Feb. 24, 1953 J. L. REYNOLDS 2,629,534

CONTAINER

Filed Oct. 8, 1947 2 SHEETS—SHEET 1

Fig. 1.

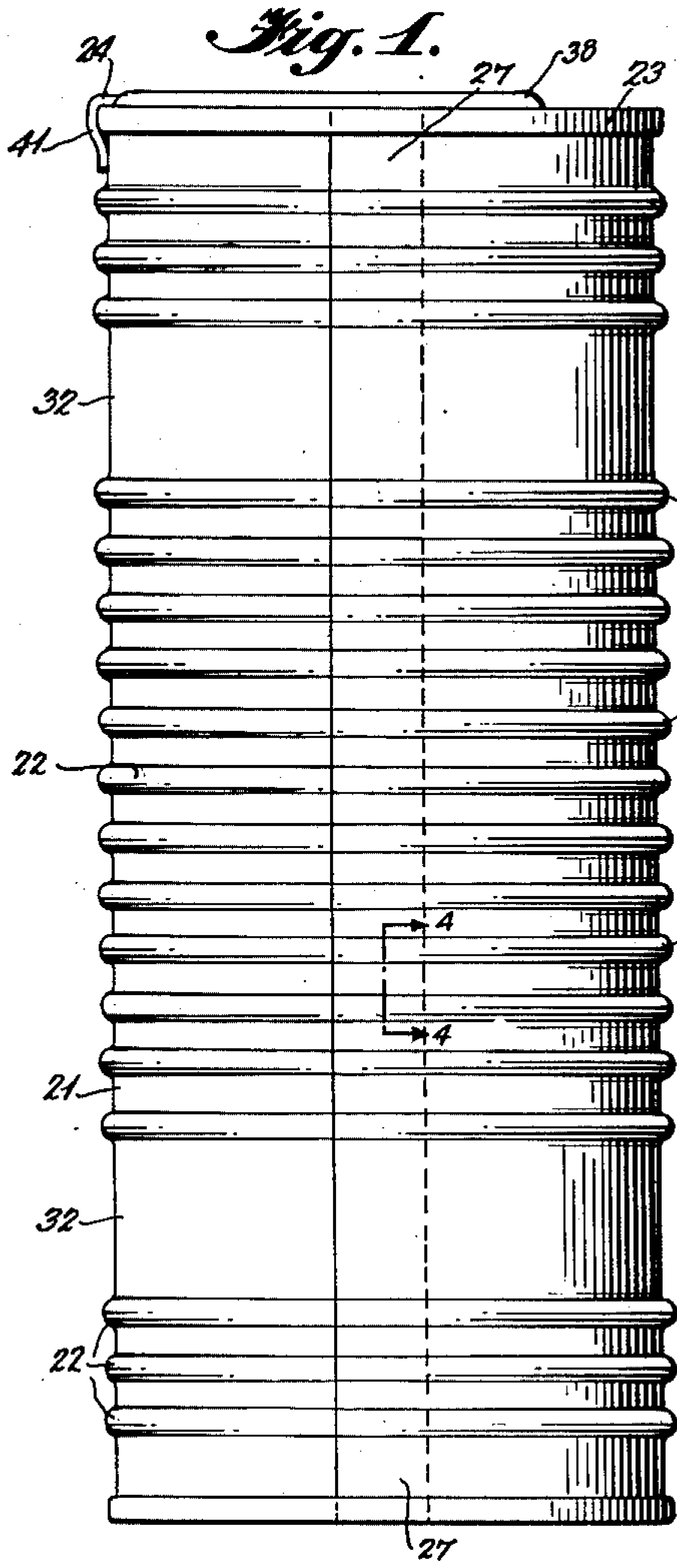

Fig. 2.

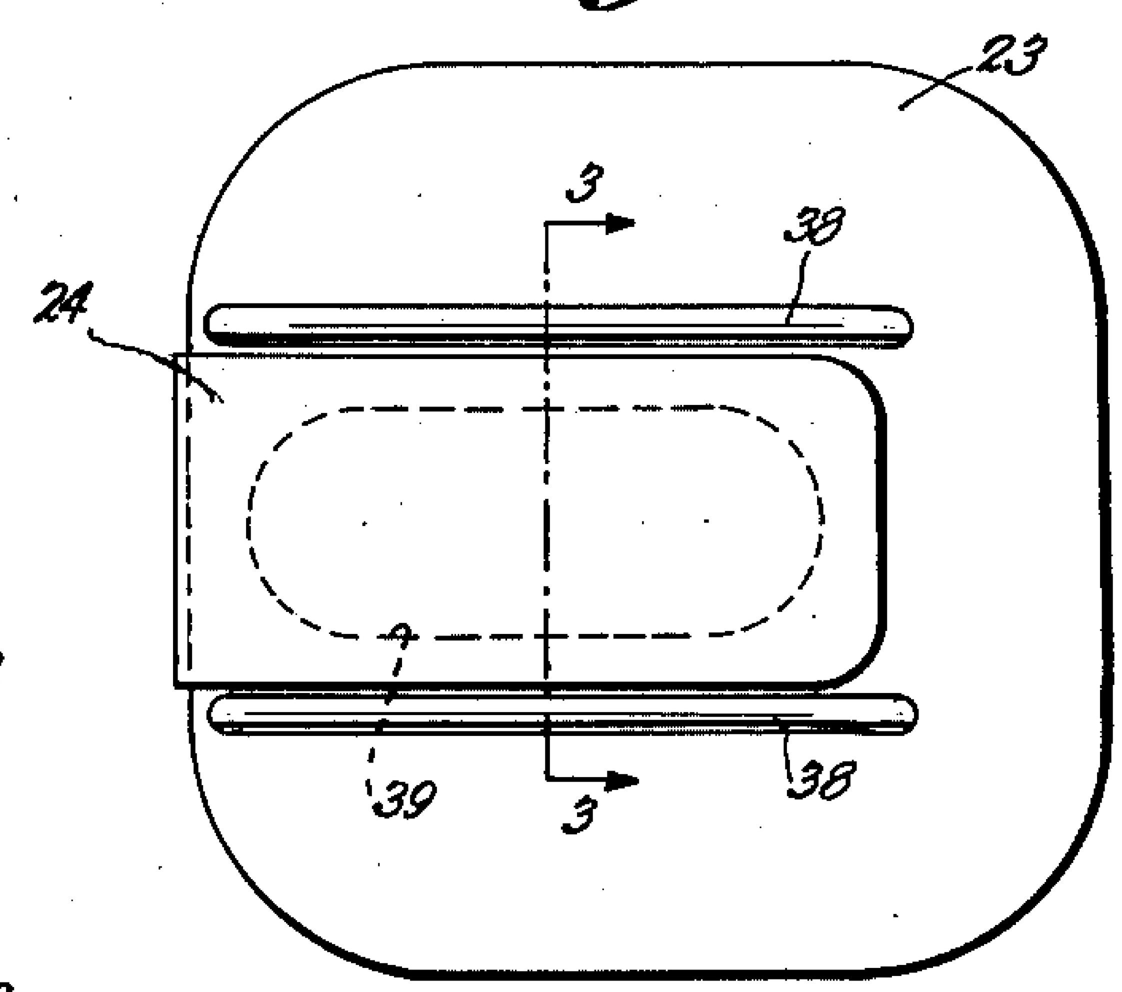

Fig. 3.

