

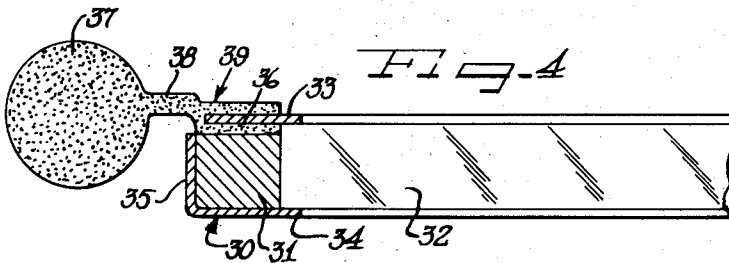
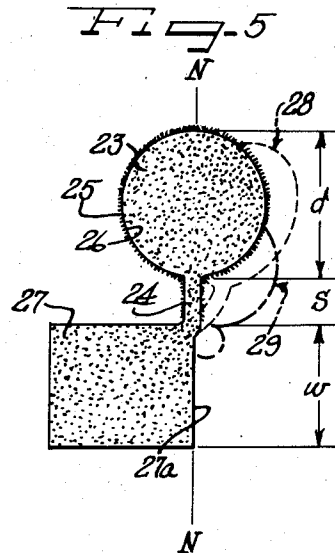
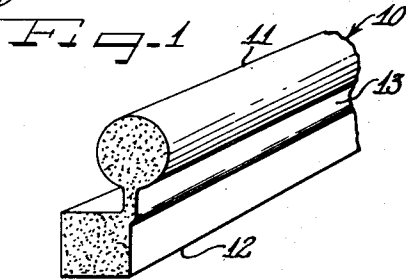
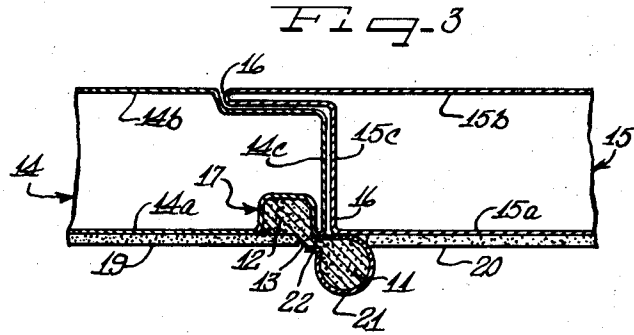
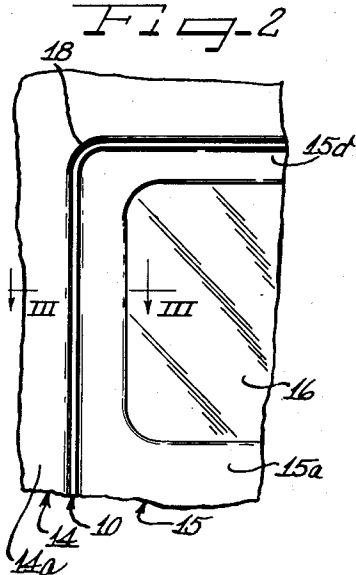
Oct. 20, 1953

J. CHALIK ET AL

2,655,698

WEATHERSTRIP CONSTRUCTION

Filed Oct. 3, 1951



Inventors

John Chalik

Peter G. Torosian

By *Niel, Sherman, Meier, Gross & Simpson Attys*

UNITED STATES PATENT OFFICE

2,655,698

WEATHERSTRIP CONSTRUCTION

John Chalik, La Porte, Ind., and Peter G.
Torosian, Chicago, Ill.

Application October 3, 1951, Serial No. 249,474

8 Claims. (Cl. 20—69)

1

Our invention is directed to an improved weatherstrip construction and relates particularly to such a construction which is to be configured to irregular contours by curving the same therearound.

Although various weatherstrip constructions have been suggested heretofore in the art, the construction which has enjoyed almost exclusive use in the automobile industry involves a separably attached bead and fabric wrapping member. The bead is made from suitably resilient and compressible material and is wrapped by a fabric which is stitched together at one side of the bead so as to form a radially extending flange-like member which may be secured in position by use of tacking strips, clip buttons, adhesive or other fasteners.

In the foregoing construction the bead member may be bent to conform to various desired contours and the flange-like portion may then be tacked or clipped in place to maintain the particular configured position of the bead. The securing operation is, however, an additional step which leaves something to be desired from a commercial point of view in a weatherstripping procedure.

