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WINDING-TYPE PANEL SHUTTER

This invention relates to a winding-type panel shutter and more particularly to a winding-type panel shutter comprising a shutter curtain constituted by slats each of which consists of: upper and lower long horizontal frames having connecting portions for pivotal connection at parallel horizontal axes; a transparent or semi-transparent long panel inserted between the upper and lower horizontal frames; and short vertical frames supported between the upper and lower horizontal frames with desired spaced distances in the longitudinal direction of the upper and lower horizontal frames and the panel. The slats are connected to each other at parallel horizontal axes through the connecting portions to form a cross-striped shutter curtain. The shutter curtain is wound and unwound around a winding drum which is rotatably supported through a shaft in a shutter casing, so that an aperture of a building is closed and opened.

Generally, since such a winding-type panel shutter is made to have a cross-striped shutter curtain, the panel shutter offers the advantages that; especially in the case of being arranged at a doorway of a shop, it has aesthetic appeal and abundant natural illumination can pass through the panels to

the inside of the closed shop thus providing a bright interior.

For a shutter curtain of the prior-art panel shutter of this type, the following structure has been proposed: upper and lower long horizontal frames are provided in their facing surfaces with panel-fitting grooves; upper and lower edges of a long panel are fitted in the panel-fitting grooves to form a slat; the slats are pivotally connected together at parallel horizontal axes to form a shutter curtain.

Alternatively, the following structure has been put to practical use: short vertical frames are supported between the upper and lower long horizontal frames to form a cross-striped framework made of the horizontal and vertical frames; the panels are fitted in the respective isolated spaces to form a slat; the slats are pivotally connected together at parallel horizontal axes to form a shutter curtain.

However, the former shutter curtain has the disadvantage that, in the case of the wide doorway of the shop to be provided with the panel shutter, the horizontal frames may be bent so that the panels come off the horizontal frames. Thus, it is difficult to put the shutter curtain of this type to practical use. The latter shutter curtain has the disadvantage that the panels must be fitted in the respective spaces isolated by the horizontal and vertical frames and furthermore sealant must be inserted at the periphery of the panel to prevent the panels from becoming rickety and to improve airtightness, so that the assembly work becomes extremely complicated and troublesome, resulting in very bad workability.

Accordingly, the present invention has been developed to eliminate the above disadvantages of the prior art. The invention seeks to provide a winding-

type panel shutter having the following features: a shutter curtain hangs on a winding drum so as to be wound and unwound; each of slats for the shutter curtain is made of upper and lower long horizontal frames having connecting portions for pivotal connection together at parallel horizontal axes and short vertical frames supported between the upper and lower horizontal frames to form a cross-striped framework having a unique appearance; the panel to be inserted between the upper and lower horizontal frames is not made of several short panels obtained by cutting off a long panel with a short pitch in the longitudinal direction, but from a single long panel to form a slat.

The invention also seeks to provide a winding-type panel shutter having the following features: when the shutter curtain closing the doorway of a shop is wound around the winding drum to open the doorway, the vertical frames of the succeeding slat are wound with being brought into contact with the vertical frames of the preceding wound slat and overlapping them; thus, the front and rear surfaces of the panel are protected from being injured so that the appearance of the panel is not deteriorated with the passage of time.

This invention comprises, as basic components of a winding-type panel shutter, guide rails disposed upright at both sides, right and left, of an aperture of a building (a doorway of a shop or the like) to guide a vertical movement of a shutter curtain, a shutter casing disposed near the upper ends of the guide rails to accommodate the wound shutter curtain, a winding drum disposed in the shutter casing and rotatably supported through a shaft between the right and left side plates of the shutter casing,

and a shutter curtain hanging at its upper end (hanging base) on the winding drum and having slats which are pivotally connected together at parallel horizontal axes.

