling gear 60 reaches at the land portion and begins to freely rotate thereon. When the blind is closed to the desired position, the slats can be adjusted by operating the ball chain in the opposite direction whereby the travelling gear 60 is rotated in the opposite direction and reengaged with the thread portion 58, thus starting the reverse movement. During the reverse movement, the actuating gear 71 is rotated in the reverse direction but its rotation is not transmitted to the slat feeding rod by the action of the one-way clutch 72. The travelling gear acts to drive the gear trains to rotate the slats to the desired angle. In order to open the blind, the operating gear 21 is rotated in said reverse direction so that the slats are rotated to the transverse position by the action of the three gear trains and then the travelling gear 60 comes out of engagement with the gear 75 and into engagement with the flange 63 to start the rotation of the shaft 57 which is transmitted to the slat feeding rod to start to open the blind. Thus the slats are held in their transverse position during the opening and closing operation of the blind.

FIG. 14 illustrates an embodiment of the invention in which the operating mechanism is housed in a relatively compact casing formed by a casing body 86 and an end plate 87. The operating device includes a first travelling gear shaft 88 journaled in the casing and a second travelling 89 fixedly connected to a slat feeding rod 2. The shaft 88 has a male thread 90 and a first travelling gear 91 threadedly engages thereon. The shaft 89 has a male thread 92 and a second travelling gear 93 threadedly engages thereon. The travelling gears 91 and 93 are arranged so that they move in an axial direction while rotating on the respective shafts and at the ends of the axial movement they start to rotate the corresponding shafts 88 and 89.

The device includes a first operating gear 95 driven by a sprocket wheel 11 and a ball chain 12 and a second operating gear 98 which constantly engages with a gear 99 which is integrally formed with the second travelling gear 93.

The first shaft 88 has a flange integrally formed at its one end, while the second shaft 89 has flanges 101 and

102 integrally formed at its both ends. A gear 104 driven by the travelling gears 91 and 93 is formed on a boss 103 fixedly mounted on a slat rotating rod 3. The gear 104 is so arranged that it is driven in one direction by the engagement with the first travelling gear 91 to rotate the slats substantially 90° in one direction and is driven in the opposite direction by the engagement with the second gear 93 to rotate the slats substantially 90° in the opposite direction.

The operation of the device as shown in FIG. 14 will be described. At the start of slat closing operation the first travelling gear 91 is located at the left end on the shaft 88 and the second travelling gear 93 is located at the right end on the shaft 89. As the operating gear 95 is operated by the ball chain the first travelling gear moves in axial direction and on the way of its travel it engages and rotates the gear 104 to rotate the slats in one direction substantially 90°. At the end of the travel the gear 91 starts to rotate the shaft 88 and thus the second travelling gear 93 starts its axial movement owing to the engagement of the gears 98 and 99. The gear 93 rotate engages and rotates the gear 104 to rotate the slats in the opposite direction substantially 90°. Thus the slats are held in their transverse position. After the second travelling gear moves to the end of its travel, it starts to rotate the slat feeding rod 3 to close the blind.

In order to rotate the slats to adjust the shielding effect the ball chain is operated in the reverse direction to rotate the gear 95 in the reverse direction. Thus the travelling gear 91 moves to the left and drives the gear 104 on the way of its travel to rotate the slats substantially 90 degrees in one direction and then the travelling gear 93 moves to the right and drives the gear 104 to rotate the slats substantially 90° in the other direction. Then, by reversing the operation of the ball chain the travelling gear 91 is moved in the opposite direction and then the travelling gear 93 is moved in the opposite direction, thus the slats are rotated in said other direction and then in said one direction. Thus, by operating the ball chain to the desired degree the slats can be adjusted to any desired angle.

When it is desired to open the blind, the ball chain is operated in the reverse direction. The slats are rotated to their transverse position and then successively moved to the opposite direction to that of the slat closing operation, in the similar manner as in the slat closing operation.

