June 10, 1952 J. C. BENNETT 2,599,884

VENETIAN BLIND TILTING MECHANISM

Filed Aug. 21, 1950 2 SHEETS—SHEET 1

Fig. 1.

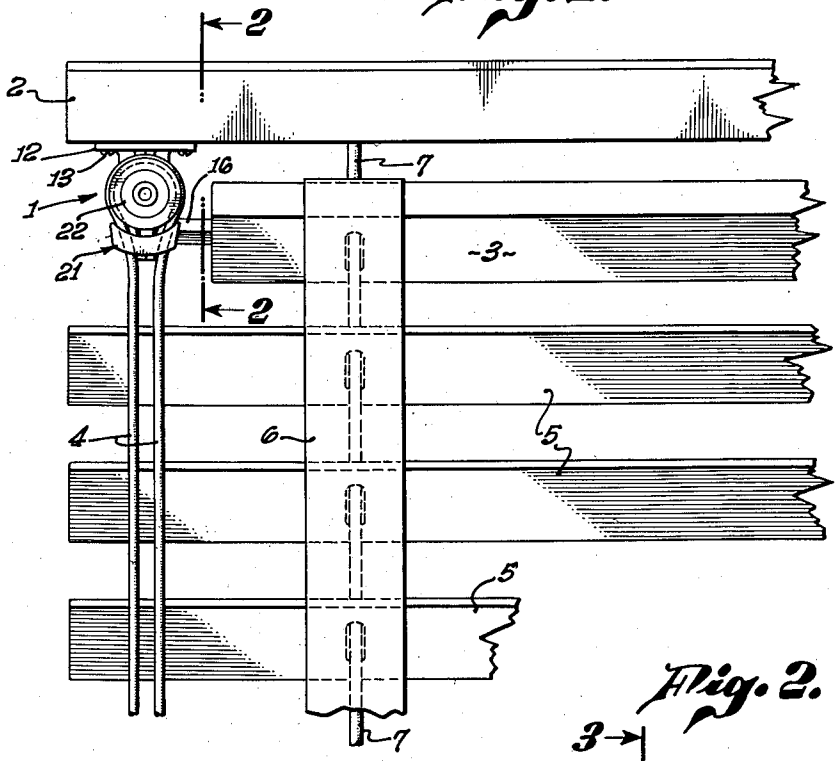


Fig. 2.

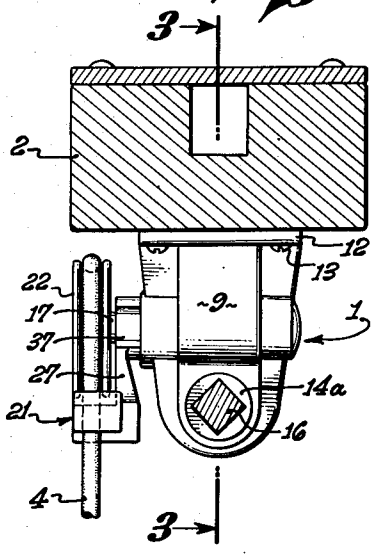
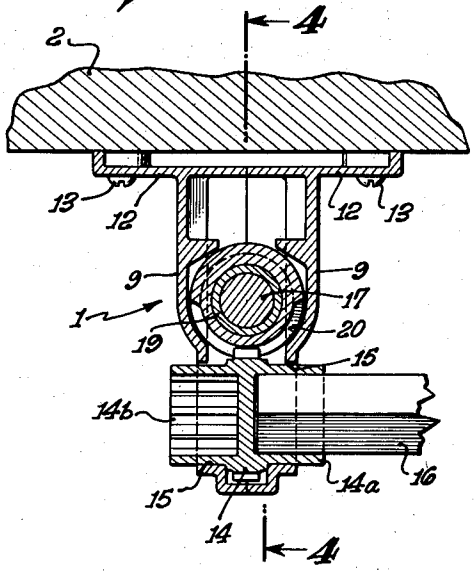


Fig. 3.



