June 6, 1944. E. K. BUXBAUM 2,350,874

APPARATUS FOR MANUFACTURING OPEN CONTAINERS MADE OF PLIABLE SHEET MATERIAL

Filed Aug. 14, 1941 4 Sheets-Sheet 1

FIG. 1.

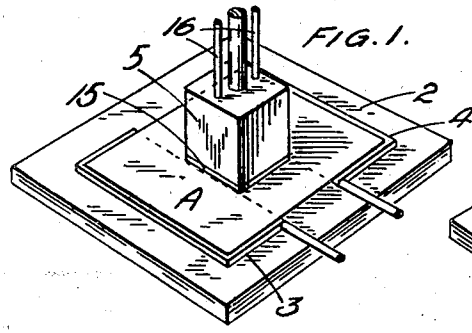


FIG. 2.

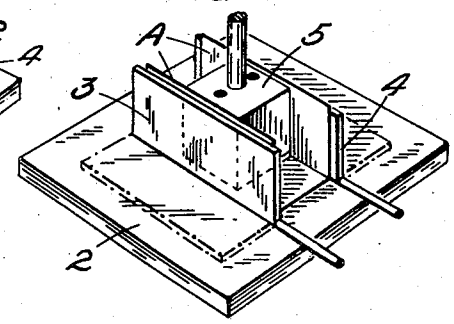


FIG. 3.

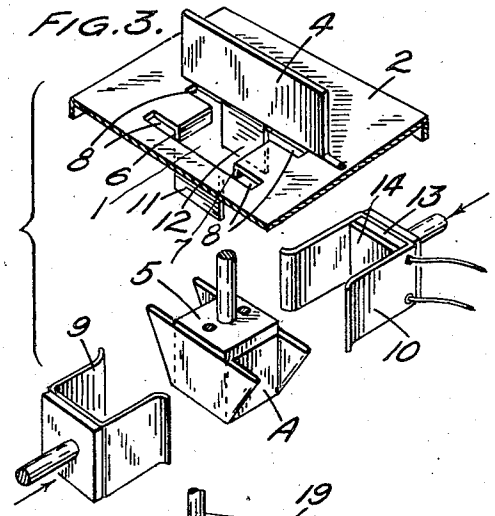


FIG. 4.

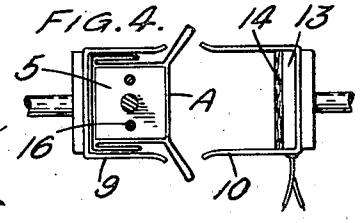


FIG. 5.

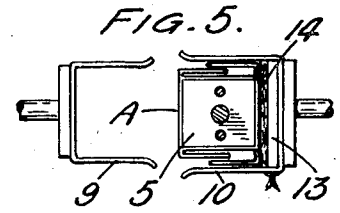


FIG. 7.

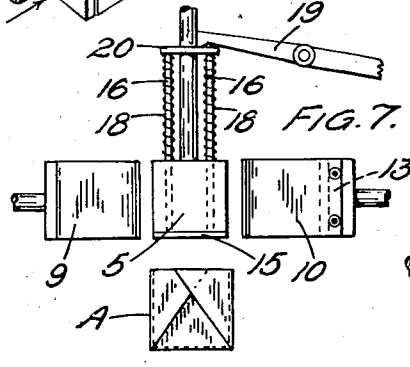


FIG. 6.

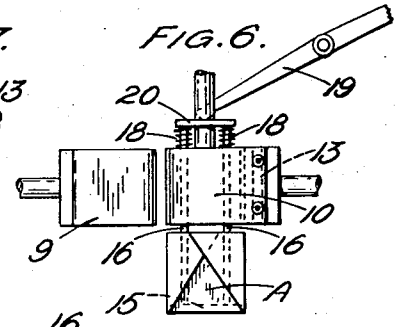


FIG. 8.

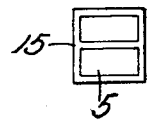
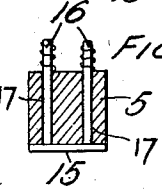


FIG. 9.

FIG. 10.



Inventor.
Erich Karl Buxbaum
By Michael S. Striker
his agent

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June 6, 1944. E. K. BUXBAUM 2,350,874

APPARATUS FOR MANUFACTURING OPEN CONTAINERS MADE OF PLIABLE SHEET MATERIAL

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FIG. 11.

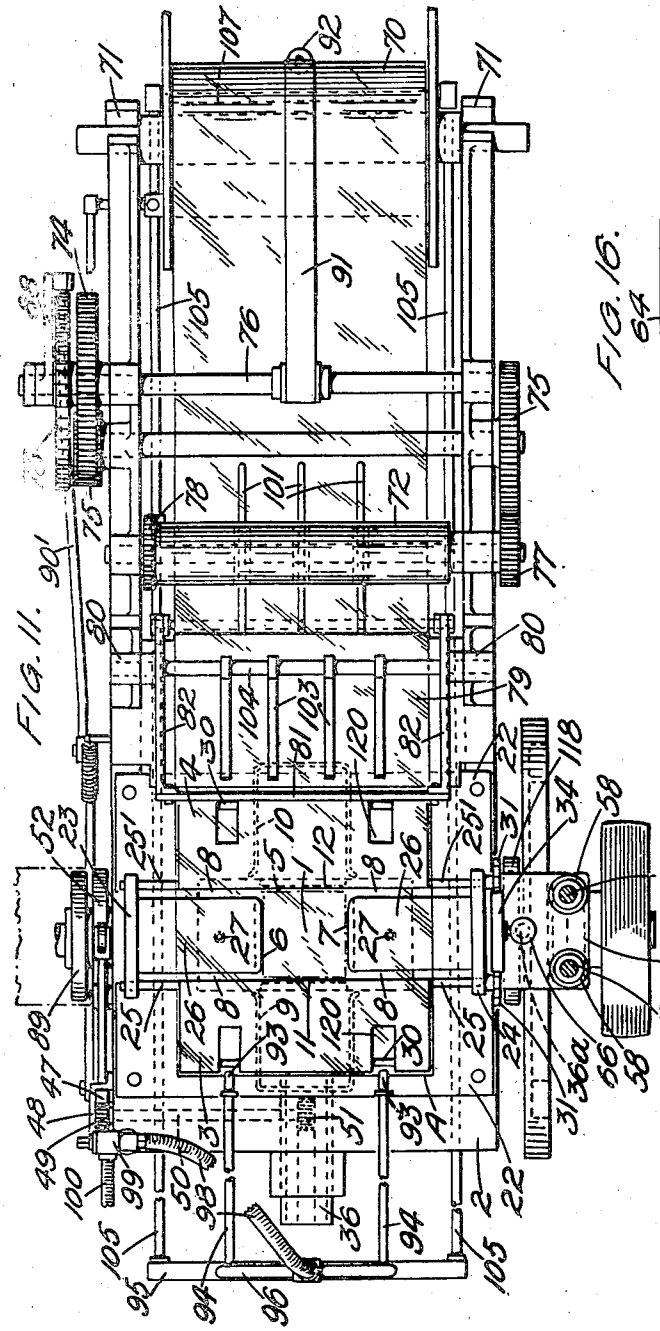


FIG. 16.