Fig. 4.

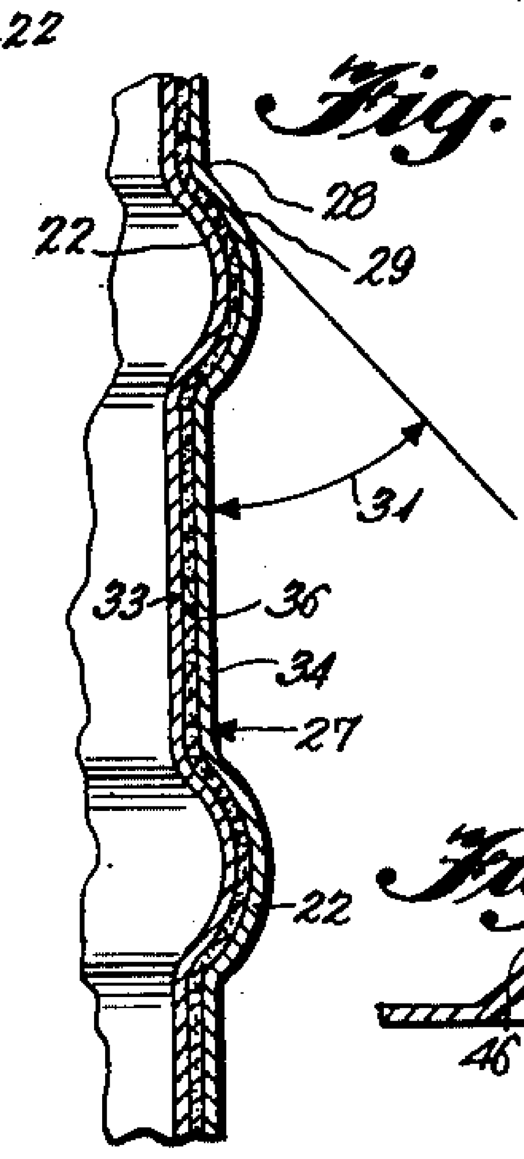

Fig. 5.

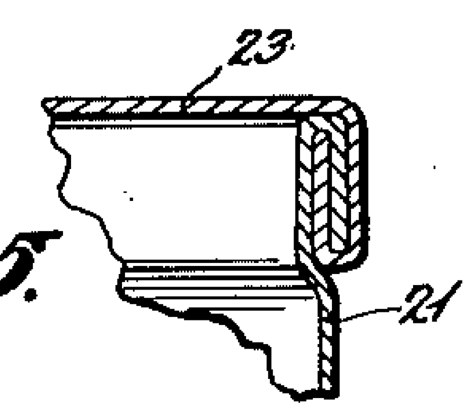

Fig. 6.

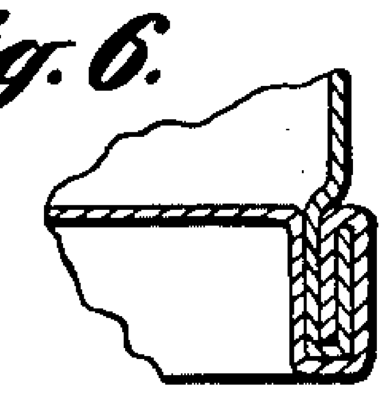

Fig. 8.

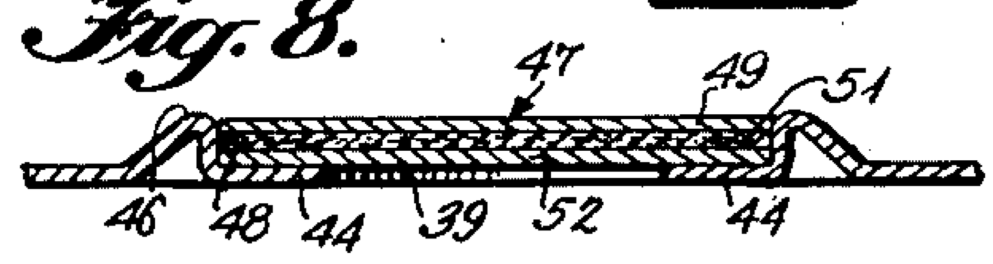

Fig. 9.

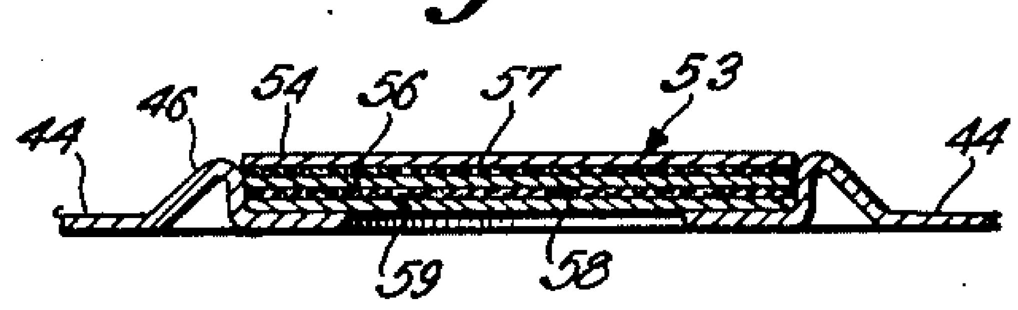

Fig. 7.