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Fig. 4.

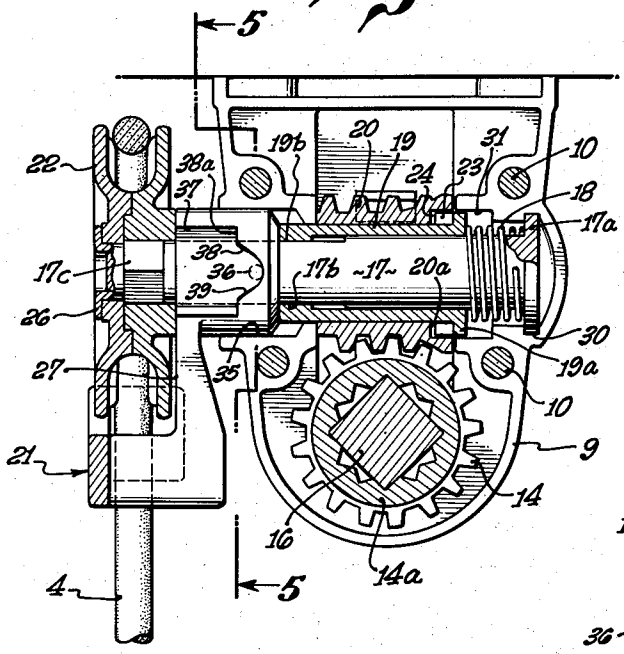


Fig. 5.

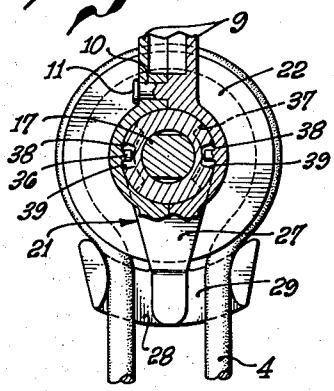


Fig. 7.

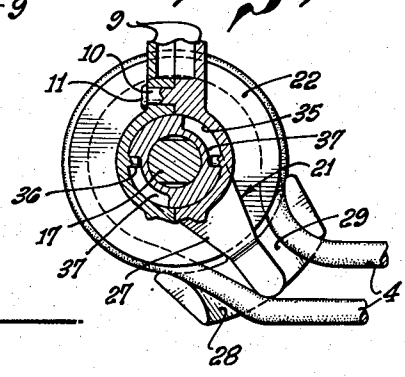


Fig. 6.

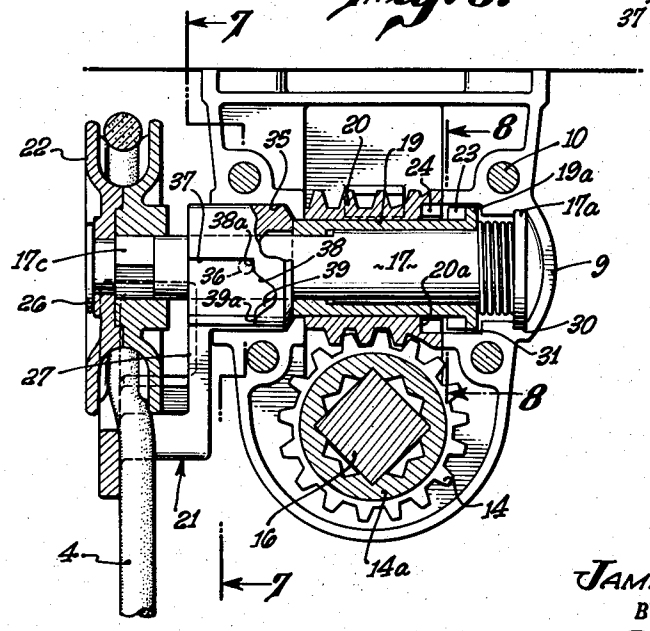
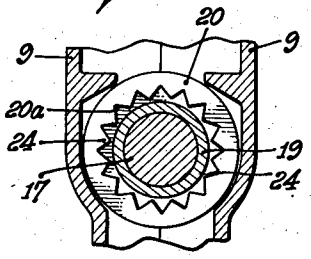


Fig. 8.



