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(54) WEATHER STRIP FOR A DOOR OR A WINDOW

(71) We, SCHLEGEL GMBH, a company organised under the laws of the Federal Republic of Germany of Bredowstrasse 33, 2000 Hamburg 74, Federal Republic of Germany, 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:—

The invention relates to a weather strip for windows or doors, comprising a foot portion provided with a contact-bond adhesive and a pliable sealing lip. In the sealed state, a bending moment affects the sealing lip, said moment in accordance with known physical laws increasing with the distance from that edge of the lip which is subjected to the sealing force. As is known, contact-bond adhesives are not able to withstand the effects of constant tensile forces or bending moments, because such adhesives are permanently plastic and will gradually begin to loosen under the influence of such forces. In known lip seals having a foot portion that is attached by means of this type of durable adhesive, therefore, the sealing lip — as seen from the mating surface — has been disposed above the foot portion, such that the compressive line of force goes through the foot portion. In the sealed condition, the foot portion in such an arrangement will be forced against the base to which it is attached, such that the contact-bond adhesive cannot loosen. A disadvantage of such seals, however, is their thickness, which is comprised of the thickness of the foot plus the thickness of the lip, this dimension being too great to permit the use of the seal in many cases. It is true that lip seals for windows and doors do exist in which the lip is arranged alongside the foot portion, but the foot portion in such seals is then fastened permanently to the base, for example, by inserting it in a groove or by means of nails which do not loosen when the lip is subjected to bending forces. Lip seals have therefore not been completely successful in practice, especially in that wide area of application where such seals are intended to be installed by laymen.

Lip seals also have the disadvantage that the corner connections will be ineffective or fail to

seal properly if the adjacent sealing strips are not adhered together correctly, which is often the case when laymen mount such seals.

An object of the invention, therefore, is to provide a lip seal for windows and doors which can easily be attached by means of a contact-bond adhesive, which is suited for use even in cases where there is little clearance between the mounting surface and the mating surface, and which also provides a good seal in the corners.

According to the invention, there is a weather strip for a window or door, the strip having a foot portion with a contact-bond adhesive and a pliable sealing lip, the lip being of a more pliable material than the foot portion, extending over an area essentially laterally of the foot portion and consisting of a neck portion bent away from the plane of the foot portion and a tube portion at the end of the neck portion, the neck portion of the lip, in cross section, having a curved configuration such that when a force is applied to the lip transverse to the plane of the foot portion, a part of the neck portion immediately adjacent to the foot portion is first pressed against a mounting surface for mounting the strip.

This embodiment provides a seal having a number of valuable characteristics. The lip portion immediately adjacent to the foot portion, when bent even slightly and consequently when affected by even small bending forces, will press against the mounting surface/frame surface, and thus cannot transfer any greater moment of bend to the foot portion than that which occurs with its contact against the mounting surface. One thus avoids a transfer to the foot portion of the entire moment of bend, which corresponds to the force in effect with a complete compression of the lip at the edge thereof and the distance between the foot portion and the edge of the lip. Thus, only an insignificant part of this amount is transferred, and this will not affect the adherence of the adhesive. The foot portion and neck portion can be made rather thin, such that the tube portion, which effects the seal, will constitute the thickest part of the weather strip. The weather strip can therefore be used in relatively narrow joints. In addition, if the seal joint is very narrow or tight, the weather strip can be

arranged such that the tube portion lies outside the edge of the mounting surface to which the foot portion is attached. The tube portion will then be pushed in back of the plane of the mounting surface by the mating surface, thus enbaling the weather strip to be used to seal a joint whose width is barely larger than the thickness of the foot and neck portion. An especially advantageous characteristic of this new sealing strip is that it can easily (i.e. no particular practical skills are required) be installed to fit snugly and properly even in the corners. This is done by cutting into the foot portion, all the way into the neck portion, such that one can easily bend the strip and change the direction of installation for the foot portion. The tube portion, on the other hand, is not altered, but will curve softly over from the first direction to the second. This is not possible with conventional, tubeless lip seals, which, if they are bent about an axis of bend that is not parallel with the plane of the lip, will be uncontrollably deformed. The tube, conversely, has an essentially equal moment of inertia in all directions, such that one can guide it around corners or into corners without undesirable deformation.

The properties of the weatherstrip thus adapt it for installations under various conditions, including its installation by persons lacking specialized skills.

Preferably, the thickness of the foot portion is less than one-third of the outer diameter of the tube portion. With this embodiment, it will not be necessary to mitre the foot portion when laying the strip in a corner. Instead, it is sufficient merely to make a cut perpendicular to the strip's length. The cut ends of the foot portions can then be adhered one on top of the other.

The requirement that the portion of the neck which immediately adjoins the foot portion shall press against the mounting surface upon the application of even small forces, is preferably obtained in that this area of the neck protion in cross section has the same direction as the foot portion and thus lies against the mounting surface even in the relaxed state. It is especially practical that there be contact-bond adhesive not only on the foot portion, but also on the area of the neck portion that is immediately adjacent to the foot portion.

The invention will be further explained with reference to the accompanying drawings, where

Figure 1 is a cross section through the weather strip in the relaxed state,

Figure 2 is a cross section through the weather strip in the sealed state between two frame surfaces,

Figure 3 shows the weatherstrip in cross section in the sealed state between two frame surfaces having less clearance between them, and

Figures 4 and 5 show the arrangement of the weather strip in typical corners.