FIGS. 15-20 show another embodiment of the invention which comprises a travelling gear shaft 105 fixedly mounted at one end of a head rail 1 in parallel with a slat feeding rod 2 and a slat rotating rod 3 and having a screw thread portion 106 and threadless portions 107 at both ends thereof, a travelling gear 108 threadedly engaging on said screw thread portion and an operating gear 110 constantly meshing with said travelling gear and driven by a ball chain or the like operating means. Thus the travelling gear is movable while rotating on substantially entire length of the fixed shaft 105 and freely rotatable on the both ends thereof. Means is provided for transmitting the free rotation of said travelling gear at one end of the shaft to the slat feeding rod only in one rotating direction and means is provided for transmitting the free rotation of the travelling gear at the other end of said shaft to the slat feeding rod only in the other rotating direction.

In the form shown in FIGS. 15-20, each means for transmitting the free rotation of the travelling gear comprises an actuating gear 111 for actuating the rod 2 adapted to be engaged by the travelling gear 108 positioned at one end of the shaft 105 and an annular member 113 having a radial projection 115 arranged to contact with an axial projection 115 on said actuating gear 111. The construction is such that when the travelling gear is moved, while rotating, on the shaft 105 in one direction and then it comes out of engagement with the screw thread portion 106, the travelling gear comes into engagement with one of the driven gears 111 and starts to drive the same, and then the projection 115 of said driven gear engages with the projection 114 of said annular member 113 whereby the slat feeding rod 2 is rotated. When the travelling gear is rotated in the opposite direction it engages with the screw thread portion 106 under the action of a compression spring 116 arranged at each end of the shaft 105 and starts its axial movement and rotation, whereby the annular member 113 is rotated and thus the projection 114 moves away from the projection 115, and before said annular member 113 completes its one revolution the travelling gear 108 comes out of engagement with the driven gear 111, so that the slat rotating rod is not driven when the travelling gear is rotated in said opposite direction.

A pair of driven gears 117 are mounted on the slat rotating rod 3 so that they are engaged by the travelling gear on a part of its axial movement, and a driven gear 118 is mounted on the rod 3 and an intermediate gear 119 engaging said gear 118 is mounted on a shaft 120 so that it is engaged by the travelling gear on a part of its axial movement. These driven gears are so arranged that the travelling gear serves to rotate the slats firstly substantially 90° in one direction, secondly substantially 180° in the opposite direction and thirdly substantially 90° in said one direction.

The operation of the device as shown in FIGS. 15-20 is substantially identical with that of the preceding embodiment.

FIG. 21 shows a modified form of that shown in FIGS. 20-25. In FIG. 21, gears 121 are arranged on the threadless portions 107 of the shaft 105 for free rotation thereon and actuating gears 122 are fixedly mounted on the slat feeding rod 2 and constantly mesh with the gears 121, respectively. The gear 121 is axially movable on the threadless portion 107 and resiliently biased toward the screw thread portion 106 by means of a coil spring. The gears 121 and the travelling gear 108 have projections 124 and 125, respectively, which are arranged to come into contact with each other when the travelling gear onto either of the threadless portions 107. The construction as shown in FIG. 21 operates in substantially similar manner as in FIGS. 15-20, and when the travelling gear 108 moves onto the threadless portion 107, the free rotation of the travelling gear is transmitted through the gear 121 and the actuating gear 122 to the slat feeding rod 2.

FIGS. 22 and 23 illustrate a further modified form in which a set of gears 130 and 131 for driving the slat rotating rod 3, which are similar to the gears 117 and 118 in FIG. 17, is freely mounted on the rod 3 and kept thereon by means of an adjusting nut 133 threadedly engaged on said rod and a spring 134 interposed between said set of gears and the nut 133. The adjusting nut 133 has a plurality of recesses 135 on its surface

and a lock plate 36 having a projection for engaging in one of said recesses is fitted on a non-circular portion 137 of the slat rotating rod. Thus the adjusting nut can be rotated on the rod to adjust the load of the spring 134 to the desired degree and locked in position by means of said lock plate 136.

