July 15, 1958 J. A. KITZINGER 2,843,071

APPARATUS FOR INCREASING BLANK HOLDING PRESSURE DURING DRAWING OPERATION

Filed Oct. 25, 1952

Fig. 2

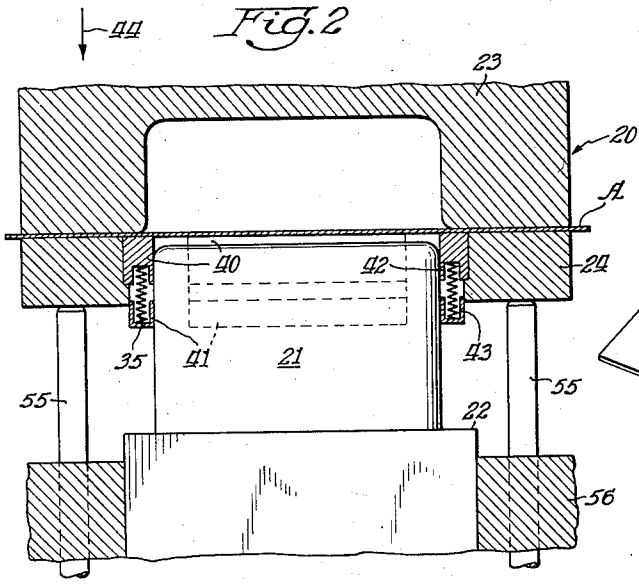


Fig. 1

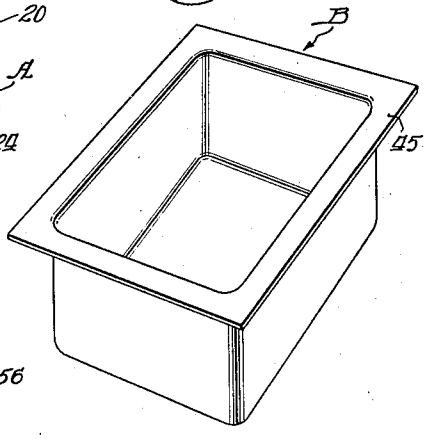


Fig. 3

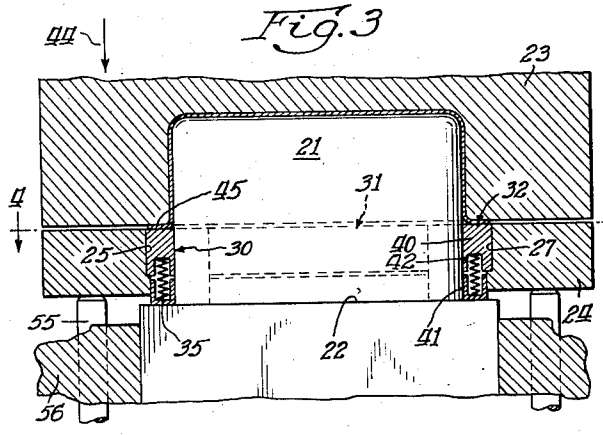


Fig. 5

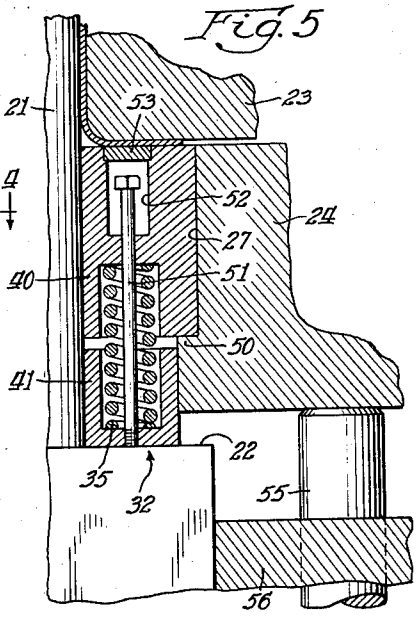
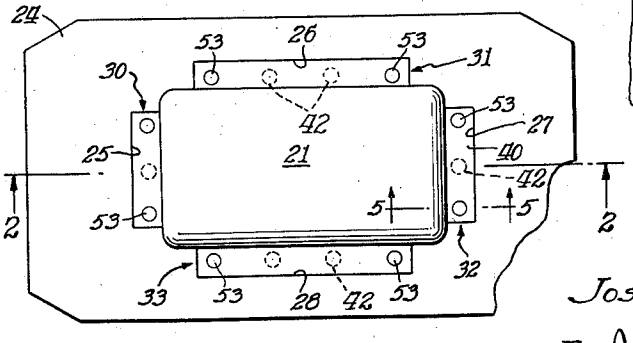


