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(54) IMPROVEMENTS IN OR RELATING TO VENTILATORS

(71) We, COLT INTERNATIONAL LIMITED, a British Company of New Lane, Havant, Hampshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This inventon relates to ventilators and concerns louvred ventilators.

The object of the present invention is to provide improved arrangements for supporting louvres in a louvred ventilator.

According to the present invention a louvred ventilator comprises a plurality of parallel louvres supported by at least one mullion, to the front of the mullion, each louvre being of trough section having an intermediate longitudinal portion and longitudinal edge portions at opposite longitudinal edges thereof lying to that side of the intermediate portion adjacent the mullion, and for each louvre, fixing means on the mullion, the fixing means co-operating with said longitudinal edge portions of the louvre to tension the louvre transversely between its longitudinal edge portions and fix the louvre to the mullion.

The fixing means may comprise a pair of held apart elements in engagement respectively with said longitudinal edge portions of the louvre. The pair of elements may be part of a common bracket member fixed to the mullion. Alternatively they may be separately formed, in which case one of the elements may be formed as part of the mullion. The other element may be removably attached to the mullion. The fixing means may further comprise a strut engaged between said elements. The fixing means may also further comprise screw means rotatable to force apart said pair of elements, and the screw means may comprise a screw threaded member which acts as said strut.

In a further arrangement, the fixing means may comprise a bracket on the mullion and a screw threaded member which acts to force apart a limb of said bracket and one of the said longitudinal edge portions of the louvre upon rotation of the screw threaded member, said bracket limb engaging the other longitudinal edge portion of the louvre.

Preferably, the fixing means for each louvre also acts to lock in place a next adjacent, previously fixed one of the said louvres.

Specific embodiments of the present invention will now be described by way of example, with reference to the accompany drawings in which:

Fig. 1 is a side elevation showing the fixing of a louvre to a mullion in a ventilator according to the present invention,

Fig. 2 is a front elevation of part of the fixing shown in Fig. 1,

Fig. 3 is a front elevation of a further form of mullion which may be employed in a ventilator according to the present invention,

Fig. 4 is a side elevation of the mullion shown in Fig. 3,

Fig. 5 is a partial side elevation in cross-section of the mullion shown in Fig. 3,

Fig. 6 is a plan view of the mullion shown in Fig. 3,

Fig. 7 is a side elevation of a support bracket for use with a mullion as shown in Figs. 3 to 6 in a ventilator according to the present invention,

Fig. 8 is a view in the direction of arrow 8 in Fig. 7,

Fig. 9 is a view in the direction of arrow 9 in Fig. 7,

Fig. 10 shows a further detail of the fixture using the parts of Figs. 3 to 9 in a ventilator according to the present invention,

Fig. 11 is a side elevation showing the fixing of adjacent louvres to a mullion in a ventilator according to the present invention and employing the parts of Figs. 2 to 10,

Figs. 12 and 13 are front and side elevations respectively illustrating the fixing of two adjacent louvres to a mullion in a ventillator according to the present invention,

Fig. 14 is a front view of a fixing bracket used in Fig. 15,

[Price 33p]

Fig. 15 is a side elevation showing the fixing of two adjacent louvres to a mullion in a further ventilator according to the present invention using brackets as shown in Fig. 14,

Figs. 16 and 17 correspond respectively with Figs. 14 and 15 and illustrate a fixing arrangement for the louvres in a still further ventilator according to this invention,

Figs. 18 and 19 correspond respectively with Figs. 14 and 15 and illustrate a fixing arrangement for the louvres in a still further ventilator according to this invention,

Figs. 20 and 21 correspond respectively with Figs. 12 and 13 and illustrate a fixing arrangement for the louvres in a still further ventilator according to this invention,

Figs. 22 and 23 correspond respectively with Figs. 12 and 13 and illustrate a fixing arrangement for the louvres in a still further ventilator according to this invention,

Figs. 24 and 25 correspond respectively with Figs. 12 and 13 and illustrate a fixing arrangement for the louvres in a still further ventilator according to this invention,

Figs. 26 and 27 correspond respectively with Figs. 12 and 13 and illustrate a fixing arrangement for the louvres in a still further ventilator according to this invention, and

Figs. 28 to 35 illustrate still further embodiments of the present invention.

