

FIREPROOF, SMOKE PREVENTION AND HEAT-INSULATING SLAT

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a fireproof, smoke prevention and heat-insulating slat, in particular to a rolling door installed in a building and cooperative with a door operator, and slats for the rolling door.

2. Description of the Related Art

[0002] It is conventional to fill fireproof materials in slats of a known fireproof rolling doors, as disclosed in Taiwanese Patent No. I371521 entitled "Door slat components, fireproof and heat-insulating door slats and rolling doors", Taiwanese Patent No. I668360 entitled "Fireproof, heat-insulating and smoke proof rolling shutter door structure", Taiwanese Utility Model Patent No. M450612 entitled "Structural improvement of heat-resistant fireproof roller door slat ", Taiwanese Utility Model Patent No. M405475 entitled "Structure of thermal insulated fireproof rolling door slat ", and Taiwanese Utility Model Patent No. M512058 entitled "Improved structure for fireproof roller door slat". However, the means applied in the above patents fail to completely prevent heat conduction, as a front metallic housing and a rear metallic housing of a slate are abutted on each other, and heat can be transferred from one of the front metallic housing and the rear metallic housing to the other of the front metallic housing and the rear metallic housing by heat conduction. As such, efficient heat insulating is not possible.

[0003] To solve the above-mentioned heat conduction problem caused by direct contact between the metallic housings, those skilled in the art have proposed numerous heat isolation technologies on rolling door slats, for example, Taiwanese Utility Model Patent No. M437372 entitled "Structure of fireproof rolling door slat", and Taiwanese Utility Model Patent No. M585827 entitled "Fire-resisting thermal isolation door slat and roll door using the same door slat". The above-mentioned heat isolation technology involves the provision of heat-insulating materials between the front and rear metallic housings. Although they may effectively prevent heat conduction, the assembly of the slats is too complicated. Screws or rivets must be used to connect the metallic housings with the heat-insulating materials so that heat may still be conducted through the screws or rivets.

[0004] Therefore, there is an urgent need to present a rolling door that is simple in construction, easy to assemble, and effective in preventing heat conduction.

SUMMARY OF THE INVENTION

[0005] The primary object of the present invention is to provide a fireproof, smoke prevention and heat-insulating slat, which is capable of completely preventing heat conduction between the front and rear housings of the slat. The rolling door having the slats would achieve the function of effective heat insulation, effectively prevent smoke from passing through the gaps between the slats, is easy to assemble, low in manufacturing cost, highly reliable and has long life span.

[0006] The fireproof, smoke prevention and heat-insulating slat comprises a first housing, a second housing, and a heat-insulating intermediate body. The first housing includes an upper hinge portion and a lower hinge portion respectively formed on opposite ends of the first housing, an upper locking portion adjacent to the upper hinge portion, and a lower locking portion adjacent to the lower hinge portion. The second housing includes a first locking portion and a second locking portion respectively formed on opposite ends of the second housing. The heat-insulating intermediate body includes an upper coupling portion and a lower coupling portion. The upper locking portion of the first housing and the first locking portion of the second housing are secured in the upper coupling portion, while the lower locking portion of the first housing and the second locking portion of the second housing are secured in the lower coupling portion, so that the heat-insulating intermediate body is sandwiched between the first and second housings. The first and second housings are isolated from each other by the heat-insulating intermediate body to block heat conduction therebetween.

[0007] The fireproof, smoke prevention and heat-insulating slat of the present invention mainly isolates the first housing from the second housing by means of a heat-insulating intermediate body, and thereby blocks the heat conduction between the two housings. Moreover, the first and second housings are directly assembled on the heat-insulating intermediate body without any auxiliary components. The construction of the invention is simple, easy to assemble, and highly reliable. Most importantly, it is fireproof and may effectively prevent heat conduction.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a cross-sectional view of a first embodiment of the fireproof, smoke prevention and heat-insulating slat according to the present invention;

FIG. 2 is a cross-sectional exploded view of the first embodiment of the fireproof, smoke prevention and heat-insulating slat of the present invention;

FIG. 3 is a partial cross-sectional view of the rolling door constituting the slats of the first embodiment;

FIG. 4 is a cross-sectional view of a second embodiment of the fireproof, smoke prevention and heat-insulating slat according to the present invention;

FIG. 5 is a partial cross-sectional view of the rolling door constituting the slats of the second embodiment;

FIG. 6 is a cross-sectional view of a third embodiment of the fireproof, smoke prevention and heat-insulating slat according to the present invention; and

FIG. 7 is a partial cross-sectional view of the rolling door constituting the slats of the third embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] The present invention is related to a fireproof, smoke prevention and heat-insulating slat. In the descriptions, similar elements will be denoted by the same reference numerals. Moreover, the drawings illustrating the present invention are only schematic and not necessarily drawn to scale, and may not show all details thereof.

