

Nov. 12, 1935.

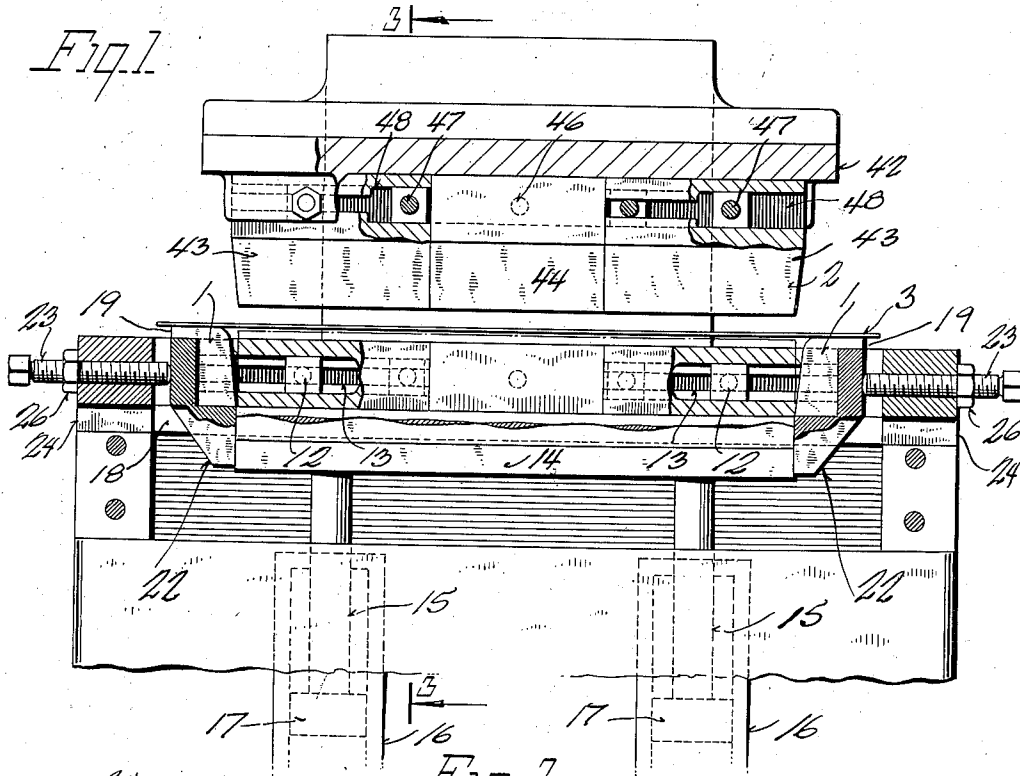
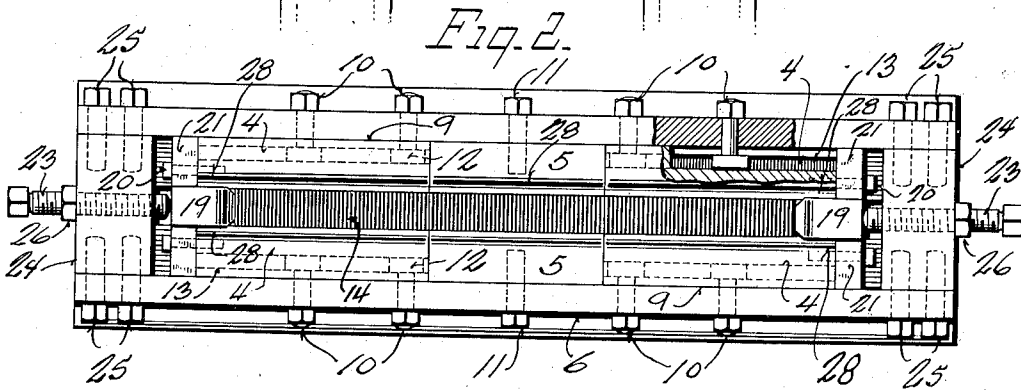
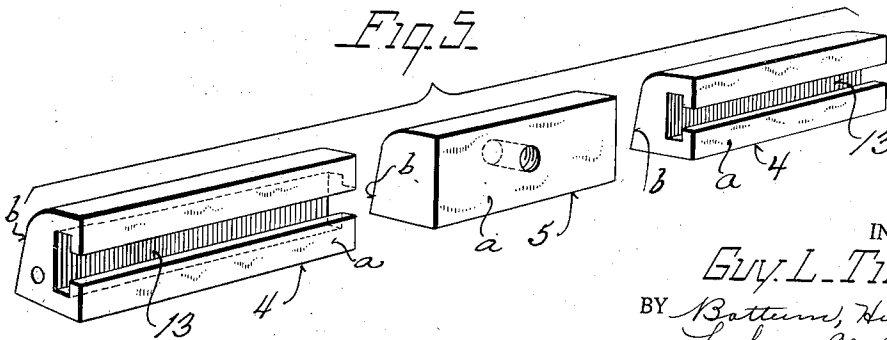
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2,021,118

EXPANSION JOINT MAKING APPARATUS FOR ICE TRAYS

Filed March 10, 1934

6 Sheets-Sheet 1



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EXPANSION JOINT MAKING APPARATUS FOR ICE TRAYS

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6 Sheets-Sheet 2

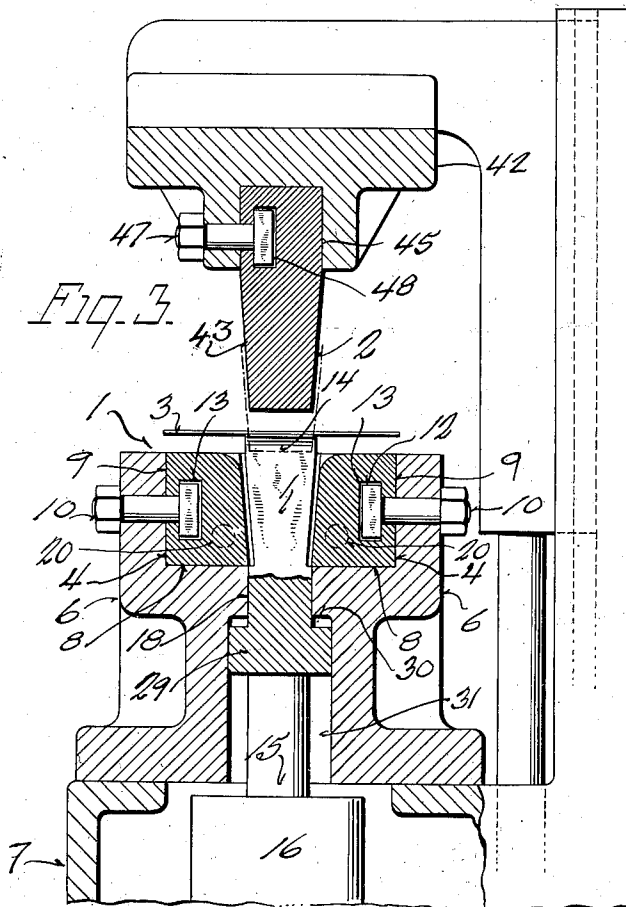


Fig. 3.