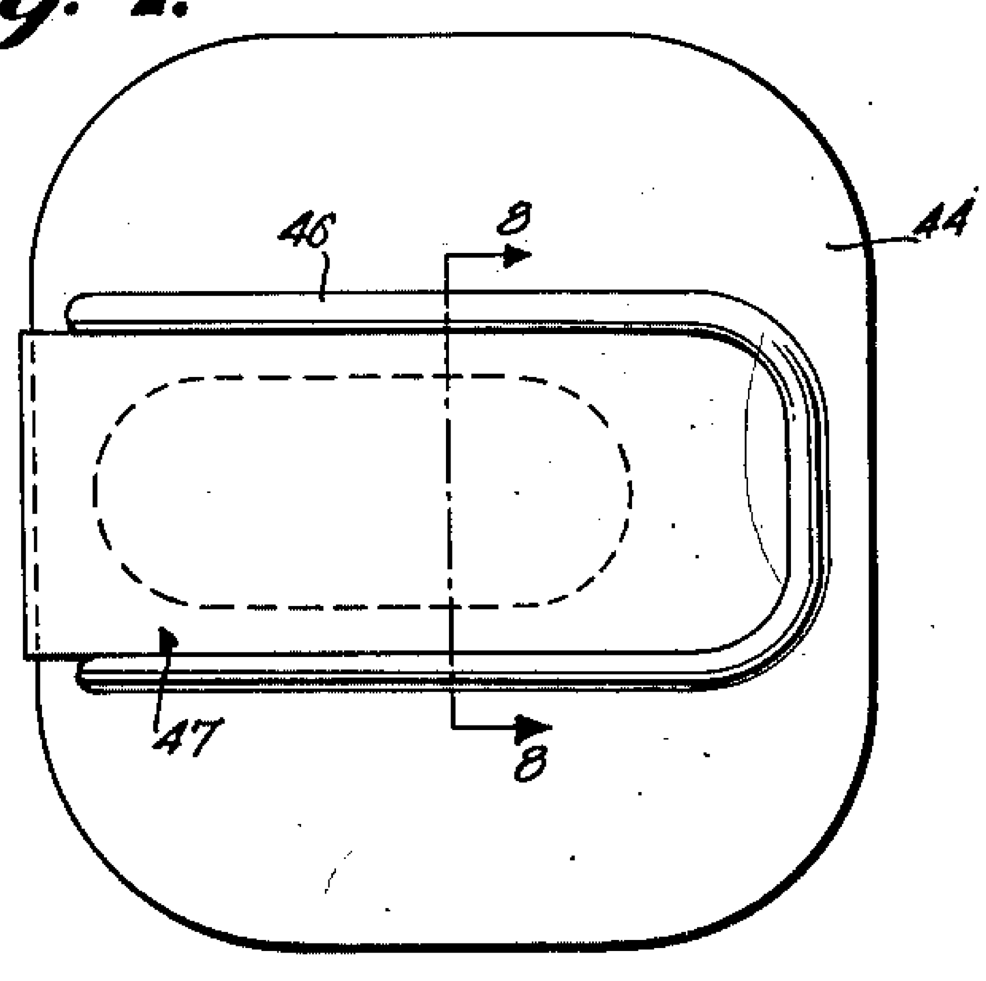

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Fig. 10.

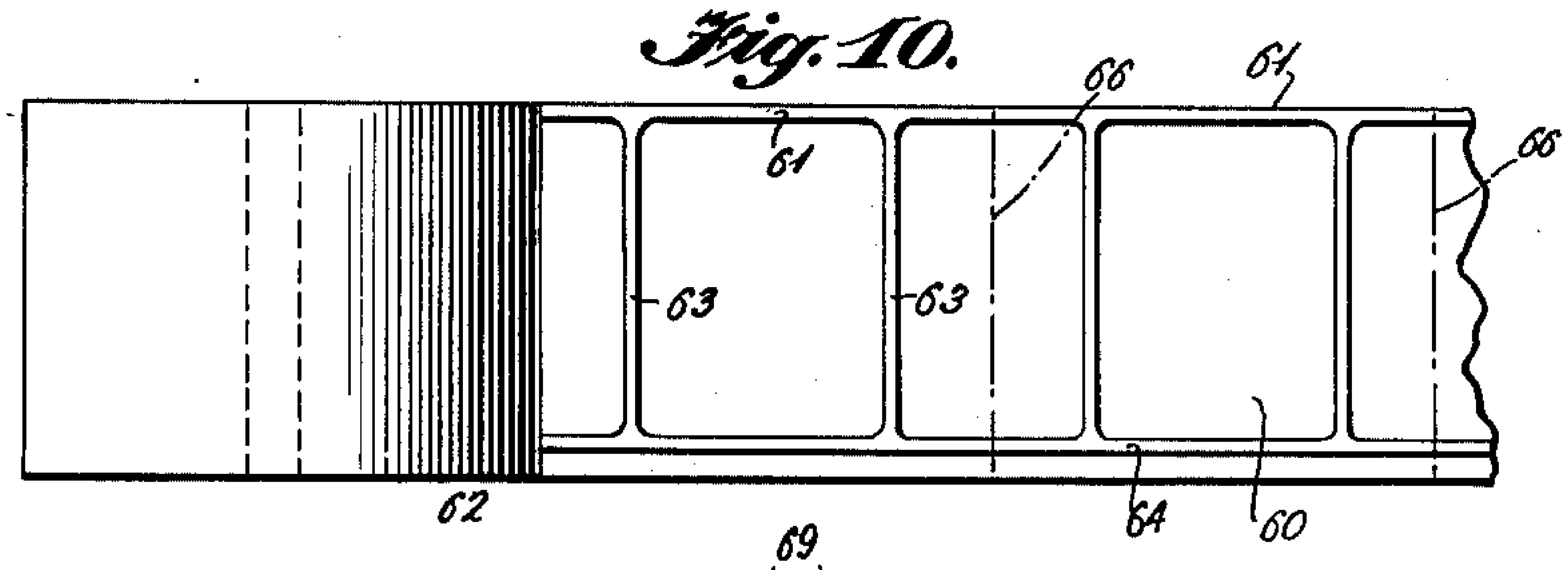


Fig. 11.

