United States Patent

[11] 3,552,341

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[45] Patented **Jan. 5, 1971**
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[54] **METHOD FOR FORMING A ROOF HATCH ASSEMBLY**
10 Claims, 12 Drawing Figs.

[52] **U.S. Cl.** **113/116,** 29/416
[51] **Int. Cl.** **B21d 28/08**
[50] **Field of Search** 113/116BB, 121C; 29/41L

[56] **References Cited**

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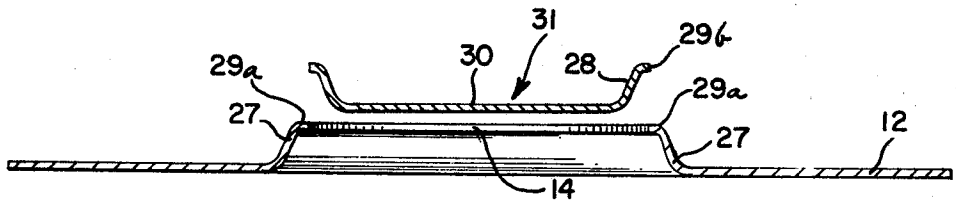
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Primary Examiner—Richard J. Herbst
Attorney—Sabin C. Bronson

ABSTRACT: A method for forming a freight vehicle roof hatch assembly including a circular hatch frame formed integral with a roof sheet and a hatch cover formed from a cutout defining the hatch frame opening. The roof sheet is drawn or stretched into an annular raised section at the location at which the hatch frame is desired. The annular raised section is cut to remove a substantially dish-shaped section so that an opening bounded by an upstanding wall remains on the roof sheet. The upstanding wall is thereafter reformed to a substantially conical configuration of which the end is formed with an outwardly curled lip. The dish-shaped section is reformed into a circular hatch cover having a depending flange seatable about the curled lip.



