

March 28, 1939.

W. WADE ET AL

2,152,116

VENETIAN BLIND

Filed Jan. 28, 1937

2 Sheets-Sheet 1

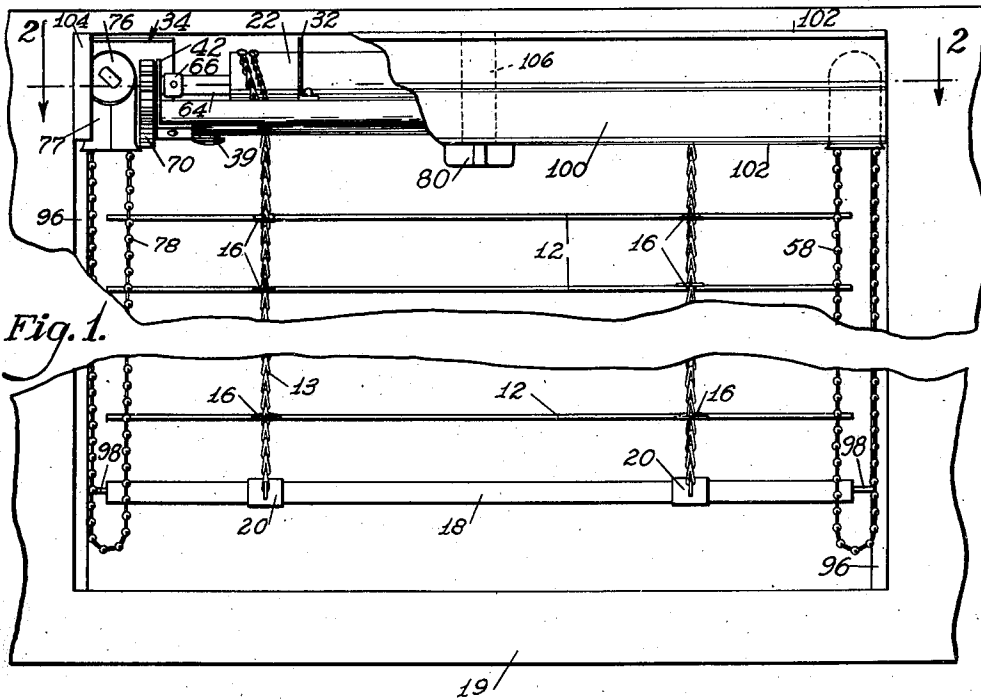


Fig. 1.

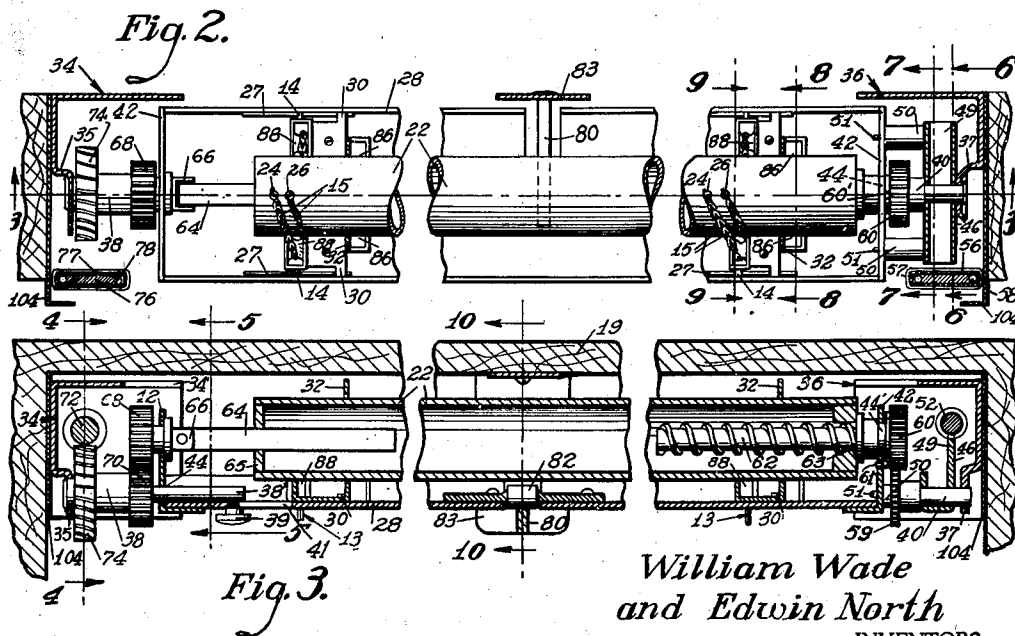


Fig. 2.