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VENETIAN BLIND TILTING MECHANISM

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10 Claims. (Cl. 160—176)

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This invention relates to mechanisms for tilting the slats of Venetian blinds responsive to downward pulling of lengths of a tilt cord suspended from a pulley forming a part of such a mechanism, and wherein the cord is frictionally contacted with the pulley and in time will slip so that the depending lengths become objectionably unequal and make it difficult to adjust the slats as desired.

It is known that tilting mechanisms have been used wherein a clutch means operable responsive to a definite manipulation of the cord other than required for tilting the slats, makes it possible to adjust the cord without tilting the slats.

In my pending application, Serial No. 6830, filed February 7, 1948, now U. S. Patent 2,559,928 of July 10, 1951, there is shown a tilting mechanism wherein a clutch means responds to an arcuate swinging movement of the tilt cord in either direction in a plane substantially parallel to the blind so that the depending lengths of the cord may be equalized without tilting the blind.

It is an object of this invention to provide an improved tilting mechanism of this character.

It is another object of this invention to provide a Venetian blind tilting mechanism which constitutes an improvement in this art in respect of simplicity of construction, convenience of assembly, low cost of production, and reliability of operation.

It is another object of this invention to provide Venetian blind tilting mechanism in which operating elements thereof are constructed and arranged to facilitate an easy preassembly thereof as a complete workable unit, thereafter readily applicable as such in one operation in assembling the device, thereby making it unnecessary to separately install the elements within the housing therefor in the operation of forming the device.

It is another object of this invention to provide in a tilting device such as described a unit construction of the operating elements thereof which embodies two units, one being a tilting means for effecting a drive connection with the tilt rail of the Venetian blind; and the other unit being pre-assembled and comprising a combined clutch means and operating means for the tilting means, subject to convenient placement and removal in the operation of assembling and disassembling the device, thereby making it unnecessary to individually place and assemble the several elements of the device, reducing the number of assembly operations heretofore carried

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out, and assuring a more reliable performance of the device.

It is a further object of this invention to provide in a device of the character described a new and advantageous arrangement of the spring usually employed in connection with clutch means for such devices, which arrangement makes it unnecessary to treat or form the ends of the spring in a separate pre-assembly operation, to prevent such ends from frictionally contacting or biting against the housing of the device or other parts thereof and thus interfering with proper operation of the mechanism; also prevents the spring from interfering with the proper operation of the device and does away with the necessity of individually assembling the operating elements in the housing against the action of the spring means which as heretofore practiced in this art is a difficult operation.

This invention possesses many other advantages and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there is shown one form in the drawings accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

Figure 1 is a front elevational view of tilting mechanism embodying the present invention as applied to a Venetian blind, only part of which latter is shown;

Figure 2 is an enlarged vertical sectional view taken on line 2—2 of Figure 1;

Figure 3 is a sectional view taken on line 3—3 of Figure 2;

Figure 4 is an enlarged sectional view taken on line 4—4 of Figure 3, showing the mechanism in position for tilting the blind;

Figure 5 is a sectional view taken on line 5—5 of Figure 4;

Figure 6 is a sectional view corresponding to Figure 4, showing the mechanism in position for adjusting the tilt cord without tilting the blind;

Figure 7 is a sectional view taken on line 7—7 of Figure 6; and

Figure 8 is a sectional view taken on line 8—8 of Figure 6.

As shown in Figure 1, a tilting mechanism 1 embodying the present invention is mounted on a header member 2 so as to support one end of

the tilt rail 3 of a Venetian blind. The other end of the tilt rail is supported in the usual manner by a means not shown, and which forms no part of the present invention.