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SHEET 1 OF 2

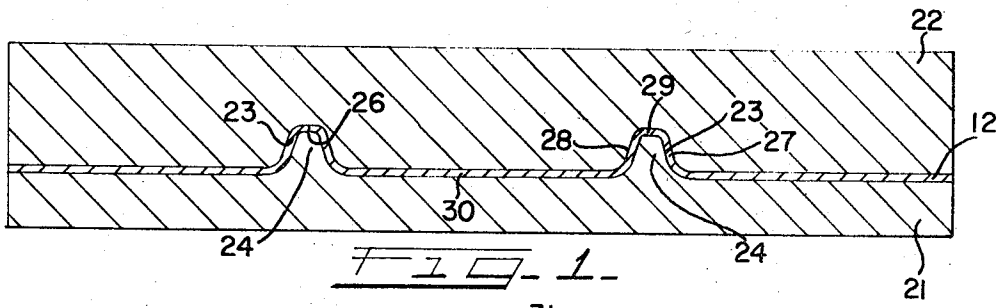


FIG. 1

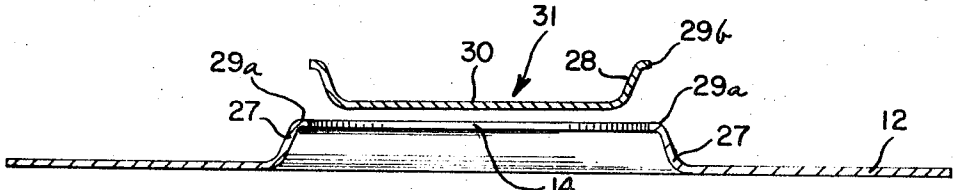


FIG. 2

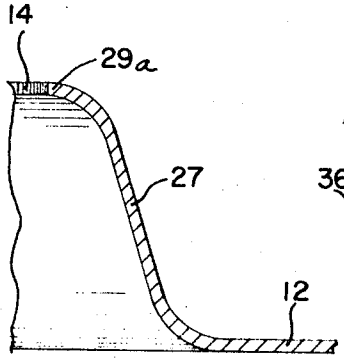


FIG. 3

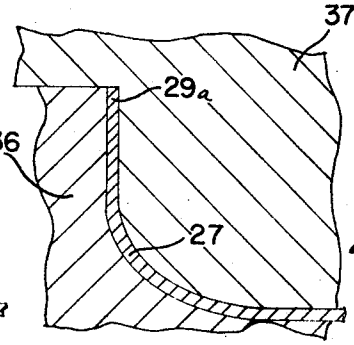


FIG. 4

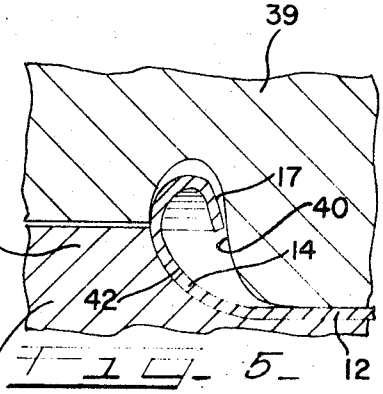


FIG. 5

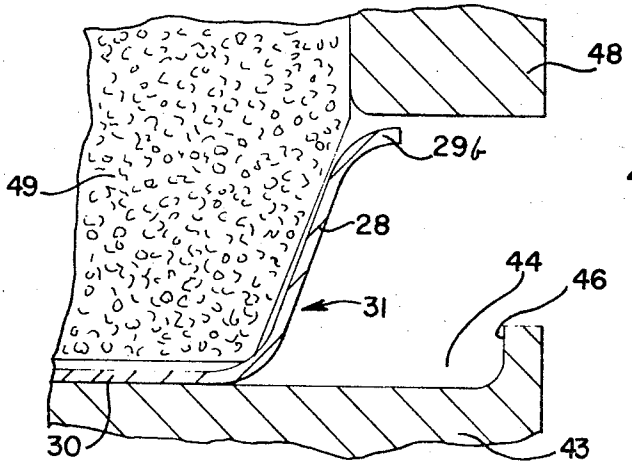


FIG. 6

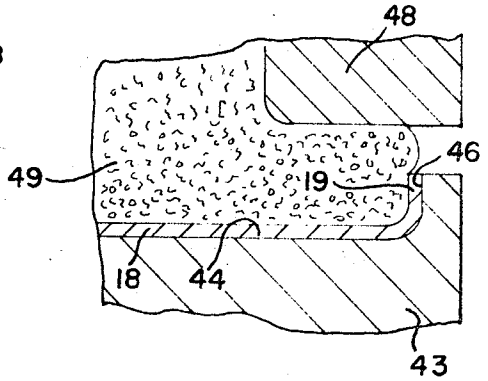


FIG. 7

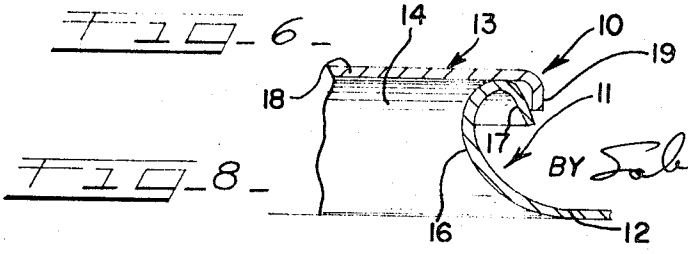


FIG. 8

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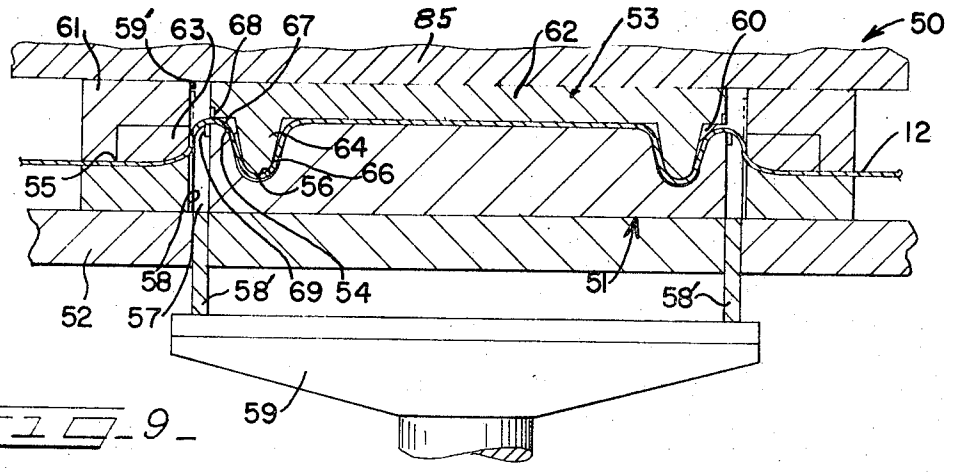


FIG. 9

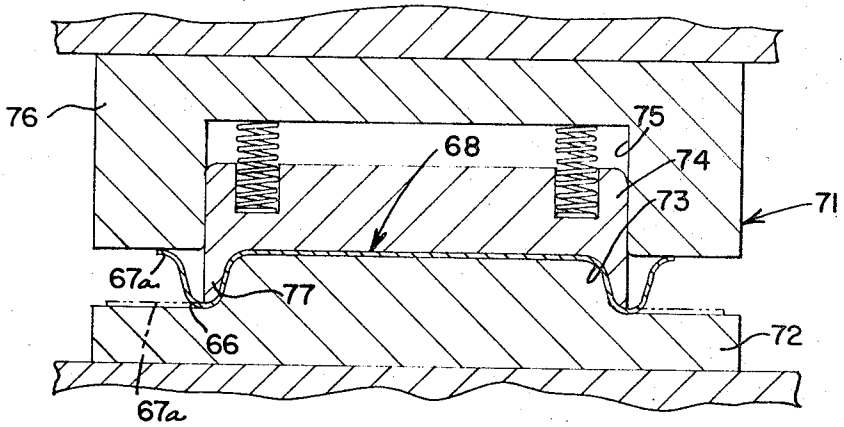