In the form as shown in FIGS. 22 and 23, if the travelling gear comes into engagement with the set of the gears 130 and 131 at improper angular position thereof so that undue force is applied to the slats after they have been rotated to the positions where the slats contact with each other at their edges, the gear freely rotates on the slat rotating shaft to prevent the slats from rotating beyond such positions to cause damages of the slats.

FIGS. 24 and 25 illustrate a modification of the form as shown in FIGS. 22 and 23, in which a disc 145 is arranged between a spring similar to the spring 134 in FIGS. 22 and 23 and a set of gears 130 and 131 for rotating the slat rotating rod 3. The gear set and the disc 145 have cooperating projections 143 and 144, respectively. In operation of this form, if the travelling gear comes to the position for engagement with the gear set in improper angular position so that it cannot mesh with the gear set, the gear set freely rotates on the rod 3 until it meshes with the travelling gear, and after the travelling gear and the gear set mesh with each other to some extent the projection 143 comes into contact with the projection 144 to initiate to transmit the driving force from the travelling gear to the slat rotating rod. Accordingly, the travelling gear can mesh with the gear for rotating the slat rotating rod in smooth manner.

I claim:

1. In a vertical type venetian blind, including a head rail, carriages movable along said head rail, a series of slats each suspended from each of the carriages, a slat feeding rod and a slat rotating rod journaled in said head rail, means for rotating the slat feeding rod to successively feed the carriages to open and close the blind and means for rotating the slat rotating rod to rotate the slats about their vertical axes to adjust shielding effect, an operating device comprising a travelling gear for axial movement while rotating on an axis in parallel with the slat feeding and rotating rods, a gear on said slat rotating rod for meshing with said travelling gear on a part of its axial movement and means on said slat feeding rod for engaging with said travelling gear at the end of its axial movement to rotate said rod by the travelling gear.

2. A device according to claim 1, in which a male thread member is connected to an end of the slat feeding rod and the travelling gear threadedly engages thereon.

3. A device according to claim 2, including an operating gear constantly meshing with the travelling gear

and adapted to be driven by a manual control means.

4. A device according to claim 2, including a wheel integrally formed on the travelling gear and adapted to be driven by a manual control means.

5. A device according to claim 1, three gear trains are arranged to transmit the rotation of the travelling gear to the slat rotating rod, one for rotating the slats substantially 90° in one direction, one for rotating the slats substantially 180° in opposite direction and one for rotating the slats substantially 90° in said one direction.

6. A device according to claim 1, in which an overload release clutch is disposed to transmit the rotation of the travelling gear to the slat rotating rod.

7. A device according to claim 1, in which the travelling gear is threadedly engaged on a male thread member which is rotatable with said travelling gear at the end of its axial movement.

8. A device according to claim 5, including a rotatable shaft for mounting the travelling gear which is movable while rotating on substantially entire length of said shaft and freely rotatable at one end thereof, a one-way clutch interposed between said shaft and a slat feeding rod, and a one-way clutch interposed between the gear trains and the slat rotating rod.

9. A device according to claim 1, including a first shaft mounting a first travelling gear, and a second shaft mounting a second travelling gear, said first travelling gear and said second travelling gear successively moving in opposite axial directions to successively driving the gear on said slat rotating rod to opposite directions on a part of their axial movements.

10. A device according to claim 5, including a fixed shaft mounting a travelling gear which is movable while rotating on substantially entire length of said fixed shaft and freely rotatable at the both ends thereof, means for transmitting free rotation of said travelling gear at one end of the shaft to the slat feeding rod only in one rotating direction and means for transmitting free rotation of said travelling gear at the other end of said shaft to the slat feeding rod only in the other rotating direction.

11. A device according to claim 5, in which a set of gears for driving the slat rotating rod is freely mounted on said rod and kept thereon by means of an adjusting nut adjustably fixed on said rod and a spring means interposed between the nut and the set of the gears.

12. A device according to claim 11, further including a freely rotatable disc interposed between the spring means and the set of gears for driving the slat rotating rod, said gear set and disc having cooperatable projections for transmitting the rotation of the travelling gear to the slat rotating rod.

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