Referring to the accompanying drawings and first to Figs. 1 and 2 continuous louvres 14 are mounted on rigid brackets 170*a* rivetted to mullions 171 at 170*b*.

Each bracket 170*a* acts to support a single louvre 114 independently of other brackets 170*a* located upwardly or downwardly of said bracket 170*a* so that any one louvre 114 can be removed without disturbing any of the others.

Each bracket 170*a* is appropriately shaped to correspond with the shape of a louvre 114 and its profile and preferred angles are as shown in Figure 1.

A vertically extending series of the brackets 170*a* is arranged with flat upper bracket portions 170*c* in superficial contact with flat lower bracket portions 170*d*.

The louvres 114 are as described and claimed in our Patent Application No. 12370/71 (Serial No. 1,404,451). Each louvre is of metal sheet form and of trough section, having an intermediate, planar longitudinal portion 114^1 and longitudinal edge portions 101 and 102 at opposite longitudinal edges thereof and both lying to the same side of the intermediate portion 114^1.

The portion 102 of the louvre 114 shown in Figure 1 is received within an angled portion 170*e* of the appropriate bracket 170*a* in superficial contact with said angled portion. A downwardly projecting leg portion 170*f* of the bracket 170*a* is received by the portion 101 of the louvre, which is of channel formation, in contact with an internal apex of the channel.

A nut member 170*g* is secured to a portions 170*k* of the bracket 170*a* adjacent to the leg portion 170*f* and a screw 170*h* is screwed into the nut member 170*g*. The screw 170*h* extends upwardly from the nut member to engage the portion 102 of the louvre to hold the louvre 114 firmly in the bracket 170*a*.

Thus it will be realised that louvres 114 may be built up on site and locked rigidly in position in the appropriate brackets by tightening the corresponding screws, and any louvre 114 can be independently removed on loosening of the screw 170*h*.

The action of tightening the screws tensions the louvres and prevents the louvres from rattling.

The longitudinal edge portions 101 and 102 of the louvres 114 lie to that side of the intermediate longitudinal portions 114^1 adjacent the mullions and the louvres thus obscure the louvre fixings as well as overlapping one another lengthwise of the mullions so rendering the mullions substantially unapparent from the side of the louvres remote from the mullions i.e. as they are viewed from the front of the ventilator.

Additional banks of louvres may be provided behind the louvres 114 and one of these additional louvres is shown in Figure 1 at 130.

Referring now to Figures 3 to 11, these show a further form of mullion 180 and a further form of support bracket 181 for supporting each of the continuous louvres 114 on, and removably securing the individual louvres to, the mullion, locking screws 182 being used to combine with the brackets 181 and the mullion to hold the individual louvres in place.

The mullion 180 is of top-hat section (see Fig. 6) and has pressed out tabs 180*a* formed and positioned as indicated in Figs. 3 to 6 inclusive at the levels required for the louvres 114 to be attached to the mullion.

It will be understood that the mullion 180 is, in the present example, again disposed vertically and incorporated into a structure defining a ventilation opening which is to be protected by the louvres and that one or more of the mullions 180 are provided, the louvres extending continuously across the front of the mullion or mullions whereby, as viewed from the front of the ventilator, the mullions are substantially obscured from view by the louvres.

Each bracket 181 is of metal strip form, shaped and having its various straight portions bent at the angles clearly shown in Figs. 7, 8 and 9 inclusive. The bracket has, rivetted centrally to an intermediate portion 181*a* an internally screw threaded boss 181*b*.

