

Aug. 12, 1958

E. J. MCCARTHY ET AL

2,847,040

VACUUM FILLING MACHINE

Filed March 18, 1954

11 Sheets-Sheet 1

Fig. 1

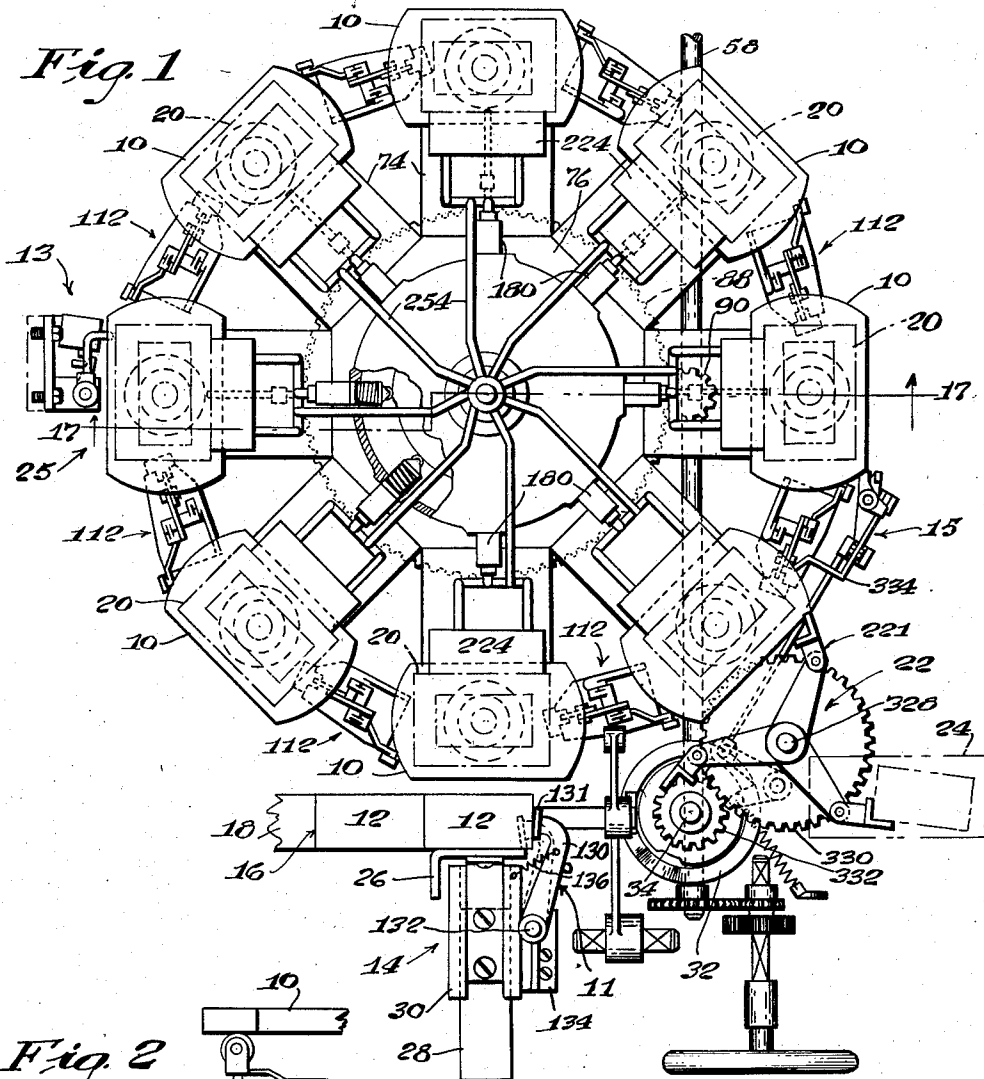
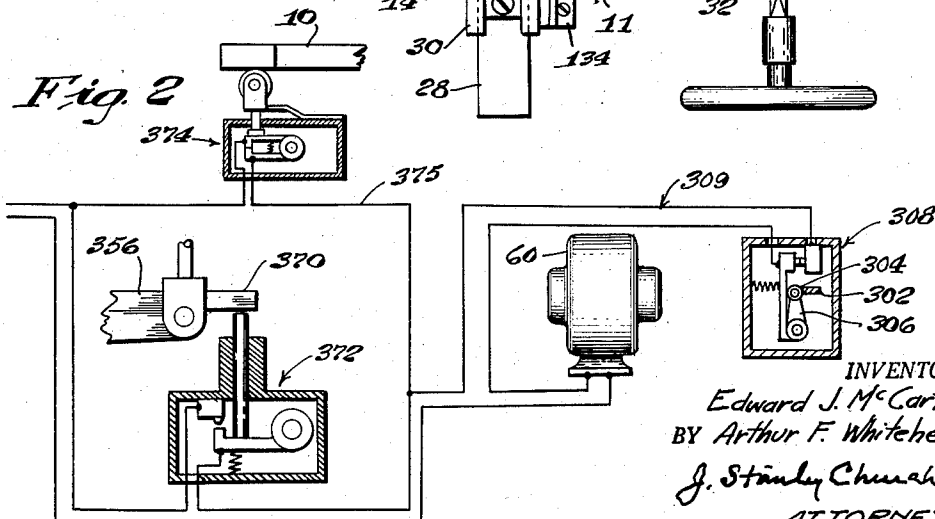


Fig. 2



INVENTORS.
Edward J. McCarthy
BY Arthur F. Whitehead
J. Stanley Churchill
ATTORNEY