FIG. 10

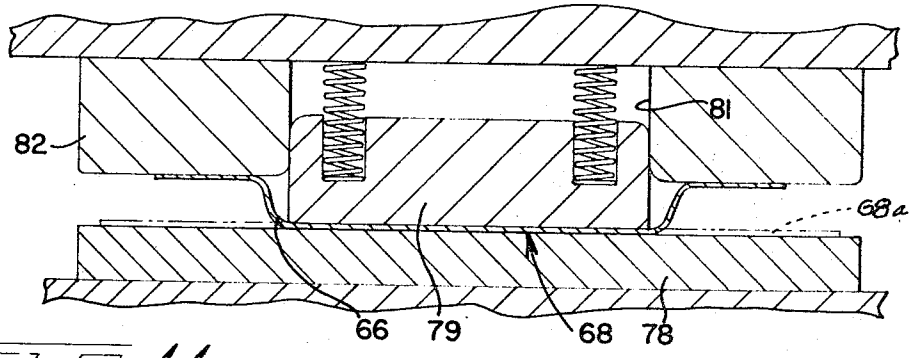


FIG. 11

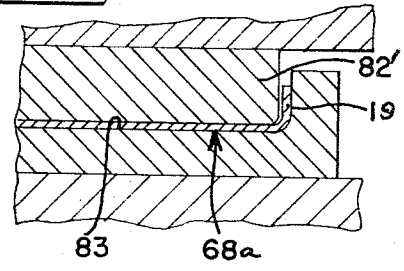


FIG. 12

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METHOD FOR FORMING A ROOF HATCH ASSEMBLY

BACKGROUND - SUMMARY - DRAWINGS

Heretofore hatch frames have been constructed as assemblies formed from sheet material shaped into a cylinder and welded along the adjoining edges. The hatch frames are thereafter fixed about an opening formed in the roof sheet by a weld. The welding is time consuming and costly, and also may create problems such as leakage and the like if the weld seam is imperfect.