According to the first embodiment of the invention there is provided a winding-type panel shutter comprising panels held by upper and lower horizontal frames and vertical frames to form slats, the slats being pivotally connected together at parallel horizontal axes to form a shutter curtain, the shutter curtain hanging on a reversibly rotatable winding drum allowing an aperture of a building to be closed and opened in accordance with forward and reverse rotation of the winding drum, wherein

the panels are long single panels fixedly fitted in grooves formed in respective facing surfaces of the horizontal frames and extending longitudinally thereof; and

the vertical frames are supported between engaging grooves formed in respective front and rear surfaces of the upper and lower horizontal frames and extending longitudinally thereof, the vertical frames pressing against the front and rear surfaces of the panels to hold the panels therebetween.

The vertical frames are supported between the upper and lower horizontal frames with desired spaced distances in the longitudinal direction of the engaging grooves. Furthermore, the vertical frame is made to form a concave shape protruding from the front and rear surfaces of the upper and lower horizontal frames so that when the shutter curtain is wound around the winding drum to open the aperture, the vertical frames of the succeeding slat are wound with being brought into contact with the vertical frames of the preceding wound slat and with overlapping them. In addition, the panel is made of a translucent resin

plate of transparent or semi-transparent material.

According to the second embodiment of the invention there is provided a winding-type panel shutter comprising panels held by upper and lower horizontal frames and vertical frames to form slats, the slats being pivotally connected together at parallel horizontal axes to form a shutter curtain, the shutter curtain hanging on a reversibly rotatable winding drum allowing an aperture of a building to be closed and opened in accordance with forward and reverse rotation of the winding drum, wherein

the panels are long single panels fitted in grooves formed in respective facing surfaces of the horizontal frames and extending longitudinally thereof; and

the vertical frames are supported between engaging grooves formed in either front or rear surfaces of the upper and lower horizontal frames and extending longitudinally thereof so as to press and be brought into intimate contact with one side of the panel.

The vertical frames are, like the first embodiment slat, supported between the upper and lower horizontal frames with desired spaced distances in the longitudinal direction of the engaging grooves. In addition, the panel is made of a translucent resin plate which is either transparent or semi-transparent.

To sum up, the primary difference between the first embodiment slat and the second embodiment slat resides in that for the first embodiment slat, the vertical frames supported between the upper and lower horizontal frames engage with the engaging grooves formed on the front and rear surfaces of the upper and lower horizontal frames, while for the second embodiment slat, the vertical frames supported

between the upper and lower horizontal frames engage with the engaging grooves formed on either front or rear surfaces of the upper and lower horizontal frames.

An advantage of the present invention is that inserting sealant between the vertical frames and the panels to keep the stable structure can be eliminated; thus, the assembly work becomes simplified and it is easy to carry out mass production and the panel shutter is superior in watertightness and airtightness.

Fig. 1 is a schematic front view of a winding-type panel shutter;

Fig. 2 is a perspective view of an essential portion of a shutter curtain of the winding-type panel shutter according to the first embodiment;

Fig. 3 is a partially broken-away front view of the slat of the same embodiment;

Fig. 4 is a side view of the slat of the same embodiment;

Fig. 5 is a sectional view taken along line A-A in Fig. 3 in the same embodiment;

Fig. 6 is a sectional view taken along line B-B in Fig. 3 in the same embodiment;

Fig. 7 is a side view of an essential portion of the shutter curtain which has been wound around the winding drum in the same embodiment.

Fig. 8 is a perspective view of an essential portion of a shutter curtain of the winding-type panel shutter according to the second embodiment;

Fig. 9 is an exploded sectional view of the slat in the same embodiment; and

Fig. 10 is a side view of the vertical frame in the same embodiment.

The invention will now be described in detail for more understanding by referring to the

accompanying drawings.

Figs. 1 to 7 show the first embodiment of the invention. In the figures, a winding-type panel shutter 1 comprises guide rails 3 disposed upright at both the sides, right and left, of an aperture of a building (a doorway of a shop or the like), a shutter casing 4 disposed near the upper ends of the guide rails 3, a winding drum 5 disposed in the shutter casing 4 and rotatably supported through a shaft between right and left side plates 4a, 4b of the shutter casing 4, and a shutter curtain 6 hanging on the winding drum 5.

The reference numeral 7 denotes a slat constituting the shutter curtain 6. The slat 7 comprises upper and lower long horizontal frames 8, 9 extending right and left, a long single panel 10 inserted between the upper and lower horizontal frames 8, 9, and short vertical frames 11 supported between the upper and lower horizontal frames 8, 9 with predetermined desired spaced distances.