A tilt cord 4 provides for operation of the tilting mechanism to tilt rail 3 and turn in unison, the slats 5 supported from the tilt rail by means of the usual latter tapes 6. The means for lifting and lowering the blind is omitted in Figure 1, as this means forms no part of the present invention, there being shown, however, one of the lift cords 7, which is associated with the header member 2, tilt rail 3, and slats 5, in the manner well known in this art.

The tilting mechanism 1 includes a pair of mating housing sections 9 best shown in Figure 3, and which are held assembled by means of studs 10 on one of the sections extended through corresponding openings in the other section and then riveted over, as shown at 11 in Figure 5. Flanges 12 on the housing sections are secured to the header member 2 by means of screws 13, as shown in Figures 1, 2 and 3, thereby mounting the tilting device in place.

A tilting means comprising a worm wheel 14 rotatably mounted between the housing sections 9 in the usual manner, includes integral socket portions 14*a* and 14*b* extending from opposite sides of the wheel and outwardly through openings 15 in said sections. The tilt rail 3 is provided with a trunnion 16 of non-circular cross section, which as here shown, is mounted in the socket portion 14*a*. The two socket portions are internally serrated whereby the socket portion in use provides a drive connection between the worm wheel and the tilt rail, the two socket portions making the device subject to right or left hand installation. As the worm wheel and socket portions are integral and form a tilting unit, it is apparent that this unit may be quickly and easily assembled with the housing sections 9.

In accordance with this invention, the other elements of tilting device which provide a releasable drive connection with the worm wheel 14 and a means for releasing said connection for adjustment of the tilt cord 4, are constructed and arranged so that they may be assembled with the housing sections as readily and easily as is possible with the worm wheel 14 and its associated integral socket portions 14*a* and 14*b*. Moreover, these elements are subject to ready pre-assembly to form a complete workable unit, which when placed between the housing sections before the latter are joined together, will be positioned in proper operative relation to the worm wheel and said sections and so maintained when said sections are joined, thus making unnecessary the individual installation of such elements in the housing sections, reducing manufacturing costs and assuring reliable operation of the mechanism over long periods of use.

This preassembled operating unit comprises a rotary shaft 17, a coiled spring 18, a clutch member in the form of a sleeve 19, a driving member in the form of a worm sleeve 20, a combined cam sleeve and cord guide member 21, and a pulley 22, there being cooperating clutch elements 23 and 24 on the clutch sleeve and worm sleeve respectively, thus completing the unit.

In assembling the unit, the spring 18 is first mounted on the shaft with one end abutting a flange 17*a* formed on one end of the shaft. Next the clutch sleeve 19 is mounted on the shaft so that a flange 19*a* at one end thereof abuts the other end of the spring 18, after which the worm sleeve 20 is mounted on the clutch sleeve, or if desired, the clutch sleeve with worm sleeve previously mounted thereon may be mounted as a unit on the shaft. After the clutch sleeve and worm sleeve are mounted in place, the combined cam sleeve and cord guide member 21 which constitutes a means for releasing the drive connection between the shaft and the worm sleeve, is mounted on the shaft 17, then the pulley 22 is fixed on the outer end of the shaft which latter is upset or pivoted as at 26, thus completing the assembly of the unit.

The clutch elements 23 are formed integral with the exterior of the clutch sleeve and the flange 19*a* and are urged against the clutch elements 24 on the worm sleeve 20 by means of the spring 18, the elements 24 being formed in a recess 20*a* in the end of the worm sleeve. In order that the clutch sleeve may be driven by the shaft 17 and moved axially thereof into and out of driving connection with the worm sleeve, the shaft is provided with a portion 17*b* of non-circular cross section, which is slidably contacted with a flattened portion 19*b* at one end of the bore through the clutch sleeve, as shown in Figure 4.

