April 12, 1949. C. B. DOTY 2,466,935

WEATHERSTRIPPING

Filed Aug. 28, 1944 2 Sheets-Sheet 1

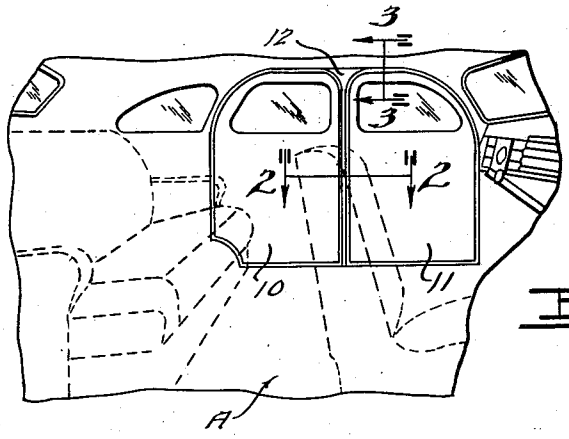

Fig. 1.

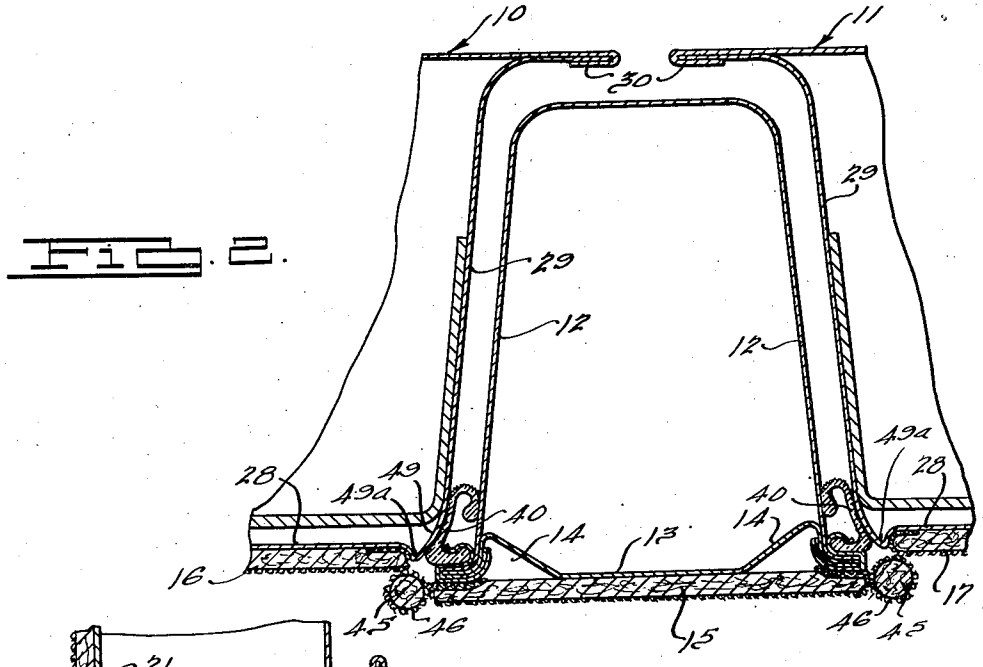

Fig. 2.

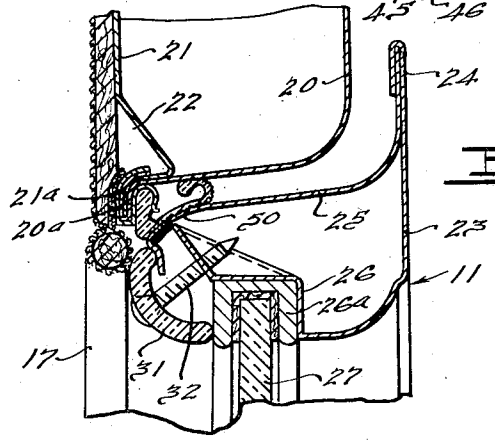

Fig. 3.