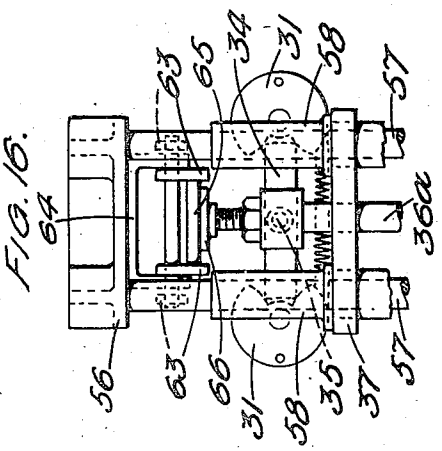


FIG. 14.

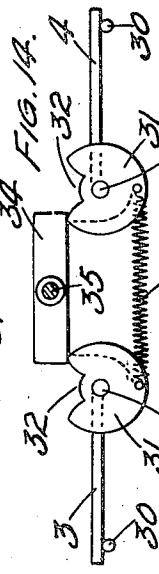
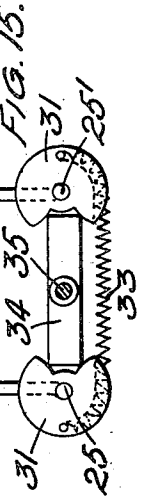


FIG. 15.



Inventor,
Erich Karl Buxbaum
By Michael S. Stiller
his Agent

June 6, 1944. E. K. BUXBAUM 2,350,874

APPARATUS FOR MANUFACTURING OPEN CONTAINERS MADE OF PLIABLE SHEET MATERIAL

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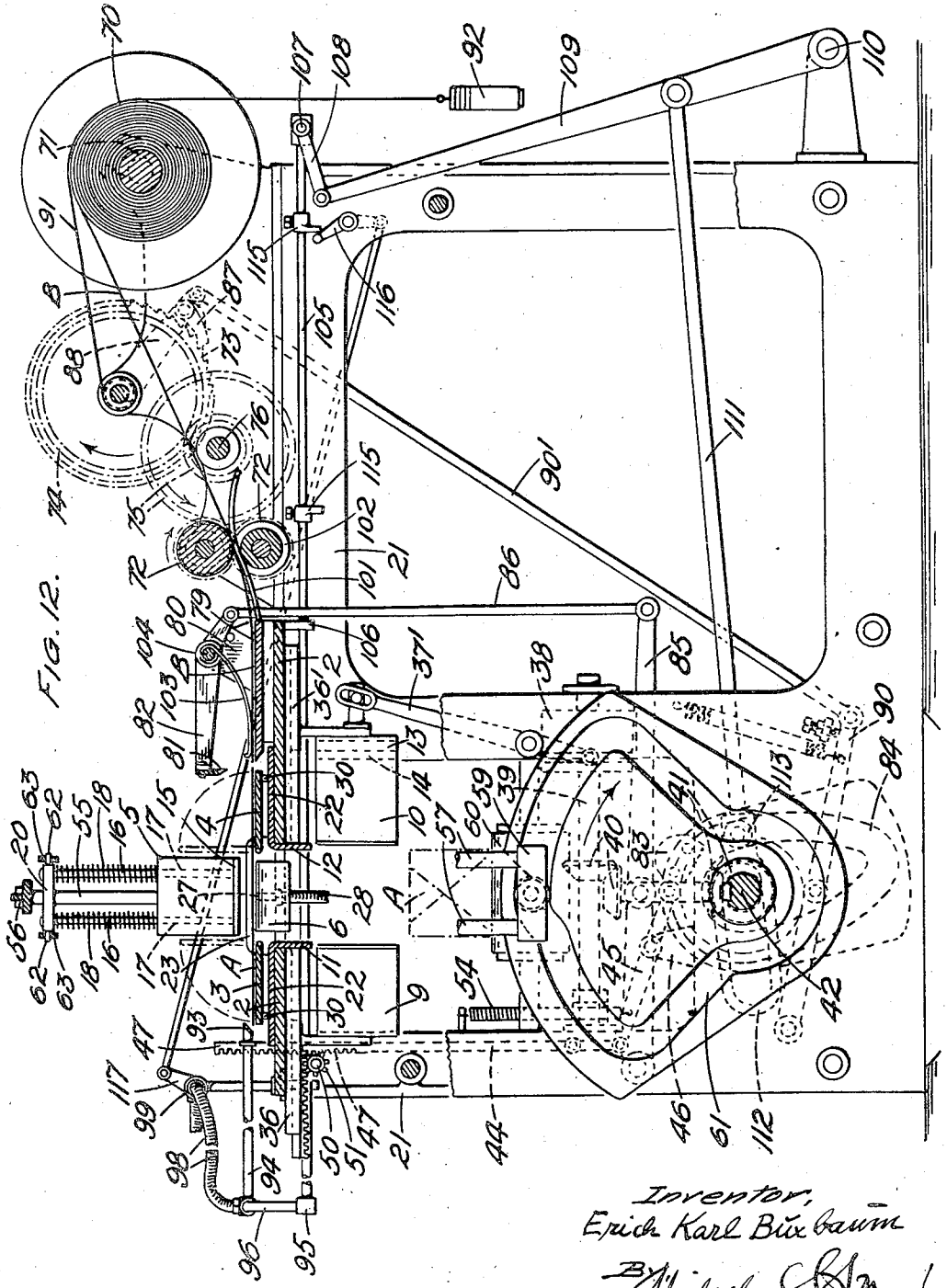
FIG. 12.