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Fig. 3

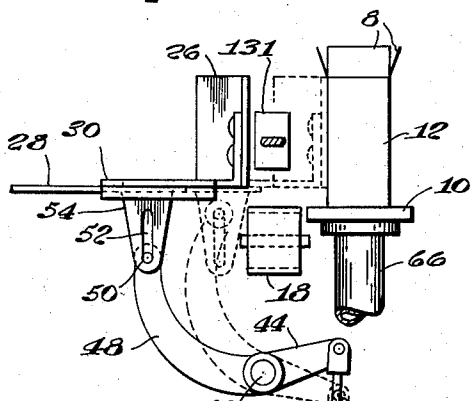
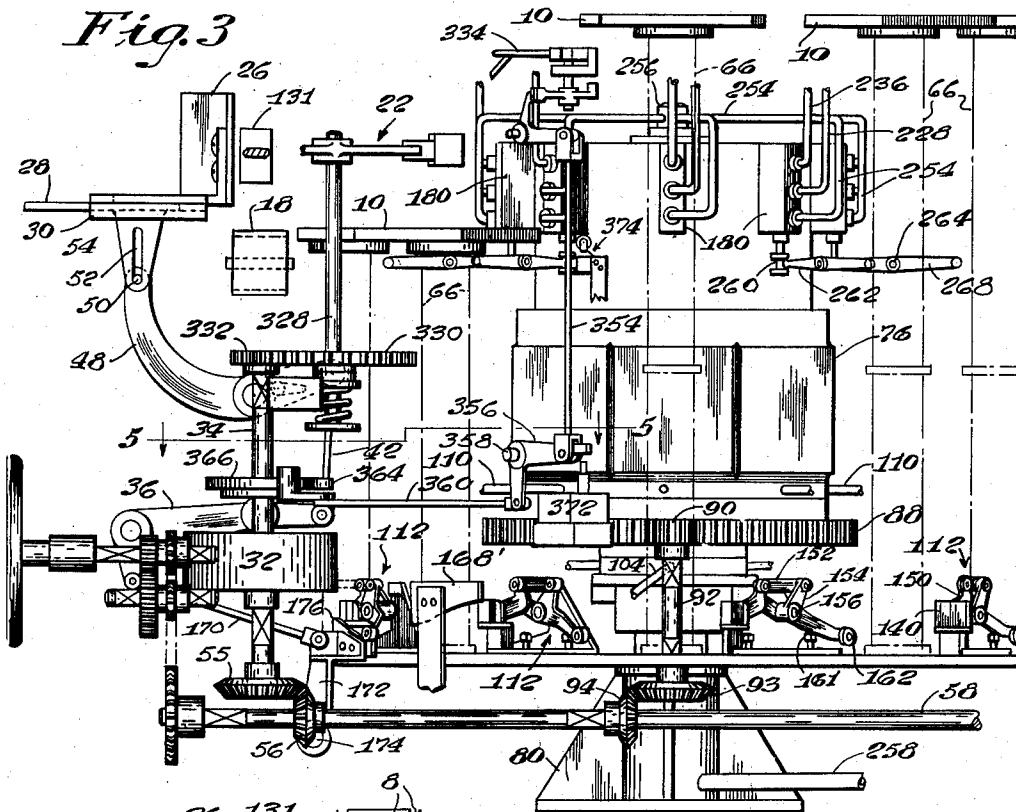


Fig. 4

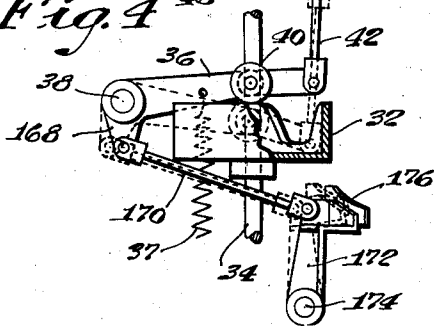
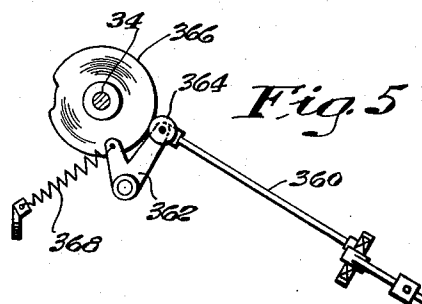


Fig. 5



INVENTORS.
Edward J. McCarthy
BY Arthur F. Whitehead
J. Stanley Churchill
ATTORNEY

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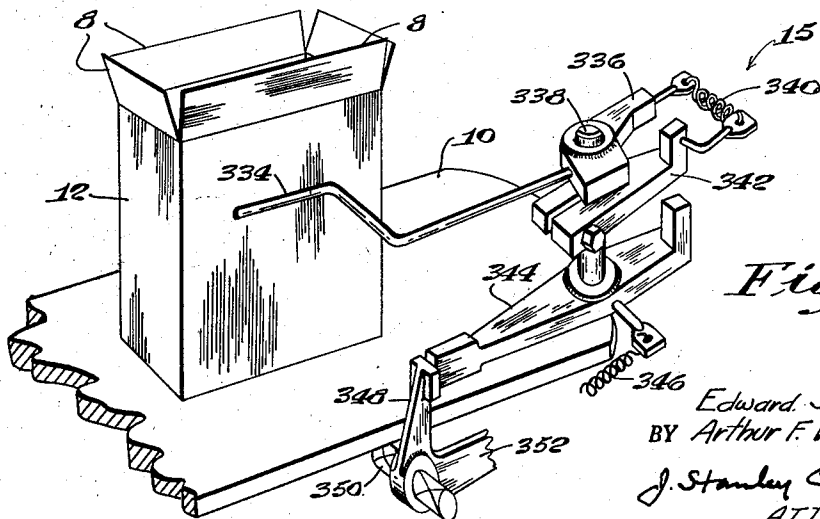
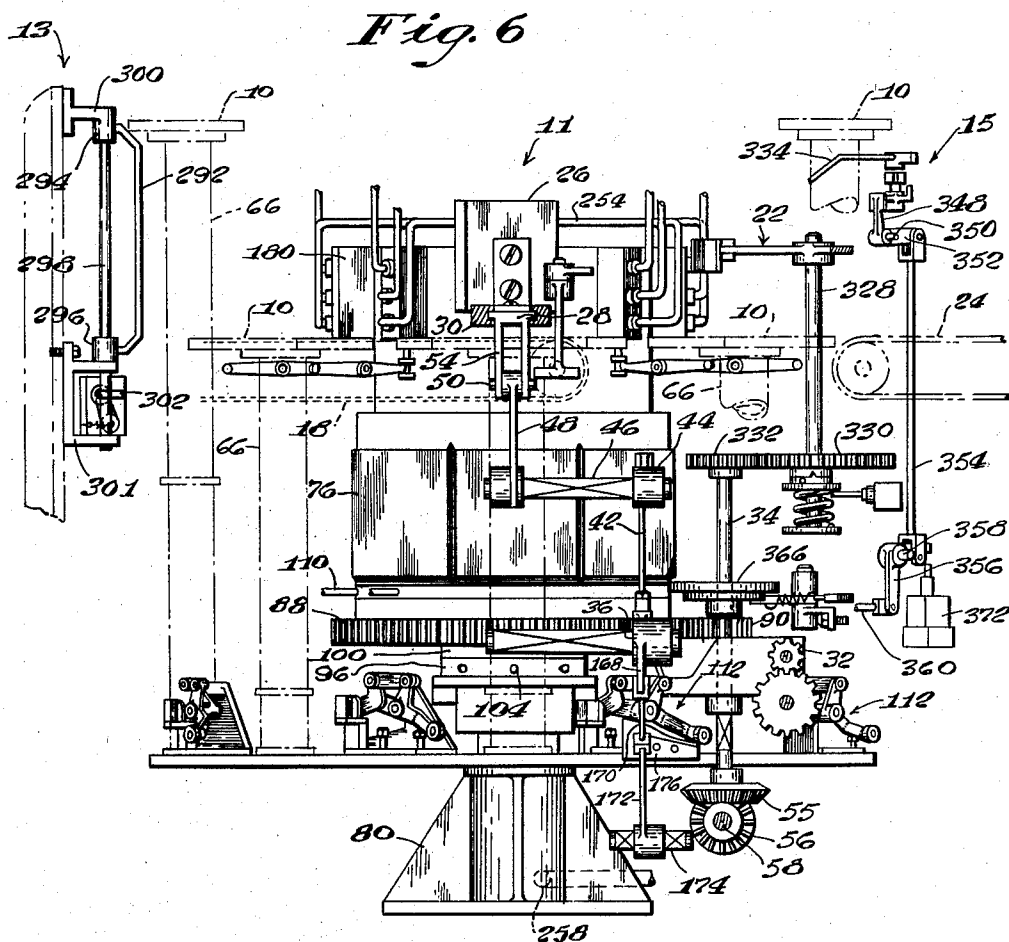
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INVENTORS.
Edward J. McCarthy
BY Arthur F. Whitehead
J. Stanley Churchill
ATTORNEY