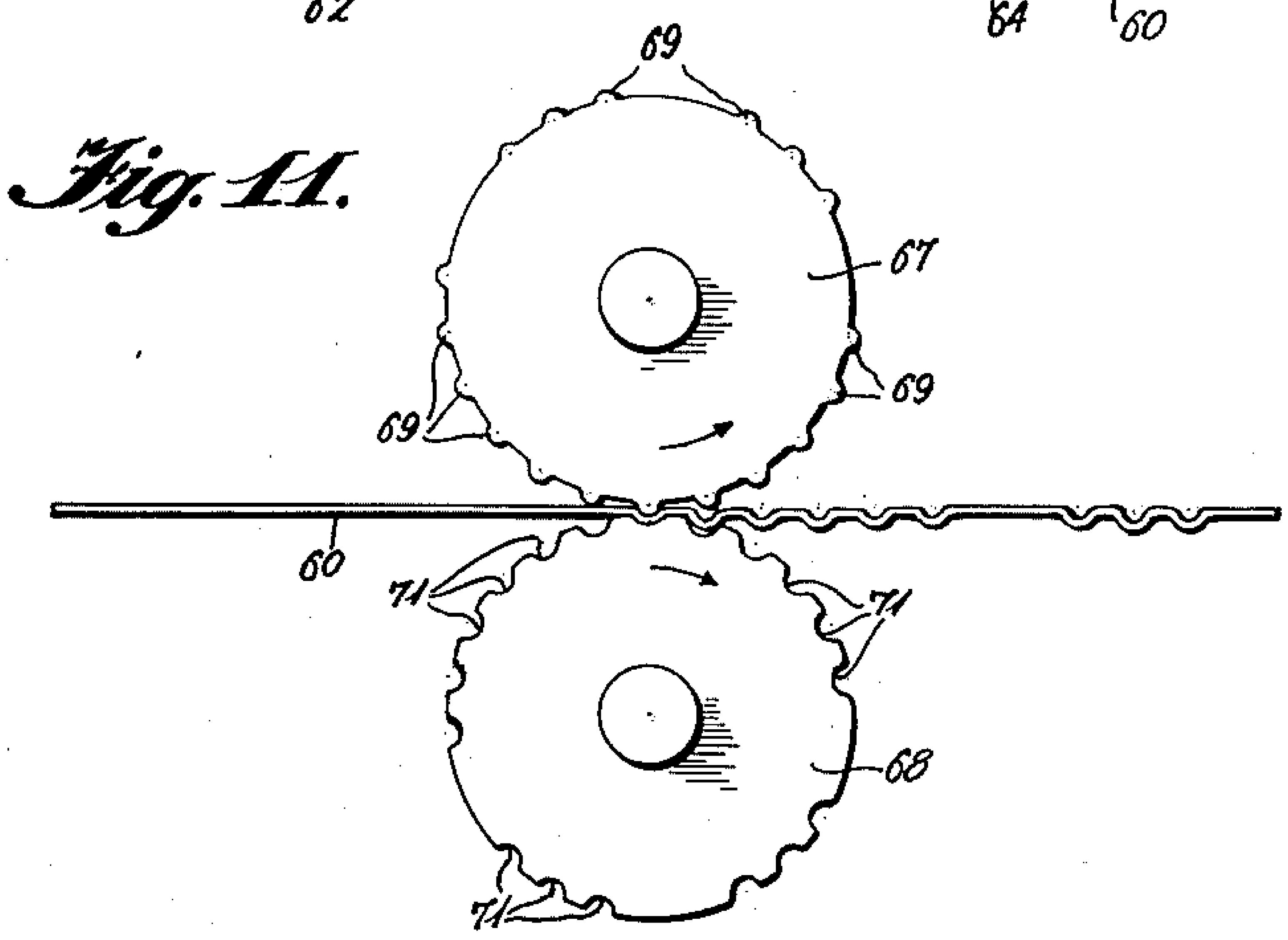


Fig. 12.

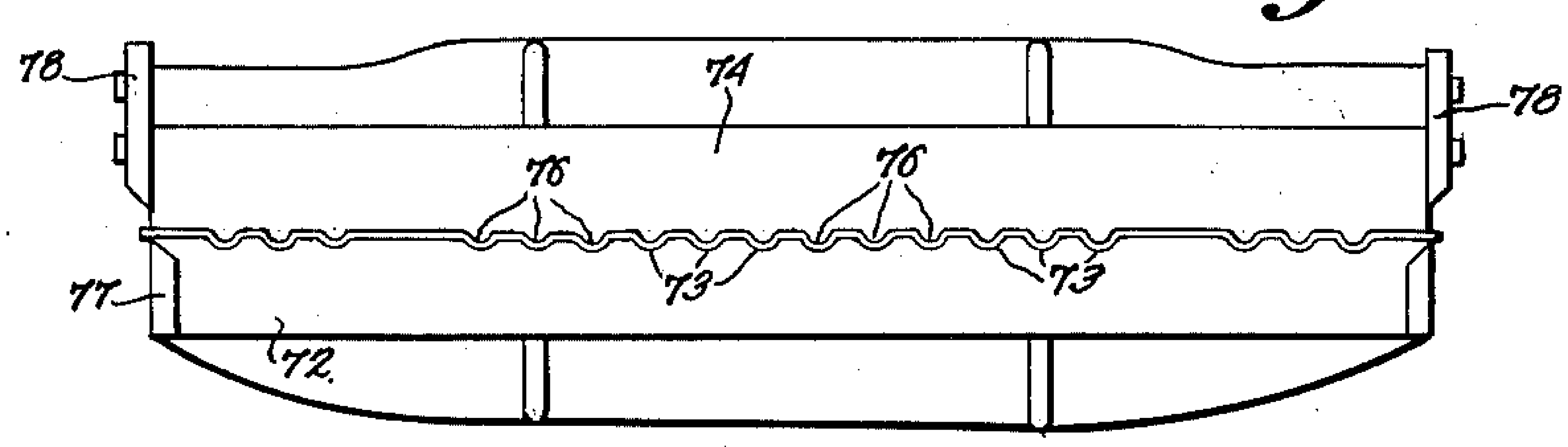
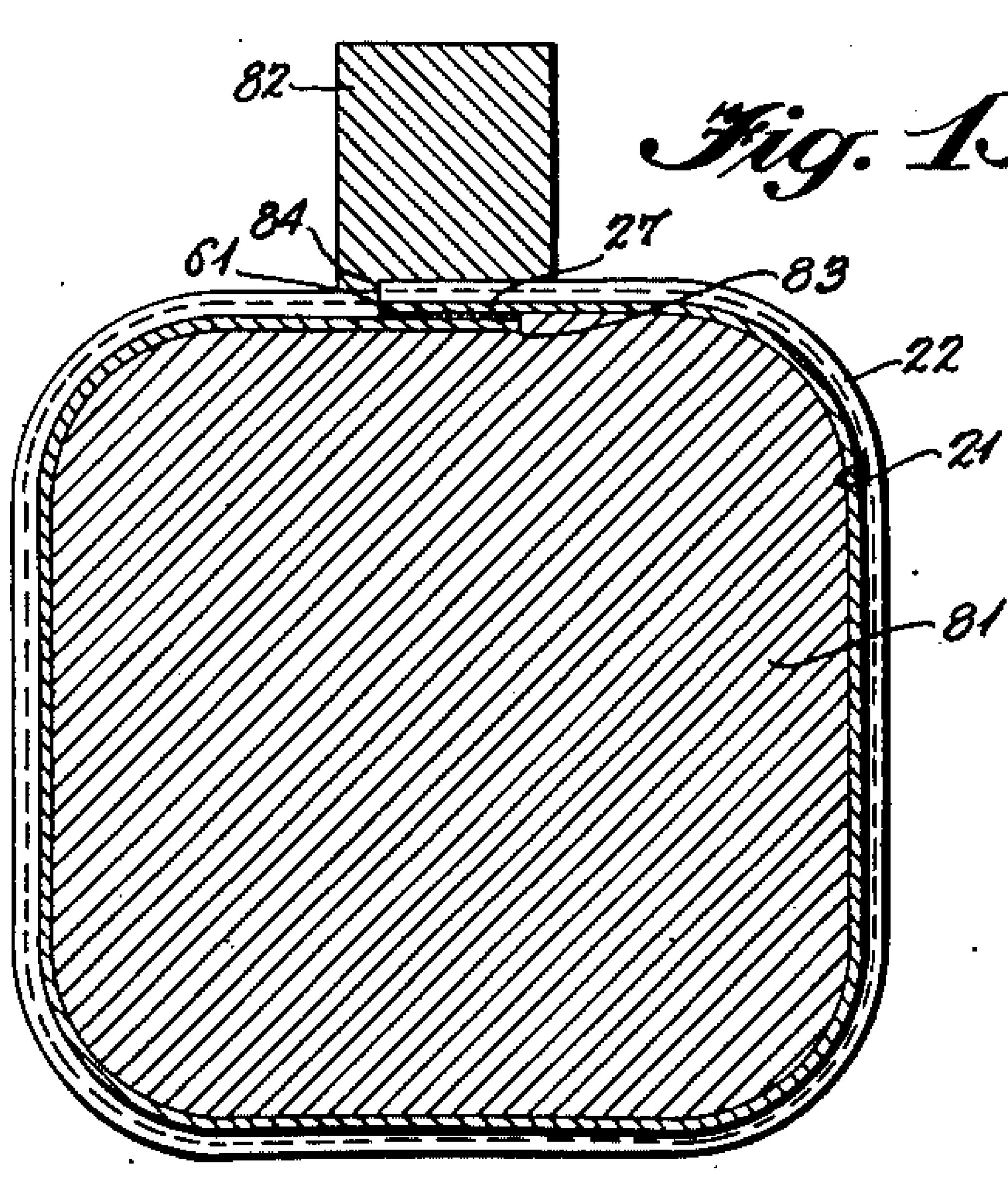


Fig. 13.