Inventor,
Erich Karl Buxbaum
By Michael S. Striker
his agent

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APPARATUS FOR MANUFACTURING OPEN CONTAINERS MADE OF PLIABLE SHEET MATERIAL

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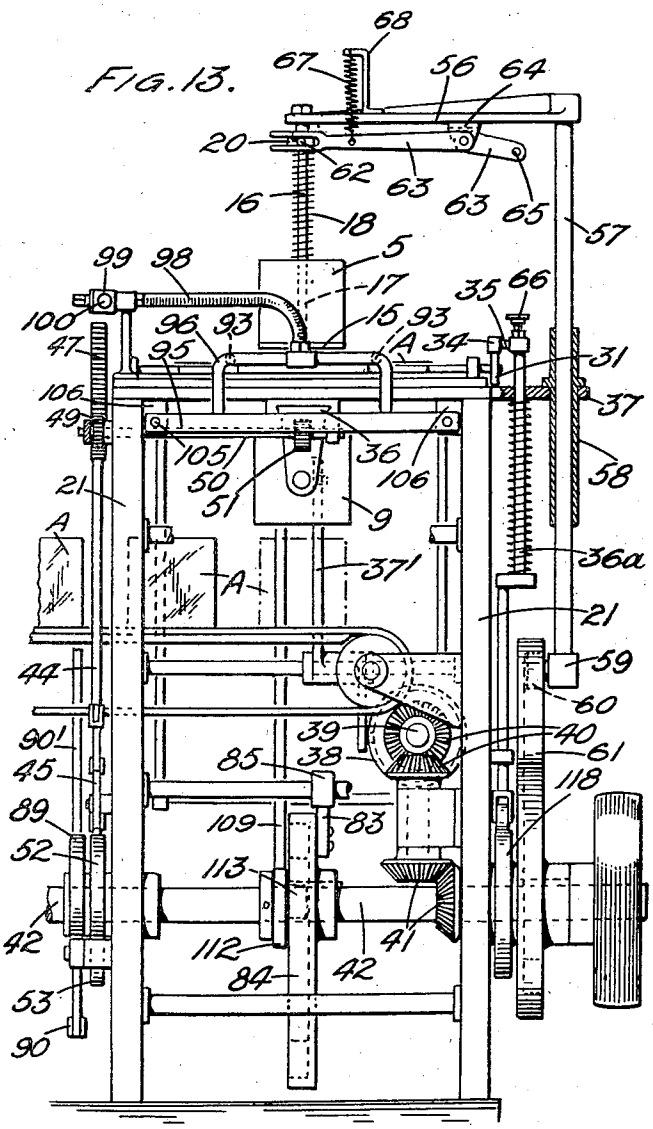
FIG. 13.



Inventor,
Erich Karl Buxbaum
By Michael S. Striker
his Agent

Patented June 6, 1944 2,350,874

UNITED STATES PATENT OFFICE

2,350,374

APPARATUS FOR MANUFACTURING OPEN CONTAINERS MADE OF PLIABLE SHEET MATERIAL

Erich Karl Buxbaum, London, England

Application August 14, 1941, Serial No. 406,780
In Great Britain June 24, 1940

15 Claims. (Cl. 93—51)

This invention relates to the manufacturing of open containers from pliable sheet material, particularly thin sheets of cellulose derivatives, waxed paper, metal foil, tissue paper and the like, that is to say materials which have hitherto been mainly used as wrappings or made up into open as opposed to collapsed containers only by hand or with the aid of hand-operated implements. The invention has for its object to enable open containers to be manufactured from flimsy materials of this description wholly by mechanical means, that is to say without manual intervention at any stage of the manufacturing process.

A further particular object of the invention is to enable containers to be produced mechanically from impervious material of the kind specified, which when sealed or otherwise closed are substantially air-tight and moisture-proof.

The invention has a valuable application in connection with the packing and sealing method forming the subject of our co-pending United States patent application Serial No. 405,632, but is equally applicable to the manual, semi-mechanical or mechanical packaging of any articles which do not constitute a body suitable as an abutment for wrapping operations, such as sweets and articles of confectionery in general, granular or comminuted goods of all kinds as opposed to piece goods, and also fragile goods.

According to the invention, a container which is open at one end only is produced from a sheet of thin pliable material by mechanically folding said sheet about the base and sides of a forming block, causing the folds formed thereby to adhere at least to each other, and stripping the finished open container from said block by pressure applied to the inner surface thereof.

According to a further feature of the invention, the folding of the sheet of starting material is initiated by relative movement between an apertured table supporting the blank sheet of material and the said forming block, whereby the block is transferred from one side to the other of the table, causing the sheet of material to be dragged through the aperture and thereby converted into a loosely folded condition, and is completed by exerting a wiping action upon the loose folds by means of one or more members co-acting with said forming block.

The manner in which the loose folds become formed may be controlled to suit the action of the final wiping member or members, by appropriate dimensioning of the clearance between the forming block and the sides of the aperture at various points and if necessary by the provision of fixed and/or movable guiding or folding members associated with the table at the sides of the aperture.

When the starting material is of a nature to be rendered adhesive by the application of heat, as is the case for instance with cellulose derivatives and waxed paper, the sticking together of the folds may be effected by heating the wiping means or the forming block. When material requiring the application of extraneous adhesive is used, means for dispensing adhesive may be associated with a part of the table bounding the die aperture or with part of the wiping means whereby adhesive is applied to a portion of the outer surface of the sheet which is subsequently covered by a fold or folds.

According to a further feature of the invention, the finished container is stripped off the forming block by means of a skeleton structure normally bearing against the base of said block and conforming to the contour thereof, said structure being mounted on a plunger working in said block and operated to strip the container from the block after the operation of said wiping means and preferably while said wiping means are still in contact with the sides of the container.

The method according to the invention for the continuous mechanical production of open containers made of flimsy material, and also, by way of example, a preferred form of apparatus for the carrying out of this method, is illustrated in the accompanying drawings, in which

Figures 1 to 7 show, in diagrammatic form, the consecutive stages of the formation of a finished container;

Figures 8, 9 and 10 show the forming block and stripping means associated therewith, in inverted plan view, transverse section and longitudinal section, respectively;

Figure 11 is a plan view of a container forming machine according to the invention with the forming block and the jib arm on which it is mounted removed;

Figure 12 is a longitudinal section of the machine;

Figure 13 is an end elevation, partly in section, of the machine as seen from the left of Figures 11 and 12;

Figures 14, 15 and 16 show details of the

folding flap operating mechanism and of the mechanism by which the forming block and stripping means are operated.

Referring to Figures 1 to 7, the essential stages in the method according to the invention for the production of an open container made of flimsy material are as follows:

A piece of sheet material, such as a cellulose acetate derivative, denoted by A, is first placed in position over an aperture 1 in a table 2, overlaying two pivoted wings or flaps 3 and 4, the inner edges of which, about which they are adapted to be pivoted, are in alignment with two opposite edges of the aperture 1. A vertically movable forming block 5, which registers with said aperture, is brought into position touching the surface of sheet A, while the flaps 3 and 4 lie flat against the upper surface of the table.