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Fig. 8

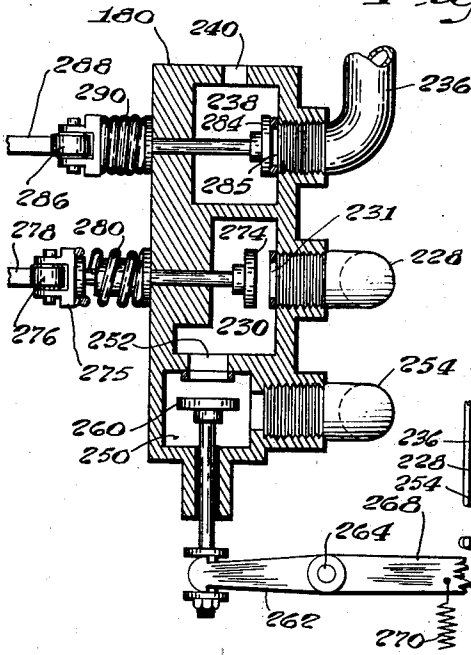


Fig. 9

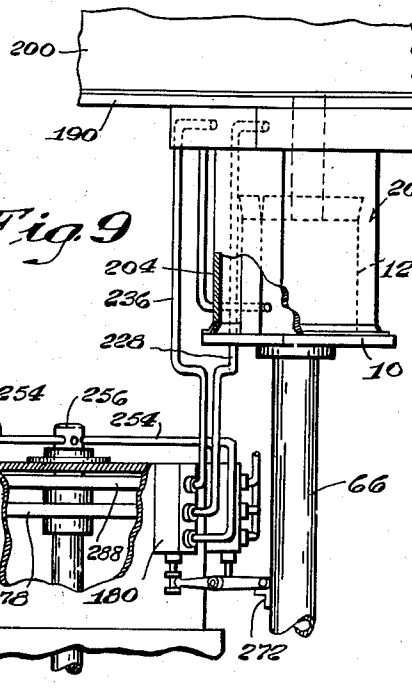


Fig. 10

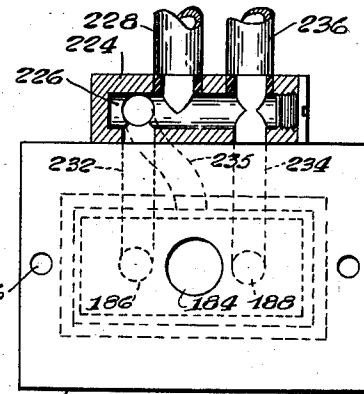
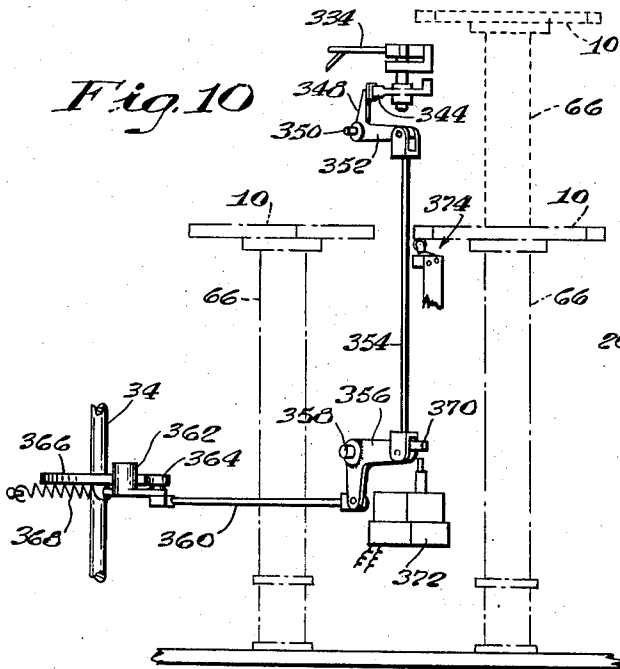


Fig. 11

INVENTORS.
Edward J. McCarthy
BY Arthur F. Whitehead
J. Stanley Churchill
ATTORNEY

Aug. 12, 1958

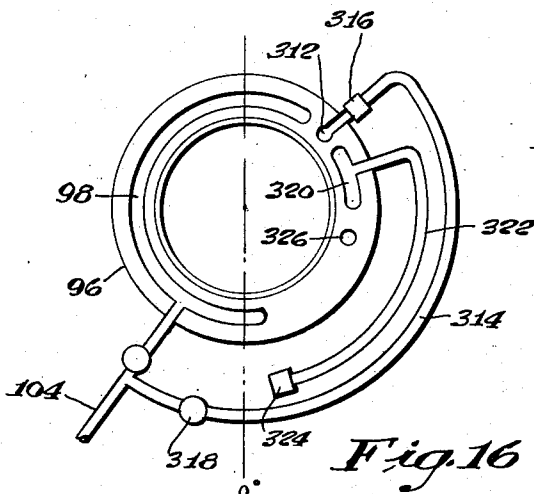
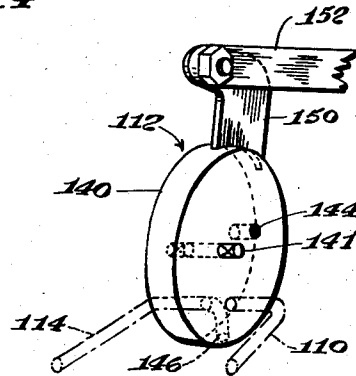
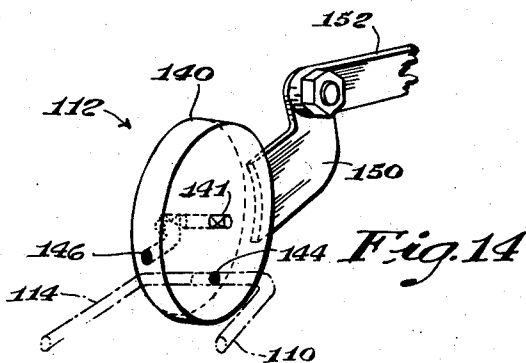
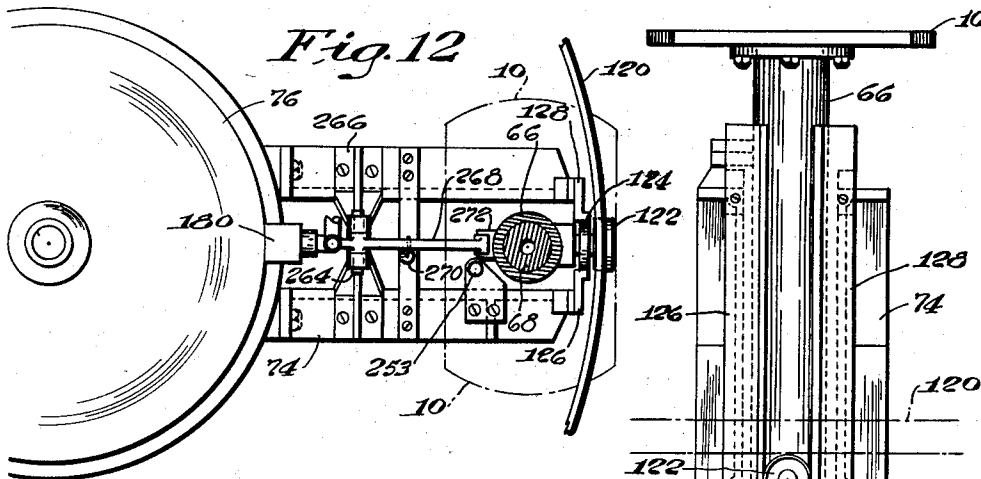
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Edward J. McCarthy
BY Arthur F. Whitehead
J. Stanley Churchill
ATTORNEY

