March 15, 1949. C. HIRSCHFELD 2,464,506

SHEET METAL ASSEMBLY AND METHOD OF MAKING IT

Filed June 14, 1947 2 Sheets-Sheet 1

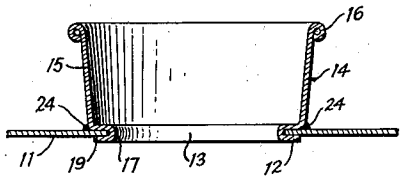

Fig. 1

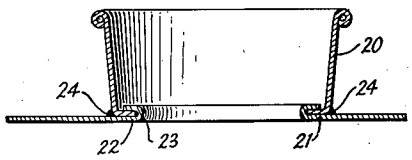

Fig. 2

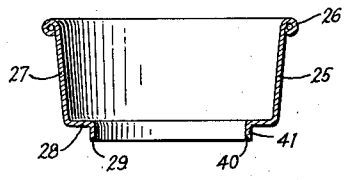

Fig. 3

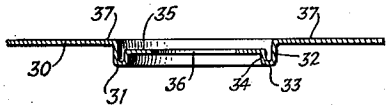

Fig. 4

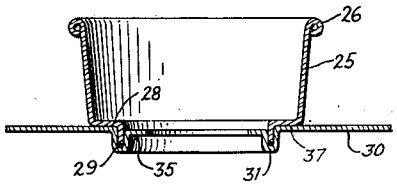

Fig. 5

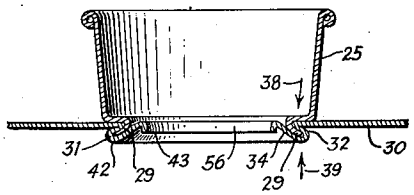

Fig. 6

INVENTOR.
CHARLES HIRSCHFELD
BY
Albert M. Austin
his ATTORNEY

March 15, 1949. C. HIRSCHFELD 2,464,506

SHEET METAL ASSEMBLY AND METHOD OF MAKING IT

Filed June 14, 1947 2 Sheets-Sheet 2

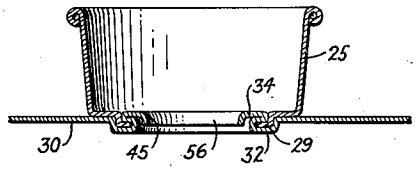

Fig. 7

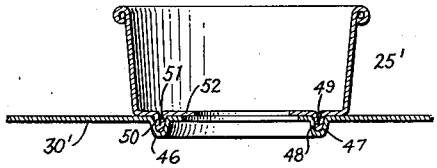

Fig. 8

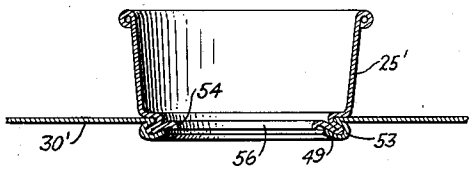

Fig. 9

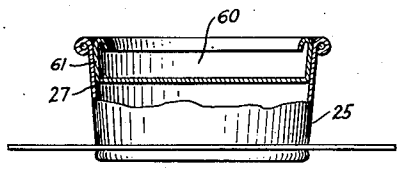

Fig. 11

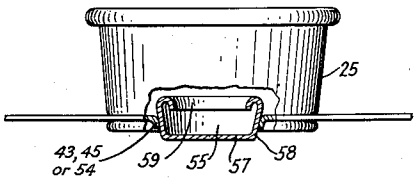

Fig. 10

INVENTOR.
CHARLES HIRSCHFELD
BY
Albert M. Austin
his ATTORNEY

Patented Mar. 15, 1949 2,464,506

UNITED STATES PATENT OFFICE

2,464,506

SHEET METAL ASSEMBLY AND METHOD OF MAKING IT

Charles Hirschfeld, Strasbourg, France

Application June 14, 1947, Serial No. 754,721
In France June 22, 1946

7 Claims. (Cl. 285—49)

1

This invention relates to sheet metal working and provides, among other improvements, an improved method of attaching to a sheet metal wall a tubular sheet metal structure, for example a spout, neck, gullet, or tube.