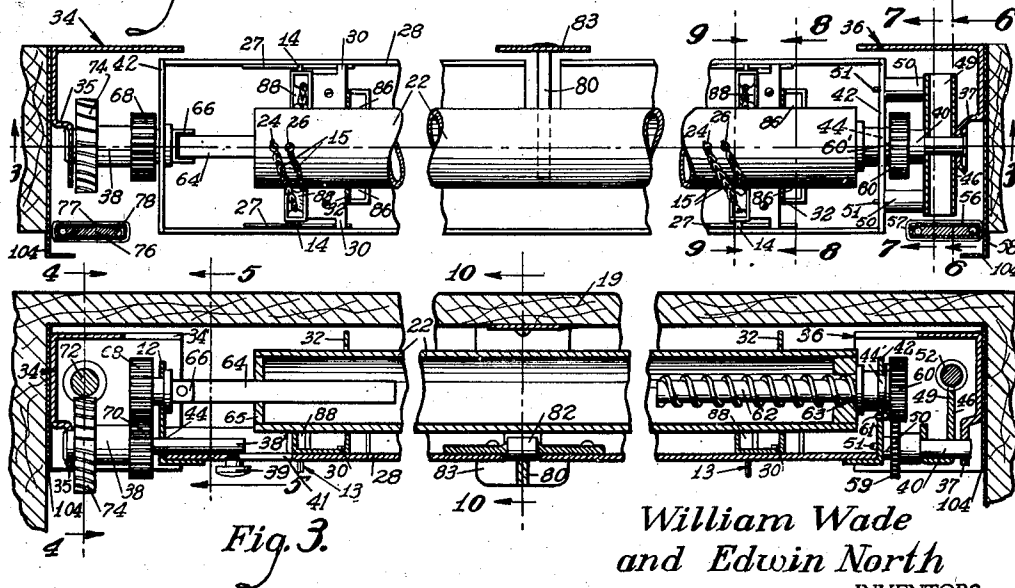


Fig. 3.

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2 Sheets-Sheet 2

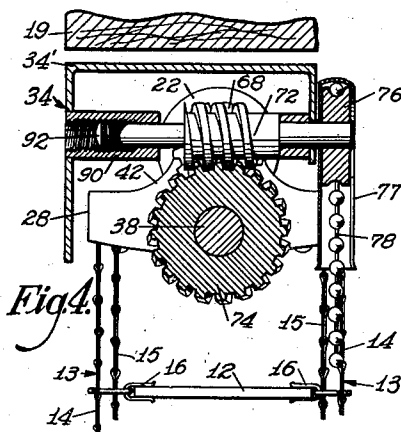


Fig. 4.

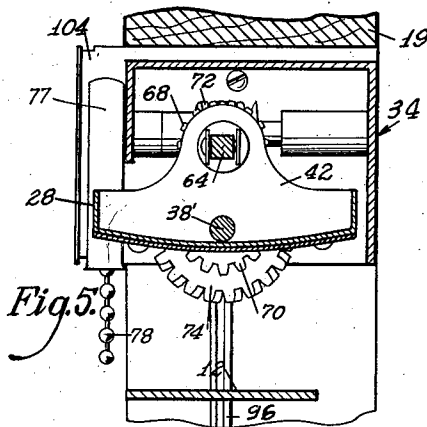


Fig. 5.

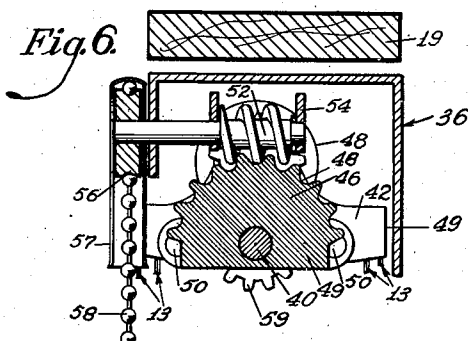


Fig. 6.

