June 13, 1967 A. SCHMERMUND 3,324,622

CIGARETTE-MAGAZINE FILLING MACHINES

Filed Sept. 23, 1964 20 Sheets-Sheet 1

Fig. 1

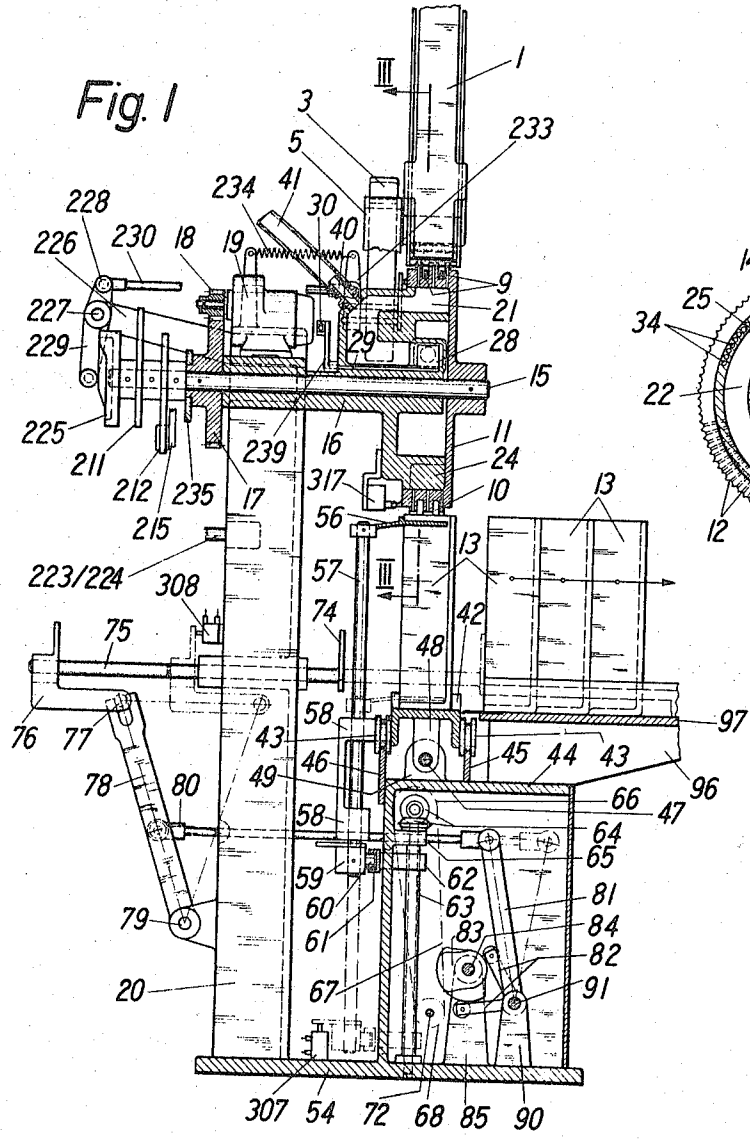
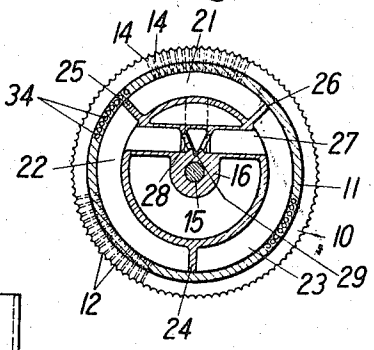


Fig. 3



INVENTOR
ALFRED SCHMERMUND

BY Nolte & Nolte

ATTORNEYS

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CIGARETTE-MAGAZINE FILLING MACHINES

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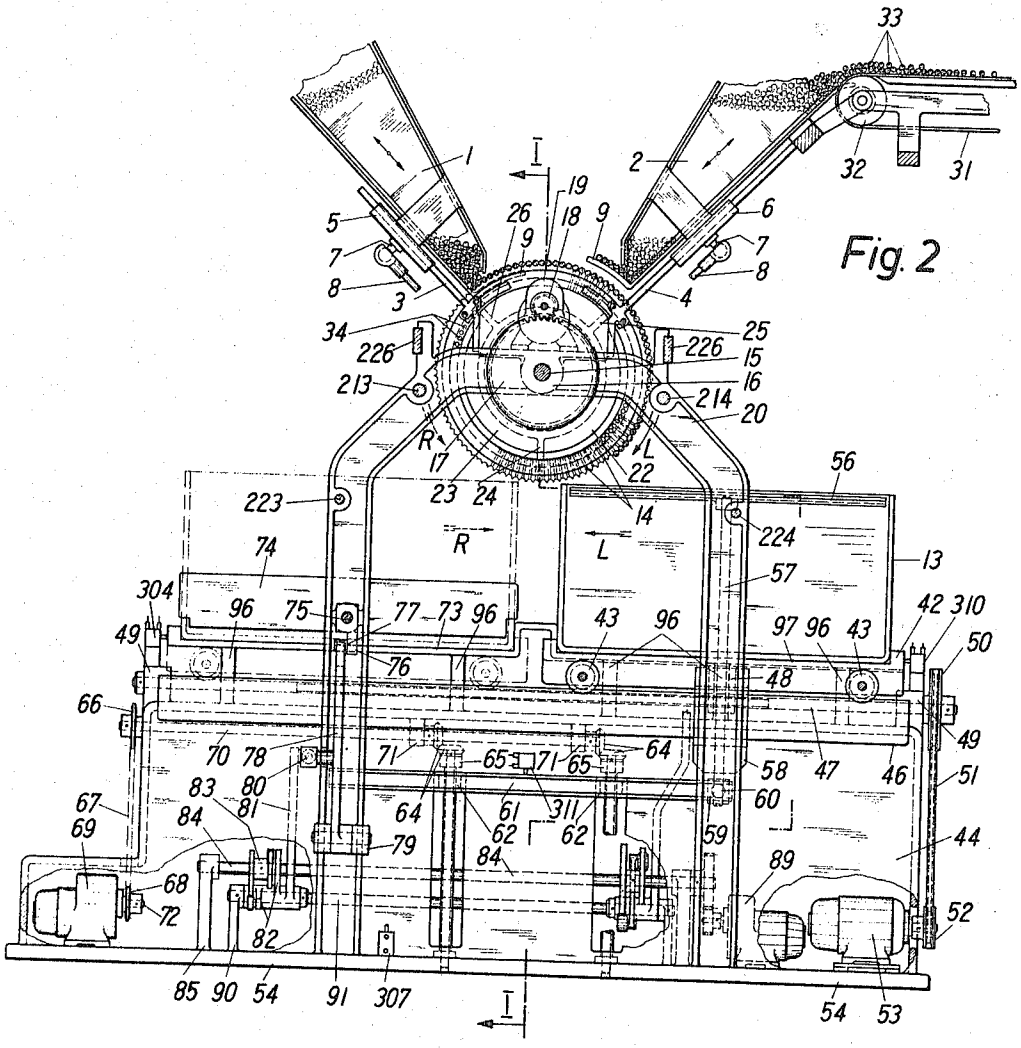


Fig. 2

INVENTOR
ALFRED SCHMERMUND

BY Nolte & Nolte

ATTORNEYS

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CIGARETTE-MAGAZINE FILLING MACHINES

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Fig. 4

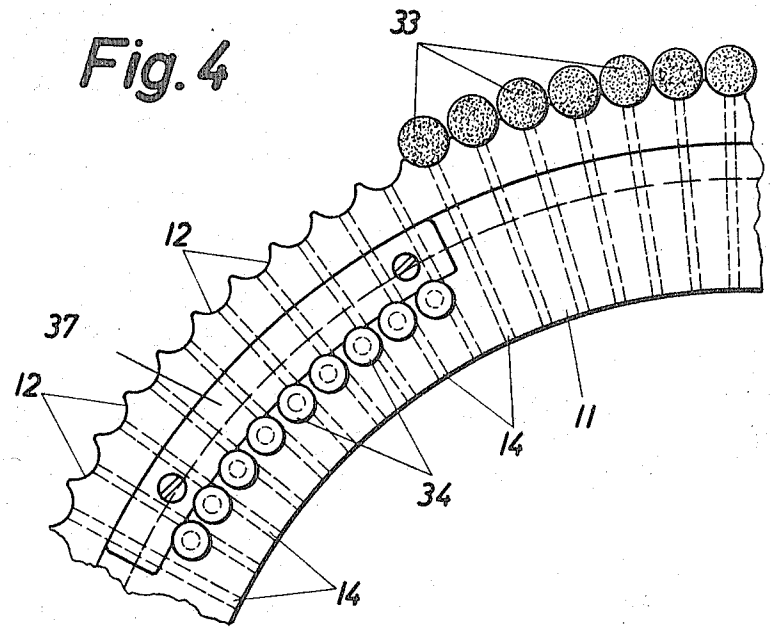


Fig. 5

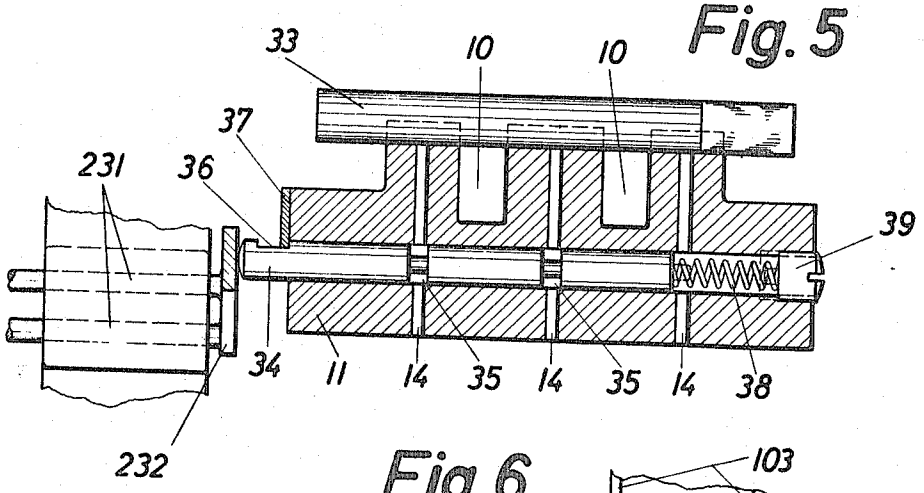
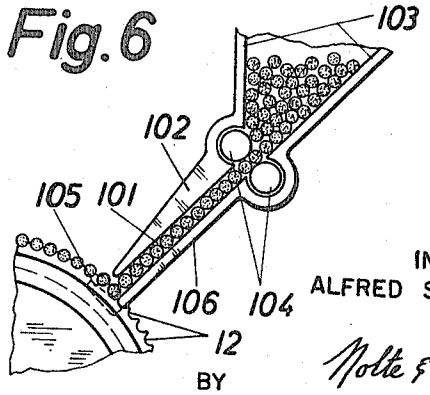


Fig. 6



INVENTOR
ALFRED SCHMERMUND

BY Nolte & Nolte

ATTORNEYS

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CIGARETTE-MAGAZINE FILLING MACHINES

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Fig. 9

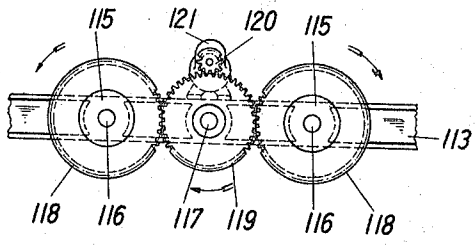
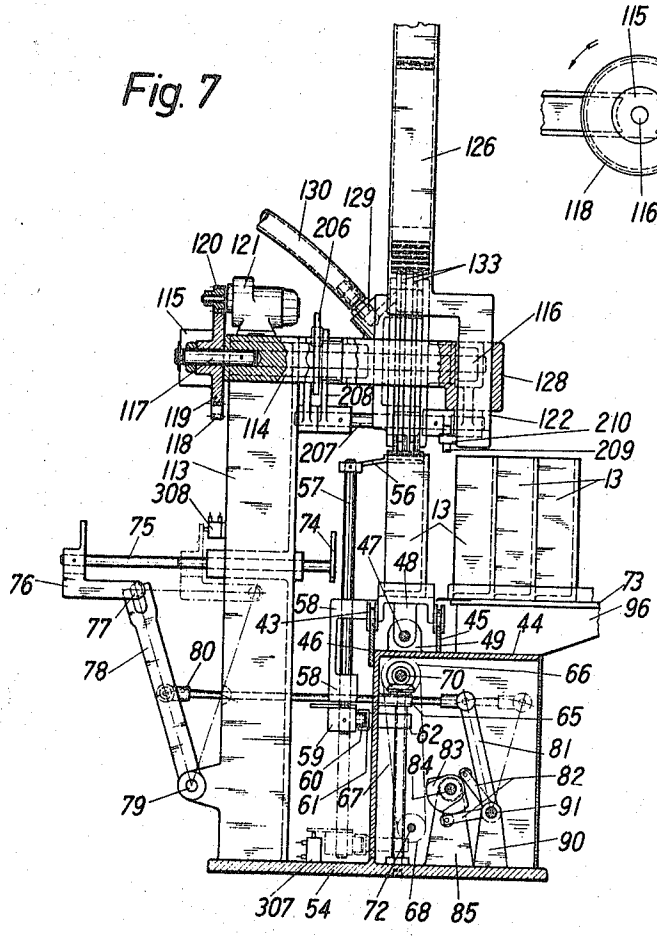


Fig. 7



INVENTOR
ALFRED SCHMERMUND

Nolte & Nolte

BY

ATTORNEYS

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CIGARETTE-MAGAZINE FILLING MACHINES