INVENTOR.
Clifford B. Doty.
BY
Gray & Smith
ATTORNEYS.

April 12, 1949. C. B. DOTY 2,466,935

WEATHERSTRIPPING

Filed Aug. 28, 1944 2 Sheets-Sheet 2

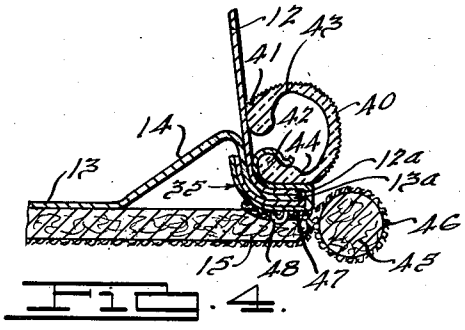

Fig. 4.

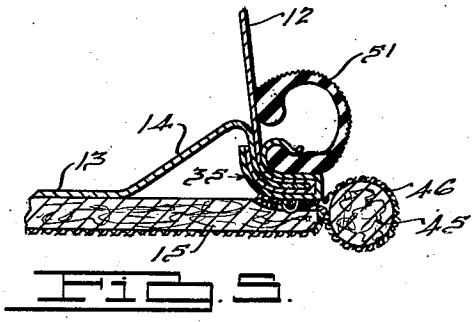

Fig. 5.

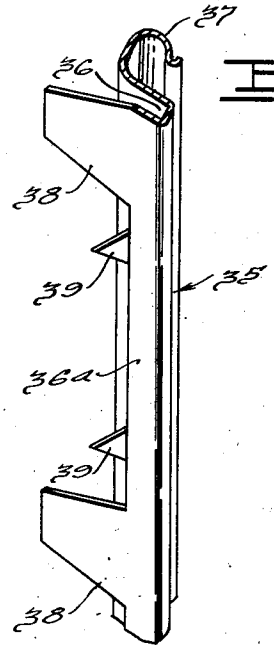

Fig. 6.

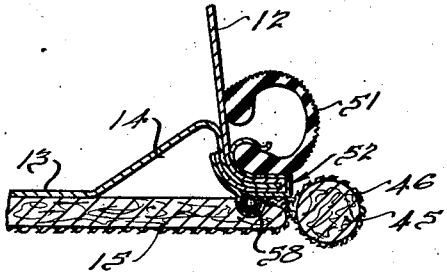

Fig. 7.

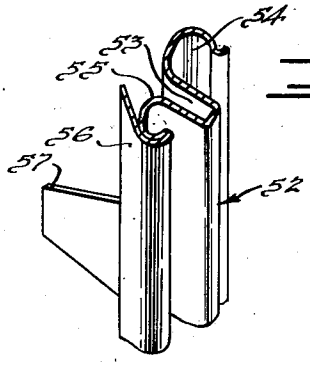

Fig. 8.

INVENTOR.
Clifford B. Doty.
BY
Gray & Smith
ATTORNEYS.

Patented Apr. 12, 1949 2,466,935

UNITED STATES PATENT OFFICE

2,466,935

WEATHER STRIPPING

Clifford B. Doty, Detroit, Mich., assignor to Briggs Manufacturing Company, Detroit, Mich., a corporation of Michigan

Application August 28, 1944, Serial No. 551,577

14 Claims. (Cl. 296—44)

1

This invention relates to weatherstripping adapted particularly, although not exclusively, for use around the door openings of motor vehicle bodies and the like to seal the spaces or joints between the doors and the adjacent portions of the body around the door openings.

One of the objects of the present invention is to provide improved means of a yieldable or elastic nature for effecting a seal around a door opening, when the door is closed, such means being easy to install and having the advantage of providing substantially uniform contact with the door and door frame along spaced parallel lines whereby a single means is capable of providing an adequate and efficient seal.