Each locking screw 182 is threaded

adjacent its head 182*a* for a short distance only and the remainder of its shank is machined to the core diameter of the thread. This enables the screw to be inserted freely through the boss 181*b* for most of its length and assembly is therefore speeded. The shank has a conical tip 182*b* which locates in a hole 180*a*[1] in the mullion tab.

Referring to Fig. 11, once the bottom louvre 114 has been located on the bottom tab or tabs 180*a* by means which may be otherwise than as described herein and which may take any convenient form, a bracket 181, or the next bracket 181, is inserted in the hole 184 left by the tab 180*a* locating the bottom louvre in each mullion. The bracket has an end portion 181*c* which is foreshortened transversely of the bracket by notching the corners of the metal strip at 181*d*. The end portion 181*c* is inserted through a centrally disposed recess 184*a* of the hole 184 and the bracket swung downwardly to come to rest on top of the bottom louvre 114. A locking screw 182 thereafter is inserted upwardly through the boss 181*b* and then turned to engage it with the screw thread of the boss with its tip 182*b* located in the hole 181*a*[1] of the next upper tab 180*a*, in which it seats. This locks the top edge of the bottom louvre in position engaging over the bottom tab 180*a* and prevents it coming off the tab.

The next upper louvre 114 is then swung into place over said next upper tab 180*a* having been placed over the front edge of the bracket 181, the front edge of the bracket entering the channel formation 101 of the louvre. Thus, the portion 102 of the louvre passes over the tab and comes to rest behind it. The bolt 182 is then tightened as required. This has the effect of deflecting the tab 180*a* somewhat so that its upper edge engages across the front of the inturned edge 102[1] of the portion 102 of the louvre and locks the upper edge of the louvre in place. At the same time the front edge of the bracket is forced outwardly and downwardly to engage firmly in the apex of the channel form position 101. This tightens the tab and bracket in relation to the louvre, slightly tensions the louvre, and prevents any rattle.

The build-up of louvres continues in the fashion described progressing from the bottom to the top of the mullion.

The louvres 114 may be formed in two sections abutting end to end and joined at the location of the tabs 180*a*, for example along the centre line of the tab. No additional fixing means is required for the abutting ends.

Since the locking screws do not locate on the louvres, the louvres may expand and contract quite freely without distorting in this case.

Referring now to Figures 12 and 13 the construction there shown is generally as described with reference to Figures 3 to 11 except first that the front edge portion 210 of the louvres 212 is of a somewhat modified shape, as shown. However, the louvres 212 are still of metal sheet form and of trough section. The longitudinal front and rear edge portions 210 and 215, of which the rear edge portion 215 is of the same shape as before, again lie to that side of the intermediate longitudinal portion 212[1] adjacent the mullion. The louvres render the mullion substantially unapparent from the side of the louvres remote from the mullion, i.e. in the direction of arrow 220 in Figure 13.

The support brackets 225 are the same as the support brackets previously described except that they have side flanges 225*a* which strengthen the brackets against twisting.

The mullion tabs 226 are less wide than before and are formed by pressed out, rectangular portions of the sheet metal forming the top-hat sectioned mullion 221. The brackets are not foreshortened laterally by notching their corners in this case but are located laterally, directly between the side edges of the holes left by the pressed out tabs 226. Instead of machined locking screws, a rod 230 is provided in combination with a much shorter screw 231 which enters an axial bore in one end of the rod.

This simplifies and cheapens the construction particularly using louvres of greater width between their longitudinal front and rear edge portions.

Each rod and screw 230, 231 act as a strut which is adjustable lengthwise to force apart the bracket and tab. These elements are thus engaged respectively with the edge portions 210 and 215 of the louvre to tension the louvre slightly and thereby hold it tightly in place whereby any rattling is prevented.

In this construction, as before, each bracket 225, when inserted in a hole in the mullion left by one of the pressed out tabs 226 lies across the top of the rear edge portion 215 of the next adjacent previously fixed louvre 212, to lock it in place on its tab 226.