In detail, the upper horizontal frame 8 is, like the lower horizontal frame 9, made of an extruded section of aluminium or the like. The upper horizontal frame 8 is provided on its upper end with a female connecting portion 12 and on its lower end with a fitting groove 14 in which the upper end of the panel, made of a translucent resin plate which is either transparent or semi-transparent, is to be fixedly fitted through sealant (bead) 13. The upper horizontal frame 8 is further provided on both its front and rear sides with engaging grooves 15 for engaging with the vertical frames.

On the other hand, the lower horizontal frame 9 is provided on its upper end with a fitting groove 16 in which the lower end of the panel 10 is fixedly fixed through the sealant 13 and on its lower

end with a male connecting portion 17 which can engage with the female connecting portion 12 of the upper horizontal frame 8 to make a bendable interlock connection. The lower horizontal frame 9 is further provided on both its front and rear sides with engaging grooves 18 for engaging with the vertical frames.

In addition, the vertical frame 11 is provided on both its upper and lower ends with engaging projections 19, which can be fitted in the engaging grooves 15, 18 from either right or left sides of the upper and lower horizontal frames 8, 9 and slid horizontally to the predetermined position which is set beforehand, so that the vertical frames 11 are supported between the upper and lower horizontal frames 8, 9 so as to hold the panel 10 therebetween from both the front and rear sides and to face the panel 10. In this case, the upper and lower ends of the vertical frame 11 are made to form concave shapes protruding, in the front and rear direction, from the front and rear surfaces of the upper and lower horizontal frames 8, 9. Thus, as shown in Fig. 7, when the shutter curtain 6 is wound around the winding drum 5 to open the aperture 2 of the building, the vertical frames 11 of the succeeding slat 7 are wound with being brought into contact with the vertical frames 11 of the preceding wound slat 7 and overlapping them.

The reference numeral 20 denotes a liner which is disposed at the upper and lower ends sides of the vertical frame 11 and fitted in the engaging grooves 15, 18. The liner 20 is made of an extruded channel having an external surface which can be aligned with the front and rear surfaces of the upper and lower horizontal frames 8, 9. In addition, the length of the liner 20 is set to be consistent with the pitch of the spaced distance for

the vertical frames. The vertical frames 11 and the liners 20 are alternately inserted in the engaging grooves 15, 18 and slid horizontally in order, so that the vertical frames 11 can be set and fixed at the predetermined positions without special fixing means. The vertical frame 11 is further provided on its sides facing the upper and lower portions of the panel 10 with ridges 21 to pressingly hold the panel 10 between the facing ridges, so that the panel 10 is very stably held in place by the ridges 21 and the upper and lower horizontal frames 8, 9.

On the other hand, 22 denotes an end member, which can be fixed to both the right and left ends of the slat 7 by tightening up screws 23 into threaded portions 24, 25 formed on the upper and lower horizontal frames 8, 9, so that the panel 10 and others are prevented from coming off.

Next, Figs. 8 to 10 show the second embodiment of the invention. The second embodiment of the invention, like the first embodiment of the invention, comprises as basic components of a winding-type panel shutter, as shown in Fig. 1, guide rails 3 disposed upright at both the sides, right and left, of an aperture of a building (a doorway of a shop or the like), a shutter casing 4 disposed near the upper ends of the guide rails 3, a shutter curtain 6 disposed in the shutter casing 4 and rotatably supported through a shaft between right and left side plates 4a, 4b of the shutter casing 4.

The second embodiment of the invention is characterised in that, for the structure of the slat, the vertical frame to be supported between the upper and the lower horizontal frame engages with engaging grooves formed on either front or rear surfaces of the upper and lower horizontal frames. Describing in more detail by referring to the drawings, 26 denotes a slat

constituting the shutter curtain. The slat 26 consists of upper and lower long horizontal frames 27, 28 made of extruded sections of aluminium or the like, vertical frames 29, and a long single panel 30 made of translucent resin material which is either transparent or semi-transparent.