It is an important object of our invention to provide a weatherstripping construction which may be suitably secured in place without the use of tacking or clipping operations heretofore employed.

It is another object of our invention to provide a weatherstripping construction such that may be configured to conform to irregular contours without undesired distortion thereof.

It is a further object of our invention to provide a weatherstripping construction involving the use of suitably resilient and compressible material which may be bent without losing its effectiveness as a weatherstripping material, particularly with regard to distortion thereof caused by lateral expansion of compressed parts.

In the bending of a resilient, compressible material of the above character for the purposes above set forth, one of the difficulties encountered arises from the fact that the inner portion thereof is compressed during the bending action while the outer portion is stretched or elongated. As a result of this action an undesirable weather sealing arrangement may be attained since the compressed inner part at the curve tends also to be compressed laterally outside of the normal confines of the side of the weatherstrip, or alternatively, the bending of the material may cause such extreme compression at the bent portion thereof that the material at that portion is

2

unable to function suitably as weather seal or weatherstrip over that portion of a crack or opening which the weatherstrip has been bent to conform with. In either case, the result obtained is undesirable.

It is another important object of the present invention to provide an integral weatherstrip comprising a bead and a base strip joined together by a web in such a manner as to avoid the above mentioned difficulties.

It is yet another object of the present invention to provide an improved weatherstrip construction having an integral body of material characterized by the presence of interstices and yet which is so constructed that moisture and the like cannot penetrate such interstices, thus to enhance the deterioration thereof.

It is yet a further object of the present invention to provide an improved weatherstrip construction, made from resilient and compressible material, which may be formed in elongated strips that may be bent so that the part thereof, which is normally compressed during the bending operation, will undergo substantially longitudinal compression, without expanding laterally thereof to an appreciable extent and without compressing longitudinally to so great an extent that the weatherstrip fails to function suitably.

It is still another object of the present invention to provide a weatherstrip construction comprising an integral bead-web-and-base strip assembly having a uniform composition throughout, and made from a resilient and compressible material.

In accordance with the general features of our invention there is provided herein an improved weatherstrip construction made from a suitably resilient and compressible material such as sponge rubber or the like that may be cut into an integral elongated form having a bead and a base strip connected by a relatively thin web extending radially of the bead.

Other objects and advantages of the invention will become apparent from the following description and accompanying drawings of preferred embodiments thereof, in which:

On the drawings:

Figure 1 is a view in perspective of a form of weatherstrip construction embodying our invention;

Figure 2 is an elevational partial view of an automobile door post and closed door, taken from the inside of the automobile, showing the weatherstrip construction of the instant invention suitably mounted for use on the door post;

Figure 3 is enlarged sectional plan view taken substantially on the line III—III of Figure 2;

Figure 4 is an enlarged sectional plan view, showing the position of another preferred weatherstrip construction of the invention, adapted for use in automobile door and post construction such as those used in convertible automobiles; and

Figure 5 is an enlarged cross-sectional view of another weatherstrip construction preferred for use in the invention.

As shown on the drawings:

The reference numeral 10 indicates generally the weatherstrip construction of Figure 1. The weatherstrip construction 10 constitutes an elongated strip of a suitably resilient and compressible material, such as sponge rubber. Preferably, the weatherstrip construction 10, which it can be seen constitutes an integral body of sponge rubber material, is extruded or otherwise prepared in a single process step from a sponge rubber material of substantially uniform composition. In other words, the weatherstrip construction 10 does not require the use of materials therein of varying or different compressibility at different portions of the weatherstrip construction 10. Instead, the desired strength characteristics of the different portions or members of the weatherstrip construction 10 are obtained by a certain alteration in the cross-sectional size and shape which will be explained hereinafter in detail.

In general, the weatherstrip construction 10 comprises an integral bead-web-and-base strip assembly, wherein there is a generally cylindrically-shaped bead 11, a generally quadrilaterally cross-section base strip 12 extending longitudinally of the bead 11 and spaced radially therefrom, and a web 13 integral with the bead 11 and the strip 12 and extending therebetween radially from the bead 11 to the strip 12. The web 13 is relatively thin compared to the bead 11 and the strip 12.