The invention has particular application to the production of can bodies equipped with a reclosable dispensing or filling spout and provides an improved method for producing an air and liquid tight connection between a can wall and a neck spout or other tubular member, the connection being produced solely by sheet metal forming operations without resort to the use of gaskets or to special sealing operations such as soldering or welding.

The invention further provides structural improvements including an improved air and liquid tight sheet metal joint between a wall and a spout, neck, or other form of tubular structure. As a specific improvement, the invention provides a dispensing spout which can be air and liquid tightly sealed by a friction type closure, for example, a lid or plug and which requires for its formation nothing but sheet metal forming operations which can be performed by dies of simple construction on an ordinary power press.

The objects, features and advantages of this invention and its advance over conventional methods and constructions will appear more fully from the detailed description which follows, accompanied by drawings showing, for the purpose of illustration, sequences of operational steps as well as structural embodiments of the invention.

The invention also consists in certain new and original features of construction, combinations of elements and method steps hereinafter set forth and claimed.

Although the characteristic features of the invention which are believed to be novel will be particularly pointed out in the claims appended hereto, the invention itself, its objects and advantages and the manner in which it may be carried out may be better understood by referring to the following description forming a part of it, in which:

Figures 1 and 2 are sectional elevational views illustrating conventional ways of attaching a spout to a can wall;

Figure 3 is a sectional elevational view of a preferred form of spout for use in practicing the invention;

Figure 4 is a sectional elevational view of a sheet metal wall after a preparatory forming and blanking operation prior to the attachment of a spout thereto;

2

Figure 5 is a sectional elevational view showing the spout of Figure 3 and the wall portion of Figure 4 prior to a stamping operation by which the spout is air and liquid tightly connected to the wall.

Figure 6 is a sectional elevational view of the spout and wall portion of Figure 4 after a stamping operation by which the spout is air and liquid tightly attached to the wall portion and a rim surrounding the dispensing aperture is shaped to form a seat for a friction type closure member.

Figure 7 is a sectional elevational view of the spout and wall portion of Figure 4 after a modified stamping operation by which the engaging sheet metal portions of the wall and spout are differently shaped to produce an air and liquid tight seal therebetween, the rim surrounding the dispensing aperture being likewise shaped to form a seat for a friction type closure member;

Figure 8 is a sectional elevational view of a sheet metal wall after a modified forming and blanking operation, assembled with a spout structure of modified shape, the assembly being shown prior to the stamping operation by which the spout is attached to the wall;

Figure 9 is a sectional elevational view of the assembly of Figure 8 after a stamping operation by which the spout is air and liquid tightly attached to the wall portions and a rim is formed on the spout to form a seat for a friction type closure member; and

Figures 10 and 11 illustrate in side views, partly in section, representative forms of plug type closures frictionally fitting into the spout or dispensing aperture in order to seal the same.

In the following description and in the claims, various details will be identified by specific names for convenience. These names, however, are intended to be as generic in their application as the art will permit. Like reference characters refer to like parts in the several figures of the drawings.

In the drawings accompanying and forming part of the specification, certain specific disclosure of the invention is made for the purpose of explaining broader aspects of the invention, but it is understood that the described structural details and method steps may be modified in various respects without departure from the principles of the invention and that the invention may be applied to other structures than the ones shown.

In order that the structural and the method features of the invention may be better understood, reference is first had to Figures 1 and 2 of the drawings illustrating two conventional ways

in which dipensing spouts have been attached to the sheet metal wall of a can body prior to the present invention. The sheet metal wall 11 of a can body has an aperture 12 therein into which the bottom portion 13 of a spout 14 is inserted. The spout 14 has a side wall 15, the top portion of the side wall being rolled outward and downward to form a bead 16. The bottom portion 13 of the spout comprises a flange portion or shoulder 17 seated on the wall 11 and the bottom edge of the spout is flared out at 18 to provide a second flange 19, the wall 11 being frictionally held between the flanges 17 and 19.

In the construction shown in Figure 2, the spout 20 has an inturned bottom flange 21 frictionally held between the wall portion 22 and an upwardly and outwardly turned flange portion 23 of the wall.

