United States Patent [19]

Groff

[11] **3,782,876**

[45] **Jan. 1, 1974**

[54] **EXTRUSION MACHINE FOR PRETZELS AND THE LIKE**

[75] Inventor: **Edwin I. Groff,** West Reading, Pa.

[73] Assignee: **Reading Pretzel Machinery Co.,** West Reading, Pa.

[22] Filed: **Dec. 30, 1971**

[21] Appl. No.: **213,872**

[52] **U.S. Cl.** **425/232,** 425/311

[51] **Int. Cl.** **A23g 5/02**

[58] **Field of Search** 425/225, 226, 232, 425/311, 313; 83/168

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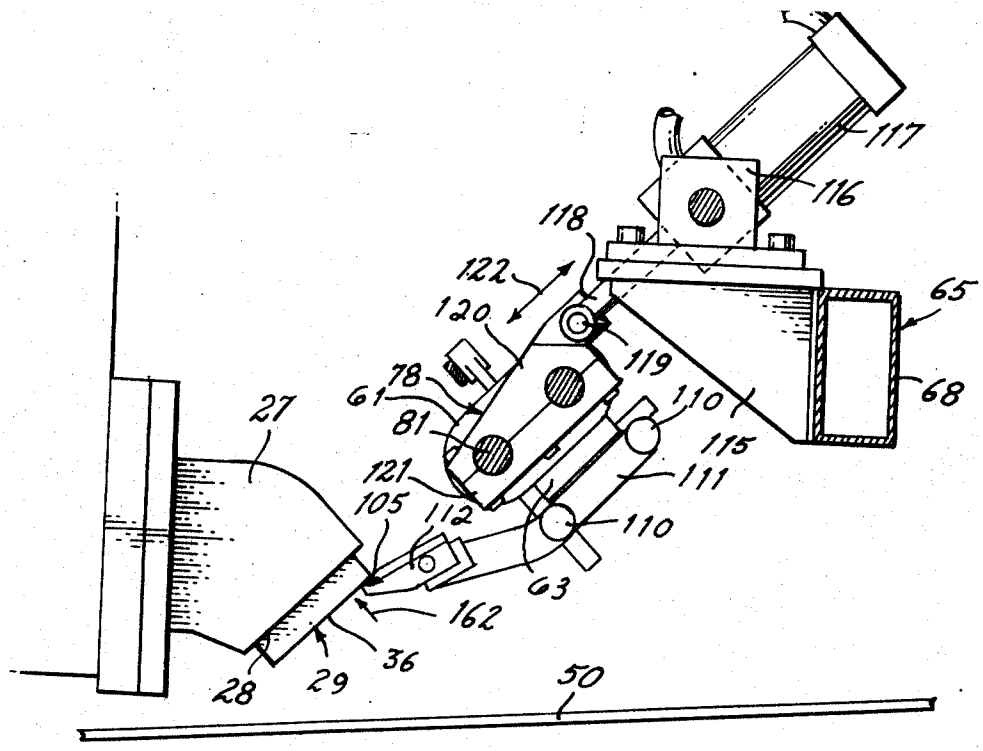
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Primary Examiner—J. Spencer Overholser
Assistant Examiner—David S. Safran
Attorney—Robert K. Youtie

[57] **ABSTRACT**

A machine for extruding dough including an extrusion head having a specifically configured outlet die, a cut-off mechanism mounted for back and forth movement across the die to sever extruded material into shorter lengths or slices, cleaning means for the cut-off mechanism, and a removal conveyor for receiving and removing the severed pieces.

8 Claims, 28 Drawing Figures

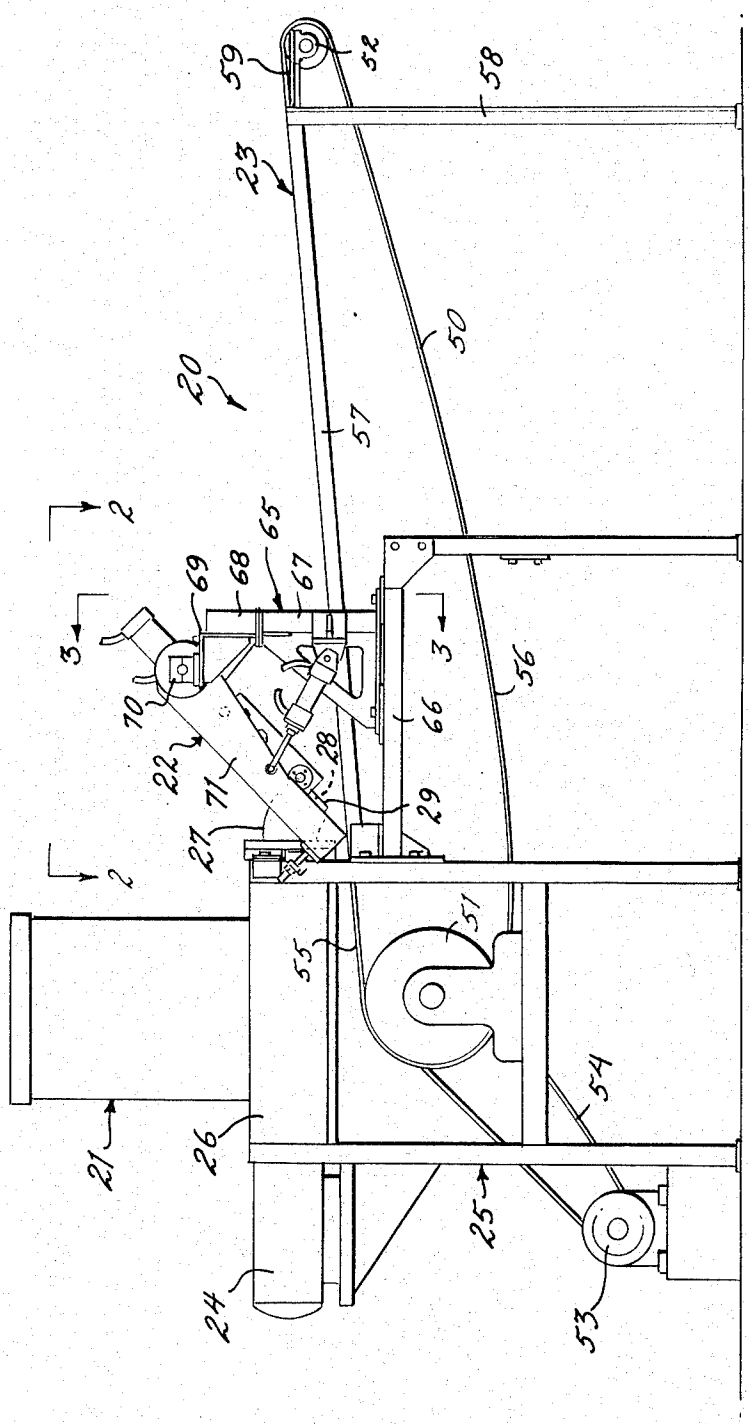


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Fig. 1.



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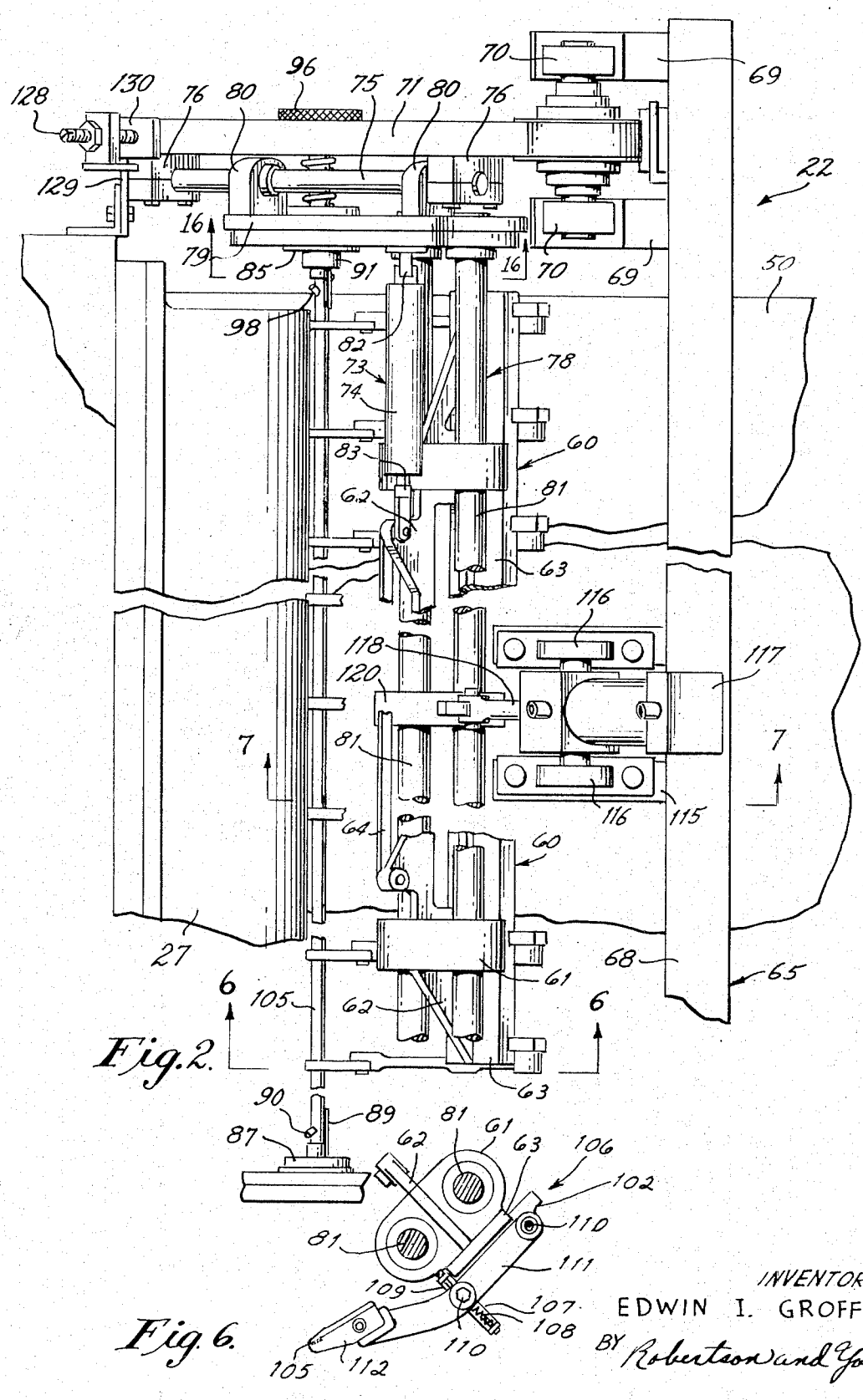


Fig. 2.

