March 12, 1968 K. BELL 3,372,654

METHOD OF AND APPARATUS FOR FORMING AN EDIBLE PRODUCT

Filed Sept. 1, 1965 2 Sheets-Sheet 1

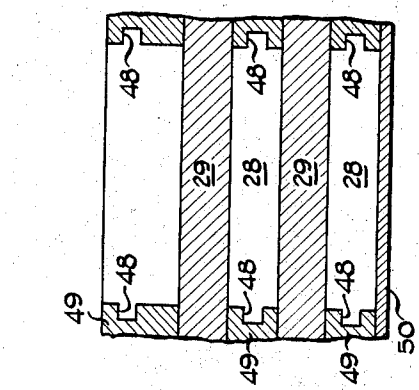


Fig 2

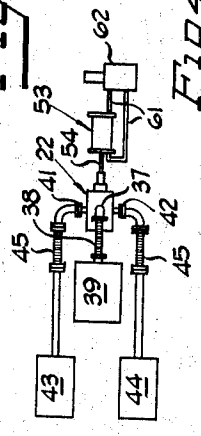


Fig 4

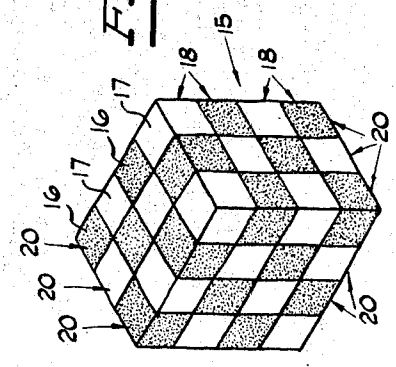


Fig 5

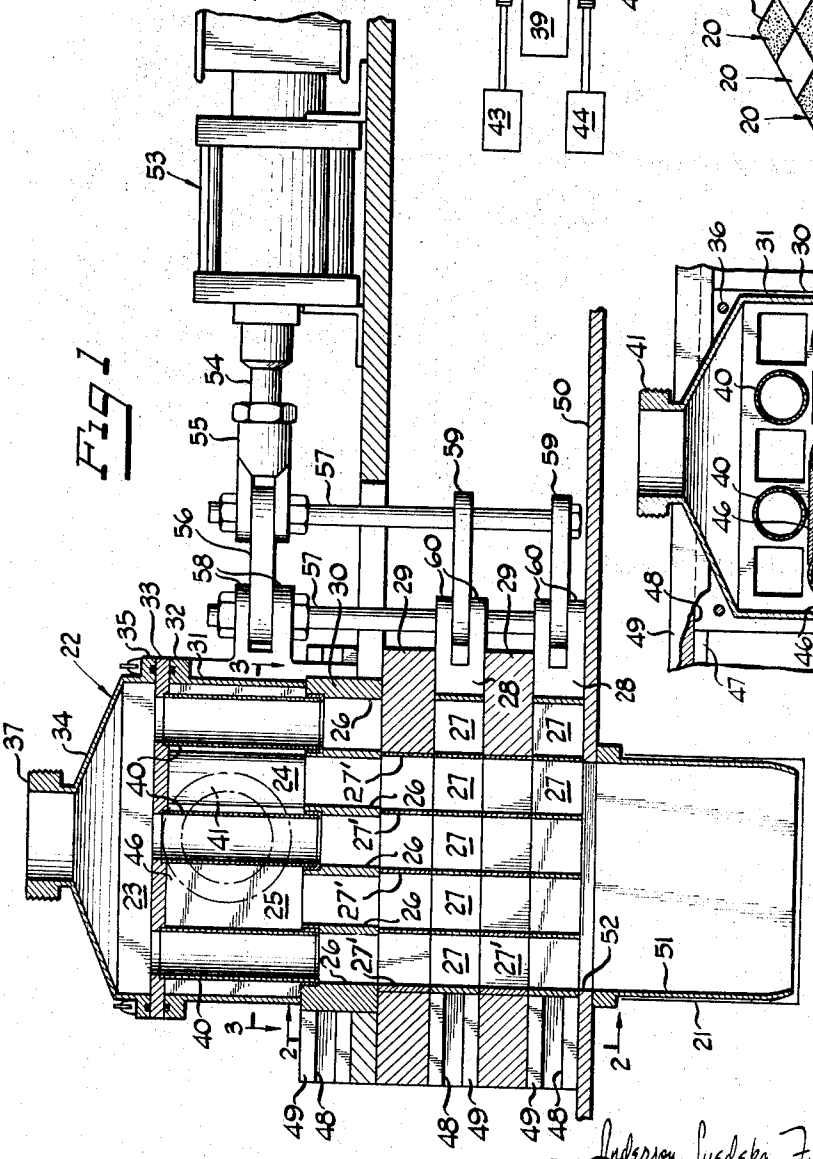


Fig 1

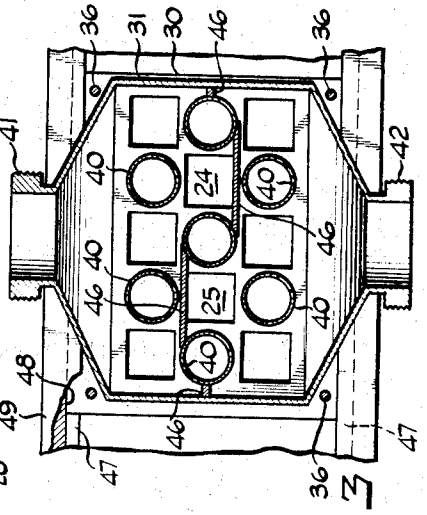


Fig 3

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METHOD OF AND APPARATUS FOR FORMING AN EDIBLE PRODUCT

Filed Sept. 1, 1965 2 Sheets-Sheet 2

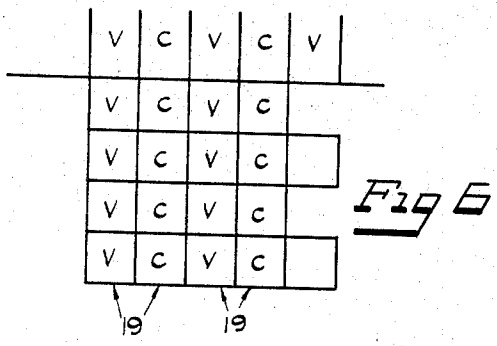


Fig 6

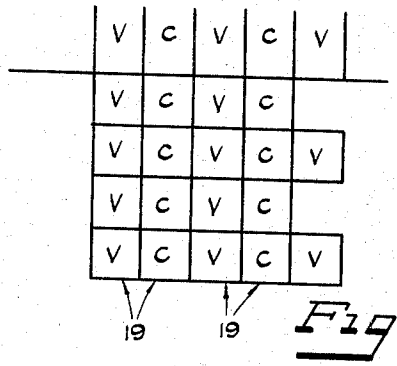


Fig 10

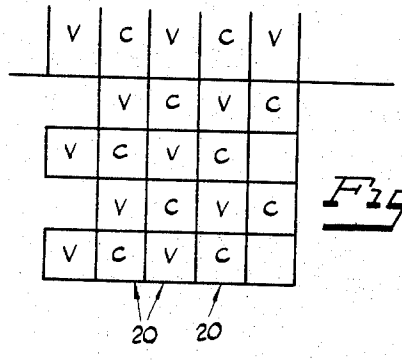


Fig 7

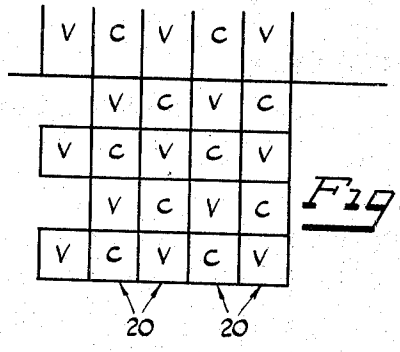


Fig 11

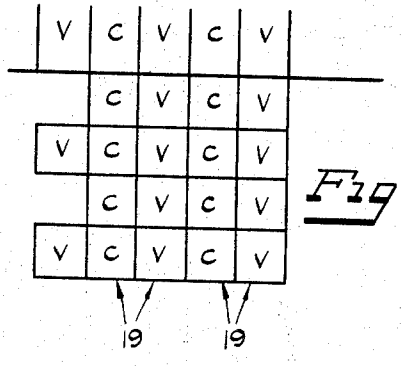


Fig 8

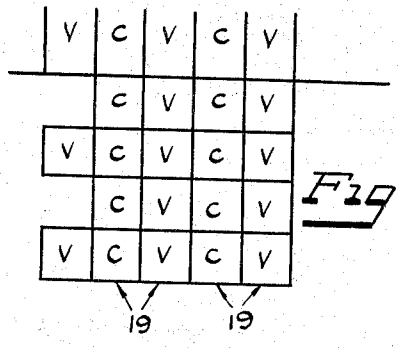


Fig 12

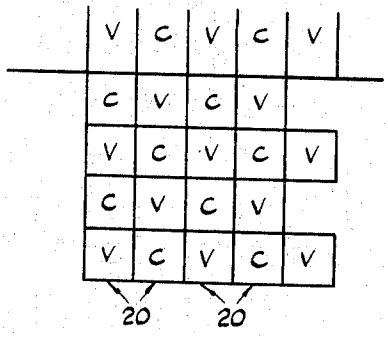


Fig 9

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METHOD OF AND APPARATUS FOR FORMING AN EDIBLE PRODUCT

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7 Claims. (Cl. 107—1)

ABSTRACT OF THE DISCLOSURE

A method and apparatus for forming an edible product of different materials with similar sections of the materials arranged in contacting layers and with the sections in each layer arranged in parallel contacting rows, each section in each row in each layer contacting at least one section of a different material in the same row, at least one section of different material in at least one adjacent row, and at least one section of different material in at least one adjacent layer.