Another object of the invention is to provide an improved elastic or yieldable weatherstrip means for a door capable of providing sealing engagement with the door frame over a substantial area while also being of such construction as to accommodate variations in the clearance between the door and frame consequent to tolerance variations in production.

Still another object of the invention is to provide retainer means for supporting an elastic or yieldable weatherstrip which may be inexpensively manufactured and quickly and easily installed on the door.

A further object of the invention is to provide improved weatherstrip means comprising as a unit a metallic retainer strip and an elastic or yieldable weatherstrip carried thereby, which unit may be quickly installed on the vehicle door by means of deformable metallic elements carried by the retainer strip at spaced points in its length and adapted to be bent or clinched into position along an edge of the door.

Still a further object of the invention is to construct the metallic retainer strip in such improved manner as to provide means for attaching a windlace or weather cord in position adjacent the elastic weatherstrip, the retainer strip being also preferably constructed with reversely formed channels or grooves, one to receive the weatherstrip and the other to embrace or fit over a flange or edge member on the inner edge of the door frame jamb projecting into the door opening.

Another object of the invention is to provide an improved weatherstrip or seal which can be

2

readily installed in the body without necessitating any structural change in the body parts to which it is applied; and one in which the metal attaching and supporting means or members can be deformed or bent into gripping engagement with the body parts, as by means of a blow from a hammer or other suitable tool.

A further object of the present invention is to provide improved weatherstripping or sealing material which is of relative simple construction and which can be manufactured at relatively low cost and applied or installed with ease and facility.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a fragmentary perspective view of the interior of a motor vehicle body illustrating one application of the present invention.

Fig. 2 is an enlarged horizontal sectional view taken substantially through lines 2—2 of Fig. 1 looking in the direction of the arrows.

Fig. 3 is an enlarged fragmentary vertical sectional view taken substantially through lines 3—3 of Fig. 1 looking in the direction of the arrows.

Fig. 4 is an enlarged fragmentary horizontal section, in part similar to Fig. 2, illustrating the use of a resilient or yieldable weatherstrip formed of synthetic plastic material.

Fig. 5 is a view similar to Fig. 4 illustrating the use of a weatherstrip formed of resilient or yieldable rubber material.

Fig. 6 is a fragmentary perspective view of one form of metallic retainer strip.

Fig. 7 is a view similar to Fig. 5 but illustrating a modification in the manner of attaching the windlace or wind cord in position.

Fig. 8 is a fragmentary perspective view of the retainer strip used in the embodiment of Fig. 7.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and

of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the drawings I have illustrated, by way of example, certain embodiments of the present invention as applied to an automobile body indicated at A in Fig. 1. The body is of any conventional construction having lefthand rear and front doors 10 and 11, respectively, and a center body pillar 12. This pillar is of channel construction having opposed jamb faces terminating adjacent their inner marginal edges in outturned flanges 12a, which flanges extend outwardly of the jamb faces into the respective door openings. The open side of the pillar is closed or boxed in by a metal closure or facing plate 13 having outturned flanges 13a extending contiguous to the flanges 12a. In the present construction the flanges 12a of the pillar are crimped around the flanges 13a of the closure plate 13 and the adjacent overlapping flange portions are secured together as by spot welding. The metal plate or strip 13 is embossed to provide a number of outwardly extending depressions, pockets or recesses 14 along each vertical inner side edge of the pillar immediately behind the flange or edge members 12a, 13a. The recesses or openings 14 are preferably formed by a simple press operation, although it will be understood that these openings may be punched out or pierced in the metal of the face plate. The metal plate or strip 13, in the finished body, is concealed by the usual trim panel 15 secured thereto in any conventional manner. Likewise the inner faces of the rear and front doors are finished by means of trim panels 16 and 17.

