Claims

1. A slat assembly for a roller shutter, the slat assembly comprising:

an insulation layer;

a slat having a first receiving portion and a second receiving portion, the slat being lined with the insulation layer, wherein the first and second receiving portions of the slat are a pair of bent portions of the slat, each of the pair of bent portions forming an acute angle;

and

a retaining mechanism having a first end and a second end, the first and second ends being opposite ends of the retaining mechanism, wherein the retaining mechanism is disposed on the insulation layer with the first end pressing a first portion of the insulation layer into the first receiving portion of the slat and the second end pressing a second portion of the insulation layer into the second receiving portion of the slat such that the first and second ends of the retaining mechanism respectively cooperates with the first and second receiving portions of the slat to hold the insulation layer between the retaining mechanism and the slat,

wherein the retaining mechanism is pre-loaded to supply an expansion force for the first and second ends of the retaining mechanism to respectively urge the first and second portions of the insulation layer against the respective first and second receiving portions of the slat.

2. The assembly as claimed in claim 1, wherein the first and second receiving portions of the slat extend longitudinally along the slat and are parallel to each other.

3. The assembly as claimed in claim 1 or 2, wherein the pair of bent portions of the slat forms a pair of grooves having a V-shaped cross-section or a U-shaped cross-section or a horse-shoe-shaped cross-section.

4. The assembly as claimed in claim 3, wherein the pair of grooves is opposing each other.

5. The slat assembly as claimed in claims 3 or 4, further comprising a first pusher member, wherein the first pusher member is disposed between the first portion of the

insulation layer and the retaining mechanism, and wherein the first pusher member is aligned with a first groove of the pair of grooves.

6. The slat assembly as claimed in claim 5, wherein the first pusher member comprises a bar with a V-shaped cross-section or a U-shaped cross-section or a horse-shoe-shaped cross-section.

7. The slat assembly as claimed in claim 5 or 6, further comprising a second pusher member, wherein the second pusher member is disposed between the second portion of the insulation layer and the retaining mechanism, and wherein the second pusher member is aligned with a second groove of the pair of grooves.

8. The slat assembly as claimed in claim 7, wherein the second pusher member comprises a bar with a V-shaped cross-section or a U-shaped cross-section or a horse-shoe shaped cross-section.

9. The slat assembly as claimed in any one of claims 1 to 8, wherein the retaining mechanism comprises an insert in the form of a strip of resilient material which has a length longer than a distance between the first and second receiving portions of the slat.

10. The slat assembly as claimed in any one of claims 1 to 9, wherein a first longitudinal edge portion of the slat is curled inwardly towards a longitudinal axis of the slat to form a first curled edge portion and a second longitudinal edge of the slat is curled outwardly away from the longitudinal axis of the slat to form a second curled edge portion.

11. The slat assembly as claimed in claim 10, wherein the first curled edge portion has a smaller curl radius than the second curled edge portion.

12. The slat assembly as claimed in any one of claims 1 to 11, wherein the insulation layer comprises a layer of insulation wool sandwiched between two layers of insulation cloths.

13. The slat assembly as claimed in any one of claims 1 to 12, wherein the insulation layer is lined across the slat and extends beyond the first receiving portion and the second receiving portion of the slat.

14. The slat assembly as claimed in claim 13, wherein the first end of the retaining mechanism presses the first portion of the insulation layer into the first receiving portion of the slat to sandwich the first portion of the insulation layer between the first end of the retaining mechanism and the first receiving portion of the slat and the second end of the retaining mechanism presses the second portion of the insulation layer into the second receiving portion of the slat to sandwich the second portion of the insulation layer between the second end of the retaining mechanism and the second receiving portion of the slat such that the first and second ends of the retaining mechanism respectively cooperates with the first and second receiving portions of the slat to sandwich the insulation layer between the retaining mechanism and the slat without the retaining mechanism being in contact with the slat.

15. The slat assembly as claimed in any one of claims 1 to 14, wherein the insulation layer is a thermal insulation layer.