The head of the screw 231 may be of a tamper-proof shape, requirtng a special tool for removing the screw.

It will be noted that the individual fixing means for each louvre comprising a screw, rod and bracket 231, 230 and 225 is hidden from view by the louvre when the ventilator is viewed from the side of the louvre remote from the mullion i.e. in the direction of arrow 220.

In the Figs. 14 and 15 construction the tab 226*a* is formed as part of the bracket

225*a* which is provided additionally with an intermediate portion 225*b* which is secured flat against the mullion 221 as is the corresponding bracket in the arrangement described with reference to Figs. 1 and 2 by screws or rivets. The louvres and the fixing screws are as described with reference to Figs. 3 to 11.

In the Figs. 16 and 17 construction the tab 226*b* formed as part of the bracket 225*c* has a return edge which makes hooking engagement with the rear edge of the louvre. The front of the bracket is extended as at 225*d* to engage flat inside the channel formation at the front edge of the louvre. The louvres and the fixing screws are again as described with reference to Figs. 3 to 11.

In the Figs. 18 and 19 construction the support bracket 225*f* is again modified as shown so as to enable a somewhat shorter fixing screw to be used. The arrangement is otherwise as described with reference to Figs. 14 and 15.

In the Figs. 20 and 21 construction the mullion has pushed out tabs 226 as in Figs. 12 and 13. L-shaped support brackets 240 are hooked in the holes left by the tabs. The forwardly extending limbs 240*a* of the brackets are of channel section having side flanges the rear end faces of which engage against the front face of the mullion. An angle plate 242 is secured to the underside of each bracket limb 240*a* towards the front end of the limb by means of a screw 243 screwed into a unit 244 fixed to the bracket. The louvres are as described with reference to Figs. 12 and 13. When fixing a louvre in position a bracket 240 is positioned across the rear edge portion of the next lower, previously fixed louvre with the angle plate 242 hanging loosely as shown in the upper part of Fig. 21. A louvre is positioned over the next upper tab 226 and the loose angle plate 242 is positioned inside the channel formation at the front edge of the louvre. This causes the angle plate 242 to tilt into a position as shown in the lower part of Fig. 21 in which its angle is fulcrumed against the underside of the bracket. The screw 243 is then tightened thus causing the angle plate to pivot and draw the louvre tight between said next upper tab 226 and the angle plate. At the same time the louvre is pulled downwardly on to the front end faces of the side flanges of the forwardly extending limb 240*a* which are inclined so as to engage flat against the back of the intermediate portion of the louvre. As the screw is tightened the depending limb 246 of the bracket 240 is pulled tight against the back of the front wall of the mullion, the bracket tending to pivot about the upper horizontal edge of the hole left by the tab 226 across which the bracket is positioned.

In the Figs. 22 and 23 construction the angle plates 242 are replaced by S-shaped spring steel plates 250. When the screws 243 are tightened, these spring plates are extended from the front ends of the support brackets 251, to draw the louvres tight. The brackets themselves are again L-shaped and hooked in the holes left by the mullion tabs 226. The forwardly extending limbs of the brackets have depending side flanges 254 cut away as at 255 to interfit with the rear edge portions of the louvres. The construction is otherwise as described with reference to Figs. 20 and 21.

In the Figs. 24 and 25 construction the support brackets 260 are again modified to a rectangular sectioned, tapering tubular form each having a tab 261 to hook into one of the mullion holes and a pair of ears 262 to engage inside the front edge portion of the louvre. A short screw 264, screwed through a nut 265 fixed to the bracket and accessible through a hole (not shown) in the bracket, engages the tab 226. Tightening the screw causes the bracket to pivot downwards about a line of contact with the front face of the mullion thereby tensioning the louvre.