In the second stage (Figure 2), while the forming block 5 is held stationary the flaps 3 and 4 are pivoted about their inner edges at an angle of 90°, whereby they fold the two overlying portions of the sheet A up against the two corresponding opposite sides of the forming block 5, leaving the remaining portion of the sheet lying partly on the upper surface of the table 2 and partly against the under surface of the forming block. As will be explained in due course supplementary means are preferably employed to ensure that during this stage the non-folded portions of the blank extending laterally of the forming block shall be positively held down on the surface of the table and prevented from rising in irregular folds which would interfere with the desired clean folding up of the two opposite side portions of the sheet throughout their entire length against the side of the forming block as indicated in Figure 2.

In the third stage of the forming process relative movement between the table 2 and the forming block 5 is brought about, so that the forming block passes bodily through the aperture 1, dragging the partly pre-folded sheet A through with it. It will be understood that it is immaterial whether the table is moved and the block held stationary or vice versa. Certain features of construction of the portions of the table bounding the aperture 1 are however essential in order to effect the desired further folding of the sheet A, and these will now be described.

The aim in this stage of the forming process is to lay the greater part of the two side portions of the sheet A which were not affected by the folding portion carried out in the second stage, against the two remaining sides of the folding block, leaving four substantially triangular loops or "ears" extending outwards from the block and substantially parallel with the two initially folded portions of the blank, as shown in Figure 3. To this end two depending wings 6 and 7 are attached to the central portion of the two corresponding edges of the aperture 1, while a recess 8 is formed in the table 2 between each end of these wings 6 and 7 and the adjacent edge of the aperture at right angles thereto, for the accommodation of the side ears during the passage of the forming block through the aperture. Beneath the table 2 and in spaced relation thereto are two horizontally moving wiping members 9 and 10 of substantially rectangular shape adapted to embrace three sides of the forming block 5 with slight clearance when moved inwards alternately from a normal position in which they are shown in Figure 3 into their respective operative positions shown in Figures 4, 5 and 6 respectively. The extent to which the side wings 6 and 7 depend from the edges of the aperture 1 is immaterial to the principle of the invention but must of course be less than the clearance between the wiping members 9 and 10 and the inside of the table 2. In order to ensure that the initially folded side portions of the sheet A are retained against the side of the forming block during this stage of the forming process depending wings 11 and 12 are similarly provided on the two corresponding sides of the aperture, and these wings preferably extend downwards sufficiently far as to be still overlapping the upper edge of these portions at the end of the relative movement between the table and the forming block by which the block is caused to pass through the aperture. The edges and corners of the aperture 1 and its corner recesses 8, and particularly the edges to which the wings 6 and 7 are attached, are carefully rounded off in order to prevent tearing or cutting of the material of the blank during this stage of the forming process.

The completing stages, by which the ears are folded over against the adjacent sides of the sheet A and against each other, and are caused to adhere, in the present instance, by the application of heat, will be readily understood from Figures 4 and 5. The wiping member 10 is equipped with an electric heating element 13 adapted to heat the side cheeks to a predetermined temperature, for instance under thermostatic control, and an insulating element 14 is provided at the base of the wiping member 10 in order to ensure that the application of heat is confined to the sides of the container contacting one of the cheeks of the wiping member, for a reason to be explained in due course. As will be clear from Figures 4 and 5 the wiping member 9 is first moved into the operative position thereby laying two of the ears into tight folds against the sides of the container formed in the previous stage by the wings 6 and 7. After this the heated wiping member 10 is simultaneously moved into the operative position while the wiping member 9 is being at the same time retracted. In this way the remaining ears are folded across on top of those previously compressed by the side cheeks of the wiping member 9.

In the above described five stages, the blank sheet A is thus formed into a completed open container about five sides of the forming block 5. In the next stage (Figure 6) the finished container is stripped from the forming block by pressure applied to the inside of the container, and the stripping is preferably effected, as indicated in Figure 6, while the heated wiping member 10 is still in the operative position. In this way an additional wiping action is obtained and the sealing of the folded sides of the container is improved.

In the present instance the stripping pressure is applied to the container by means of a skeleton frame 15 made of thin strip material and normally laying flush with or counter-sunk in the base of the forming block 5 and co-extensive with the contour thereof the frame 15 is longitudinally movable relatively to the block by being mounted on two guide rods 16, 16 which work in holes 17, 17 formed in the block. The stripping movement of the frame 15 and its guide rods 16 is effected against the action of return springs 18, 18 by means of a cam lever 19 which

bears against a head piece 20 to which the upper ends of the guide rods 16 are attached.

When the finished container has been stripped from the block 5 by depression of the cam lever 19, as shown in Figure 6, it drops clear of the machine and the stripping means and wiping member 10 are then returned to their normal positions, as shown in Figure 7. The forming block is then restored to its initial position relative to the table 2, after which the described cycle of operations can be repeated for production of another container.

In the present instance the forming block and the table aperture with which it co-acts are of square shape. It will however be understood that any size or shape of container may be produced by the described method, provided it is of rectangular basic cross section. In order to enable containers of different sizes and shapes to be produced on one and the same machine, the invention provides as already indicated, for the working parts of the forming mechanism, that is to say the aperture of the table 2 together with the wiping members 9 and 10 associated therewith, the flaps 3 and 4, and the forming block 5 together with the stripping means, to be interchangeably assembled upon the framework of the machine, and for the driving mechanism by which these parts are operated to be detachably coupled thereto and adjustable or interchangeable to obtain the requisite changes in the extent of their respective operative movements.

The precise manner in which the movement of the forming block or of the table, together with the parts associated therewith, and of the wiping members is brought about does not constitute an essential part of the invention, and various expedients for this purpose will readily occur to those skilled in the art to which the invention pertains.

It will be understood that the size of the starting sheet of material or blank A depends on the size of the container to be formed, but we have found that in practice, the blank must be somewhat larger, more particularly as to the dimension measured parallel to the pivoted folding flaps, than corresponds to a development of all five sides of the container in one plane. The main reason for this is the fact, already referred to, that the side portions of the blank which are folded up during the relative movement between the apertured table and the forming block and against which the corner "ears" of the semi-formed container are subsequently folded and compressed, are not positively held against the corresponding sides of the forming block throughout the subsequent stages. There is an interval between the time when these portions come clear of the lower edge of the side wings or skirts 6 and 7 and the time when the wiping member 9 is brought to bear, during which they tend to spring away from the forming block and consequently become to some extent crumpled and at the same time reduced in depth by the action of the wiping members. In order to allow for this deformation, it is necessary to over-dimension the blank.