16. The slat assembly as claimed in any one of claims 1 to 15, further comprising two side covers, wherein one side cover is attached to one end of the slat and wherein each side cover is configured to cover respective edge portion of the insulation layer along the respective end of the slat.

17. A roller shutter comprising:

a plurality of slats pivotally interlocked one after another to form a shutter curtain;

an insulation layer lined across at least two adjacent pivotally interlocked slats of the plurality of slats;

at least one retaining mechanism having a first end and a second end, the first and second ends being opposite ends of the at least one retaining mechanism, wherein the at least one retaining mechanism is disposed on the insulation layer with the first end pressing a portion of the insulation layer into a first receiving portion of one of

the at least two adjacent pivotally interlocked slats and the second end pressing a further portion of the insulation layer into a second receiving portion of the one of the at least two adjacent pivotally interlocked slats such that the first and second ends of the at least one retaining mechanism cooperates with the first and second receiving portions of the one of the at least two adjacent pivotally interlocked slats to hold the insulation layer between the at least one retaining mechanisms and the at least two adjacent pivotally interlocked slats,

wherein the first and the second receiving portions of the one of the at least two adjacent pivotally interlocked slats are a pair of bent portions of the one of the at least two adjacent pivotally interlocked slats, each of the pair of bent portions forming an acute angle,

wherein the at least one retaining mechanism is pre-loaded to supply an expansion force for the first and second ends of the at least one retaining mechanism to urge the respective portions of the insulation layer against the respective first and second receiving portions of the one of the at least two adjacent pivotally interlocked slats.

18. The roller shutter as claimed in claim 17, wherein the pair of bent portions of the one of the at least two adjacent pivotally interlocked slats forms a pair of parallel opposing grooves having a V-shaped cross-section or a U-shaped cross-section or a horse-shoe-shaped cross-section.

19. The roller shutter as claimed in claim 18, further comprising at least one pusher member, wherein the at least one pusher member is disposed between the insulation layer and the at least one retaining mechanism, and wherein the at least one pusher member is aligned with a groove of the pair of parallel opposing grooves of the one of the at least two adjacent pivotally interlocked slats.

20. The roller shutter as claimed in claim 19, wherein the at least one first pusher member comprises a bar with a V-shaped cross-section or a U-shaped cross-section or horse-shoe-shaped cross-section.

21. The roller shutter as claimed in any one of claims 17 to 20, wherein the at least one retaining mechanism comprises an insert in the form of a strip of resilient material which has a length longer than a distance between the first and second receiving portions of the one of the at least two adjacent pivotally interlocked slats.

22. The roller shutter as claimed in any one of claims 17 to 21, wherein the insulation layer comprises a layer of insulation wool sandwiched between two layers of insulation cloths.

23. The roller shutter as claimed in any one of claims 17 to 22, wherein the insulation layer is lined across the slat and extends beyond the first receiving portion and the second receiving portion of the one of the at least two adjacent pivotally interlocked slats.

24. The roller shutter as claimed in claim 23, wherein the first end of the retaining mechanism presses the first portion of the insulation layer into the first receiving portion of the one of the at least two adjacent pivotally interlocked slats to sandwich the first portion of the insulation layer between the first end of the retaining mechanism and the first receiving portion of the one of the at least two adjacent pivotally interlocked slats and the second end of the retaining mechanism presses the second portion of the insulation layer into the second receiving portion of the one of the at least two adjacent pivotally interlocked slats to sandwich the second portion of the insulation layer between the second end of the retaining mechanism and the second receiving portion of the one of the at least two adjacent pivotally interlocked slats such that the first and second ends of the retaining mechanism respectively cooperates with the first and second receiving portions of the one of the at least two adjacent pivotally interlocked slats to sandwich the insulation layer between the retaining mechanism and the one of the at least two adjacent pivotally interlocked slats without the retaining mechanism being in contact with the one of the at least two adjacent pivotally interlocked slats.

25. The roller shutter as claimed in any one of claims 17 to 24, wherein the insulation layer is a thermal insulation layer.

26. The roller shutter as claimed in any one of claims 17 to 25, wherein the roller shutter comprises two sets of the plurality of slats to form two shutter curtains, wherein, when in the lowered state, the two shutter curtains are spaced apart and facing each other.