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2,629,534

UNITED STATES PATENT OFFICE

2,629,534

CONTAINER

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Application October 8, 1947, Serial No. 778,596

1 Claim. (Cl. 229—3.5)

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This invention relates to an all metal foil single use container adapted for containing and transporting liquid, such as, for example, milk.

The metal container of this invention is made from, for example, thin aluminum foil, so that the problem of contamination of flavor of milk is avoided. The application of thin aluminum foil obviates the problem of liquid absorption, a problem common to paper containers. The use of aluminum foil containers also permits an efficient and rigid pasteurization of milk while in the container. Moreover the containers, being made of thin aluminum foil, are light in weight and hence signify a minimum cost for transportation.

It is an object of this invention to provide a metal foil container from aluminum, which is hermetically sealed.

It is a further object of this invention to provide a light weight, single use, aluminum container of relatively great strength such as to withstand the stresses and strains of normal handling.

It is also an object of this invention to provide an aluminum container having a top closure having an aperture therein, said aperture being disposed between the linear corrugations and closed by means of a sealing element adapted to be resealable.

These and other objects of this invention will become apparent from the following disclosures taken in conjunction with the attached drawings, in which:

Fig. 1 is a side elevation of a container in accordance with the present invention.

Fig. 2 is a top view of the container of Fig. 1;

Fig. 3 is a fragmentary vertical section on an enlarged scale taken on the lines **3—3** of Fig. 2;

Fig. 4 is a fragmentary vertical section on a still further enlarged scale taken on the line **4—4** of Fig. 1;

Fig. 5 is a fragmentary vertical section on an enlarged scale showing a suitable joint between the top and side wall of the container;

Fig. 6 is a view similar to Fig. 5 showing a suitable joint between the bottom and side wall of the container;

Fig. 7 is a view similar to Fig. 2 showing a modification of a top or cover for the container;

Fig. 8 is a fragmentary vertical section on an enlarged scale taken on the line **8—8** of Fig. 7;

Fig. 9 is a view similar to Fig. 8 showing a modified sealing structure;

Fig. 10 is a view showing a roll of thin sheet aluminum illustrating one manner of applying a thermoplastic adhesive compound thereto;

Fig. 11 is a diagrammatical side view showing

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forming or corrugating rolls suitable for employment in making the container of the present invention;

Fig. 12 is a view similar to Fig. 11 showing pressing and trimming apparatus for the formed aluminum sheets produced by the rolls of Fig. 11; and

Fig. 13 is a diagrammatic sectional view through a mandrel and sealing device suitable for use in forming the containers of the present invention.

Referring more particularly to the drawings, the container of Fig. 1 may have side walls **21** formed with stiffening corrugations **22** extending completely around the container. The container may also have a cover member **23** provided with a detachable closure and sealing member **24** and a bottom cover **26**. The entire aluminum container is fabricated of thin sheet aluminum or heavy foil, i. e., aluminum having a thickness ranging from approximately .004 to .006 inch. Such thin aluminum stock has very little resistance to bending out of the plane of the sheet stock or very little resistance to compression stresses parallel to the plane of the sheet stock. It has been found that the resistance to such stresses may be markedly increased by forming strengthening ribs or corrugations **22** of special shape and disposition in the metal sheet making up the side walls of the container. The shape of the ribs is shown in Fig. 4 which is a vertical section taken through the lap joint **27** for the body of the container. It has been found that these ribs should be formed without any substantial stretching of the metal, otherwise tearing of the aluminum will occur. One manner of forming ribs in the sheet aluminum without such stretching action will be described below with respect to Fig. 11. Also in forming the ribs, any sharp corners between the original plane of the aluminum sheet and the curved portion of the ribs must be avoided to prevent cutting or breaking of the aluminum. Thus, the corner **28** in Fig. 4 must have a substantial radius of curvature. Furthermore, the maximum angle which the sides **29** of the corrugations make with the original plane of the sheet must fall within rather definite limits. If this angle, indicated as angle **31** in Fig. 4, is too small, the sheet is not substantially stiffened against bending along a line crossing the corrugations, and if the angle is too great, the sheet of aluminum, even when formed into a container, can be easily compressed or extended along a line crossing the corrugations in a manner similar to an accordion bellows. It has been found that if the angle 31 lies between approximately 40° and 60°, the aluminum is stiffened materially against bending along a line crossing the corrugations and also resists compression and tension stresses in the original plane of the sheet along a line crossing the corrugations. The cold working of the aluminum metal also stiffens this metal such that a container made therefrom has remarkable resistance to stresses in all directions in spite of the fact that the metal stock is extremely thin. The top of the corrugations 22 should also be void of sharp corners and it has been found that for metal stock of the thickness referred to above, the width of the corrugations should be approximately 1/8'' with a height of approximately 1/16'' although corrugations having a width ranging from approximately 3/32'' to 1/4'' may be employed with heights ranging from approximately 3/64'' to 1/8''. The corrugations are preferably spaced relatively close together, for example, between approximately 1/4'' and 5/8'' on centers, although spaces 32 between the various series of corrugations ranging up to approximately one inch in width may be left without any serious decrease in strength of the container. Such spaces are convenient for the application of labels, printing, etc.

As shown in Figs. 1 and 4, the side seam of the container is preferably a lapped joint of considerable width, for example 3/8'' to 3/4'' in which the corrugations of the underlying layer of metal 33 conform to and fit the corrugations of the overlying or upper layer of metal 34. The corrugations thus extend completely around the container body. The joint is preferably made with a thermoplastic adhesive material 36 which adheres well to aluminum and which has a relatively high melting point. Various thermoplastic adhesive sealing compositions are available on the market and the invention is not limited to any particular type of thermoplastic sealing material. As a specific example, a vinyl copolymer may be employed. As described in more detail below, the thermoplastic sealing material may be applied in the form of a solvent solution to one or both surfaces to be adhered together and the solvent then evaporated by a heat treatment. A specific example of such a solvent solution may be vinyl copolymer 22½% by weight, and acetone or methyl ethyl ketone 87½% by weight. The vinyl copolymer is tasteless and also, is insoluble in aqueous solution.

