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VENETIAN BLIND

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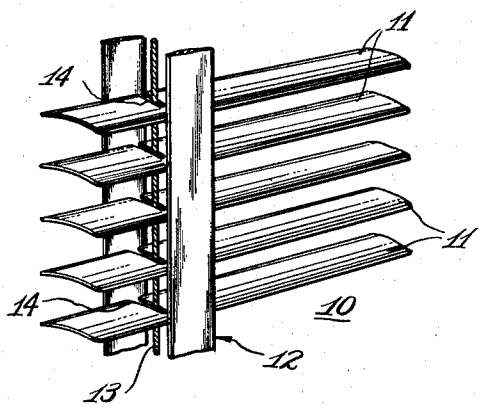


Fig. 1

Fig. 2

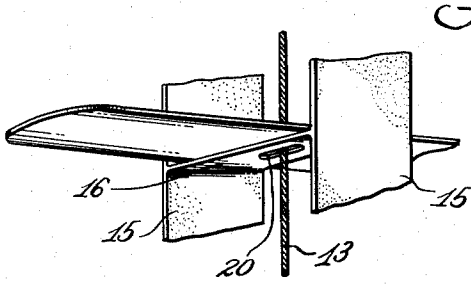


Fig. 3

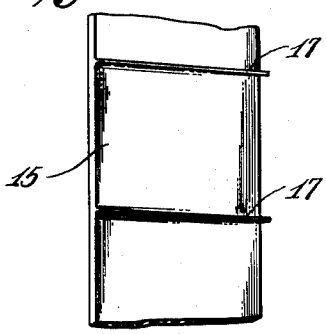
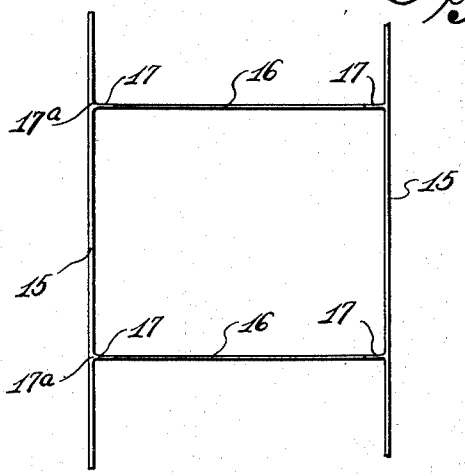


Fig. 4



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VENETIAN BLIND

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11 Claims. (Cl. 160—178)

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Our invention relates to Venetian blinds and has particular reference to a novel type of Venetian blind ladder employing slightly stiff cross bars so that accidental angular misalignment of one slat with respect to another may be avoided.

Venetian blinds ordinarily employ a plurality of supporting ladders, between which are spaced slats to form the blind element of the Venetian blind. These ladders include two vertical tapes and a plurality of cross bars secured between the tapes, and the slats are supported upon these cross bars or "rungs" of the ladder. The amount of light passing through a Venetian blind is controlled by adjusting the angular disposition of the slats, which is accomplished by lifting one vertical tape of the ladder with respect to the other. The cross bars of the ladder are thus inclined, causing the slats to become similarly inclined.

It frequently happens, however, that persons or articles touch a Venetian blind sufficiently hard so that the angular disposition of one or more of the slats is changed, thus giving an uneven appearance to the blind, permitting localized differences in light transmission, either more or less light transmission. The ability of individual slats to have their orientation thus changed is due to the fact that the cross bars of the ladder are generally formed of an extremely flaccid fabric material which yields to conform to a particular disturbance of the angular position of the slat.

Our invention provides a Venetian blind ladder wherein accidental disturbances or changes of the angular position of some of the slats is prevented by providing a semi-rigid type of cross bar for Venetian blind ladders, which cross bar will restore a Venetian blind slat to its selected angular position. Ladders built in accordance with our invention therefore include a pair of flaccid vertical tapes having cross bars of stiffened material. It is essential that the vertical tapes be flaccid inasmuch as they must adequately bunch or loop when the Venetian blind is raised. Therefore there must be a difference in pliability or flexibility between the cross bars and the vertical tapes and our invention includes suitable construction technique and material composition to effect this relative pliability between the vertical tapes and the cross bars of Venetian blind ladders.