The main disadvantages encountered with the constructions of the type illustrated in Figures 1 and 2 are the difficulty of forming an air and liquid tight seal between the spout and the can wall and the difficulty of sealing the can aperture tightly after filling of the can.

Referring first to the requirement of obtaining a liquid and air tight joint between the spout and the wall, it should be remembered that this joint has to withstand considerable pressures in order to meet the demands of the trade. Frequently, liquid filled cans are subjected to considerable changes in temperature causing the pressure inside the can to rise appreciably. Such pressure rises frequently lead to leakage around the spout. Pressure changes are also caused by deformation of the cans, for example, due to stacking of cans one on top of another.

In order to overcome the problems of leakage, it has become common practice to reinforce the connection between the spout and the sheet metal wall by soldering or welding, such solder or weld seams being applied at 24. Soldering or welding operations considerably increase production costs because of the necessity of performing on the can body an operation which is foreign in character to the stamping and other sheet metal forming operations employed in forming and attaching together the can wall and the spout.

The invention provides a method of attaching a spout or other tubular member to a sheet metal wall so that a pressure tight connection is formed therebetween, tightness being obtained entirely by stamping operations.

The invention may be carried out as follows: The tubular sheet metal structure, illustrated in Figure 3 for the purpose of illustration as a spout 25, comprises a beaded top rim 26, a side wall portion 27, a bottom flange portion 28 integral with the side wall portion 27 and a skirt portion 29 depending from the bottom flange portion 28. Spouts of the form of Figure 3 may be formed in dies of simple construction as will be apparent to persons skilled in the art which are, for this reason, not illustrated in the drawings.

The portion of the wall 30 of the can or container to which the tubular structure 25 is to be attached is first prepared by forming therein a ring-shaped depression 31. This is accomplished by a simple drawing die which also flattens a limited area of the wall around the depression against which the bottom flange portion 28 of the spout is later seated. The annular depression 31 is preferably of U or L shape in cross-section and may comprise an outer wall portion 32 depending from the wall 30, a bottom portion 33 and an inner wall portion 34 from which a central flange portion 35 extends inwardly. An aperture 36 is formed in the central flange portion.

The tubular structure 25 is assembled with the wall 30 by placing its bottom flange portion 28 on the wall portion 37 surrounding the annular depression 31. The depending skirt portion 29 extends into the hollow depression whose walls have substantially the shape of the letter U, if viewed in cross-section.

The assembly shown in Figure 5 is then placed between the two portions of a forming die which folds the walls 32 and 34 of the annular depression and the depending skirt portion 29 of the tubular structure outwardly into the position shown in Figure 6. In the finished structure, as illustrated in Figure 6, the outer wall portion of the depression is folded back towards and nearly upon the sheet metal wall 30, and the inner wall portion 34 lies substantially parallel to the outer wall portion 32, the flared skirt portion 29 being imbedded therebetween. The connection can be made particularly tight by pressure applied by the portions of the forming die in the direction of arrows 38 and 39.

The connection between the spout and the wall owes its tightness partly to the tendency of the deformed interengaging portions of the spout and the wall to return, due to the inherent resiliency of the sheet metal, towards the position occupied before the forming operation. This tendency, although infinitesimally small, causes the skirt portion 29 of the spout to move slightly out of the parallel position with respect to the inner and outer walls 32 and 34 of the depression 31, whereby the bottom edge 40, as well as the portion of the skirt 41, immediately below the bottom flange portion 28 (see Figure 3) tend to form a line-contact-seal with respect to the walls 32 and 34 of the depression. By way of contrast, it will be observed that the same tendency of the sheet metal causes the seams to open in the conventional forms of connection shown in Figures 1 and 2.

Substantially simultaneously with the folding operation performed on the walls on the depression 31 and the skirt 29, or immediately thereafter, and preferably in the same die which folds the depression and skirt into a bead 42, the inwardly extending central flange portion 35 is drawn to form an accurately shaped sealing rim 43 which is adapted to receive a closure plug of a friction type.