[0010] Reference is to FIGS. 1 and 2, in which FIG. 1 is a cross-sectional view of the first embodiment of the fire and smoke prevention and heat-insulating slat of the present invention, and FIG. 2 is a cross-sectional, exploded view of the first embodiment of the fire and smoke prevention and heat-insulating slat of the present invention. The fireproof, smoke prevention and heat-insulating slat 1 as shown in the figures is mainly composed of three components, namely a first housing 2, a second housing 3, and a heat-insulating intermediate body 4.

[0011] The first housing 2 includes an upper hinge portion 21, an upper locking portion 23, a lower hinge portion 22, and a lower locking portion 24. The upper and lower hinge portions 21, 23 are respectively formed on opposite ends (top and bottom ends) of the first housing 2. The upper locking portion 23 is formed adjacent to the upper hinge portion 21, and the lower locking portion 24 is formed adjacent to the lower hinge portion 22.

[0012] The first housing 2 includes an upper surface 201, a lower surface 202, and a side surface 203. The upper hinge portion 21 is formed in a hook shape integrally with the first housing 2 and protrudes from the upper surface 20 in a direction away from the lower hinge

portion 22. That is to say, the upper hinge portion 21 protrudes upwards and beyond the upper surface 201. Similarly, the lower hinge portion 22 is formed in a hook shape integrally with the first housing 2 and protrudes from the side surface 203 in a direction away from the lower locking portion 24. The lower edge of the lower hinge portion 22 is flush with the lower surface 202. That is to say, the lower hinge portion 22 protrudes toward the inside of the slat.

[0013] The first housing 2 of this embodiment further includes a disengagement prevention protruding portion 25, which projects from the side surface 203 of the first housing in the same direction as the lower hinge portion 22 lies. The disengagement prevention protruding portion 25 is formed adjacent to the lower hinge portion 22 and is located higher than the lower hinge portion 22 protruding from the side surface 203. When the adjoining slats are interconnected, that is to say, when the lower hinge portion 22 of the upper slat and the upper hinge portion 21 of the lower slat are hingedly connected to each other, the protruding portion 25 serves as a stop to prevent the upper hinge portion 21 of the lower slat from disengaging from the upper opening of the lower hinge portion 22 of the upper slat, as shown in FIG. 3.

[0014] As shown in the figures, the upper locking portion 23 and the lower locking portion 24 according to this embodiment are formed by bending opposite ends of the first housing 2 in a direction towards each other. As given above, all the components of the first housing 2, such as the upper hinge portion 21, the lower hinge portion 22, the upper locking portion 23, the lower locking portion 24, and the disengagement prevention protruding portion 25 are integrally formed with the first housing and can be simply formed by bending. The manufacturing process is simple and easy.

[0015] On the other hand, the second housing 3 includes an upper surface 301, a lower surface 302, a side surface 303, a first locking portion 31, a second locking portion 32, and a smoke blocking tab 304. The first locking portion 31 and the second locking portion 32 are respectively located at two opposite ends of the second housing 3 adjacent to the upper surface 301 and the lower surface 302, respectively. Specifically, similar to the upper locking portion 23 and the lower locking portion 24 of the first housing 2 described hereinabove, the first locking portion 31 and the second locking portion 32 of the second housing 3 are also formed by bending the opposite ends of the second housing 2 in a direction towards each other.

[0016] The smoke blocking tab 304 of this embodiment protrudes from the lower surface 302 in a direction away from the upper surface 301, that is, protrudes downwardly, and beyond the side surface 303. When the adjoining upper and lower slats are interconnected, the smoke blocking tab 304 would not obstruct the connection between the upper and the lower slats and

can effectively prevent the smoke from flowing through the air gap between the adjoining upper and lower slats, as shown in Figure 3.