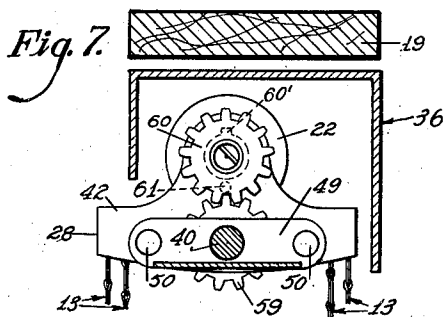


Fig. 7.

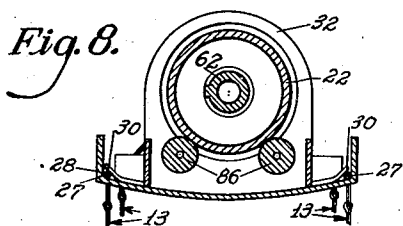


Fig. 8.

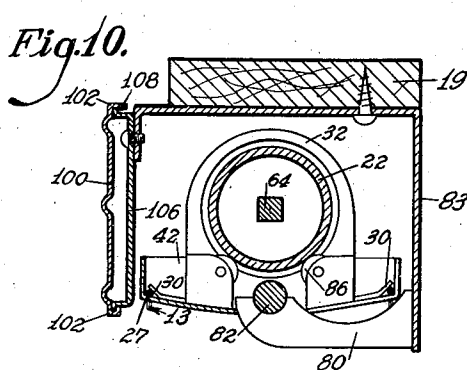


Fig. 10.

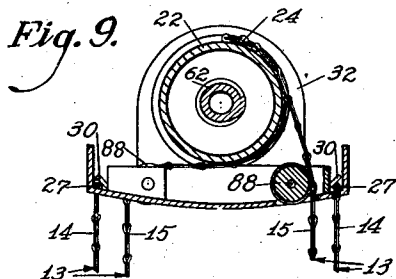


Fig. 9.

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UNITED STATES PATENT OFFICE

2,152,116

VENETIAN BLIND

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Application January 28, 1937; Serial No. 122,792

12 Claims. (Cl. 156—17)

This invention relates to Venetian blinds, and particularly to a blind of the so-called chain tape type, and has among its important objects the provision of a novel operating mechanism by which both the vertical or folding movement as well as the tilting movement of the blind may be effected conveniently and with a positive and smooth action.

More particularly stated, an important object of the invention is the provision of an operating mechanism including a top rail or carriage having a rotatable drum or roller on which the chain tape is wound, together with mechanism for simultaneously rotating the drum and sliding it longitudinally along its axis of rotation, whereby twin sets of supporting chains or tapes may be uniformly wound onto the drum to effect the raising and lowering of the slats.

An additional and important object is the provision with the mechanism just above described of mechanical means cooperating with the drum and top rail to oscillate the entire top rail and drum structure about a horizontal axis to effect the tilting of the slats independently of the raising and lowering operation and mechanism.

Still another and specific object of the invention is the provision of a blind operating mechanism having a principal top rail supported for oscillation about a horizontal axis and having depending therefrom twin pairs of slat supporting chains effective to tilt the slats when the top rail is pivoted about its horizontal axis, together with a gear mechanism operable by an endless chain and pulley device to oscillate the rail, the blind operating mechanism further including a drum rotatable about the axis of oscillation of the top rail and simultaneously slidable along said axis and adapted by such movement to wind-on portions of supporting chains to effect a collapsing or folding together of the slats, the operating mechanism further including a gear device operable by an endless chain and pulley means for effecting the simultaneous rotative and sliding action of the drum independently of the gear mechanism for oscillating the top rail or carriage.

Other novel objects of construction and operation will appear as the following detailed description develops, in view of the annexed drawings, in which:

Fig. 1 is a front elevation of the novel blind structure;

Fig. 2 is a horizontal section of the blind operating mechanism and taken along lines 2—2 of Fig. 1;

Fig. 3 is a vertical section of the operating mechanism taken along lines 3—3 of Fig. 2;

Fig. 4 is an enlarged vertical section of the elevating means or mechanism for driving the chain drum and taken along lines 4—4 of Fig. 3;

Fig. 5 is a vertical section taken along lines 5—5 of Fig. 3 and showing particularly the keyed or square rotating shaft for the drum;

Fig. 6 is a vertical section taken along lines 6—6 of Fig. 2 and showing particularly the driving mechanism for oscillating the carriage;