This difficulty may be overcome, however, and a considerable saving of material may be achieved in return for a slight additional outlay and slight increase in running cost, by holding the sides of the container in snug contact with the faces of the forming block during the forming procedure, by the application of suction through very small ports in the faces of the forming block communicating, through passages drilled in the block, with a common connection from which a flexible hose leads to a vacuum main. We have found that the ports may be of such small area that the vacuum consumption occasioned by this expedient is very slight and does not warrant the provision of means for cutting off the vacuum during the portion of the working cycle when the forming block is not in contact with a blank.

The bringing of a blank into position on the apertured table beneath the forming block may be effected in various ways, such as are employed for similar purposes for instance in the printing art. We have however devised and the present invention covers a method of and means for bringing a length of sheet material from a supply roll into position, by positive feeding combined with positive guidance of the leading edge, and subsequently severing such length from the remainder of the continuous web coming from the supply roll, to leave a blank in situ. In particular, said positive guidance of the leading edge is effected with the aid of pneumatic means.

In connection with this arrangement, which will be described in greater detail hereinafter, the invention further provides for positively holding the length of material down on to the table, conveniently by suction action, before it is either released by the said leading edge guiding means or severed from the continuous web. Thus, the blank is uninterruptedly held in position right up to the time when it is engaged by the forming block and folding flaps and has no opportunity of becoming displaced.

An example of an actual embodiment of the above described principles is shown in Figures 11 to 16 in which the parts identified in the diagrammatic Figures 1 to 10 are denoted by the same reference numerals throughout.

To a table 2 having a central aperture 1 and supported on a main framework 21, there is detachably secured a bottom die assembly comprising the following parts: Two transverse plates 22, 22 bridged at the ends and held together in spaced relation, corresponding to the width of the aperture 1 in a longitudinal direction, by members 23, 24; two flaps 3 and 4 pivotally mounted on shafts 25, 26 rotatably supported in the bridging members 23, 24; and two intermediate fixed plates 26, 26 of a width less than the gap between the transverse plates 22, 22 attached at their outer ends to the bridging members 23, 24 and extending from either side slightly beyond the corresponding edges of the aperture 1. Adjoining the inner ends of the plates 26, 26 and conveniently formed integrally therewith, are the forming wings 6 and 7 described with reference to Figure 3, while the longer holding-up wings 11 and 12 similarly adjoin the central portion of the inner edge of the transverse plates 22, 22 (see Figure 12).

The intermediate plates 26, 26 are each provided with a small aperture 27 to which, on the under side of the plate, a branch pipe 28 is attached for connection, through a control valve, to a source of vacuum.

Attached with their inner edges to spindles 25 rotatably mounted in the bridging members 23, 24, are the flaps 3 and 4 referred to in connection with the above description of the principle forming the container. There is a minimum of clearance between the spindles 29 and the top of the table 2, and suitable distance pieces, which take, in the present instance, the form of rods 30, are

attached to the table 2 for the purpose of supporting the outer edges of the flaps 3 and 4 when in the inoperative position, and the arrangement is such that the upper surfaces of the flaps 3 and 4 and the intermediate plates 26, 26 lie in one horizontal plane which forms the supporting surface for the blank A at the commencement of the cycle of operations of the machine. The portions of the spindles 29 extending externally of the bridging member 24 each carry a cam disc 31 having a peripheral excision 32 of the shape shown in Figures 14 and 15. The cam discs 31 are provided with a peripheral groove, and a tension spring 33 is connected between two corresponding points at the base of this groove, so as to urge the two cam discs rotatably away from each other. In the inoperative position, that is to say when the flaps 3 and 4 are horizontal, the excisions 32 in the cam discs 31 are disposed uppermost, as shown in Figure 14, and bear with their inner corners, under the force of the tension spring 33, against the underside of a stop 34 attached to an arm 35 adapted to be moved down and up through a predetermined distance once in the course of an operating movement of the machine by a plunger 36a slidably supported in an extension 37 on the table 2 (see also Figures 13 and 16). The distance through which the stop 34 travels on the downward track of the plunger 36a is sufficient to rotate the cam discs 31 through 90°, into the position shown in Figure 15. The shape of the excisions 32 is such that in this position the two sides of the excision 32 bear against the two corners of the corresponding end of the stop member 34. In this way accurate and positive movement of the flaps 3 and 4 from the horizontal to the vertical position is ensured.

Beneath the table 2, the wiping members 9 and 10 already referred to are secured respectively to slides 36 and 36' supported in guides attached to the table 2 and operated independently of each other by means of the following mechanisms.

The rear end of the slide 36' is connected to one arm of rocking lever 37' the other arm of which co-acts with a face cam 38 fast on a counter-shaft 39 driven through a train of bevel gears 40, 41 through a master cam shaft 42 from which the movements of the machine are derived, one revolution of this shaft corresponding to a complete cycle of operations of the machine. The return movement of the slide 36' and wiping member 10 is effected by the action of the cam 38.

The side cheeks of the wiping member 10 are heated in the manner already described.

The wiper 9 is moved forward into the operative position by the downward movement of a pull rod 44 which constitutes a link between the outer rocking member 45 pivoted on bracket 46 attached to the frame 41, on the one end, and the lower end of a rack 47 supported in a guide 48 with one side of the rear end of the table 2. The rack 47 meshes with a pinion 49 on a shaft 50 supported in lugs on the other side of the table 2 and carrying a further pinion 51 which meshes with a pinion formed on the underside of the slide 36. The inner arm of the rocking lever 45 co-acts with a cam disc 52 having a peripheral cam 53 of such shape and position as to effect the forward movement of the wiping member 10, through the intermediary of the parts 44, 47, 49, 50, 51, to retain it in forward position, and then to release it for the return movement in response to the action of a tension spring 54 connected to the outer side of lever 45 and framework 21, in the manner described in connection with the operation of the machine.

The forming block 5 carrying the already described stripping means is attached to a stem 55 secured at its upper end to a jib arm 56, the rear end of which is attached to twin plunger rods 57, 57 connected for vertical movement in sleeves 58, 58 in apertures in the extension 37 on the table 2. The lower ends of the plunger rods 57 are attached to a crosshead 59. Centrally coupled to the crosshead 59 is a lever 60 fulcrumed on the framework 21 and co-acting with a cam disc 61 fast on the master cam shaft 42.

The mechanism for operating the stripping means associated with the forming block 5 is as follows. Pins 62, 62 extending laterally outwards from the rods 16 are engaged by the forked ends of twin levers 63 pivoted towards their other end in a lug 64 formed on the underside of the jib arm 56. The shorter rear arms of the levers 63 are inclined downwardly at an angle to the longer arms and are bridged at their rear end by a bolt 65 which is in vertical alignment with adjustable stops 66 on the upper end of the plunger rod 36a. In the normal position of the levers 63, in which they are retained by the action of tension spring 67, 67 attached to brackets 68, 68 mounted on the jib arm 56, the longer arms of these levers are disposed substantially horizontal and parallel to the jib arm 56, while shorter rear arms are downwardly inclined, as shown in Figure 13.