The worm sleeve 20 is freely rotatably supported on the clutch sleeve, the combined cam sleeve and cord guide member 21 is freely rotatable on the clutch sleeve 17, but the pulley 23 is fixed to the shaft for rotation therewith as the portion 17*c* of the latter which extends through a non-circular opening in the pulley, is of corresponding non-circular cross section. The pulley is preferably made of two sections in a manner well known in the art, for convenience of manufacture, and has the tilt cord 4 extended therearound in frictional contact therewith so that corresponding lengths of the cord will depend therefrom for manipulation to rotate the pulley.

The cord guide means of the combined cam sleeve and cord guide member 21 comprises an arm 27 which depends from the cam sleeve and is formed with guide channels 28 and 29 through which the depending lengths of the cord 4 are guided, and which retain the lengths therein so that responsive to movement of said lengths other than downwardly the cord guide means will be correspondingly moved and turn the cam sleeve for declutching the clutch sleeve 19, as will be hereinafter more fully described. As here provided, the cord is swung arcuately in a plane substantially parallel to the blind to effect the release of the drive connection between the shaft and the means for tilting the blind.

The two housing sections 9, as is customary in this art, provide suitable bearing and retention surfaces for the various parts maintained therebetween. Thus, the sections have complementary recesses 30 for reception of the flange 17*a* on the shaft 17, these recesses providing bearing surfaces for the flange and retaining the shaft against axial withdrawal from the housing. Similar bearing recesses 31 are provided for reception of the flange 19*a* on the clutch sleeve 19, while portions 32, 33 and 34 maintain the worm sleeve 20 in proper working position in the assembly. Arcuate recesses 35 form a cylindrical socket in which the cam sleeve 21 is slidable axially of the shaft and from which the shaft and said sleeve extend exteriorly of the housing, as shown in Figure 4.

The two housing sections are provided with integral pins or like projections 36 in the recesses

35 and which extend into like elongated pockets or recesses 37 on opposite sides of the cam sleeve 21, for contact with oppositely inclined cam surfaces 38 and 39 at the inner ends of said pockets. These cam surfaces are arranged to cause the cam sleeve to move axially of the shaft as said surfaces ride on the projections 36 responsive to rotation of the cam sleeve in either direction. The projections 36 are normally disposed on the juncture points of the oppositely inclined cam surfaces and so maintained as the cam sleeve and clutch sleeve are normally held by spring 18 in outermost position, as shown in Figure 4. However, when the cam sleeve is moved to position disengaging the clutch elements 23 and 24, the pins or projections 36 will be disposed on one or the other of the short circumferentially extended surfaces 38*a* and 39*a* of the cam surfaces, thereby preventing the axial force of the spring 18 from urging the cam sleeve to turn out of position maintaining the sleeve 19 in declutching position.

With the parts in the position shown in Figure 4, the mechanism is subject to normal operation for tilting the slats of the blind. Thus, upon appropriate downward pulling of the depending lengths of cord 4, the pulley 23 and shaft 17 fixed thereto will be rotated, thereby rotating the clutch sleeve 19, which at this time is clutched with the worm sleeve 20, so that the latter will also rotate and turn the worm wheel 14, to tilt the slats as desired.