This invention relates generally to the formation of edible food products in which small sections of a plurality of different materials are arranged in layers with adjacent sections within each layer and adjacent sections of adjacent layers formed of different materials. More particularly, the invention relates to the formation of an edible product of rectangular shape with the sections of different materials forming a checkerboard pattern in any plane parallel to one of the flat sides, ends, or top and bottom of the rectangle.

The primary object of the present invention is to form an edible product of the above character by a novel method and apparatus which are faster and insure more uniform products when compared with prior methods and apparatus.

Another object is to provide a novel method and apparatus in which a single extrusion of the different materials is utilized to transfer a finished product to a container and deliver to a pattern forming apparatus all of the materials needed to form another product.

A further object is to arrange the sections of different materials of the rectangular block in the finished pattern in a novel manner enabling the finished block to be extruded in a single operation.

A more detailed object is to form an alternating pattern of different materials by substituting spaced portions of a column of one material for spaced portions of a column of another material.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings in which:

FIGURE 1 is a fragmentary sectional view of apparatus embodying the novel features of the present invention, the section being taken in a vertical central plane of the apparatus;

FIG. 2 is a fragmentary sectional view taken along the line 2—2 of FIG. 1;

FIG. 3 is a fragmentary sectional view taken along the line 3—3 of FIG. 1;

FIG. 4 is a reduced schematic plan view of the apparatus;

FIG. 5 is a perspective view of a rectangular edible product formed by the apparatus of FIG. 1; and

FIGS. 6, 7, 8, 9, 10, 11 and 12 are schematic views similar to FIG. 1 and showing successive steps in the method of forming the edible product.

The method and apparatus of the present invention are especially suited for the formation of an edible product

15 made up of a plurality of sections 16 and 17 of different material arranged in contacting layers 18 with adjacent sections of each layer formed of different materials and adjacent sections of adjacent layers aligned with each other transversely of the layers and also formed of different materials.

In more particular aspects of the invention, the product 15 is rectangular in shape as shown in FIG. 5 with the sections 16 and 17 of different material in each layer 18 arranged in perpendicular parallel and transverse rows to form a checkerboard pattern and with a similar checkerboard pattern appearing in vertical planes parallel to the side and end walls of the block.