Fig. 7 is a vertical section along lines 7—7 of Fig. 2 and shows the trunnion bracket oscillated by the mechanism of Fig. 6;

Fig. 8 is a vertical section through the roller and carriage taken along lines 8—8 of Fig. 2 and shows particularly the idling bracket and rollers partially supporting the main drum or roller;

Fig. 9 is another vertical section taken along lines 9—9 of Fig. 2 and shows another feature of the idling bracket which provides an idling roller for the chains; while

Fig. 10 is a vertical section through the center of the blind operating mechanism taken along lines 10—10 of Fig. 3 and showing the central supporting bracket.

The embodiment of the invention shown for purposes of illustration discloses in Fig. 1 a plurality of horizontally extended slats 12 secured in normally spaced relation between twin sets of chains 13 by means of clips 16 of the type set forth and particularly described in the co-pending application of William Wade, Serial No. 7,528, filed February 21, 1935, Patent No. 2,103,394, Dec. 28, 1937, and which provide a simple pivotal connection between the edge of the slat and an adjoining link of one of the chains of the pair, the other chain of the pair being freely movable through the connecting link between the clip 16 and the first mentioned chain except in the case of the bottommost slat to which both chains are attached, it being understood, however, that any suitable means for pivotally attaching the chain to the edge of the slat may be utilized in place of the novel clip means referred to.

Each pair of supporting chains 13 includes a front chain which may also be designated by the character 14 and a rear chain 15, as seen for example in Fig. 9, and the lower extremities of each of these chains are pivotally attached to the edge portion of the bottom slat 18 by means of suitable attaching clips 20, it being observed that the lower slat is preferably heavier than

the remaining slats so as to assure a ready downward movement of the slat assembly when the blind is lowered.

The upper extremities of each of the inner chains 15 are each attached to the main roller or drum 22 along a longitudinal peripheral element thereof at points spaced suitably in a longitudinal direction, as shown for example at 24 and 26 in Fig. 2, the purpose of this particular manner of attaching the chains being to effect a proper winding of the chain onto the drum as the latter is rotated and simultaneously moved along its axis of rotation by the means and in the manner hereinafter to be described in detail.

The upper extremities of each of the outer chains 14 of each pair pass through the top rail or carriage 28 and are secured thereto by means of an elongated pin 27 having a central depending loop which engages the end link of each chain and which extends in a longitudinal direction on the inner side of the carriage and which is secured against removal by means of an ear 30 pressed thereagainst and extending from the adjacent idling brackets 32 (Figs. 2 and 9).

The blind structure is adapted to be attached to the usual window frame 19 by means of end brackets 34 and 36, each having upset side portions such as the top portion 34' shown in Fig. 4 adapted to fit flush against the corner portions of the window casing, as shown for example in Fig. 3. The vertical wall portions 34 and 36 of each of these supporting brackets have an inwardly offset portion 35 and 37 in which the trunnions 38 and 40 for the main carriage are seated.

The main carriage 28 comprises a generally elongated trough-like plate or member having at each of its extremities an upstanding bracket 42, one of which is provided with an aperture 44' which embraces the worm stud 62, and the other of which at the opposite extremity of the carriage has an aperture 44 which embraces the trunnion stud 38'.

The trunnion 38 includes a main gear sleeve or bore portion into which is axially slidable an adjustable stud portion 38' having a laterally extending set screw 39 which passes through an elongated slot 41 in the bottom portion of the carriage plate. By loosening the set screw 39, the stud portion 38' of the trunnion 38 may be moved into or out of the sleeve portion thereof, as seen in Fig. 3, so as to permit the removal of the entire carriage unit where desired.

The opposite trunnion comprises a stud portion 40 which terminates in a yoke-shaped rocking arm 49 best seen in Figs. 2 and 6 and 7 in combination. This arm includes a laterally extending wall portion 46 having an arcuate edge in which are cut a plurality of gear teeth 48 and having a forward laterally extending upset portion from which extend a pair of axially extending studs 50 having reduced end portions 51 extended through the laterally extending end brackets 42 of the main carriage. Thus the carriage 28 may be oscillated about its long axis on the slidable stud 38' and the yoke trunnion 40, as seen in Figs. 2 and 3.