Fig. 6.

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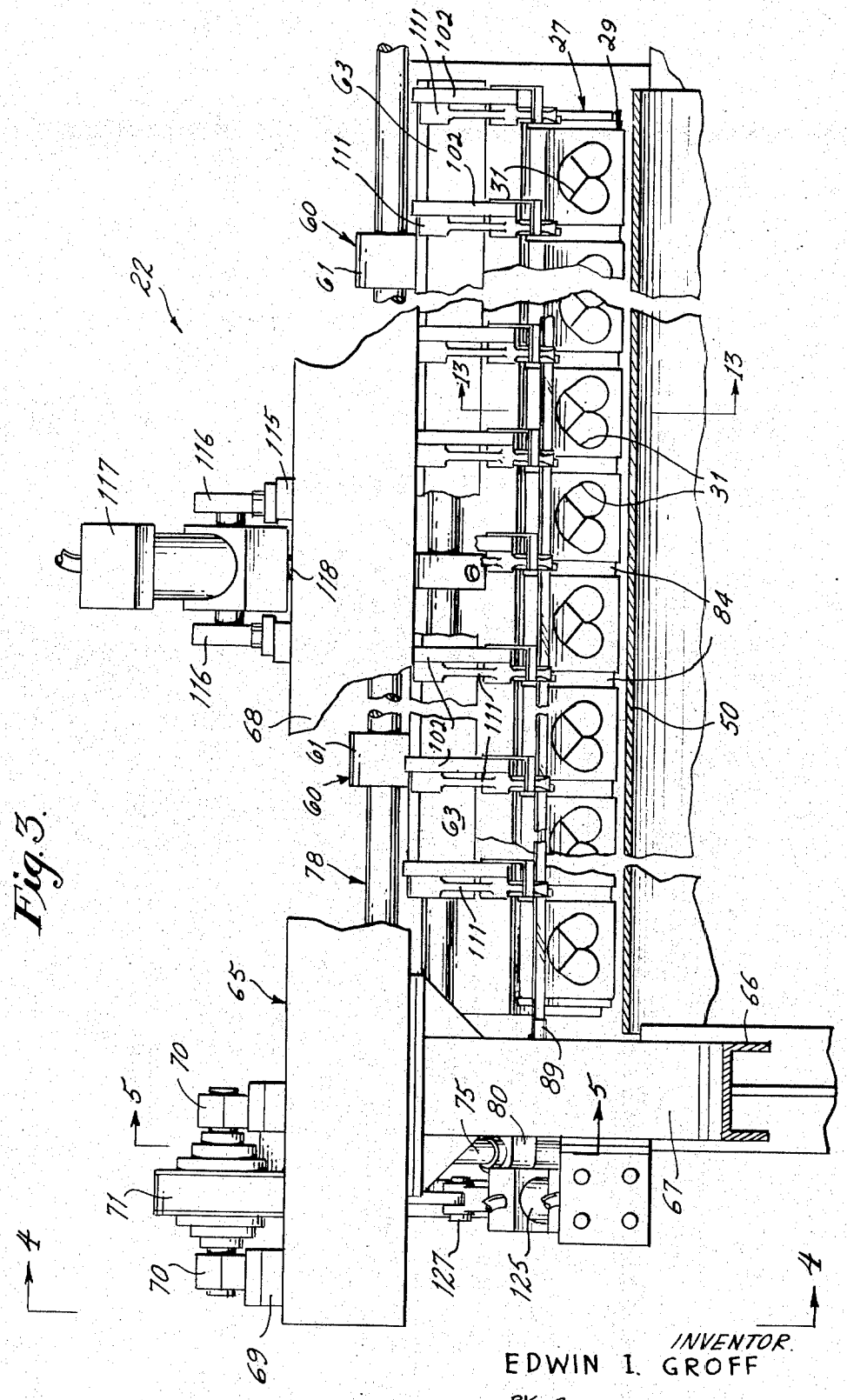
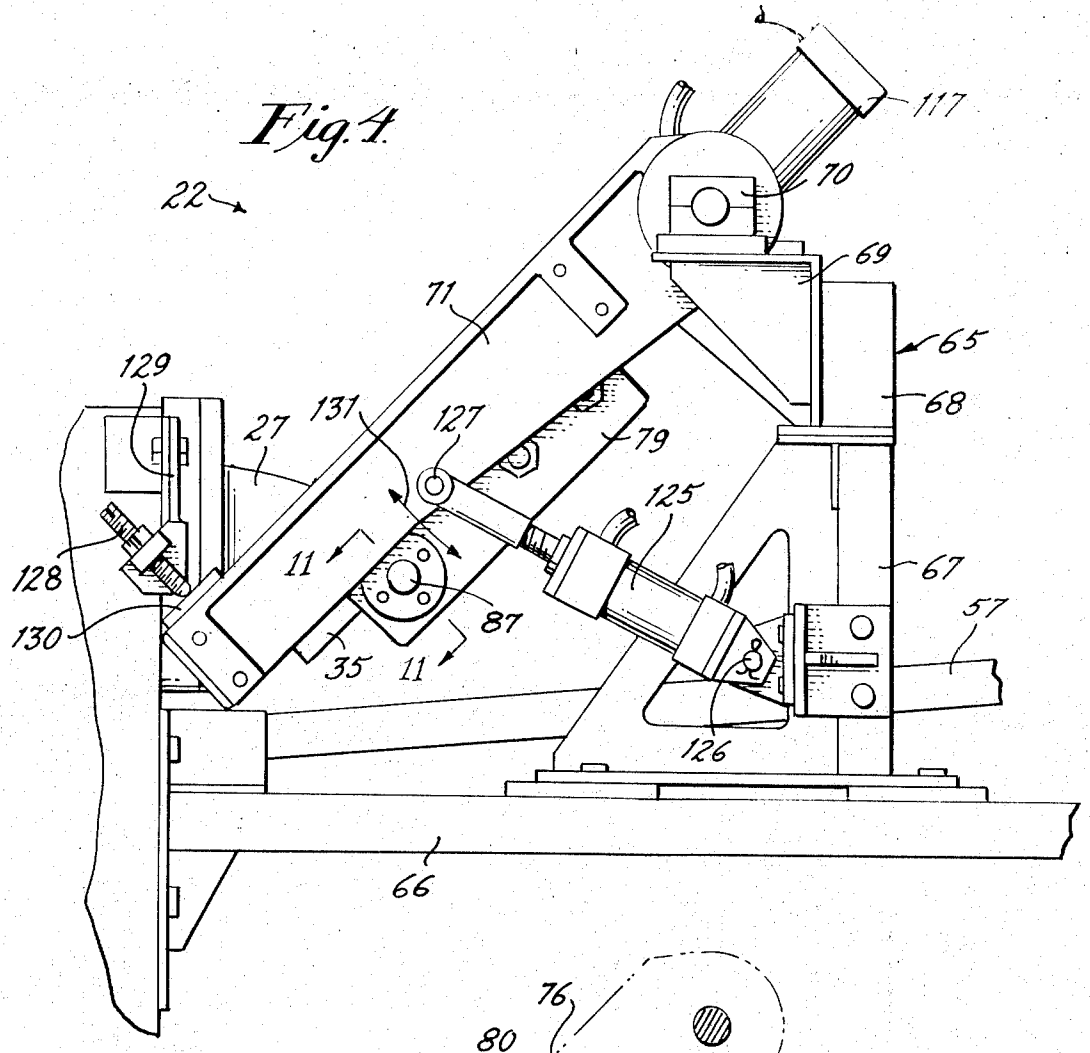


Fig. 5.

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Fig. 4.



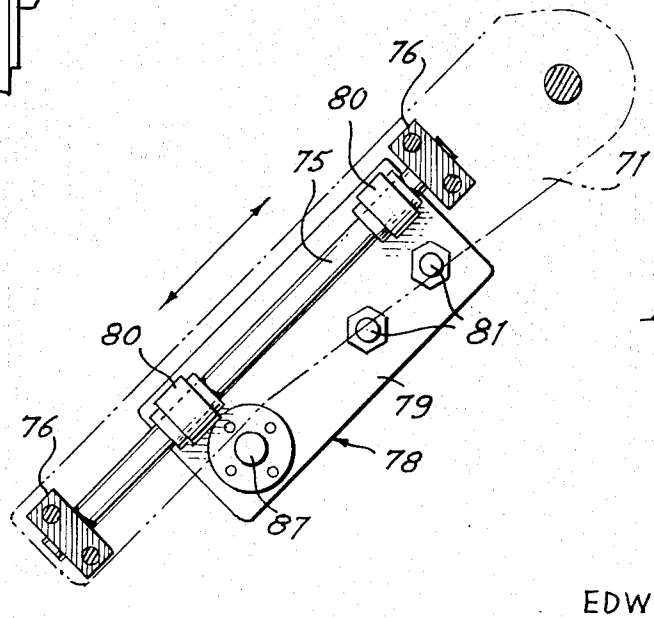


Fig. 5.

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Fig. 7.

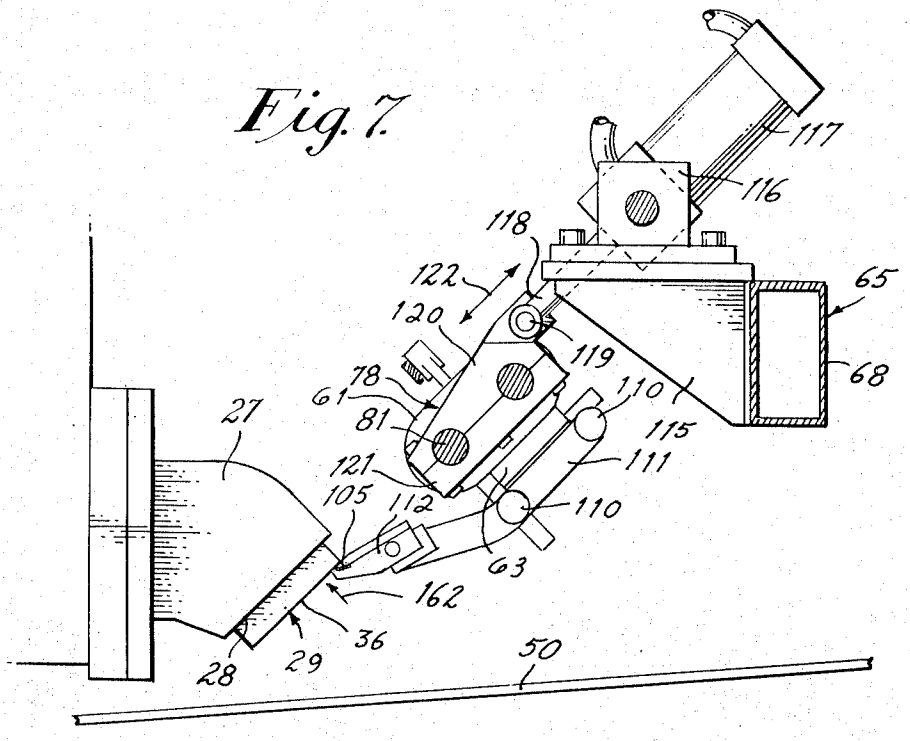
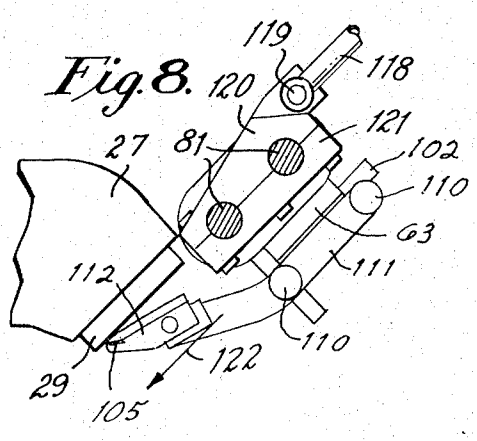


Fig. 8.



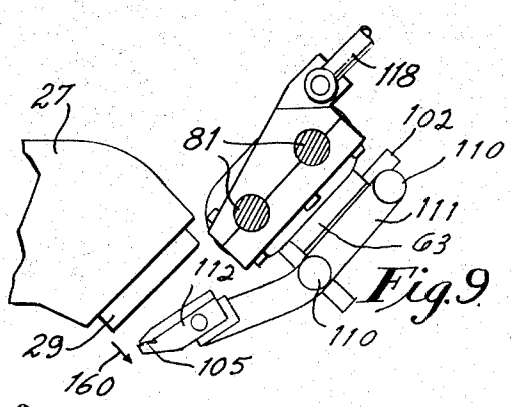
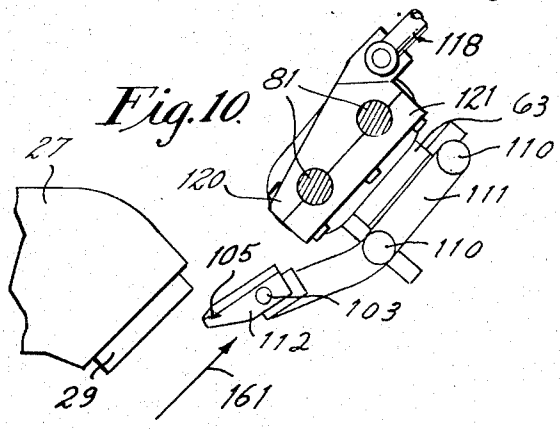


Fig. 9.

Fig. 10.



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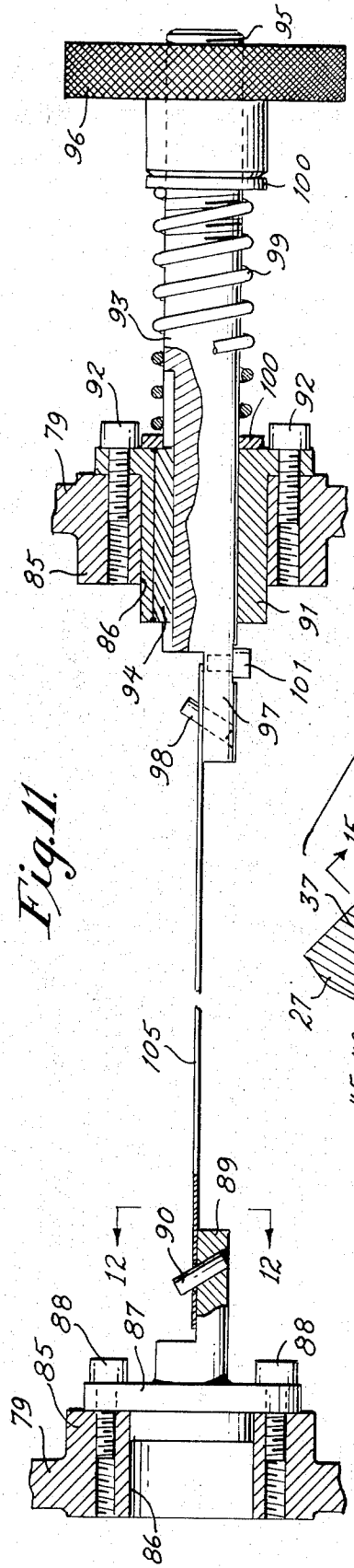


Fig. 11.

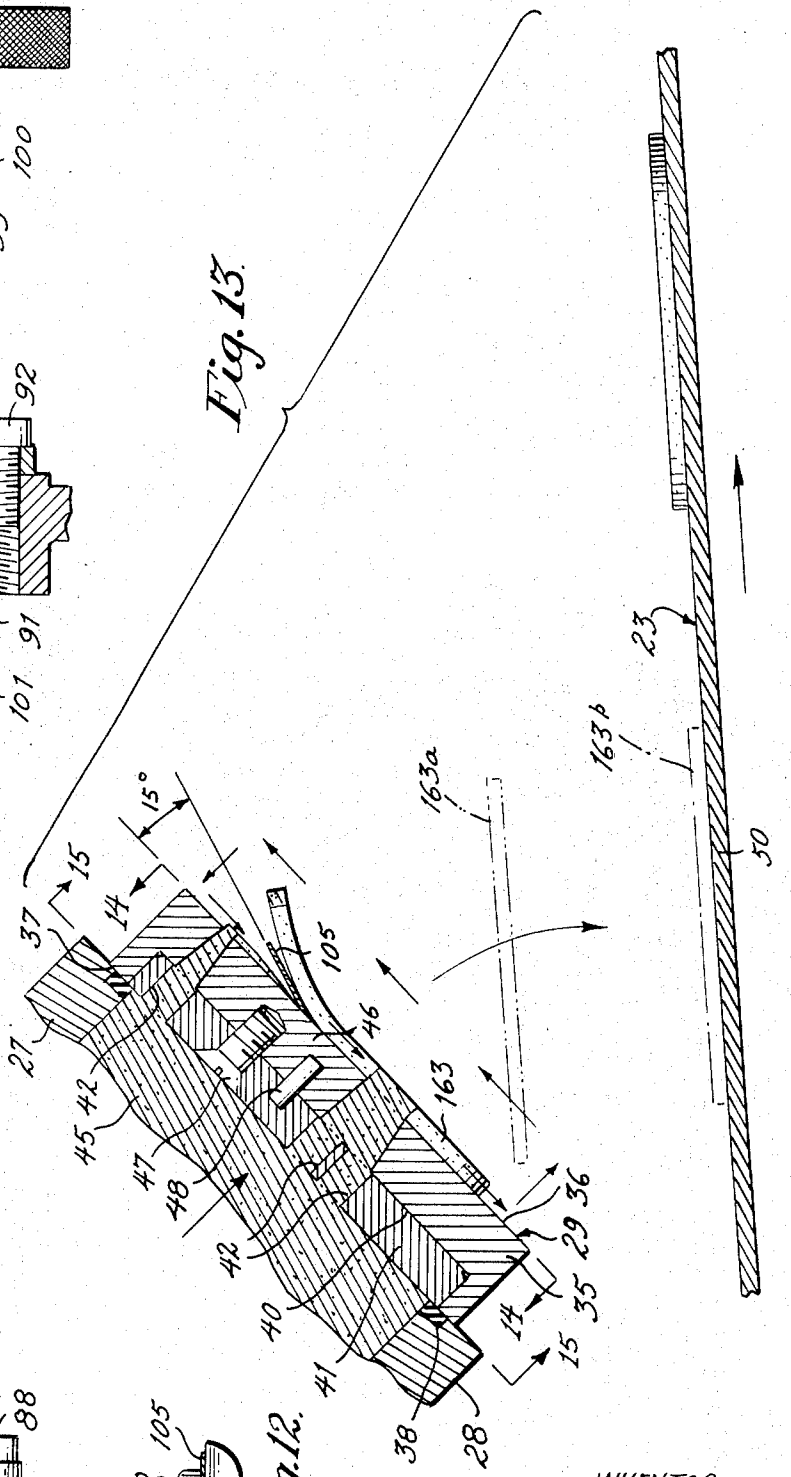


Fig. 13.

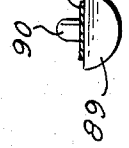


Fig. 12.

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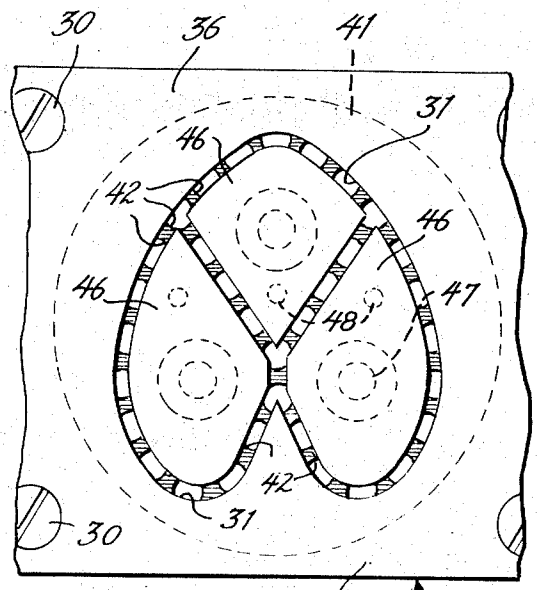


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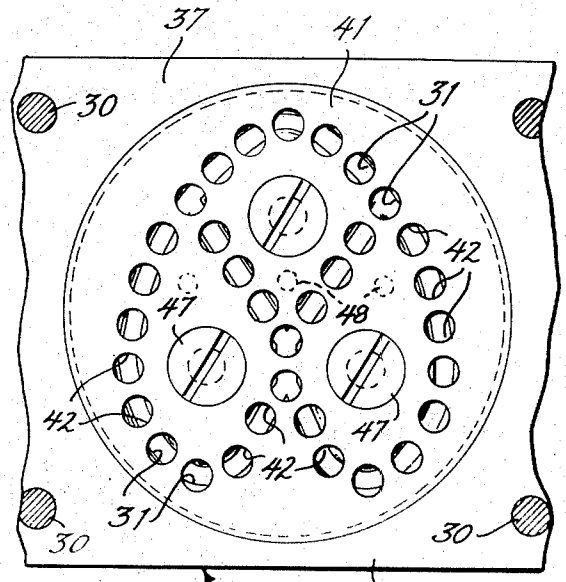


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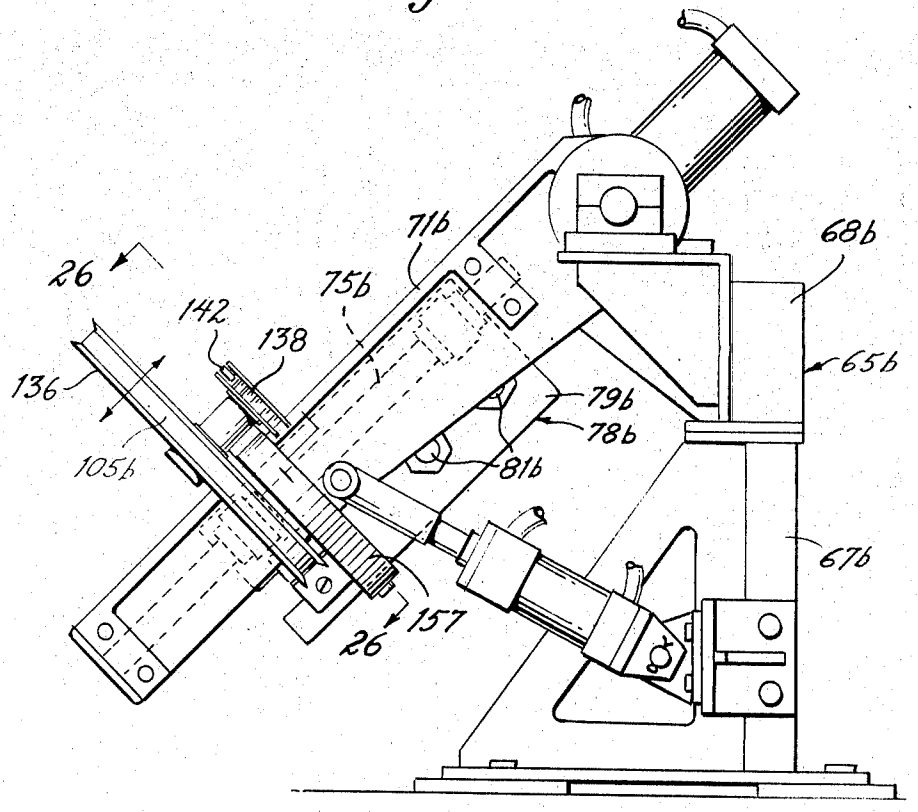


Fig. 25.

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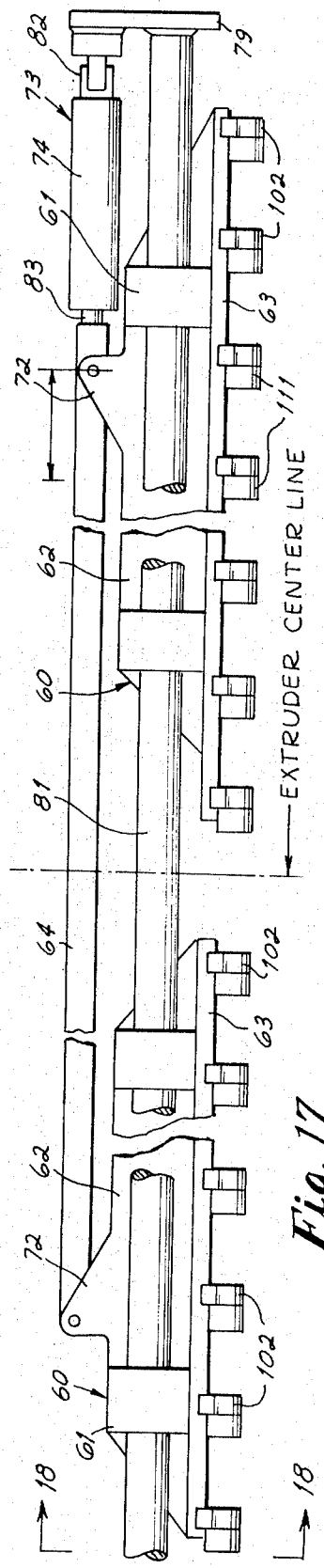


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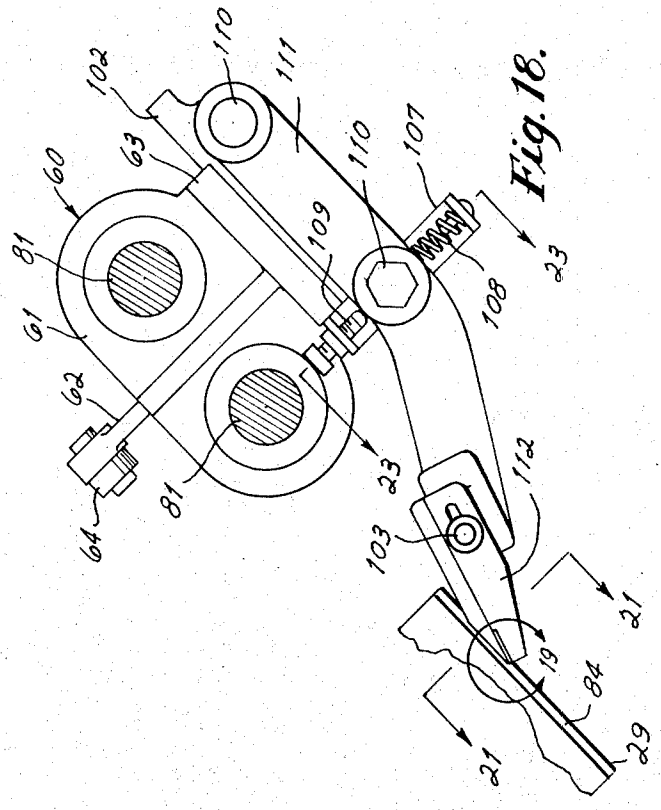


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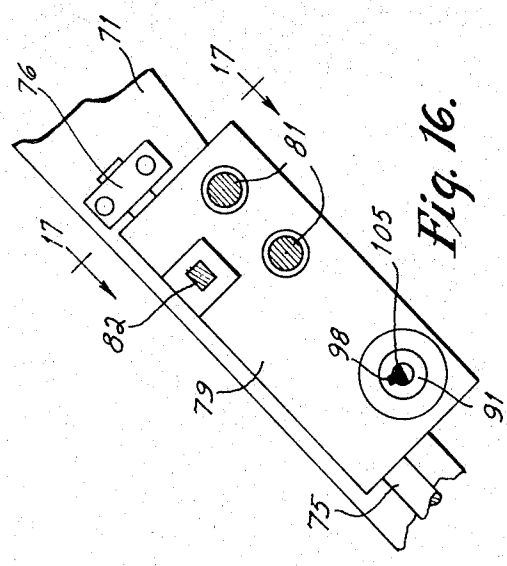


Fig. 16.

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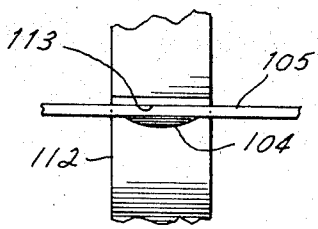


Fig. 20

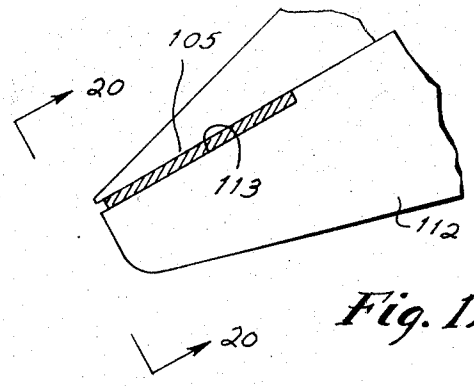
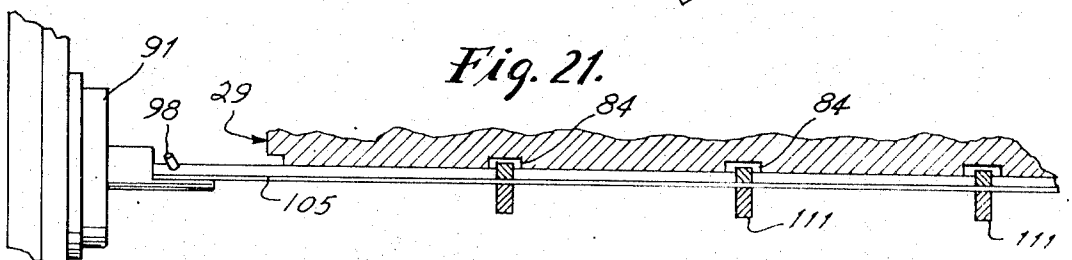


Fig. 19.

Fig. 21.



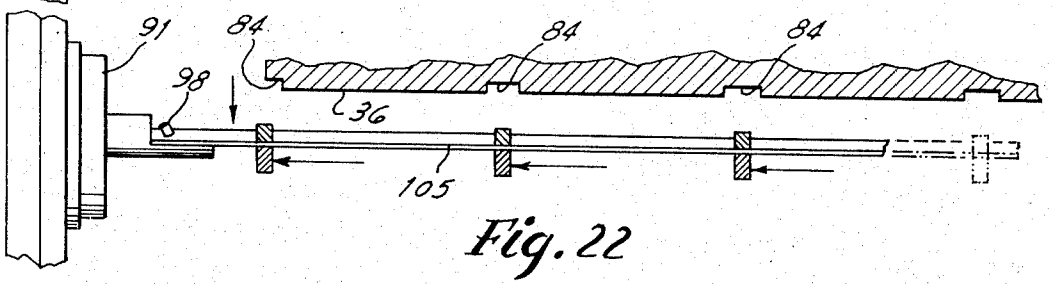


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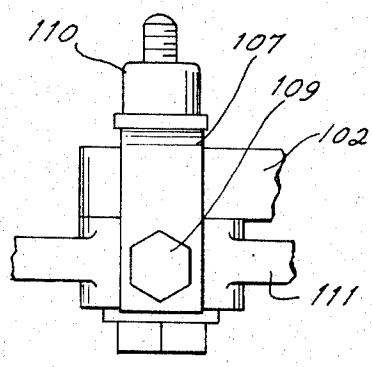


Fig. 24

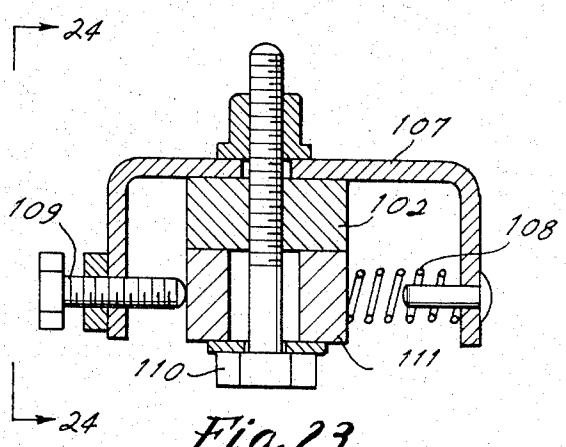


Fig. 23.

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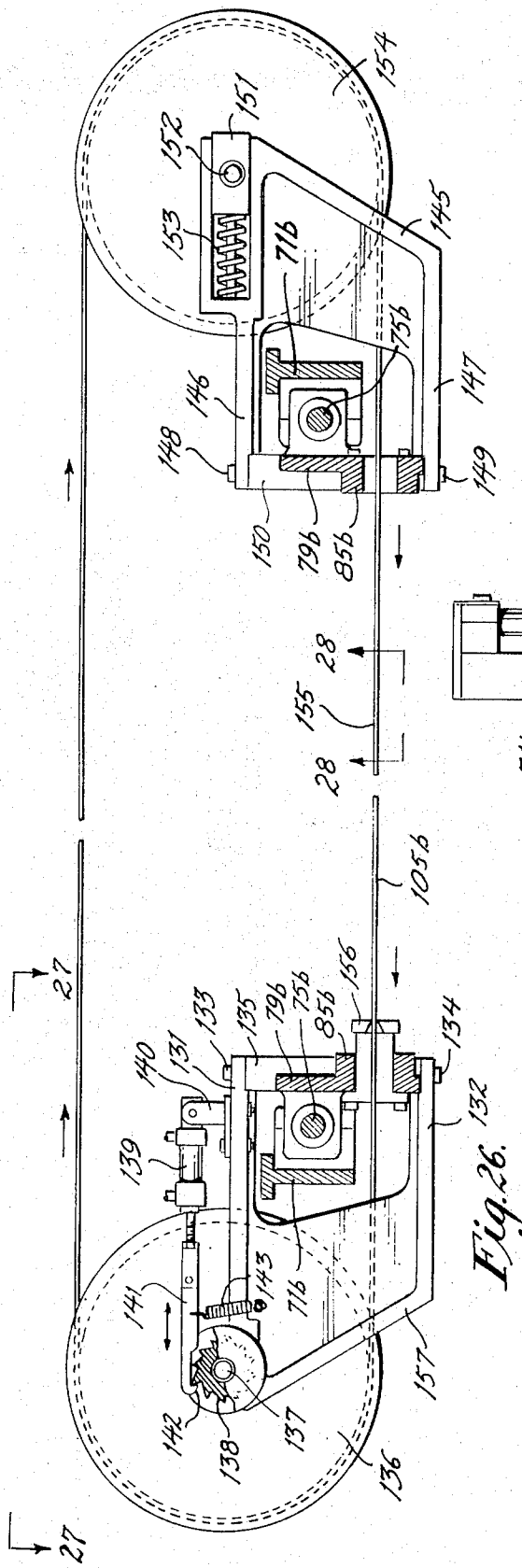


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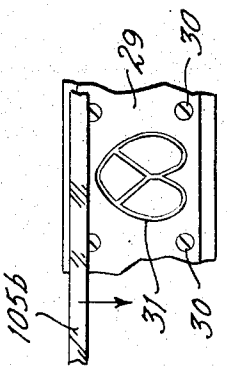


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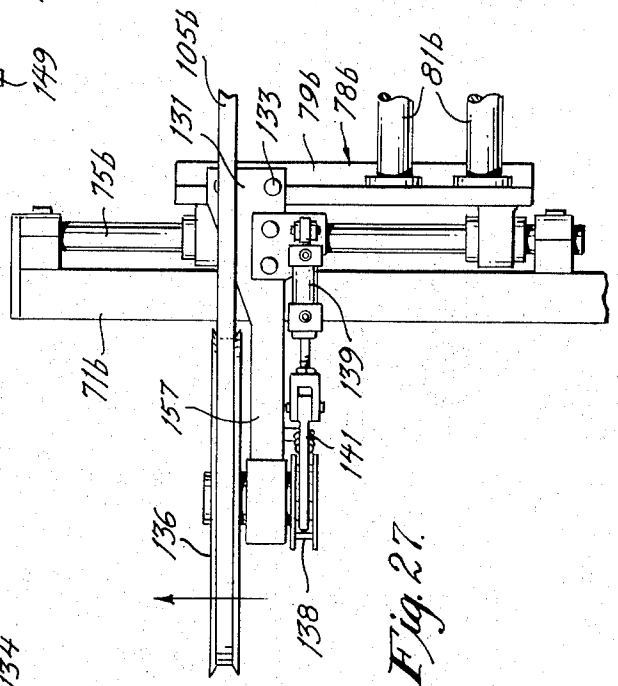


Fig. 27.

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EXTRUSION MACHINE FOR PRETZELS AND THE LIKE

BACKGROUND OF THE INVENTION

While there have, in the past, been proposed extrusion machines for extruding dough and similar food products, including pretzels, and the like, these machines have been less than satisfactory. For example, prior extrusion machines of this type have had particular problems in the severance or cutting off of the extruded material into short lengths or slices, particularly by the nature of the material being severed, so that frequent shut down was required to clean and readjust the equipment. Prior extrusion devices for pretzels and the like also suffered other disadvantages, such as rapid wearing of the parts, requiring frequent and expensive down time and replacement. Also, prior machines of this general type were relatively slow so that production rates suffered and resulted in increased costs.

SUMMARY OF THE INVENTION

Accordingly, it is an important object of the present invention to provide an extrusion machine, including cut-off mechanism therefor which overcomes the above-mentioned difficulties, is capable of long continued usage without appreciable adverse effects from the difficult material being worked, wherein accuracy is maintained for long continuous periods of use without the need for adjustment, and wherein adjustment is not required to a high degree of precision, so that adjustment may be made quickly and easily by relatively unskilled personnel.

It is another object of the present invention to provide an extrusion machine of the type described which maintains its sanitary operating conditions over extremely long operating periods, and may be quickly and cleaned, which cleanings are required only at infrequent intervals.

It is still another object of the present invention to provide an extrusion machine having the advantageous characteristics mentioned in the preceding paragraphs, which is of high production capacity, being durable and reliable throughout long periods of continuous use, and throughout a long useful life, so as to effectively reduce production costs.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view showing an extrusion machine for pretzels, and the like, constructed in accordance with the teachings of the instant invention.

FIG. 2 is a partial top plan view taken generally along the line 2—2 of FIG. 1, with parts broken away for clarity of understanding.

FIG. 3 is a partial sectional elevational view taken generally along the line 3—3 of FIG. 1, also broken away for clarity and conservation of drawing space.

FIG. 4 is a partial side elevational view taken generally along the line 4—4 of FIG. 3, enlarged for clarity.

FIG. 5 is a partial sectional elevational view taken generally along the line 5—5 of FIG. 3, showing certain parts in phantom.

FIG. 6 is a partial sectional elevational view taken generally along the line 6—6 of FIG. 2.

FIG. 7 is a partial sectional elevational view taken generally along the line 7—7 of FIG. 2.

FIG. 8 is a fragmentary sectional elevational view similar to FIG. 7, but showing a slightly later stage in operation of the machine.

FIG. 9 is a partial sectional elevational view similar to FIG. 8, but showing a slightly later stage in machine operation.

FIG. 10 is a partial sectional elevational view similar to FIGS. 8 and 9, but showing a later operative position of the apparatus.

FIG. 11 is a partial sectional view taken generally along the line 11—11 of FIG. 4, being broken away to save drawing space.

FIG. 12 is a sectional view taken generally along the line 12—12 of FIG. 11.

FIG. 13 is a fragmentary sectional elevational view taken generally along the line 13—of FIG. 3, enlarged for clarity and illustrating in phantom successive positions of dough movement.

FIG. 14 is a sectional view taken generally along the line 14—14 of FIG. 13.

FIG. 15 is a sectional view taken generally along the line 15—15 of FIG. 13.

FIG. 16 is a partial sectional elevational view taken generally along the line 16—16 of FIG. 2.

FIG. 17 is a partial sectional view taken generally along the line 17—17 of FIG. 16, partially broken away.

FIG. 18 is a partial sectional elevational view taken generally along the line 18—18 of FIG. 17.

FIG. 19 is an enlarged fragmentary sectional elevational view illustrating in greater detail the area 19 of FIG. 18.

FIG. 20 is a partial view taken generally in the direction of line 20—20 of FIG. 19.

FIG. 21 is a partial sectional view taken generally along the line 21—21 of FIG. 18, illustrating the dough shearing operation.

FIG. 22 is a sectional view similar to FIG. 21, but showing the blade out of dough shearing relation, and illustrating operation of the blade cleaning means.

FIG. 23 is an enlarged sectional view taken generally along the line 23—23 of FIG. 18, illustrating certain structural details.

FIG. 24 is a fragmentary view taken generally in the direction of line 24—24 of FIG. 23.

FIG. 25 is a side elevational view similar to FIG. 4, but showing a slightly modified embodiment constructed in accordance with the teachings of the present invention.

FIG. 26 is a sectional view taken generally along the line 26—26 of FIG. 25.

FIG. 27 is a partial sectional view taken generally along the line 27—27 of FIG. 26.

FIG. 28 is a sectional view taken generally along the line 28—28 of FIG. 26.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now more particularly to the drawings, and specifically to FIG. 1 thereof an extrusion machine of

the present invention is there generally designated 20, and includes an extruder 21, a cut-off mechanism 22, and a conveyor 23.

The extruder 21 may be mounted on an upstanding frame or stand 25, including a fluent material feeding device 26, such as feed screws or other suitable feeding means, which may be powered by one or more motors 24. It has been found advantageous to employ individual electric motors 24 for powering each feed screw, thereby permitting enhanced versatility and accuracy in operation. A material hopper 28 upstands from the feeding means 26, through which dough or similar material may be introduced to the feeding means.

On the forward or discharge end of the material feeding means 26, there is provided an extrusion head 27, which is formed with an outlet 28 facing obliquely downwardly and forwardly to the right as seen in FIG. 1. An extrusion die 29 is disposed in covering relation with respect to the extrusion head outlet 28, lying in a generally oblique plane, approximately 45 degrees to the horizontal. The extrusion die 29 is formed with specifically configured through openings or slots, for passing lengths of extruded material or dough having a cross-sectional configuration conforming to the configuration of the die opening.

As best seen in FIG. 3, the extrusion head 27 may be of considerable lateral extent, its outlet being of similar lateral extent, and the extrusion die 29 also of laterally elongate configuration in its covering relation with the outlet of the extrusion head. If desired, the extrusion die 29 may be of sectional construction, a plurality of die sections being secured in end-to-end relation, as by fasteners 30 across the extrusion head outlet. It will also there be apparent that the extrusion die 29 may be formed with a plurality of separate, side-by-side through openings or slots 31, each of a specific desired configuration, being shown in the illustrated embodiment as of convention pretzel shape. The die openings or slots 31 are located in relation to the screws of feeding means 26 and their drive motors 24.

As appears in FIGS. 13, 14 and 15 the extrusion die 29 includes an outer plate 35 disposed in covering relation with respect to the extrusion head opening 28, having its outer side or face 36 substantially flat and facing obliquely downwardly and forwardly. The inner surface 37 of the outer die plate 35 is secured in sealed relation with respect to the outlet 28 of the extrusion head 27, as by a sealing gasket 38, or other suitable sealing means. Further, the inner surface of the outer die plate 35 is recessed, as at 40 facing inwardly toward the interior of the extrusion head. Secured in the recess 40 of the outer die plate 35 in an inner die plate 41. That is, the inner die plate 41 is secured in the recess 40 in facing engagement with the outer die plate; and further, the inner die plate 41 is formed with a series or row of adjacent, spaced through apertures 42 disposed in an array for conforming alignment with the specifically configured die opening or slot 31. As seen in the exterior view of FIG. 14, the series of through inner plate openings 42 are visible through the outer plate opening or slot 31; and also, as seen from the interior of the extrusion head 27 in FIG. 15, the outer die plate opening or slot 31 is visible at spaced intervals through the several inner plate openings or holes 42.

Of importance in the extrusion procedure, is the cross-sectional configuration of the outer plate opening or slot 31, see FIG. 13, wherein it will be observed that the slot or opening 31 is outwardly convergent or tapering. By this gradually reducing configuration, the material or dough 45 is extruded in a uniform manner, having a substantially constant density and free from interruptions and voids.

In the extrusion of a conventional pretzel shaped cross-section, as shown in the illustrated embodiment, the outer die plate opening or slot 31 is necessarily continuous, so that the die plate parts, as at 46, are necessarily separate from the remainder of the outer die plate 35. Such separate outer die plate parts 46 may be effectively retained in their proper coplanar relation by securement to the inner die plate 41, say utilizing fasteners 47 and locator pins 48.

The conveyor mechanism 23 may be of any suitable construction, and as illustrated, includes an endless conveyor belt 50 trained about a powered pulley 51 located on the stand 25 beneath the extruder 21, and an idler pulley 52 located at some distance forward or downstream from the extruder. Suitable drive means, such as an electric motor 53 may be connected in driving relation with the pulley 51, as by a belt 54 or other transmission means.

The endless conveyor member or belt 50 includes an upper run 55 passing beneath the extruder head 27 and extrusion die 28 and thence proceeding over the idler roll 52 for return along a lower stretch or run 56 to the powered roll 51. Suitable support means, such as a frame or bed 57 may extend from the stand 25 beneath the extruder head 27 for supporting the upper conveyor run 55. The conveyor bed or guide 57 may have its downstream end supported by an upstanding leg 58, which may also support the idler roll 52, as by a bracket 59. The disposition of the upper conveyor run 55 may be generally horizontal, and slightly inclined toward the downstream end, as illustrated.

The cut-off mechanism 22 includes a fixed supporting structure 65 mounted on a stand or support 66 extending downstream from the stand 25 and laterally beneath the upper run 55 of the conveyor 50. The fixed structure 65 includes a pair of pedestals or standards 67, each upstanding from the nether frame 66 on opposite sides, respectively, of the upper conveyor run 55. A bridging member or beam 68 of the fixed structure 65 extends between the standards 67 across and spaced over the upper conveyor run 55. Adjacent to each end of the beam 68, there are mounted thereon, as by brackets 69, a pair of journal bearings or pillow blocks 70. The pillow blocks 70 of each pair are in alignment with each other laterally of the conveyor 50, and are preferably in alignment with the pillow blocks of the other pair.

A pair of laterally spaced arms 71, being respectively located on opposite sides of the conveyor 50, are each located with its upper end rotatably supported or journaled between an adjacent pair of pillow blocks 70. Thus, the arms 71 are swingable about the aligned axes of the pillow blocks 70, and extend therefrom generally downwardly and rearwardly, or upstream of the conveyor 23, toward the extrusion head 27.

On the inner side of each arm 71 is fixedly secured a slideway or guide 75, say in the form of a rod extending longitudinally of the respective arm on the laterally inner side thereof and fixedly mounted in inwardly spaced relation thereto, as by mounting clamps 76 fixed to the respective arm. Thus, the rods 75 on the re-

spective arm 71 afford guideways, as will presently appear more fully.

Extending laterally across and spaced over the conveyor 23, between guideways 75 of respective arms 71, is a carrier structure, generally designated 78, which is slidably mounted on the ways 75 for sliding movement therealong between the arms 71. The carrier structure 78 includes a pair of end plates 79 each extending along and on the laterally inner side of a respective guide rod 75, and provided with a pair of spaced outstanding lugs or ears slidably receiving the adjacent guide rod. Thus, the plates 79 are each slidable along the adjacent guide rods 75. The laterally spaced pair of plates 79 are rigidly connected together in parallel spaced facing relationship by a pair of laterally extending, generally parallel elongate members or rods 81. Thus, the elongate connecting members 81 extend across and spacedly over the conveyor 23, relatively rigidly tying together the arms 71 for simultaneous swinging movement. The connecting members 81 are shiftable with the arms 71 upon swinging movement of the latter about the aligned axes, and are further shiftable generally longitudinally of the arms along the ways 75. The connecting members 81 may be fixed at their opposite ends to the plates 79 by any suitable means, such as clamping nuts, or otherwise as desired.

Formed in a lower, rearward or upstream region of each plate 79 is a boss 85, having a central through bore 86, best seen in FIG. 11. Fixed to one boss 85, say the boss of left hand plate 79 as seen in FIG. 11, is an anchor member 87, as by fasteners 88 or other suitable securement means. The anchor member 87 is located on the laterally inner side of plate 79, and includes a projection 89 extending toward and terminating short of the opposite or distal boss 85. The projection 89 may be provided with a retaining pin 90 fixed to the projection and protruding in an oblique laterally outwardly direction.

The boss 85 of the right hand plate 79, as seen in FIG. 11, is provided with an internal bushing 91 secured within the bore 86 of the boss by fasteners 92 or other suitable means. A shaft 93 is slidable in the bushing 91, being constrained to longitudinal sliding movement and restrained against rotation by a key 94 interfitting between the shaft and bushing, or by other suitable restraining means. The shaft 93 extends laterally outwardly, where it is formed with screw threads 95 and provided with an internally threaded knob 96 circumposed about and in threaded engagement with the shaft. The laterally inner end of the shaft 93 is provided with a projection 97 in alignment with the projection 89, and carrying a holding pin 98 protruding obliquely laterally outwardly. Circumposed about the shaft 93, intermediate the knurled knob 96 and fixed bushing 91 is a coil compression spring 99 and a pair of bearing washers 100 at opposite ends of the spring.

It will thus be apparent that the spring 99 serves to resiliently urge the shaft 93 laterally outward or rightward as seen in FIG. 11. Also, the resilient urging force of spring 99 may be determined by the position of knob 96 on shaft 93, as deflected by rotation of the knob. In order to limit laterally outward movement of shaft 93, there may be provided suitable stop means, such as a headed member 101 fixed to the shaft laterally inwardly of the plate 79, for limiting abutting engagement with the fixed bushing 91.

A cutting member 105, say in the form of an elongate strip or blade, may extend between the projections 89 and 97, having its opposite end portions hooked over respective pins 90 and 98. Thus, the cutting member or blade 105 is effectively maintained at a desired degree of tautness by adjustment of knob 96, causing the spring 99 to apply a desired degree of tightening force to the blade. It will, of course, be appreciated that the blade 105 extends longitudinally of carrier means 78 and rods 81, and is located adjacent to the extrusion die 29 for movement relative thereto in a manner to be described more fully hereinafter.

At spaced locations along the elongate connecting members 81, there may be provided one or more blade supporting and cleaning assemblies, each generally designated 60 and best seen in FIGS. 2, 3 and 17. The blade supporting and cleaning assemblies 60 may be two in number, located in spaced relation along the laterally extending rods 81 of carrier structure 78. Each blade supporting and cleaning assembly 60 may include a slide or trolley 61 slidably receiving and mounted on the elongate members or rods 81, and having a depending member or plate 62 extending generally longitudinally of, between and below the rods 81. The plates 62 each extend longitudinally of the rods 81 and carry below the rods an elongate mounting member or bar 63. Each of the bars 63 extend longitudinally generally horizontally in parallelism with and beneath the rods 81, being transversely inclined in general parallelism with the rods, and being in end-to-end spaced aligned relation with respect to each other, see FIG. 17. Thus, the blade supporting and cleaning assemblies 60 are each horizontally shiftable along the rods or ways 81; and further, are connected for simultaneous shifting movement, as by a link 64 having its opposite ends pivotally connected to respective plates 62 at upstanding lugs 72 of the plates.

Operatively associated with the blade supporting and cleaning assemblies 60 is an assembly shifting or motive means 73, which may advantageously assume the form of a fluid cylinder 74 having one end connected, as by suitable connection means 82 to one of the end plates 79. A piston rod 83 extends telescopically from the other end of cylinder 74 remote from connection 82, and is connected to the adjacent plate 62, as to the associated lug 72 of the adjacent plate. Thus, by suitable fluid control, the motive cylinder 73 may be caused to shift the assemblies 60 in a desired manner, as will appear more fully hereinafter.

Carried at spaced locations along each bar 63, being fixed thereto by any suitable securing means, are mounting members or brackets 102. Attached to each mounting member or bracket 102, as by fasteners 110, is an elongate blade rest arm or wiper 111 extending obliquely downwardly and rearwardly, or upstream of the conveyor 23, having its distal end region 112 free and adjustably connected to the remainder of the arm 111, as by suitable fastener means 103. The distal end parts 112 of wiper-rest 111 is formed, see FIGS. 19 and 20, with an end slot 113 which opens laterally through opposite sides of the part 112 and is configured for slidably, conformably receiving the blade 105, with the latter extending completely through and beyond opposite sides of the part 112. Further, the slot 113 may be considered as internally hollow or concave, being formed with a smoothly arcuate concavity 104 extending endwise into the part 112, being spaced between opposite

sides thereof and opening through the upstream end of the part. In practice, the wiper-rest 111 is shiftable laterally (longitudinally of the received blade 105) to effectively wipe any dough accumulation or the like from the blade to keep the latter clean, while supporting the blade for its shearing movement, as will appear more fully hereinafter. The end opening internal hollow or cavity 104 has proved advantageous in maintaining sharpness of the blade scraping action effected by wiper parts 112, while affording an opening for exit of dough, and the like, from the slot 113.

The downstream or right-hand fastener 110 as seen in FIG. 18 may support the member 111 for limited swinging movement about the latter fastener, while the upstream fastener 110 may be loosely received in the member 111 to permit limited swinging of the latter about the downstream fastener. This loose fit of upstream fastener 110 is shown in detail in FIG. 23. It is also there seen that a generally U-shaped member or yoke 107 is carried by the upstream fastener 110 and mounting bracket 102, having its opposite end portions on the upper and lower sides, respectively of the member 111. A coil compression spring 108 is interposed between the lower end region of yoke 107 and the underside of member 111 to urge the latter upwardly, while a stop member 109, such as a limit screw, is engaged threadedly through the upper end region of the yoke 107 into endwise abutting engagement with the upper side of member 111 to limit upward movement of the latter. By this means the rest-wiper member 111 is angularly adjustable to properly locate the blade 105 in its maximum effectiveness with respect to the guide 29. That is, the blade 105 is advantageously moved in edgewise shearing engagement across the face of die 29.

Also, as best seen in FIG. 18, the die 29 is provided with a plurality of slots or grooves 84 formed in the outer die face 36 extending entirely thereacross in the upstream-downstream direction of conveyor movement. The grooves or recesses 84 are thus open-ended, and each adapted to receive the free end region of a respective wiper-rest member 111 while the blade 105 moves in its shearing engagement with the adjacent die face regions. As best seen in FIG. 3, the grooves or recesses 84 may be each located between an adjacent pair of extrusion openings 31. However, this is not critical. It is, however, essential that the shifting movement of the blade supporting and cleaning assemblies 60, and consequently of the wiper-rests 111, as effected by the motive means 73, have a stroke equal to or a multiple of the spacing between recesses 84. For example, see FIGS. 21 and 22, the former illustrating one position of wiper rests 111 each in a respective groove 84, and the latter illustrating a laterally shifted position of the wiper-rests 111 each proximate to the next adjacent recess 84 for receipt by the latter.

By means of the rest-wipers 111, and particularly the end regions 112 having slots 113, the blade 105 is effectively supported throughout its length, while being scraped or wiped clean of any dough or other material, as will appear more fully hereinafter.

Also mounted on the fixed bridging structure 65, generally medially of the beam 68, may be a bracket 115 carrying a pair of laterally spaced upstanding pedestal bearings or journals 116. The journal bearings 116 are in alignment with each other laterally of the conveyor 23, and rotatably support therebetween an actuating device 117, which may be a cylinder and piston, or other suitable actuating means. The actuating device 117 may include an actuator rod 118 extending obliquely downwardly and rearwardly, and pivotally connected, as by a pin 119, to clamping blocks 120 and 121 which are rigidly clamped to the elongate members 81. Thus, upon energization of the actuating means 117, the rod 118 is shifted longitudinally, as in the direction of arrow 122, to effect back and forth shifting movement of the carrier 78 and its associated structure, including the cutting member or blade 105.

In addition, there is at least one actuating device 125 associated with at least one arm 71, and may comprise a cylinder and piston extending between and pivotally connected to a standard 67, as by a pin 126, and the adjacent arm 71, as by a pin 127. While any suitable actuating means 125 may be employed, operation of the actuating means serves to effect rotary shifting movement of the arms 71 and associated carrier means 78 about the axes of the arms. This rotative shifting of the arms 71 effects movement of the cutter or blade 105 toward and away from the extrusion die 29, as will appear presently. Also, suitable stop means may be employed to limit rotative shafting movement of the arms 71 and carrier means 78, such as an adjustable abutment 128, say in the form of a threaded member engaged threadedly through a bracket 129 mounted on the extruder 21. The abutment member 28 is selectively positionable for abutting engagement, as with a wear pad 130 on the upper distal end region of the arm 71 to limit upward movement of the arm and consequent movement of the cutter blade 105 toward the die 29. The double ended arrow 131 in FIG. 4 illustrates the rotative shifting movement of the arms 71 and carrier means 78.

OPERATION

Referring now more particularly to FIGS. 7–10, in FIG. 7 it will be seen that the blade 105 is located beneath and adjacent to the upper region of the outer face of die 29. More specifically, the blade has its lower edge in engagement with the outer face of the die 29, and is disposed at an acute angle with respect thereto, approximating 15 degrees, as shown in FIG. 13. Upon energization of actuating means 117, the carrier means 78 is shifted downwardly and rearwardly to move the blade 105 along and in shearing relation with the die surface 36 to the position shown in FIG. 8. From this position, the actuating means 125 is energized to shift the arms 71 and carrier means 78 downwardly away from the die 29, in the direction of arrow 160. The actuating means 117 is again energized, but in the reverse direction to shift the carrier means 78 upwardly, as in the direction of arrow 161 in FIG. 10, and subsequently the actuating means 125 is again energized to return the carrier means 78 to its position of FIG. 7, as in the direction of arrow 162. Of course, the actuating means 117 and 125 are sequentially energized in the manner described by any suitable timing means (not shown).

In FIG. 13 is illustrated the cutting member or blade 105 in an operative position of movement intermediate the positions of FIGS. 7 and 8. More specifically, the cutter or blade 105 effects severance of a length or slice of dough, as at 163, upon its downward movement in severing relation with respect to the outer face 36 of the extrusion die 29. By the afore-mentioned angle or approximately 15 degrees between the blade 105 and die face 36, relief is afforded on the underside of the

blade so as not to obstruct continued extrusion of material through the die during the severance. Further, by the oblique angle of the die **29** relative to the conveyor **23**, and the downward cutting action of the blade **105** along the oblique face **36**, it will be apparent, see FIG. **13**, that the severed piece **163**, at the instant of full severance, is disposed substantially horizontally or parallel to and over the conveyor **23**, as at **163a**. Hence, upon continued gravitational falling of the severed piece **128a** it will land substantially flat on the conveyor, as at **163b** for movement therealong in its properly configured relation.

In addition, the aforedescribed operative action of the blade cleaning assemblies **60**, as illustrated in FIGS. **21** and **22**, effects repeated wiping of the entire cutting region of the blade **105**, as the rest-wiper members **111** combine to wipe the entire cutting region of the blade, each moving at least one intergroove **84** distance. This lateral reciprocation by the blade cleaning assemblies **60** is effected by the operator cylinder **73** and may occur in timed relation with respect to the steps discussed above in connection with FIGS. **7–10**. For example, a leftward shifting of the wiper-rests **111**, as indicated by the arrows in FIG. **22**, may occur during one retraction shown in FIG. **10**, and a rightward return shift may occur during the next retraction as shown in FIG. **10**. Other suitable synchronized motions may be effected, for example a complete leftward and rightward cycle of shifting may occur during the retraction step of FIG. **10**, or otherwise, as desired.

MODIFICATION

Referring now to the embodiment of FIGS. **25–28**, it will be seen that a fixed structure is there generally designated **65*b***, including a pair of laterally spaced standards **67*b*** and a laterally extending bridging member or beam **68*b***, all corresponding to the first described embodiment. Also, the embodiment of FIGS. **25–28** includes a pair of laterally spaced pivotally mounted arms **71*b***, each having a longitudinally extending guideway or rod **75*b*** carried on its laterally inner side, also substantially identical to the first described embodiment.

A carrier means **78*b*** may include a pair of laterally spaced, facing plates **79*b***, each slidably mounted on a respective guide rod **75*b*** and rigidly connected together by laterally extending elongate members **81*b***. The carrier means **78*b*** is thus movable with the arms **71*b*** about the pivotal axis of the arms, and also slidable longitudinally of the arms along the guides **75*b***.

The plates **79*b*** may be essentially identical to the plates **79**, each having a centrally bored boss **85*b***. However, the anchor member **87** and bushing **91** of the first described embodiment, and the elements attached thereto, are omitted. In place thereof, a somewhat U-shaped bracket **157** is located laterally outwardly of one arm **71*b***, the left arm as seen in FIG. **17**, having upper and lower legs **131** and **132** extending laterally inwardly, respectively spaced above and below the adjacent arm and suitably fixedly secured to the adjacent plate **79*b***, as by fasteners **133** and **134**, and an adapter block **135**. On the laterally outer end of the bracket **157**, there is rotatably mounted a pulley, wheel or sheave **136**, say for rotation about a shaft **137** extending generally parallel to the axis of guide rod **75*b***. Keyed to the pulley shaft **137** is a sprocket wheel **138**, and an actuator **139** may be mounted on the bracket **130**, say a piston and cylinder type actuator being pivotally mounted on the bracket by an upstanding lug **140**, and having an oscillatory arm or rod **141** provided with a pawl or tooth **142** for engagement with the ratchet wheel **138**. That is, upon successive reciprocations of the arms **141**, the ratchet wheel **138** is rotated in stepped relation about the shaft **137**, to rotate the pulley **136**. A coil spring **143** may maintain the pawl **142** in engagement with the ratchet wheel **138** for moving the latter in one direction and to ride over the ratchet wheel teeth upon pawl movement in the other direction.

Carried by the other carrier means plate **79*b***, the right hand plate in FIG. **26**, is a similar generally U-shaped bracket **145** located outwardly of the adjacent arm **71*b***, and having its legs extending laterally inwardly respectively above and beneath the adjacent arm, as at **146** and **147**. The inner ends of bracket arms **146** and **147** are fixedly secured to the adjacent carrier means plate **79*b***, as by upper and lower fasteners **148** and **149**, and an adapter block **150**. In an outward region of the bracket **145** there is slidably mounted a journal block **151** journaling a shaft **152** generally parallel to pulley shaft **137**, the block being resiliently urged outwardly by a coil compression spring **153**. A wheel, pulley or shieve **154** is carried by the shaft **152**, and an endless cutting band **105b** is trained about the pulleys **136** and **154**, the lower run of the cutting band, as at **155** extending through the bores of bosses **85*b***. Located in one boss **85*b*** there may be provided a blade wiper **156** in wiping engagement with the blade **105*b***.

The operation of the embodiment of FIGS. **25–28** may be substantially the same as that described hereinbefore in connection with the first mentioned embodiment. However, in addition, the cutting band or blade **105*b*** is rotated about its endless path to successively expose different portions of the blade for severing engagement with the die. That is, the actuating means **139** is operated in timed relation with respect to the remaining actuating means, to step the cutting band **105*b*** in the interval between each severance stroke of the carrier means. This intermittent repeated band movement serves to continually wipe the band through the wiping means **156** and maintain the band in proper cutting condition for long continuous periods of use.

The acute angle of the cutting blade with respect to the die face is preferably maintained in the modified embodiment, and may be readily achieved by disposing the parallel pulley shafts **137** and **152** at the desired angle with respect to the guide rods **75*b***. Alternatively, the blade support or rest members **106** may serve to slightly flex the lower blade run **105*b*** to achieve the desired angular relationship with respect to the die surface.

From the foregoing, it is seen that the present invention provides an extrusion machine for pretzels and the like which fully accomplishes its intended objects and is otherwise well adapted to meet practical conditions of manufacture, maintenance and use.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention.

What is claimed is:

1. An extrusion machine for pretzels and the like, said machine comprising dough feeding means having an outlet, an extrusion die in closing relation with said

outlet and having a specifically configured opening for passing a length of dough having a cross-section conforming to said opening, a cut-off mechanism mounted for back and forth movement across said die for severing said dough into slices, and a removal conveyor mounted beneath said die for receiving and removing said slices, said cut-off means comprising a knife blade movable edgewise for engagement with said die and across said die opening in shearing relation with dough being extruded, blade cleaner means slidably receiving said blade for wiping engagement therewith, and motive means for said blade cleaning means, said motive means comprising a carriage mounted for movement with said blade and reciprocation relative thereto longitudinally therealong for effecting said wiping engagement, said die having recesses receiving said blade cleaning means when said blade is engaging said die.

2. An extrusion machine for pretzels and the like, said machine comprising dough feeding means having an outlet, an extrusion die in closing relation with said outlet and having a specifically configured opening for passing a length of dough having a cross-section conforming to said opening, a cut-off mechanism mounted for back-and-forth movement across said die for severing said dough into slices, and a removal conveyor mounted beneath said die for receiving and removing said slices, said cut-off means comprising a knife blade movable edgewise for engagement with said die and across said die opening in shearing relation with dough being extruded, blade cleaner means slidably receiving said blade for wiping engagement therewith, and motive means for said blade cleaner means, said motive means comprising a carriage mounted for movement with said blade and reciprocation relative thereto longitudinally therealong for effecting said wiping engagement, and said die having recesses receiving said blade cleaning means when said blade is engaging said die, said blade cleaning means comprising an elongate wiper having a laterally opening end slot conformably receiving said blade and reciprocable therealong in wiping engagement therewith, said slot having a hollow interior configuration opening endwise from said wiper for egress of wiped material from said slot.

3. An extruding machine according to claim 2, said hollow interior configuration combining with the exterior of said wiper to define a scraping edge for more effective wiping action.

4. An extruding machine according to claim 1, said blade cleaning means comprising an elongate wiper having a laterally opening endslot conformably receiving said blade and reciprocable longitudinally therealong in wiping engagement therewith, and resilient means biasing said cleaning means against said blade into said wiping engagement, the cleaning means biasing said blade toward said die into said shearing relation.

5. An extruding machine according to claim 4, said blade cleaning means comprising a plurality of generally parallel spaced wipers each movable in wiping engagement with a length of said blade at least equal to the space between wipers.

6. An extrusion machine according to claim 2, said blade cleaning means comprising resilient means biasing said cleaning means against said blade into said wiping engagement, the cleaning means biasing said blade toward said die into said shearing relation.

7. An extrusion machine according to claim 2, in combination with carrier means carrying said knife blade at an acute angle with respect to said die for simultaneous shearing and displacement of dough away from said die.

8. An extrusion machine according to claim 2, said cut-off mechanism comprising a fixed structure over said conveyor, arm means carried by said fixed structure for shifting movement toward and away from said die, carrier means mounted on said arm means for movement therewith and movement thereon along said die, said blade being carried by said carrier means for movement with said arm means from a first position spaced from said die toward the latter, then with said carrier means along and in shearing relation with respect to said die, then with said arm means away from said die, and then with said carrier means for return to said first position.

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