In general, the improved method comprises the steps of forming elongated columns 19 of the different materials (FIGS. 1, 6, 8, 10 and 12), and shifting longitudinally spaced portions of the columns transversely of the columns to remove such spaced portions from each column, and inserting such removed portions of one column between intervening portions of an adjacent column, thereby producing a column 20 divided into the sections 16 and 17 adjacent ones of which are formed of different materials. These steps preferably are performed simultaneously on a plurality of columns 19 disposed side by side and having a length equal to the desired length, or in this instance, vertical dimension, of the finished product. After the spaced portions of each column have been replaced by portions of another column of different material, the columns 20 of mixed materials are extruded into side by side contacting relationship and transferred into a carton. To form the rectangular product of FIG. 5, there are the same number of mixed columns as there are sections in each layer of the block. In the present instance, there are 12 columns corresponding to the 12 sections of each layer arranged in three rows of four sections each, there being four layers in the illustrated block.

The improved method and apparatus, although particularly suited for ice cream of different flavors or colors, also may be employed with other products which are extruded but have sufficient viscosity to retain their shape until deposited in a container 21. Examples of such other products are sherbets, ices, dough, puddings, peanut butter, cream cheese and shortenings such as margarine. Two different materials are shown in the product of FIG. 5 as forming a checkerboard pattern in each of three planes parallel to the sides, ends and top and bottom walls of the block 15. However, more than two different materials may be employed as will appear more in detail hereinafter.

The improved apparatus for practicing the method includes a housing 22 defining a plurality of chambers 23, 24 and 25 adapted to receive the different materials of the finished product 15 and communicating with discharge ports 26 arranged in a pattern similar to the pattern of the sections 16 and 17 of each layer of the product, adjacent ports communicating with different chambers so as to deliver different materials side by side. Aligned vertically with the ports are similarly arranged openings 27 in a plurality of parallel plate 28 and similar openings 27′ in other plates 29 which are parallel to and alternate with the first plates 28. These plates 28 and 29 and another plate 30 defining the discharge ports are arranged in parallel horizontal planes and are divided into two groups one of which is formed by the discharge plate 30 and the alternating plates 28. The other group is formed by the intervening plates 29. The plates 28 and 29 beneath the discharge plate 30 form a stack and each of these plates is of a thickness equal to a layer 18 of the finished product 15, the openings and 27′ in these plates being of the same rectangular cross-sectional shape

as the shape of the sections 16 and 17 in each layer of the product.

The column 19 of different materials in the improved method are formed by extruding the materials from the chambers 23, 24 and 25 and through the discharge ports 26 into the aligned openings 27 and 27' of the forming plates 28 and 29 disposed beneath the discharge plate 30. Spaced sections of the columns are replaced by spaced sections of different materials by shifting one of the aforementioned groups of plates transversely of the columns, herein horizontally, to bring different openings of adjacent plates and the different materials therein into vertical alignment. After such shifting of spaced portions of adjacent columns, the newly formed columns 20 of different materials are extruded from the newly aligned openings in the stack of plates and new columns are formed in such openings by additional material discharging through the ports in the discharge plate.

Following the formation of the new columns 19 each of a single material, the groups of plates 28, 29 and 30 are shifted relative to each other in the reverse direction to bring the originally aligned openings 27 and 27' back into alignment vertically. This results in the removal of spaced sections of material from the columns 19 and insertion of the removed sections of one column between intervening sections of the adjacent column 19. To insure the formation of a regular checkerboard pattern, that is, adjacent sections in each layer and adjacent sections in adjacent layers of different materials, the plates in the group including the discharge plate 30 and the alternating plates 28 are formed with one more row of ports 26 or openings 27 and 27' extending transversely of the rows which parallel the direction of relative shifting of the groups.

In the present instance, the housing 22 comprises a tubular vertical side wall 31 of rectangular cross section abutting at its lower end against the discharge plate 30 which also forms the bottom of the housing. At its upper end, the side wall is formed with an outwardly and horizontally projecting rim 32 which supports an upper divider plate 33 and a top cover 34 of the housing, the cover being tubular and of the same cross-sectional shape as the side wall with an outwardly projecting lower rim 35 coextensive with an overlapping the side wall rim 32 and the periphery of the upper plate 33. The assembly made up of the cover member, upper plate, side wall and bottom plate is secured together by suitable bolts 36 extending vertically between the bottom plate and the upper side of the rim on the cover along the outer side of the side wall.