Referring to Fig. 3, each door frame of the body is provided with a channel roof rail 20 forming a header along the top edge of the door opening. This rail has a jamb face terminating at its inner edge in a depending flange 20a, similar to the flange 12a, which is secured by spot welding to a similar flange 21a of an upright angle member 21. The flanged edge of the member 21 is crimped around the flange 20a in the same manner as described above in connection with the flange portions 12a and 13a of the center pillar 12. In like manner, the member 21 is embossed to provide a number of depressions, pockets or openings 22 along the upper edge of the door frame, these pockets or recesses being generally similar to the pockets 14 and designed for similar purposes, as later explained. As further shown in Fig. 3, each door 10 or 11 is formed with an outer metal door panel 23, the upper edge of which is crimped at 24 around the upper flanged edge of the top door frame member 25. This construction provides the upper overlap flange of the door while the member 25 provides a jamb face. The outer door panel 23 is pressed to form the window reveal and also a portion 26 which supports a channel 26a for the glass 27. The inner metal door panel for each of the doors is shown at 28, this panel being formed with a jamb face 29 terminating in an overlap flange around the edge of which the outer door panel 23 is crimped as indicated at 30 in Fig. 2. Extending around the window reveal is a garnish molding 31 of any conventional type which is secured in position as by means of screws 32, as illustrated in Fig. 3.

In the present embodiment of the invention the weatherstrip as a whole comprises a metal retainer strip adapted to be secured along the edge of the door frame and a yieldable or elastic sealing strip carried by the retainer strip and disposed in such manner as to be engaged by the inner edge of the door in the closed position of the latter. In addition, the weatherstrip in the preferred embodiment of the invention is constructed to support a windlace which may be attached to the retainer strip and disposed in position for additionally sealing the door opening around the marginal edge thereof when the door is closed.

Referring to the embodiment of Figs. 4 to 6 inclusive, the retainer strip is indicated at 35 and comprises a strip of metal which is rolled or otherwise formed to provide a channel or groove 36 adapted to fit over the flange portion or edge member 12a, 13a or the flange portion or edge member 20a, 21a. The metal retainer strip is also rolled or pressed to provide a channel or groove 37 formed reversely to the channel 36 and adapted to provide means for the attachment of the resilient sealing strip thereto. One side wall of the channel 36 is in the form of a return bent flange 36a which is cut away or stamped to provide a series of spaced tabs or projecting tongues 38. These tabs are spaced apart throughout the length of the retainer strip 35 in accordance with the spacing of the recesses or openings 14 and, of course, correspond in number thereto. In addition to the projecting tongues or tabs 38, the flange portion 36a thereof intermediate the tabs is provided with integral pointed ears or claws 39 which project from the edge of the flange 36a and serve the purpose, as hereinafter described, of attaching the windlace to the retainer strip. In the preferred construction the retainer strip is of sufficient length and shape to extend entirely around three sides of the door opening, namely, along the top, front and rear edges thereof. However, it will be understood that a plurality of these retainer strips extending end to end may be utilized.

Referring to Fig. 4, the resilient or elastic sealing strip forming part of the weatherstrip as a whole is illustrated at 40. In the construction shown in Fig. 4 the sealing strip 40 is formed of thermoplastic material having elastic property substantially similar to that of rubber. Whether formed from thermoplastic material or rubber the sealing strip is formed so as to present characteristics of yield and compressibility in any direction with rapid return to normal shape when released from strain or pressure. The shape of the strip, when free of stress or distortion, is illustrated in Fig. 4. The sealing strip is of curved formation providing a hollow tubular construction with the edges thereof separated and spaced apart. The outer terminal edge of the sealing strip is thickened at 41 to provide a relatively thick rib or bead adapted to contact the adjacent jamb face of the door frame. The inner edge 42 of the strip is, in like manner, thickened to provide a rib or bead adapted to fit within the channel portion 37 of the retainer strip. Proximate to the beads 41 and 42 the strip is thinned down at points 43 and 44 and between these points the convex or curved outer portion of the strip is preferably of substantially uniform wall thickness. The beaded or ribbed edge 42 is permanently secured to the retainer strip 35 by inserting it within the channel 37 and then crimping of pressing the outer wall of the channel to clinch the strip therein.