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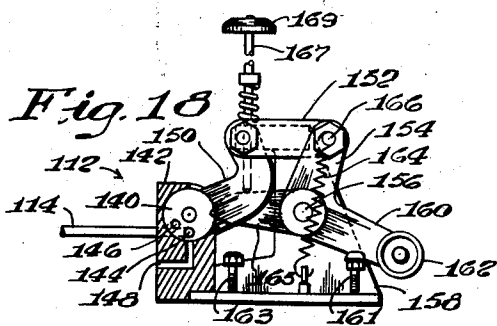
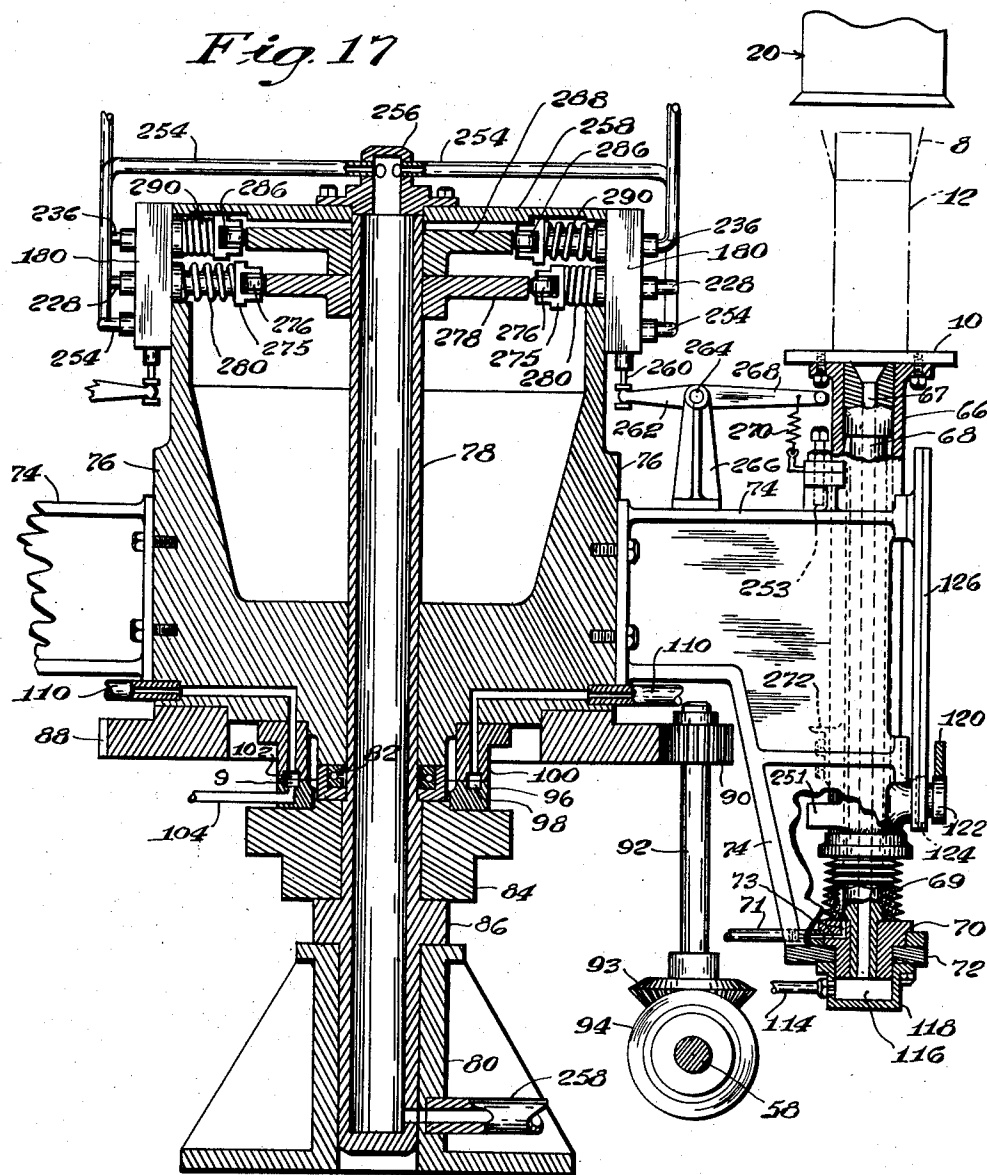
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Fig. 17



INVENTORS.
Edward J. McCarthy
BY Arthur F. Whitehead
J. Stanley Churchill.
ATTORNEY