Fig. 4



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APPARATUS FOR INCREASING BLANK HOLDING PRESSURE DURING DRAWING OPERATION

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Application October 25, 1952, Serial No. 316,855

1 Claim. (Cl. 113—46)

This invention relates, in general, to the fabrication of refrigerator cabinet liners formed of sheet metal by draw die operations, and is more particularly concerned with the mechanical press mechanism employed in the formation of refrigerator liners from a single sheet metal blank.

This is a continuation-in-part of my now abandoned patent application Serial No. 766,623, filed August 6, 1947, entitled Apparatus for Increasing Blank Holding Pressure During Drawing Operation.

Heretofore, because of the large size of the refrigerator liners and because of the deep drawing operations required, the old method of fabricating refrigerator liners consisted of a three-piece tank which was suitably welded together to define a refrigerator liner. This procedure in fabricating such refrigerator liners produced a refrigerator liner lacking in rigidity and having surfaces hard to clean after welding and having a welded corner which was definitely hard to cover with paint or porcelain because of the roughened surfaces produced in welding operations.

Accordingly, an important object and accomplishment of the invention is the provision of a mechanism adaptable to form from a single sheet metal blank, a refrigerator cabinet liner having a continuous, uninterrupted metal surface free from welded slits, flanges and patches, thereby securing substantial economies in manufacture and an improved appearance, while eliminating enameling flaws resulting from the difficulty in providing a clear, uniform baked enamel or other desirable surface finish, due to the welds heretofore employed in the foundation material.

Another object of the invention is to provide a refrigerator liner as contemplated herein which overcomes the difficulties and eliminates many of the objections and complicated operations involved in prior practice.

The invention seeks, as a further object and accomplishment, to provide a refrigerator cabinet liner as contemplated herein and characterized by an arrangement to more advantageously and satisfactorily perform the function required of it and adapted to provide a unit which will successfully combine the factors of structural simplicity and durability, and yet be economical to manufacture.

A further object and accomplishment of the invention is to provide a refrigerator liner as contemplated herein which may be of simple construction without welding and which refrigerator liner may be readily coated with a preferably acid-resisting finish such as, for example, enamel or plastic so that the resulting coating is uniform in appearance and characteristics and a refrigerator liner which is free from flaws which result if welded areas are present in the sheet metal base.

The invention has for a further object, the provision of a refrigerator liner which may be formed in a single drawing operation regardless of the fact that such refrigerator liners require a substantially deep drawing operation and which refrigerator liner, at the same time, provides smooth regular well-rounded corners at all junctures of the wall in the inner portions of the liner which has been long

desired and has heretofore been impossible with presently known practices.

Additional objects, features and advantages of the invention disclosed herein will be apparent to persons skilled in the art after the construction and operation are understood from the within description.

It is preferred to accomplish the various objects of this invention and to practice the same in substantially the manner hereinafter fully described and as more particularly pointed out in the appended claim, reference being had to the accompanying drawing which forms a part of this specification, wherein:

Fig. 1 is a perspective view of a refrigerator cabinet liner embodying the features of the present invention;

Fig. 2 is a sectional elevational view taken in the plane of line 2—2 of Fig. 4 showing a mechanical drawing die which may be employed in the formation of the refrigerator liner depicted in Fig. 1, said die being illustrated in a position before the actual drawing operation;

Fig. 3 is a view similar to Fig. 2, but shown in a final position of the drawing operation;

Fig. 4 is a top plan view of the mechanical drawing die depicted in Fig. 2 and illustrates the relative disposition of the spring elements which comprise an important feature of the invention contemplated herein, this view being taken substantially on the plane of the line 4—4 in Fig. 3; and

Fig. 5 is a fragmentary sectional view of the spring elements and means for supporting the spring retainers, this view being taken substantially on the plane of the line 5—5 in Fig. 4.

The drawing is to be understood as being more or less of a schematic character for the purpose of illustrating and disclosing a typical or preferred form of the improvements contemplated herein, and in the drawing like reference characters identify the same parts in the several views.

In the exemplary embodiment of the invention depicted in Figs. 1, 2, 3 and 4, I have illustrated a mechanical die press designated in its entirety by the numeral **20** and generally comprising a punch **21** formed to define a substantially rectangular shape and having a flange projecting portion **22**, the function of which will be hereinafter described, a female die member **23** formed by any approved practice in a manner complementary to said punch and being adaptable to receive portions of the punch during the drawing operations contemplated herein, a blank support ring **24** adaptable to carry a metal blank such as at A during the initial drawing operation, said support ring being provided with suitable recesses **25, 26, 27** and **28** each adaptable to receive a spring retaining member **30, 31, 32** and **33**, respectively, and each of said spring retaining members having operatively disposed therein compression springs **35** of suitable tension and thickness to exert an additional sixty-ton clamping pressure on the formed flange of the refrigerator liner during approximately the last three-eighths inch of drawing, thereby restricting the metal on the two sides and the ends and giving a stretching action on these areas while allowing metal in the corners to flow, thereby preventing contortion of the sides and ends usually found in prior art practices. Thus, the result is the provision of a refrigerator liner B shown in Fig. 1 as having straight sides and ends and, more important, is the provision of a refrigerator liner having a continuous uninterrupted metal surface free from welded slits, flanges and patches, thereby securing substantial economies in manufacture and improved appearance, while eliminating enameling flaws resulting in the difficulty in preventing a clear uniform baked enamel or other desirable surface finish to the welds heretofore employed in foundation material when forming such refrigerator liners.

Adverting to Fig. 4, it can be seen that I have disposed the spring retaining means on each side and at each end of the die. It is important to note that the corners are left free thereby permitting the metal in the corners to flow, which results in a well-rounded corner having a continuous uninterrupted metal surface.

The spring retainers are disposed in the recesses **25**, **26**, **27** and **28** in a manner to permit vertical movement with respect to the support ring **24**. It is notable that such spring retainers are composed of two parts **40** and **41** (Fig. 2), each part having a recess **42** and **43**, respectively, adaptable to receive the spring **35**.

In order to retain the retainer members **40** in the recesses there is provided a flange **50** which permits upward movement of the retainer member **40** but resists downward movement below the area defined by the flange.

To prevent separation of the retaining members when the assembly is in a position as shown in Fig. 2, there are provided bolt members as at **51** (see Fig. 5) having end portions respectively engaging the retaining members **40** and **41** as shown so as to provide restricted relative movement therebetween. The cavities as at **52** may be provided with a removable plug indicated at each instance by the numeral **53** to present a smooth top surface to the retaining members **40**.

It is noted that only certain of the springs **35** are provided with a rod **51**. For example, the springs **35** shown in Figs. 2 and 3 are not provided with a rod. These springs are disposed intermediate the springs **35** which surround the rods **51** and which are further characterized by having the plugs **53** disposed immediately above the rods **51**.

Thus, it is apparent from the showing of Fig. 4 that the dotted circles indicated by the reference numerals **42** represent the projection of the recesses **42**, housing the upper end of the intermediate springs **35**. The plugs **53** of course, denote those locations wherein the springs **35** have been provided with a rod **51**.