Also our invention provides an improved type of Venetian blind ladder for use with removable slat Venetian blinds. These removable slats generally employ a transverse notch in the slats

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that extends approximately two-thirds of the distance across the slat. Inasmuch as Venetian blind slats are made from either very flexible metal, only .002 or .003 of an inch thick or thin wood, the effect of the notch is to weaken the slat requiring support by the cross bar on either side of the notch. This support has heretofore been imperfectly rendered by a fabric type of cross bars but the semi-rigid cross bar as provided by our invention positively supports the slat on either side of the notch, thus preventing a warping of one part of the slat with respect to the other.

It is therefore a principal object of our invention to provide a Venetian blind wherein a slat will be restored to an angular position as determined by the angular position of the cross bars when the slat is accidentally displaced to another angular position.

Another object of our invention is to provide a Venetian blind ladder wherein the cross bars are of greater rigidity than the vertical tapes.

A further object of our invention is to provide a plastic type of Venetian blind ladder wherein the plastic of the cross bar is of greater rigidity than the plastic of the vertical tapes.

A further object of our invention is to provide a Venetian blind ladder wherein a cross bar is provided that adequately supports a slat of the removable type.

Other objects and advantages of our invention will be apparent from a study of the following specifications, read in connection with the accompanying drawing, wherein

Fig. 1 is a perspective fragmentary view of a Venetian blind ladder embodying our invention and illustrated as used with a removable type of Venetian blind slat;

Fig. 2 is an enlarged perspective view, from the under side, of one of the cross bars of Fig. 1;

Fig. 3 is a perspective view of a fragment of a preferred form of vertical tape incorporating our invention; and

Fig. 4 is an elevation view of a fragmentary portion of a Venetian blind ladder embodying our invention.

Referring to Fig. 1, a Venetian blind 10 may include a plurality of generally horizontal slats 11 supported by a plurality of ladders 12 that are provided particularly in accordance with our invention. Only one such ladder 12 is illustrated but it will be obvious that a pair of ladders is generally employed between which the slats 11 extend. A lifting cord 13 of any suitable material may be provided that passes through the

slats 11 and through apertures in the cross bars or "rungs" of the ladder 12.

While our invention is applicable to any type of Venetian blind, we will describe it as used with a Venetian blind employing removable slats. Accordingly, the slats 11 may be provided with transverse notches 14 that extend at least half way across the width of the slat and preferably approximately two-thirds of the distance. These slats may be removed from the ladder 12 by rotating them manually to a vertical position and then sliding them longitudinally from between the ladders. It will be noted, however, that the notch 14 greatly weakens the slats 11 and if the slat is not supported on both sides of the notch one side will tend to droop or twist with respect to the other part, thus giving rise to an unsightly appearance.

The ladder 12 may include a pair of vertical tapes 15 having cross bars or webs 16 extending between them, which webs may be stiffened in accordance with our invention. These cross bars 16 may have a stiffness equivalent to thick parchment paper, or corresponding approximately to that of a playing card, so that the weight of a canted slat may be easily borne by the cross bar without appreciable bending. This is in contrast to the physical characteristics required for the vertical tapes 15, which tapes must be extremely flaccid and pliable so that they may be properly folded into loops or gathers at the top of the Venetian blind when the slats are raised to be in surface to surface contact with each other. Another important advantage of the semi-rigid cross bars is the fact that they remain flat in the transverse direction at all times, and therefore have no tendency to fold up and enter the notch 14 when the slat is canted; which occurs frequently when notched removable slats are used with conventional flaccid cross bars. Each full width cross bar 16 may be provided with a central aperture 20 through which the lifting cord 13 may pass.

While various techniques may be employed in practicing our invention to achieve greater rigidity of the cross bar 16 with respect to the vertical tapes, at present we prefer to achieve this relative flexibilty by employing materials formed of organic plastic, utilizing a stiffer material for the cross webs 16 than for the vertical tapes 15.