[0017] The heat-insulating intermediate body 4 according to this embodiment includes an upper end face 401, a lower end face 402, an upper coupling portion 41, and a lower coupling portion 42. The upper coupling portion 41 includes a first upper slot 412 and a second upper slot 413 provided on the upper end face 401. The lower coupling portion 42 includes a first lower slot 422 and a second lower slot 423 provided on the lower end face 402. Accordingly, the upper locking portion 23 and the lower locking portion 24 of the first housing 2 can be inserted into the first upper slot 412 and the first lower slot 422, respectively, while the first and second locking portions 31, 32 of the second housing 3 can be inserted into the second upper slot 413 and the second lower slot 423, respectively. That is, the first and second housings 2, 3 can be firmly attached to the opposite sides of the heat-insulating intermediate body 4 by structural mechanics. As such, the housings 2, 3 are isolated from each other and heat conduction therebetween is prevented.

[0018] FIG. 3 shows a partial cross-sectional view of a rolling door according to the first embodiment. As shown in the figure, the rolling door of this embodiment includes a series of adjoining fire and smoke prevention and heat-insulating slats 1 which are interconnected. Between the adjoining slats 1, the upper hinge portion 21 of the first housing 2 is hingedly connected to the lower hinge portion 22, and the smoke blocking tab 304 of the second housing 3 partially covers the adjacent lower slat. When the rolling door is dropped, the smoke blocking tab 304 may sufficiently cover the air gap between the two adjoining slats, thereby forming a barrier in the gap between the two slats. Such an arrangement is capable of preventing the smoke from passing through the gap between the two slats, and spreading of the smoke is avoided.

[0019] Moreover, as shown in FIG. 3, when the rolling door is dropped, the first housing 2 and the second housing 3 of this embodiment are not in contact with each other. The first housing 2 of this embodiment is only in contact with the first housings 2 of the adjacent slats 1, and the second housing 3 is only in contact with the second housings 3 of the adjacent slats 1. Therefore, when a fire occurs, the heat from either side of the slat 1 would not be transferred to the other side through heat conduction between the first and second housings 2, 3. On the contrary, the heat-insulating intermediate body 4 would efficiently block the heat conduction and achieve the effects of heat isolation and fire prevention.

[0020] In the present invention, the first and second housings 2, 3 are attached to the heat-insulating intermediate body 4 by means of slots and locking portions. Specifically, the

upper and lower locking portions 23, 24 of the first housing 2 and the first and second locking portions 31, 32 of the second housing 3 are aligned with and then inserted into the first and second upper slots 412, 413 and the first and second lower slots 422, 423 of the heat-insulating intermediate body 4, respectively. The orientation of the heat-insulating intermediate body 4 does not have to be considered. The manufacturing process for the slat according to the present invention is simple. Further, the slat according to the present invention is safe, reliable, and durable. More importantly, the slat according to the present invention is capable of effectively isolating heat transfer and preventing the spread of the smoke.

[0021] Reference is made to FIGS. 4 and 5, in which FIG. 4 is a cross-sectional view of a second embodiment of the fireproof, smoke prevention and heat-insulating slat of the present invention, and FIG. 5 is a partial cross-sectional view of a rolling door formed by the slats of the second embodiment. As shown in the figures, the main differences between the second embodiment and the first embodiment lie in that: (1) the upper coupling portion 41 and the lower coupling portion 42 have different forms; (2) smoke prevention measures, and (3) the lower hinge portion 22 of the first housing 2 is partially received in the heat-insulating intermediate body.

[0022] The upper coupling portion 41 and the lower coupling portion 42 of this embodiment comprise a wider upper groove 411 and a wider lower groove 421, respectively, which facilitate the assembly process because the upper locking portion 23 and the first locking portion 31 can be more easily inserted into the upper groove 411, and the lower locking portion 24 and the second locking portion 32 can be more easily inserted into the lower groove 421.

[0023] Furthermore, a smoke-blocking depression 33 is provided on the second housing 3 at a location corresponding to first locking portion 31. A smoke-blocking protrusion 34 opposite to the smoke-blocking groove 33 is disposed on the lower side of the second housing 3 and projects downwardly. In particular, the smoke-blocking protrusion 34 protrudes from a lower surface of the second housing 3 in a direction away from the smoke-blocking depression 33. That is to say, the smoke-blocking protrusion 34 extends downwardly from the edge of the lower surface of the second housing 3.

[0024] On the other hand, the heat-insulating intermediate body 4 is provided with a first lateral recess 43 at a location that corresponds to the lower hinge portion 22 of the first housing 2, and a second lateral recess 44 at a location that corresponds to the smoke-blocking depression 33. The first lateral recess 43 serves to partially receive the lower hinge portion 22

of the first housing 2, while the second lateral recess 44 serves to accommodate the smoke-blocking depression 33 of the second housing 3.