The means according to the invention for bringing the blank A into position over the aperture 1 in the table 2 at the commencement of the operating cycle of the machine will now be described. A supply roll 70 carrying a continuous web B of sheet material, in the present instance thin cellulose acetate, is idly mounted between bearing brackets 71, 71 attached to the framework 21 which also supports a pair of friction rolls 72, 72 and a train of gearing comprising a ratchet wheel 73 coupled to a driving spur wheel 74, intermediate pinions 75, countershaft 76 and driven pinions 77 keyed to the shaft of one of the friction rolls 72. The friction rolls are geared together by means of toothed end discs 78, 78, and one or both of these rolls are provided with a covering of resilient material such as soft rubber. In horizontal alignment with the folding flaps 3 and 4 and intermediate fixed plates 26, 26 and slightly spaced therefrom, is a platen 79 carrying end brackets 80, 80 in which a cutter blade 81 is pivotally mounted by means of arms 82, 82. The blade 81 co-acts with the forward edge of the platen 79 to sever a portion of the web B to form a blank A, when this portion has been fed from supply roll 70 by rotation of the friction roll 72. The requisite movement of the blade 81 is derived from a peripheral cam 83 attached to a groove cam disc 84 fast on the master cam shaft 42 and serving a further purpose to be described in due course. Cam 83 co-acts with lever 85 linked by a push rod 86 to a rearward extension on one of the arms 82, whereby the blade 81 is depressed for a short space of time once in the course of each rotation of the cam shaft 42.

The ratchet wheel 73 is rotated through a fixed angular distance at each cycle of operation of the machine by means of pawl 87 mounted on the outer end of an arm 88 pivoted on a shaft carrying ratchet wheel 73 and spur wheel 74, and reciprocated at each cycle of operations by the

action of a further cam disc 89 on the master cam shaft 42 through the intermediary of a lever 90 and pull rod 90'.

Braking means are provided in order to prevent snatching or overrunning of the supply roll 70, and in the present instance this purpose is served by a fabric strip 91 attached to the driving shaft of the feed gear and suspended over the supply rolls 70 with a weight 92 attached to its free end.

According to the invention the leading edge of the web B is positively guided through the feeding phase. For this purpose in the present instance two suction heads 93, 93 having a sloping undersurface provided with a second aperture are attached to two spaced tubular arms 94, 94 secured at their rear ends by a stirrup member 95 through the intermediary of a hooped tubular connecting piece 96 having a fitting 97 for the attachment of flexible hose 98 leading to a rotary valve 99 controlling the connection to the hose 96 of a vacuum main 100.

A series of slightly curved guard rods 101 attached to the platen 79 and accommodated in grooves 102 in one or both of the friction rolls 72, 72 serve to prevent the web B from sagging on either side of these rolls, while a number of spaced weak leaf springs 103 attached to a shaft 104 secured between the brackets 80 serve to hold down the forward end of the web B and to prevent it from being lifted by the cutter blade 81 on its return stroke.

The stirrup member 95 is secured to two spaced rods 105, 105 which pass beneath the table 2 through supporting guides 106 and extend beneath the feed mechanism. The rear ends of the rods 105, 105 are joined by a cross bar 107 to which there is centrally articulated a drag-link 108 coupled to the upper arm of a two-armed lever 109 pivoted at 110 on the framework 21. The lower arm of the lever 109 is in its turn coupled by a link 111 to a slotted link 112 embracing the camshaft 42 adjacent the cam disc 84 and adapted to be reciprocated horizontally by virtue of the engagement of a pin 113 engaging in a cam groove 114 in the cam disc 84.

To one of the rods 105 are secured two adjustable collars 115, 115 adapted to co-act with a slide 116 coupled by a suitable linkage to an arm 117 attached to the plug member of the valve 99. The collars 115, 115 are adjusted in such positions on the rod 105 that they alternately engage and move the slide 116 from one extreme to the other of its travel during the respective end portions of the phases of the reciprocating movement of the rods 105, 105, stirrup member 95 and parts assembled thereon.

The lower end of the plunger rod 36a co-acts with a cam disc 118 keyed on the camshaft 42 and having a cam surface so shaped that the rod 36a and its stop 66 as also the stop 34 are lowered and raised once in the course of the working cycle of the apparatus.

The setting and shaping of the various cam discs on the shaft 42 is such that when the block 5 has been lifted above the level of the bottom die assembly on its upward return stroke and the flaps 3 and 4 have returned or nearly returned to the horizontal position, the suction heads 93 are brought forward, by the action of cam discs 84 (gaps 120 being provided in the flaps 3 and 4 to allow of the passage of the suction heads 93 and tubular holders 94 as the flaps descend) to a point close to the leading edge of the web B. Towards the end of this movement the slide 116 is moved by a collar 115 to connect the suction heads to vacuum thereby picking up the leading edge of the web. The feed mechanism then brought into operation by the action of cam 89 to feed the web forward and at the same time and at the same linear speed, the suction head carrying assembly is moved back into the starting position where it releases the leading edge of the web owing to the cutting off of the vacuum by the return movement of slide 116 by the other collar 115. At the same time the web is held fast to the bottom die assembly by the application of suction at the two apertures in the intermediate plates 26, 26 through a valve (not shown) which serves in the present instance to control the vacuum supply to a plurality of pneumatic handling units according to my aforesaid co-pending application Serial No. 405,632 which co-operate with the described container-forming apparatus to form a mechanical packaging machine.

The cutter blade 81 is then operated by the cam 83 to sever the advanced length of web, whereby the condition represented in Figure 1 is attained.

The plunger rods 57 and block 5 then commence to descend and at or about the time the base of the block 5 touches the severed blank A, the plunger rod 36 descends the full length of its stroke and rotates the discs 31, 31 thereby lifting the flaps 3, 4. The suction at the apertures in the intermediate plates 26, 26 is then cut off.

During the remainder of the descent of the block 5 through the aperture 1 the previously held-down side portions of the blank are folded up by the wings 6 and 7, the corner ears being accommodated in the gaps 8 formed between the intermediate plate 26, 26 and side flaps 22, 22. When the block has reached the end of its descent, the wiping members 9 and 10 are brought into action by their respective cams 38 and 52 in the manner described in connection with Figures 4 and 5. The stop 66 is so adjusted that the down stroke of the plungers 57 brings the rod 65 into contact with the upper surface of this stop, as shown in Figure 16.