We have found that certain of the vinyl resins have the required flexibilities for these two different applications and by employing resins of the same basic type they may be easily heat welded or otherwise bonded together. For example, we have found that the vertical tapes 15 may be satisfactorily formed of vinyl chloride-acetate copolymer that has been plasticized with a high boiling point plasticizer such as tricresyl phosphate so that it is flaccid or pliable in the same sense that woven fabrics are pliable. Thus this plasticized material may be formed into sheets or strips of the desired size for the vertical tapes 15. The cross bars 16, however, may be formed of vinylidene copolymer or vinyl chloride or vinyl chloride-acetate copolymer in its so-called "natural state" or unplasticized state, or in the state wherein very little plasticizer is employed to soften the material.

Considerable variation in the properties is obtainable by varying the degree of polymerization or the relation of vinyl chloride to vinyl acetate, or the amount of plasticizer. Also the properties may be varied by pigmenting or compounding. Hence the rigidity or flexibility of the desired cross web may be suitably controlled in the fabricating process. The type of plastic cross web we presently prefer may have a parchment-like stiffness feel and may be on the order of .012 to .015 of an inch thick. The material is readily bent by the fingers to any desired shape but upon standing will assume its original shape, for example, flat sheets. The material is generally rigid as to small forces and, in fact, is commercially referred to as rigid vinyl resin sheets when supplied in sheet form.

We have further found that the assembly of rigid vinyl resin cross bars to flaccid vinyl resin vertical tapes may be facilitated by the use of projecting cross bar stubs on the vertical tapes. Additionally, the provision of such stubs gives rise to a great flexibility in the more flaccid material, thus permitting the cross bars 16 to remain substantially unflexed, and also reducing flexing of the vertical tapes.

Referring to Fig. 3, it will be noted that the vertical tape 15 may be provided with a series of cross bar stubs 17 in the form of projecting ridges. By reference to Fig. 4, it will be noted that each stub 17 is joined to the vertical tape 15 by a filleted joint as at 17*a*. The semi-rigid cross bar 16 may be secured between a pair of the vertical tapes 15 by bonding to the tips of oppositely disposed stubs 17.

The stubs 17 may be formed on the vertical tapes 15 in any desired manner and we have found that they may be suitably formed of the same composition as the vertical tapes 15 as extrusions and then cut in lengths equivalent to the width of the vertical tapes 15 and heat bonded solvent adhered, glued or otherwise secured to the vertical tapes. Additionally, the vertical tapes may be molded in a mold provided with transverse recesses of a size and shape to form the filleted projecting stubs 17. Also if desired the vertical tapes 15 may be reinforced with threads, pliable fabric or other material to prevent elongation under load.

The attachment of the rigid vinyl chloride-acetate cross bar 16 to the stub 17 may be obtained by cementing or by heat bonding. For adhesion of the cross bars to the stubs, the tips of the cross bar and the stubs may be first softened by a suitable solvent, preferably solvents of the slow acting type so as not to craze or locally weaken the sheet. Softening solutions are well known in the industry and by way of example may include methyl acetate, ethyl acetate, methyl ethyl ketone, methylene dichloride and cyclohexanone. After the two joining materials are suitably softened they may be overlapped and pressed together and upon evaporation of the thinner solvent the sheets will be strongly adhered to each other. Adhesives may also be used, the most successful of which are based upon the synthetic rubbers and also upon latex solutions.

Heat bonding may be used either with or without the use of a preliminary softener. Heat bonding in most cases may take place below 200° F. but higher temperatures may be utilized for stronger bonds.

It should be noted that where our cross bars are employed with removable slats the cross bar is preferably of the same width as the width of the vertical tapes so as to give adequate support to the slat on either side of the notch 14. However, standard patterns of staggered arrays of cross bars may be utilized with standard types of slats inasmuch as only fractional width cross

bars are necessary. "Full width" cross bars may be slightly narrower than vertical tapes for the sake of appearance.

In operation, one vertical tape 15 may be lifted by the usual tilting mechanism (not shown) with respect to the other, thus disposing the cross bars 16 at an angle. The slats 11 resting on the cross bars 16 will assume a corresponding angle. The flexing of the cross bars as a whole may take place in the stub portion 17, thus relieving the semi-rigid cross bar 16 of stresses. Hence, each stub portion forms a flexible articulated joint connecting one end of the attached cross bar to the adjacent vertical tape. If the slats should be accidentally disturbed to a new position, the cross bar 16 will tend to maintain its straight position, thus causing the slat to return to the position designated by the tilt of the cross bar. This is in contrast to flaccid cross bars wherein the slat will remain at any angle to which it is disturbed.