As previously stated, it is preferred that a single retainer strip 35 be provided and in such

instance it is also preferred that a single sealing strip 40 be used for sealing three sides of the door opening when the door 10 or 11 is closed. Such a strip would have a length sufficient to extend continuously from the floor up one side, across the top and down the other side to the floor, the flexible character of the strip permitting it to be bent at the corners of the door opening. Where a single metal retainer strip is used it will also be constructed so as to conform to the shape of the door opening and extend around the corners thereof. With the sealing strip firmly anchored within the channel 37 the retainer strip is installed on the body with the tabs 38 disposed opposite the pockets or recesses 14 and 22 which are located at the properly spaced intervals around the edges of the door opening. The channel 36 is slid over the edge flanges 12*a*, 13*a* as well as the edge flanges 20*a*, 21*a*. With the tabs 38 thus lined up or registered with the pockets 14 and 22 they are hammered or otherwise bent tightly into these pockets as illustrated in the drawings. This firmly anchors the weatherstrip to the body since the tabs are, as shown, hooked or bent tightly around the corners of the pockets so as to extend across the plane of the inner edge of the attaching flanges on the body.

After the weatherstrip has been thus installed, as in the manner shown in Fig. 4, the windlace is secured to the retainer strip 35 by means of the pointed ears or prongs 39. The windlace comprises the usual relatively soft core 45 of sponge rubber or any other suitable material covered with fabric 46 which is extended beyond the core to provide a fabric attaching portion 47. This portion 47 of the fabric is impaled upon the prongs or ears 39 which, after passing through the fabric, are bent back by the blow of a tool to clinch the windlace to the flange portion 36*a* of the retainer strip in the manner shown at 48 in Fig. 4. After installation of the weatherstrip and windlace, the inner trim panel 15 is installed with the edges thereof concealing the attaching portion of the windlace.

The construction shown in the embodiment of Fig. 5 is substantially the same as that shown in Fig. 4 with the exception that in this instance the sealing strip 51, which preferably corresponds in shape and size to the sealing strip 40, is formed of rubber having the required elasticity so as to yield in the desired manner under compression consequent to the closing of the door and also to return rapidly to normal shape when free of stress or distortion.

The embodiment of the invention illustrated in Figs. 7 and 8 is substantially the same as that previously described with the exception that a modified construction is provided for attaching the windlace to the retainer strip. In this embodiment the retainer strip, indicated as a whole at 52, is formed with a channel portion 53, corresponding to the channel 36, adapted to fit over the edge flange around the margin of the door opening, such as flanging 12*a*, 13*a* and 20*a*, 21*a*. At the outer side of the channel 53 a second reversely formed channel 54 is rolled or pressed in the strip to receive the beaded edge of the sealing strip 40 or 51 in the same manner as described in connection with the embodiments of Figs. 4 to 6 inclusive. At the inner side of the channel 53 the strip is rolled to provide a channel 55 of relatively small cross-section, the inner edge of which is return bent to provide a flange 56 from the edge of which project tabs 57 ar-

ranged at spaced intervals along the retainer strip in the same manner as the tabs 38. The fabric 46, which covers the core 45 of the windlace, extends laterally to provide an attaching portion, the edge of which receives a cord 58. This corded edge of the windlace is inserted within the channel 55 of the retainer strip and the outer wall of the channel is pressed or crimped inwardly to clinch the corded edge 58 of the windlace attaching portion between the walls of the channel 55. In preferred practice the attaching edges of the sealing strip and windlace are inserted into the channels 54 and 55 after which the retainer strip is passed through a rolling machine having pressure rollers engaging the outer walls of the channels and operative to roll or press them inwardly into clamping engagement with the edge portions of the sealing strip and windlace. In the embodiment of Figs. 7 and 8 the weatherstrip, after assembly of the sealing strip and windlace with the retainer strip, is inserted over the edge flanging around the door opening in the same manner as previously described and the tabs 57 are hammered into the depressions or apertures 14, 22 with which the tabs register.