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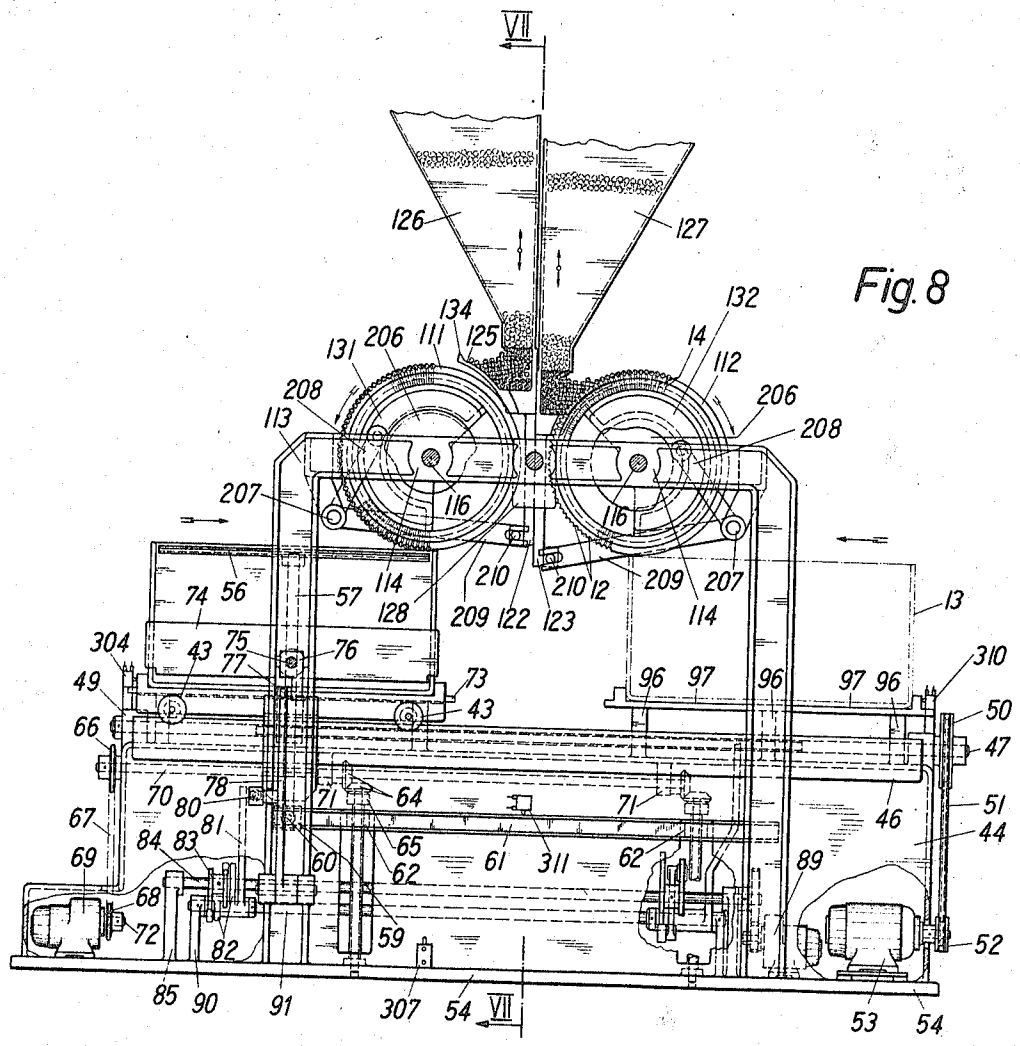


Fig. 8

INVENTOR
ALFRED SCHMERMUND

BY Nolte & Nolte

ATTORNEYS

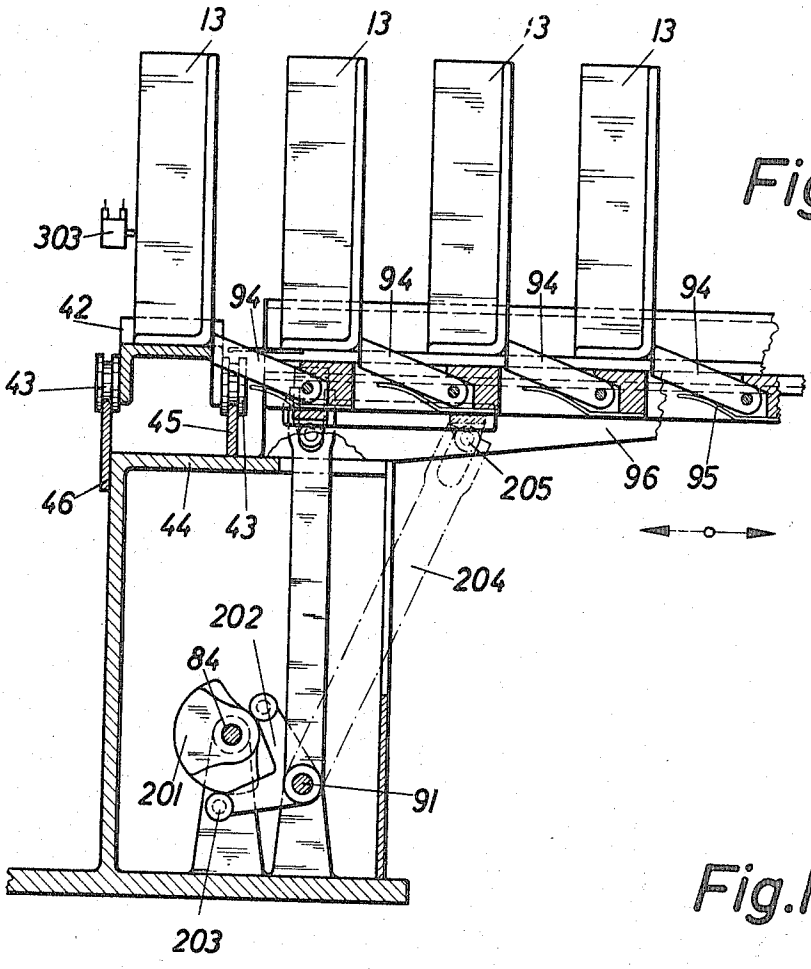
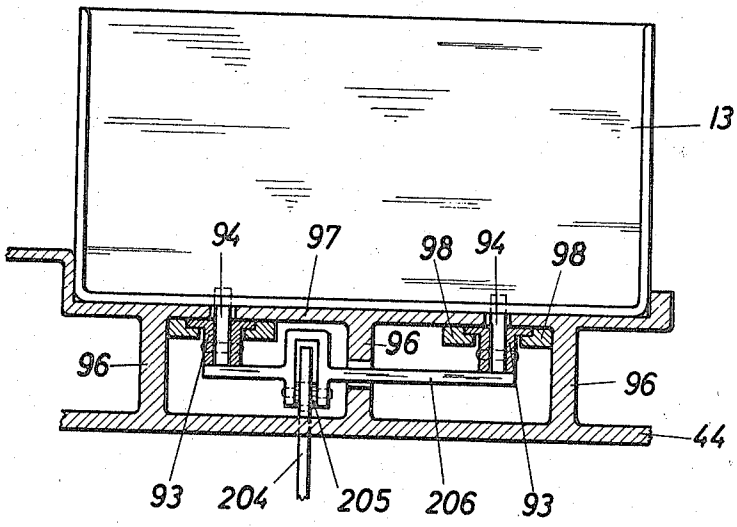

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Fig. 10

Fig. 11


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CIGARETTE-MAGAZINE FILLING MACHINES

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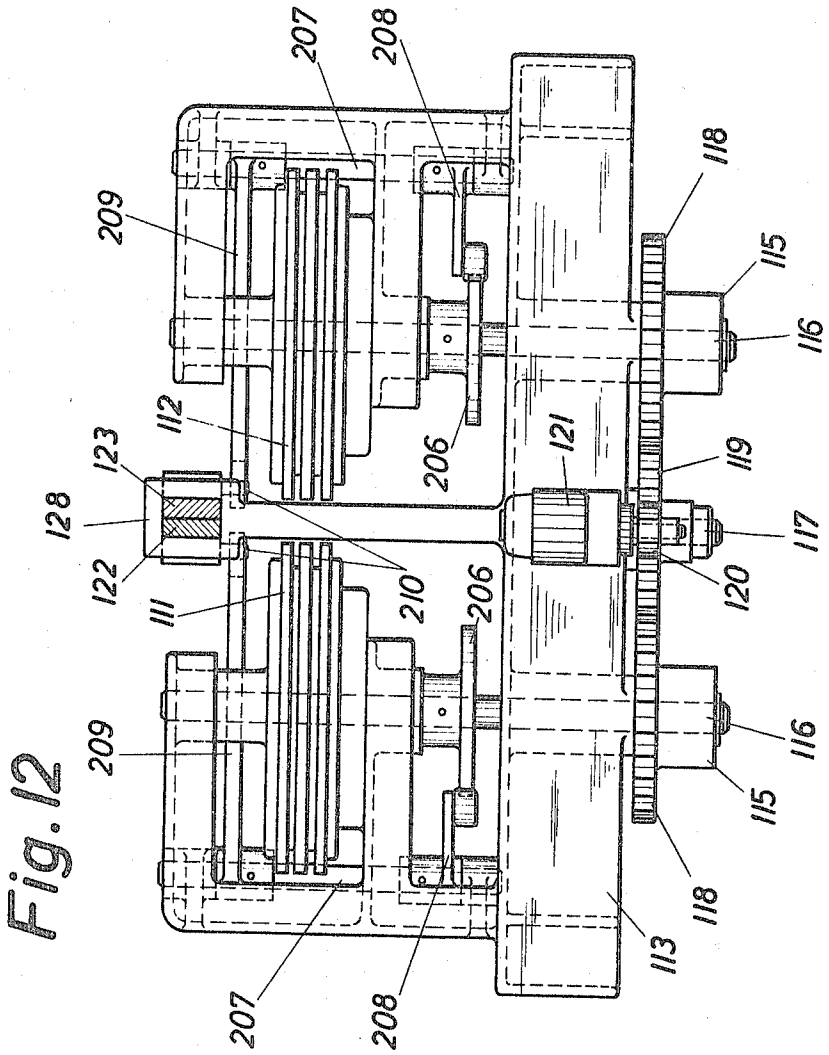


Fig. 12

INVENTOR
ALFRED SCHMERMUND

BY Nolte & Nolte

ATTORNEYS

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CIGARETTE-MAGAZINE FILLING MACHINES

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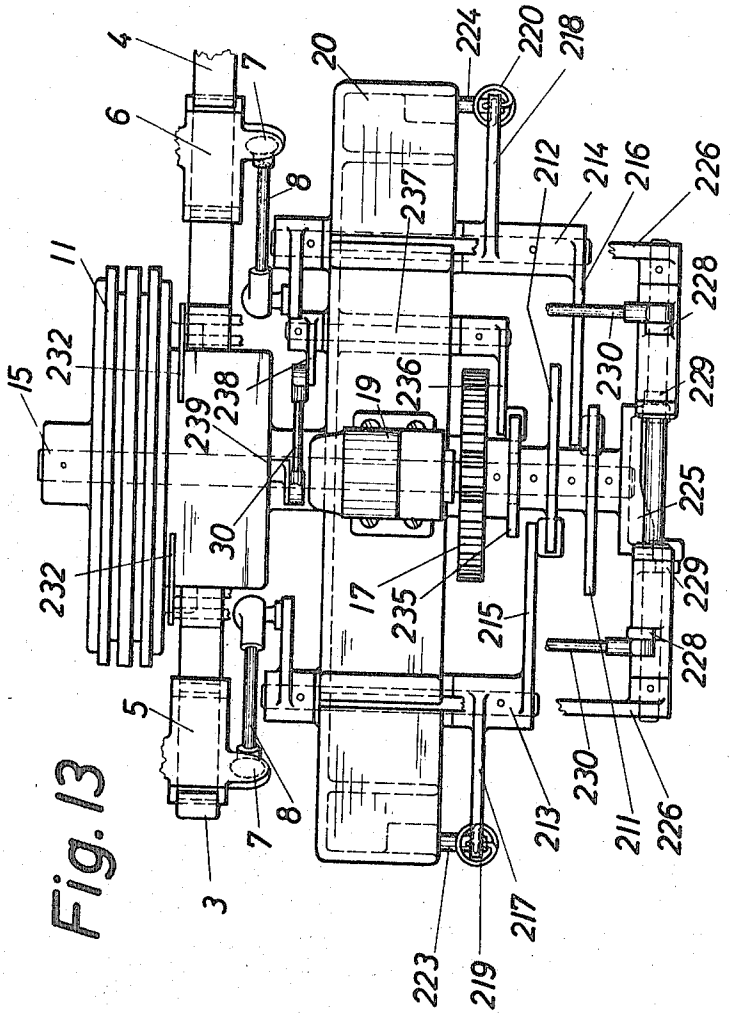


Fig. 13

INVENTOR
ALFRED SCHMERMUND

BY Nolte & Nolte

ATTORNEYS

Fig. 14

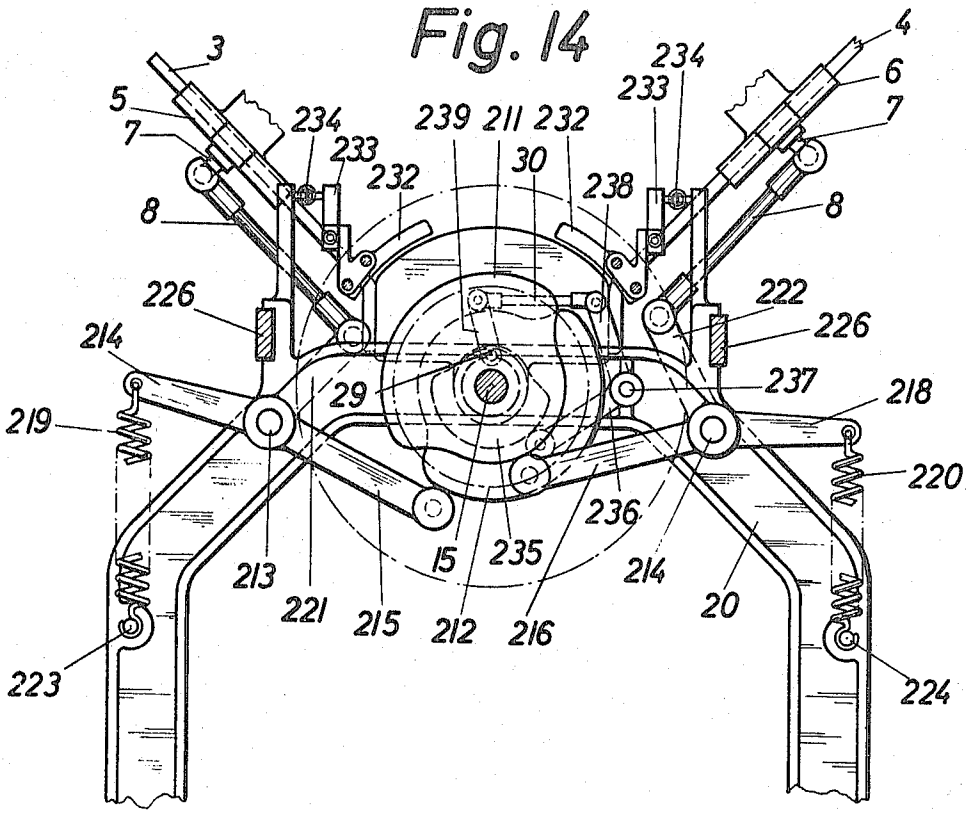
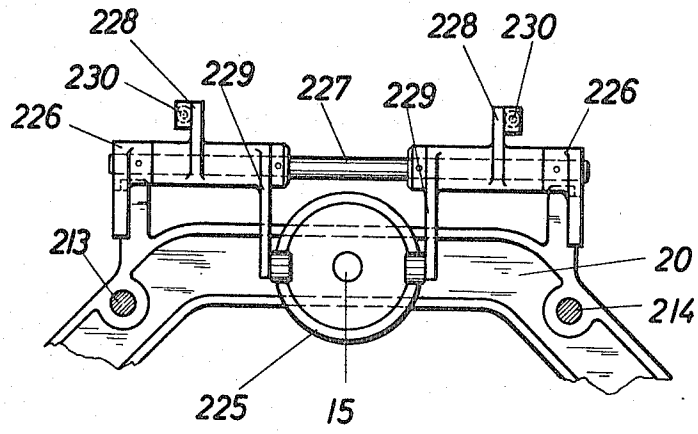