[0025] It should be particularly noted that in this embodiment, with reference to the cross-sectional view of the heat-insulating intermediate body 4, the first lateral recess 43 and the second lateral recess 44 are the same in dimension, opposite to each other diagonally, and are rotationally symmetrical. As such, in the course of assembling the first housing 2 and the second housing 3 on the heat-insulating intermediate body 4, one does not have to specifically place the heat-insulating intermediate body 4 at a specific orientation. One just have to simply align the lower hinge portion 22 of the first housing 2 with one of the first and second lateral recesses 43, 44, and align the smoke-blocking depression 33 of the second housing 3 with the other one of the first and second lateral recesses 43, 44. The assembling process is comparatively simple.

[0026] FIG. 5 shows a partial cross-sectional view of the rolling door formed by the slats 11 of the second embodiment. As shown in the figure, the rolling door of this embodiment includes a series of adjoining fire and smoke prevention and heat-insulating slats 11 of the second embodiment which are interconnected. Between the adjoining slats 11, the smoke-blocking depression 33 and the smoke blocking protrusion 34 of the second housing 3 are coupled with each other. When the rolling door is dropped, the smoke-blocking protrusion 34 is completely received in the smoke-blocking depression 33, thereby forming a barrier in the gap between the two slats, which can completely prevent smoke from passing through the gap between the two slats, and thus preventing the smoke from spreading.

[0027] Reference is made to FIG. 6 which is a cross-sectional view of the third embodiment of the fire and smoke prevention and heat-insulating slat of the present invention. The main difference between the third embodiment and said second embodiment lies in that each of the upper surface 301 and the lower surface 302 of the second housing 3 of this embodiment each is formed with a high shoulder 35. Each of the upper surface 201 and lower surface 202 of the first housing 2 is formed with a low shoulder 26. The upper hinge portion 21 and the lower hinge portion 22 of this embodiment are located in the middle of the upper and lower sides of the body of the slat. For each upper or lower hinge portion, a low shoulder 26 is provided at the right side while a high shoulder 35 is provided at the left right side. The upper hinge portion 21 or the lower hinge portion 22 is located adjacent to the respective lower shoulder 26.

[0028] Reference is made to FIG. 7 which is a partial cross-sectional view of the rolling door formed by the slat 111 according to the third embodiment. As shown in the figure, the rolling

door of this embodiment includes a series of adjoining fire and smoke prevention and heat-insulating slats 111 of the third embodiment which are interconnected. Moreover, in the slats connected in series, two adjacent slats are arranged to be horizontally reversed with respect to each other. As shown in FIG. 7, the upper and lower hinge portions 21, 22 of the upper slat 111 open toward the right while the upper hinge portion 21 and the lower hinge portion 22 of the lower slat 111 open toward the left. In this way, the upper and lower slats can be hingedly connected to each other.

[0029] In this embodiment, in the adjoining slats 111, the upper hinge portion 21 and the lower hinge portion 22 of the first housing 2 are hingedly connected to each other, and the high shoulder 35 of the second housing 3 and the low shoulder 26 of the first housing 2 are coupled to each other. When the rolling door is dropped, the high shoulder 35 of the second housing 3 and the low shoulder 26 of the first housing 2 may form a barrier in the gap between the two slats, which can completely prevent smoke from passing through the gap between the two slats, and thus preventing the smoke from spreading.

[0030] On the other hand, the upper hinge portion 21 and the lower hinge portion 22 correspond to the upper coupling portion 41 and the lower coupling portion 42, respectively. That is, as shown in FIG. 7, when the rolling door is dropped, the upper hinge portion 21 and the lower hinge portion 22 can be respectively accommodated in the upper coupling portion 41 and the lower coupling portion 42 and spaced from each other. Accordingly, in the adjoining slats, the first and second housings 2, 3 located on the left side of the rolling door are not in direct contact with the first and second housings 2, 3 located on the right side of the rolling door. As such, when a fire occurs, there is no heat conduction through the slats. Therefore, the transmission of heat can be efficiently blocked, and the intended effects of heat insulation and fire prevention can be achieved.

[0031] The preferred embodiments of the present invention are illustrative only, and the invention is not limited to the details disclosed in the drawings and the specification. Accordingly, it is intended that the invention is not limited to the disclosed embodiments, but that it has the full scope permitted by the language of the following claims.