An important feature of the invention resides not only in the construction of the weatherstrip but the manner in which sealing contact with the door is provided over a relatively large area thereof. The metal of the door jamb face 29 is extended inwardly to provide a smooth curved surface 49 terminating at 49*a* opposite the channel 37 thereby causing surface 49 to overlap substantially the entire outer curved wall of the sealing strip 40. The terminal edge 49*a* of the surface 49 overlaps the edge of the trim panel 16 or 17. A construction similar to that at 49 is provided entirely around the sides and top of the door frame, as for example, shown at 50 in Fig. 3. When the door is closed the surface 49, 50 engages the sealing strip 40 and due in part to the thinned neck portions 43 and 44 in the wall of the sealing strip adjacent the beaded or ribbed edges 41 and 42 the curved wall of the strip will readily flex and collapse or flatten between the points 43 and 44, conform closely to the curvature of the surfaces 49, 50, and ensure uniform contact therewith over a large area transversely of the door, thus increasing the sealing effectiveness of the weatherstrip. It will also be noted that the extended area of the door jamb at 49, 50 provides the entire contact between the door and sealing strip.

I claim:

1. In a vehicle body, a door frame having a jamb face provided adjacent its inner marginal edge with an edge member extending in a plane longitudinally of the body and outwardly of the jamb face into the door opening and terminating in an edge spaced outwardly of said jamb face, a metal piece having an inwardly opening channel embracing said edge member, and a resilient weatherstrip having a portion secured to said piece adjacent said channel at the outer face of said edge member and extending into the door opening for engagement by the door when closed, the inner side of said channel having a projecting portion bent across the plane of said edge member into a recess in the frame.

2. In a vehicle body, a door frame having a jamb face provided adjacent its inner marginal edge with an edge member extending in a plane longitudinally of the body and outwardly of the jamb face into the door opening and terminating

in an edge spaced outwardly of said jamb face, a metal strip having a channel embracing said edge member and projecting means secured to the door frame adjacent said edge member, and a flexible weatherstrip secured to said metal strip within the angle between said edge member and jamb face.

3. A weatherstrip comprising a retainer strip having longitudinal channels opening generally oppositely to each other, one channel adapted to fit over an edge member on the inner jamb edge of a door frame, a flexible sealing strip having a portion secured within the other channel, and spaced projections extending from the edge of the outer wall of the first channel in the plane thereof and bendable transversely for securing the retainer strip to the frame.

4. In a vehicle body, a door frame having a jamb face provided adjacent its inner marginal edge with an edge member extending outwardly of the jamb face into the door opening, a retainer member having generally oppositely opening channels, one channel fitting over said edge member, a flexible sealing strip having an edge anchored within the other channel, and spaced projections extending from the edge of the outer wall of said one channel and bendable transversely across the plane of said edge member into openings in the frame.

5. In a vehicle body, a door frame having a jamb face provided adjacent its inner marginal edge with an edge member extending in a plane longitudinally of the body and outwardly of the jamb face into the door opening, a retainer member having generally reversely opening channels, one channel fitting over said edge member, a flexible sealing strip having a portion anchored within the other channel, and projections extending from the outer wall of said one channel and bent outwardly of the body into retaining positions with respect to the door frame.

6. In a weatherstripping for a door and door frame, a retainer member having three longitudinally extending parallel channels, adjacent channels facing in opposite directions, a sealing strip anchored in the outer channel and a windlace anchored in the inner channel, the intermediate channel being formed to fit over an edge member on the door frame jamb face.