When it is desired to declutch the clutch sleeve 19 so that the shaft 17 may be turned freely for adjusting the tilt cord 4, relative to the pulley, the depending lengths of the cord are grasped and moved arcuately in a plane substantially parallel to the blind in either direction. This causes the cord guide portions 27, 28 and 29 to be moved correspondingly thereby turning the cam sleeve 21 relative to the shaft 17, so that the cam surfaces 38 or 39, depending on the direction of turning of the cam sleeve, will ride on the projections 36 and move the cam sleeve 21 and clutch sleeve 19 axially of the shaft 17, to the right as viewed from Figure 4, into position shown in Figure 6, thereby withdrawing the clutch elements 23 from the clutch element 24, so that rotation of the shaft will not turn the worm sleeve and worm wheel. The cord 4 may now be adjusted relative to the pulley 22, without tilting the tilt rail, to equalize the depending lengths of the cord. As the cam sleeve 21 is restrained against movement at this time by the pins or projections 36 contacting one or the other of the portions 38*a* and 39*a* of the cam surfaces 38 and 39, the swinging of the cord 4 arcuately in the reverse direction will move the cam sleeve so that the projections 36 will encounter the inclined cam surfaces, whereupon the spring 18 will aid this movement of returning the cam sleeve to the normal position shown in Figure 4, in which the sleeve 19 effects a drive connection with the worm sleeve 20 and restores the tilting mechanism to operative condition for tilting the blind.

It should be noted that in having the shaft 17 and pulley 22 remain stationary while the cam sleeve 21 and clutch sleeve 19 are moved axially of and relative to the shaft for declutching the clutch sleeve from the worm sleeve 20, undue wear of the bearing surfaces of the housing is avoided, as well as possible damage or derangement of the housing, as might take place in shifting the shaft and pulley relative thereto.

In having the spring 18 mounted on the shaft as here shown, the assembly of the worm 20,

clutch sleeve 19, and associated elements against the action of the spring, and separately, as heretofore practiced in the art, is done away with. Furthermore, with the present arrangement, the ends of the spring do not have to be treated or formed as a distinct pre-assembly operation, to prevent such ends from biting into non-rotary portions, for example, the housing, and thereby interfering with the proper operation of the mechanism. These advantages, in addition to the unit construction making possible a convenient preassembly of the shaft and elements mounted thereon, as a workable unit, render the device hereof as a whole, a decided improvement over those heretofore produced.

I claim:

1. In a Venetian blind tilting mechanism, a shaft, a pulley fixed to the shaft, tilting means adapted to be operated by rotation of said shaft, means forming a releasable drive connection between the pulley and said tilting means including a rotary member for driving said tilting means, a clutch member splined on said shaft and supporting said rotary member in driving relation therewith, and means for moving said clutch member axially of the shaft out of driving relation with said rotary member.

2. In a Venetian blind tilting mechanism, a shaft, a pulley fixed to the shaft, tilting means adapted to be operated by rotation of said shaft, means forming a releasable drive connection between the pulley and said tilting means including a clutch member splined on the shaft, and a driving member rotatable on said clutch member for operating said tilting means, means on said clutch member for engaging and rotating said driving member, and means for moving said clutch member axially of the shaft for releasing said driving connection.

3. In a Venetian blind tilting mechanism, a shaft, a pulley fixed to the shaft, tilting means adapted to be operated by rotation of said shaft, means forming a releasable drive connection between the pulley and said tilting means including a clutch member mounted on the shaft in driving connection therewith and for axial movement relative thereto, and a driving member for operating said tilting means, surrounding said clutch member; means on said clutch member for engaging and driving the driving member, spring means mounted on said shaft for urging said clutch member into position effecting a driving connection with the driving member, and means for moving said clutch member into position for releasing said driving connection.

4. In a Venetian blind tilting mechanism, a housing, a shaft journalled in the housing, a clutch sleeve mounted on said shaft for rotation therewith and axial movement relative thereto, a worm journalled on said clutch sleeve for rotation therewith in one position of the clutch sleeve, a worm wheel in the housing meshing with said worm and adapted for connection with a blind, cooperative clutch elements on said sleeve and worm adapted to be disengaged upon axial movement of said sleeve, a spring mounted on said shaft with one end against said sleeve, means on the shaft abutting the other end of the spring and maintaining the spring compressed, and cam means in the housing operable upon rotation thereof to move said sleeve axially of the shaft to disengage said clutch elements.