What is claimed is:

1. A fireproof, smoke prevention and heat-insulating slat comprising:
a first housing having an upper hinge portion, a lower hinge portion, an upper locking portion and a lower locking portion, the upper hinge portion and the lower hinge portion being respectively formed on opposite ends of the first housing, the upper locking portion being disposed adjacent to the upper hinge portion, the lower locking portion being disposed adjacent to the lower hinge portion;
a second housing having a first locking portion and a second locking portion respectively formed on opposite ends of the second housing; and
a heat-insulating intermediate body having an upper coupling portion and a lower coupling portion, the upper locking portion of the first housing and the first locking portion of the second housing being secured in the upper coupling portion, the lower locking portion of the first housing and the second locking portion of the second housing being secured in the lower coupling portion, so that the heat-insulating intermediate body is sandwiched between the first housing and the second housing;
wherein the first housing and the second housing are isolated from each other by the heat-insulating intermediate body so that heat conduction therebetween is blocked.
2. The fireproof, smoke prevention and heat-insulating slat of claim 1, wherein the upper locking portion and the lower locking portion are formed by bending opposite ends of the first housing in a direction towards each other, and the first and second locking portions are formed by bending the opposite ends of the second housing in a direction towards each other.
3. The fireproof, smoke prevention and heat-insulating slat of claim 1, wherein the upper coupling portion of the heat-insulating intermediate body comprises an upper groove, and the lower coupling portion of the heat-insulating intermediate body comprises a lower groove; the upper locking portion of the first housing and the first locking portion of the second housing are fitted into the upper groove, the lower locking portion of the first housing and the second locking portion of the second housing are fitted in the lower groove.
4. The fireproof, smoke prevention and heat-insulating slat of claim 1, wherein the heat-insulating intermediate body is provided with a first lateral recess at a location that corresponds to the lower hinge portion of the first housing for partially receiving the lower hinge portion of the first housing.
5. The fireproof, smoke prevention and heat-insulating slat of claim 4, wherein the heat-insulating intermediate body includes a second lateral recess, the second housing includes a smoke-blocking depression corresponding to the second lateral recess, and a

smoke-blocking protrusion, the smoke-blocking protrusion is disposed opposite to the smoke-blocking depression, and protrudes from a lower surface of the second housing in a direction away from the smoke-blocking depression.

6. The fireproof, smoke prevention and heat-insulating slat of claim 1, wherein the upper coupling portion of the heat-insulating intermediate body includes a first upper slot and a second upper slot, and the lower coupling portion of the heat-insulating intermediate body includes a first lower slot and a second lower slot; the upper locking portion of the first housing and the first locking portion of the second housing are respectively inserted into the first upper slot and the second upper slot, the lower locking portion of the first housing and the second locking portion of the second housing are respectively inserted into the first lower slot and the second lower slot.
7. The fireproof, smoke prevention and heat-insulating slat of claim 1, wherein the first housing includes an upper surface, a lower surface, and a side surface, the upper hinge portion is formed in a hook shape integrally with the first housing and protrudes from the upper surface in a direction away from the lower hinge portion; the lower hinge portion is formed in a hook shape integrally with the first housing and protrudes from the side surface in a direction away from the lower locking portion, a lower edge of the lower hinge portion is flush with the lower surface.
8. The fireproof, smoke prevention and heat-insulating slat of claim 7, wherein the first housing further includes a disengagement prevention protruding portion projecting from the side surface of the first housing in the same direction as the lower hinge portion lies; the disengagement prevention protruding portion protruding from the side surface is located higher than the lower hinge portion protruding from the side surface.
9. The fireproof, smoke prevention and heat-insulating slat of claim 1, wherein the second housing includes an upper surface, a lower surface, a side surface, and a smoke blocking tab protruding from the lower surface in a direction away from the upper surface, and extending beyond the side surface.
10. The fireproof, smoke prevention and heat-insulating slat of claim 1, wherein the corresponding ends of the second housing each includes a high shoulder, and the corresponding ends of the first housing each includes a low shoulder; the upper and lower hinge portions are arranged between respective low and high shoulders, and are located adjacent to the respective low shoulders; the upper coupling portion and the lower coupling portion of the heat-insulating intermediate body are arranged between the respective low and high shoulders, and correspond to the upper hinge portion and the lower hinge portion, respectively.