The above vertical frame 29 is obtained by cutting off an extruded section with the predetermined length, the extruded section being integrally provided with engaging portions 29a which engage with the below-mentioned engaging grooves 41, 42 formed on either front or rear surfaces of the upper and lower horizontal frames 27, 28 and with a flat portion 29b which is formed between the engaging portions 29a and protrudes toward the panel 30. In addition, the panel 30 is provided at its upper and lower ends with I-shaped locking strips 31, 31. Moreover, the upper horizontal frame 27 is provided with a connecting portion 32 with a shape of recessed groove while the upper horizontal frame 28 is provided with a connecting portion 33 with a shape of projection, so that the upper horizontal frame 27 and the lower horizontal frame 28 can be pivotally connected with each other in parallel horizontal axes.

Furthermore, the upper and lower horizontal frames 27, 28 are provided in their facing inner surfaces with engaging grooves for slidably receiving the locking strips 31, 31 of the panel 30, the upper horizontal frame 27 being provided in its lower surface with an engaging groove 34 while the lower horizontal frame 28 being also provided in its upper surface with an engaging groove 35. The respective locking strips 31, 31 of the panel 30 are slidably inserted in the above engaging grooves 34, 35 in the right and left direction to produce a slat 26.

In addition, the upper and lower horizontal frames 27, 28 are provided near the connecting portions 32, 33 with inclined surfaces 36, 37 which slope toward the connecting portions 32, 33, so that when wound around the winding drum 5 the slat 26 is wound with a small diameter as much as possible.

The reference numeral 38 denotes an end member, which can be fixed to both the right and left ends of the slat 26 through threaded portions 39, 40, so that the panel 30 is prevented from coming off.

The reference numerals 41, 42 respectively denote engaging grooves each of which is formed in one side of the upper or lower horizontal frame 27, 28. The engaging portions 29a projectingly formed on the upper and lower ends of the vertical frame 29 can be inserted in the engaging grooves 41, 42 along the longitudinal direction of the upper and the lower horizontal frames 27, 28, so that the vertical frame 29 is supported between the upper and lower horizontal frames 27, 28. The central region of the vertical frame 29 is made to protrude toward the panel much more than the engaging portions 29a, so that when the vertical frame 29 is supported its flat portion 29b is brought into intimate contact with the panel 30. The reference numeral 43 denotes a liner which is disposed at the upper and lower end sides of the vertical frame 29 and fitted in the engaging grooves 41, 42. The liner 43 is made of an extruded channel having an external surface which can be aligned with the surfaces, which are provided with engaging grooves 41, 42, of the upper and lower horizontal frames 27, 28. In addition, the length of the liner 43 is set to be consistent with the pitch of the spaced distance for the vertical frames 29. The vertical frames 29 and the liners 43 are alternately inserted in the engaging grooves 41, 42 and horizontally slid in order, so that

the vertical frames 29 can be set and fixed at the predetermined positions without special fixing means.

Next, an operation of the above-structured invention will now be described for the first and second embodiments.

The first embodiment will first be described. The winding drum 5 is rotated in forward and reverse so that the shutter curtain 6 is vertically moved, being guided by the guide rails 3 to open and close the aperture 2. Since the short vertical frames 11 are supported between the upper and lower horizontal frames 8, 9 and on the front and rear surfaces of the upper and lower horizontal frames 8, 9, the slat 7 constituting the shutter curtain 6 is reinforced so that the upper and lower horizontal frames 8, 9 are not bent even where the width of the aperture 2 is wide. For example, no centre pole is needed with a width of up to three meters.

Furthermore, the panel 10 is not a short one which has been obtained by cutting off with a short pitch and inserted alternately with vertical frames in the prior art, but a long single panel 10 which is held by the vertical frames 11 from the front and rear directions and faces them. In addition, the panel 10 is inserted and is pressingly held between the ridges 21 formed on the upper and lower portions of the vertical frames 11. Accordingly, there is no necessity for sealing between the vertical frames 11 and the panel 10, there is no disadvantage of deterioration of the seal with the passage of time, and complicated and troublesome assembly work for the sealant is eliminated. A small number of parts are needed and the assembly work for the slat 7 is extremely simplified, so that the workability is greatly improved.