In order to effect a rocking or oscillating movement of the carriage 28, the right hand mounting bracket 36 is provided with a worm gear 52 supported or journaled in a pair of upset ears 54 (Fig. 6) in such position that the worm meshes with the geared edge portion 48 of the lateral yoke extension 46. The shaft of the worm 52 terminates in a pulley having a fluted pulley track

56 which is adapted to receive an endless chain 58 (Figs. 1 and 2), and also provided with a pulley sleeve 57 identical with the pulley sleeve 77 shown in Fig. 1 and which is adapted to prevent the chain from slipping off the pulley and to assure positive and smooth movement of the chain. By movement of the chain 58 in either direction, the worm 52 may be rotated and by its engagement with the geared edge portion 48 of the yoke on trunnion 40 the top rail or carriage 28 may be rocked about its horizontal axis. This rocking movement will effect a tilting of the individual slats of the blind since, as previously pointed out, one extremity of each chain of each pair of chains is secured to the carriage and to the supporting clips 16, and as the carriage rocks, one such chain moves in a descending direction while the corresponding chain on the opposite side of the slats moves in an ascending direction, and since the connection of each of the clips to these particular chains is pivotal, the rising movement of the chains on one side of the slats and the descending movement of the chains on the other sides thereof will tilt the several slats in either a clockwise or anti-clockwise direction about their individual axes from a substantial vertical position to a substantially horizontal position, representing respectively the completely closed and completely open condition of the blind.

As will be observed in Figs. 2, 3 and 7, the trunnion 40 is provided with a fixed gear 59 which in turn meshes with a riding gear 60 on the outwardly extending portion of a worm spindle 62 which is rotatable in an apertured portion of the right-hand end plate or bracket 44' of the top rail or carriage. The trunnion 40 is immovably secured to the offset portion 37 of the bracket 36 and likewise the fixed gear 59 is immovable on the trunnion 40. Thus when the worm 52 is rotated by the chain as aforesaid, and when the carriage is tilted as a result thereof, the riding gear 60 will simply idle around the periphery of the fixed gear 59 as the entire carriage moves about its longitudinal pivotal axis which corresponds to the axis of the trunnions 40 and 38', and in this action the worm turns slightly.

The drum 22 is hollow, and as seen in Fig. 3 the worm shaft 62 extends within the drum an appreciable distance, the end wall of the drum having a tooth 63 engageable with the worm threading such that if the drum be rotated, the worm shaft 62 will tend to remain stationary as a result of the stationary disposition of the fixed gear 59, and as a result the tendency of the drum is to move axially toward the left simultaneously with its rotating movement.

For this purpose a square shaft 64 has been provided at the other or left hand extremity of the drum 22 and extends from within the drum through a square opening in the corresponding axial end wall 65 for a pivoted connection with the yoke 66 on the extremity of a stud supporting a driving gear 68 which is journaled in the end bracket 44 of the main carriage. The driving gear 68 in turn is meshed with a gear 70 on the trunnion stud 38.

In order to transmit rotating movement to the drum 22, a second worm 72 is rotatably supported in the left-hand mounting bracket 34 and drives a large gear 74 rotatable with the trunnion 38. The worm 72 terminates at its outward extremity in a pulley 76 provided with a pulley sleeve 77 similar to the pulley structure 57 on the opposite or right-hand side of the carriage, as seen in Figs. 2 and 3.

The drum 22 may be rotated by pulling on the chain 78 which rides in the fluted pulley track of the pulley 76 and thus rotates the worm 72 and consequently the large gear 74, the driving gear 70, the driven gear 68, and the square or keyed drum shaft 64. Simultaneously with this movement the tooth portion 63 on the right-hand axial end wall of the drum will ride in the worm threading of the worm stud 62 and cause the drum to shift along its axis toward the left, the gear 60 on the worm stud remaining stationary.

The carriage 28 is supported intermediately of its axial extremities by means of a central arm 80, best seen in Fig. 10, and which has a recessed end portion in which is seated a circular bearing portion 82 of a bracket 83.

The drum 22 is additionally supported intermediate its extremities by a pair of spaced idling brackets 32 (Figs. 1, 8 to 10) in the form of substantially circular metallic plates with a large central opening through which the drum extends, and having lower portions folded back upon itself and rotatably supporting a pair of oppositely disposed idling rollers 86 each engageable with the periphery of the drum 22 and affording a support which assures the smooth rotation of the drum while at the same time permitting slidable axial movement of the same.