On Figs. 1—3, the foot portion 1 made of relatively hard material, for example, hard PVC is marked by diagonal lines to the right, while the lip made of a resilient, rubber-elastic material, for example, soft PVC and consisting of a neck portion 2 and a tube portion 3, is marked by diagonal lines to the left. The weather strip is held in place against a mounting surface 4 by means of a contact-bond adhesive 5. The mounting surface 4, for example, can be on a non-movable frame member or on a door leaf or a window casing. The facing surface, which is movable relative to the mounting surface and is indicated by reference number 6 on Figs. 2 and 3, will be called the mating surface to differentiate it from the mounting surface.

The mating surface is not shown on Fig. 1, as the door or window is assumed to be open. The weather strip is therefore in the relaxed state. The neck portion 2 is a natural extension of the foot portion 1 and in the transition area is flush with the foot portion. A part of the neck portion is attached to the mounting surface 4 by means of the contact-bond adhesive 5. One can also see on Fig. 1 that the neck portion curves out toward the tube portion 3, its convex side facing the mounting surface 4. When the tube portion 3 is moved toward the mounting surface 4 by the impingement of the mating surface, the neck portion 2 will thus gradually be forced against the mounting surface 4, and one is thus assured that no moment of bend of any significance is transferred to the foot portion 1.

A weather strip in the sealed state is shown on Fig. 2. The greater part of the neck portion 2 is then in contact with the mounting surface 4. In cases where there is only a small clearance between the mounting surface 4 and the mating surface 6, possibly less space than the thickness of the tube portion 3, it is recommended that the strip be mounted as shown on Fig. 3, where the tube portion 3 lies outside the edge 8 which delimits the mounting surface 4, such that the tube portion can be pressed partially behind the plane of the mounting surface 4. A secure seal requiring little sealing force can also be obtained in cases where the clearance between the mating surface 6 and the mounting surface 4 is approximately equal to the thickness of the foot portion 1 or neck portion 2. As these parts can be made to have a thickness of less than 1 mm in practical embodiments, and as there is sufficient room outside the edge 8 on nearly all doors and windows for the tube portion 3, the new weather strip can be used to solve almost any kind of sealing problem. It should be noted that in one practical embodiment the tube portion can have an outer diameter of only about 3 mm, for example.

When guiding the weather strip around a corner, a cut is made through the foot portion 1 at the position indicated on Fig. 4 by reference number 9, and this cut may be extended

into the neck portion 2. The cut can extend as far as to the tube portion 3. One can of course also make a mitre cut. However, if the simple straight cut 9 is chosen, the cut ends of the foot portion and partially the neck portion are adhered one on top of the other, as indicated by reference number 10. The tube portion will form a soft curve and will not lose its sealing ability in the corner. Figure 5 shows a corresponding corner formation with the strip bent in the opposite direction.

WHAT WE CLAIM IS:—

1. A weather strip for a window or door, the strip having a foot portion with a contact-bond adhesive and a pliable sealing lip, the lip being of a more pliable material than the foot portion, extending over an area essentially laterally of the foot portion and consisting of a neck portion bent away from the plane of the foot portion and a tube portion at the end of the neck portion, the neck portion of the lip, in cross section, having a curved configuration such that when a force is applied to the lip transverse to the plane of the foot portion, a part of the neck portion immediately adjacent to the foot portion is first pressed against a mounting surface for mounting the strip.

2. A weather strip according to claim 1, wherein the thickness of the foot portion is less than one-third of the outer diameter of

the tube portion.

3. A weather strip according to claim 1, wherein the part of the neck portion immediately adjoining the foot portion has, in cross section, the same direction as the foot portion.

4. A weather strip according to claim 3, wherein the foot portion and the immediately adjacent part of the neck portion have a contact-bond adhesive thereon.

5. A weather strip substantially as herein described with reference to the accompanying drawings.

6. A sealing arrangement for a window or a door having two frame members movable relative to one another, one of the frame members having a weather strip, in accordance with claim 1, mounted on a mounting surface delimited by an edge, the weather strip being attached to the mounting surface so that when a tube portion is outside the surface and the delimiting edge associated with the mounting surface.

7. A sealing arrangement for a window, or a door, the arrangement being substantially as herein described with reference to the accompanying drawings.

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For the Applicants

Fig.1

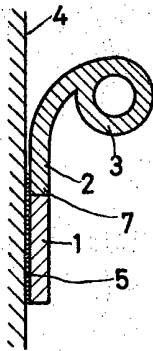


Fig.2

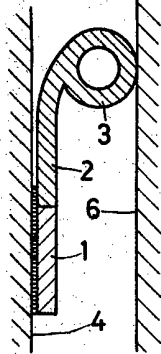


Fig.3

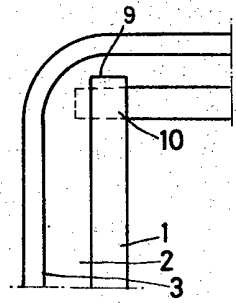
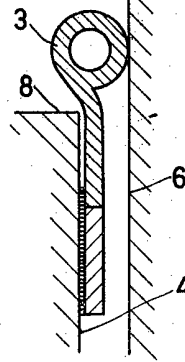


Fig.4

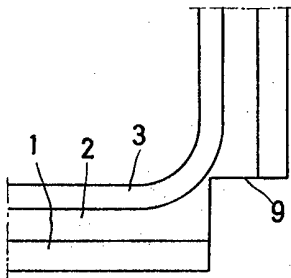


Fig.5