Prior hatch covers have been constructed from separate sheet material to fit over the hatch frame assemblies.

By the present invention there is provided a new and novel method for forming a roof hatch assembly and hatch cover therefor which reduces the cost and overcomes the difficulties encountered heretofore.

This is accomplished generally by stretching and drawing the roof sheet in the location where the hatch opening is desired so as to form a hatch frame integral therewith and to utilize the material which is cut from the roof sheet to form the hatch opening as the hatch cover.

The roof sheet is stretched or drawn to form a raised annular portion. The raised annular portion is then cut along the upper end thereof to remove a dishpan-shaped section to provide an opening in the roof sheet. The opening is bounded by the unsevered raised annular portion which is reshaped to form a hatch frame of generally conical form and having an outwardly curled upper end defining a weather lip.

The removed dishpan section is reshaped as by pressing so as to form a shallow cover having a circular top wall and an integral depending flange. The pressed hatch cover is sized so that the depending flange is seatable over the outer end of the weather lip.

For a more complete understanding of the invention, reference is made to the following description and drawings forming part of the description and wherein like parts are identified alike.

FIG. 1 is a cross-sectional view of a pair of die members for drawing the roof sheet into an annular raised portion for forming the roof hatch in accordance with the method of the present invention.

FIG. 2 is a cross-sectional view of the roof sheet after the annular raised projection has been formed and showing the dishpan section for forming the hatch cover removed therefrom.

FIG. 3 is an enlarged fragmentary cross-sectional view illustrating the annular wall structure remaining integrally attached to the roof sheet, after the severance of the dishpan section as shown in FIG. 2.

FIG. 4 is an enlarged fragmentary cross-sectional view of a pair of die members showing the reforming of the wall structure shown in FIG. 3.

FIG. 5 is an enlarged fragmentary view of a pair of die members showing the final forming and reshaping of the hatch frame members.

FIG. 6 is a fragmentary cross-sectional view of the hatch cover-forming apparatus in the open position.

FIG. 7 is a fragmentary cross-sectional view of the hatch cover-forming apparatus of FIG. 6 in the closed position.

FIG. 8 is a fragmentary cross-sectional view showing the completed hatch frame and the cover.

FIG. 9 is a cross-sectional view of another form of metal drawing apparatus for forming the roof hatch and cover in accordance with another embodiment of the method of the present invention.

FIG. 10 is a cross-sectional view of the apparatus for partially flattening the severed portion of the roof sheet.

FIG. 11 is a cross-sectional view of the apparatus for completely flattening the partially flattened severed portion of FIG. 10.

FIG. 12 is a cross-sectional view of the forming apparatus for reforming the flattened sheet formed in the apparatus of FIG. 11 into a hatch cover.

Referring now to FIG. 8, there is shown a hatch frame and cover assembly 10 including a hatch frame 11 formed integral with a roof sheet 12 and a hatch cover 13. The hatch frame 11 is of generally conical configuration projecting upwardly from the roof sheet 12. The sidewall 14 is curved concavely upwardly and defines a generally circular hatch opening 16 terminating in an outwardly curled weather lip 17. The cover 13 includes a top circular panel 18 having a downwardly depending flange 19 disposed over the weather lip 17.

In accordance with the method of the present invention, a flat roof sheet 12 is inserted between a male die 21 and a female die 22 as shown in FIG. 1 to form an annular raised projection 23 in the location at which the hatch frame 11 is desired. To this end the male die 21 is formed with an upwardly projecting ringlike boss 24. The female die 22 is formed with a complementary cavity 26 into which the roof sheet 12 is pressed by the ringlike boss 24. The die members 21 and 22 are mounted in a press which may be of the double-acting type for reasons which will be apparent hereafter.