The upper plate 33 and the top cover 34 cooperate to define one chamber 23 for one material and this is connected through a fitting 37 on the cover and a flexible tube 38 to a source 39 (FIG. 4), herein an ice cream freezer, of the material. Communication between this chamber and spaced ones of the discharge ports 26 is effected herein through the provision of flow tubes 40 secured and extending between the upper and lower plates 30 and 33. Other fittings 41 and 42 are secured to and extend outwardly from opposite sides of the vertical side wall 31 of the housing and are connected respectively through flexible tubes 45 to one or more other sources 43 and 44 again freezers in this instance, of other materials in the final product. In this instance, two such other sources are shown.

To separate materials from the second and third sources 43 and 44 and from the other chambers 24 and 25 for them within the housing, separator or divider plates 46 extend between the upper and lower housing plates 33 and 30 and are secured to and close the space between adjacent flow tubes 40 in the center row of these tubes and the space between the end tubes of this row and the ends of the side wall 31. With this arrangement, each of the other chambers is defined by the separator plates, the upper and lower housing plates, the vertical side wall and the flow tubes. On its lower side, the lower discharge plate 30 terminates in a plane and the discharge ports 26 are in this plane and are of square cross section to correspond to the shape of the sections 16 and 17 of the layers 18 in the finished product.

The relative movement between the groups of plates in this instance is effected by supporting the intervening plates 29 of the second group stationarily and mounting the housing with its discharge or lower plate 30 and the alternating plates 28 for horizontal reciprocating movement. Such support comprises the fixed plates and a stationary horizontal support plate 50 which slidably receive the moving plates, the horizontal support plate lying beneath and slidably supporting the lowermost alternating plate 28. Also, outwardly projecting horizontal ribs 47 on the respective moving plates are received in grooves 48 of complementary shape formed in spaced stationary guide bars 49 rigid with the stationary plates.

The stationary plate 50 beneath the lowermost reciprocating plate 28 supports the latter for sliding horizontal movement and also rigidly supports a downwardly extending discharge tube 51. This tube is rectangular in cross section and its walls register with the edges of an opening 52 in its supporting plate and with the outermost walls of the aligned openings 27 and 27' in the fixed forming plates 29 so that, as material is extruded through the discharge ports 26 and into the aligned openings 27 and 27' in the forming plates, material already in the openings is extruded into the discharge tube. From the tube, the material is extruded further into the carton 21 which is supported in an enclosing position about the downwardly opening lower end portion of the discharge tube. At this end, the walls of the tube 51 are tapered inwardly a small amount as shown in FIG. 1 to retain the columns of materials in the tube and aligned plate openings 27 and 27' as the carton is replaced between extrusion steps.

The reciprocating plates 28 and 30 are shifted between one extreme position in which first the ports 26 and openings of the transverse row of such openings at one end of these plates are aligned with the openings 27 and 27' in the stationary plates 29 and the ports and openings of the transverse row at the other end (herein, the right end) are blocked by the stationary plates 29 and 50 as shown in FIG. 1 and another extreme position in which the originally blocked ports and openings are aligned with the openings in the fixed plates and the ports and openings of the transverse row at the other end are blocked. Such reciprocation may be effected by suitable actuating means, for example, a fluid pressure motor 53 of the piston and cylinder type having a stationarily mounted cylinder and a piston whose rod 54 is coupled to the reciprocating plates 28 and 30. The coupling herein is a clevis 55 connected by a link 56 and bolts 57 to lugs 58 secured to and projecting outwardly from one end of the housing 22. Extensions of the bolts are similarly connected through links 59 to other lugs 60 projecting outwardly from the reciprocating forming plates 28 in parallel with the lugs on the housing.

Pressure fluid for actuating the piston and cylinder operator 53 is introduced to opposite ends of the cylinder through conduits 61 under the control of a solenoid valve 62. In this instance, it is contemplated that the pressure fluid be compressed air derived from a suitable source (not shown), the valve alternating connecting each end of the cylinder to the source or venting the end to atmosphere.

In the operation of the improved apparatus, let it be assumed that no ice cream is present in the forming openings 27 and 27' or the discharge tube 51 but is available in the various chambers 23, 24 and 25. Pressure then is applied to the materials to extrude them in amounts sufficient to just fill the openings in the forming plates 28 and 29. Let it be assumed further that there are only two flavors of ice cream such as vanilla and chocolate with one supplied by one source 39 through the upper chamber

23 and the other supplied by both of the other sources 43 and 44 through the other chambers 24 and 25. After extrusion of these materials in the proper amounts to just fill the forming openings, the condition of these openings will be as depicted schematically in FIG. 6, the small "v's" indicating vanilla and the small "c's" indicating chocolate. It will be seen that the discharge ports 26 of the rightmost row ports in the discharge plate 30 are blocked by the uppermost stationary plate 29 and the forming openings 26 in the rightmost rows of reciprocating forming plates 28 thus remain empty.

After the original columns 19 of the different materials are formed as shown in FIG. 6, the discharge plate 30 and the reciprocal forming plates 28 are shifted to the left, thereby substituting spaced portions of the three columns to the right for corresponding portions in the adjacent three columns to the left as shown in FIG. 7. The rightmost columns at this time are incomplete. This shifting is followed by a repeated extrusion of materials in amounts equal to those of the finished product 15 to form new columns 19 each of only one material as shown in FIG. 8, the leftmost discharge ports 26 for vanilla being shut off by the uppermost forming plate 29. In this extrusion step, the previously formed incomplete product of alternating sections is extruded into the discharge tube 51.

Following the second extrusion stop, the discharge and reciprocable forming plates 30 and 28 are reversely shifted to the right to the positions shown in FIG. 9 to form the first completed product with all mixed columns 20 having alternating sections of chocolate and vanilla throughout their lengths. This horizontal shifting is followed by another extrusion of the materials in amounts equal to those in the finished product and such extrusion results in advance of the first completed product into the discharge tube and the formation of new columns 19 each of a single material as shown in FIG. 9.

Following this step, the steps of extrusion and horizontal shifting are repeated alternatingly, a completed product 15 being extruded into the discharge tube and another completed rectangular block being extruded from the tube after each succession of shifting and extrusion steps. As each completed product is discharged from the discharge tube, it is received in the carton 21 which is removed from the discharge tube and replaced by an empty carton telescoped upwardly over the lower end of the tube.

While the invention is susceptible of various modifications and alternatives, preferred embodiments are described above and shown in the drawings. It is to be understood, however, that the invention is not intended to be limited by such disclosure. Rather, it is the aim to cover all modifications and alternatives falling within the spirit and scope of the invention as expressed in the appended claims.

What is claimed is:

1. A method for forming an edible plastic product including two materials comprising the steps of forming two elongated columns of said materials, simultaneously removing a plurality of portions at spaced intervals along the length of each column and inserting the portions removed from one column between intervening portions of the other column, thereby providing a column with alternating portions of said materials.

2. In a method of forming an elongated edible product of different materials in contacting layers each divided into sections with adjacent sections in each layer contacting each other and formed of different materials and adjacent sections of adjacent layers formed of different materials and aligned transversely of the layers, the steps of extruding said materials into parallel columns disposed side by side and having a length equal to the desired length of said product with adjacent columns formed of different materials, shifting spaced portions of the columns transversely of the columns to remove such spaced portions from the columns and inserting the removed portions of one column between intervening portions of an adjacent column to form mixed columns each having sections of different materials along its length, and extruding said mixed columns longitudinally of the columns and into a container.

3. In a method of forming a rectangular block of different edible materials in contacting layers each parallel to ends of the block and divided into sections with adjacent sections in each layer contacting each other and formed of different materials in a checkerboard pattern and with adjacent sections of adjacent layers formed of different materials and aligned transversely of the layers, the steps of extruding said materials into parallel columns disposed side by side and having a length equal to the desired length of said product between said ends with adjacent columns formed of different materials, shifting spaced portions of the columns transversely of the columns to remove the spaced portions from the columns and inserting the removed portions of one column between intervening portions of an adjacent column to form mixed columns each having sections of different materials along its length, and extruding said mixed columns longitudinally of the columns and into side by side engagement with each other with adjacent sections of adjacent columns formed of different materials to provide checkerboard patterns in planes perpendicular to each other and parallel to the flat sides of said block between said ends.