Referring to Figures 2 and 3, in a standard automobile a door post 14 is vertically mounted on the automobile so that the inside wall 14a thereof forms a part of the continuous inside wall of the automobile and the outside wall 14b thereof forms a continuous part of the outside wall of the automobile. The automobile door 15 cooperates with the door post 14 so that its inside wall 15a cooperates with the door post inside wall 14a to form a substantially continuous surface portion of the inner wall of the car when the door is closed. The outside door wall 15b likewise cooperates with the outside post wall 14b to form a substantially continuous portion of the outside wall of the automobile, when the door is closed. The door 15 also has a window 16 suitably mounted therein.

As best shown in Figure 3, when the door 15 is in closed position, there is an opening between the contiguous faces 14c and 15c of the post 14 and the door 15, respectively. It can be readily appreciated that the opening 16 between the contiguous faces 14c and 15c affords a passageway for wind, rain and the like to enter the automobile, as well as heat to escape therefrom. The instant weatherstrip construction 10 is designed to effectively weatherstrip or weather seal the opening 16.

The door post 14 contains a generally rectangularly cross-sectioned groove 17 which extends closely adjacent the opening 16 (the contiguous face 14c being therebetween) along the vertical inner wall 14a of the door post 14 to the full

height of the door 15 and then turning 90° at 18 (Figure 2), extends horizontally in the inner wall of the automobile adjacent to the top 15d of the door 15, which forms an opening with the car wall that is substantially of the same structure as the opening 16, as shown in Figure 3.

Heretofore, the groove 17 was ordinarily filled with a material such as hard vulcanized rubber which was suitable for firmly mounting clips or for receiving tacks. The fabric wrapped bead portion heretofore used was suitably secured to the hard rubber in the groove 17 by the use of such clips or tacks mounted in a flange-like stitched seam extending radially from the bead to the hard rubber material in the groove 17. Covered rag board members 19 and 20 were suitably mounted on the inner post wall 14a and the inner door wall 15a respectively. Ordinarily, the post rag board member 19 was employed to cover or conceal the clips or tacks used to secure the stitched fabric flange portion to the hard rubber in the groove 17.

In the use of the instant weatherstrip construction 10, as shown in Figure 3, the base strip 12 is placed in the groove 17 so that the web 13 extends in the direction of the door 15 and may or may not overlie at least partially the opening 16. The bead 11 mounted as it is on the web 13 thus overlies the portion of the inner door wall 15a that is adjacent the opening 16 and the bead 11 is resiliently urged by the web 13 against the inner door wall 15a, so as to effectively weather seal the opening 16.

It can thus be seen that the instant weatherstrip construction 10 is adapted to weather seal the opening 16 between the contiguous faces 14c and 15c of a door post 14 and the closed door 15, respectively, in an automobile at the inside continuous surface formed by the inner post wall 14a and the inner door wall 15a. The weatherstrip construction 10 comprises an integral bead-web-and-base strip assembly made of a resilient material of substantially uniform composition and compressibility, the base strip 12 being adapted to securely mount the weatherstrip on the door post 14 (in the groove 17 therein) adjacent the opening 16 and is substantially flush with the continuous surface of the inner walls 14a and 15a. The bead 11 is adapted to be mounted so as to overlie the continuous door surface 15a. The web 13 extends radially from the bead 11 to the base strip 12 so as to complete the weather seal across the opening 16 and, in addition, so as to resiliently urge the bead 11 into contact with the inner door wall or surface 15a.

The base strip 12 may be mounted in the groove 17 in a number of ways, including the ordinarily expedient method, such as the use of an adhesive to cause the base strip 12 to adhere to the inner walls of the groove 17. On the other hand, an additionally advantageous feature of the instant invention resides in the fact that the base strip 12 is compressible and, as such, the base strip 12 may be made appreciably larger than the groove 17 into which it is to fit and then forced into the groove so as to obtain an extremely sturdy mounting, particularly when the strip 12 is clamped into the groove 17 by means of rag board 19. Also, if the base strip 12 is made slightly wider than the groove 17 (i. e., the dimension of the strip that extends radially of the bead is increased beyond the actual width of the groove 17), a forced fit may be employed to hold the weatherstrip construction 10 in position at least tem-

5

porarily during assembly, perhaps for the purpose of permitting an adhesive to dry so as to secure the strip more permanently to the walls of the groove 17. It should also be noted that the strip 12 may be readily removed from the groove 17 by the use of ordinary prying instruments and/or suitable solvent for the adhesive, should it be necessary to replace a worn out weatherstripping.