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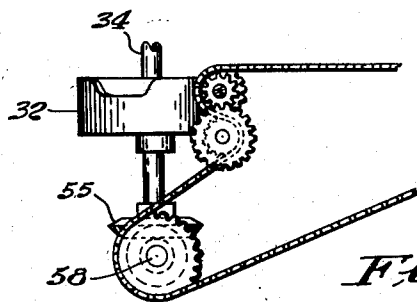
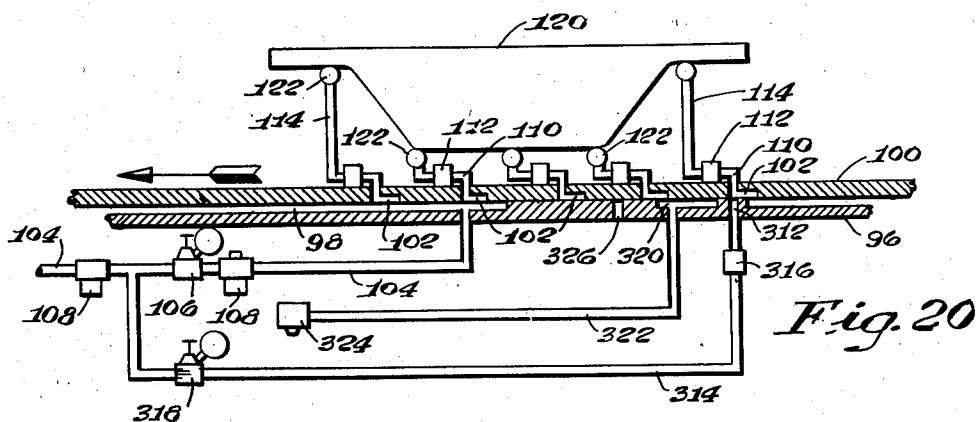
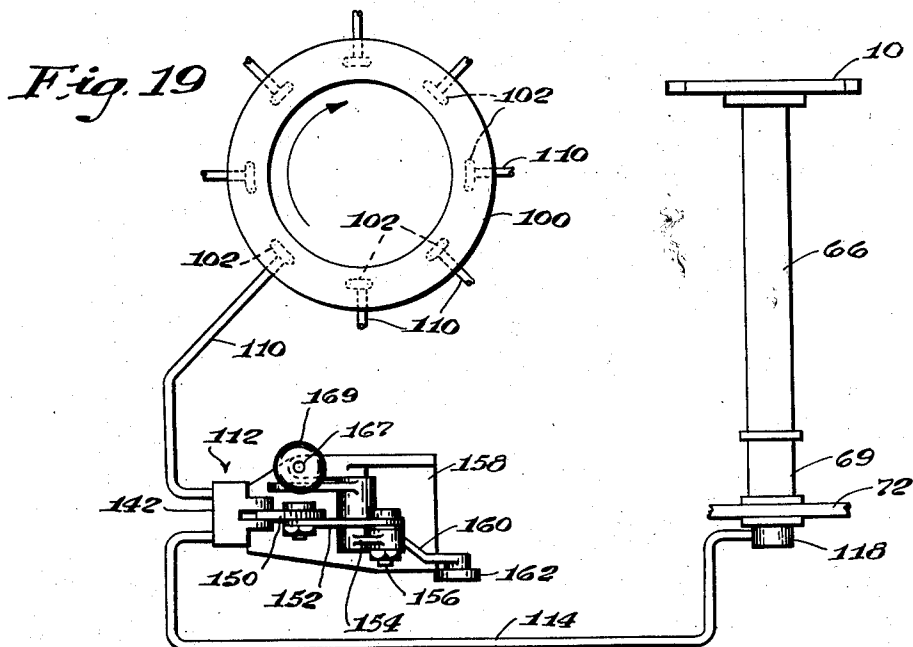


Fig. 21

INVENTORS.

Edward J. McCarthy
BY Arthur F. Whitehead
J. Stanley Churchill
ATTORNEY

Aug. 12, 1958

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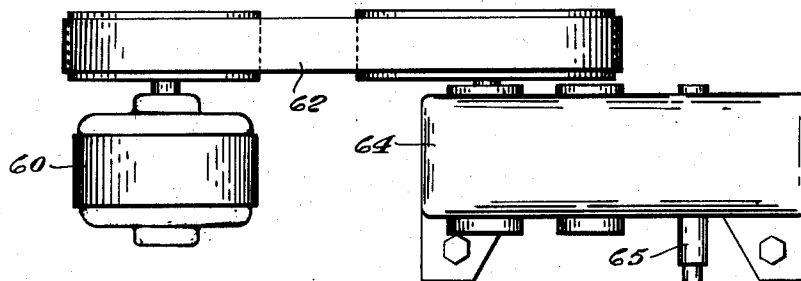


Fig. 22

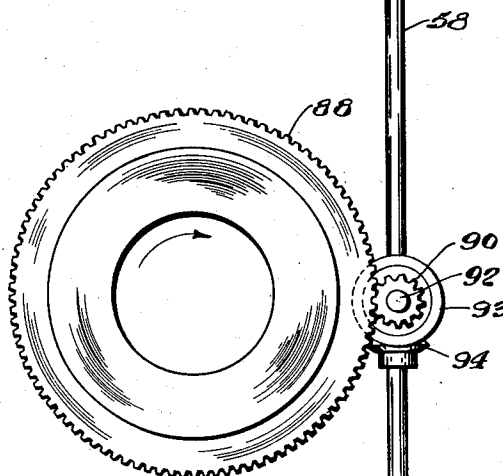
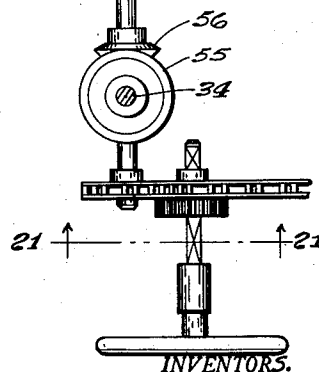
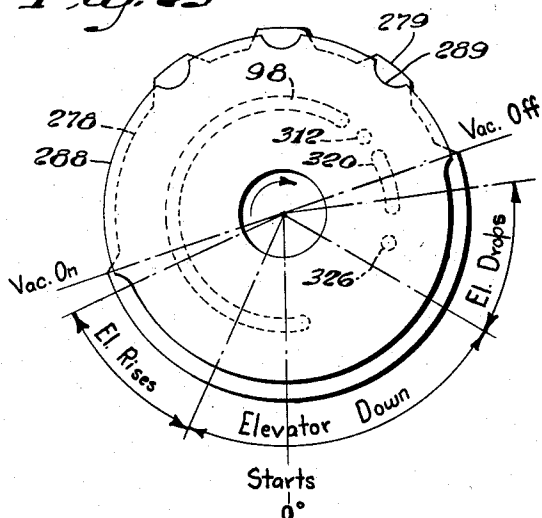


Fig. 23



INVENTORS.
Edward J. McCarthy
BY Arthur F. Whitehead
J. Stanley Churchill.
ATTORNEY

Aug. 12, 1958

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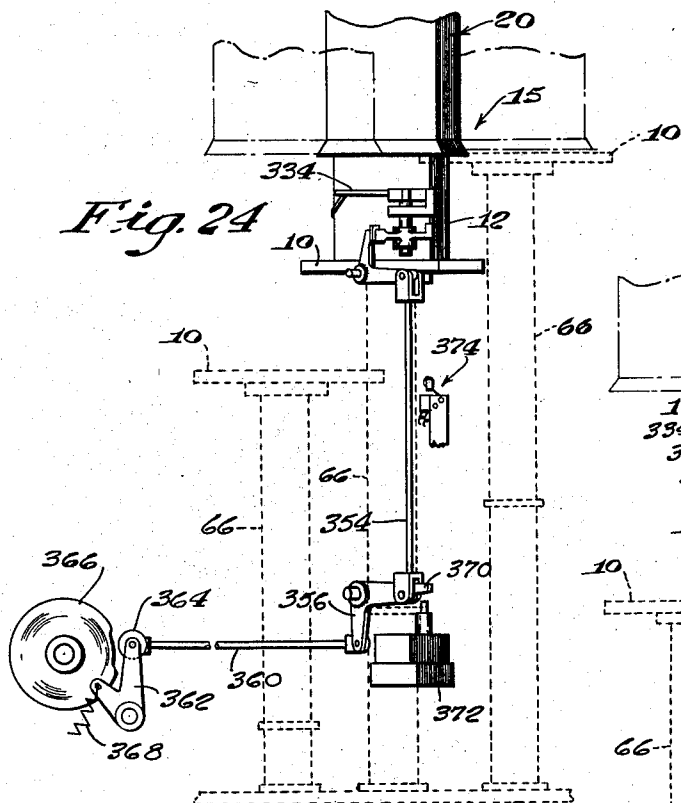


Fig. 24

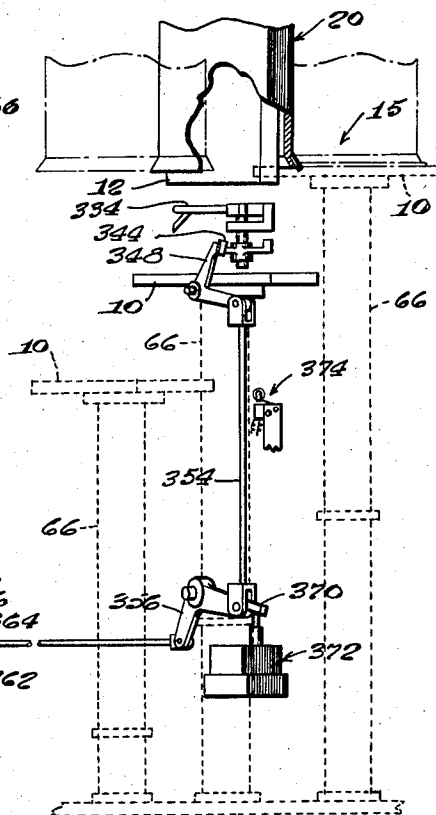


Fig. 25

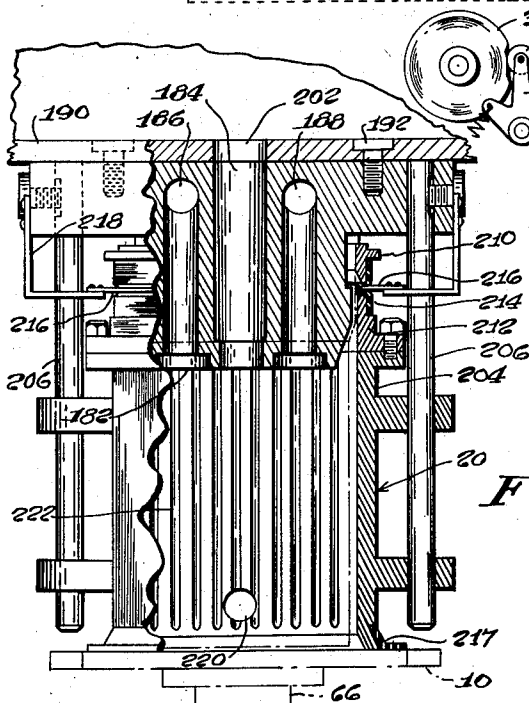


Fig. 26

INVENTORS.

Edward J. McCarthy
BY Arthur F. Whitehead
J. Stanley Churchill
ATTORNEY

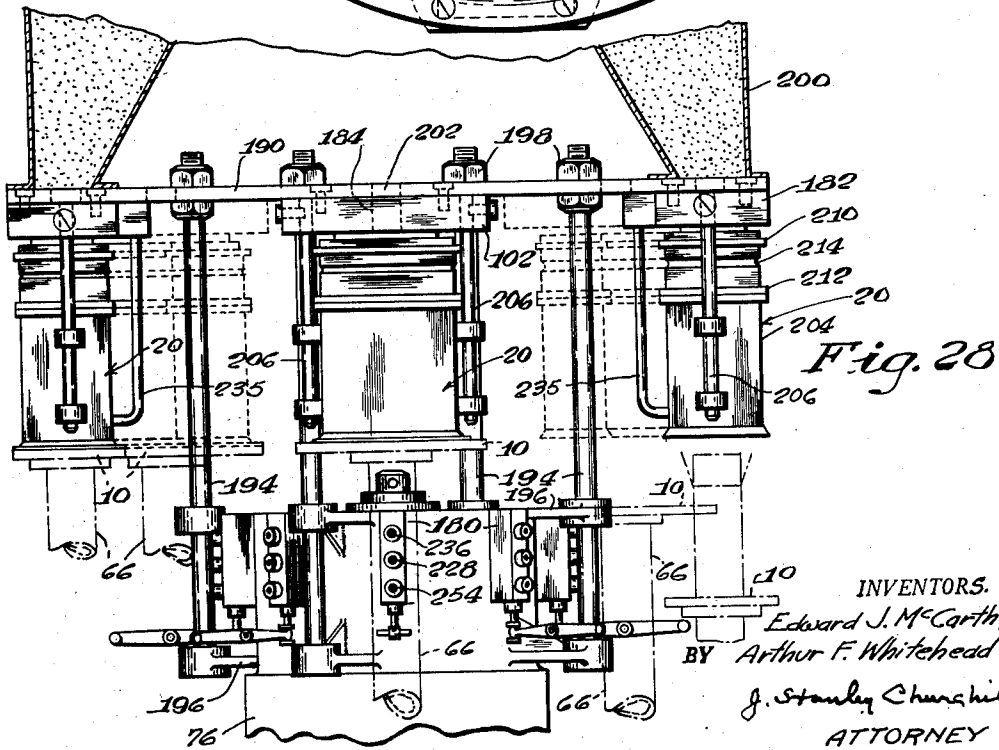
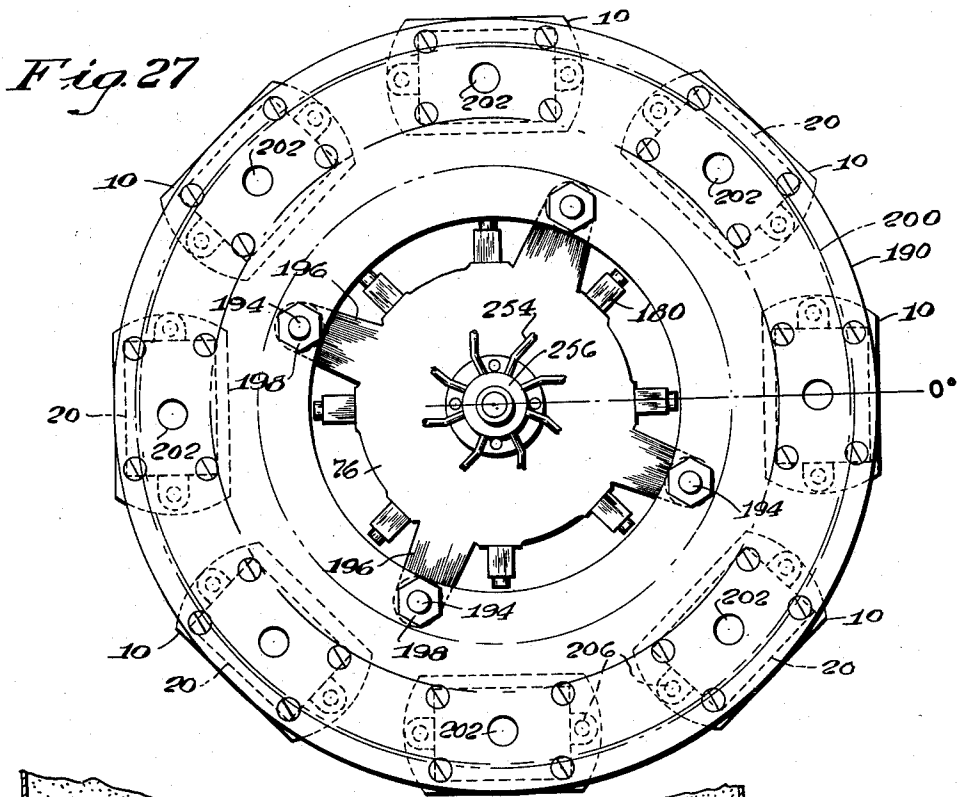
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INVENTORS.