Furthermore, the upper and lower end portions of the vertical frame 11 supported between

the upper and lower horizontal frames 8, 9 protrude from the front and rear surfaces of the upper and lower horizontal frames 8, 9, so that when the shutter curtain 6 is wound around the winding drum 5, the vertical frames 11 of the succeeding slat 7 are wound with being brought into contact with the vertical frames 11 of the preceding wound slat 7 and overlapping them. Accordingly, there is no danger of contact between the upper and lower frames 8, 9 themselves and between the panels 10 themselves and further the panels 10 are protected. In this case, if the vertical frames 11 on one side are made of resilient material such as rubber, the front and rear surfaces of the vertical frames 11 are hardly injured even where the vertical frames 11 are rubbed against each other and further there is no unpleasant metallic noise when opening and closing the shutter.

Furthermore, the vertical frames 11 can be positioned only by alternately inserting the vertical frames 11 and the liners 20 in the engaging grooves 15, 18, so that precise positioning is carried out very easily without special fixing means. In addition, the liners 20 offer the change of appearance of the slat 7.

Next, an operation of the second embodiment will be described. Like the first embodiment, the winding drum 5 is rotated in forward and reverse so that the shutter curtain 6 is vertically moved and is guided by the guide rails 3 to open and close the aperture 2. The slat 26 constituting the shutter curtain 6 has short vertical frames 29 supported between the upper and lower horizontal frames 27, 28 and on either front or rear surfaces of the upper and lower horizontal frames 27, 28, so that the structure is more simplified than the first embodiment. Furthermore, the vertical frames 29 can reinforce

the upper and lower horizontal frames 27, 28 in accordance with the required strength for the shutter curtain 6, so that the upper and lower frames 27, 28 are not bent. In addition, the panel 30 is not a short one which is obtained by cutting off with a short pitch and inserted alternately with vertical frames in the prior art, but an I-shaped long single panel 30 which is inserted between the fitting grooves 34, 35 formed in the upper and lower horizontal frames 27, 28 and brought into intimate contact with the flat portions 29b formed on the central regions of the vertical frames 29. Accordingly, there is no necessity for sealing between the vertical frames 29 and the panel 30, there is no disadvantage of deterioration of the seal with the passage of time, troublesome assembly work for the sealant is eliminated. A lesser number of parts are needed with the simplified structure and the assembly work is carried out with an improved efficiency.

Furthermore, the upper and lower horizontal frames 27, 28 are respectively provided near the connecting portions 32, 33 with the inclined surfaces 36, 37 which slope toward the connecting portions 32, 33, so that when the shutter curtain 6 is opened the wound shutter curtain 6 is made to have a small diameter as much as possible.

As can be seen from the above description, the invention offers the following advantages:

- (1) Since the slat constituting the shutter curtain has short vertical frames supported between the upper and lower horizontal frames and on the respective front and rear surfaces of the upper and lower horizontal frames or on either front or rear surfaces of the upper and lower horizontal frames, the upper and lower horizontal frames are reinforced so as not to be bent and a unique cross-striped appearance

is always kept to increase aesthetic appeal.

(2) Since the panel is not a short one which is obtained by cutting off with a short pitch and inserted alternately with the vertical frames between the upper and lower vertical frames, but a long single panel which is pressingly held by the vertical frames from the front and rear directions or brought into intimate contact at its one side with the vertical frames, the structure has watertightness and airtightness. The assembly work is simplified, mass production is easily carried out, and the cost is greatly reduced.

(3) For the slat in which the upper and lower ends of the vertical frames supported between the upper and lower horizontal frames are made to protrude from the front and rear surfaces of the upper and the lower horizontal frames, when the shutter curtain is wound around the winding drum, the vertical frames of the succeeding slat are brought into contact with the vertical frames of the preceding wound slat and overlap them. Accordingly, there is no danger of contact between the upper and lower horizontal frames themselves and between the panels themselves, and further the panel is protected so that there is no danger of being injured when opening and closing the panel shutter.