The ringlike boss 24, and cavity 26 are shaped to draw or stretch the metal from which the roof sheet 12 is made sufficiently high to provide an adequate wall dimension for forming the hatch frame 11 and hatch cover 13 therefrom. In this connection it should be mentioned that the roof sheet 12 may be heated to a temperature of about 1,400° F. so that the annular projection is hot pressed therein. However, the metallurgical characteristics of the roof sheet metal may be such that the annular projection may be cold drawn. It is also to be understood that the annular projection 23 may be formed in a two-stage draw.

The annular projection 23 is of generally trapezoidal cross section having an outer sidewall 27, an inner sidewall 28 and a top wall 29. The inner sidewall 28 is connected at the lower end thereof by a bottom circular panel 30. To provide the hatch opening 14, the annular projection 23 is cut along the top wall 29 to remove a generally dishpan-shaped section 31 as shown in FIG. 2. This may be accomplished by a circular knife assembly, not shown, either mounted on the double acting press in which the die members 21 and 22 are mounted, or the cutting of this section 31 may be accomplished as a separate operation.

Upon severance of the dishpan section 31 from the roof sheet 12 the outer sidewall 27 and a lip 29*a* bounds the opening 14 as shown in FIG. 2. The removed dishpan section 31 includes the panel 30, inner wall 28 and an outwardly projecting lip 29*b*. The length of the sidewall 27 and lip 29*a* is sufficient to provide the required height of the hatch frame sidewall 16 including the weather lip 17 formed thereon.

To form the hatch frame 16 the roof sheet 12 is inserted in a press between a pair of dies 36 and 37 as shown in FIG. 4 so that the outer sidewall 27 and lip 29*a* are reformed into a substantially upstanding position. At the same time the lower end of the wall may be formed with an increased radius of curvature.

The upstanding wall 27 and lip 29*a* are thereafter cold pressed between a male die member 38 and a female die member 39 to finally form the upstanding wall 14 and weather lip 17. The female die 39 is formed with a concavo-convex surface 40 and the male die 38 is with a male boss 41 having a convex surface 42. As the outer sidewall 27 and lip 29*a* are pressed therebetween, the upper edge thereof is engaged by concavo-convex surface 40 so as to curl the upper margin into the weather lip 17. As the lip 17 is being formed, the remainder of the wall is forced into engagement with and conformity with the convex surface 42 of the male boss 38 to impart the final upwardly extending concave curvature to the sidewall 14.

The dishpan section 31 is converted or reformed into a hatch cover 13 by cold reforming in the apparatus shown in FIGS. 6 and 7. As shown, the apparatus includes a lower die 43 having a circular cavity 44 into which the dishpan section 31 is centrally positioned. The cavity 44 is defined by an upstanding circumferential wall 46 against which the depending flange 19 of the hatch cover is formed.

An upper die member includes an annular boss **48**. Seated and attached within the annular boss **48** is a compressible forming pad of circular cross section which projects downwardly beyond the annular boss **48** and is accommodated within the inner walls **28** of the dishpan section **31**. The forming pad **49** may be made from a natural or synthetic rubber such as urethane rubber. As the die members **43** and **48** move to the closed position as shown in FIG. **7**, the pad **49** is compressed and exerts a force on the inner wall **28** and lip **29***b* so that the dishpan section **31** is conformed to the cavity **44**. In this manner the panel **30**, inner wall **28** and lip **29***b* are reformed to form the hatch cover **13** including the top **18** and depending flange **19**.