Edward J. McCarthy

BY *Arthur F. Whitehead*

J. Stanley Churchill

ATTORNEY

Aug. 12, 1958

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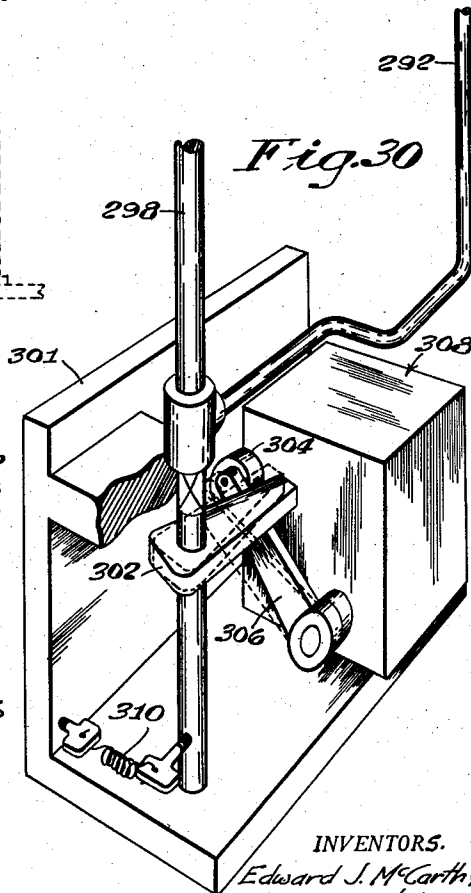
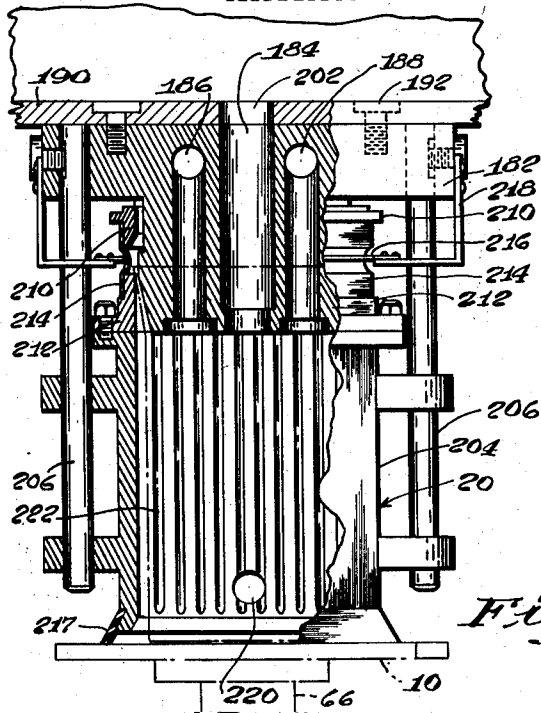
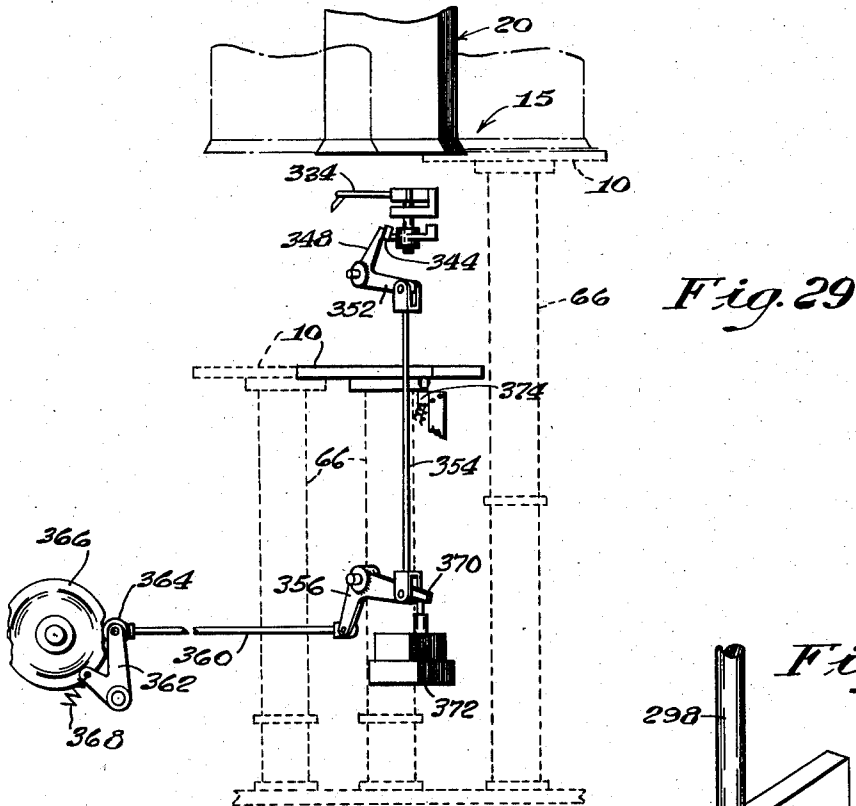