The brackets 32 are also provided at their lower extremities with a lateral extension on a side thereof opposite to the rollers 86 through which are extended mounting screws attaching the brackets in an upright position to the inner floor of the carriage 28. This lateral extension is also provided with a portion bent back upon itself and rotatably seating a pair of oppositely disposed idling pulleys 88 over which the inner chains 15 pass in their winding movement onto the drum 22, it being noted as in Fig. 9 that one of the chains 15 passes over its pulley 88 beneath the drum 22 and around the same for attachment thereto at the point 26 in such manner that during the rotative movement of the drum both chains 15 will be wound thereon in the same advancing or receding direction.

The foregoing particular disposition and attachment of the inner chains 15 to the drum 22 is of importance in conjunction with the simultaneous axial and rotative movement of the drum under urging of the driving worm 72 corresponding to the shutter raising mechanism seen at the left of Figs. 1 and 2 for example.

It will be observed that the right-hand end of the carriage, as seen in Fig. 3, has an axially directed stud 61 which is engageable with a stud 60' (see also Fig. 7) formed on one axial face of gear 60. This provision prevents the carriage being rotated more than one complete revolution and is important in that it not only provides means for keeping the worm in properly adjusted position after assembly, but also prevents the roller being screwed in so tightly as to jam it.

As the drum rotates, both of the chains 15 wind onto the same and creep toward the right as the drum slides axially toward the left, the chains being wrapped onto the drum in a uniform side by side relation as the rotation progresses. During this movement it is well to observe that the outer chains 14 of each set 13 having their respective extremities anchored to the lower slat and to the carriage, and each being attached or linked with the clips 16 supporting the individual slats, necessarily fold up as the slats are raised into folded condition by manipulation of the chain 78. The end brackets 34 and

36 having been secured in the upper corner portions of the window casing 18, the operating mechanism may readily be removed for any purpose by loosening the set screw 38 (Fig. 3) and sliding the trunnion stud 38' inwardly of the carriage to disengage it from the sleeve portion of the trunnion 38, whereupon the carriage may be slid off of the pins 51 on the yoke arms 50 at the right-hand extremity of the structure.

The driving worm 72 is seated at its extremity opposite the pulley 76 in a threaded sleeve 90 having a plug 92 threadably movable therein against the axial end of the worm shaft so that the play in this shaft may be taken up as desired.

To assure the uniform motion of the shutter assembly both in a vertical direction and in a direction about the respective axes of the slats, tracks or channel strips 96 (Fig. 1) are attached to the vertical sides of the window casing, and the lowermost slat 18 has a pair of endwise and axially extending pins 98 receivable in the channel parts of the strips 96. The lower and heavier slat 18 pivots about the pins 98 and also rises and falls in a uniform linear direction with these pins sliding in the channel strips.

When the mechanism is in position on a window casing, it may be desirable to shield the operating mechanism from view, and for this purpose we have provided a shield plate or valance 100 having edgewise lip or channel formations 102 along its longitudinal edge portions and receivable on end brackets 104 and a middle bracket 106 having divergent offset edge portions 108 likewise receivable in the lip or channel portions of the cover plate, the formation of the channel portions 102 and the offset end portions 108 of the middle bracket being dimensioned so that the cover plate may be snapped into place to effectively shield the mechanism from view.

It is to be understood that the foregoing particular description of the invention is in no way intended to limit the disclosure to the precise details recited, and it is our intention to avail ourselves of all the modifications, variations and adaptations of the novel mechanism set forth and as provided in the annexed claims.

Having thus described our invention, what we claim as new and desire to protect by Letters Patent is:

1. In a blind of the type having a plurality of spaced slats and flexible members cooperating with said slats to raise and lower the same and also to pivot the said slats about their respective axes, operating mechanism comprising supporting means, a carriage member supported by said supporting means for movement about a horizontal axis and having flexible slat engaging elements connected thereto and operable to tilt said slats when said carriage is rotated about the said horizontal axis, an elongated winding member supported on said carriage member and being rotatable about, and slidable along, a horizontal axis substantially parallel with that of said carriage, said winding member having flexible elements attached thereto and to one of said slats such that a simultaneous rotative and sliding movement of said winding member will effect a winding thereon of the said flexible element attached thereto to effect a raising and lowering of said slats, said mechanism further including manually operable means for rotating said carriage, manually operable means for rotating said winding member independently of said carriage, and means operable when said winding member is

rotated to slide the same along its axis of rotation.