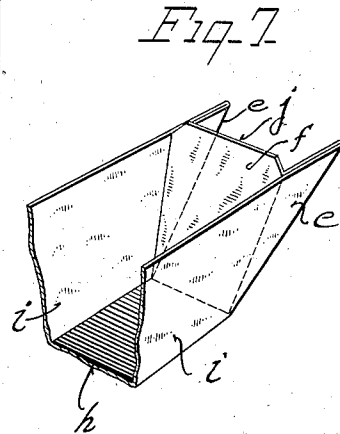


Fig. 7

Fig. 4.

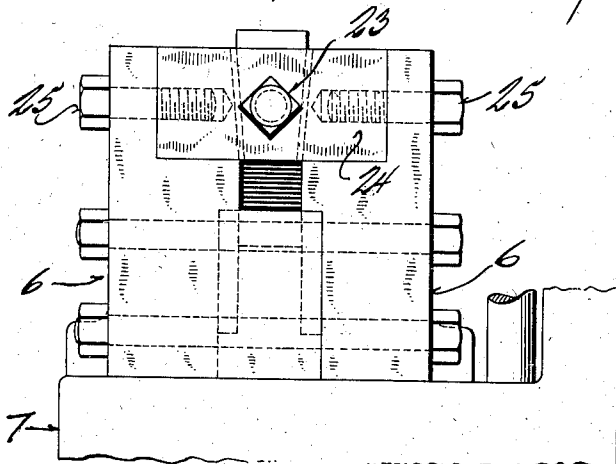
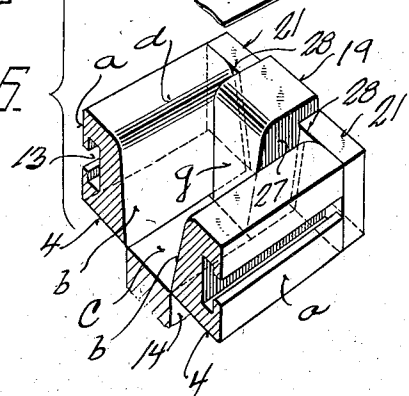


Fig. 5.



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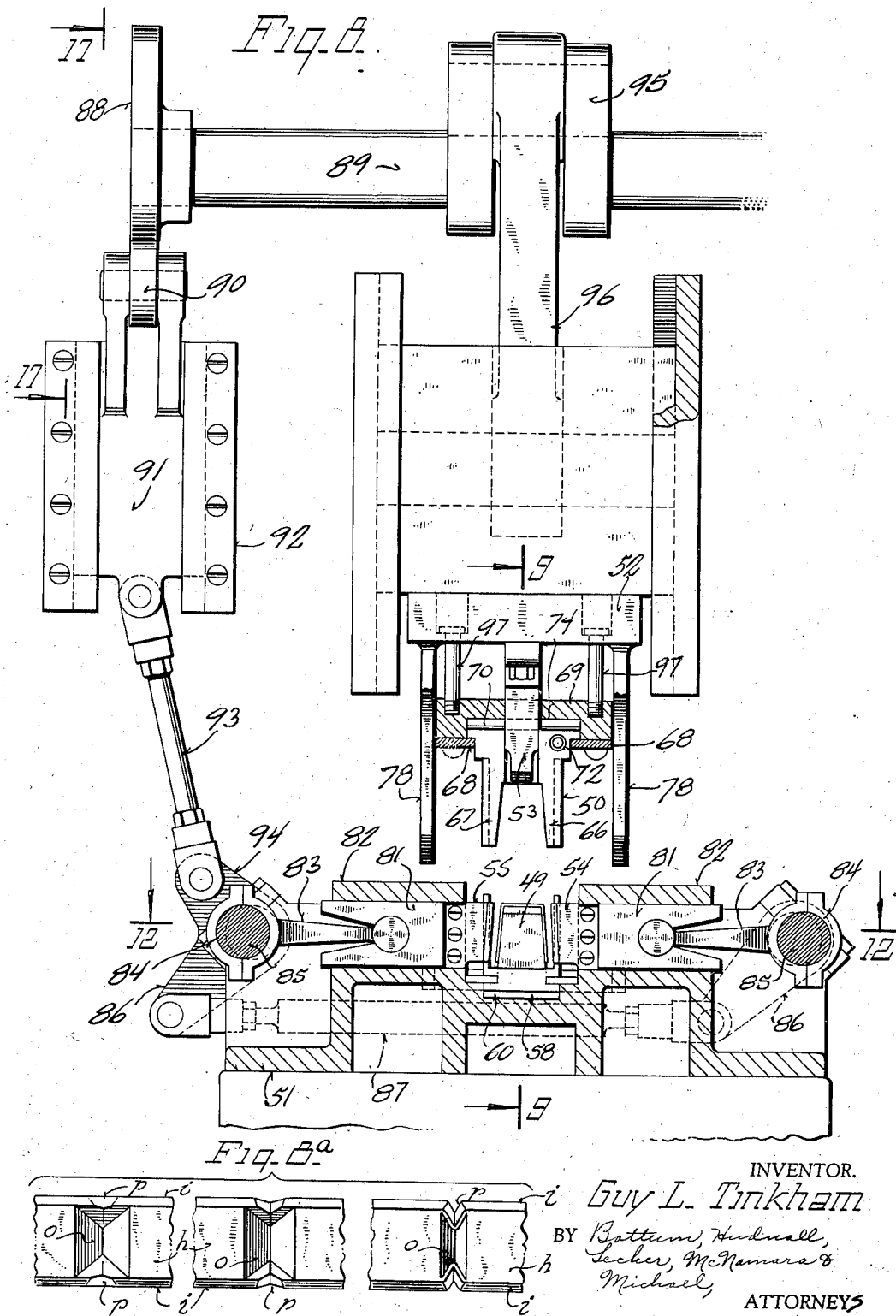
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EXPANSION JOINT MAKING APPARATUS FOR ICE TRAYS

Filed March 10, 1934

6 Sheets-Sheet 3



Nov. 12, 1935.