5. In a tilting mechanism for a Venetian blind, a housing, a shaft journalled in said housing, a worm wheel rotatable in the housing and adapted for connection with a blind, a clutch sleeve

mounted on said shaft for rotation therewith and for axial movement relative thereto, a worm mounted on said sleeve for rotation therewith and for rotation relative thereto, being enmeshed with said worm wheel, cooperating clutch elements on said sleeve and worm adapted to be disengaged upon axial movement of said sleeve, an abutment on said shaft, a coil spring encircling said shaft with its ends contacting said abutment and an end of said sleeve for urging said sleeve into position to engage said clutch elements, and means for moving said sleeve axially of the shaft to disengage said clutch elements.

6. In tilting mechanism for a Venetian blind, a shaft, means mounting said shaft for rotation, tilting means on said mounting means including a worm wheel and means for effecting a driving connection with the tilt rail of the blind, a clutch sleeve mounted on said shaft for rotation therewith and for axial movement relative thereto, a worm mounted on said sleeve for rotation relative thereto and rotation therewith, cooperating clutch elements on the sleeve and worm adapted to be disengaged on axial movement of the sleeve relative to the shaft, means urging said sleeve into position to engage said clutch elements, and means for moving said sleeve relative to the shaft for disengaging said clutch elements.

7. In a Venetian blind tilting mechanism having a mounting means and a tilting means thereon adapted to be rotated and to be connected with the tilt rail of the blind; an operating unit for said tilting means comprising a rotary shaft, a pulley fixed to one end of the shaft, a clutch sleeve mounted on said shaft for rotation therewith and for axial movement relative thereto, a rotary driving member mounted on said sleeve for free rotation thereon and adapted to have driving contact with said tilting means; cooperating clutch elements on said sleeve and driving member adapted to be disengaged upon movement of said sleeve axially of said shaft, a cam means mounted on the shaft for rotation relative thereto for moving said sleeve to disengage said clutch elements, and a spring urging the sleeve into position to engage said clutch elements.

8. An operating unit for the tilting means of a Venetian blind, comprising a rotary shaft having abutment means thereon, a pulley fixed to said shaft, a clutch sleeve mounted on said shaft for axial movement relative thereto between the pulley and the abutment means, means forming a drive connection between said clutch sleeve and said shaft, a rotary driving member mounted on said clutch sleeve to rotate therewith and

relative thereto, and adapted for driving contact with said tilting means, cooperating clutch elements on the clutch sleeve and driving member adapted to be disengaged upon movement of said sleeve axially of said shaft, means mounted on the shaft for movement relative thereto for moving said sleeve to disengage the clutch elements, and a spring operable on the shaft between said abutment means and said clutch sleeve for urging the latter into position to engage said clutch elements.

9. An operating unit for the tilting means of a Venetian blind, comprising a rotary shaft, a pulley fixed to said shaft, a clutch sleeve mounted on said shaft for axial movement relative thereto, means forming a drive connection between said clutch sleeve and said shaft, a driving member mounted between the ends of said shaft adapted for driving contact with said tilting means, cooperating clutch elements on the clutch sleeve and driving member adapted to be disengaged upon movement of said sleeve axially of said shaft, means mounted on the shaft for movement relative thereto for moving said sleeve to disengage the clutch elements, and a spring operable for urging the sleeve into position to engage said clutch elements.

10. An operating unit for the tilting means of a Venetian blind, comprising a rotary shaft having abutment means thereon, a pulley fixed to said shaft, a clutch sleeve mounted on said shaft for axial movement relative thereto between the pulley and the abutment means, means forming a drive connection between said clutch sleeve and said shaft, a driving member mounted between said abutment means and said pulley adapted for driving contact with said tilting means, cooperating clutch elements on the clutch sleeve and driving member adapted to be disengaged upon movement of said sleeve relative to said driving member and said shaft, cam means mounted between said pulley and said sleeve, operable for moving the sleeve to disengage said clutch element, and spring means for urging said sleeve into position to engage said clutch elements.

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