After completion of the wiping operations and while the block 5 remains at the bottom of its stroke, the plunger 36a is lifted. The stop thereby raises the rear end of levers 63, 63 and depresses the rods 16, 16 and skeleton frame 15, to strip the finished container from the block while the heated wiping member 10 is still in the operative position. At the same time the stop 34 is raised and releases the cam discs 31, 31, with the result that the flaps 3 and 4 are returned to their horizontal position by the action of the tension spring 33. The plunger rod 36a thus performs two distinct functions although it descends and ascends once only in the course of a working cycle.

Then, but not until then is the wiping member 10 retracted and the block 5 raised into the elevated position, thus completing the cycle. As the block 5 ascends the levers 63, 63 and with them the stripping frame 15 are returned to their normal positions by the springs 67.

When the prime material used is not of a nature to be rendered adhesive by the application of heat, means for dispensing liquid adhesive matter, in the form of rollers, pads or wicks associated with a source of supply of such matter, may be provided for instance in suitable positions on said fixed wings bordering the edges of

the die aperture brushed by the portions of the workpiece destined to form the basis of the folded sides of the container and/or on the wiping member 9 which is advanced first.

It will be understood that the wiping members must be replaceable to allow of changing these parts when the bottom die unit is changed. Alternatively, the wiping members may be mounted on the die unit and detachably associated with their respective driving or operating means.

With the aid of the described apparatus containers made of flimsy sheet material may be turned out in continuous and rapid succession and discharged for instance on to a conveyor as indicated in Figure 13 for subsequent handling and use in packing articles or goods of the kinds indicated at the outset.

What I claim and desire to secure by Letters Patent is:

1. Apparatus for producing an open container made of flimsy sheet material, comprising an apertured supporting surface for a blank of flimsy sheet material, a forming block of substantially rectangular section, normally supported over the aperture in said surface with its central axis at right angles to the main plane of said supporting surface and spaced therefrom, means for effecting relative movement between said surface and forming block so as to bring said block into contact with the blank and thereafter through the aperture in said surface, means for positioning the blank on said supporting surface symmetrically with reference to said forming block, movable folding means above said supporting surface operable when the forming block has been brought into contact with the blank, for folding the portions of the blank extending outwardly of two opposite edges of the base of the block, bodily at right angles and into contact with the corresponding faces of the block, while leaving the remaining two portions of the blank extending outwardly of the other two edges of the base of the block substantially in the plane of the base of the block, means for passing said block and blank through said apertured surface whereby the central part of each of the said remaining portions is wiped into contact with the corresponding faces of the block, leaving four ears connecting said parts with the previously folded portions all extending outwardly of the block substantially parallel with said portions, movable folding means beneath said supporting surface for folding opposite pairs of said ears inwardly into overlapping relationship with each other and into contact, respectively, with said wiped parts of the two remaining side portions of the sheet, means for sealing said ears at least to each other to complete the open container on the block, and stripping means associated with the block for exerting pressure on the inner surface of the base of the container to strip it from the block and deliver it axially in open condition.

2. Apparatus according to claim 1, in which said movable folding means beneath said supporting surface consists of a pair of reciprocating wiper members engageable from opposite direction with the same pair of sides of the block, and means for controlling the movements of said wiper members so that, after the first wiper member has been moved from the normal position into the position of full engagement with its side cheeks embracing three sides of the forming block and partly formed container thereon, the second wiper member is moved forward until the forward or outer end of its side cheeks approaches the corresponding end of the first wiper member, after which the first wiper member is retracted commensurately with the advancing of the second wiper member, whereby the second pair of ears become progressively drawn through the gaps between the outer ends of the wiper members and at the same time laid over the pairs of ears previously laid by the forward movement of the first wiper member, after which the first wiper member is left in the retracted normal position while the second wiper member is retracted.

3. Apparatus according to claim 1, for use in connection with heat-sealable flimsy sheet material, such as, for instance, a cellulose derivative film, in which said movable folding means beneath said supporting surface consists of a pair of reciprocating wiper members engageable from opposite directions with the same pair of sides of the block, means for controlling the movements of said wiper members so that, after the first wiper member has been moved from the normal position into the position of full engagement with its side cheeks embracing three sides of the forming block and partly formed container thereon, the second wiper member is moved forward until the forward or outer end of its side cheeks approaches the corresponding end of the first wiper member, after which the first wiper member is retracted commensurately with the advancing of the second wiper member, whereby the second pair of ears become progressively drawn through the gaps between the outer ends of the wiper members and at the same time laid over the pairs of ears previously laid by the forward movement of the first wiper member, after which the first wiper member is left in the retracted normal position while the second wiper member is retracted, and means for heating the wiper member which comes lastly into operation, so that the wiping action effects sealing of the overlaid ears to each other and to the underlying portion of the container wall.

4. Apparatus according to claim 1, for use in connection with heat-sealable flimsy sheet material, such as, for instance, a cellulose derivative film, in which said movable folding means beneath said supporting surface consists of a pair of reciprocating wiper members engageable from opposite directions with the same pair of sides of the block, means for controlling the movements of said wiper members so that, after the first wiper member has been moved from the normal position into the position of full engagement with its side cheeks embracing three sides of the forming block and partly formed container thereon, the second wiper member is moved forward until the forward or outer end of its side cheeks approaches the corresponding end of the first wiper member, after which the first wiper member is retracted commensurately with the advancing of the second wiper member, whereby the second pair of ears become progressively drawn through the gaps between the outer ends of the wiper members and at the same time laid over the pairs of ears previously laid by the forward movement of the first wiper member, after which the first wiper member is left in the retracted normal position while the second wiper member is retracted, means for heating the wiper member which comes lastly into operation, so that the wiping action effects sealing of the overlaid ears to each other and to the underlying portion of the container wall, and an insulation

protecting the base of the said heated wiper member from becoming heated and restricting the heating action to the side cheeks, whereby the initially folded side portions of the container wall, with which the base of said wiper member comes in contact, are preserved from the action of heat and thereby retained in a condition susceptible of heat sealing in a subsequent operation after the container has been filled and closed.