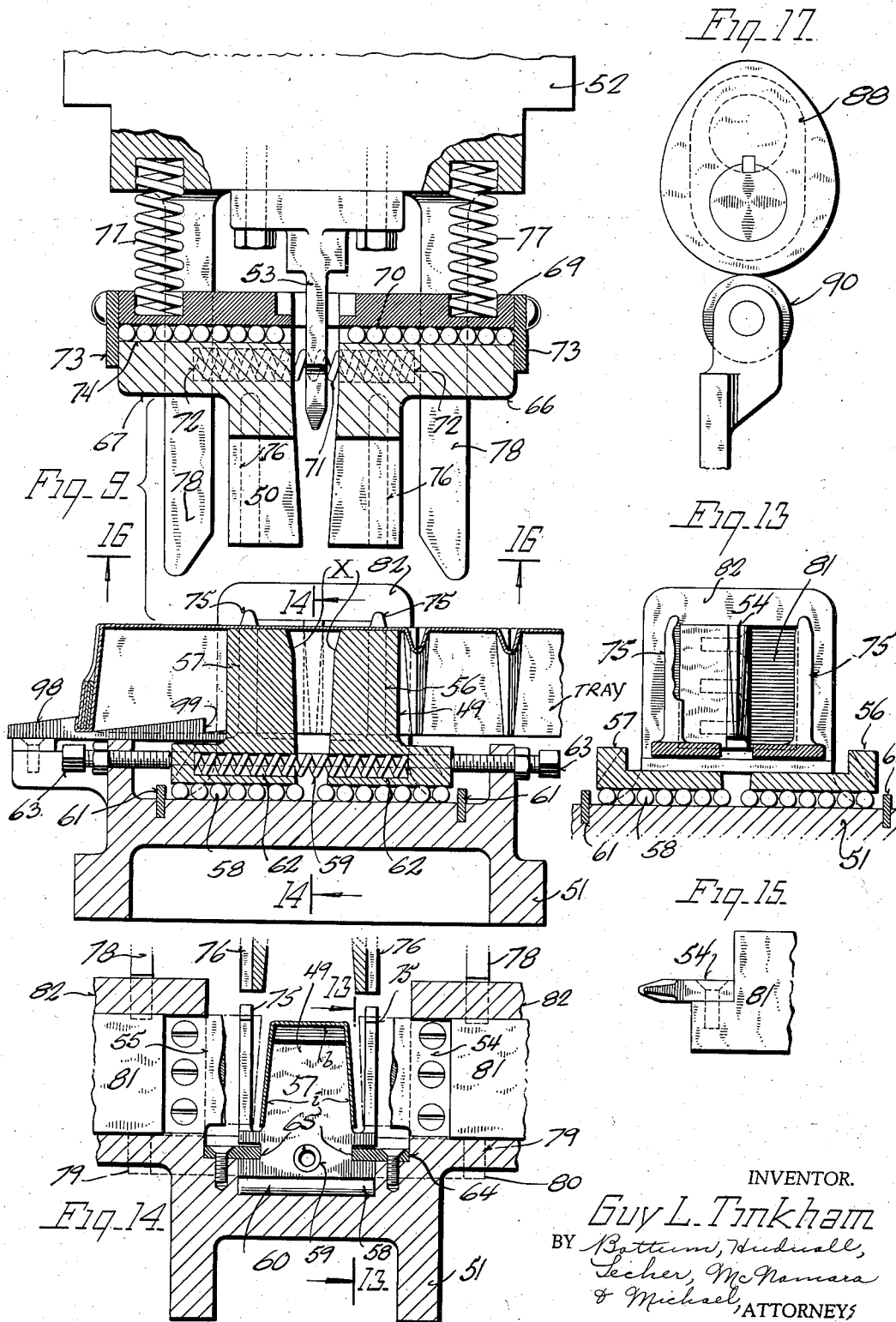
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EXPANSION JOINT MAKING APPARATUS FOR ICE TRAYS

Filed March 10, 1934

6 Sheets-Sheet 4



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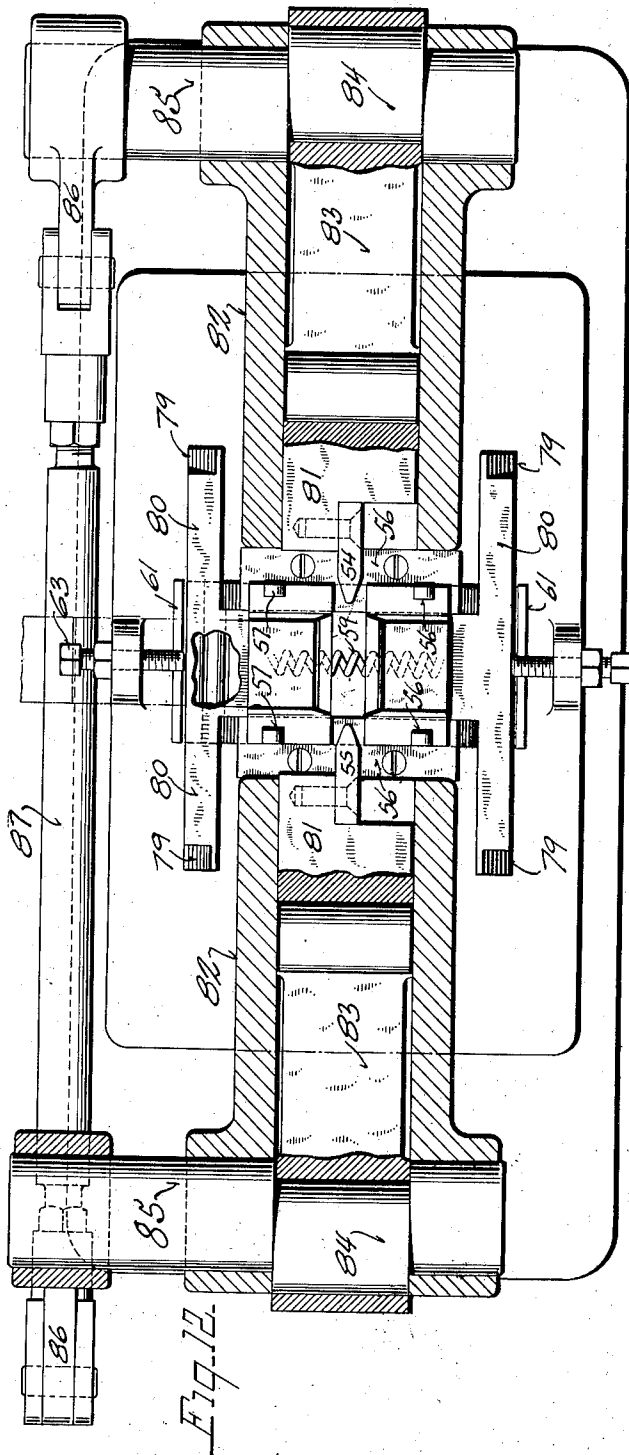
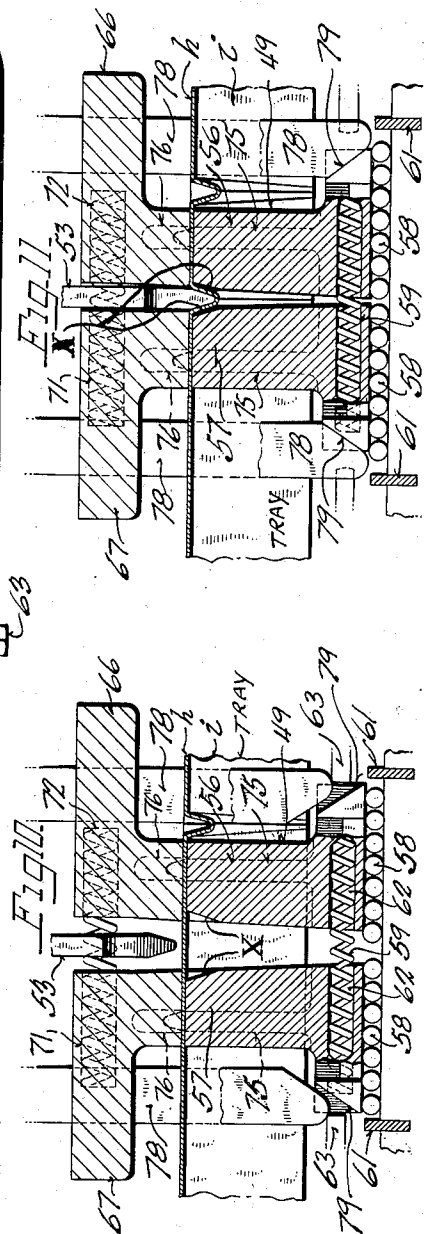
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EXPANSION JOINT MAKING APPARATUS FOR ICE TRAYS