Referring now to FIGS. **9—12** there is shown another embodiment for forming the hatch frame and cover assembly wherein like parts are identified alike. As shown in FIG. **9** the roof sheet **12** is inserted into a press generally indicated at **50** having a lower or male die **51** mounted on a bed **52**, and an upper or female die **53** mounted on a ram, not shown. The male die is formed with an outer ringlike projection **54** extending above the die base surface **55** and an inner contiguous ringlike cavity **56** having a depth extending below the die base surface **55**. The outer ringlike projection is formed in part by a vertically movable cutter or blanking collar **57**.

The blanking collar **57** is slidable in vertically aligned annular slots **58** and **59'** provided in the male and female dies **51** and **53** respectively. The blanking collar **57** is held in the metal forming position shown by cushion pins **58'** vertically slidable within bed **52** and carried by a cushion pad assembly **59**. Upon relative vertical movement of the bed **52** and cushion pad assembly **59**, the cushion pins **58'** are operative to activate the blanking collar as more fully to be explained hereinafter.

The upper or female die **53** includes an outer annular die ring **61** in which an inner die member **62** is coaxially disposed and defines therewith the annular slot **59'**. The inner and outer die members are each suitably fastened to a press ram **85**. The outer die member **61** may be provided along the lower inner end thereof with a hardened forming block **63** for shaping the contour of the lower end of the trough hatch frame **11**.

The inner die member **62** is formed with a downwardly depending ringlike boss **64** spaced radially inwardly from the circumference thereof to provide an outer circumferential recess **60** accommodating the outer ringlike projection **54** of the male die **51** therein. In this connection it is to be noted that the upper end of the circular blanking collar **57** is contoured so as to form an accurate end with the projection **54**. The female die projection **64** is shaped complementary to the cavity **56**.

The roof sheet **12** may be placed hot in the press **50** to form the hatch frame **11** in the desired location. The upper die **53** is then driven downwardly thereupon so that the metal in the vicinity of the ringlike projection **64** is drawn and stretched into the cavity **56** to form an inner downwardly extending projection **66** in the roof sheet **12**. At the same time the metal in the vicinity of the cutting blade **57** is drawn over the upper end of the circular cutter blade **57** and the male die projection **54** to form an outer annular projection **67**.

After the formation of the inner and outer projections **66** and **67** the cushion pad assembly **59** is actuated so that the pins **58'** move the circular blade upwardly so that coacting cutting inserts **68** and **69** mounted respectively on the inner die **62** and blade **57** sever the outer corrugation at the peak.

In connection with the circular cushion pins **58'** it is to be noted that the outer wall is spaced from the inner wall of the slots **58** and **59'** a distance at least as great as the thickness of the roof sheet **12**. Thus after outer roof projection **67** is severed, the continued upward movement of the blade **57** is operative to wipe the outer portion of the projection remaining attached to roof sheet upwardly as shown in phantom. In this manner the partially formed roof hatch frame is in substantially the same form as shown in FIG. **4** so that the reforming step performed as a separate operation in the embodiment illustrated in FIGS. **1—7** is not required. This partially formed roof hatch is then reformed to the final configuration as heretofore described in connection with FIG. **5**.

The severed inner portion is in the general shape of an inverted dishpan **68** including the downwardly projecting portion **66** and the remaining wall portion **67** of the upward annular projection **67***a*. The dishpan **68** is then hot pressed between a pair of die members **71** and **72** as shown in FIG. **10**. The die member **72** is mounted on the press bed and includes a circular boss **73** on which the dishpan section **68** is seated.

The upper die member has a spring biased retaining block **74** disposed within a recess **75** of an annular straightening die **76**. The retaining block **74** includes a depending ring **77** which terminates at the peak of the downwardly depending projection **66** and clamps the dishpan on the boss **73**. Thus upon downward movement of the annular straightening die **76**, the remaining wall portion **67***a* and the unclamped portion of the downwardly projection portion **66** is pressed to the phantom line position shown.

The partially straightened dishpan **68** is then inverted and completely flattened as shown in FIG. **11**. The partially straightened dishpan is held clamped to the press bed **78** by a spring biased retaining block **79** which is vertically slidable in an annular cavity **81** of a straightening die **82**.