Substantially all of the solvent is driven out before the sealing operation is performed so that no deleterious taste is imparted to the contents of the container. Sealing may be accomplished by overlapping the container edges and first pressing with a hot sealing member to melt the adhesive between the surfaces to be sealed and then pressing with a cold pressing member until the thermoplastic cools to solid form. Although thermosetting resins such as phenyl aldehyde or urea aldehyde resins, or mixtures of such resins with thermoplastic resins, may be employed in substantially the same manner, the requisite curing time, in general, renders such sealing materials impracticable for rapid fabrication of the containers.

For packaging milk and like food products, it is extremely desirable that the top of the container be substantially smooth and have no upstanding ridges around the edge thereof. A suitable joint for attaching the top of the container to the body thereof is shown in Fig. 5, in which the top 23 is double-seamed with the side wall 21 so that the

top and side walls have interlocking convolutions without producing an upstanding ridge. Methods for fabricating such joints are known and consist of first flanging the upper edge of the open container outwardly substantially at right angles with a suitable forming or spinning tool, then applying the container top with its edges extending a short distance outwardly of the flange. The extending edge of the top is then spun downwardly and under the flange of the container and the resulting outwardly extending composite flange then spun downwardly against the container side. The formation of such a joint with the thin sheet aluminum requires an inner support adjacent the top and during such seaming operation the container is ordinarily supported upon a mandrel.

For a milk package, the top 23 is preferably provided with a pair of upstanding ribs or corrugations 38 formed in the top before it is applied to the container. The top is also preferably provided with an elongated pouring opening 39 positioned midway between the ribs 38 and having rounded ends. The ribs 38 provide a depression therebetween for receiving the sealing member 24. The sealing member 24 preferably has an extending portion or tab 41 extending over the top edge of the package and downwardly against the side thereof. The sealing member 24 may be held in position by an adhesive 42. The simplest manner of sealing the container is to use a pressure sensitive adhesive which is substantially odorless and tasteless. Such pressure sensitive adhesive compounds satisfactorily adhering to aluminum are commercially available. In such cases, the sealing member 24 may be made of aluminum stock of substantially the same thickness as that of the container body.

The pressure sensitive adhesive may be applied to the sealing member 24 so as to cover the under-surface of all portions of the sealing member 24, but a preferred structure is to omit such adhesive on the surface of the sealing member corresponding to the pouring opening 39. With this structure, the sealing member may be applied to the container by a simple pressing operation after the container has been filled. It may be readily removed by inserting a thumb or fingernail under the tab 41 and tearing the sealing member from the container top. The pressure sensitive adhesive has the advantage of ease in application and ease in removal of the sealing member, but has the disadvantage of not being tamper-proof in that the closure member may be reapplied without difficulty so as to show no indication of previous removal. It is also possible to employ a thermoplastic adhesive similar to that described with respect to the side seam 27 so as to heat-seal the sealing member 24 to the container top. The use of such a thermoplastic adhesive does render the container tamper-proof but does not permit the easy reapplication of the closure member after initial removal to prevent undue contamination during storage and use of the remaining contents. The ribs 38 not only strengthen the top member to enable application of the sealing member but also protect the edges of the sealing member against accidental removal of the sealing member, and furthermore reduce the possibility of accumulation of contamination around the edges of the sealing member.

A modified type of top member 44 is shown in Fig. 7 which is particularly useful with a modified type of sealing element, such as shown in either Fig. 8 or Fig. 9. In Fig. 7, a single stiffening rib or corrugation 46 which is of U-shape extends completely around the sealing member 47. As shown in Figs. 8 and 9, the stiffening rib 46 may have a substantially vertical inner edge 48 so as to tightly fit the sealing member 47. Sealing member 47 may be a laminated structure having an upper layer of foil or thin aluminum stock 49, an intermediate layer of wax 51 and a lower layer of thin porous paper 52. The sealing member is applied within the opening formed by the rib 46 so as to cover the pouring opening 39 and a heated member applied against the metal upper layer 49. The wax 51 is thereby melted and penetrates through the porous paper 52 into contact with the metal of the cover 44 so as to seal the sealing member 47 to the cover. The vertical longitudinal surfaces 48 of the ribs 46 also tend to frictionally hold the sealing member 47 in position and the rib 46 guards against accidental displacement of the sealing member 47. The form of the ribs 46 of Fig. 8 is also more effective in preventing accumulation of contamination around the edges of the sealing member 47.

The sealing member 53 of Fig. 9 is also a laminated structure of somewhat more elaborate construction than the sealing member 47 of Fig. 8. The sealing member 53 of Fig. 9 may have a metal upper layer 54 and an intermediate layer of paper 56 secured to the metal layer 54 by means of a high melting point adhesive 57 such as solid glue. The lower surface of the upper layer 56 may be coated with a layer of wax 58 which is in turn covered by a thin layer of porous paper 59. Upon application of heat to the metal layer 54, the wax carried by the paper 56 is melted and penetrates the porous paper 59 to adhesively secure the sealing member to the container top 44. The structure of Fig. 9 provides a somewhat stiffer sealing member, and also the wax is more easily applied to the paper layer 56 adhesively secured to the metal 54 than it is directly to the metal layer 54. It will be apparent that the form of the container top 44 having the stiffening rib 46 may be employed with the single metallic seal of Figs. 2 and 3 or that the container top 23 having the side stiffening ribs 38 may be employed with the sealing members of Figs. 8 and 9. One advantage of the form of the container top 44 shown in Figs. 7, 8 and 9 is that an adhesive such as wax or a thermoplastic resin may be employed to produce a tamper-proof container which enables the closure or sealing member to be reapplied after partial use of the contents although the fact that the container has once been opened may be readily detected. In other words, upon reapplication of the sealing member, it is held in place by friction against the vertical walls of the ribs 46 since the adhesive bond has been broken.

Several of the more important steps in fabricating the container of the present invention are illustrated in Figs. 10 to 13, inclusive. It is contemplated that the containers will be fabricated at the point of use, i. e., at the filling plant, from a roll of thin sheet aluminum and from top and bottom members which have been previously cut and shaped at the container factory. It is difficult to apply solvent free thermoplastic adhesive at the filling plant although it is possible to employ molten adhesive or a thin separate ribbon of solid thermoplastic. Application of adhesive to the aluminum sheet at the

container factory or aluminum rolling plant is therefore contemplated. It may be applied in the form of a coating of a solvent solution of the adhesive followed by a heat treatment to evaporate the solvent. The adhesive for the side seam 27 of the container is applied as a strip 61 along one lateral edge of the sheet of aluminum. Applying an adhesive strip along one edge of the aluminum sheet will, however, prevent even rolling of the aluminum into a roll 62. A grid of adhesive made up of transverse strips 63 and a longitudinal strip of adhesive 64 can, however, also be applied to a surface of the aluminum sheet material. Such additional adhesive will, in general, perform no function in fabrication of the container but will enable the aluminum sheet to be uniformly and evenly rolled into the roll 62. By employing a considerable number of transverse adhesive strips 63, it is possible to eliminate the additional longitudinal strip 64 of adhesive, and if the additional longitudinal strip 64 of adhesive is employed it will ordinarily be spaced inwardly from the other edge of the metal sheet so that it will not be in contact with either the heated pressing member during the sealing operation or under the heated pressing member and in contact with the mandrel during such sealing operation. The adhesive is preferably applied to one surface only of the aluminum but a corresponding grid of adhesive may also be applied to the other surface of the aluminum sheet so that both surfaces of the aluminum to be sealed together will be provided with adhesive.