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Fig. 15

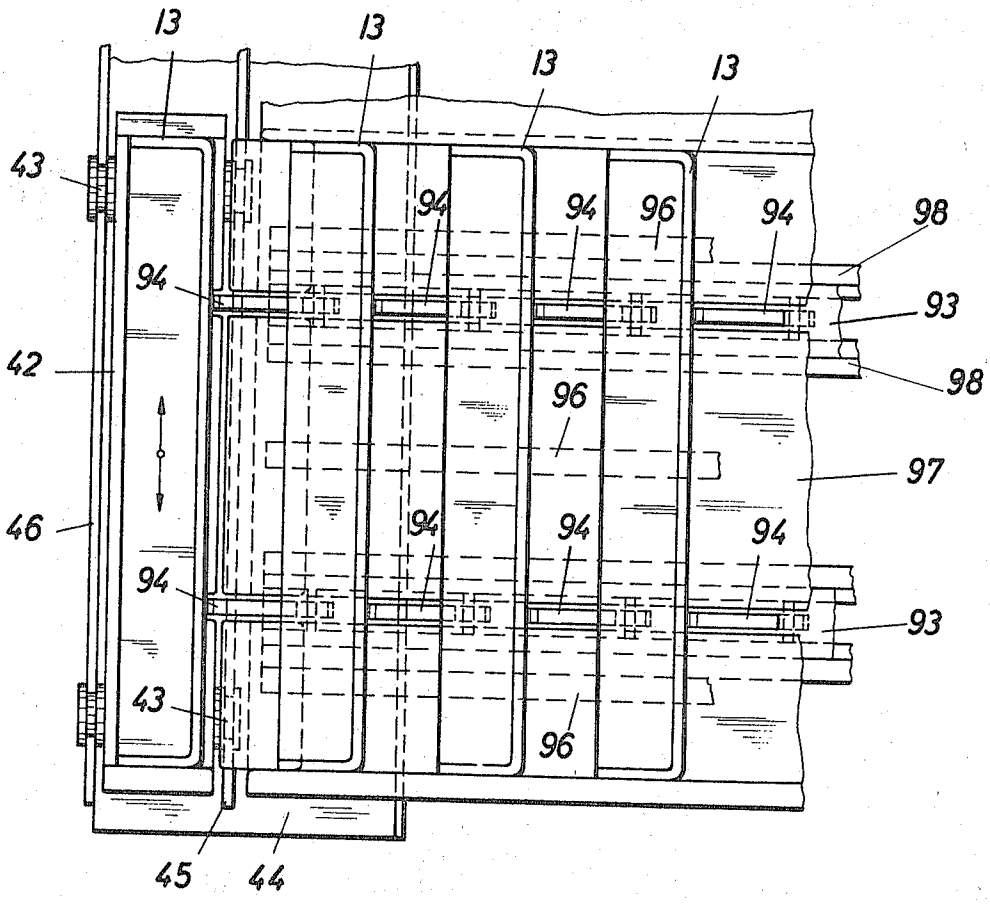

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CIGARETTE-MAGAZINE FILLING MACHINES

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Fig. 16



INVENTOR
ALFRED SCHMERMUND

BY Nolte & Nolte

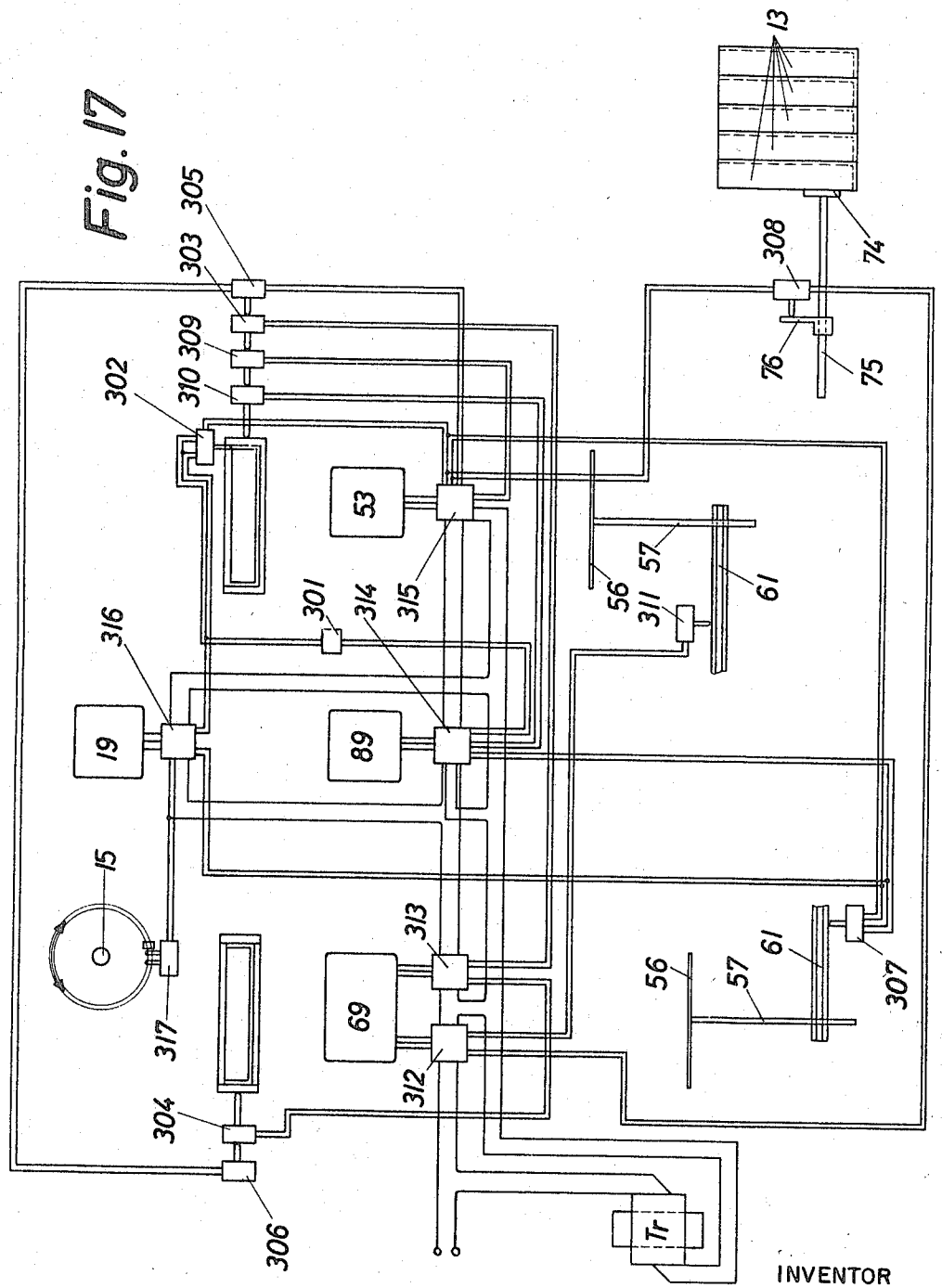
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June 13, 1967 A. SCHMERMUND 3,324,622

CIGARETTE-MAGAZINE FILLING MACHINES

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Fig. 17



INVENTOR
ALFRED SCHMERMUND

BY Nolte & Nolte

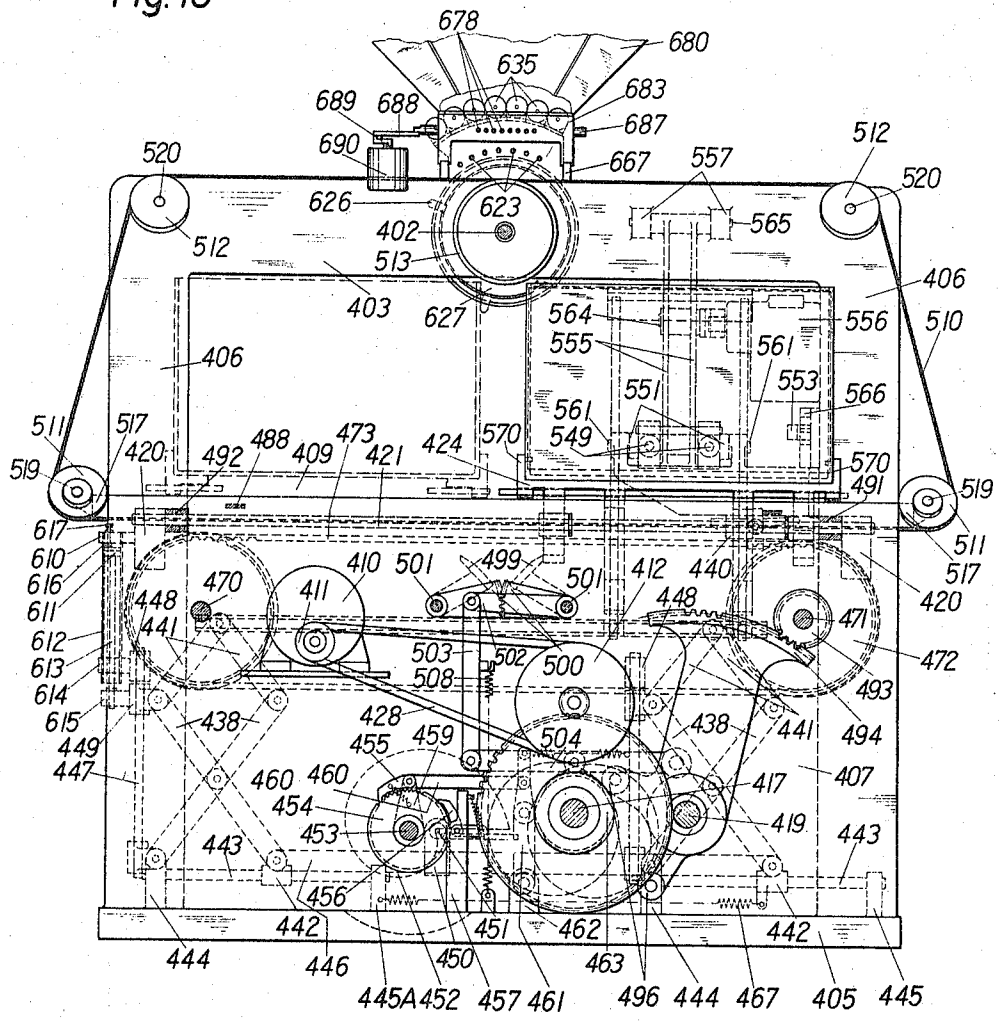
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CIGARETTE-MAGAZINE FILLING MACHINES