2. In a Venetian blind, bracket means attachable to opposite sides of a window casing, a top rail pivotally supported between said bracket means for movement about a horizontal axis, means operable to oscillate said top rail about said axis, flexible means attached to said rail and to the slats of said blind whereby the oscillation of said top rail will effect a tilting of said slats about their respective axes, a drum rotatably supported by said top rail between said bracket means and slidable along its axis of rotation, means including a slide shaft supportably engaging said drum at one end thereof on said top rail and including driving means operable to rotate said drum, means including a threaded shaft axially aligned with said drum and engageable with a member thereon to provide a mounting for the drum at its opposite end to effect sliding movement thereof when the drum is rotated, and flexible means connecting said drum and said slats whereby the latter may be moved in a vertical direction by the rotation of said drum.

3. Operating mechanism for a Venetian blind including a pair of bracket members constructed for attachment to opposite sides of a window casing, a top rail having pivotal support between said brackets, a plurality of blind slats connected in normally spaced relation by flexible elements attached to said top rail, gear driven trunnion means on one of said brackets supportably engaging an end of said top rail and operable to pivot the latter in opposite directions to tilt said slats, means mounted on said top rail for raising and lowering the slats and including a drum mounted on the top rail for both rotative and axially sliding movement by means of a slide shaft member rotatably mounted on said top rail at one end of said drum and slidably engaged by the drum and also keyed with the latter to rotate the same when the slide shaft is rotated, driven gear means on the corresponding and remaining bracket member and having driving engagement with said slide shaft, the opposite end of said drum being rotatably supported on a worm shaft rotatably mounted on the top rail and provided with gear means engageable with a stationary gear member mounted on pivot means cooperable with said trunnion whereby said worm shaft is held stationary when said slide shaft is rotated, the gear means on said worm shaft idling around said stationary gear means when the top rail is tilted.

4. In a Venetian blind structure of the type including a plurality of slats suspended from a top rail mounted between bracket members for rocking movement, slat control mechanism including a drum mounted on said top rail for both rotative and axially sliding movement and having connection by means of flexible elements with the lowermost one of said slats whereby all of the latter may be raised and lowered by turning said drum, means for pivotally mounting said top rail between said bracket means and including a driven gear mounted on one of said brackets, manually operable driving gear means for said driven gear, pin means extending from one end of said top rail axially into said driven gear, a slide shaft pivotally mounted at said one end of the top rail and extending axially into an end of said drum to provide a sliding shaft support for the latter, gear means on said slide shaft and having driving engagement with said driven gear, the

other said bracket means being provided with a gear-driven trunnion supportably engaging the opposite end of said top rail and pivotable about a fixed shaft attached to said bracket means, and a worm shaft extending axially into the corresponding end of said drum and pivotally mounted at the corresponding end of said top rail and provided with gear means engaged with a stationary gear on said fixed shaft whereby said worm shaft is held against rotation when said drum is rotated responsive to rotation of said slide shaft, said gear means on the worm shaft riding on said fixed gear means on the fixed shaft when the top rail is tilted.

5. In a traverse roller mechanism for a Venetian blind, a top rail and bracket means for pivotally mounting the same at its ends in a window or like structure, the pivotal mounting at one end including a driven trunnion pivotable in opposite directions to tilt said top rail, a stationary toothed element supported coaxially with said trunnion, a drum pivotally mounted on said top rail by a shaft member having axially sliding engagement at one end thereof and pivotally supported on the top rail, driven gear means for rotating said shaft and drum, the latter having support at the opposite axial end on a threaded member extending threadably therein and pivotally supported on said top rail, said threaded member having a toothed element engaged with said stationary toothed element and effective to prevent rotation of said threaded element when the drum is turned regardless of the tilted position of the top rail.