The container is preferably constructed so that the grain of the aluminum extends vertically of the container body, i. e., the corrugations are formed in the sheet 60 so as to extend transversely thereof. The longitudinal edges of the sheet form the seam 27 and the width of the sheet may be just sufficient to form the container body including the seam 27 or may be slightly wider to enable final trimming of the edges of the container body blanks. Rolled aluminum sheet material has a definite grain structure, and it has been found that maximum strength of the container is obtained when the grain runs vertically of the container, the corrugations being formed across the grain.

The line along which the strip 60 is to be cut to form the container body blanks is indicated by the dash-dot lines 66 of Fig. 10, and it will be apparent that the transverse strips 63 of adhesive may be positioned such that they fall within the uncorrugated portions 32 of the container body shown in Fig. 1 although the thin layer of adhesive does not interfere with the corrugating operation such that the strips may be placed on portions of the sheet which are thereafter corrugated. In the finally fabricated container, the additional adhesive represented by the transverse strips 63, as well as the other longitudinal strips 64, if employed, may be positioned internally or externally of the container. The additional adhesive strips are, however, preferably positioned externally of the container, and the transverse strips 63 may be employed as a protection for printing upon the aluminum. In other words, the adhesive coated strip fabricated at the factory may be first printed with appropriate labels in the areas underlying the transverse strips of adhesive 63 and the adhesive then applied and dried so as to provide a protective film over the printing. The printed sheet may then be corrugated so that the printing with the protective coating occupies uncorrugated portions of the container of Fig. 1.

The aluminum sheet 60 of Fig. 10 may then be fed through corrugating rolls 67 and 68 (Fig. 11) at the filling plant. One of the corrugating rolls 67 may have projections 69 extending longitudinally of the roll and with depressions 71 in the roll 68, the projections 69 and recesses 71 having the desired shape of the corrugations 22 of Fig. 4. It is important that no substantial stretching of the aluminum metal take place during the corrugating operation since otherwise tearing of the aluminum will almost inevitably occur. The forming rolls must therefore be designed so that one corrugation in the metal sheet is substantially completely formed before the metal is gripped between the surfaces of the rolls between the corrugations and before any substantial bending of the metal in forming the next corrugations takes place. Thus in Fig. 11, the strip may be fed toward the right between the rolls 67 and 68. The corrugation being completely formed substantially on the line between the axis of the roll should be substantially completed before there is any gripping action of the metal between the surfaces of the rolls to the left of the line joining the axis of the rolls, and before there is substantial bending of the sheet 60 by the next projection 69 on the roll 67. Furthermore, the mating projections 69 and recesses 71 are preferably formed in accordance with gear tooth design so that there is substantially rolling contact between the projections 69 and the metal being formed into corrugations. Power is preferably supplied to both of the rolls to drive them in synchronism, and in order to insure accurate feeding of the strip, the surfaces of the rolls between the projections 69 and recesses 71 should firmly grip the metal of the strip without, however, either cutting of the metal or causing substantial lateral or longitudinal displacement thereof. It is possible to lightly knurl such surfaces to provide a better gripping action on the aluminum sheet but such knurling should not be sufficient to cause cutting or any material stretching of the metal.

Although with accurately formed corrugating rolls 67 and 68 it is possible to advance the formed sheet directly into the mechanism for forming the container body, the metal many times tends to adhere to one or the other of the rolls so as to bend or otherwise distort the rolled sheet. It is therefore preferred to press the corrugated strip between dies such as those diagrammatically illustrated in Fig. 12. Thus, the corrugated sheet from the rolls of Fig. 11 may be received upon a lower die 72 having recesses 73 formed therein corresponding to the corrugations of the sheet and an upper forming die 74 may be pressed downwardly against the sheet, the upper forming die having projections 76 also corresponding to the corrugations of the sheet. In general, the corrugations must be substantially completely formed before the sheet can be subjected to a pressing operation such as illustrated in Fig. 12 as any attempt to completely form the corrugations in an operation between such pressing dies requires stretching of the metal resulting in tearing thereof. The pressing dies of Fig. 12 do, however, remove any inaccuracies in the strip and straighten the same for the subsequent container body forming operation.

Since the top and bottom edges of the formed container body accurately fit the top and bottom covers, it is preferred to trim at least the leading and trailing edges of the container body blank while the same is positioned between the pressing dies 72 and 74 and for this purpose, stationary knife blades 77 may be secured to the lower die 72 while vertical reciprocal shearing blades 78 may be slidably secured to the upper die 74. After the corrugated sheet has been pressed between the dies, shearing blades 78 may be driven downwardly by any suitable mechanism to trim the leading and trailing edges of the blank. No attempt has been made to illustrate the operating mechanism for the rolls of Fig. 11 or the dies and knives of Fig. 12 as such mechanism involves mechanical details forming no part of the present invention.

It will be understood that the metal being formed between the rolls of Fig. 11 may be stripped therefrom in any suitable manner, for example, by compressed air exhausted from apertures in the circumferential surfaces of the rolls through suitable ducts in the rolls and that compressed air may be employed for moving the corrugated material from the rolls of Fig. 11 into the dies of Fig. 12, and for stripping and forwarding the metal from the dies of Fig. 12 after opening of the dies. Thus for example, the metal may be stripped from the dies 72 and 74 of Fig. 12 by compressed air forced through suitable apertures in the faces of the dies. The metal strip may be cut into container-body blanks either before corrugation in the rolls of Fig. 11 or the trimming knives at the entrance end of the dies 72 and 74 of Fig. 12 may be employed to sever the blank from the strip. For mechanical reasons, its is somewhat easier to cut the blank from the strip before it enters the corrugating rolls of Fig. 11 and then trim the blank in the pressing dies of Fig. 12, but either method of forming the container body blank is contemplated. If desired, the side edges of the sheet may also be trimmed in the pressing and trimming operation of Fig. 12, but this is usually not necessary.