The straightening die **82** includes an annular straightening surface **83** which engages the previously straightened portion and the remainder of the downward projection **66**, so that a substantially flat circular panel **68** is formed.

The flat panel **68***a* is then reformed to the desired dimension with a depending flange **19** to form the hatch cover **13** for the hatch frame **11** in the typical pressing apparatus shown in FIG. **12**. The hatch forming apparatus includes a forming head **82'** and die cavity between which the flattened sheet **68***a* is placed so that when pressed therebetween the sheet is reformed to the final hatch cover configuration.

Although the embodiments constructed in accordance with the present invention have been described with the requisite particularity, the disclosure is of course exemplary. Changes in details of construction, in size, configuration and arrangement of components and materials and in modes of application will be apparent to those versed in the art and may be resorted to without departing from the scope of the invention as set forth in the following claims.

I claim:

1. The method of forming a roof hatch assembly including a roof hatch frame and a hatch cover comprising stretching a roof sheet to form an annular raised projection having a top wall spaced above the plane of the roof sheet encompassed by said annular projection, cutting said annular projection along the top wall thereof to form a dishpan section removable from said roof sheet, leaving an opening bounded by a wall of said annular projection, reforming said bounding wall of said projection to form a hatch frame having an outwardly curled weatherlip, and reforming said dishpan section into a hatch cover having a top panel and a peripheral depending flange seatable over said weather lip.

2. The invention as defined in claim **1** wherein said final hatch frame configuration and said hatch cover are cold formed.

3. The invention as defined in claim **1** wherein said annular projection is formed by hot pressing.

4. The invention as defined in claim **1** wherein said roof sheet is stretched into an annular projection of substantially trapezoidal cross section including an outer wall and an inner wall joined by said top wall.

5. The invention as defined in claim **4** wherein said top wall is cut to form said removable dishpan section so that said dishpan section includes said inner wall and a portion of said top wall, said portion of said top wall defining a peripheral lip.

6. The invention as defined in claim **5** wherein the length of said inner wall and said lip and the diameter of the base of said dishpan section are of a length sufficient to form a hatch cover having a downwardly depending flange seatable over said weather lip.

7. The invention as defined in claim **1** including forming an inner annular downwardly extending projection in said roof sheet contiguous with said annular upwardly extending projection.

8. The invention as defined in claim 7 wherein said dishpan, including said inner annular downwardly extending projection and said severed portion of said annular raised projection, is flattened and reformed into a hatch cover having a depending flange.

9. The invention as defined in claim 1 wherein said cutting is performed by a circular cutting blade movable normal to the plane of the roof sheet, reforming said bounding wall into an upstanding wall upon further normal movement, and finally forming said upstanding wall into a hatch frame including a curled weather lip.

10. The invention as defined in claim 7 wherein said cutting is performed by a circular cutting blade movable normal to the plane of the roof sheet, reforming said bounding wall into an upstanding wall upon further normal movement, and finally forming said upstanding wall into a hatch frame including a curled weather lip.

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3552341 Dated January 5, 1971

Inventor(s) WILLIAM W. LANNIN

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

After the abstract, insert the following paragraph:

In another embodiment for forming a roof hatch assembly a downwardly depending annular projection is formed in the roof sheet contiguous with the annular raised section. The annular raised section is severed by a circular cutting blade means along the top to remove a dish-shaped sectic including the downwardly depending annular projection. The circular cutting blade means is arranged so that the portion of the annular wall remaining about the opening is reformed into an upstanding cylindrical wall. The upstanding wall is reformed to the final configuration of the hatch frame having a weatherlip. The removed dishpan section is flattened and reformed into a hatch cover for the hatch frame.

Signed and sealed this 8th day of June 1971.

(SEAL)
Attest:

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Attesting Officer

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Commissioner of Patent: