United States Patent [19]

Jernigan

[11] **3,724,984**

[45] **Apr. 3, 1973**

[54] **EXTRUDER NOZZLE DISTRIBUTION PLATE WITH A PLURALITY OF VALVE CONTROLLED GROOVES**

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[21] Appl. No.: **74,329**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 820,168, April 29, 1969, abandoned.

[52] **U.S. Cl.** **425/131,** 222/330, 425/245, 425/308, 425/463, 141/105

[51] **Int. Cl.** **A23g 5/00**

[58] **Field of Search**.....425/113, 114, 130, 131, 447, 425/461–467, 382, 245, 308; 141/9, 100, 105, 392; 53/202; 222/139, 330

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Primary Examiner—James R. Boler
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[57] **ABSTRACT**

A method and nozzle assembly for producing confection bars severed from lengths of the confection in a plastic state that are extruded from a multiple compartmented nozzle assembly in which a distribution plate is fitted between the feed tube or tubes supplying the confection and nozzle assembly. The distribution plate contains passages which each lead from beneath the outlet end of the feed tube and extend across the plane of the plate to an aperture passing through the bottom of the plate into communication with each of the different nozzle compartments with the passage configured to control to the desired degree the amount of confection that flows to each of the multiple nozzle compartments.

4 Claims, 17 Drawing Figures

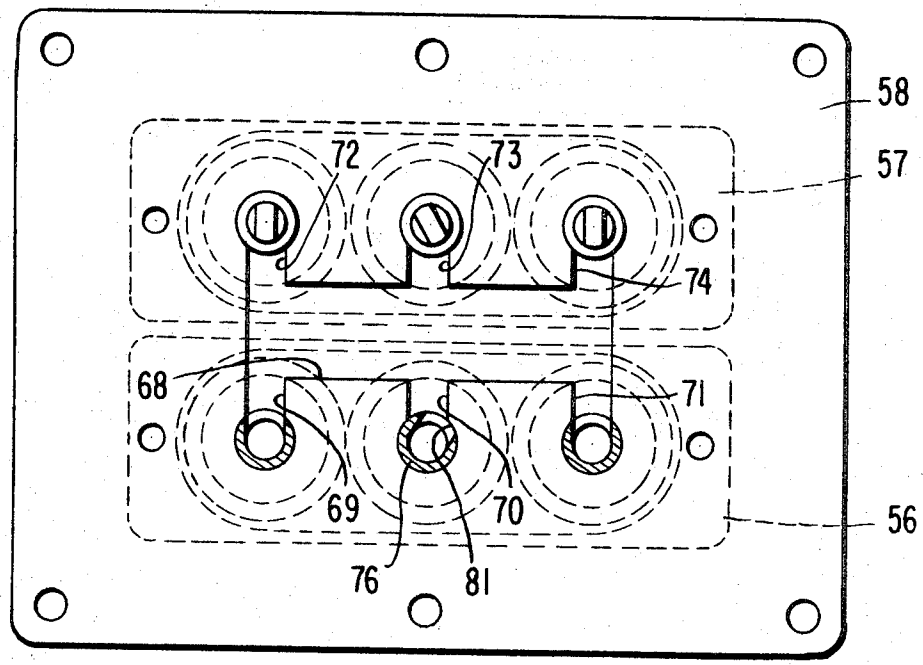


FIG. 1

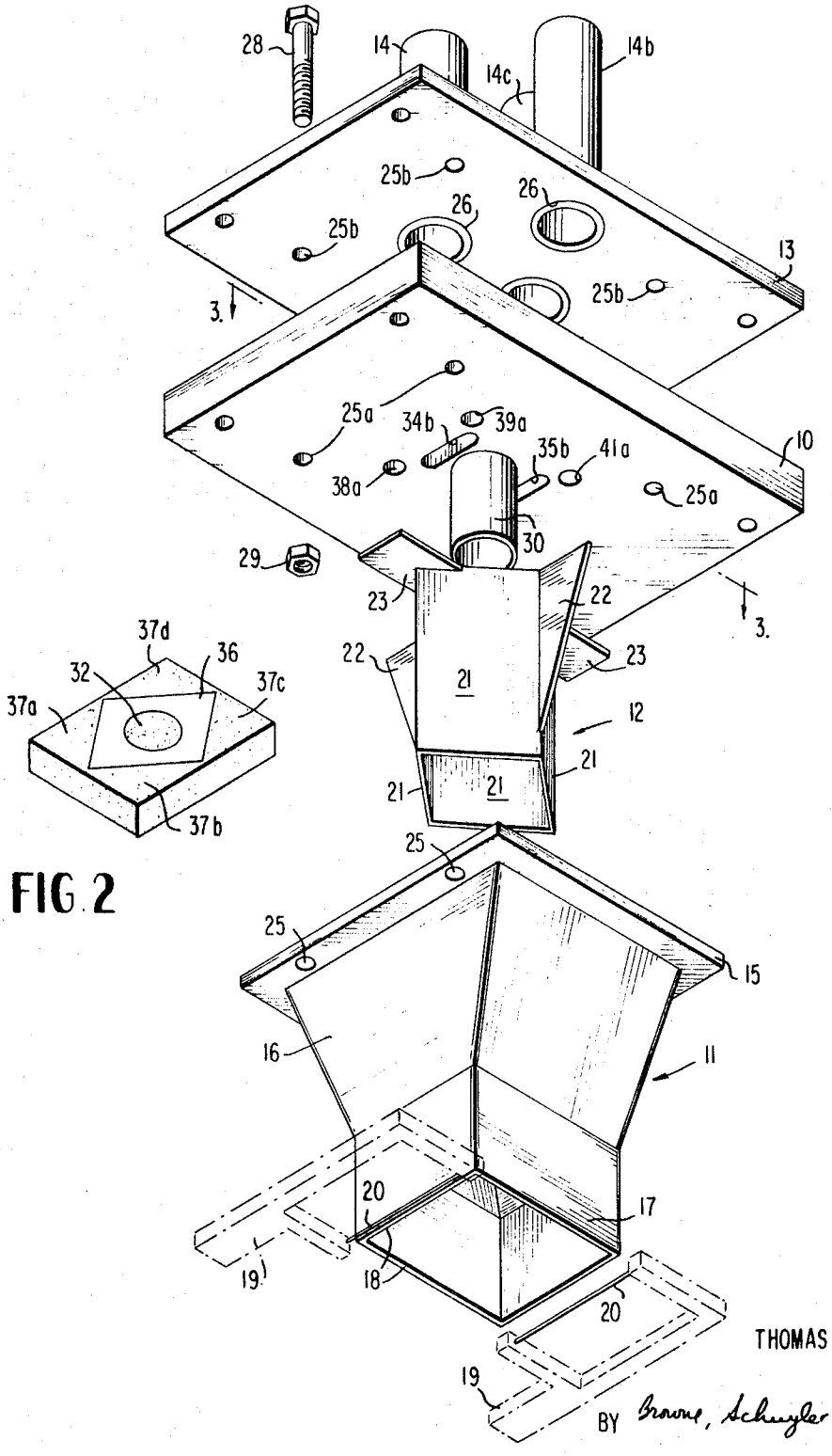


FIG. 2

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FIG. 3

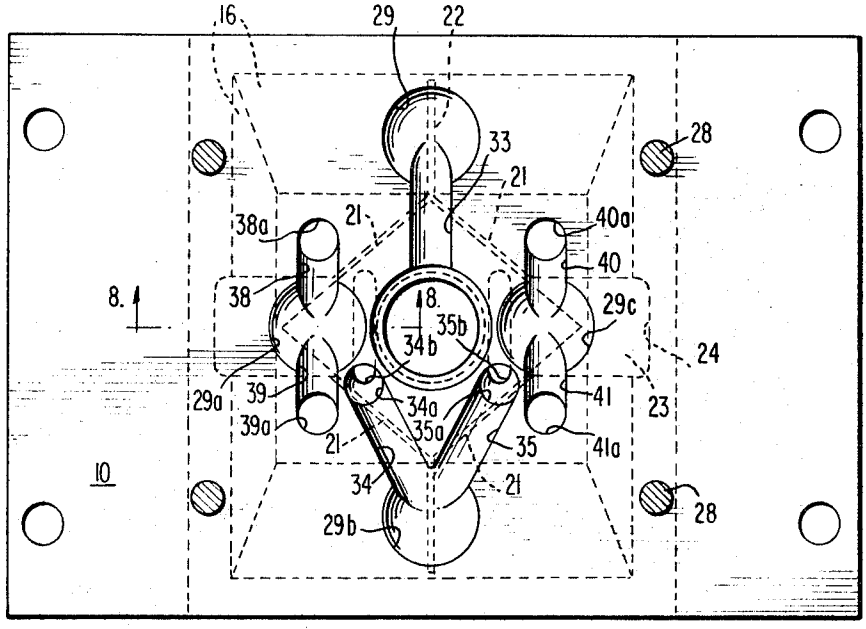

16
29
22
33
21
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38a
21
40a
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38
8.
8.
35b
34b
29c
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FIG. 4

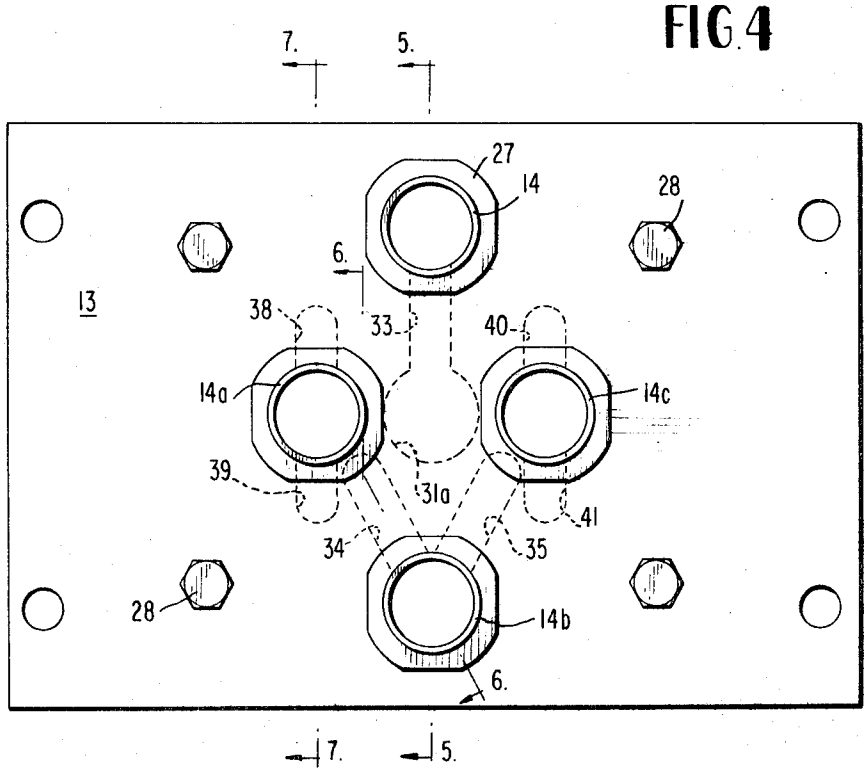

7.
5.
27
14
28
6.
13
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14b
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FIG. 5

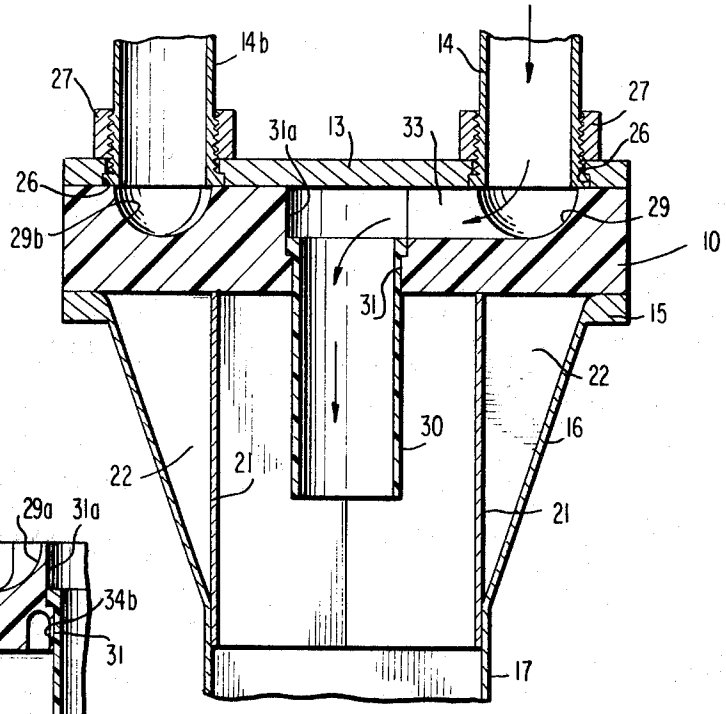


FIG. 8

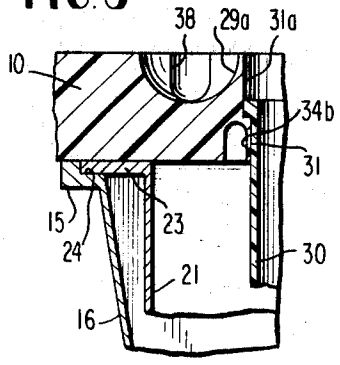


FIG. 6

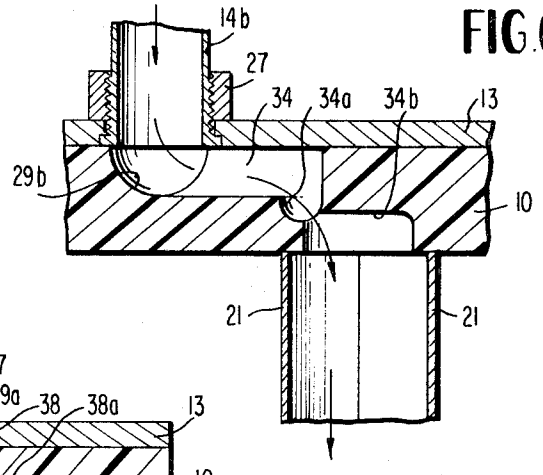
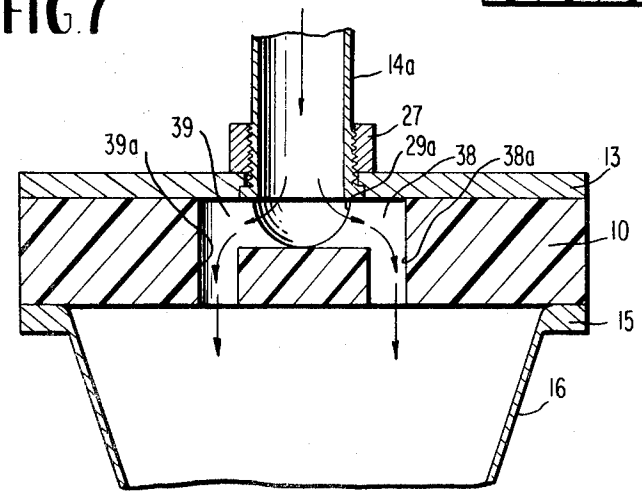


FIG. 7



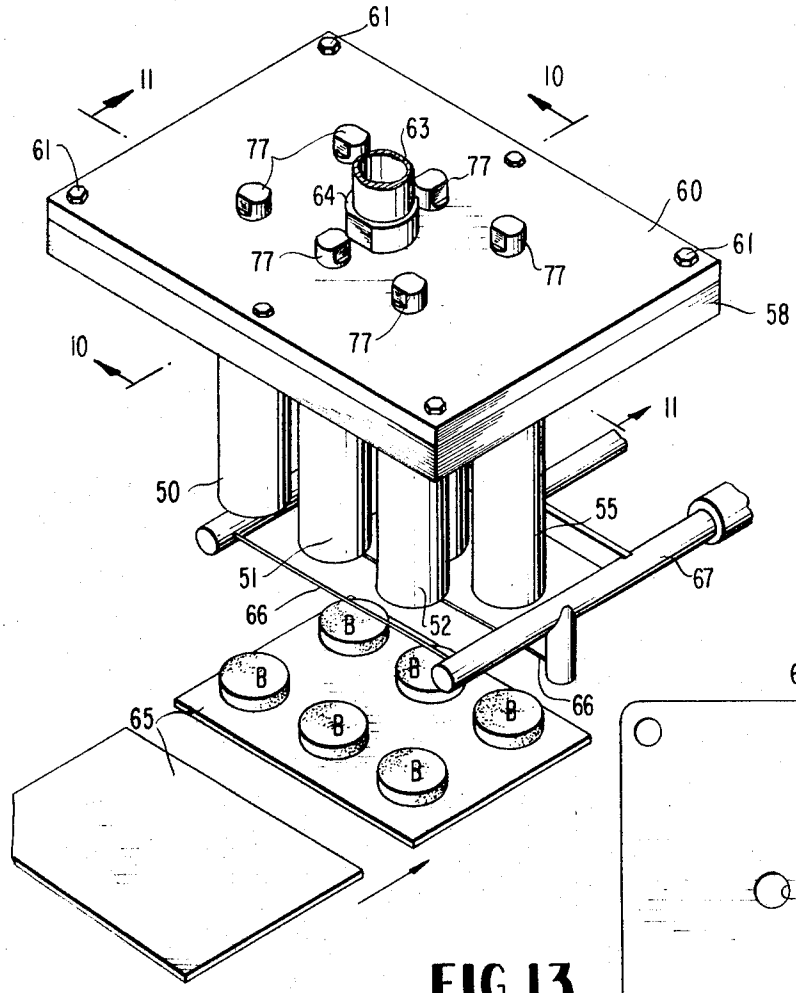


FIG. 9

FIG. 13

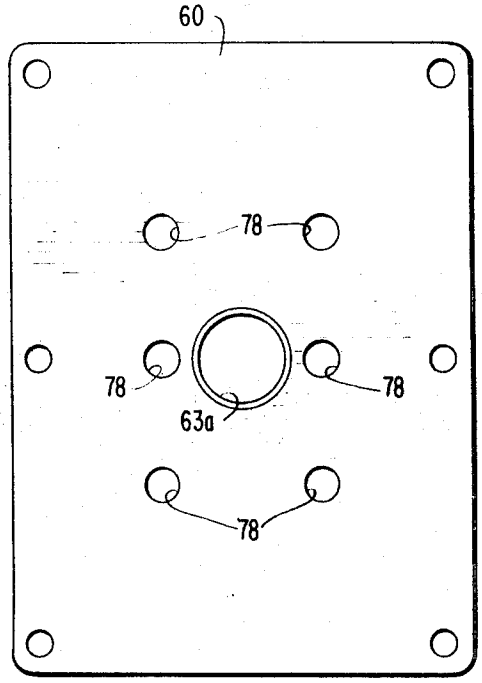
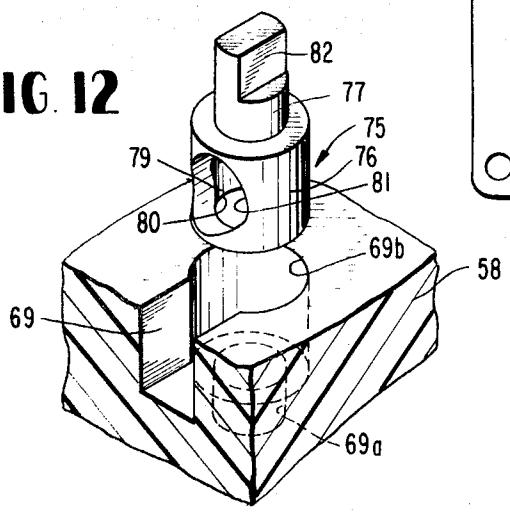


FIG. 12



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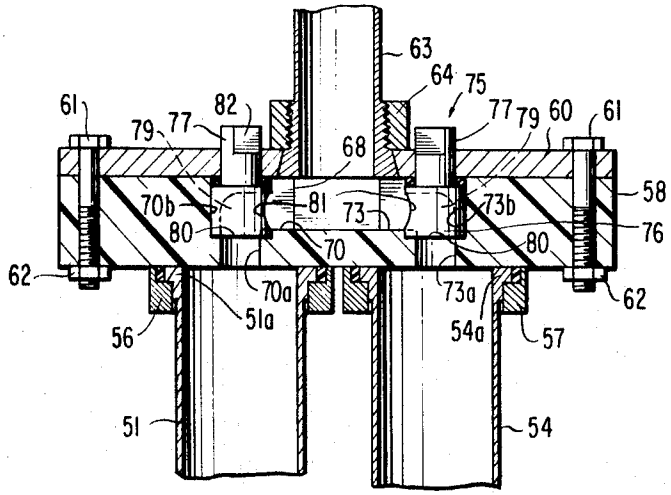


FIG. 10

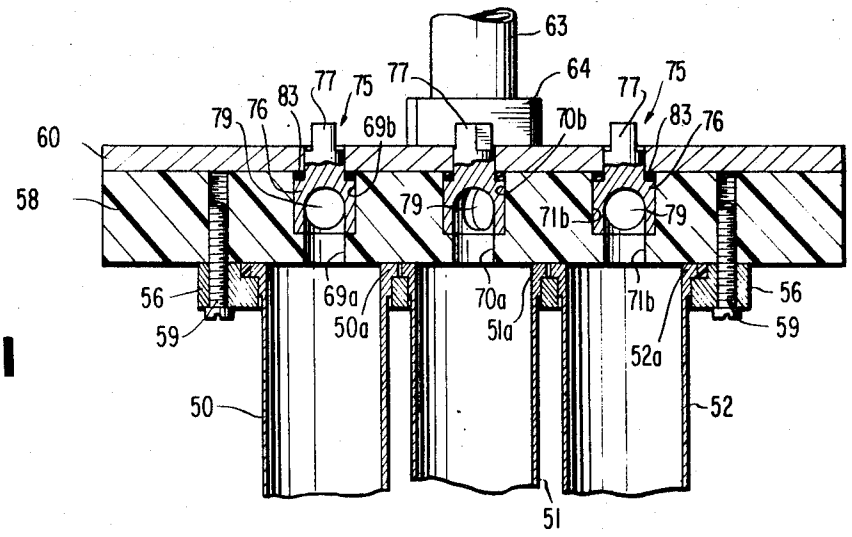


FIG. 11

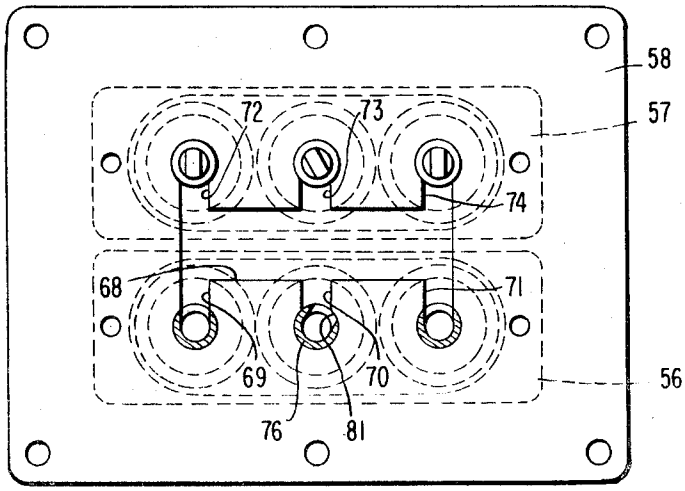


FIG. 14

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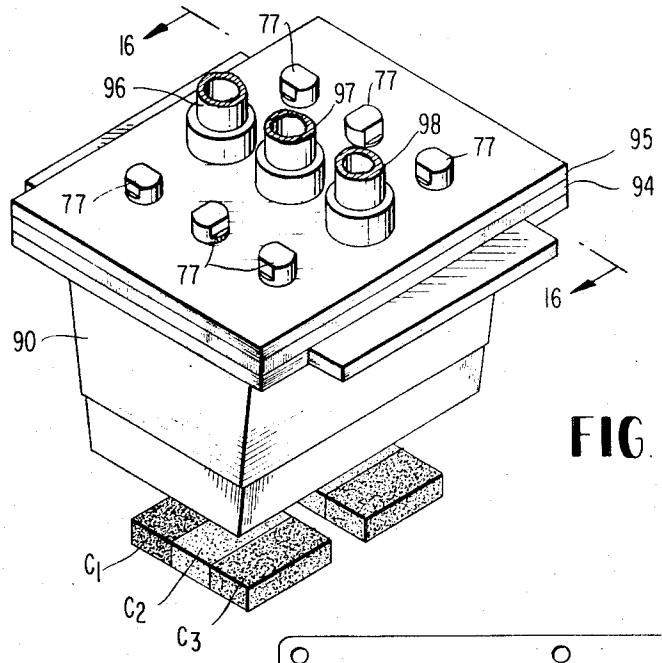


FIG. 15

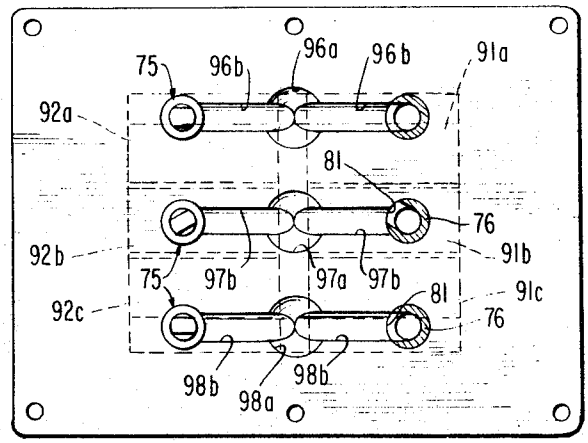


FIG. 16

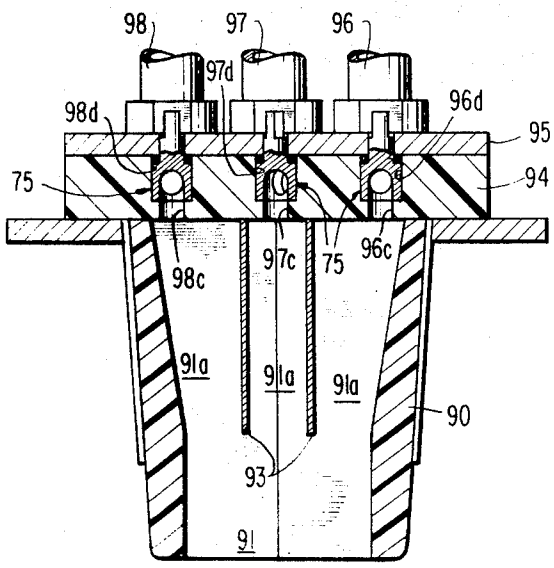


FIG. 17

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EXTRUDER NOZZLE DISTRIBUTION PLATE WITH A PLURALITY OF VALVE CONTROLLED GROOVES

METHOD AND APPARATUS FOR PRODUCING CONFECTION BARS

This is a Continuation-in-Part Application of application Ser. No. 820,168 filed Apr. 29, 1969, now abandoned entitled Frozen Confection Extruder Nozzle Assembly.

This invention relates to an improved nozzle assembly for producing confection bars having an intricate cross sectional design of different confections fed from different feed tubes or to bars extruded from multiple orifices from a single feed tube and particularly to a distribution plate that distributes the confection from the single or multiple feed tubes to the different compartments comprising the extruder nozzle assembly.

Bars of frozen confection, such as ice cream, sherbet and the like, may be rapidly and economically produced by the extrusion process disclosed in U. S. Pat. No. 2,739,545. In this process a mix of the frozen confection, which is in a semi-frozen condition at which the mix is sufficiently plastic to flow but will retain its shape for a moderate period, is extruded from the orifice of a nozzle having the outline shape conforming to the desired shape of the bar. As the extruded length of mix emerges from the downwardly facing orifice of the extruder nozzle, cutters are periodically passed across the lower open end of the orifice to sever slices from the emerging extruded length of soft ice cream or frozen confection. The severed slices of frozen confection fall onto a conveyor surface that is passed below the nozzle and are transported by the conveyor through a refrigeration compartment at subfreezing temperatures to congeal the slices into hard frozen bars. A composite bar in which its cross section constitutes a design comprising adjoining, shaped areas made from different flavored or different hued ice cream, can be produced by utilizing an extruder nozzle in which the passage contains axially extending partitions dividing the passage into separate compartments and feeding ice cream of different hues or flavors from separate feed tubes into the various compartments, such as the extrusion nozzle illustrated in U. S. Pat. No. 3,196,809. As the different flavors or colors of ice cream flow from the separate feed tubes into the adjoining compartments and emerge from the lower end of the adjoining compartments within the nozzle passage, the ice cream from the adjoining compartments is welded together into a composite mass having a cross sectional design which conforms substantially to that existing in the nozzle passage at the lower edge of the partitions. When slices are cut from the extruded length of ice cream, the outline shape of the bar conforms to the outline shape of the extruder orifice and the face of the bar displays a multi-hued or multi-flavored design conforming to that of the edges of the partitions within the extruder nozzle passage.

Although ice cream bars with different cross sectional designs across the face of the bar and extending through its thickness can be produced by the extruder nozzle illustrated in U. S. Pat. No. 3,196,809, the designs must be relatively simple and the different areas of the design must be reasonably large. This

limitation in the complexity of the design is due to the relatively large cross sectional area of the feed tube which must feed the ice cream into each of the compartments and extend into the interior of each compartment as is illustrated in FIG. 2 of U. S. Pat. No. 3,196,809. If the design is quite complex and particularly if the areas of the adjoining portions of the design are relatively small, the physical size of the feed tubes is such that a separate tube cannot be inserted into each compartment. Furthermore, since there are but three to four feed tubes available, a separate feed tube cannot be allocated to each compartment if there are a relatively large number of separate areas in the design.

A further problem involves accurately controlling the amount of confection that is flowing into each compartment. The problem is aggravated when the flow from one feed tube is being directed into several compartments. The shape and size of the passage itself and of the nozzle compartment and the nozzle orifice will affect the rate at which the confection flows from the orifice below each compartment. Obviously the rate of flow should be equalized from the adjoining compartments that create the different areas of the design so the entire cross section of the extruded mass moves as a single unit when emerging from the bottom of the nozzle.

When producing small, miniature frozen confection bars by the extrusion method, it is more economical to arrange a number of nozzle tubes side by side and sever a bar from each of the lengths of confection by passing a cutter periodically transversely across each of the multiple extruded lengths, the small severed bars then fall as a group onto a single conveyor plate for transportation through a freezing chamber in the manner disclosed in U. S. Pat. No. 2,739,545. All of the nozzles are fed from a single feed tube and a convenient manner of manifolding the flow to all nozzles and accurately controlling the flow from each nozzle so that each of the simultaneously severed bars are of equal thickness presents problems.

Accordingly, an object of this invention is to provide an extruder nozzle assembly for extruding shaped lengths of different flavored or hued frozen confections from which slices can be severed having a complex cross sectional design of different flavored or hued confection in intricate and small patterns.

Still another object of this invention is to provide a distribution plate for attachment to the feed end of a frozen confection extruder nozzle having axially extending internal partitions dividing the extruder passage into compartments conforming to the desired cross sectional design of the extruded mass in which the distribution plate channels frozen confection from the different feed tubes to the different internal compartments of the nozzle.

A still further object of this invention is to provide a distribution plate that channels frozen dessert mix from the various feed tubes to various portions of a frozen dessert extruder nozzle in which the plate can be clamped between the flanged upper end of the extruder nozzle and a cover plate containing the feed tubes.

Yet another object of this invention is to provide a variety of distribution plates channeling dessert from feed tubes to a wide variety of arrangements of compartments of a frozen dessert extruder nozzle in which

the distribution plates can interchangeably be used on the same nozzle according to the specific arrangement of compartmentation which is chosen for the nozzle.

Still yet another object of the invention is to provide an easy means for controlling the amount of confection which the distribution plate channels from a feed tube to each of the various compartments of the extruder nozzle assembly.

These objects have been attained by developing the described distribution plates that fit against the open top end of the nozzle assembly across the top of the various compartments or individual nozzle tubes that comprise the nozzle assembly. The distribution plate contains passages extending parallel to the plane of the plate with the passages communicating with the lower exit ends of the feed tube or tubes that protrude through a cover plate extending across the top of the nozzle assembly and also communicating with apertures extending through the distribution plate to its lower surface in communication with the underlying compartments or individual nozzles of the nozzle assembly. Preferably valves are installed in the passages to control the flow in an individual passage.

Preferred embodiments of this invention would be described in detail with reference to the following drawings in which:

FIG. **1** is an exploded, perspective view of the nozzle assembly including a distribution plate.

FIG. **2** illustrates a frozen confection produced by severing slices from the mass of confection extruded through the extruder illustrated in FIG. **1** and the remaining drawings.

FIG. **3** is a plan view of the assembly with the top cover plate removed.

FIG. **4** is a plan view from above of the nozzle assembly.

FIG. **5** is a sectional view along section lines **5—5** of FIG. **4**.

FIG. **6** is a sectional view along section lines **6—6** of FIG. **4**.

FIG. **7** is a sectional view along section lines **7—7** of FIG. **4**.

FIG. **8** is a section along section lines **8—8** of FIG. **3**.

FIG. **9** is a perspective view of a nozzle assembly and arrangement for producing simultaneously a number of miniature confection bars.

FIG. **10** is a sectional view of the nozzle assembly of FIG. **9** taken along section line **10—10**.

FIG. **11** is a sectional view of the nozzle assembly of FIG. **9** taken along section line **11—11**.

FIG. **12** is an exploded perspective of a small segment of the distribution plate illustrating the valving arrangement in the passages of the plate.

FIG. **13** is a plan view from below of the nozzle assembly cover plate.

FIG. **14** is a top plan view of the distribution plate with some of the valve plugs shown in section.

FIG. **15** is a perspective view of another embodiment of a nozzle assembly for producing composite confection bars.

FIG. **16** is a plan view of the distribution plate of the assembly of FIG. **15** with some of the valve plugs in section.

FIG. **17** is a sectional view of the assembly of FIG. **15** taken along section line **16—16**.

FIG. **1** shows all of the elements in the nozzle assembly to which the distribution plate **10** has been adapted for use. The basic nozzle assembly, excluding the distribution plate **10**, comprises the tapered housing **11** in the interior passage of which the partition assembly **12** is supported to extend axially along the central passage of the housing **11** and a cover plate **13** with feed tubes **14** overlying the open feed end of the housing **11**. The design and arrangement of the housing **11**, partition assembly **12** and cover plate **13** with feed tubes **14** is substantially identical to the nozzle assembly shown in U. S. Pat. No. 3,196,809 which has no distribution plate **10** interposed between a cover plate **13** and a top flange **15** of a housing **11** as is illustrated in FIG. **1**.

As described more fully in U. S. Pat. No. 3,196,809, the housing **11** has an upper body **16** defined by two pairs of oppositely disposed walls that taper inwardly from the flange **15** extending outwardly around the top open feed end of the housing to the lower body **17** comprising two oppositely disposed sets of parallel and vertically disposed sidewalls. As discussed in the above-identified U. S. Pat., the inwardly tapering walls of the upper body **16** compact the ice cream as it flows downwardly along the passage of the housing and into the lower body **17** of uniform cross section and emerges from the lower orifice **18** defined by the inner periphery of the bottom edge of the lower body **17**, which in this case conforms to the outline shape of the confection. As described in more detail in U. S. Pat. No. 2,739,545, as the ice cream, or frozen confection, emerges as a vertically depending, extruded length from the orifice **18**, the cutters **19** with severing wires **20** located immediately below the lower body **17** are periodically moved toward and away from each other so that the cutting wires **20** periodically pass across the extruded length of frozen confection and sever slices of the confection which drop onto a conveyor (not illustrated) for conveyance through the freezing conveyor (not illustrated). Although the outline shape of the lower peripheral edge of the lower body **17** establishes the shape of the orifice from which the mass of frozen confection is extruded in this shape, the orifice could be defined by some other form of structure at the exit end of the nozzle assembly, such as the orifice plate utilized in co-pending U. S. Pat. application Ser. No. 670,904 of Fox et al. that is assigned to the same assignee as this application.

The partition assembly **12** has partition plates **21** and partitioning fins **22** that, in conjunction with the sidewalls of the housing **11** and possibly other internal partitioning members, form the separate compartments extending axially along the internal passageway of the housing **11** which establish the cross sectional design pattern desired for the frozen confection bar being produced. Horizontally disposed support arms **23** affixed to and extending outwardly from the top edge of the partition walls **21** on opposite sides of the partition assembly **12** rest in the grooves **24** cut in the upper surfaces of the flange **15** (see FIG. **3**) and support the partition assembly **12** so that it extends axially along the passage of the housing **11**.

The flat distribution plate **10**, which will be subsequently described in more detail, rests on the top surface of the nozzle housing flange **15** with bolt holes **25***a*

in alignment with bolt holes **25** in the flange **15** of the housing. The cover plate **13** has holes **26** spaced apart across its face into which the threaded discharge end of feed tubes **14** are sealingly secured by means of a union **27** (see FIG. **5**). The lower surface of the cover plate **13** fits tightly against the upper surface of the distribution plate **10** with the bolt holes **25***b* of the cover plate in alignment with the bolt holes **25** and **25***a* of the housing flange and distribution plate. The cover plate **13** and the distribution plate **10** are tightly drawn together and affixed to the flange **15** of the housing **11** by means of bolts **28** protruding through the bolt holes **25**, **25***a* and **25***b* and fastened with nuts **29'**.

The distribution plate **10**, typically of a transparent plastic material, is relatively thick and has hemispherically shaped depressions **29**, **29***a*, **29***b* and **29***c* of about the same diameter and located directly below the outlet of each of the feed pipes **14**, **14***a*, **14***b* and **14***c*, respectively, the depressions extending only partially through the thickness of the distribution plate. In the embodiment illustrated for producing the frozen confection of a design illustrated in FIG. **2**, a core pipe **30**, having an inner diameter substantially corresponding to the central core **32** of the confection illustrated in FIG. **2**, is supported in the bore **31** that extends through the entire thickness of the distribution plate **10** in its center, the upper portion **31***a* of the bore being slightly larger in diameter so as to form a ledge on which the flanged end of the core pipe **30** rests with the lower end of the core pipe protruding downwardly and extending along the central axis of the partition assembly **12**. A groove **33** in the upper face of the distribution plate extends from the depression **29** to the bore **31** to join the outlet of the feed pipe **14** to the core pipe **30**.

In a generally similar manner the other depressions in the distribution plate below the feed tubes are connected by one or more grooves or passages along the upper or lower faces of the distribution plate to selected portions of the various compartments within the housing **11** formed by the various axially extending partitions of the core assembly, the wall of the housing **11** and other dividers. As may be best seen from viewing FIGS. **3** and **6**, two grooves **34** and **35** in the upper face of the distribution plate each extend in divergent directions from the depression **29***b* beneath the feed pipe **14***b* toward the center line of the plate and each terminates in wells **34***a* and **25***a*, respectively, of which the lower portions, respectively, connect with slots **34***b* and **35***b* that extend partially across the lower face of the distribution plate on opposite sides of the core pipe **30** in the compartment formed within the partition walls **21** of the partition assembly that establish the diamond shaped area **36** of the confection (see FIG. **2**).

Each of the other two depressions **29***a* and **29***c* in the distribution plate, between the other two oppositely facing feed tubes **14***a* and **14***c*, each connect through identically arranged passages to the triangular compartments in the housing **11** established between the partition plates **21** and the walls of the housing **11** that form the outer triangularly shaped portions **37***a*, **37***b*, **37***c* and **37***d* of the frozen confection. As may be seen best in FIGS. **3**, **7** and **8**, grooves **38** and **39** in the upper face of the distribution plate each extend in an opposite direction from the depression **29***a* below the feed tube **14***a* toward the outer edge of the plate to a point overlying the central portion of the two outer triangularly shaped compartment areas formed between the partition walls **21** and the walls of the housing **11** from which the mix forms the outer triangular segments **37***a* and **37***b* of he frozen confection. At this point holes **38***a* and **39***b* are drilled from the respective outer ends of the grooves **38** and **39** through the remaining thickness of the partition plate to extend through the lower face of the partition plate into communication with the respective triangular compartments. Similarly grooves **40** and **41** with the vertical holes **40***a* and **41***a* at the end of the grooves connect the depression **29***c* below the feed tube **14***c* with the triangularly shaped compartments formed between the partition walls **21** and the wall of the housing **11** that create the other two outer triangular portions **37***c* and **37***d* of the frozen confection.

The flow of the ice cream, or frozen dessert, from the various feed tubes, **14**,**14***a*, **14***b* and **14***c* into the various compartments within the housing that establish the different segments of the frozen confection bar are readily apparent from the arrows in FIGS. **5**, **6** and **7**. For example, if it be desired that the round core **32** in the center of the confection bar be red in color, the central diamond area **36** be brown in color and the outer triangular segments **37***a*, **37***b*, **37***c* and **37***d* be white in color, three different flavors of ice cream could be utilized such as strawberry, coffee and vanilla to establish the red, brown and white colorations, respectively. In this case strawberry ice cream would be fed under pressure to feed tube **14** so that strawberry ice cream would flow from the lower end of the feed tube **14** into the depression **29** in the distribution plate **10**, thence along the groove **33** into the enlarged portion **31***a* of the bore and thence vertically through the core pipe **30** into the central portion of the partition assembly enclosed by the partition walls **21**. Coffee flavored ice cream would be fed under pressure to the feed tube **14***b* from the lower end of which it would flow into the depression **29***b*, thence horizontally along the distribution plate in the two grooves **34** and **35** to the wells **34***a* and **35***a* and then along the grooves **34***b* and **35***b* in the lower face of the distribution plate **10** to fill the triangularly shaped compartment enclosed within the partition walls **21** surrounding the core pipe **30**. Vanilla flavored ice cream is fed under pressure to the two feed tubes **14***a* and **14***c* from the lower discharge ends of which the ice cream flows from the two depressions **29***a* and **29***c* to the four triangularly shaped compartments formed between the outer surface of the partition walls **21** and the four sidewalls of the housing **11** along the grooves **38** and **39** and their respective connecting holes **38***a* and **39***a* from the depression **29***a* and along the grooves **40** and **41** and through the holes **40***a* and **41***a* from the depression **29***c*. The ice cream in the various compartments is forced under pressure to flow toward the lower orifice outlet **18** of the housing and in doing so merges with the ice cream of the surrounding compartments while retaining the shape of the compartment from which the respective flavors emerge and are welded together in a composite flow that emerges from the orifice **18** of the nozzle housing as a depending length of extruded ice cream in which the cross sectional design of the face of the severed bar conforms to the shape of the various compartments within the housing at the

point where the ice cream emerges from the lower edge of the compartment.

The pattern of grooves, passages, slots and holes described above that are cut in the distribution plate **10** that lead from the depressions in the upper face of the distribution plate below the respective feed tubes into the compartments that are established by the partition assembly, core pipe, dividers etc., that extend axially along the housing from beneath the distribution plate are merely one example of specific passages in a distribution plate that may be used for producing a frozen confection bar having the cross sectional design illustrated in FIG. **2**. Obviously many other designs of ice cream bars can be produced by utilizing partition assemblies, core pipes or dividers that are arranged differently. In this event a different arrangement of grooves and passages would have to be cut along the upper or lower faces of the distribution plate to channel a frozen confection from each of the feed tubes into the various compartments in the nozzle housing that establish the cross sectional design of the frozen confection bar sliced from the composite extruded mass emerging from the lower orifice **18** of the housing **11**.

It can, therefore, be readily seen that a wide variety of frozen confection bars having many different cross sectional designs of a rather intricate nature can be produced utilizing a single tapered nozzle housing similar to the housing **11**, illustrated in FIG. **1**, in conjunction with a standard cover plate with two, three or four feed tubes of the nature indicated in FIG. **1**, in conjunction with different arrangements of internal partition assemblies, cores and dividers supported within the nozzle housing in which separate distribution plates containing the required pattern of grooves, holes and passages cut in the upper and lower faces of the distribution plate so as to channel the flow of frozen dessert from depressions in the distribution plate below each feed tube to the desired compartment or compartments established by the various partitions, cores and dividers that are supported within the central passage of the housing **11**. Although the illustrated distribution plate **10** described in this application that fits between the cover plate **13** and the flange **15** of the housing affords a convenient design for the illustrated housing and inner partitions supported by the housing, a housing could be designed in which the distribution plate fitted within the interior of the housing at its upper feed end so that the cover plate would be bolted directly onto the flanges of the housing. The partitions and dividers establishing the compartment could be affixed to and supported from the lower face of the distribution plate fitting within the housing passage and this modified apparatus would perform the same function in substantially the same manner as the described embodiment.

FIG. **9** illustrates another embodiment of a nozzle assembly that is useful to produce small, miniature confection bars. Six extruder tubes **50–55** are supported in two sets of three each from each of two support frames **56** and **57**, the upper, enlarged flange portions **50***a* – **55***a* of the tubes resting within accommodating recesses in the two support frames **56** and **57**. The ends of the support frames **56** and **57**. The ends of the support frames **56** and **57** are supported from the lower face of a distribution plate **58**, such as by the screw bolts **59** extending through the support frames into threaded holes tapped in the distribution plate **58**. A cover plate **60** fits flush with the top face of the distribution plate **58** and is sealingly secured to it by fastenings such as the bolts **61** and screw **62**. A feed tube **63** extends through a tapered opening **63a** in the center of the cover plate **60** and is sealingly connected to the cover plate by means of the union **64** in the same manner as described for the prior embodiment. The assembled cover plate **60**, distribution plate **58** and attached support frames **56** and **57** carrying the extruder tubes **50–55** are supported vertically above a moving line of conveyor plates **65** with the lower ends of the extruder tubes **50–55** slightly above and in line with the line of movement of cutting wires **66** that are supported by a frame **67** of a slicer for reciprocating motion transversely across the bottom of each of the extruder tubes. In this particular embodiment the front row of extruder tubes **50–52** is shorter than the rear row of extruder tubes **53–55** and the cutting wires are supported at different levels. The conveyor extends through a freezing chamber (not illustrated) in which the bars sliced from the extruder assembly are frozen in the manner described in U. S. Pat. No. 2,739,545.

A trench **68** extends longitudinally along the upper face of the distribution plate **58** from a central point immediately below the open end of the feed tube **63** in both directions to end locations in line with the end extruder tubes. Lateral passages **69–74** of the same depth as the central trench **68** extend laterally outwardly along the upper face of the distribution plate **58** from the central trench **68** to a point immediately above the center of each of the extruder tubes **50–55**. At the end of each of the respective lateral passages **69–74** an aperture **69***a* – **74***a* extends through the thickness of the distribution plate **58** in line with the central axis of each underlying extruder tube, the upper portion of each aperture having a diameter which is larger than the lower portion and the width of the transverse passage, this larger upper portion extending slightly below the bottom of the transverse passage to form valve seats **69***b* – **74***b*. As may be best seen in FIGS. **11** and **12**, a cylindrical valve plug **75**, which has a lower cylindrical portion **76** that snugly fits in each of the valve seats **69***b* –**74***b*, is installed in each of the valve seats **69***b* – **74***b* for rotation about the central axis of the plug, a stem **77** of somewhat smaller diameter than the lower portion **76** of the valve plug extending upwardly through access holes **78** in the cover plate **60**. A passage **79** extends through the lower portion **76** of each valve plug **75** from an opening **80** in the bottom of the valve plug to an opening **81** in the sidewall of the plug lower portion, the diameter of the passage **79** and end openings **80** and **81** being substantially the same as the width of the lateral passages **69–74** in the distribution plate. The upper end of the valve stem **77** is faced to form two parallel flat surfaces **82** that form convenient means of engagement with a tool for rotation of any selected valve plug **75** within a seat **69***b* – **74***b* in positioning the opening **81** in the valve plug sidewall to the desired position relative to the adjacent lateral passage. An O-ring **83** normally is installed between the cover plate **60** and the upper shoulder of the valve plug lower portion **76** to prevent leakage through the cover plate stem openings **78**.

three separate portions C_1, C_2 and C_3 of each of the sliced bars can be closely regulated and controlled. Thus, not only can the amount of confection mix be regulated that is flowing through each of the nozzle compartments from which each of the two bars are formed simultaneously but the amount of mix that is flowing through each of the three compartments from which each of the composite bars is comprised can be readily regulated to produce uniform bars.

Therefore, although the above descriptive matter and drawings describe and illustrate several embodiments of the invention, it should be understood that the invention as being claimed is not restricted solely to the described embodiments but that it covers all modification and variations which should be apparent to one skilled in the art and fall within the scope and spirit of the invention.

What is claimed is:

1. A distributor for feeding a confection mix in a plastic state to multiple compartments of an extruder nozzle assembly in which the compartments each constitute a cavity extending axially of a nozzle body open at both ends and a cover plate supporting a feed tube extending therethrough is affixed to the nozzle assembly to extend across the upper end of the cavities, said distributor comprising a distribution plate configured to sealingly fit between said cover plate and said compartments, said plate containing a groove extending across its upper face between a recess in the distribution plate beneath the end of a feed tube and an aperture extending from the groove through the bottom face of said distribution plate into communication with a compartment below, and a valve member having a cylindrical body portion seated for rotation within said aperture with the axis of said body portion coincident with that of said aperture and the sidewall of said body portion extending transversely of said groove, said body portion containing a hole extending from said sidewall area to a lower end of said cylindrical body portion adjacent said aperture and said valve member having a segment extending from the top of said cylindrical body portion through an aperture in said cover plate with the upper end of said segment adapted for engagement with a tool for adjusting the rotational position of said valve member.

2. An extruder nozzle assembly for extruding lengths of confection mix in a plastic condition in which the cross section of said length constitutes an intricate design of different confections, said assembly comprising a nozzle body open at both ends to define an axially extending cavity, a partition extending axially within said nozzle cavity defining separate compartments establishing the different areas of the intricate design, a plurality of feed tubes each connected to pressurized sources of different confections, a distribution plate positionable over the upper end of said nozzle body to extend transversely of said cavity with the lower face of said plate abuttingly overlying the upper edge of said partition to enclose the top of the partitioned cavity, said distribution plate having grooves extending across the upper face of said distribution plate between a recess in the plate beneath the open end of a feed tube and an aperture extending from the groove through the bottom face of said distribution plate into communication with a compartment below, a cover plate having spaced holes through which the lower end of each of said feed tubes is sealingly supported, means for affixing said cover plate and said distribution plate to the upper portion of said nozzle body to enclose the upper end of the nozzle cavity with the distribution plate sandwiched between the cover plate and nozzle body, and a valve member supported for movement relative to said distribution plate, said valve member having a cylindrical body portion seated in said distribution plate at the juncture of said groove and aperture for rotation about the axis of said aperture and a hole extending from a sidewall of said body portion lying across said groove through said body portion to the lower end thereof positioned across said aperture.

3. In a confection extruder nozzle assembly having a plurality of channels extending axially between an upper cover containing at least one opening through which extends a feed tube connecting to a source of the confection and a lower, open orifice end having the outline shape of the extruded length of confection, the improvement of a distribution plate sealingly fitting between said cover and said channels and containing passages extending transversely across said plate to pass beneath and communicate with an end of said tube with another portion of said passage extending through the thickness of said plate to its lower face into communication with selected ones of said channels, valve means in said passages operable to throttle selectively the flow of confection along the respective passages and means for controlling the setting of each said valve means, said passages including grooves extending across the upper face of said distribution plate underlying said cover to pass beneath an open end of said feed tube with other portions of said grooves connecting with an aperture extending through to the lower face of said plate, said valve means comprising a member shaped as a surface of revolution rotatably supported in a conformingly shaped recess in said plate integral with one of said passages, said member being pierced by a hole having its opposite ends positionable to communicate with portions of said passage on different sides of said recess with the cross sectional area of one of said hole ends in communication with the passage being variable in accordance with the rotational position of said member within said recess, the axis of revolution of said recess extending through the thickness dimension of said plate in alignment with said aperture underlying the lower end of said recess of larger cross sectional area to form a seat supporting the bottom of said rotatable member, said hole extending from the bottom of said member in communication with the underlying aperture to a sidewall of said member of revolution for communication with the groove portion of said passage adjoining the sidewall of said recess of revolution, and said valve setting means comprising an extension of said member protruding through said cover.

4. In a confection extruder nozzle assembly having a plurality of channels extending axially between an upper cover containing at least one opening through which extends a feed tube connecting to a source of the confection and a lower, open orifice end having the outline shape of the extruded length of confection, the improvement of a distribution plate sealingly fitting between said cover and said channels and containing passages extending transversely across said plate to

The grooved passages extending along the upper face of the distribution plate **58** in the form of the trench **68** with connecting lateral passages **69–74** fulfill substantially the same function as the passages and grooves of the distribution plate **10** of the previously described embodiment in carrying the confection mix from a single feed tube and distributing the mix to the various compartments of the nozzle assembly which includes the extruder tubes **50–55** in the embodiment of the FIGS. **9–14**. However, in this particular embodiment the amount of mix that flows into each of the extruder tubes **50–55** is readily controllable by adjusting the position of the individual valve plugs **75** that are seated within each of the lateral passages **69–74**. As can be seen in FIGS. **11** and **14**, by adjusting the position of the valve plug **75** within the valve seat **70***a* of the lateral passage **70**, so that a portion of the valve passage opening **81** of the valve plug **75** is partially blocked, the mix that is flowing from the feed tube **63** via the passages **68** and **70** into the extruder tube **51** is throttled relative to that which is flowing from the same feed tube **63** to the adjacent extruder tubes **50** and **52**, thus making it possible to equalize or adjust the flow of mix from any extruder tube relative to any other tubes. Although the outlet orifice end of each of the extruder tubes **50–55** is indicated to be round in FIG. **9**, so as to produce the small cylindrical bars B, bars having other cross sectional shapes are readily produced, such as heart shapes, rectangular shapes, etc., by modifying the shape of the extruder tube lower orifice outlet end. By utilizing the distribution block with valve plugs installed in the manner illustrated in this embodiment, the nozzle assembly can comprise extruder tubes having a variety of different shaped outlet orifices so as to simultaneously produce bars of a controlled thickness but constituting a variety of cross sectional shapes. Thus this embodiment of the invention makes it possible easily to control the amount of mix that flows from the common feed tube through various extruder tubes having the same or different shaped orifices with different flow characteristics so that the flow rate for all orifices can be synchronized and the severing device will slice bars having a uniform thickness from the lengths of mix being continuously extruded from the various extruder tubes of the assembly. The reciprocating motion of the slicing frame **67** is synchronized and the flow of mix is regulated so that a batch of bars is sliced from the length of mix being extruded from the six extruder tubes each time a conveyor plate passes beneath the assembly.

A further embodiment of a nozzle assembly that is useful in producing a composite bar, in which the cross section constitutes areas of different flavored or different colored confections of the nature generally described for the first embodiment, is illustrated in FIGS. **15–17**. The components of this nozzle assembly are substantially identical to those shown in the applicant's copending U. S. application Ser. No. 885,104 filed Dec. 15, 1969, now abandoned and entitled Extruder Nozzle Assembly except for the addition of provisions for valve plugs in the passages of the distribution plate. As described in more detail in the aforementioned copending application, the interior of the nozzle body cavity is divided into two different segments **91** and **92** of which the inwardly tapering, upper portion of each is divided into three compartments **91***a*, **91***b*, **91***c*, **92***a*, **92***b* and **92***c* by a pair of parallel partitions **93** that extend from the upper, open face of the nozzle body downwardly within the cavity to the point where the walls of the nozzle body become parallel. A distribution plate **94** extends across the upper face of the nozzle body **90** to enclose the upper end of the nozzle body cavities and a cover plate **95**, through which the three feed tubes **96**, **97** and **98** are supported at spaced intervals in the manner previously described, is positioned across the upper face of the distribution plate **94** and affixed to the nozzle body **90** with the distribution plate **94** sealingly sandwiched between the cover plate and nozzle body. The upper face of the distribution plate **94** has recesses **96***a*, **97***a* and **98***a* located immediately below the open end of the respective feed tubes **96**, **97** and **98**. Pairs of grooves **96***b*, **97***b* and **98***b* extend outwardly on the upper face of the distribution plate in both directions from each of the respective recesses **96***a*, **97***a* and **98***a* to a point immediately above the three upper compartments **91***a*, **91***b* and **91***c* of the cavity segment **91** and the three upper compartments **92***a*, **92***b* and **92***c* of the other cavity segment **92**. An aperture **96***c*, **97***c* and **98***c* extends from the outer end of each of the three pairs of grooves **96***b*, **97***b* and **98***b* through the distribution plate into communication with the underlying six compartments **91***a*, **91***b*, **91***c*, **92***a*, **92***b* and **92***c* of the two cavity segments. In the manner described in the immediately preceding embodiment, the upper portion of apertures **96***c*, **97***c* and **98***c* have an enlarged diameter which is greater than the lower portion of the aperture and the width of the grooves to form valve plug seats **96***d*, **97***d* and **98***d*. A valve plug **75** having a passage **79** extending from the lower portion through a sidewall opening **81**, in the manner described for the immediately preceding embodiment and with a configuration as indicated in FIG. **12**, is seated in each of the three pairs of valve seats **96***d*, **97***d* and **98***d* with the upper stems **77** of the valve plugs extending through holes in the cover plate **95**. As described with respect to the immediately preceding embodiment and as may be best seen with respect to the grooves and aperture leading from the central feed tube **97** of FIGS. **16** and **17** of this embodiment, adjustment of the position of the sidewall opening **81** of the passage **79** in the valve plug **75** with respect to the grooves **97***b* will have a throttling effect on the mix that is flowing from the central feed tube **97** through the grooves **97***b* and exiting into the central compartments **91***b* and **92***b* of the nozzle body cavity segments through the apertures **97***c*.

As described in the previously referenced copending application, a confection mix under pressure is fed to each of the three feed tubes **96**, **97** and **98** and the mix from each of the three feed tubes flows via the grooves and apertures of the distribution plate into the various compartments of the nozzle body from which two extruded lengths having a composite cross sectional design emerge and from which bars are sliced by the reciprocating cutting device previously described. By suitably adjusting the position of each of the six different valve plugs **75**, the flow of mix into the various compartments of the extruder body can be easily regulated so that the amount of mix from each of the three separate feed tubes **96**, **97** and **98** that constitutes the

pass beneath and communicate with an end of said tube with another portion of said passage extending through the thickness of said plate to its lower face into communication with selected ones of said channels, valve means in said passages operable to throttle selectively the flow of confection along the respective passages and means for controlling the setting of each said valve means, said passages including grooves extending across the upper face of said distribution plate underlying said cover to pass beneath said feed tube open end with other portions of said grooves connecting with an aperture extending through to the lower face of said plate, said valve means including a body member supported for movement within said passage with respect to an axis of motion of the body between positions establishing maximum and minimum restrictions to the flow of the confection through said passage and means for supporting said body member with said body member axis of motion extending transversely of the thickness dimension of said distribution plate and overlying cover, and said valve setting means comprising an integral portion of said body member in alignment with said body member axis and adapted for engagement by a tool, said cover having an opening in alignment with each said body member integral portion and said body member axis.

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