Filed March 10, 1934

6 Sheets-Sheet 5



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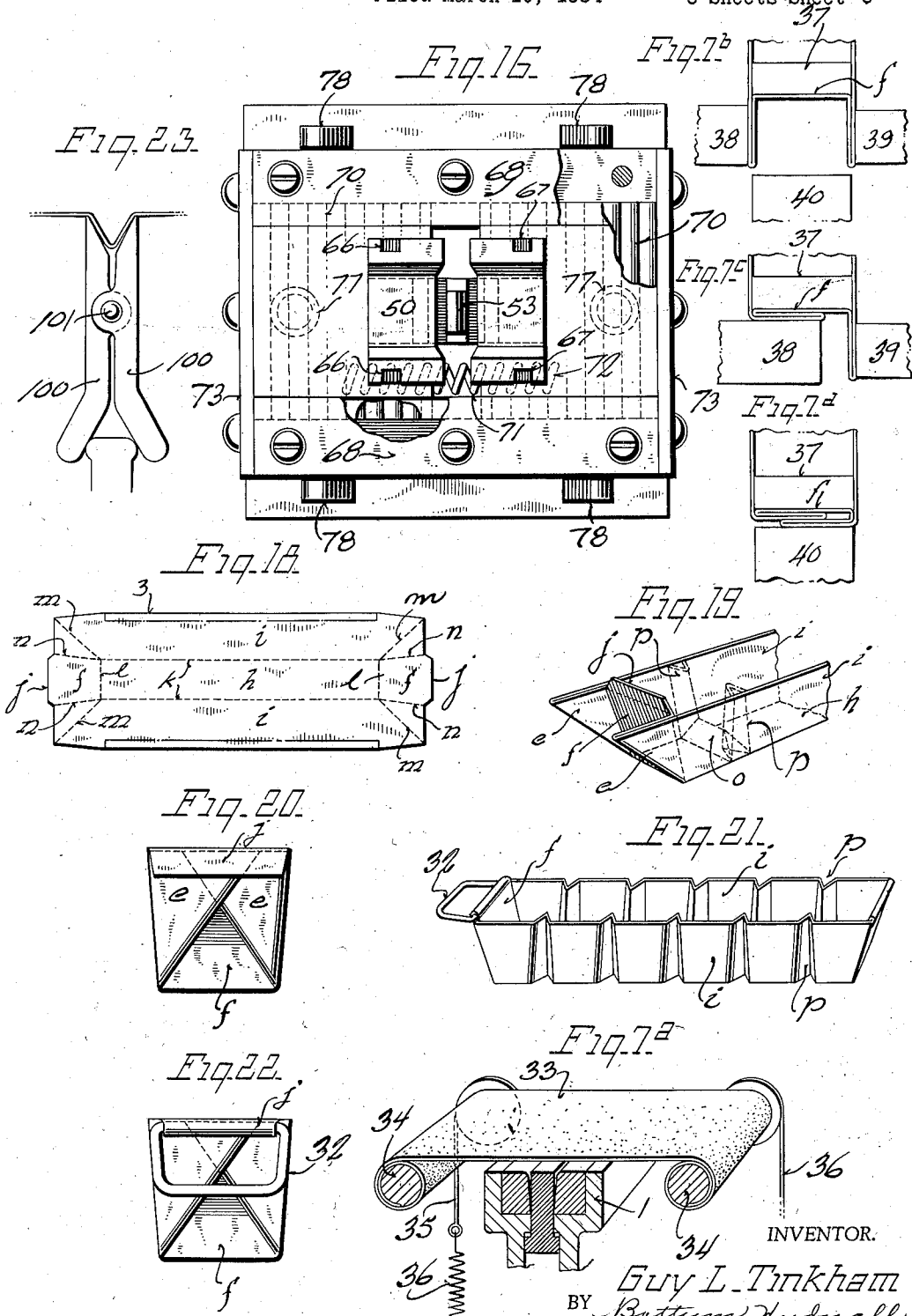
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EXPANSION JOINT MAKING APPARATUS FOR ICE TRAYS

Filed March 10, 1934

6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,021,118

EXPANSION JOINT MAKING APPARATUS
FOR ICE TRAYSGuy L. Tinkham, Detroit, Mich., assignor to
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Application March 10, 1934, Serial No. 714,908

17 Claims. (Cl. 153—13)

This invention relates to flexible metal ice trays of the character covered by my Patent No. 1,894,897 granted January 17, 1933, and co-pending applications, Serial No. 645,215 filed December 1, 1932 and Serial No. 686,328, filed August 23, 1933, the latter being a division of the first mentioned application.

The general purpose and object of my invention is to provide an apparatus for producing expansion joints in these trays and more particularly a joint producing apparatus which is useable with the mechanism employed for pre-forming the trays by a folding operation from blanks of the desired sheet metal.

A further object of my invention is to provide the expansion joint forming apparatus with clamping means which moves with the tray walls as the joints are formed therein to avoid undue stretching or elongation of the metal in forming the joints.

A further object of my invention is to provide means for initiating this movement of the clamping means as the joint forming elements are brought into contact with the tray walls.

A further object of my invention is to provide means for so controlling the action or movement of the joint forming elements with respect to each other that the metal of the tray walls where the points connect will fold easily and naturally without placing any undue strain on the metal to impair the flexibility of the completed tray.

Other and further objects of my invention will appear from the following specification taken in conjunction with the accompanying drawings, in which—

Fig. 1 is a side view, with parts broken away and in section, respectively, of the blank folding apparatus;

Fig. 2 is a top plan view of a similar character of the die part of said apparatus;

Fig. 3 is an enlarged transverse vertical sectional view taken through the blank folding apparatus on line 3—3 of Fig. 1;

Fig. 4 is an end elevational view of the die;

Fig. 5 is a perspective view of the sections comprising a side member of the die, the sections being shown removed from the die and in separated relation to indicate how the length of the die may be adjusted;

Fig. 6 is a perspective view partly in section illustrating the manner in which the end portion of a blank is folded into the form shown in Fig. 7 by the folding apparatus of the preceding figures;

Fig. 7 is a perspective sectional view showing

the end of the tray produced in the manner shown in Fig. 6;

Fig. 7a is a similar view showing the fabric employed with the die to prevent scoring of the outer surfaces of the tray walls;

Figs. 7b, 7c and 7d are diagrammatic views illustrating the manner in which the folded extensions at the end of the tray are folded into overlapped and clamped relation at the end of the tray;

Fig. 8 is an end view with parts in section of the apparatus for forming the expansion joints in the tray walls;

Fig. 8a shows the development of a set of the joists;

Fig. 9 is an enlarged vertical sectional view taken on line 9—9 of Fig. 8;

Figs. 10 and 11 are vertical sectional views with parts in elevation showing the action of the joint forming mechanism;

Fig. 12 is a horizontal sectional view with parts in elevation taken on line 12—12 of Fig. 8;

Fig. 13 is a vertical sectional view with parts in elevation taken on line 13—13 of Fig. 14;

Fig. 14 is a similar sectional view taken on line 14—14 of Fig. 9;

Fig. 15 is a top plan view of one of the side tools and its support;

Fig. 16 is a bottom plan view with parts broken away of the upper member of the joint producing mechanism shown in Fig. 8, Fig. 16 being taken on line 16—16 of Fig. 9;

Fig. 17 shows the cam and co-operating roller of the joint forming apparatus;

Fig. 18 is a top plan view of the flat metal blank from which the tray is produced;

Fig. 19 is a perspective view of one of the folded blanks, the expansion joints to be produced by the apparatus of Fig. 8 being illustrated in dotted lines in Fig. 19;

Fig. 20 is an elevational view of one end of the completed tray;

Fig. 21 is a perspective view of the completed tray;

Fig. 22 is an elevational view of the other end of the tray showing the handle member to be hereinafter described; and

Fig. 23 illustrates more or less diagrammatically means for closing the expansion joint after being made.

The blank folding apparatus comprises the punch and die assembly shown in Figs. 1 to 6 inclusive. The die is marked 1 and the punch is marked 2. These members are relatively movable toward and from each other, the punch 2

entering the die 1 to fold the tray from the flat metal blank 3 which is interposed between them. The blank is placed between these members when the latter are in separated relation as shown in Figs. 1 and 3. The blank has the shape shown in Fig. 18 and consists of a single integral piece of sheet metal of the gage and character required for ice tray purposes. The longitudinal or side edges of the blank along the portions constituting the side walls of the tray may be headed or turned over to re-inforce said walls along their upper edges in the completed tray. The dotted lines on the blank in Fig. 18 indicate the beads and the lines on which the blank folds in the production of the tray by the punch and the die. These lines will be referred to later.

In the punch and die assembly shown, the punch 2 moves into and out of the die 1, the latter being held stationary in the base of the machine. The die 1 comprises a pair of laterally spaced side members, each composed of end sections 4, 4 and an intermediate mid-section 5 as shown in Fig. 5. The side members are supported in the desired lateral spaced relation by upright standards 6, 6 secured to the supporting base 7 of the machine as shown in Fig. 3. These standards are preferably in the form of castings of similar height and length and are provided at their upper ends with inwardly facing L-shaped channels to receive the sections of the side members as shown. The channels provide the standards 6 with seating surfaces 8, 9 for the side members of the die. The sections are secured in the channels in any preferred manner, bolts 10 being employed for the end sections 4 and screws 11 for the mid sections 5. The end sections 4 are adjustable longitudinally. This may be accomplished by having the heads 12 of the bolts 10 fitting in longitudinal slots or grooves 13 in the end sections as shown. This arrangement enables the length of the die to be changed to permit the making of ice trays of different lengths. In making this adjustment, the mid-sections 5 are replaced by longer or shorter ones as the case may require and the end sections are adjusted to accommodate the length of the associated mid-sections.

The grooves 13 for the bolts 10 and the apertures for the screws 11 open through the outer side surfaces *a* of die sections 4 and 5 and not through their inner side surfaces *b* as shown. The surfaces *b* are retained smooth and continuous so that the side walls of the tray may be formed against them. The surfaces *b* as shown in Figs. 3 and 6, are inclined upwardly and outwardly from the lower edges of the sections to give the tray produced in the die the required draft for the discharge of the ice cubes from the tray.

The bottom wall for the die is provided by a member 14 reciprocally mounted in the base 7 of the machine between the side members of the die. Member 14 also serves to eject the formed tray from the die as the plunger 2 leaves the same. The member 14 is supported by one or more rods 15 which extend downwardly from the member and enter pressure cylinders 16 where they are connected to pistons 17 as shown in Fig. 1. These cylinders are connected to a compressed air supply which acting on the under sides of the pistons, cushions the lowering movement of the member 14 in response to the downward pressure of the plunger 2 thereon in folding the tray, and raises the member on the up

stroke of the plunger to carry the formed tray out of and above the die. The member 14 is guided in its up and down or vertical movement by sliding contact with the walls of a slot 18 formed by the opposed portions of the standards 6 at the base of the die and the end forming members 19 of the die to be presently described.

The portion of the metal blank constituting the bottom wall of the tray in the making of the latter is pressed against the flat top surface *c* of the member 14. This surface is co-extensive with the tray wall which it forms and also with the lower flat surface of the plunger 2. The upper edges of the inner side surfaces *b* of the die are rounded as at *d* so that the metal blank as it is forced into the die may easily enter the tray forming cavity.

The end members 19 of the die are located between the standards 6 at the ends of the side members of the die. These end members are secured to the end sections 4 of the die by screws 20 and have lateral extensions 21, 21 engaging the standards in the channels provided for the side members of the die. The end members 19 also have depending web portions 22 fitting in the slot 18 between the standards as shown in Fig. 1. The end members 19 are held against the side members of the die by set screws 23, 23 mounted in blocks 24, 24 fitted between the standards beyond the ends of the die. These blocks also fit in the channels provided in the standards for the side members of the die and are rigidly secured to the standards by screws 25, 25. The screws 23 impinge against their associated end members, and not only enable the end members to be adjusted when lengthening or shortening the die, but also clamp and hold the die forming members in tight engagement. The screws 23 have clamp units 26, 26 thereon for locking the screws 23 in their adjusted positions.

To form the end walls of the tray, the end members 19 have their body portions 27 extending into the die cavity at the opposite ends of the die. The portions 27 are laterally narrower than the width of the die cavity. This provides vertical recesses 28, 28 in the die cavity at its ends on opposite sides of the portions 27, as shown in Fig. 2. These recesses extend the full depth of the die cavity and receive the metal of the blank forming the extensions *e*, *e* at the ends of the tray as shown in Figs. 7 and 19. The body portions 27 of the end members 19 extend the full depth of the die cavity and have their inner surfaces *g* upwardly and outwardly inclined at substantially the same angle as the inner surfaces *b* of the side members of the die to form the end walls *f* of the tray. The portions 27 also project slightly above the side members of the die to support the flat blank 3 above the same for its initial bending when forced into the die by the plunger 2. (See Fig. 1.) The member 14 also supports the blank in this position as shown in Fig. 3. Upward movement of the member 14 above this position is prevented by a stop 29 on the member 14 engaging a shoulder 30 on one or both of the standards as shown in Fig. 3. The stop 29 may be in the form of a cross-head or web having a sliding fit in a recess 31 between the standards to aid in guiding the member 14 in its vertical movement.

The mechanism so far described operates as follows. After the blank 3 has been placed in proper position between the punch and the die, the punch is connected with the power of the machine. The punch descends under this power

and forces the blank into the die. The first action of the punch is to press the portion of the blank forming the bottom wall *h* of the tray against the member 14. As the downward movement of this member is resisted by the pressure in the cylinders 16, the blank is tightly clamped between the punch and the member 14. As these parts descend in unison under the downward pressure of the plunger, the blank is carried into the die cavity being bent along the edges of the bottom wall *h* to form the side walls *i*, *i* and the end walls *f*, *f* of the tray. These walls follow the inner surfaces of the die cavity and when the plunger reaches the bottom of the die, said walls stand in their desired upright relation to the bottom wall of the tray as shown in Fig. 7. The portions of the blank beyond the end walls *f* fold into the recesses 28 and provide the folded extensions *e* at the opposite ends of the tray. The end walls *f* are slightly higher than the side walls *i* and the extensions *e*. This provides extensions in the form of flanges *j* on the upper edges of the end walls. These flanges remain coplanar with the end walls of the tray, being exterior of the forming operation of the punch and the die. The flanges *j* are bent over at the ends of the tray in the completed device to secure the extensions *e* against the end walls of the tray and to secure a handle member 32 to one end of the tray as shown in Figs. 21 and 22, respectively. This handle member is preferably in the form of a metal bail over which the flange is turned to pivotally attach the bail to the tray. By this connection the bail may be swung from a non-usable position in overlapping relation with the end wall of the tray to a usable position extending outwardly from the tray as shown in Fig. 21.

Clamping the blank 3 between the plunger 2 and its co-operating member 14 throughout the area of the blank constituting the bottom wall *h* of the tray, and moving these members in unison into the die, enables the tray to be formed by a folding rather than by a drawing action. Thus undue stretching or elongation of the metal is avoided and the inherent resiliency of the metal is retained, prolonging the life of the tray under frequent flexing when in use. The portions of the blank constituting the side and the end walls of the tray fold into their wall forming relation with respect to the bottom wall along the lines of juncture between them as indicated at *k*, *l* in Fig. 18. The extensions *e* also fold along their junction with the side and the end walls as indicated at *m*, *n* in said figure. With the plunger 2 fitting the die cavity except for the clearance allowed for the gage of the metal of the blank, the tray is completely formed in one downward stroke of the plunger.

To prevent scoring or scratching of the tray walls in the folding operation, I provide a protective fabric 33, shown in Fig. 7a. This fabric extends over the top of the die and is forced down into the same by the plunger. The fabric lies under the blank 3 and prevents the side surfaces of the die contacting the blank as the latter is forced into the die. The fabric is tensioned, being fastened to rolls 34, 34 journaled on the machine on opposite sides of the die and extending the full length of the same. Cables 35 attached to the rolls connect with springs 36 which tension the fabric and return it to its normal position overlying the top of the die on withdrawal of the plunger therefrom.

On the upstroke of the plunger 2 after the

forming of the tray, the member 14 follows by the pressure on the pistons 17 and the formed tray is carried out of the die as indicated in dotted lines in Fig. 3. In this figure, as well as in Fig. 1, the punch 2 is shown just after it has left the die. At the end of its upward movement, it is free of the raised tray so that the latter may be readily and easily removed from the machine. In Fig. 6, the member 14 is shown in its depressed or lowered position to clear the inner surfaces of the die for illustration.

The tray when ejected by the member 14 has its end extensions *e*, *e* extending outwardly beyond the ends of the tray, as shown in Figs. 7 and 19. The tray is now placed in another machine or device, and the end extensions *e*, *e* are folded over against the adjacent end walls *f* of the tray. The action of this device is illustrated diagrammatically in Figs. 7b, 7c, and 7d. The tray is placed upright in this device and the anvil member 37 is lowered into the tray immediately to the rear of the end wall *f* of the tray. The anvil is held in this position, whereupon a plunger 38 is moved inward to fold over one end extension against the outer side of said end wall as shown in Fig. 7c. This plunger is withdrawn, whereupon the other plunger 39 is moved inward to fold the other extension *e* over the end wall and on the outer side of the first extension. On withdrawing this plunger, the third and final plunger 40 is moved inwardly and the folded extensions are tightly pressed against each other and against the end wall *f*. These operations are repeated for the opposite end of the tray. These plungers may be manually operated or they may be operated by power.

The flanges *j* are left upstanding. The next operation is to bend these flanges down over the overlapped extensions *e*, *e*. This is performed by suitable devices, not shown. One device bends over the flange as indicated in Fig. 20. The other device applies the handle member 32 as shown in Fig. 22.

The punch 2 is carried by the ram 42 of the machine. The punch is made sectional, having end sections 43, 43 and a mid-section 44. This construction enables the length of the punch to be varied to accommodate the punch to the length of the die being used. The sections are secured to the ram 42 in a channel 45 in the underside of the ram as shown in Fig. 3. The mid-section 44 of the punch is secured to the ram by one or more screws 46, while the end sections 43 are secured to the ram by bolts 47, the latter having square heads fitting in longitudinal grooves 48 in the end sections as shown in Figs. 1 and 3. The method of securing the punch sections to the ram is similar to the method employed for securing the side members of the die to the standards 6. The ram is moved into and out of the die through the power operated mechanism of the machine, which mechanism is controlled by a hand or foot operated releasing clutch as in punch press equipment.

The apparatus shown in Figs. 8 to 16 for producing the expansion joints in the tray walls comprises a block 49 and a pressure pad 50 and a set of forming instrumentalities or tools co-operating therewith. The block is mounted on the base 51 of the machine and the pressure pad is carried by the ram 52 of the machine. The forming tools are indicated by 53, 54, and 55. The tool 53 is carried by the ram 52 and is designed to form the expansion joint *o* in the bottom wall *h* of the tray (Fig. 19). The tools 54

and 55 are arranged on opposite sides of the block and are designed to form the joints *p, p* in the side walls of the tray as shown in Fig. 21. These joints are formed by pressing the metal 5 of the tray walls at pre-determined points along the length of the tray into the tray as shown in the drawings. The joints are V-shaped in section, thus having diverging walls which permit the metal tray to be flexed laterally in the 10 direction of its length for fracturing the mass frozen in the tray and breaking it into smaller sections along the score lines produced in the mass by the inwardly extending portions of the joints. The joints in the side walls of the tray 15 extend through the upper edges of the tray whereby the tray may be flexed.

The block and the pad are brought together with the tray between them to clamp and hold the tray in position for the forming tools to 20 operate upon it. The block and the pad are in sectional form, the parts being so arranged and constructed that the sections of each member are capable of relative movement toward each other to respond to the force exerted on the metal 25 of the tray by the forming tools in producing the joints. Thus the metal walls of the tray are not stretched or unduly strained in the forming of the joints and the inherent flexibility of the metal of which the tray is made is retained 30 to prolong the life of the tray as it is flexed in use.

The block 49 fits within and supports the tray, the latter being placed in inverted position over the block as shown in the drawings. The sections 56, 57 of the block are mounted on rollers 58 and are normally urged apart by one or more 35 interposed coil springs 59 as shown in Figs. 9 to 12. The rollers fit in a channel 60 in the portion of the machine base beneath the block and are confined in place by upright stops 61, 61 at the ends of the channel as shown in these figures. The spring 59 fits in recesses 62 bored in the sections of the block as shown. Set screws 63 mounted in the base of the machine on op- 45 posite sides of the block limit the outward movement of the block sections by the spring. The metal of the tray is forced into the space between the sections 56, 57 of the block in forming the expansion joints and the upper edge 50 portions of these sections at this space are outwardly inclined as at *x* to conform to the tapered shape of the operating end of the top tool 53 and thus permit the making of the top joint in V-shaped form as shown in Fig. 11. The block sections 56, 57 are held in place against 55 the rollers 58 by plates 64, 64 secured to the base of the machine and extending into grooves or channels 65 in the block sections at the sides thereof as shown in Fig. 14.

The sections 66, 67 of the pressure pad 50 are secured by strips 68, 68 to the underside of a carrying plate 69. Rollers 70 are interposed between the sections of the pad and carrying plate 69 to allow for ease of movement of the pad sections toward and from each other in the operation 65 of the machine. These sections are normally urged apart by an interposed coiled spring 71 fitting in aligned recesses 72, 72 bored or otherwise provided in the pad sections. Outward 70 movement of the pad sections is limited by stops 73, 73 secured to the plate 69 at opposite ends of the pressure pad. These stops also close the space or channel 74 provided in the plate for the rollers. The pad sections have movement in 75 the same direction as the block sections, thus

locating the strips 68 at the sides of the pad sections and in parallelism to the holding plates 64 for the block sections.

The forming tool 53 operates in the space between the pad sections as shown. These sections are formed to fit over the outer side of 5 the portion of the tray supported by the block sections and have horizontal top and vertical side walls to engage the corresponding portions of the tray to clamp the tray between the pad 10 and the block during the operation of the machine. The pad is brought into proper register with the block by guide rods 75 extending upwardly from the block sections and entering channels or grooves 76 in the pad sections as in- 15 dicated in Fig. 14. These guide rods are on the outer sides of the block sections and do not interfere with the placing of the tray thereon. The rods not only hold the pad central with respect to the block, but also guide the pad in its 20 vertical movement with respect to the block. The construction referred to is at the sides of the sections and does not hinder the movement of the sections toward and from each other.

Coiled springs 77, 77 are interposed between the 25 pad and the ram and serve as a resilient support for the pad, enabling it to be pressed against the tray on the block and also enabling the ram to continue its downward movement to force the forming tool 53 against the bottom wall of the 30 tray. The ends of these springs 77 seat in recesses in the plate 69 and the ram 52, respectively, as shown in Fig. 9.

Depending from the ram on opposite sides of the pad are rigid arms 78, 78 having beveled or in- 35 clining lower ends to co-operate with like surfaces 79 at the outer ends of horizontal extensions 80, 80 on the block sections 56, 57, as shown in Figs. 10 and 12. These parts engage in the descent of the pad over the block to initiate the movement 40 of the block sections toward each other in timed relation with the descent of the forming tool 53 to avoid stretching the metal of the tray in the forming of the expansion joint in its bottom wall.

The side tools 54, 55 are secured to slides 81, 81 45 mounted in suitable guides 82 on the base portion of the machine on opposite sides of the block 49. Links 83, 83 connect the slides with eccentrics 84, 84 on rock shafts 85, 85 journaled in the base of the machine on opposite sides of the block as 50 shown in Figs. 8 and 12. These shafts have rock arms 86, 86 connected by an adjustable link 87 for movement in unison from the controlling cam 88 on the power operated crank shaft 89 of the machine. Cam 88 functions against a roll- 55 er 90 carried by a slide 91 operating in a guide 92 as shown in Fig. 8. An adjustable link 93 connects the slide 91 with a rock arm 94 on one of the rock shafts 85 for imparting motion to both shafts in the operation of the main cam 88. The 60 ram 52 is connected with a crank 95 on the shaft 89 by a pitman 96 as shown. Guide rods 97 hold the pressure pad in central relation with the ram.

In forming the joints in the tray, the top tool 53 is brought into operation in advance of the 65 side tools and at no time does the top tool travel at the same speed as the side tools. Rather, the travel of the side tools is accelerated for the latter part of their operation. The variation in travel is taken care of by the shape of the cam 88 70 and its position on the crank shaft 89 relatively to the pin of the crank 95. The operating end portion of the top tool has a length less than the width of the bottom wall of the tray as shown in Fig. 8 and engages the bottom wall intermedi- 75

ate the side walls of the tray in forming the joint in the bottom wall. Thus sufficient clearance is allowed at the side edges of the top tool for the metal of the bottom wall beyond said side edges to

5 fold naturally and easily as the side tools form the joints in the side walls of the tray. This surplus metal follows the side tools as they are forced against the tray walls and enables the joints in the side walls to extend completely across the
10 same as shown. The operating end portions of the side tools are as wide as the side walls of the tray and are tapered similarly to the top tool, as shown in Fig. 15. The development of a set of joints is shown in Fig. 8a. The view at the left
15 end of this figure shows the joint started in the bottom wall. The bottom wall has been indented considerably by the top tool. The side tools have just started the joints in the side walls, indenting said walls slightly as shown. The central view
20 shows the joints further advanced and the view at the right shows the joints completely formed. When the top tool completes its joint, the speed of the side tools is then increased to complete the forming of their joints.

25 The joints in the tray are spaced apart along the length of the tray to divide it into the desired number of cube forming sections or cells. The joints in one side wall are opposite to those in the other side wall and connect with the corresponding joints in the bottom wall. This, as stated, divides the tray into a series of connected cells or
30 compartments of the size required for the individual cubes to be produced. These joints are not produced all at the same time, each cube separation being produced individually. The tray is moved manually with respect to the joint producing mechanism, there being a suitable stop arrangement provided to enable the tray to be set
35 at the proper points for the joints to be formed. This stop comprises a bar 98 extending outwardly from one of the block sections in line with the feed of the tray through the machine as shown in Fig. 9. This bar has its upper side formed to provide notches 99 spaced along the length of the
40 bar in conformity with the spacing required for the cube forming sections of the tray. Moreover, the block 49 is so designed that it conforms to the dimension of the individual cube sections. The operator in producing the joints in a tray places the tray in an inverted position over the block
45 49 when the pressure pad 50 is in elevated position above the same as shown in Fig. 8. One end of the tray is adjusted against the notch 99 nearest the block, whereupon the machine is set in operation to produce the first joint section. After that joint has been formed, the tray is then adjusted
50 lengthwise by the operator to contact with the next following stop or notch 99 on the bar 98 and the operation of the machine is repeated to produce the next following joint. This is followed throughout the entire length of the tray until all of the joints have been produced.

55 The mechanism shown and described enables a flexible metal ice tray of the character referred to to be readily and easily made. The die assembly of the first set of figures provides an efficient mechanism for producing the tray from the flat metal blank by a folding method without unduly
60 elongating the metal to stretch or weaken it. The joint forming mechanism enables the joints to be produced in the tray without stretching the metal to weaken or impair its flexibility and also enables trays of different lengths to be operated upon without changing or adjusting the joint forming
65 structure.

After a tray has been run through the joint forming mechanism the walls of the joints are brought closer together to restrict somewhat or control the flexibility of the finished tray. This is accomplished by subjecting each joint to a
5 squeezing action, as indicated in Fig. 23. The joint is inserted between the operative ends of a pair of members 100, 100 fulcrumed together at 101 and so constructed that they act as pliers to bring the walls of the expansion joint in closer re-
10 lation than as produced by the forming tools.

The details of construction and arrangement of parts shown and described may be variously changed and modified without departing from the spirit and scope of my invention, except as pointed
15 out in the appended claims.

I claim as my invention:

1. An apparatus for producing expansion joints in the bottom and side walls of a pre-formed sheet metal ice tray whereby the tray
20 may be flexed, comprising joint forming instrumentalities, means for operating them, and means for clamping the tray during the joint forming operation, said means consisting of sections movable relatively to each other lengthwise
25 of the tray to respond to the force exerted on the metal of the tray by the joint forming instrumentalities in producing the joints to prevent stretching or undue straining of the tray walls in the forming of the joints.

2. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray whereby the tray
30 may be flexed, comprising joint forming instrumentalities, means for operating them, and means for clamping the tray in a fixed position during the joint forming operation, said means consisting of sections spaced lengthwise of the tray whereby the joint forming instrumentalities may force the metal of the tray at the joints
35 into the spaces between the sections.

3. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray whereby the tray
40 may be flexed, comprising joint forming instrumentalities, means for operating them, and means for engaging the outer and inner sides of the tray adjacent the joints to be formed, said means consisting of separate sections,
45 means for normally holding the sections apart to provide a space for the metal forced into the tray in the making of the joints, and rotative supports for the sections whereby they may have relative movement.

4. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray whereby the tray
50 may be flexed, comprising joint forming instrumentalities, means for operating them, and a co-operating block and pressure pad to engage the tray on its inner and outer sides, respectively, for holding the tray in a fixed position during the joint forming operation, the block and pad consisting of separate relatively movable mem-
55 bers, resilient means for normally maintaining the members in spaced relation, and stops for limiting the outward movement of the members.

5. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray whereby the tray
60 may be flexed, comprising joint forming instrumentalities, means for operating said instrumentalities, a co-operating block and pressure pad for engaging the tray on the inner and the outer sides thereof for holding the tray in a fixed po-
65 70 75

sition during the joint forming operation, and co-acting guide means on the pad and block for holding the pad and the block central with respect to each other and for guiding the pad in its movement into and out of engagement with the tray.

6. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray whereby the tray may be flexed, comprising a co-operating block and pressure pad to engage the tray on its inner and outer sides for holding the tray in a fixed relation during the joint forming operation, the pad and the block consisting of separate sections, resilient means for normally maintaining the sections in spaced relation to provide openings for the joint forming instrumentalities and to permit them to force the engaged metal of the tray into the space between the sections of the block, and means for moving the instrumentalities into and out of engagement with the tray walls.

7. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray whereby the tray may be flexed, comprising joint forming instrumentalities, a co-operating block and pressure pad for engaging the inner and outer sides of the tray for holding the tray in a fixed relation during the joint forming operation, the pad and the block consisting of separate sections, spring means for normally separating the sections to provide spaces for the joints to be formed by the joint forming instrumentalities, and supports, one for the block and the other for the pad, and bearing rollers for movably mounting the sections on their respective support.

8. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray whereby the tray may be flexed, comprising joint forming instrumentalities, means for clamping the tray in fixed relation during the joint forming operation, and means providing a row of spaced stops engageable with the tray for so positioning the tray with respect to the joint forming instrumentalities that a series of expansion joints may be made in the tray walls in spaced relation along the length of the same.

9. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray, comprising joint forming instrumentalities, a co-operating block and pressure pad for clamping the tray in fixed relation during the joint forming operation, said block consisting of separate sections, resilient means for normally maintaining the sections in spaced relation whereby the sections of the block may move toward each other in the forming of the joints of the tray whereby the metal of the tray walls will respond to the force applied on the same to prevent undue stretching or strain of the metal while forming the joints, and cam means acting in the clamping of the tray between the pad and the block to initiate the inward movement of the block sections in the forming of the joints.

10. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray, comprising a base, a ram movable toward and from the base, a block on the base to support the tray, a pressure pad on the ram to engage the tray to clamp it against the block during the joint forming operation, joint forming instrumentalities, the in-

strumentality for forming the joint in the bottom wall of the tray being carried by the ram and the instrumentalities for forming the joints in the side walls of the tray being carried by the base, and means operable through the movement of the ram to actuate the joint forming instrumentalities on the base.

11. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray, comprising a base, a ram movable toward and from the base, a block on the base to support the tray, a pressure pad on the ram to engage the tray to clamp it against the block, the block and the pad consisting of relatively movable sections, resilient means for normally maintaining the sections spaced apart, joint forming instrumentalities, one carried by the ram to form the joint in the bottom wall of the tray and the other instrumentalities being carried by the base to form the joints in the side walls of the tray, rigid arms extending from the ram toward the base and having inclined ends, and cam surfaces on the block sections to be engaged by the inclined ends of the arms in the movement of the ram toward the base for initiating the movement of the block sections toward each other in the operation of the device.

12. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray, comprising means for clamping the tray in fixed relation during the joint forming operation, joint forming instrumentalities, one operating against the bottom wall of the tray and others operating against the side walls, and means for operating said instrumentalities in the desired timed relation to initiate the forming of the joint in the bottom wall prior to the forming of the joints in the side walls whereby the metal of the walls at their juncture may naturally fold in the production of the joints.

13. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray, comprising means for clamping the tray in fixed relation during the joint forming operation and permitting movement of the tray walls at that time to avoid undue stretching of the metal, joint forming instrumentalities arranged in exterior relation to the tray, one for forming the joint in the bottom wall and the others for forming the joints in the side walls, and means for operating said instrumentalities in desired timed relation to initiate the forming of the joint in the bottom wall prior to the forming of the joints in the side walls, said means also serving to accelerate the movement of the instrumentalities for the side walls at the completion of the joint in the bottom wall.

14. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray, comprising means for clamping a tray in fixed relation during the joint forming operation, joint forming instrumentalities, one forming the joint in the bottom wall of the tray and the others forming the joint in the side walls, said instrumentalities having substantially V-shaped operating ends to provide inward extending portions extending into the tray to provide the joints, and means for operating the instrumentalities in desired timed relation to form the joints in the tray walls, the operating end of the instrumentality for producing the joint in the bottom wall having a dimension less than the width of the bottom wall whereby the joint forming instrumentalities forming the

side walls may fold the metal of the tray at the junction between the tray walls into V-shaped form to conform with the shape of the joints in the side walls.

15. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray, comprising a base and a ram, means carried by the base and the ram for engaging the tray and holding it in fixed relation during the joint forming operation, joint forming instrumentalities, one carried by the ram for forming the joint in the bottom wall of the tray and the other instrumentalities being carried by the base for forming the joints in the side walls, and resilient means for connecting the ram with the clamping means carried thereby whereby the clamping means may engage the tray prior to the operation of the joint forming instrumentalities on the tray walls.

16. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray, comprising a base and a ram, means carried by the base and ram, respectively, for engaging the tray and holding it in fixed relation during the joint forming operation, joint forming instrumentalities, one carried

by the ram for forming the joint in the bottom wall of the tray and the others carried by the base for forming the joints in the side walls of the tray, means for connecting the last named instrumentalities for movement in unison, and means for giving a simultaneous movement to all of the instrumentalities to form the joints.

17. An apparatus for producing expansion joints in the bottom and the side walls of a pre-formed sheet metal ice tray, comprising a base and a ram, a block carried by the base, a pressure pad carried by the ram, the block and the pad serving to engage the tray on the inner and outer sides thereof for holding the tray in fixed relation during the joint forming operation, joint forming members, one carried by the ram for forming the joint in the bottom wall of the tray and the others carried by the base for forming the joints in the side walls of the tray, said members being arranged to operate in the same plane whereby the joints in the tray walls will be in the same plane, and means for operating the members for the side walls through the movement of the ram.

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