7. In a vehicle body, a door frame having a jamb face provided adjacent its inner marginal edge with an edge member extending in a plane longitudinally of the body and outwardly of the jamb face into the door opening, a retainer member having a channel or groove embracing said edge member, means for securing a portion of a sealing strip to the retainer member at the outer side of said channel, and a door having a jamb face extended inwardly to overlap said strip and contact the same in the area extending substantially from the said portion of the sealing strip outwardly.

8. In a vehicle body, a door frame having a jamb face provided adjacent its inner marginal edge with an edge member extending outwardly of the jamb face into the door opening, a trim panel overlapping the inner face of said edge member, a retainer member for a flexible sealing strip having a channel fitting over said edge member with the inner wall of the channel interposed between the trim panel and edge member, and means on the retainer member also interposed between the trim panel and edge member for securing a windlace thereto.

9. In a vehicle body, a door frame having a jamb face provided adjacent its inner marginal edge with an edge member extending outwardly of the jamb face into the door opening, a trim panel overlapping the inner face of said edge member, a retainer member for a flexible sealing strip having a channel fitting over said edge member with the inner wall of the channel interposed between the trim panel and edge member, means on the retainer member also interposed between the trim panel and edge member for securing a windlace thereto, and projections extending from said retainer member into openings or recesses in the door frame concealed by said trim panel.

10. In a vehicle body, a door frame having a jamb face provided adjacent its inner marginal edge with a flange extending outwardly of the jamb face into the door opening, a metal piece having an inwardly opening channel embracing said flange and a second adjacently located channel opening outwardly, and a resilient weatherstrip having an edge portion anchored within said last channel, the inner side of said first named channel being extended to provide a tab bendable around the inner edge of the flange into a pocket in the frame, and means for attaching said piece to the frame.

11. In a vehicle body, a door frame having a jamb face provided adjacent its inner marginal edge with an edge member extending outwardly of the jamb face into the door opening, a metal piece having an inwardly opening channel embracing said edge member, and a resilient weatherstrip having an edge portion secured to said piece adjacent said channel and extending into the door opening for engagement by the door when closed, the inner side of said channel having a projecting portion bendable across the plane of said edge member beyond the inner terminus thereof into a recess in the frame.

12. In a vehicle body, a door frame having a jamb face provided adjacent its inner marginal edge with a flange extending outwardly of the jamb face into the door opening, a metal piece having adjacent reversely formed channels one opening toward the frame to embrace said flange and the other opening away from the frame, a yieldable weatherstrip anchored in said last mentioned channel, and means for securing said piece to the frame, said means comprising a projecting portion on said piece bendable transversely of the plane of said flange across the inner edge thereof into a recess in the frame.

13. In a vehicle body, a door frame having a jamb face provided adjacent its inner marginal edge with a flange extending outwardly of the jamb face into the door opening, a metal piece having adjacent reversely formed channels one opening toward the frame to embrace said flange and the other opening away from the frame, a yieldable weatherstrip anchored in said last mentioned channel, and means for securing said piece to the frame, said means comprising a portion projecting from the inner wall of the first named channel to overlap the frame and bendable into a recess or pocket therein.

14. In a vehicle body having a door frame provided with a jamb face having a flange extending outwardly of the jamb face into the door opening, a metal piece having adjacent channels one opening toward the frame to embrace said flange and the other opening away from said frame, a yieldable weatherstrip anchored in said last mentioned channel and having a portion adapted to project into position for engagement by the door when closed, the inner wall of the

first mentioned channel having an extension bendable transversely of said flange across the inner terminus thereof into a recess or pocket in the frame.

CLIFFORD B. DOTY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,613,044	Marshall	Jan. 4, 1927
1,728,120	Greene	Sept. 10, 1929
1,787,169	Roberts	Dec. 30, 1930
2,165,399	McCormick	July 11, 1939
2,263,806	Hammerl	Nov. 25, 1941
2,294,101	Tripp	Aug. 25, 1942