The sealing rim can be shaped with great accuracy so that a tight fit with a friction closure is insured. By way of contrast, it will be observed that the conventional construction of Figures 1 and 2 do not provide an accurately shaped internal surface or edge at the aperture of sufficiently close tolerance to form a seat for a friction plug. A friction plug seated in the apertures of the spout of Figure 1 and 2 is usually not tight and therefore not dependable.

The spout and wall assembly shown in Figure 5 may also be secured together by forming the walls 32 and 34 and the skirt 29 of the spout 25 into an inwardly folded bead as shown in Figure 7. This folding operation also permits shaping of the central flange portion 35 into an accurate downwardly drawn sealing rim 45.

Whether the walls of the depression 32 and 34 and the skirt 29 of the spout 25 be formed into an outwardly folded bead as shown in Figure 6, or an inwardly folded bead, as shown in Figure 7, in either case the bead comprises in cross section at least three thicknesses of the sheet material of

the wall 30, the skirt 29 extending between two of the three thicknesses of the wall. In either case the wall 30 is unbroken at the spout and extends uninterruptedly to the sealing rim 43 or 45, whereby leakage at spout is rendered impossible.

It is, of course, not necessary that the sealing rim surrounding the dispensing aperture be formed of the sheet material of the wall 30. It may equally well be formed of the sheet material of the spout. This is illustrated in Figures 8 and 9.

Referring first to Figure 8, an annular depression 46 is formed in the wall 30', the depression having an outer wall portion 47 and an inner wall portion 48. The depression is substantially U-shaped in cross section and into it extends the skirt 49 of the spout 25'. The skirt 49 is of double thickness and comprises an outer wall 50 and an inner wall 51. A central flange portion 52 extends inwardly from the inner skirt wall 51.

In securing the spout 25' to the wall 30', the skirt 49 and the walls 47 and 48 of the depression are folded outwardly to form a bead 53 as shown in Figure 9. The bead again consists in cross section of three thicknesses of sheet material of the wall 30', the skirt 49 being seated between two of the three thicknesses. The central flange portion 52 of the spout 25' is downwardly drawn to form a sealing rim 54.

As previously mentioned, a closure plug 55 may be tightly seated in the dispensing aperture 56 surrounded by the sealing rim 43, 45, or 54. This is shown in Figure 10 where the plug 55 comprises a bottom portion 57, a tapered side wall portion 58, and a top bead 59.

A closure plug of larger dimensions may also be seated in the spout proper either in place of, or in addition to, the plug 55 shown in Figure 10. Figure 11 shows a plug 60 having tapered side walls 61 seated against the side wall 27 of the spout 25.

The invention thus provides an improved spout construction for sheet metal containers which has great strength and a degree of tightness heretofore only obtained by soldering or welding. The invention accomplishes this entirely by stamping operations performed on the sheet metal. Spouts attached according to the present method have great mechanical strength and have proved leakproof even after being subjected to deformation or considerable abuse, for example after dropping a filled can on its spout.

Evidently the present invention is not restricted to the attaching of spouts to tin cans but may, with equal advantage, be employed wherever a tubular sheet metal member is to be attached to a sheet metal wall. A particular advantage of the invention is that the wall to which the tubular member is to be attached need not be flat. It may, for example, be corrugated. The forming operations performed on a corrugated wall remove the corrugations completely at the aforementioned depression and an area thereabout, so that after formation of the depression the assembly may be handled as if the wall had no corrugations in it at any time.

Various modifications, additions, omissions, substitutions, and other changes both in the method and in the structure will suggest themselves to persons skilled in the art. Such changes obviously do not involve departure from the spirit and the essence of this invention.

What is claimed is:

1. The method of air and liquid tightly attaching to a sheet metal wall a tubular structure having a wall portion, a bottom flange portion and a skirt portion depending from said bottom flange portion, the method comprising the steps of first forming a ring-shaped depression in said sheet metal wall encircling the space of an aperture in the completed structure; then inserting into said depression the depending skirt portion of the said tubular structure; then folding over the walls of said depression and the depending skirt portion of said tubular structure to form a bead surrounding said aperture, said bead securing together said wall and tubular structure; and last drawing the sheet metal portion lying between the bead and the aperture to form a downwardly extending sealing rim adapted to receive a friction closure element.