As is shown in Figure 3, the weatherstrip construction 10 of the instant invention is particularly well adapted to receive and retain a fabric wrapping 21 about the bead 11 and, preferably, over a portion of the web 13. Since it is ordinarily desirable to design automobiles from an ornamental point of view according to a predetermined color scheme, the automobile manufacturer usually prefers to install all of the upholstery. The instant weatherstrip construction 10 is particularly suited for that purpose. Heretofore, the fabric wrap for the bead was a necessary part of the original weatherstrip construction, since it carried the means whereby the bead was to be secured to the hard rubber base strip. Accordingly, the automobile manufacturer was required to purchase his weatherstripping construction from a jobber who either might not have the proper color or texture of fabric wrap or might himself be inconvenienced by the necessity of maintaining a substantial stock of different types of fabric wrapped weatherstrip bead.

In contrast, in the instant invention there is a very great advantage as far as the jobber is concerned, in that he need produce only one kind of weatherstrip construction, and also as far as the automobile manufacturer is concerned in that he has complete freedom in the selection of the particular type of fabric he wishes to use as a wrap for the bead 11. Moreover, the automobile manufacturer is ordinarily in a more advantageous position to apply the fabric wrap to the bead 11, since the application of the wrap 21 and the stitching thereof, at 22, is most suitably done by the upholsterers in the employ of the automobile manufacturer.

It can also be seen that the web 13 performs the additional useful function of furnishing a relatively thin portion in the weatherstripping which can be readily penetrated by a stitching needle so as to stitch the fabric wrap to the opposite side of the web 13.

An additional important feature of the instant invention resides in the fact that, since the bead-web-and-base strip assembly is an integral sponge rubber body which can be made in a single fabricating step, for example, by extrusion, it is possible to employ fabricating methods such that the outer skin of the weatherstrip construction 10 is a continuous relatively smooth surface. As shown in Figure 5, the continuous relatively smooth skin or surface of the bead 23 and the web 24 of the embodiment of the invention shown in Figure 5 may be very readily and uniformly coated with flock 25 which may be caused to adhere to the bead 23 and the web 24 by means of an adhesive at the surfaces thereof, for example, at 26. Recently, the use of flock upholstery has had a great deal of commercial acceptance because of the economic feature thereof. The instant weatherstripping construction is, of course, particularly suitable to the use of flock upholstery; whereas the fabric wrapped prior art structures were wholly unsuitable therefor.

6

Referring again to Figure 5, which shows an enlarged cross-sectional view of a bead 23, a web 24 and a base strip 27 integrally formed in accordance with the principles of the instant invention, it can be seen that the base strip 27 has a cross-section in the general form of a parallelogram. In fact, the base strip cross-section is preferably substantially square so as to conform with the general contour of the groove 17. The width w of the strip 27, which is essentially that width necessary to conform with the width of the groove 17, is preferably about one-half inch. The diameter d of the bead 23 is, likewise, preferably about one-half inch. The width s of the web 24, or the space by which the web separates the bead 23 and the strip 27 is preferably about one-eighth inch.

It can be seen that in the construction of Figure 5 a line may be drawn through the center of the bead 23 which passes substantially through the middle of the web 24 and along one surface 27a of the strip 27. It can thus be seen that the web 24 extends radially from the bead 23 and, preferably, also in substantially the same plane as that of one of the surfaces 27a of the strip 27. When the strip 27 is placed in the groove 17 and the rag board 19 is placed over the top of the groove 17 and adjacent the strip surface 27a, the normal position of the bead 23 as urged by the web 24 would be interfered with by the inner door wall 15a when the door 15 is closed. Accordingly, when the door 15 is closed the actual position of the bead 23 is represented in part by the dotted line designated by the reference numeral 28. It is apparent that when the bead 23 is in the position designated by the reference numeral 28, the web 24 tends to urge the bead 23 back to its original position and, therefore, to urge it against the inner door wall 15a.