In the Figs. 26 and 27 construction the support bracket 270 is again of L-shape and is hooked through a hole in the mullion left by a mullion tab 226. The forwardly extending limb of the bracket has upwardly extending side flanges. A screw adjustable sliding foot 275 on the bracket engages the front edge portion of the louvre and is extendable by tightening the screw to tension the louvre between the foot 275 and the next upper adjacent tab 226.

Fig. 28 is a side elevation showing the fixing of two adjacent louvres to a mullion in a still further ventilator according to this invention by means employing a "SPIRE" (Registered Trade Mark) captive nut 280 as shown in detail in Figs. 29 and 30. The nut is clipped onto a support bracket 281 which may take the form of the corresponding bracket previously described with reference to Fig. 13 or Fig. 15 or Fig. 17 or Fig. 19. The screw 282 corresponds with the screw described with reference to Fig. 15 or Fig. 17 but may be replaced by a shorter screw and an extension rod as described with reference to Fig. 13.

Fig. 31 is a side elevation showing the fixing of two adjacent louvres to a mullion in a still further ventilator according to this invention. The arrangement is generally as described with reference to Figs. 12 and 13 except that the conventional nut provided on the bracket, together with the screw 231 and rod 230 are replaced by a push nut 290 (see also Fig. 32) and a plane rod 291.

The rod is pushed into position from below in the direction of arrow 292.

Figs. 33 and 35 illustrate an arrangement for a louvred ventilator according to the invention in which the louvres extend round an external corner 300. Mullions 221 are provided adjacent the corner. A sheet form louvre corner piece 301 has a corresponding trough section to fit inside each pair of continuous louvre lengths 302 which extend almost to the corner and a support bracket of any of the constructions previously described and one on each mullion 221 engages inside the corner piece to tension the corner piece 301 and thereby the louvre lengths 302 in the same manner as previously described. The corner may be made at any desired angle. Thus Figure 34 illustrates an arrangement at an internal corner 305 on the same principle.

In all the constructions described having pressed out tabs the arrangement is such that the fixing means for each louvre prevents the removal of the next lower louvre. Where support brackets are rivetted to the mullion, the brackets may be flexed to remove and attach or re-attach the louvres with the louvres untensioned.

The louvres are preferably of sheet metal construction but they may be of extruded metal or plastics material. Sheet metal louvres may be roll formed if desired.

Throughout the description of the specific embodiments it has been assumed that the mullion extends vertically and the louvres horizontally. It will be appreciated that this orientation has been adopted for the convenience of the description only and the mullion and louvres may extend at any desired angle.

An assemblage of continuous louvres as herein described may, in itself, constitute a louvred ventilator or it may constitute the front bank of louvres in a louvred ventilator having a number of banks of louvres arranged one behind the other.

WHAT WE CLAIM IS:—

1. A louvred ventilator comprising a plurality of parallel louvres supported by at least one mullion, to the front of the mullion, each louvre being of trough section having an intermediate longitudinal portion and longitudinal edge portions at opposite longitudinal edges thereof lying to that side of the intermediate portion adjacent the mullion and, for each louvre, fixing means on the mullion, the fixing means co-operating with said longitudinal edge portions of the louvre to tension the louvre transversely between its longitudinal edge portions and fix the louvre to the mullion.

2. A louvred ventilator as claimed in claim 1 wherein the fixing means comprises a pair of held apart elements in engagement respectively with said longitudinal edge portions of the louvre.

3. A louvred ventilator as claimed in claim 2 wherein the pair of elements are parts of a common bracket member fixed to the mullion.

4. A louvred ventilator as claimed in claim 2 wherein the pair of elements are separately formed.

5. A louvred ventilator as claimed in claim 4 wherein one of the elements is formed as part of the mullion.

6. A louvred ventilator as claimed in claim 5 wherein the other element is removably attached to the mullion.

7. A louvred ventilator as claimed in any preceding claim 2 to 6 wherein the fixing means further comprises screw means rotatable to force apart said pair of elements.