(4) For the slat in which the upper and lower horizontal frames are respectively provided near the connecting portions with the inclined surfaces which slope toward the connecting portions, when the shutter curtain is opened, the wound shutter curtain around the winding drum can be made to have as small diameter as possible. Accordingly, even if the lintel of the setting site is comparatively narrow, the panel shutter of this type can meet the customer's need.

(5) Since the panel is made of a

translucent resin plate which is either transparent or semi-transparent, abundant natural illumination is obtained even when the shutter curtain is closed. Accordingly, the inside of the closed shop is always bright creating a pleasant atmosphere.

A winding-type panel shutter according to the present invention is usable at apertures of all buildings such as factories, store-houses, residences and shops. In particular, the winding-type panel shutter of this type is made to have a unique appearance caused by the cross-striped framework as compared with the panel shutter of another type in which a plurality of panels are provided on both their sides with roller shafts which are connected through chains to form a shutter curtain. Accordingly, the appearance offers aesthetic appeal to a shopping street and has a function of attracting customers. Thus, the panel shutter of this type is most preferable for being arranged at shops.



CLAIMS:-

1. A winding-type panel shutter comprising panels held by upper and lower horizontal frames and vertical frames to form slats, the slats being pivotally connected together at parallel axes to form a shutter curtain, the shutter curtain hanging on a reversibly rotatable winding drum allowing an aperture of a building to be closed and opened in accordance with forward and reverse rotation of the winding drum, wherein

the panels are long single panels fixedly fitted in grooves formed in respective facing surfaces of the horizontal frames and extending longitudinally thereof; and

the vertical frames are supported between engaging grooves formed in respective front and rear surfaces of the upper and lower horizontal frames and extending longitudinally thereof, the vertical frames pressing against the front and rear surfaces of the panels to hold the panels therebetween.

2. A winding-type panel shutter comprising panels held by upper and lower horizontal frames and vertical frames to form slats, the slats being pivotally connected together at parallel horizontal axes to form a shutter curtain, the shutter curtain hanging on a reversibly rotatable winding drum allowing an aperture of a building to be closed and opened in accordance with forward and reverse rotation of the winding drum, wherein

the panels are long single panels fitted in grooves formed in respective facing surfaces of the horizontal frames and extending longitudinally thereof; and

the vertical frames are supported between engaging grooves formed in either front or rear



surfaces of the upper and lower horizontal frames and extending longitudinally thereof so as to press and be brought into intimate contact with one side of the panel.

3. A winding-type panel shutter according to claim 1 or 2, wherein the upper and lower horizontal frames are made of extruded sections integrally provided with connecting portions for pivotally connecting the slats together in parallel horizontal axes, fitting grooves for the panel, and engaging grooves for supporting the vertical frames.

4. A winding-type panel shutter according to claim 1, wherein the vertical frames is obtained by cutting off, with a predetermined length, an extruded section which is provided, on its surface having engaging projections for engaging with engaging grooves formed on the front and rear surfaces of the upper and lower horizontal frames, with a concave portion, and on its surface facing the upper and lower portions of the panel with ridges for pressing against the panel.

5. A winding-type panel shutter according to claim 2, wherein the upper and lower horizontal frames are respectively provided near the connecting portions with inclined surfaces which slope toward the connecting portions.

6. A winding-type panel shutter according to claim 2, wherein the vertical frame is obtained by cutting off an extruded section which is integrally provided with engaging portions for engaging with engaging grooves formed in either front or rear surfaces of the upper and lower horizontal frames and a flat portion arranged between the engaging portions



and made to protrude further toward the panel than the engaging portions.

7. A winding-type panel shutter according to claim 2, wherein the panel is provided on its upper and lower ends with locking strips consisting of flanges and webs, and the upper and lower horizontal frames between which the panel is inserted are respectively provided in their facing inner surfaces with fitting grooves in which the locking strips of the panel are slidably inserted.

8. A winding-type panel shutter according to claim 1, 2, 3, 4, 6 or 7, wherein the panel is made of translucent resin material which is either transparent or semi-transparent.

9. A winding-type panel shutter substantially as herein described with reference to the accompanying drawings.

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