27. The roller shutter as claimed in claim 26, wherein foot portions of the two shutter curtains comprise insulating blocks in an overlapping arrangement to seal a gap between the foot portions of the two shutter curtains.

28. The roller shutter as claimed in claim 26 or 27, wherein a first shutter curtain of the two shutter curtains is attached to a first drum which is driven by a first motor, and a second shutter curtain of the two shutter curtains is attached to a second drum which is driven by a second motor, wherein simultaneous driving the rotation of both the drums in a same direction in a coordinated manner rolls in or rolls out both the shutter curtains at the same time in a synchronized manner.

29. The roller shutter as claimed in claim 26or 27, wherein a first shutter curtain of the two shutter curtains is attached to a first drum which is driven by a first motor, and a second shutter curtain of the two shutter curtains is attached to a second drum which is driven by a second motor, wherein simultaneous driving the rotation of both the drums in opposite directions in a coordinated manner rolls in or rolls out both the shutter curtains at the same time in a synchronized manner.

30. The roller shutter as claimed in claim 26 or 27, wherein the two shutter curtains are attached to one single drum which is driven by a first motor, and the two shutter curtains are attached to the one single drum in a manner in which driving the rotation of the drum rolls in or rolls out the two shutter curtains at the same time in a synchronized manner.

31. The roller shutter as claimed in claim 30, wherein interlocking elements of each of the plurality of slats of each shutter curtain are configured to interlock in a manner so as to provide lateral leeway between the at least two adjacent pivotally interlocked slats such that the at least two adjacent pivotally interlocked slats may be

in a suspended mode or a stacked mode, and wherein bottom ends of the two shutter curtains are fixedly joined together.

32. A method of manufacturing a slat assembly according to any one of claims 1 to 16, the method comprising:

providing the slat having the first receiving portion and the second receiving portion, wherein the first and second receiving portions of the slat are the pair of bent portions of the slat, each of the pair of bent portions forming the acute angle;

lining the insulation layer on the slat; and

disposing the retaining mechanism having the first end and the second end on the insulation layer with the first end pressing the first portion of the insulation layer into the first receiving portion of the slat and the second end pressing the second portion of the insulation layer into the second receiving portion of the slat such that the first and second ends of the retaining mechanism cooperates with the first and second receiving portions of the slat to hold the insulation layer between the retaining mechanism and the slat,

wherein the first and second ends are opposite ends of the retaining mechanism,

wherein the retaining mechanism is pre-loaded to supply an expansion force for the first and second ends of the retaining mechanism to respectively urge the first and second portions of the insulation layer against the respective first and second receiving portions of the slat.

33. A method of manufacturing a roller shutter according to any one of claims 17 to 31, the method comprising:

providing the plurality of slats pivotally interlocked one after another to form the shutter curtain;

lining the insulation layer across at least two adjacent pivotally interlocked slats of the plurality of slats;

disposing the at least one retaining mechanism having the first end and the second end on the insulation layer with the first end pressing the portion of the insulation layer into the first receiving portion of the one of the at least two adjacent pivotally interlocked slats and the second end press the further portion of the insulation layer into the second receiving portion of the one of the at least two

adjacent pivotally interlocked slats such that the first and second ends of the at least one retaining mechanism cooperates with the first and second receiving portions of the one of the at least two adjacent pivotally interlocked slats to hold the insulation layer between the at least one retaining mechanism and the at least two adjacent pivotally interlocked slats,

wherein the first and second receiving portions of the one of the at least two adjacent pivotally interlocked slats are a pair of bent portions of the one of the at least two adjacent pivotally interlocked slats, each of the pair of bent portions forming an acute angle,

wherein the first and second ends of the at least one retaining mechanism are opposite ends of the at least one retaining mechanism,

wherein the at least one retaining mechanism is pre-loaded to supply an expansion force for the first and second ends of the at least one retaining mechanism to urge the respective portions of the insulation layer against the respective first and second receiving portions of the one of the at least two adjacent pivotally interlocked slats.