4. An apparatus for forming an edible product of different materials having contacting layers each divided into sections with adjacent sections within each layer formed of different materials and adjacent sections of adjacent layers aligned transversely of the layers and formed of different materials, the combination of a plurality of section forming plates arranged side by side in parallel planes to form a stack and each having a thickness equal to the thickness of one of said layers and openings corresponding in shape and arrangement to the shape and arrangement of said sections in each layer, means defining a plurality of chambers, each adapted to contain a different material, a discharge plate lying in a plane parallel to and closely adjacent the forming plate at one end of said stack of plates and having a plurality of ports corresponding in number and arrangement and registering with the respective openings in such end plate with adjacent ones of said ports communicating with different ones of said chambers, said discharge plate and alternating plates of said stack constituting one group of plates and the intervening plates including said end plate constituting another group, and means supporting said plates for relative movement of one of said groups relative to the other group and in a direction parallel to said planes to shift the one group from one position of alignment of the openings of its plates with the openings of the other group to a different position of such alignment.

5. An apparatus for forming an edible product of different materials having contacting layers each divided into sections with adjacent sections within each layer formed of different materials and adjacent sections of adjacent layers aligned transversely of the layers and formed of different materials, the combination of a plurality of section forming plates arranged side by side in horizontal planes to form a stack and each having a thickness equal to the thickness of one of said layers and openings corresponding in shape and arrangement to the shape and arrangement of said sections in each layer, means defining a plurality of chambers, each adapted to contain a different material, a discharge plate lying in a horizontal plane above and closely adjacent the uppermost forming plate in said stack and having a plurality of ports corresponding in number and arrangement and registering with the respective openings in such uppermost plate with adjacent ones of said ports communicating with different ones of said chambers, said discharge

plate and alternating plates of said stack constituting one group of plates and the intervening plates including said uppermost plate constituting another group, and means supporting said plates for relative movement of one of said groups horizontally relative to the other group to shift the one group from one position of alignment of the openings of its plates with the openings of the other group to a different position of such alignment.

6. An apparatus for forming a rectangular product of dicerent edible materials, the combination of a plurality of section forming plates lying side by side in parallel planes to form a stack and each having a plurality of rectangular openings arranged in a checkerboard pattern in parallel and transverse rows and aligned with the openings of the other plates transversely of said planes, each of said plates having a thickness equal to the desired thickness of a layer of said product, means defining a plurality of chambers each adapted to contain a different material, a discharge plate lying in a plane parallel to and closely adjacent the forming plate at one end of said stack of plates and having a plurality of ports corresponding in number and arrangement and registering with the respective openings in such end plate with adjacent ports communicating with different ones of said chambers, said discharge plate and alternating plates of said stack constituting a first group and each having one more of said transverse rows of openings and ports than the intervening plates which include said end plates and constitute another group, and means supporting said plates for relative movement of said groups in a direction parallel to said parallel rows of openings to bring said openings of said transverse rows of said other group alternately into registry with different transverse rows of the first group.

7. An apparatus for forming a rectangular product of different edible materials, the combination of a plurality of section forming plates lying side by side in horizontal planes to form a stack and each having a plurality of rectangular openings arranged in a checkerboard pattern in parallel and transverse rows and aligned vertically with the openings of the other plates, each of said plates having a thickness equal to the desired thickness of a layer of said product, means defining a plurality of chambers each adapted to contain a different material, a discharge plate lying in a horizontal plane above and closely adjacent the uppermost one of said forming plates in said stack and having a plurality of ports corresponding in number and arrangement and registering with the respective openings in such plate with adjacent ports communicating with different ones of said chambers, said discharge plate and alternating plates of said stack constituting one group and each having one more of said transverse rows of openings and ports than the intervening plates which includes said uppermost plate and constitute another group, and means supporting said plates for relative movement of said groups in a direction parallel to said parallel rows of openings to bring said openings of said transverse rows of said other group alternately into registry with different transverse rows of the first group.

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