After the pressing and trimming operation of Fig. 12, the container body blank will be carried below the mandrel or horn 81 diagrammatically illustrated in cross-section in Fig. 13. Although the mandrel 81 is indicated as being solid in Fig. 13, it will be understood that such mandrel will ordinarily be a collapsible mandrel as is conventional in the making of metallic containers. After the blank has been fed below the mandrel, it can be wrapped around the mandrel by any known or suitable mechanism contacting the container body blank between the corrugations 22 so that the container body portion 21 assumes its final configuration about the mandrel 81. It has been found that it is unnecessary to place corrugations completely around the mandrel 81 corresponding to corrugations 22 in the container body but that the mandrel should have corresponding corrugations underlying the joint 27. It will be appreciated that the thermoplastic adhesive strip 61, which was originally placed along one edge of the sheet 60 of Fig. 10, will occupy a position between the overlapped edges of a container blank at the joint 27. The heated presser member 82, either a solid shoe or a roll fitting the corrugations in the container body, may be pressed against the seam or joint 27 to melt the adhesive 61. The heated presser member 82 may then be removed and a chilled presser member (not shown) may then be pressed against the same or joint 27 to rapidly cool the adhesive and thus complete the joint.

It has been found that the pressure necessary to make a satisfactorily adhesive seam 28 has a tendency to cause the edge of the underlying portion of the container body to cut the overlying portion, and similarly, that the edge of the overlying portion of the container body has a tendency to cut the underlying portion. Even though the metal of the container body is only a few thousandths of an inch thick, it has been found desirable to provide clearance in both the mandrel 81 and the presser member 82. Thus, mandrel 81 may be recessed, as indicated at 83, so that the upper surface of the underlying portion of the container body is substantially flush with the adjacent surface of the mandrel. Similarly, the presser member 82 may be recessed as indicated at 84 so that the lower surface of the overlying portion of the container body is substantially flush with the adjacent surface of the presser member 82, it being understood that both the heated and cold presser members may be similarly constructed in this respect.

After the container body portion has been formed as above discussed, one end edge of the container body is preferably flanged outwardly while the container is still on the mandrel 81 and then the container top applied and a double crimped joint, such as shown in Fig. 5, formed between the top and the container body by known or suitable mechanism. After the top has been applied, the mandrel may be collapsed and the partially formed container removed from the mandrel, for example, by a blast of compressed air through suitable ducts in the mandrel, and thereby moved into a chuck holding the container body and exposing the open end of the container. The bottom member of the container may then be applied by known or suitable mechanism to form a joint similar to that shown in Fig. 6. It will be understood that the preformed top and bottom members may have their edges provided with suitable sealing compounds known to the art so that such compounds are positioned between the layers of the final seams shown in Figs. 5 and 6. The completed container may then be subjected to a sterilization operation and delivered to a filling machine in which a liquid material is introduced into the container through the pouring aperture 39 and the sealing members 24, 47 or 53 applied thereto.

The thermoplastic adhesive for the side seam 27 as well as the sealing compounds employed in the top and bottom seams can be selected so as to be able to withstand the pasteurization temperature and the same may be true of the adhesive selected for holding the sealing member over the pouring aperture. Pasteurization of such products as milk may then be carried on after the container is filled since rapid heat transfer through the walls of the container is practicable both for heating and cooling operations.

The container of the present invention is particularly adapted for final fabrication at the filling plant so that very little shipping space is required. It will be apparent that food products other than milk, or other products, for example, lubricating oil as well as solid or powdered materials, may be packaged in containers of the general type disclosed in the present application. The shape and size of the container may, of course, be varied within relatively wide limits. Also, the container may be round in horizontal cross-section or may be of generally rectangular shape instead of the substantially square container shown. The corners of the container should, however, have a substantial radius of curvature, for example, a radius of at least 5/8'' or 3/4'' to avoid any excessive stretching of the metal in making the bottom and top seams. Also in general, a container having a vertical dimension substantially greater than its horizontal dimension is preferred as maximum strength is developed by such construction. It will be understood that in the packaging of materials other than liquid food products, for example, lubricating oil, the top member of the container may also be similar to the bottom element so as to dispense with a pouring opening and seal therefor. Such a top member may be secured to the container body by a seam substantially similar to that shown in Fig. 6. A smooth top surface is not required and opening of the container may be accomplished by suitable tools. In any case, the structure of the body portion of the container, including the type of corrugations discussed at length above, imparts the necessary strength to the container even though the container is constructed of thin sheet aluminum.

While I have disclosed the preferred embodiments of my invention, it is understood that the details thereof may be varied within the scope of the following claims.

I claim:

A sealed metal container of aluminum foil having a thickness of from about 0.004 to about 0.006 inch thickness comprising a vertical tubular body having a vertical seam sealed by an adhesive, said body being provided with a plurality of elevated strengthening corrugations having an angle of curvature of about 40–60° with the vertical body wall, said angle being adapted to prevent stretching of the metal foil during the formation of said corrugations, a bottom seal disposed inwardly of said tubular body and secured thereto by a turned-over bead, and a top seal disposed upon the vertical tubular body and secured thereto by a top turned-over bead, said top seal having a pair of spaced-apart linear corrugations having opposed substantially vertical inner walls between which there is located an aperture being closed by a sealing member disposed between said linear corrugations and over a portion of said top tuned-over bead, said sealing member consisting of a multiple-ply aluminum foil structure secured together by adhesive, said sealing member being re-sealable by frictional engagement with the substantially vertical inner walls of the linear corrugations.

JULIAN L. REYNOLDS.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
Re. 1,383	Wilson et al.	Jan. 6, 1863
82,818	Fleming et al.	Oct. 6, 1868
364,417	Jaeger	June 7, 1887
381,871	Alexander	Apr. 24, 1888
417,667	Crary	Dec. 17, 1889
663,385	Hobbs	Dec. 4, 1900
1,174,833	Dougherty	Mar. 7, 1916
1,315,394	Penn	Sept. 9, 1919
1,362,332	McGrath	Dec. 14, 1920
1,367,379	Gruenberg	Feb. 1, 1921
1,623,618	Cook	Apr. 5, 1927

(Other references on following page)

UNITED STATES PATENTS

Number	Name	Date
1,671,735	McCrery	May 29, 1928
1,770,163	McCrery	July 8, 1930
1,776,472	Ladd	Sept. 23, 1930
1,828,105	Embree	Oct. 20, 1931
1,828,991	Allerton	Oct. 27, 1931
1,884,545	Boutin	Oct. 25, 1932
1,895,133	Quarnstrom	Jan. 24, 1933
1,933,838	Ashe	Nov. 7, 1933
2,120,007	Tear	June 7, 1938
2,125,620	Schlumbohm	Aug. 2, 1938
2,170,638	Hopkins	Aug. 22, 1939
2,321,408	Mills et al.	June 8, 1943
2,327,731	McClary	Aug. 24, 1943
2,336,706	Sunderhauf	Dec. 14, 1943
2,423,869	Blessing	July 15, 1947
2,440,339	Langer	Apr. 27, 1948
2,496,677	Reedy	Feb. 7, 1950
2,499,134	De Bruyne	Feb. 28, 1950
2,573,524	Weisberg	Oct. 30, 1951

FOREIGN PATENTS

Number	Country	Date
8,775	Great Britain	Apr. 25, 1896

OTHER REFERENCES

"Steel" Periodical, September 11, 1944 (Patent Office Library), article entitled "Joining Aluminum Alloys" by Hartmann et al., pages 116, 156, and 164.