Another important aspect of the instant invention resides in the fact that the web 24 is so designed that, during the bending of the weatherstrip construction of the invention to 90°, for example, at the point designated by the reference numeral 18 in Figure 2, the web 24 collapses completely as the first step in the longitudinal compression of the weatherstrip construction. In other words, the longitudinal axis of the weatherstrip construction may be considered to extend longitudinally of the bead 23, the web 24, or the strip 27. However, for the purposes of the instant invention, the longitudinal plane of the weatherstrip construction passes through the cross-section of the weatherstrip construction along a center line N—N, as shown in Figure 5, which passes through the center of the bead, the central portion of the web and along the surface of the strip designated at 27a. The center line N—N extends radially of the bead 23 and, accordingly, compression tending to urge the bead 23 toward the strip 27 is herein designated "radial compression." It is apparent that radial compression results from the combination of longitudinal compression of the bead 23 and longitudinal tensioning of the strip 27, since the instant weatherstrip construction is so bent during use that the bead 23 is at the inner portion of the curved or bent construction and the strip 27 is at the outer portion of the curved or bent construction. The net result is that the bead 23 and the web 24 assumes substantially the position outlined in the heavy dot-dash line designated by the reference numeral 29 of Figure 5. Referring to the reference numeral 29 it

may be seen that the web 24 has been collapsed completely and that the bead 23 and the strip 27 have been urged substantially into contact. However, it can also be seen that the bead 23 is resiliently urged by the collapsed web 24 so that the bead 23 continues effectively to form a weather seal over the opening 16. Moreover, the bead 23 does not move laterally any farther than the inner door wall 15a pushes the bead 23.

It has been found that, in order for the web 24 to function suitably for the purposes hereinbefore described, the web should be from about 0.2 to about 0.1 of the bead diameter in thickness and should separate the bead from the strip by from about 2 to about 3 times its thickness. In the preferred structure of the invention wherein the bead diameter is about one-half inch, it has been found that the web thickness is preferably about one-sixteenth of an inch.

Preferably, the web is so designed with respect to the bead and the strip that the web resiliently, but collapsibly, separates the strip and the bead by substantially the decrease in the radial dimension on the weatherstrip structure that is effected by bending the weatherstrip 90° in the plane of the web i. e. in the plane N—N in which the web normally extends radially of the bead. At least, the web is so designed that bending of the weatherstrip 90° in the plane of the web can be accomplished without causing the bead to be compressed against the strip to such an extent that it fails to close the opening normally present between the contiguous faces of the door post and closed door in an automobile.

Referring to Figure 4, wherein an embodiment of the instant invention is shown suitably mounted for use as a weatherstrip means in a "convertible" automobile. As is well known in the convertible automobile construction the customary door post structure extends just up to the lower edge of the car window. Figure 4 shows a plan sectional view of the portion of the door post 30 which extends upwardly above the lower window edge in such a convertible automobile construction. The vertically extending door post 30 consists of a vertically extending substantially square cross-sectioned support post 31 which is positioned adjacent one edge of the window glass 32 and which has mounted thereon clamping members 33 and 34. The clamping members 33 and 34 may be secured to the post 31 by any suitable means and such members extend beyond the surface of the post 31 adjacent the window glass 32 so as to rigidly clamp the opposite side of the pane of glass 32 to secure the same in position. The outer clamping member 34 is bent 90° around the support member 31 so as to form a flange portion 35 extending vertically along the support member 31. The flange member 35 is comparable to the contiguous face 14c of the door post 14 of Figure 3, in that the opening, which is to be weather sealed in the structure of Figure 4, will be defined on one side by the flange portion 35. The inner clamping member 33, which may be suitably mounted on the support post 31 by means of spaced screws (not shown), is so positioned that it defines in conjunction with one vertically extending surface of the support post 31 a groove 36.

In the embodiment of the invention shown in Figure 4 the bead 37 cooperates with the web 38 in substantially the same manner as that hereinbefore described. Also, the bead 37 and the web 38 cooperate with the strip 39 in substantially the same manner as that hereinbefore de-

scribed. However, the strip 39 has a generally U-shaped cross-section so that it may be suitably bent on either side of the inner clamping member 33 having one-half of the strip 39 positioned in the groove 36 and the other half positioned on the side of the clamping member 33 opposite the groove 36. The instant embodiment demonstrates the versatile feature of the instant invention, in that the strip member may be altered to conform with the particular shape or size of the mounting and groove that may be employed, as well as any particular shape that might be desired that does not involve placing the strip member entirely within a groove mounted on a door post.

It can be appreciated that in the embodiment of the invention shown in Figure 4, the bead 37, the web 38 and the exposed portion of the strip 39 could all be suitably coated, for example, with flock as shown in Figure 5, with a fabric as shown in Figure 3 and with a combination of fabric and flock, if desired. It can also be appreciated that ordinary modification of the embodiment shown, for example, a construction such as that of Figure 3, wherein the fabric is adhered to the bead instead of stitched to the web might be used in the practice of the instant invention.

On the other hand, the embodiment of Figures 3 and 5 are particularly suitable for use in the instant invention, for the reason that each of such embodiments is so designed that the coating or protective material for the bead permits a minimum of distortion thereof during the bending of the weatherstrip construction. It is, of course, clear that the flock coating mounted as it is on the resilient rubber surface will in no way increase or complicate the forces tending to cause distortion of the bead during bending. It can also be seen that in the structure of Figure 3 the fabric, which is itself non-elastic, is attached fixedly only to the web and, accordingly, a certain amount of slippage is permitted between the bead 11 and the fabric 21 at sharp bends in the structure.

It can also be appreciated that suitably resilient skin might be applied to the surface of the instant weatherstrip construction for purposes of ornamentation or additional protection; however, the use of such resilient skin is not necessary for the essential functional purposes of the construction. Likewise, should additional strength be desired in the instant construction, suitably resilient strengthening fabrics or similar materials might be embedded in the integral sponge rubber body; however, such reinforcing materials must not be of such strength or character that they interfere with the critical function of the web.

It will, of course, be understood that various details of construction may be otherwise modified through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

We claim as our invention:

1. As an article of manufacture, a weatherstrip comprising an integral sponge rubber body which comprises a circular cross-sectioned head, a rectangularly cross-sectioned base strip of substantially the same cross-sectional area and a connecting web therebetween extending radially from said head in substantially the same plane as that of one of the surfaces of said base strip and connected to said rectangularly cross-sectioned

tioned strip at a corner thereof, said web being from 0.2 to 0.1 of the bead diameter in thickness and separating said bead from said base strip by from 2 to 3 times the web thickness.

2. As an article of manufacture, a weatherstrip comprising an integral sponge rubber body which comprises a bead, a rectangularly cross-sectioned base strip of substantially the same cross-sectional area, and a connecting web therebetween extending radially from said bead to said rectangularly cross-sectioned base strip at a corner thereof, said web separating said bead from said base strip by about one-fifth of the bead thickness.

3. In combination, a vehicle frame having an opening therein, a generally rectangularly cross-sectioned groove extending angularly around a corner of said opening in the frame, a weatherstrip including a generally rectangularly cross-sectioned base strip disposed completely within said groove, a bead overlying said opening and a thin web extending radially from said bead and connecting said bead with said base strip at one corner of the rectangular cross-section thereof; said bead, said web and said base strip being integrally formed of a resilient compressible material and said web separating said base strip and said bead by substantially the decrease in the radial dimension of said weatherstrip that is effected by bending the weatherstrip 90° in the plane in which the web normally extends radially of the bead.

4. In combination, a vehicle frame having an opening therein, means including spaced generally parallel wall members defining a rectangularly cross-sectioned groove extending angularly around a corner of said opening in the vehicle frame, and an integral body of resilient uniformly compressible material consisting of a weatherstrip bead and a rectangularly cross-sectioned base strip therefor and connected thereto by a relatively thin web extending radially of the bead and from one corner of the rectangular

cross-section of the base strip, said base strip being normally slightly wider than the space between said groove walls and being retained between said walls and completely within said groove under compression.

5. In the combination, a door post and a closed door in a vehicle defining an opening between contiguous faces thereof, a generally rectangularly cross-sectioned weatherstrip retaining groove in said door post closely adjacent said opening, a sponge rubber weather strip comprising a circularly cross-sectioned bead, a quadrilaterally-shaped base strip spaced radially from the bead and snugly and completely fitting in the retaining groove, and a web integral with said bead and said base strip and extending radially from said bead to connect with said base strip at the corner at the top of the groove adjacent said opening and so extending a sufficient distance to permit bending of the weatherstrip 90° in the plane in which the web normally extends radially of said bead without causing the bead to be compressed against the base strip more than the width of said opening.

6. A combination as claimed in claim 5 wherein said bead is wrapped in a protective fabric.

7. A combination as claimed in claim 6 wherein said fabric is stitched to said web.

8. A combination as claimed in claim 5 wherein said bead and said web are coated with flock.

JOHN CHALIK,

PETER G. TOROSIAN.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
Re. 19,416	McCormick	Jan. 8, 1935
1,613,044	Marshall	Jan. 4, 1927
2,033,436	McCormick	Mar. 10, 1936
2,099,912	Travis	Nov. 23, 1937
2,347,159	Spraragen	Apr. 18, 1944