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Fig. 18



INVENTOR
ALFRED SCHMERMUND

Nolte & Nolte

BY

ATTORNEYS

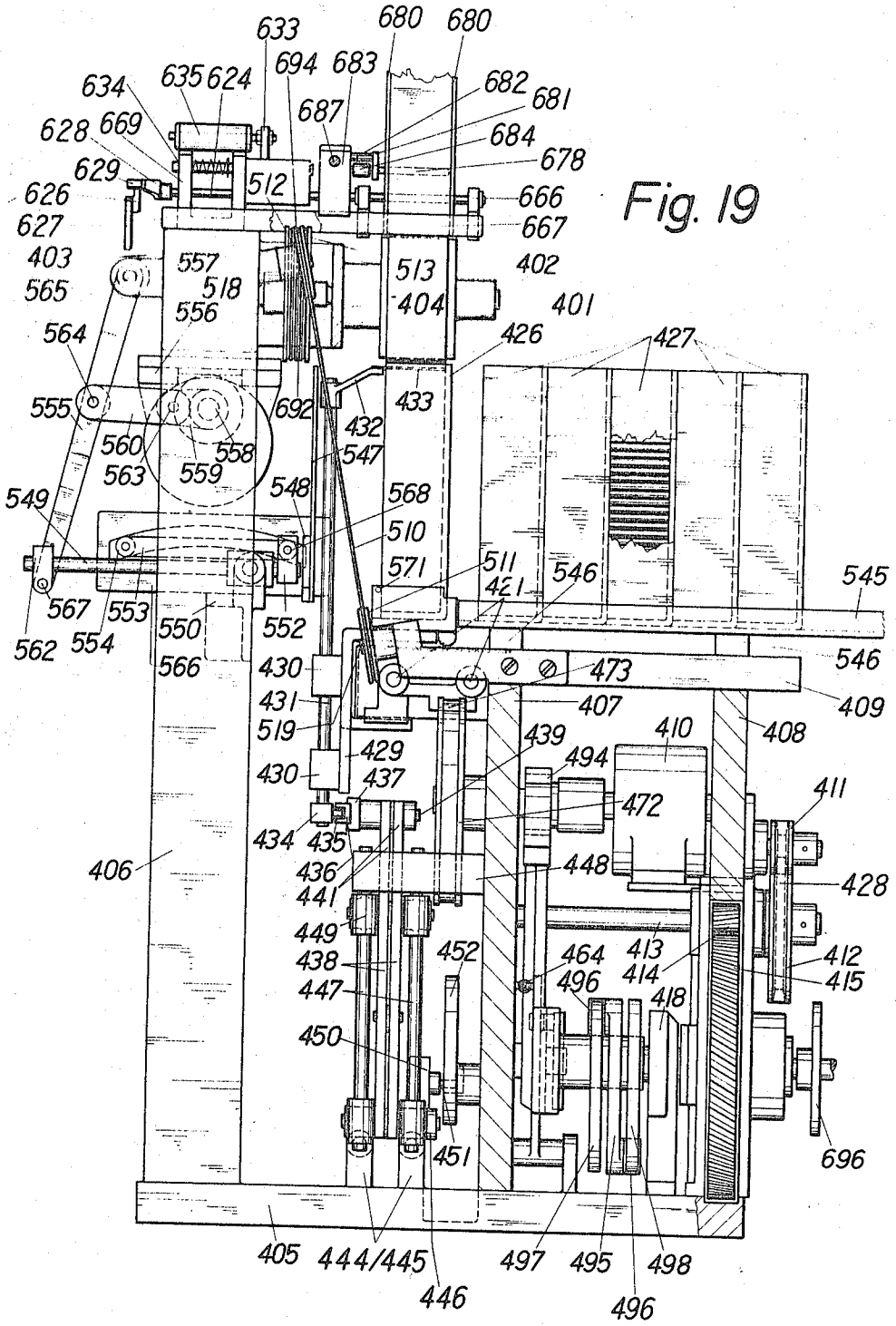

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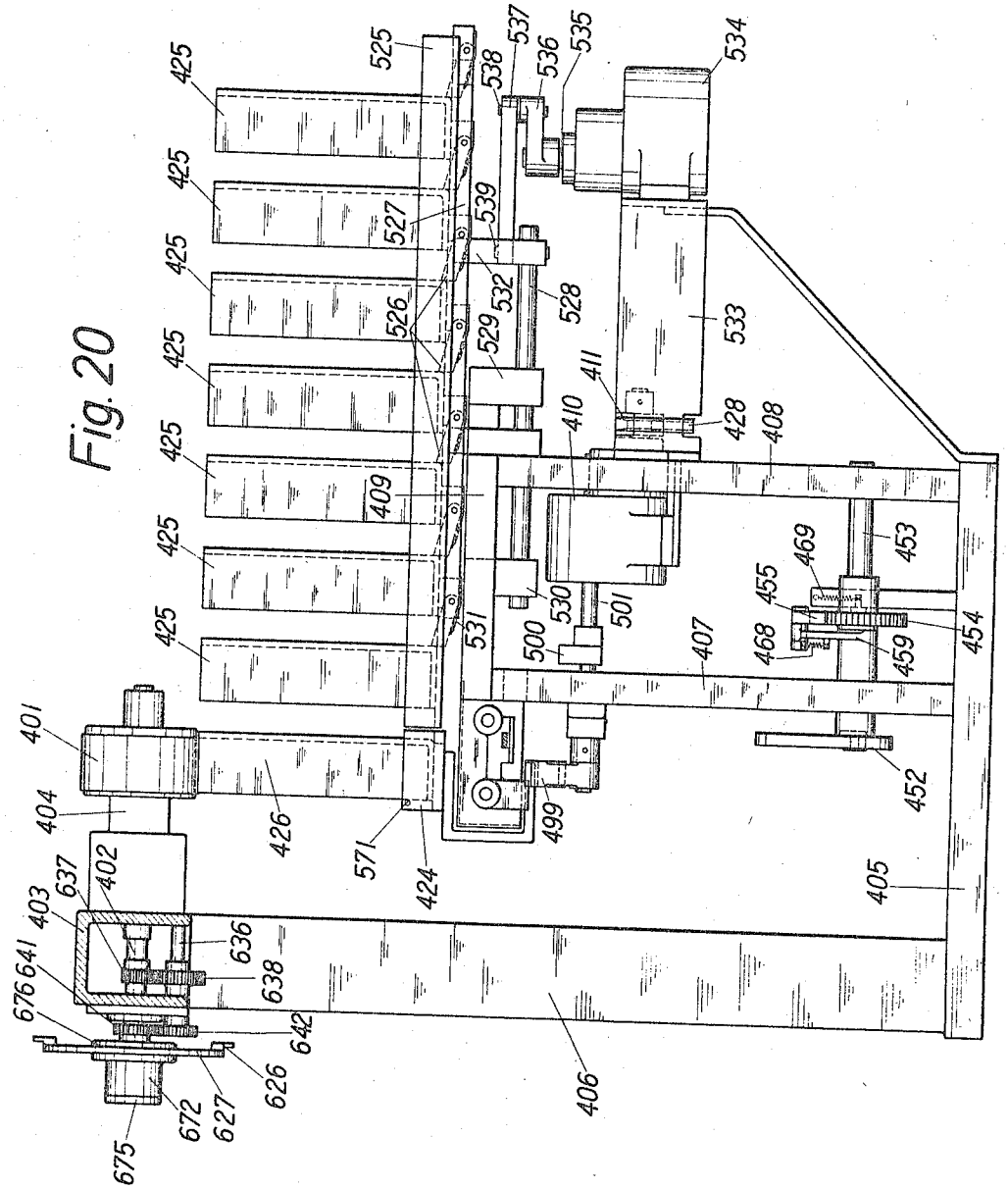
Fig. 19

June 13, 1967 A. SCHMERMUND 3,324,622

CIGARETTE-MAGAZINE FILLING MACHINES

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Fig. 20



INVENTOR
ALFRED SCHMERMUND

BY Nolte & Nolte

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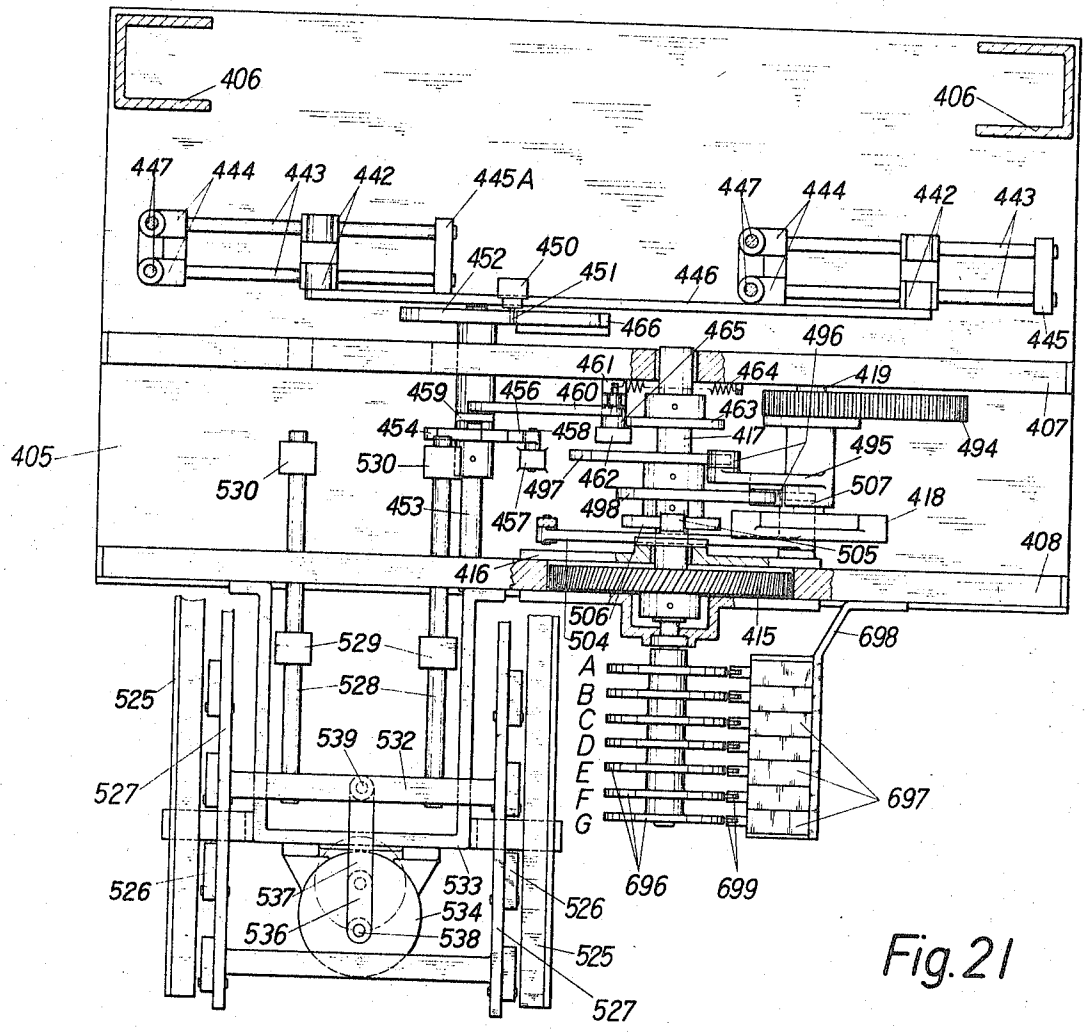


Fig. 21

INVENTOR
ALFRED SCHMERMUND

BY Nolte & Nolte

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June 13, 1967 A. SCHMERMUND 3,324,622

CIGARETTE-MAGAZINE FILLING MACHINES

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Fig. 22

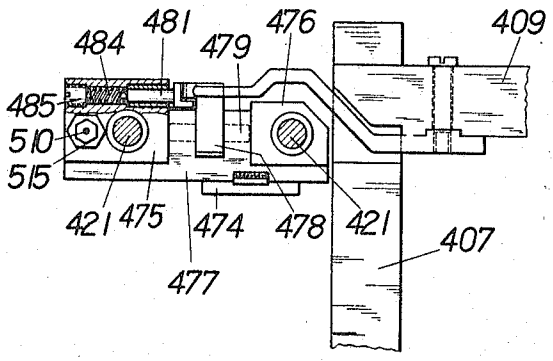
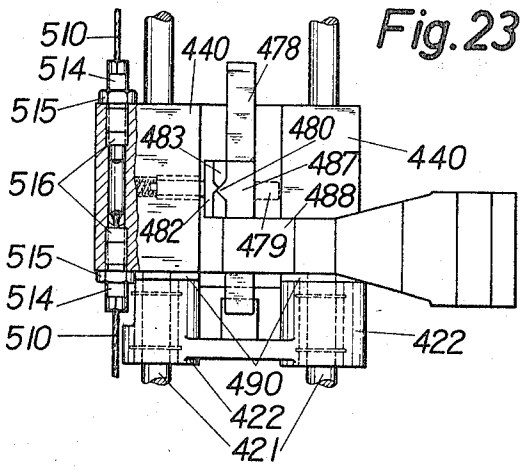


Fig. 23



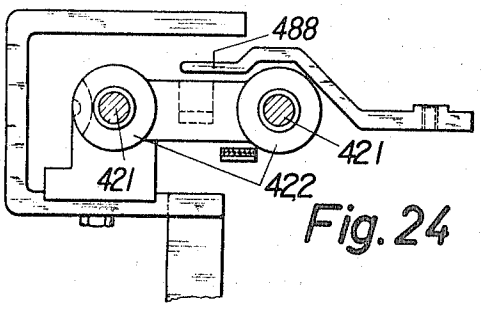


Fig. 24

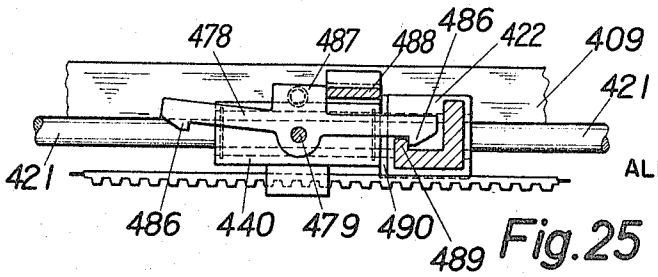


Fig. 25

INVENTOR
ALFRED SCHMERMUND

Nolte & Nolte

ATTORNEYS

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CIGARETTE-MAGAZINE FILLING MACHINES

Filed Sept. 23, 1964 20 Sheets-Sheet 17

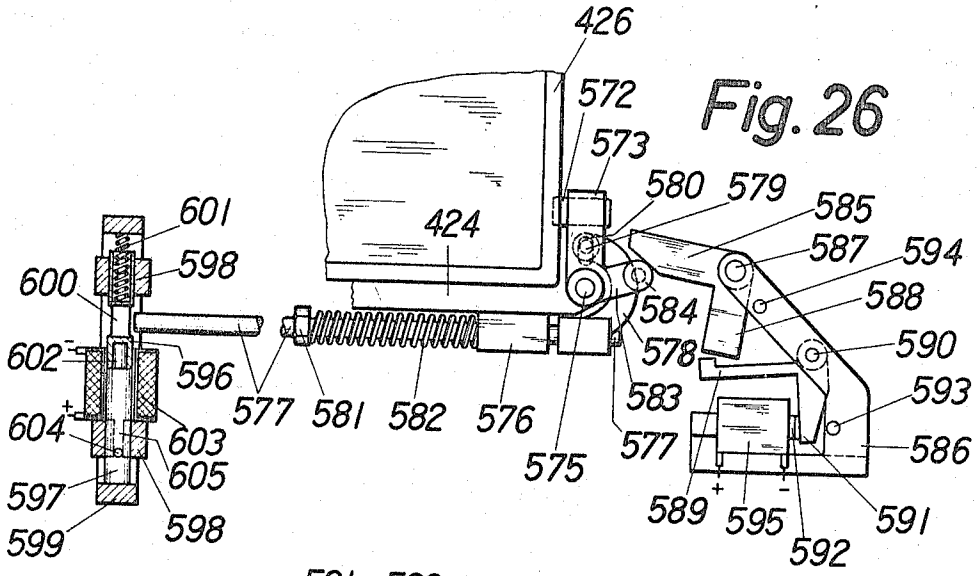


Fig. 26

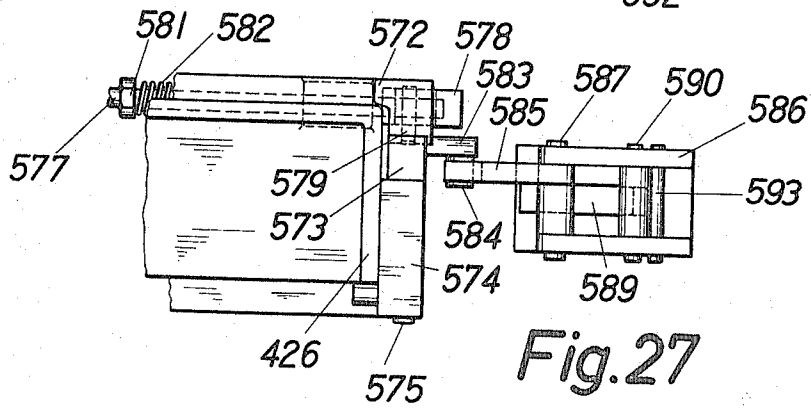


Fig. 27

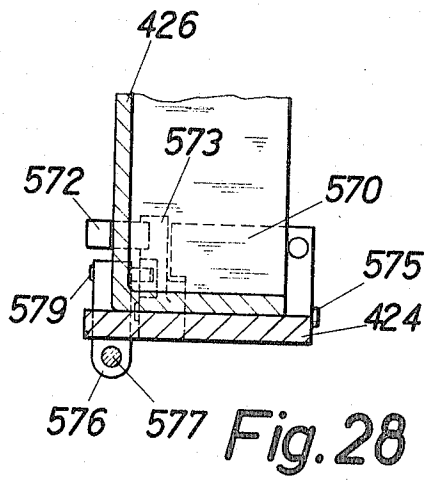


Fig. 28

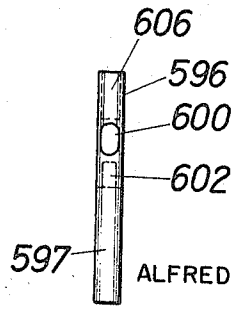


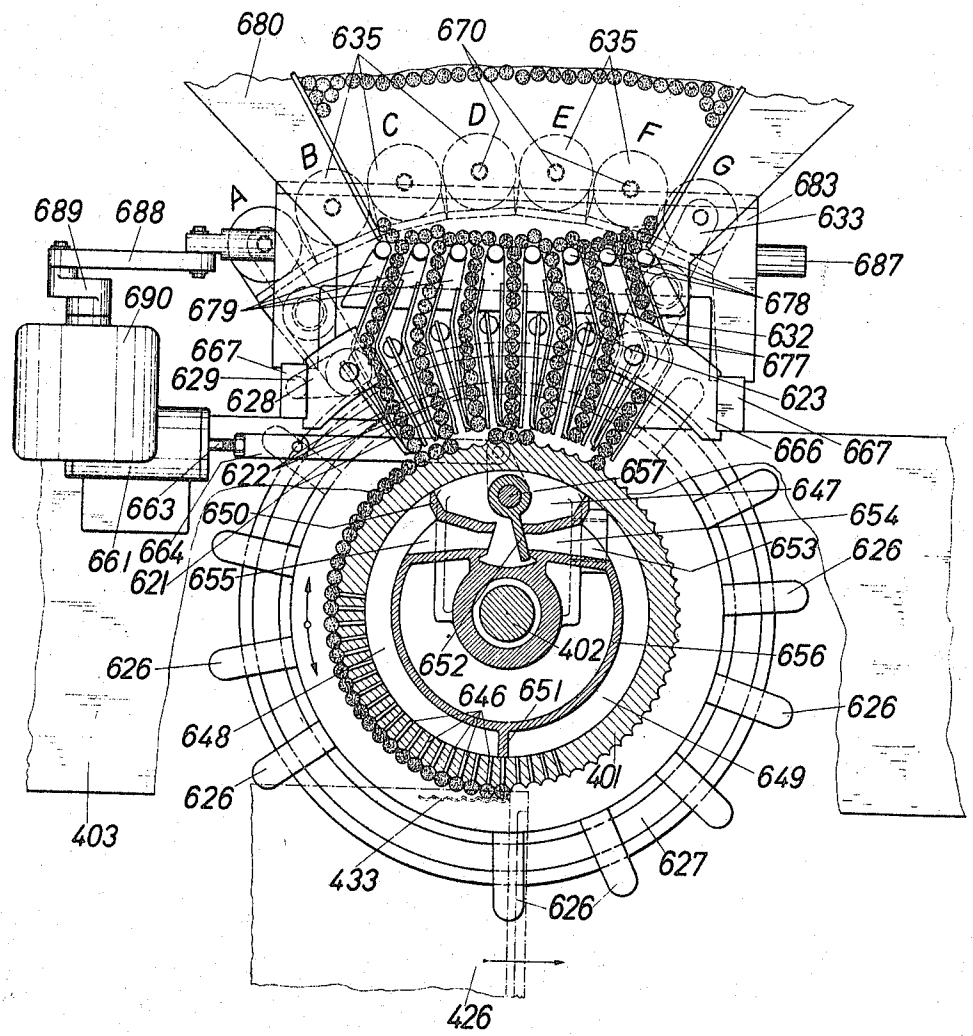
Fig. 29

INVENTOR
ALFRED SCHMERMUND

Nolte & Nolte

ATTORNEYS

Fig. 30



INVENTOR
ALFRED SCHMERMUND

BY Nolte & Nolte

ATTORNEYS

Fig. 31

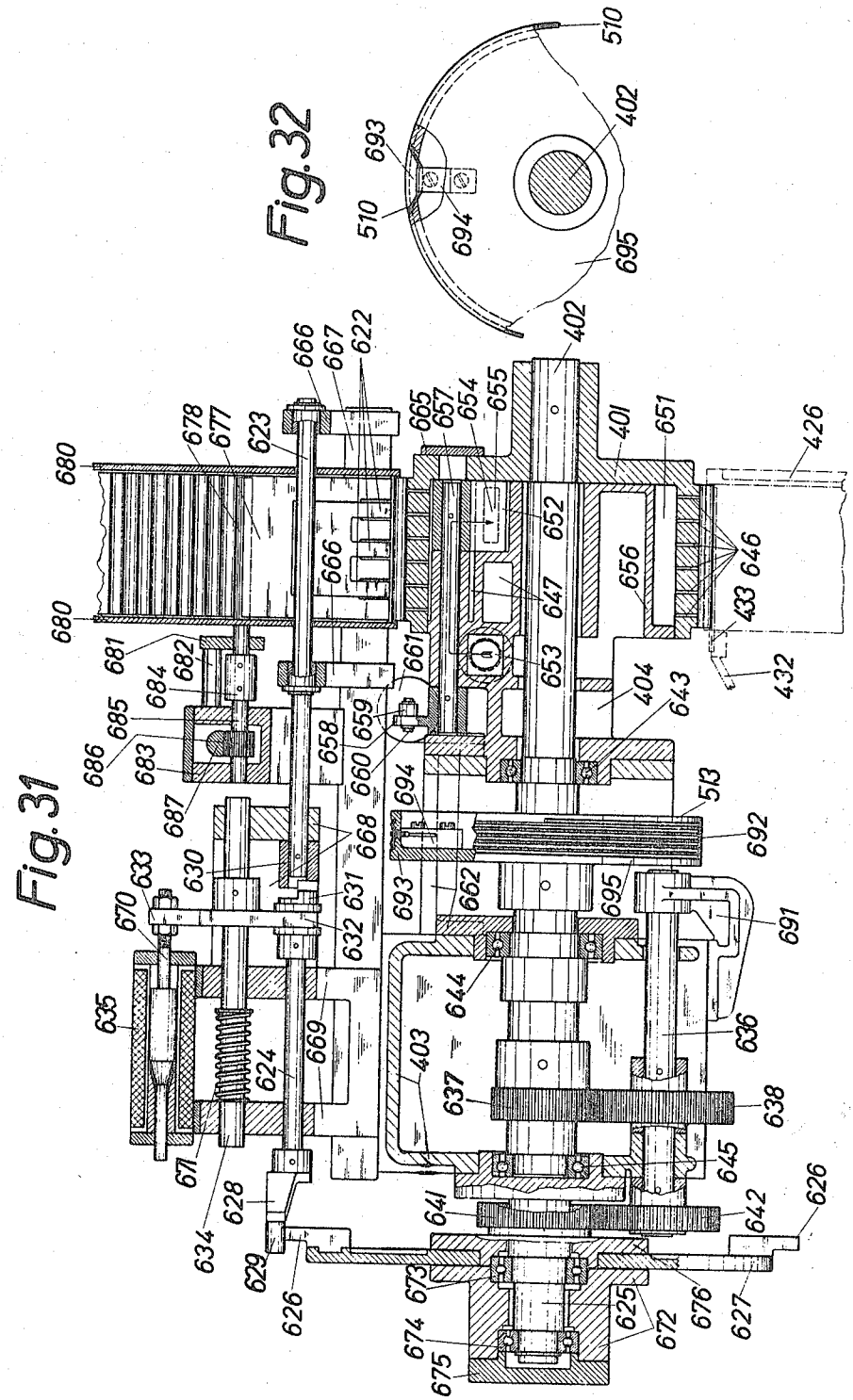


Fig. 32

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CIGARETTE-MAGAZINE FILLING MACHINES

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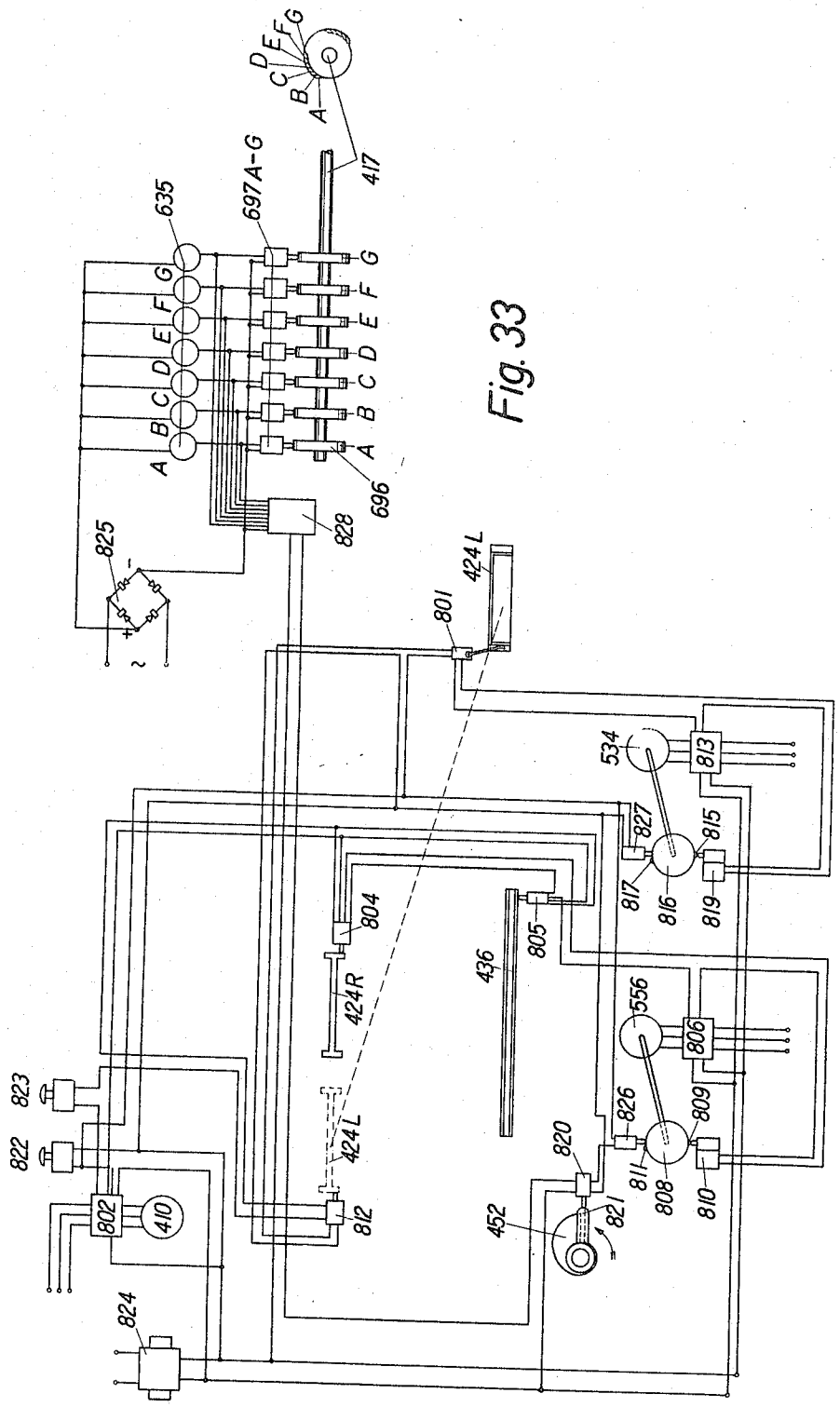


Fig. 33

United States Patent Office 3,324,622
Patented June 13, 1967

3,324,622

CIGARETTE-MAGAZINE FILLING MACHINES

Alfred Schmermund, 62 Kornerstrasse,
Gevelsberg, Westphalia, Germany

Filed Sept. 23, 1964, Ser. No. 398,701
Claims priority, application Great Britain, Sept. 27, 1963, 38,152/63
17 Claims. (Cl. 53—151)

The invention relates to cigarette-magazine filling machines.

Cigarette packing machines are conventionally fed from a hopper which is supplied with cigarettes from magazines which have previously been filled with cigarettes, the filled magazines being successively positioned above the cigarette packing machine hopper and discharged thereinto.

It is an object of the invention to provide a machine for filling such magazines with cigarettes.

It is another object of the invention to enable the cigarettes to be placed in ordered layers into the magazines.

It is a further object of the invention to provide means for facilitating the feed of empty magazines to the machine.

It is still another object of the invention to provide means for facilitating the removal of filled magazines from the machine.

These and other objects of the invention will become apparent to those skilled in the art from the following description when read in connection with the appended drawings which are given way of example only and in which:

FIG. 1 is a sectional side view of a cigarette magazine filling machine, in section along the line I—I of FIG. 2;

FIG. 2 is a front view of the machine;

FIG. 3 is a cross-sectional view of a drum of the machine along the line III—III of FIG. 1;

FIG. 4 is a fragmentary view of the drum of FIG. 3, to a larger scale;

FIG. 5 is a radial cross-sectional view through part of the drum;

FIG. 6 is an end view of a modified arrangement for supplying cigarettes to the drum;

FIG. 7 is a sectional side view of a modified cigarette magazine filling machine, which is similar to the machine of FIGS. 1 to 5 but has two drums, and represents a section along the line VII—VII of FIG. 8;

FIG. 8 is a front view of the machine of FIG. 7;

FIG. 9 is an end view of a drive arrangement for the two drums of the machine of FIGS. 7 and 8;

FIG. 10 is a partly sectional side view of an arrangement for supplying empty magazines to the machine if FIGS. 1 to 6 or 7 to 9, for filling;

FIG. 11 is a front elevational view of the arrangement of FIG. 10;

FIG. 12 is a simplified plan view of FIG. 8;

FIG. 13 is a plan view of FIG. 2;

FIG. 14 is a fragmentary elevational view of the machine of FIG. 2, showing various cam arrangements;

FIG. 15 is a fragmentary view, taken from the left hand side of FIG. 1;

FIG. 16 is a plan view of the arrangement shown in FIG. 10;

FIG. 17 is a circuit diagram for the machine of FIGS. 1 to 5, 10, 11 and 13 to 16;

FIG. 18 is a front view of another embodiment of a cigarette magazine filling machine;

FIG. 19 is a sectional view of the machine of FIG. 18, taken through a region of the machine at which filled magazines are discharged from the machine;

FIG. 20 is a sectional view of the machine of FIG. 18,

taken through a region of the machine at which empty magazines are supplied to the machine;

FIG. 21 is a simplified plan view of the machine of FIGS. 18, 19 and 20;

FIG. 22 is a fragmentary view, showing a guide arrangement for a magazine carriage;

FIG. 23 is a plan view of the arrangement shown in FIG. 22;

FIG. 24 is a transverse sectional view of the arrangement shown in FIG. 23;

FIG. 25 is a longitudonal sectional view of the arrangement shown in FIG. 23;

FIG. 26 is an elevational view of a detail of the machine, showing a magazine clamping device;

FIG. 27 is a plan view of the device of FIG. 26;

FIG. 28 is a sectional side view of the device of FIG. 26;

FIG. 29 is a side view of an armature member forming part of the device of FIG. 26;

FIG. 30 is a cross sectional view of a suction drum of the machine, showing an arrangement for feeding cigarettes thereto;

FIG. 31 is a sectional side view of the machine, showing a cable drum;

FIG. 32 is a fragmentary elevational view of the cable drum; and

FIG. 33 is a circuit diagram for the machine of FIGS. 18 to 32.

The machine of FIGS. 1 to 5 comprises cigarette supply hoppers **1** and **2** which are respectively carried by slides **5** and **6** movable on guide bars **3** and **4**. The slides **5** and **6** carry studs **7** which are engaged by operating rods **8** which serve for moving the slides and therewith the hoppers along the bars **3** and **4**, the operating rods **8** being actuated by drive means which are shown in FIGS. 13 and 14. Referring to FIGS. 13 and 14 it will be seen that two cams **211** and **212** are provided on a shaft **15** to which a drum **11** is fixed. Two lever shafts **213** and **214** are rotatably mounted in a frame **20** of the machine. At one end of the shafts **213** and **214**, roller levers **215** and **216** respectively, are provided, their rollers being in contact with the cams **212** and **211** respectively. Tension springs **219** and **220** are provided which extend between the lever arms **217** and **218** and spring-retaining studs **223** and **224** on the frame **20**. At their other ends, the shafts **213** and **214** carry levers **221** and **222** to which the operating rods **8** are pivoted.

Referring again to FIGS. 1 to 5, a conveyor belt **31** is provided for supplying cigarettes to the hopper **2**, the conveyor belt **31** being guided over a pulley **32**. Cigarettes **33** carried by the conveyor belt **31** fall into the hopper **2**. A similar conveyor belt (not shown) is provided for supplying cigarettes to the hopper **1**.

The hoppers **1** and **2** have cigarette supporting rails **9** which can engage in peripheral channels **10** of the drum **11**. The drum **11** has trough-like recesses **12** at its periphery, extending in the axial direction, there being twice as many recesses **12** as the maximum number of cigarettes which can be accommodated in a single layer in a magazine **13** which is to be filled with cigarettes by means of the machine.

The drum **11** is hollow and each recess **12** is in communication with radial bores **14** which extend between the recesses **12** and the interior of the drum **11**. The shaft **15** to which the drum is fixed is mounted in a bearing **16** fixed to the frame **20** of the machine. At one end, the shaft **15** carries a spur wheel **17** which meshes with a driving pinion **18** fixed to the shaft of a reversible driving motor **19**, the motor being fixed on the frame **20**.

The driving motor **19** is connected in an electric circuit which periodically reverses the direction of running of

the motor 19. This can be done by a known timing mechanism (not shown) but it is preferred to use a known motor-reversing limit-switch arrangement which will be described subsequently with reference to FIG. 17. In either case, the drum is periodically rotated in one direction through one revolution and then back through one revolution.

The bearing 16 has a part which extends into the interior of the drum, this part having radial webs 24, 25 and 26 on the ends of which the inner wall of the drum slidingly engages. The webs 24, 25 and 26 define suction chambers 21, 22 and 23 at the interior of the drum, the chamber 21 being connected to a suction line 41 by a connection stub 40, and communicating with one side of a flap valve 28 which is swingable by means of an operating shaft 29 into a position in which the chamber 21 is in communication with the chamber 23 through a duct 27 or into a position in which the chamber 21 is in communication with the chamber 22. The operating shaft 29 is actuated by a linkage from a control cam 235 (see also FIGS. 13 and 14). The cam 235 actuates a roller lever 236 which is provided on a shaft 237 rotatably mounted in the frame 20 of the machine. The shaft 237 carries a lever 238 to which a pull rod 30 is pivoted by one end. The other end of the pull rod 30 is pivoted to a lever 239 which is fixed on the shaft 29 which operates the flap valve 28.

When the drum 11 is being driven in the direction of the arrow L in FIG. 2, the hopper 1 is lowered so that the cigarette supporting rails 9 thereof engage in the channels 10 of the drum 11. Cigarettes are then deposited from the hopper 1 into the recesses 12 over one half of the periphery of the drum. Subsequently, cigarettes are deposited from the hopper 2 into the recesses 12 over the other half of the drum periphery, while cigarettes in the recesses of the first half of the drum periphery are discharged therefrom, as will be explained in detail further below.

It will be appreciated that the cigarettes taken from the hopper rails 9 by the drum are retained in the recesses 12 by the action of the vacuum present in the drum chamber 21 and in the drum chamber 22 or 23, the flap valve 28 being so operated that the chamber 21 communicates with the vacuum chamber 22 during rotation of the drum in the direction of the arrow L whereas the chamber 21 communicates with the vacuum chamber 23 during rotation of the drum in the direction of the arrow R.

As will be seen from FIGS. 4 and 5 the drum 11 carries a plurality of slide valves 34, one for each recess 12, only a few of the slide valves 34 being indicated in FIG. 4 for clarity. The slide valves 34 are in the form of rods extending through bores which intersect the suction bores 14. The rods 34 have grooves 35 which register with the suction bores 14 in the normal position of the rods 34. An abutment ring 37 screwed to the drum 11 engages in a notch 36 of each rod 34, the normal position of the rods 34 being such a position in which each rod abuts against the ring 37 under the action of a compression spring 38, the springs 38 extending between the inner ends of the rods 34 and threaded plugs 39 in the drum 11. Due to the disposition of the valve rod grooves 35, the suction bores 14 of a given cigarette-receiving recess 12 are shut off if the relevant valve rod 34 is pressed against the action of the spring 38.

As will be seen from FIGS. 1, 5, 13, 14 and 15, a face cam 225 is provided on the end of the shaft 15. A shaft 227 is mounted by cantilever brackets 226 on the frame 20 of the machine and levers 228, 229 are rotatably mounted on the shaft 227. The lever arms 229 carry rollers which bear against the face cam 225 and, accordingly, the levers 228, 229 are rocked in dependence on rotation of the cam 225. Rods 230 are pivoted by one end to the lever arms 228 and the valve rods 34 are actuated by a pressure plate 232 which is operated by studs 231 to which the rods 230 are linked at 233. Tension springs 234 extending between the linkage regions 233 and the frame 20 of the machine maintain the lever arms 229 in positive engagement with the cam 225. As the drum 11 rotates backwards and forwards, rather than continuously, a single cam 225 is sufficient for controlling the valve rods 34. In operation, the cam 225 rotates and operates the levers 228, 229, which displace the rods 230 and, through the pressure plate 232, the valve rods 34.

The magazine 15 to be filled with cigarettes is supported in a carriage 42 which has rollers 43 running on guide rails 45 and 46 carried by a frame 44 of the machine (see FIGS. 1 and 2). The carriage 42 is displaceable to and fro along the guide rails by means of a threaded spindle 47 which engages a nut 48 secured to the carriage. The spindle 47 is mounted in bearings 49 in the frame 44 and is driven by a pulley 50 from a pulley 52 of a motor 53, by means of a V-belt 51, the motor 53 being mounted on a base 54 of the machine.

A plate 56 fixed to a slide rod 57 is provided for receiving cigarettes from the drum 11. The slide rod 57 is guided in a bearing 58 fixed to the carriage 42 and carries at its lower end a block 59 on which a roller 60 is mounted. The roller 60 extends into a horizontally disposed channel-rail 61 and can move to and fro along the length of the channel rail 61 with movement of the carriage 42. The channel rail 61 carries nuts 62 which engage threaded spindles 63 so that by rotation of the spindles 63 and rail 61 can be moved upwards or downwards, and therewith the slide rod 57 and plate 56.

The spindles 63 are mounted in bearings 62 and in the base plate 54 of the machine, and at their upper ends carry bevel wheels 64 which mesh with further bevel wheels 64 fixed on a horizontal shaft 70. The shaft 70 is mounted in the machine frame 44 and in bearings 71 and at one end carries a chain wheel 66 which is driven by a chain 67 from a chain wheel 68 fixed on a shaft 72 of a driving motor 69. The motor 69 is mounted on the base plate 54 and has two speeds, one providing a crawling action and the other a rapid action.

The operation of the machine thus far described is as follows:

An empty magazine 13 on the carriage 42 has the position shown in full lines in FIG. 2. The carriage 42 is then moved in the direction of the arrow L and at the same time the drum 11 is rotated in the direction of the arrow L. Cigarettes fed to the drum recesses 12 from the hopper 1 are retained therein by the suction action, as a result of the suction bores 14.

The cigarette-receiving plate 56 is in the uppermost position, as shown in FIG. 2. As the plate 56, due to movement of the carriage 42, moves tangentially below the drum 11 the cigarettes held in the recesses 12 are successively released, this being effected by successive engagement, of the slide valve rods 34 against a fixed abutment 317. Thus, during rotation of the drum 11 in the direction of the arrow L, a layer of cigarettes is formed on the plate 56, the magazine 13 having at this stage reached the position shown in broken lines in FIG. 2. The direction of rotation of the drum 11 and the direction of traversing of the carriage 42 are then reversed, the plate 56 is lowered by an amount equal to the diameter of the cigarettes, and a further layer of cigarettes is formed in a similar manner to the first layer, the further layer lying on top of the first formed layer. By appropriate choice of the end positions of traversing of the carriage 42, it can be achieved that the cigarettes of the further layer and of subsequent layers lie staggered by half a diameter with respect to the cigarettes of the layer lying immediately thereunder.

With successive traversing of the magazine 13 by means of the carriage 42, the plate 56 is gradually lowered by means of the slide rod 57 until it reaches the position shown in broken lines in FIG. 1, this being the position in which the magazine 13 is completely full.

After the magazine has been filled, it is pushed on to a support plate 73 at the rear of the guide rails 45 and 46 by means of a ram plate 74. The ram plate 74 is carried by a slide rod 75 slidably mounted in a bearing on the frame 20, the end of the rod 75 carrying an arm 76 on which a stud 77 is provided, the stud 77 being engaged in a forked lever 78 which is pivoted in a bearing 79 on the frame 20. A pull rod 80 is pivotally connected at one end to the lever 78 and extends through a bearing on the frame 44 and is pivotally connected at its other end to a lever 81, 82 which is actuated by a cam 83 mounted on a shaft 84. The shaft 84 is mounted in bearings 85 and carries at one end a spur wheel 86 which meshes with a driving pinion 87 of a driving motor 89.

In place of the hoppers 1 and 2 in the machine of FIGS. 1 to 5, hoppers having the form shown in FIG. 6 may be used for feeding the drum 11. These hoppers have a channel 101 formed by members 102 and 106 which represent extensions of hopper walls 103, member 106 having cigarette supports 105 which can engage in the channels 10 of the drum 11. Rollers 104 are provided in recesses in the walls 103 and are rotatable to and fro by known means (not shown) and serve for controlling the entry of cigarettes into the channel 101.

It will be understood that the various motors 19, 53, 69 and 89 which are shown in FIGS. 1 and 2 have to be controlled in relation to each other and in relation to the functions which they perform, and this will now be described with reference to FIG. 17.

The motors are operated by high voltage, for example 360 volts, and the voltage supply to the motor is switched by means of relays operated by low voltage, for example 24 volts. This means that less stringent safety precautions have to be taken in the arrangement of various limit switches and connecting wires.

Motor 19 is controlled by relay 316, motor 69 by relays 312 and 313, motor 89 by relay 314 and motor 53 by relay 315.

Relay 314 is operated by a manual switch 301 and by this means the motor 89 is placed in operation and thereby an empty magazine is supplied to the carriage 42. When in its end position, the empty magazine actuates a limit switch 302 which causes the motor 89 to be switched off and causes the motor 53 to be switched on. The motor 53 is responsible for the to and fro movement of the carriage 42 and this movement is controlled by limit switches 305 and 306 which serve for repeatedly reversing the direction of running of the motor 53, the relay 315 controlling the reversing of the motor 53. The limit switch 302, when actuated, also causes the motor 19 to be energized for rotation of the drum 11, the repeated reversing of the running direction of the motor 19 being effected by means of the relay 316 and a double limit switch 317 operated by a portion of the drum 11.

Whenever the carriage 24 reaches one of its end positions, a respective limit switch 303 or 304 is actuated thereby. The limit switches 303 and 304 control the motor 69 through the relay 313 and cause the motor 69 to be switched on for a short period, sufficient for the plate 56 (see FIG. 2) to be lowered by an amount equal to the thickness of a layer of cigarettes. When the plate 56 has reached its lowermost position, that is to say when the magazine has been filled, a limit switch 307 is actuated by the channel-rail 61. The limit switch 307 controls relays 314, 315 and 316 and causes motors 53 and 19 to be switched off and motor 89 to be switched on, whereby to effect ejection of the filled magazine. The arm 76 carried on the rod 75 which operates the ram plate 74, actuates a limit switch 308 when the ram plate 74 reaches its extreme stroke position, and the switch 308, which is connected to the relays 315 and 312, then causes the motor 53 to be switched on for the return movement of the carriage 42 and causes the motor 69 to be switched by the relay 312 for fast running, whereby to rapidly return the plate 56 to its uppermost position. When the plate 56 reaches its uppermost position, the channel-rail 61 actuates a limit switch 311 which is connected to the relay 312 and by means of which the motor 69 is switched off. The motor 53 is then switched on by actuation of a limit switch 309 by the carriage 42 and the motor 89 is switched on by actuation of a limit switch 310. The above described procedure is then repeated.

The machine of FIGS. 7, 8 and 9 is similar to the machine of FIGS. 1 to 5 and similar components have been given the same reference numerals as in FIGS. 1 to 5 and will not be further described.

Instead of a single drum, however, the machine has two drums 111 and 112, each having cigarette-receiving recesses 12 around half of its periphery, the drums 111 and 112 being mounted by shafts 116 in bearings 114 in a frame 113. The left hand drum 111 (as viewed in FIG. 8) is driven in anticlockwise direction, and the right hand drum 112 is driven in clockwise direction. Both drums are driven by a motor 121 mounted on the frame 113, by means of a pinion 120, an intermediate spur wheel 119 and spur wheels 118. The spur wheels 118 can be coupled to the shafts 116 for desired periods of time by electromagnetic clutches 115. The clutches 115 are arranged in known manner to have a braking action when not transmitting a drive, so that the drums 111 and 112 are either positively driven or held braked.

Suction chambers 131 and 132 respectively are provided in the hollow interior of the drums 111 and 112 and are connected to suction lines 130 by connections 129. Cigarette supply hoppers 126 and 127 are provided which are fixed to slides 122 and 123 respectively, which are guided in fixed guides 128. The slides 122 and 123 carry rollers 210 which are engaged by fork ends of levers 209. The levers 209 are fixed on shafts 207 which are rotatably mounted in the frame 113 of the machine. Levers 208 fixed to the shafts 207 carry follower rollers which bear against cams 206 fixed on the shafts 116. Accordingly, the cams 206 control the movement of the slides 122 and 123 in timed relation to movement of the drums 111 and 112. The slides 122 and 123 are thus alternately and separately controlled to lower and raise the hoppers 126 and 127. The bottoms of the hoppers 126 and 127 are in the form of strips 125 having thickened tips 134, which engage in corresponding peripheral channels 133 of the drums 111 and 112 when the respective hopper is lowered.

Apart from the provision of two drums rotatable in opposite directions, as indicated by arrows, and the drive arrangements therefor, the remainder of the machine of FIGS. 7, 8 and 9 is generally similar to the machine of FIGS. 1 to 5.

In the arrangement of FIGS. 7, 8, and 9, one of the drums is supplied with cigarettes while the other drum discharges cigarettes previously supplied. Empty magazines 13 are supplied to the machine of FIGS. 1 to 5 or the machine of FIGS. 7, 8 and 9 by the arrangement illustrated in FIGS. 10, 11 and 16. This arrangement comprises a series of pawl latches 94 mounted in slides 93 which are movable between guides 98 carried by a magazine supporting plate 97. The latches 94 are urged into the position shown, by springs 95. The slides 93 are connected by a bridge 206 which extends through a slot in a web 96 of the frame 44. The bridge 206 carries a roller 205 which is engaged by a fork end of an arm 204 which is rigid with a pair of arms 202 and 203, the arms 202, 203 and 204 being jointly pivoted on a fixed shaft 91. The arms 202 and 203 carry follower rollers which bear against cams 201 mounted on a cam shaft 84. The shaft 84 is driven by known drive means (not shown), for example an electric motor. The slides 93 are thus moved to and fro in the direction of the horizontal arrow in FIG. 10. For each to and fro movement of the slides 93, the empty magazines 13 are advanced by one pitch, the latches 94 yielding below the magazines on the return

movement of the slides **93**. Thus, for each forward movement of the slides **93**, an empty magazine is pushed into the carriage **42**, the filled magazine having already been removed from the carriage **42** by means of the ram plate **74** (see FIGS. 1 and 7).

The cigarette magazine filling machine of FIGS. 18 to 33 comprises a suction drum **401** arranged on a shaft **402** which is mounted in a frame of the machine and in a bearing member **404**. This function of the drum **401** will be subsequently described in detail.

The machine frame comprises a base plate **405**, two columns **406**, an upper traverse **403**, and frame members **407** and **408** on which a table-like plate **409** is fixed. On the frame member **408**, a main drive motor **410** is fixed which by means of a V-belt pulley **411** and a V-belt **428** drives a V-belt pulley **412** arranged on a lay shaft **413**. On the lay shaft **413**, which is mounted in the frame members **407** and **408**, a pinion **414** is provided which drives a spur wheel **415**. This is fixed on a control shaft **417** mounted in the frame member **407** and in a bearing cover **416** provided on the frame **408** (see FIG. 21). The control shaft **417** has arranged parallel thereto a shaft **419** which is mounted in the frame member **407** and in a bearing arm **418** provided on the base plate **405**.

On the frame member **407** (see FIGS. 18, 19, 22, 23 and 24), bearings **420** are arranged on which two cylindrical bars **421** which are parallel to each other are fixed, cylindrical guides **422** and a slide **440** being slidably arranged on the bars **421**. U-shaped supporting members **423** are fixed on the guides **422**, and on the top of the members **423** a magazine carriage **424** is provided, which can slide to and fro along the rails **421**.

On the magazine carriage **424**, L-shaped supporting members **429** are fixed on which slide-bearings **430** are provided (see FIG. 19). Slide rods **431** are guided in the bearings **430**.

The slide rods **431** carry a bracket **432** at their upper end, on which a plate **433** is mounted, the function of the plate **433** being the same as that of the plate **56** in the embodiment of FIGS. 1 to 5. At the lower end of the rods **431** a traverse **434** is provided which has two rollers **435** which slide in a U-shaped guide **436** which is fixed to a pair of scissor systems **441** (see FIG. 18) in a pivotal manner by means of a carrier **437** and studs **439**.

Each scissor system comprises a pair of upper scissor members **441** and a pair of lower members **438**. One of the scissor members **438** of each pair is pivotally mounted in a bearing **444** provided on the base plate **405** of the machine, whereas the other scissor member **438** of each pair is pivotally mounted on a slide block **442**, the slide blocks **442** sliding on two horizontal bars **443** which are fixed in the bearings **444** and bearings **445**. The two slide blocks **442** are connected with each other by means of a connecting rod **446**. On the bearings **444**, vertical rods **447** are fixed which are secured to the frame member **407** at their upper ends by means of bearings **448**. Slide members **449** slide on these rods **447** and on each of the slide members **449** in each case one of the scissor members **441** and **438** is pivotally mounted.

A bearing member **450** is fixed on the connecting rod **446** and has a stud **451** rotatably mounted therein which acts as a follower roller and engages spirally shaped cam **452** provided on a shaft **453** which is mounted in the frame members **407** and **408**. A ratchet wheel **454** is fixed to the cam **452** and on the same shaft **453** a lever **459** is provided on which a spring loaded ratchet pawl **455** is drivingly arranged. The lever **459** is operated by a pull rod **460** and a lever **461** which is mounted between the frame member **407** and a bearing **462**, by means of a follower roller **465** (see also FIG. 21) from a cam **463** which is mounted on the control shaft **417**.

A further ratchet pawl **456** which is spring loaded and which is pivotally mounted by a stud **458** on a bearing bracket **457** provided on the base plate **405**, prevents backward rotation of the cam **452**. Moreover, an abutment rail **466** is provided on the cam disc **452**. A tension spring **467** is provided which is attached to one of the slide blocks **442** and the bearing **445***a* and acts on the scissor members **438** in such manner that the scissor systems are urged in to their upwardly extended position. The U-shaped guide **436** (see also FIG. 19) is thus urged upwardly and simultaneously, through the roller **435**, the traverse **434** and the linkage **431**. Springs **468** and **469** (FIG. 20) hold the ratchet pawls **455** and **456** resiliently against the ratchet wheel **454**.

Shafts **470** and **471** are mounted in the frame members **407** and **408**, and carry ribbed-belt pulleys **472** over which a ribbed belt **473** is entrained. The slide **440** (FIG. 25) is connected to the upper transit of the ribbed belt **473** (FIG. 18), and is held firmly by means of a link **474** (see FIG. 22).

The slide **440** comprises bearing slide members **475** and **476** (see FIG. 22) which are screwed to a connecting part **477**. In the connecting part **477**, a double locking lever **478** (FIG. 25) having locking projections **486** is rockably mounted on a stud **479** which has a locking projection **480** (FIG. 23).

A locking stud **481** (FIG. 22) is displaceably mounted in the bearing slide member **475**, this stud having a slide part **483** (FIG. 23) and a locking projection **482** which is permanently in engagement with the locking projection **480** of the double locking lever **478** under the influence of a compression spring **484** and a threaded pin **485** which serves as an abutment. An abutment **488** is allocated to each of the end positions, these being adjustably fixed below the table-like plate **409** and actuating a control member **487** (FIG. 25).

Each of the locking projections **486** of the double locking lever **478** engages over the blocking projection **489** of the respective guide **422** and couples this with the slide **440**. Two damping rings **490** are arranged between the slide **440** and the guides **422** for damping the impact, and abutment rings **491** and **492** (see FIG. 18) are provided on the bars **421** for defining the end positions of the magazine carriage **424**.

The to and fro movement of the magazine carriage **424** is effected through a spur wheel pinion **493** arranged on a shaft **471** which is rotated by means of a toothed segment lever **494**. The toothed segment lever **494** is mounted on a shaft **419** which carries a lever **495** (FIG. 19) having follower rollers **496** which are actuated by cams **497** and **498** provided on the control shaft **417**.

Abutment levers **499** (FIG. 18) are provided on shafts **501** which are mounted in the frame members **407** and **408**. These shafts **501** are coupled with each other by means of toothed segments **500**. On one of the shafts **501**, a lever **502** is provided which is actuated through a pull rod **503** by means of a lever **504** which is pivoted on a stud **507** on the bearing cover **416** and which carries a follower roller **505** by means of which it is actuated from a cam **506** provided on the control shaft **417** (see also FIG. 21). The abutment levers **499** engage in their end positions against one of the U-shaped supporting members **423** and hold the magazine carriage **424** in the end position, when the slide **440** is decoupled by the double locking lever **478**, the necessary locking force being supplied by a tension spring **508**.

The to and fro movement of the suction drum **401** is derived from the slide **440** by means of a cable **510**. The cable **510** is of steel and has hard soldered nipples **516** at its ends. The nipples **516** are held by means of mounting screws **514** and lock nuts **515**, on the bearing slide member **475** so that the cable is under tension.

The steel cable **510** is guided over deviating rollers **511** which are rotatably mounted on the table-like plate **409** by means of bearings **517** and studs **519**, and deviating roller **512** each rotatably mounted on a bearing **518** provided on the traverse **403**, by means of a stud **520**, the cable being entrained about a cable drum **513** which is fixed on the shaft **402** and which has a helical groove **692**

in which the cable engages, the cable passing around the drum in a plurality of convolutions and being fixed to the drum 513 by a cable clamp 694 (see also FIG. 19). Accordingly, on to and fro movement of the slide 440, the suction drum 401 which is fixed on the shaft 402 on which also the cable drum 513 is fixed, is subjected to a to and fro rotation.

The empty cigarette magazines 425 (see FIG. 20) are positioned on angular slide rails 525 between which a feed device comprising feed pawls 526 is provided, these pawls being pivoted on a frame 527 and resiliently held in their operative positions by means of flat springs 531. The feed frame 527 is fixed by means of cross traverse 532 onto round bars 528 which can slide in slide bearings 529 and 530 provided on the table-like plate 409. A frame 533 is fixed on the frame member 408 and on this frame 533 a drive motor 534 is provided. On its shaft 535, a crank 536 is arranged and on the crank 536 a push rod 537 is provided which is pivoted thereto by means of a stud 538. The crank engages the traverse 532 by means of a stud 539 and thus causes the to and fro movement of the feed frame 527 and the feed pawls 526.

The filled magazines 427 (see FIG. 19) are pushed successively onto slide rails 545 which are fixed on the table-like plate 409 by means of distance pieces 546. This movement of the filled magazines is effected by a pushing plate 547 which is fixed on bars 549 by means of a pushing plate holder 548, a pivot block 552 and a pivot stud 568, the bars 549 being suspended in a pendulum-like manner in pendulum slide bearings 551 (see also FIG. 18) which are mounted on pivot studs 561 in a bearing bracket 550 which is fixed on the column 406. A double lever 555 is pivotally mounted on the bars 549 by means of a pivot stud 567 and a pivot member 562, and is also pivoted in bearings 557 carried by the upper frame traverse 403, by means of a pivot stud 565.

A drive motor 556 is arranged below the upper frame traverse 403, and on its shaft 558 a crank 559 is provided. Between the crank 559 and the double lever 555, a push rod 560 is arranged which engages on a crank pin 563 and a lever pivot pin 564. By means of the push rod 560, the crank 559 of the drive motor 556 places the lever 555 in to and fro movement and accordingly the filled magazines 427 are pushed onto the slide rails 545 from the magazine carrier 424 by means of the pushing plate 547.

On the pushing plate holder 548, a lateral link 553 is fixedly arranged, which carries at its free end a roller 554 which is guided in a track 566 fixed on the column 406 in such a manner that in spite of the radius of the lever 555, the pushing plate 547 is always disposed parallel to the magazine 426 about to be pushed.

The magazine carriage 424 has the form of a shallow U open at both sides. It has end walls 570 which comprise abutment studs 571 which define the position of the magazine in the carriage 424. For providing more secure retention of the magazine, a separate device as illustrated in FIGS. 26 to 29 is provided. This is in the form of an automatically acting clamping device, and comprises a clamping member 572 which is provided on a clamping lever 573 mounted in a bearing 574 on the magazine carriage end wall 570 by means of a pivot stud 575. Below the bottom of the magazine carriage 424, two slide bearings 576 are laterally provided in which a circular rod 577 is slidably mounted, this rod 577 carrying a rigid lever arm 578 which at its free end has a stud 579 which engages in a slot 580 of the clamping lever 573. The release of the clamping is effected magnetically, when a roller 584 of a lever 583, which is connected to the clamping lever 573, travels against an abutment lever 585 which is pivotally arranged on a stud 587 in a fixed frame member 586, and in which also a blocking lever 589 is pivotally mounted on a stud 590, a portion 591 of the lever 589 forming an armature which is drawn into engagement with the core 592 of an electromagnet 595, which likewise is arranged on the frame member 586. An arm 588 of the lever 585 is thus blocked and the lever 585 presses the roller 584 downwardly, so that the full magazine 426 is released.

The removal of blocking means which prevent feeding of an empty magazine 425 at the other side of the machine that is to say the left hand side as viewed in FIG. 18 is also effected, since the rod 577 at the said other side (see FIG. 26) travels against an armature 596, 597 of an electromagnet 603 which is mounted in a fixed frame member 599 and in a fixed bearing 598, a lower part of the armature 596, 597 consisting of magnetic material but an upper part 596 thereof being of non-magnetic material, both parts being connected together by means of a stub 602. A compression spring 601 holds the armature 596, 597 normally in its lower position. In this position, the rod 577 does not engage against the armature 596, 597 but extends through a slot 600 therein (see FIG. 29). The armature 596, 597 is secured against rotation by means of a pin 604 which is movable in a slot 605 of the bearing 598. The compression spring 601 is disposed in a bore 606 in the armature part 596.

The suction drum 401 (see FIGS. 30 and 31) has seventy-two trough-like recesses which are fed from seven feed channels 621. Each feed channel 621 has blocking means which consists of a blocking lever 622 which is provided on a shaft 623 which is releasably connected with a shaft 624 and which is actuated through a control lever 628 and control rollers 629 from a control disc 627 having control projections 626 which are rotatably mounted on the shaft 625.

The shafts 623 are mounted in bearing bridges 666 which are arranged on extensions 667 secured to the traverse 403. The shafts 623 are moreover mounted in a bearing bracket part 668 which forms part of a bearing bracket 669 fixed on the traverse 403. The shafts 624 are rotatably and slidably mounted in the bearing bracket 669 concentrically to the shafts 623.

Coupling of the shafts 623 and 624 with each other is effected through a dog clutch 630, 631, slides 632 which carry the dog clutch members 631 being operated by means of sliders 633 which are displosed on the shafts 634 mounted displaceably in the bearing bracket parts 668 and 669 and which are operated by means of electromagnets 635 having armature studs 670 fixed to the sliders 633.

The magnets 635 are fixed on the bearing bracket part 669. A compression spring 671 holds the dog clutches 630 and 631 in engagement, and the magnets 635 release this engagement when necessary.

On each shaft 624, a lever 628 is fixed which carries a relatively long roller 629 in order that the rollers remain in engagement with the control projections 626 on displacement of the shafts 624. The control disc 627 on which the projections 626 are provided is rotatably mounted by means of flange bearing 672 and roller bearings 673 and 674 on the shaft 625 and a cover 675 is provided which closes the bearing region. A flange 676 is fixed on the control disc 627 and the spur wheel 641 is fixed thereto.

The fed channels 621 each comprise radially extending pairs of parallel plates 677 which are arranged in a fan-like manner relative to agitating rollers 678 provided thereabove. The plates 677 are fixed at their upper ends to intermediate pieces 679 which are fixed onto sheet metal walls 680.

The agitating rollers 678 are mounted in a bearing rail 681 which is fixed by means of studs 682 on a fixed housing part 683. The agitating rollers 678 are connected by means of coupling members 684 with the shafts 685 of pinions 686 mounted in the housing part 683, these pinions being given a to and fro rotary movement by means of a common rack 687. The rack 687, outside the housing 683, is connected through a pull rod 688 with a crank 689

of a driving motor **690**, so that it receives a to and fro movement.

The control disc **627** is driven from the shaft **402** by means of spur wheels **637** and **638** having 3:2 reductions transmission, through lay shaft **636** and spur wheels **641** and **642** in such manner that the control disc **627** turns through two angular units when the suction drum **401** turns through three angular units. The lay shaft **636** is mounted in a bearing bracket **691** which is fixed from below onto the traverse **403**. Due to the abovementioned 3:2 reduction, the control disc **627** has 108 control positions for one revolution thereof and can thus have up to 108 control actions co-ordinated to individual angular positions of the drum **401**.

When seventy-two cigarettes have been received by the drum **401**, then further supply from the feed channels **621** is blocked by actuation of the magnets **635**. Cigarettes are supplied by the drum **401** to the magazine **426** during the movement of the magazine **426** by the carriage **424** and when the last cigarettes of a layer have been deposited in the magazine **426**, then the suction drum **401** is completely empty.

Before the magazine **426** moves back again, the slide **440** moves through the distance to the abutment **492**. The renewed charging of the suction drum **401**, the rotation of which is related to the movement of the slide **440** by means of the steel cable **510**, begins simultaneously with the backward movement of the magazine **426**, as a result of de-energising of the magnets **635**. Thus the corresponding suction drum is again supplied with cigarettes and on return movement of the magazine **426** cigarettes are immediately available in the suction drum **401** again, so that the cigarettes can again be deposited in the magazine **426**.

The pitch difference required between layers in the magazine **426**, that is to say the displacing of successive layers by half of the diameter of a cigarette, is effected by appropriately setting the abutments **491** and **492**.

The electro-magnets **635** can be individually controlled. Accordingly, each individual feed channel **621** can be separately controlled and any desired number of cigarettes can thus be fed to the suction drum **401**, this enabling an allowance to be made for the extra cigarette which should be provided in each alternate cigarette layer when the cigarettes in alternate layers are displaced through half of a cigarette diameter.

The electromagnets **635** are actuated by microswitches **697** (see FIG. 21) which are actuated by cams **696**A to **696**G provided on the control shaft **417** of the machine.

The shaft **402** on which the suction drum **401** is fixed is mounted in bearings **643**, **644** and **645** provided in the frame member **403** and **404** (see FIG. 31). An air duct **404** is provided for the bearing **643**.

The suction drum **401** has six suction bores **646** in each of its troughs, which are permanently connected with suction chamber **647** (see FIG. 30) and which are alternatingly connected with suction chambers **648** and **649** in the drum **401**. The suction chambers are separated by strips **650** and **651** and an annular wall **656**. A flap valve **652** alternatingly connects the chamber **647** with chamber **649** or **648** through the channels **654** and **655**. As the drum **401** rotates, the strip **651** successively closes the bores **646** and thus effects the deposition of the cigarettes into the magazine **426**, since the suction by the drum **401** is interrupted at this region by the strip **651**.

The flap valve **652** is fixed on a shaft **657** which is mounted in the bearing member **404** and which carries a lever **658** (see also FIG. 31) to which a pull rod **659** is attached by means of a stud **660**, the pull rod being actuated by means of a magnet **661** which is fixed by a bearing bracket **662** on the traverse **403**, the actuation taking place through an armature rod **663** of the electromagnet **661** and the pivot member **664**. A cover **665** closes the end of the bore in which the shaft **657** is disposed. By means of the flap valve **652**, the central suction chamber **647** is alternatingly connected with the lateral suction chambers **648** and **649**, so that on the one hand the left hand half of the suction drum **401** is filled with cigarettes and on the other hand the right hand half is filled with cigarettes.

The electrical circuit of the machine will now be described with reference to FIG. 33.

The main driving motor **410** of the machine, which is operated by high voltage, for example 360 volts, is controlled by means of a relay **802** operated by low voltage, for example 24 volts, supplied by a transformer **824**. When an empty magazine is fed into the machine, the magazine carriage **424** is moved into the position **424**L shown in FIG. 33 and by means of microswitches **801** and **812** the relay **802** is energised and the motor **410** thus placed in operation.

Layer upon layer of cigarettes are then placed in the magazine **426** (see FIG. 19) by means of the drum **401** on each stroke of the to and fro movement of the carriage **424**, that is to say, during each complete to and fro movement two layers of cigarettes are placed in the magazine **426**. When the last layer has been placed in the magazine, the carriage **424** is in the position **424**R shown in FIG. 33 and actuates the micro-switch **804**. The switch **804** remains ineffective, however, unless at the same time the U-shaped guide **436** (see also FIG. 19) is in its lowermost position and thus simultaneously actuates a microswitch **805**, which is the case if the magazine is full. Simultaneous actuation of micro-switches **804** and **805** causes the motor **410** to be switched off by the relay **802**.

At the same time, by actuation of micro-switches **804** and **805**, a relay **806** is operated which causes the motor **556** to run, this motor serving for operating the previously described mechanism which ejects the filled magazine. The output shaft of the motor **556** performs only a single revolution, since a control disc **808** fixed on the said shaft has a lobe **809** which actuates a time switch **810** which switches off the motor **556** after one revolution of the said output shaft, the time switch **810** being of such nature that shortly after switching off the motor **556** it restores the motor circuit to a condition ready for renewed switching on of the motor **556** for a next revolution of its output shaft.

The control disc **808** has another lobe **811** which serves for actuating a micro-switch **826** for switching on the driving motor **410** for the period necessary until the carriage **424** has reached the position in which a magazine can be supplied thereto. The operating circuit for the motor **410** is then opened by the microswitch **812**. At the same time, by means of the microswitches **812** and **801**, a relay **813** is operated which causes a motor **534** to run, the motor **534** serving for operating the previously described mechanism which supplies empty magazines to the carriage **424** when in its position **424**L.

The motor **534** is a reduction geared motor, its output shaft performing a single revolution, this being controlled by a time switch **819** which is actuated by a lobe **815** provided on a control disc **816** fixed to the output shaft of the said motor **534**. By means of the single revolution of the shaft of the motor **534** an empty magazine is supplied to the carriage **424**.

The control disc **816** has a further lobe **817** which actuates a micro-switch **827** which is connected to relay **802** and causes the main driving motor **410** to be switched on. This takes place somewhat before the motor **534** is switched off, in order that the lobe **817** can move beyond the micro-switch **827** and allow it to lapse. The relay **802** is self-holding, its circuit being arranged in such manner that the self-holding can be released only by simultaneous actuation of micro-switches **804** and **805** or by actuation of micro-switches **812** and **801**.

When the main driving motor **410** is switched on, and the empty magazine carriage **424** is moved into the position **424**L then simultaneously therewith a final movement of the spiral cam **452** takes place, so that the follow-

er roller 451 (see FIG. 18) moves to the minimum radius point of the cam 452 and the U-shaped guide 436 and therewith the plate 433 (see FIG. 19) are elevated, the plate 433 reaching a position appropriate to receiving a first layer of cigarettes.

During this movement of the carriage 424 into the position 424L, the electromagnets 635A to 535G are kept energised, so that cigarettes are prevented from reaching the suction drum 401 (see FIG. 30). This is effected by a micro-switch 820 which is actuated by a lobe 821 provided at the maximum radius region of the spiral cam 452, and by a relay 826 which is controlled by the micro-switch 820. The relay 828 controls the direct current output of a bridge rectifier 825 for operating the electromagnets 635, the circuits to the respective electromagnets 635 being completed by micro-switches 697A to 697G which are actuated by the cams 696A to 696G provided on the cam shaft 417.

An manually operable switch 822 is provided in the energising circuit of relay 802, for controlling the main driving motor 410, and a manually operable interrupting switch 823 is provided, which immediately stops the machine when operated.

I claim:

1. A machine for automatically filling cigarette magazines, comprising a rotatably mounted drum, a plurality of peripheral formations on said drum, said formations being adapted to receive cigarettes from a supply device and holding the cigarettes during rotation of the drum, means for guiding a magazine to be filled in a reciprocatory path below said drum and substantially tangential thereto, a plate-like member associated with said magazine guiding means, said plate-like member being adapted to be disposed inside said magazine, means for progressively lowering said plate-like member within said magazine, and means for discharging cigarettes from said drum onto said plate-like member and into said magazine, said cigarette discharging means forming one layer of cigarettes on said plate-like member on each half reciprocation of said magazine.

2. A machine as defined in claim 1, wherein the drum has twice as many cigarette-receiving formations as the number of cigarettes in a single layer, means being provided for rotating said drum in alternate directions in timed relation with the movement of the magazine in its alternate directions of reciprocations.

3. A machine as defined in claim 1, and further comprising suction means communicating with suction openings in said cigarette-receiving formations for holding the cigarettes during rotation of said drum by the action of suction, and valve means for interrupting the suction action in timed relation with movement of the respective cigarette-receiving formations to a position immediately above regions of said magazine into which the respective cigarettes are to be released.

4. A machine as defined in claim 1, and further comprising means for automatically supplying empty magazines to the machine and automatically removing filled magazines.

5. A machine as defined in claim 4, wherein the supply of empty magazines is effected in a direction parallel to the direction of removal of filled magazines.

6. A machine as defined in claim 5, wherein the said directions are such that the empty magazine is supplied when the magazine guiding means are in one end position of the reciprocatory movement and the filled magazine is removed when the magazine guiding means are in the other end position.

7. A machine as defined in claim 1, and further comprising means for elevating the plate-like member to its initial position subsequent to removal of a filled magazine.

8. A machine as defined in claim 7, wherein said elevating means are combined with said lowering means and operate at a faster speed than the said lowering means.

9. A machine as claimed in claim 1, wherein said magazine guiding means comprise a carirage, and guide rails, said carriage being movable on said guide rails.

10. A machine as defined in claim 1, and further comprising at least two devices for supplying cigarettes to said drum, and means for controlling said supply devices to operate alternately, depending on the direction of movement of said magazine guiding means.

11. A machine as defined in claim 1, wherein said device for supplying cigarettes to said drum comprises a plurality of feed channels, each feed channel terminating close to the periphery of the drum, and means for individually blocking said feed channels.

12. A machine as defined in claim 11, wherein said blocking means are electro-mechanically operable.

13. A machine as defined in claim 12, and further comprising a plurality of electromagnets, a plurality of switches, and a plurality of cam means, said blocking means being operable by said electromagnets, said electromagnets being energised in a desired sequence by said switches, said switches being operable by said cam means, said cam means being movable in timed relation to rotation of the drum.

14. A machine as defined in claim 1, and further comprising a second drum, the two drums being arranged for alternately depositing layer of cigarettes in said magazine, the drums being rotatable in opposite directions.

15. A machine as defined in claim 14, and further comprising a second cigarette supply device for said second drum, and means for controlling the two supply devices to operate alternately, depending on the direction of movement of the magazine guiding means.

16. A machine as defined in claim 15, wherein said supply devices are disposed centrally between and above the two drums.

17. A machine as defined in claim 14, and further comprising clutch means and brake means for allowing two drums to be driven alternately and holding the non-driven drum at rest, during movement of said magazine guide means in the one and the other directions respectively.

No references cited.

TRAVIS S. McGEHEE, *Primary Examiner.*

R. J. ALVEY, *Assistant Examiner.*