6. In a traverse roller mechanism for a Venetian blind, a carriage rail, spaced mounting brackets pivotally supporting said rail at its ends and adapted for attachment to a window structure, a traverse roller having slidable engagement with a first main shaft means at one axial end of the roller, said first shaft means being pivotally supported by means on said carriage rail and also being engaged with said roller to rotate with the latter, a driving gear having an axial bore and mounted on said bracket means at one end of the carriage rail, pin means mounted for movement on said carriage rail into and out of said axial bore for pivotal support of the rail at that end, a second main shaft member threadably engaging and supporting the opposite end of said roller and pivotally supported by means on said carriage rail, the mounting bracket at the corresponding end of the carriage rail having a pivot shaft, a trunnion pivotally mounted on said pivot shaft, driven gear means on said last-mentioned bracket for pivoting said trunnion, a fixed gear element on said pivot shaft and engaged with a gear element on said second main shaft for rotation of the latter when said carriage rail is tilted as aforesaid.

7. In a traverse roller mechanism for Venetian blinds, a rocking top rail and means for rocking the same, a traverse roller mounted on said rail, coaxing driving and driven gear means at one end of said roller for rotating the latter and coaxing worm, idling, and fixed gear means at the opposite end of the roller for effecting axial movement of the roller when the same is rotated.

3. A traverse roller mechanism for use with Venetian blinds and comprising a rocking head rail, a traverse roller, a slide shaft mounting one end of said roller on said rail and arranged for rotation to rotate the roller and permit axial displacement thereof, a screw shaft drivingly engaged with the opposite end of the roller and pro

viding axial support for said end of the roller on the rail, coacting driving and driven gear means for rotating said slide shaft, an idling gear on said screw shaft, and a fixed gear element immovable relative to both the roller and head rail and engaged by said idling gear to restrain the screw shaft against rotation when said roller is rotated.

9. Operating mechanism for a Venetian blind of the type including a plurality of spaced blind slats and flexible supporting and control members therefor, said mechanism comprising supporting bracket means attachable to a window casing, a carriage pivotally supported by said bracket means for movement about a horizontal axis, manually operable gear mechanism for moving said carriage about said axis, a winding drum supported on said carriage, said drum being simultaneously rotatable and slidable relative to its axis of rotation, manually operable gear mechanism for rotating said drum, and means cooperable with said last mentioned gear mechanism for effecting a sliding movement of said drum when the same is rotated, whereby the said flexible elements may be wound onto the drum to effect a raising and lowering of said slats, and said carriage may be rotated about a horizontal axis as aforesaid to effect a tilting of said slats.

10. In a Venetian blind, traverse roller mechanism comprising a head rail pivoted on opposite ends for tilting motion, a traverse roller mounted on said head rail at one end by means of a keyed shaft arranged for rotation with said roller and also permitting axially sliding movement of said roller, the remaining end of said roller being supported by a worm shaft having driving engagement with the roller and arranged to effect axially sliding movement of said roller when the same is turned by said keyed shaft, means for rotating said keyed shaft, means held in a stationary position relative to said head rail and arranged to movably engage said worm shaft so as to hold the latter against movement when said roller is turned, said last-mentioned means, together with

said means for rotating the keyed shaft being arranged and constructed to permit relative rocking movement of the roller respective thereto when said head rail is tilted in opposite directions.

11. In a head rail structure for a Venetian blind, a head rail and means mounting the same for rocking movement in a window casement or the like, means for rocking said head rail, a traverse roller arranged on said head rail for both axially sliding and rotative movement, means for actuating said traverse roller, said roller being supported at its opposite ends for rotative movement on the head rail, and means providing additional rotative support for the roller between its ends, said means including a relatively rigid member substantially encircling the roller and attached to said head rail in the region between the ends of the roller, said rigid member having roller elements mounted thereon in circumferentially spaced relation relative to the traverse roller and arranged to supportably engage peripheral portions of the traverse roller for the purpose set forth.

12. In a tilting head rail structure for Venetian blinds, a head rail having blind operating mechanism mounted thereon and further having support at one end on means engaged with the head rail by movement of the latter in the direction of its long axis, a driving gear arranged at the opposite end of the head rail for cooperation with said blind operating mechanism, said driving gear having an axial bore and said head rail being demountably supported at the corresponding end by means of an axially sliding pin thereon engaged in said bore of the driving gear in such manner that by withdrawing said pin from the bore the head rail may be withdrawn from the supporting means at the remaining end thereof by axial movement of the rail for the purpose of dismounting the latter.

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