5. Apparatus according to claim 1, for use in connection with heat-sealable flimsy sheet material, such as, for instance, a cellulose derivative film, in which said movable folding means beneath said supporting surface consists of a pair of reciprocating wiper members engageable from opposite directions with the same pair of sides of the block, means for controlling the movements of said wiper members so that, after the first wiper member has been moved from the normal position into the position of full engagement with its side cheeks embracing three sides of the forming block and partly formed container thereon, the second wiper member is moved forward until the forward or outer end of its side cheeks approaches the corresponding end of the first wiper member, after which the first wiper member is retracted commensurately with the advancing of the second wiper member, whereby the second pair of ears become progressively drawn through the gaps between the outer ends of the wiper members and at the same time laid over the pairs of ears previously laid by the forward movement of the first wiper member, after which the first wiper member is left in the retracted normal position while the second wiper member is retracted, means for heating the wiper member which comes lastly into operation, so that the wiping action effects sealing of the overlaid ears to each other and to the underlying portion of the container wall, and means whereby the movement of the said heated wiper member is so controlled that it is arrested and retained in the fully advanced position for a period of time sufficient for its heating action to take effect.

6. Apparatus according to claim 1, for use in connection with heat-sealable flimsy sheet material, such as, for instance, a cellulose derivative film, in which said movable folding means beneath said supporting surface consists of including a pair of reciprocating wiper members engageable from opposite directions with the same pair of sides of the block, means for controlling the movements of said wiper members so that, after the first wiper member has been moved from the normal position into the position of full engagement with its side cheeks embracing three sides of the forming block and partly formed container thereon, the second wiper member is moved forward until the forward or outer end of its side cheeks approaches the corresponding end of the first wiper member, after which the first wiper member is retracted commensurately with the advancing of the second wiper member, whereby the second pair of ears become progressively drawn through the gaps between the outer ends of the wiper members and at the same time laid over the pairs of ears previously laid by the forward movement of the first wiper member, after which the first wiper member is left in the retracted normal position while the second wiper member is retracted, means for heating the wiper member which comes lastly into operation, so that the wiping action effects sealing of the overlaid ears to each other and to the underlying portion of the container wall, an insulation protecting the base of the said heated wiper member from becoming heated and restricting the heating action to the side cheeks, whereby the initially folded side portions of the container wall, with which the base of said wiper member comes in contact, are preserved from the action of heat and thereby retained in a condition susceptible of heat sealing in a subsequent operation after the container has been filled and closed, and means for bringing the stripping means into action during the period of arrestment of the said heated wiper member, so as to effect an additional wiping ironing down action on the ears, thereby improving the sealing and the finish of the container.

7. Apparatus according to claim 1, including side cheeks on said wiper members which are flared slightly as to their end portions, in order to enable them to be moved at relatively high speeds without tearing the material of said ears engaged by them.

8. Apparatus according to claim 1, in which said movable folding means beneath said supporting surface consists of a pair of reciprocating wiper members engageable from opposite direction with the same pair of sides of the block, means for controlling the movements of said wiper members so that, after the first wiper member has been moved from the normal position into the position of full engagement with its side cheeks embracing three sides of the forming block and partly formed container thereof, the second wiper member is moved forward until the forward or outer end of its side cheeks approaches the corresponding end of the first wiper member, after which the first wiper member is retracted commensurately with the advancing of the second wiper member, whereby the second pair of ears become progressively drawn through the gaps between the outer ends of the wiper member and at the same time laid over the pairs of ears previously laid by the forward movement of the first wiper member, after which the first wiper member is left in the retracted normal position while the second wiper member is retracted, and means for thermostatically controlling the heating of the said heated wiper member to maintain an optimum sealing temperature.

9. Apparatus according to claim 1, including along the edges of the aperture in said surface contiguous with said folding means above the surface, retaining wings extending at right angles to the blank supporting surface so as to form a continuation on the other side of the supporting surface of the central portion of the said folding means, when operative, for the purpose of retaining the initially folded side portions of the container wall in contact with the forming block.

10. Apparatus according to claim 1, in which said movable folding means beneath said supporting surface consists of a pair of reciprocating wiper members engageable from opposite direction with the same pair of sides of the block the first of said wiper members being unheated and the second being heated, means for controlling the movements of said wiper members so that, after the first wiper member has been moved from the normal position into the position of full engagement with its side cheeks embracing three sides of the forming block and partly formed container thereof, the second wiper member is

moved forward until the forward or outer end of its side cheeks approaches the corresponding end of the first wiper member, after which the first wiper member is retracted commensurately with the advancing of the second wiper member, whereby the second pair of ears become progressively drawn through the gaps between the outer ends of the said second heated wiper member and at the same time laid over the pairs of ears previously laid by the forward movement of the first wiper member, after which the first wiper member is left in the retracted normal position while said second heated wiper member is retracted, means for thermostatically controlling the heating of the said second heated wiper member to maintain an optimum sealing temperature, and slides to which the said wiper members are attached and supported on the underside of the supporting surface.

11. Apparatus according to claim 1, in which said movable folding means above the supporting surface consist of flaps attached at their inner edges to shafts rotatably supported in side members secured to said supporting surface.

12. Apparatus according to claim 1, in which said movable folding means above the supporting surface consist of flaps attached at their inner edges to shafts rotatably supported in side members secured to said supporting surface, and means for intermittently rotating said shafts through the required angle of 90°, said means comprising an arm, a plunger attached to said arm and working in an extension on said supporting surface, co-acting cam discs secured to adjacent ends of said shafts, and spring means for effecting after each folding operation return movement of said shafts and said flaps attached thereto into their initial position.

13. Apparatus according to claim 1, including a stem to which said forming block is secured, a jib arm from which said stem depends, and twin plunger rods working in an extension on said table and attached to the root of said jib arm.

14. Apparatus according to claim 1, in which said stripping means consist of an ejector member of an outer contour corresponding to that of the base of the forming block, rods on which said ejector member is mounted extending through the block, spring means for normally retaining said ejector member against the under surface of the base of the forming block, and means for operating said rods to effect movement of the ejector member away from the block.

15. Apparatus according to claim 1, in which said movable folding means beneath said supporting surface consist of a pair of reciprocating wiper members engageable from opposite direction with the same pair of sides of the block, side cheeks on said wiper members which are flared slightly as to their end portions, in order to enable them to be moved at relatively high speeds without tearing the material of said ears engaged by them, holding down means which comprises suction apertures in the supporting surface, means for controllably connecting said apertures to a source of vacuum, and means for controlling the movements of said wiper members so that, after the first wiper member has been moved from the normal position into the position of full engagement with its side cheeks embracing three sides of the forming block and partly formed container thereon, the second wiper member is moved forward until the forward or outer end of its side cheeks approaches the corresponding end of the first wiper member, after which the first wiper member is retracted commensurately with the advancing of the second wiper member, whereby the second pair of ears become progressively drawn through the gaps between the outer ends of the wiper members and at the same time laid over the pairs of ears previously laid by the forward movement of the first wiper member, after which the first wiper member is left in the retracted normal position while the second wiper member is retracted.

ERICH KARL BUXBAUM.