The blank support ring **24** is movable in a vertical path but its movement is resisted by a plurality of draw pins as at **55** having their upper portion in engagement with portions of the support ring **24** and the lower portions thereof extending into the bolster **56** wherein there is provided spring means or hydraulic means (not shown) to provide an initial blankholder pressure.

According to the construction of the present invention, it may be observed in Fig. 2 that the spring retaining means does not have any important function in the initial steps of drawing operation; however, after the punch has been received into the female die member **23** which is caused by suitable pressure being exerted upon the female die member in the direction of the arrow **44** (Fig. 2), it can be seen that the spring retainer is in contact with the projecting portion **22** of the punch **21**. As additional downward pressure is applied during the last three-eighths inch of drawing the spring retainers are positioned between the flange **45** of the refrigerator liner and the projecting portion **22** of the punch **21**, whereby because of the natural action of the compression spring **35**, an additional sixty-ton clamping pressure is exerted upon the flange **45** in the areas as hereinbefore described which will restrict the metal on the two sides and ends and give a stretching action on these areas while allowing metal in the corners to flow thereby preventing contortion of the sides and ends usually found in prior art practices.

The operation of the device may be as follows: normally the female die member is in a raised position (not shown), and the blank A may be placed in position upon the support ring **24**, as shown in Fig. 2. Force is then applied to urge the female die member **23** downwardly which will force the punch **21** to enter the complementary portions of the female die member and proceed to form the refrigerator liner as shown in Fig. 3. During the last steps of the drawing operation it may be observed that the spring retainers are in contact with the projecting portion **22** of the punch **21** thereby tending to compress the two members **40** and **41** of the spring retainers, which compression is resisted by the compression springs **35** resulting in an additional sixty-ton clamping pressure on the formed flange **45** in the areas hereinbefore described during the last three-eighths inch of drawing, thereby restricting the metal on the two sides and ends and giving a stretching action on these areas while allowing the metal in the corners to flow. It is important to understand that the drawing operations contemplated herein are deep draw operations as distinguished from the usual drawing operations in prior art practices for such shallow drawing operations for smaller units.

The mechanisms disclosed herein may be advantageously employed in mass production manufacturing methods where quick and easy drawing operations result in economies in manufacture which determine the final cost of the units drawn.

From the foregoing disclosure, it may be observed that I have provided a refrigerator liner and mechanism for forming the same which may be summarized as follows:

(1) Structurally simple, efficient and durable;

(2) Economical to manufacture and readily adaptable to mass production manufacturing principles; and

(3) The provision of a refrigerator liner and mechanism for forming the same which may be of simple construction and which refrigerator liner may be formed of a one-piece metal blank without welding and may be readily coated with a preferably acid-resisting finish so that the resulting coating is uniform in appearance and characteristic and a refrigerator liner which is free from flaws which result if welded areas are present in the sheet metal base.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but wish to avail myself of all changes within the scope of the appended claim.

I claim:

A mechanical die press for deep draw operations from a one-piece blank, comprising a rectagular punch, a rectangular female die member arranged to receive portions of said punch during the drawing operation, movable rectangular support means arranged to carry the metal blank during the initial drawing operation, means in engagement with said support means to resist movement of said rectangular support means to provide initial blankholder pressure, said support means being arranged to substantially surround the punch and to cooperate with the die member for clamping the blank during the drawing operation, a plurality of retaining members each member being composed of two cup-shaped members and a spring with each end disposed in the recess of each cup-shaped member to normally maintain said cup-shaped members in spaced relation, retaining means in each recess to limit the separation of said cup-shaped members, said retaining members being disposed in the support means adjacent the punch and at a distance from the corners of the support means with the upper cup-shaped member of each retaining member being disposed on a level with the upper surface of the support means and the lower cup-shaped member projecting below the support means, and abutment means arranged around the bottom of the punch whereby the lower cup-shaped member will contact the abutment means during the last fraction of an inch of drawing and apply localized clamping pressure by the compression of the springs and retaining members so that metal in the blank is restricted at the portions of the blank engaged by the retaining members and forced to flow at the corner portions of the blank.

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