8. A louvred ventilator as claimed in claim 7 wherein the screw means comprises a screw threaded member which acts as a strut to force apart said pair of elements upon rotation of the screw threaded member.

9. A louvred ventilator as claimed in claim 1 wherein the fixing means comprises a bracket on the mullion and a screw threaded member which acts to force apart a limb of said bracket and one of said longitudinal edge portions of the louvre upon rotation of the screw threaded member, said bracket limb engaging the other longitudinal edge portion of the louvre.

10. A louvred ventilator as claimed in any one of claims 2 to 6 wherein the fixing means further comprises a strut engaged between said elements.

11. A louvred ventilator as claimed in any preceding claim wherein the fixing means for each louvre also acts to lock in place a next adjacent, previously fixed one of said louvres.

12. A louvred ventilator as claimed in claim 1 substantially as any one of the specific embodiments hereinbefore described with reference to, and as shown in, the accompanying drawings.

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In all the constructions described having pressed out tabs the arrangement is such that the fixing means for each louvre prevents the removal of the next lower louvre. Where support brackets are rivetted to the mullion, the brackets may be flexed to remove and attach or re-attach the louvres with the louvres untensioned.

The louvres are preferably of sheet metal construction but they may be of extruded metal or plastics material. Sheet metal louvres may be roll formed if desired.

Throughout the description of the specific embodiments it has been assumed that the mullion extends vertically and the louvres horizontally. It will be appreciated that this orientation has been adopted for the convenience of the description only and the mullion and louvres may extend at any desired angle.

An assemblage of continuous louvres as herein described may, in itself, constitute a louvred ventilator or it may constitute the front bank of louvres in a louvred ventilator having a number of banks of louvres arranged one behind the other.

WHAT WE CLAIM IS:—

1. A louvred ventilator comprising a plurality of parallel louvres supported by at least one mullion, to the front of the mullion, each louvre being of trough section having an intermediate longitudinal portion and longitudinal edge portions at opposite longitudinal edges thereof lying to that side of the intermediate portion adjacent the mullion and, for each louvre, fixing means on the mullion, the fixing means co-operating with said longitudinal edge portions of the louvre to tension the louvre transversely between its longitudinal edge portions and fix the louvre to the mullion.

2. A louvred ventilator as claimed in claim 1 wherein the fixing means comprises a pair of held apart elements in engagement respectively with said longitudinal edge portions of the louvre.

3. A louvred ventilator as claimed in claim 2 wherein the pair of elements are parts of a common bracket member fixed to the mullion.

4. A louvred ventilator as claimed in claim 2 wherein the pair of elements are separately formed.

5. A louvred ventilator as claimed in claim 4 wherein one of the elements is formed as part of the mullion.

6. A louvred ventilator as claimed in claim 5 wherein the other element is removably attached to the mullion.

7. A louvred ventilator as claimed in any preceding claim 2 to 6 wherein the fixing means further comprises screw means rotatable to force apart said pair of elements.

8. A louvred ventilator as claimed in claim 7 wherein the screw means comprises a screw threaded member which acts as a strut to force apart said pair of elements upon rotation of the screw threaded member.

9. A louvred ventilator as claimed in claim 1 wherein the fixing means comprises a bracket on the mullion and a screw threaded member which acts to force apart a limb of said bracket and one of said longitudinal edge portions of the louvre upon rotation of the screw threaded member, said bracket limb engaging the other longitudinal edge portion of the louvre.

10. A louvred ventilator as claimed in any one of claims 2 to 6 wherein the fixing means further comprises a strut engaged between said elements.

11. A louvred ventilator as claimed in any preceding claim wherein the fixing means for each louvre also acts to lock in place a next adjacent, previously fixed one of said louvres.

12. A louvred ventilator as claimed in claim 1 substantially as any one of the specific embodiments hereinbefore described with reference to, and as shown in, the accompanying drawings.

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