2. The method of producing a sheet metal structure comprising a tubular spout surrounding an aperture in a sheet metal wall adapted to be sealed by a friction closure element, the method comprising the steps of first forming a ring shaped depression in said sheet metal wall encircling the aperture, the depression being substantially U-shaped in cross-section; then inserting into the depression a downwardly depending skirt portion of the sheet metal spout; then folding over the walls of said depression and the inserted skirt portion of the spout to form a bead surrounding said aperture; and last drawing the sheet metal stock between said bead and said aperture to form a sealing rim extending in a direction opposite to the spout to form a seat adapted to receive a friction closure element for sealing the aperture, whereby an accurately shaped seat is produced not affected by distortion of the stock occurring during the bead forming operation.

3. In an assembly of a sheet metal wall element having an aperture therein with a tubular sheet metal element attached to the wall element about said aperture, the connecting structure between said wall element and said tubular element which comprises; a composite bead formed from the sheet metal of said wall element and said tubular element, said bead comprising in cross-section at least three thicknesses of the sheet material of the wall element, the three thicknesses of the wall element forming substantially a Z, the tubular member extending between two of the three thicknesses, said bead being folded to seat the inserted portion of the tubular element at an angle in cross-section of less than ninety degrees with respect to the wall element.

4. In an assembly of a sheet metal wall having an aperture therein with a tubular sheet metal element attached to the wall about said aperture, the connecting structure between said wall and said tubular element which comprises; a composite bead formed from the sheet metal of said wall and said tubular element, said bead comprising in cross-section at least three thicknesses of the sheet material of the wall, the three thicknesses of the wall forming substantially a Z, the tubular member extending between two of the three thicknesses said two thicknesses forming a channel open towards the open end of the spout; and a sealing rim inwardly of said bead drawn from the sheet material of said wall and adapted to form a seat for a friction closure.

5. In an assembly of a sheet metal wall having an aperture therein with a tubular sheet metal element attached to the wall about said aperture, the improved connecting structure be-

tween said wall and said tubular element which comprises; a composite bead formed from the sheet material of said wall and said tubular element, said bead comprising, in cross-section, at least three thicknesses of the sheet material of the wall with the tubular member extending between two of the three thicknesses, said bead being outfolded with respect to the aperture, the inserted portion of the tubular element being seated between the thicknesses of the wall at an angle in cross-section, of less than ninety degrees with respect to the wall; and a sealing rim inwardly of said bead, said rim being drawn from the sheet material of said wall and adapted to form a seat for a friction closure.

6. In an assembly of a sheet metal wall having an aperture therein with a tubular sheet metal element attached to the wall about said aperture, the improved connecting structure between said wall and said tubular element which comprises; a composite bead formed from the sheet material of said wall and said tubular element, said bead comprising in cross section at least three thicknesses of the sheet material of the wall with the tubular member extending between two of the three thicknesses, said bead being folded towards said aperture, the inserted portion of the tubular element being seated between the thicknesses of the wall at an angle, in cross section, of less than ninety degrees with respect to the wall; and a

sealing rim inwardly of said bead, said rim being drawn from the sheet material of said wall, the rim being adapted to form a seat for a friction closure.

7. A sheet metal assembly comprising a sheet metal wall element having an aperture therein, a tubular sheet metal spout attached to the wall element about said aperture at a bead formed of interengaging portions of said wall element and said spout, and a sealing rim inside said spout, said sealing rim being adapted to form a seat for a friction closure, characterized in that the sealing rim is spaced and separate from said bead and is formed of sheet metal of the wall element, whereby the fluid tightness of the structure becomes independent of the tightness of the bead.

CHARLES HIRSCHFELD.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
Re. 17,825	Wikstrom	Oct. 14, 1930
461,041	Paddack	Oct. 13, 1891
1,000,486	Bauroth	Aug. 15, 1911
1,976,673	Titus	Oct. 9, 1934
2,031,838	Leonhart	Feb. 25, 1936