While at present we prefer to use vinyl resin materials for our improved Venetian blind ladder, it will be obvious to those skilled in the art that various other materials may be utilized; for example, standard fabric Venetian blind ladders could be employed wherein the fabric cross bar is stiffened by the application of a paint, plastic wax or other material so that it will have sufficient rigidity to act in accordance with our invention. Also various other plastics may be employed including, by way of example only, the cellulose acetate compounds, various of the modified or chlorinated synthetic rubbers, polymers of chloroprene, ethyl rubber, etc. Accordingly, the recitation of vinyl resins is by way of example only and we include within the true spirit and scope of our invention all such materials as will give the result described. The primary requirement is that the cross bar shall have sufficient rigidity to have but little deflection when a slat is accidentally distorted so that one edge bears along a medial portion of the cross bar. The use of the stubs as hinges permits the use of even very rigid material for cross bars and for example we may employ acrylic copolymer as a cross bar material.

For these and various other reasons, it will be obvious that the disclosed embodiment is merely illustrative and is not limiting or definitive of our invention.

We claim:

1. A Venetian blind ladder comprising flaccid vertical tapes and semi-rigid cross bars connected to and extending between said tapes, at least the major portion of said cross bars having substantially greater rigidity than the vertical tapes.

2. A Venetian blind ladder as defined in claim 1 in which said major portion of the cross bars has a rigidity sufficient to support a Venetian blind slat without sagging under the weight thereof.

3. A Venetian blind ladder as defined in claim 1 in which the vertical tapes and cross bars are of resinous material.

4. A Venetian blind ladder as defined in claim 1 in which the vertical tapes and cross bars are of a vinyl resin, and in which the vertical tapes contain sufficiently more plasticizer than said major portion of the cross bars to make them substantially more flaccid.

5. A Venetian blind ladder as defined in claim 1 in which the vertical tapes are of plasticized vinyl chloride and said portion of the cross bars is of a vinyl acetate-chloride copolymer.

6. A Venetian blind ladder comprising flaccid vertical tapes and semi-rigid cross bars connected to and supported between said tapes, each cross bar having the major portion thereof of substantially greater rigidity than the vertical tapes and stubs extending from the vertical tapes of greater flexibility than said major portion of the cross bars and connecting the vertical tapes to said portion of the cross bars and forming articulated joints between the vertical tapes and said portions of the cross bars.

7. A Venetian blind ladder as defined in claim 6 in which the short sections at each end of the cross bars are of the same material as and integral with the vertical tapes.

8. A Venetian blind ladder as defined in claim 6 in which the short sections of greater flexibility at each end of the cross bars are of the same material as and integral with the vertical tapes, and in which the portions of the cross bars of greater rigidity form a butt joint with said short sections.

9. A Venetian blind ladder as defined in claim 6 in which the vertical tapes are of resinous material and the short sections of greater flexibility at each end of the cross bars are integral with the vertical tapes and of the same resinous material.

10. A removable-slat Venetian blind comprising flaccid vertical tapes and semi-rigid cross bars connected to and extending between said tapes, said cross bars having an aperture for receiving a lifting cord, slats between said vertical tapes and supported by the respective cross bars, each of said slats having a notch extending inwardly from one side edge thereof with inner portions of the notches aligned with the respective apertures of the cross bars, and a lifting cord extending through the aligned apertures and notches, the width of the notches in the slats being sufficiently narrow that edges of the slats defining the sides of the notches rest upon the respective cross bars, at least the major portion of said cross bars having substantially greater rigidity than the vertical tapes and a rigidity sufficient to support the respective overlying slats without sagging under the weight thereof, whereby the edges of the slats defining the sides of the notches are maintained in alignment.

11. A removable-slat Venetian blind as defined in claim 10 in which the cross bars are of substantially the same width as the vertical tapes.

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