Fig. 31

BY

INVENTORS.
Edward J. McCarthy
Arthur F. Whitehead
J. Stanley Churchill
ATTORNEY

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VACUUM FILLING MACHINE

Edward J. McCarthy, Braintree, and Arthur F. Whitehead, Quincy, Mass., assignors to Pneumatic Scale Corporation, Limited, Quincy, Mass., a corporation of Massachusetts

Application March 18, 1954, Serial No. 417,198

15 Claims. (Cl. 141—51)

This invention relates to a vacuum filling machine.

The invention has for an object to provide a novel and improved vacuum operated filling machine for filling flexible containers with finely divided materials in a rapid and superior manner and which embodies novel safety mechanisms for controlling the operation of the machine in the event of the absence of a container or in the event of displacement of a flexible container relative to a filling head whereby to eliminate disadvantages encountered in the operation of prior filling machines.

With this general object in view and such others as may hereinafter appear, the invention consists in the vacuum filling machine and in the various structures, arrangements and combinations of parts hereinafter described and particularly defined in the claims at the end of this specification.

In the drawings illustrating the preferred embodiment of the invention;

Fig. 1 is a plan view of the lower portion of a vacuum filling machine embodying the present invention;

Fig. 2 is an electric wiring diagram forming a part of the safety control mechanism;

Fig. 3 is a side elevation of the machine shown in Fig. 1;

Fig. 4 is a detail view of a portion of the mechanism shown in Fig. 3;

Fig. 5 is a plan view detail of a portion of the safety mechanism as seen from the line 5—5 of Fig. 3;

Fig. 6 is a front elevation of the machine shown in Fig. 1;

Fig. 7 is a perspective view of a portion of the safety mechanism shown in Fig. 6;

Fig. 8 is a cross-sectional view of a control valve forming a part of the vacuum filling mechanism;

Fig. 9 is a detail view of a portion of the vacuum filling mechanism showing the air lines connected between the control valve and a vacuum filling head;

Fig. 10 is a detail view of the safety control mechanism shown in Fig. 6;

Fig. 11 is a plan view partly in cross section of one of the shrouded vacuum filling heads;

Fig. 12 is a plan view partly in cross section of one of the elevating units;

Fig. 13 is a front elevation of an elevating unit;

Fig. 14 is a diagrammatic perspective view of a rotary valve forming a part of the control mechanism;

Fig. 15 is a view similar to Fig. 14 showing the valve in a different position of operation;

Fig. 16 is a detail view of the stationary portion of a rotary valve for supplying air to the elevating units, the air lines being shown diagrammatically;

Fig. 17 is a cross-sectional view taken on the line 17—17 of Fig. 1 showing the air lines and including one of the elevating units;

Fig. 18 is a detail view of the rotary valve shown in Fig. 14 and the operating linkage associated therewith;

Fig. 19 is a diagrammatic view of the air lines between the central rotary valve and the elevating units,

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the upper portion of the valve for cooperation with the stationary portion illustrated in Fig. 16 being shown;

Fig. 20 is a diagrammatic view in side elevation illustrating the air lines to the elevating mechanism and showing the central rotary valve in cross section;

Fig. 21 is a detail view of a portion of the driving mechanism, as seen from the line 21—21 of Fig. 22;

Fig. 22 is a plan view of the driving mechanism, part of which is shown in Fig. 1;

Fig. 23 is a plan view of the control valve operating cams shown in Fig. 17, forming a part of the vacuum filling mechanism;

Fig. 24 is a detail view in side elevation of a portion of the safety control mechanism shown in one position of operation, the cam for operating the linkage being shown in plan;

Fig. 25 is a similar view showing the parts in a different position of operation;

Fig. 26 is a detail view partly in cross section of a shrouded vacuum filling head;

Fig. 27 is a plan view of the material supply hopper and the vacuum filling heads connected thereto;

Fig. 28 is a side elevation of the supply hopper and the vacuum filling heads shown in Fig. 27;

Fig. 29 is a view similar to Fig. 24 showing the safety mechanism in still another position of operation;

Fig. 30 is a perspective view of one of the safety devices shown in Fig. 1; and

Fig. 31 is a view similar to Fig. 26 showing a condition wherein the container has failed to become fully seated in the shrouded vacuum filling head.

In general the present invention contemplates a novel and improved vacuum operated filling machine, herein shown as provided with shrouded vacuum filling heads, adapted to fill flexible containers, such as cardboard cartons having closing flaps, with finely divided flowable materials, such as flour. The invention is herein illustrated as embodied in a continuously operated rotary machine having a plurality of elevating platforms arranged to receive successive containers delivered thereto and to elevate the same into operative relation to the shrouded vacuum filling heads during the rotary movement of the machine.

In the normal operation of the machine successive containers are transferred from a line thereof onto successive elevating platforms and are elevated into operative relation to their respective shrouded vacuum filling heads rotated in alignment therewith, and when the container is fully seated and sealed in the vacuum filling head, the containers are evacuated and filled with the material being packaged. The elevating platforms are then caused to be lowered with their filled containers, successive containers being transferred from their platforms onto a discharge conveyor.

In accordance with one feature of the present invention provision is made for controlling the operation of the machine in a manner such as to prevent elevation of a particular elevating platform, in the event that a container is absent from the supply in a position to be transferred thereto, while permitting the machine to continue in operation to fill and discharge the preceding and succeeding containers delivered thereto. By permitting continuation of operation of the machine production is increased and wear and tear caused by unnecessary or excessive stopping and starting of the machine is reduced to a minimum. In practice failure of the elevator to rise because of the absence of a container also renders the corresponding vacuum filling head inoperative, as will be hereinafter described.

In accordance with another feature of the present invention provision is made for detecting the position of

the elevating platform prior to the filling operation to determine whether or not the container is fully seated and sealed in the shrouded vacuum filling head, and in the event that the elevating platform has not reached a predetermined height at this time, indicating that the container may be jammed or otherwise displaced in the shroud, means responsive to the detecting means is arranged to discontinue operation of the machine.

Provision is also made in accordance with another feature of the present invention for detecting the presence or absence of a filled container on its platform during the lowering operation. In the event that the container is absent from the platform at such time, indicating that the container is jammed or otherwise retained in the shroud when the elevating platform is lowered, provision is made for discontinuing the operation of the machine in response to the detecting means. Provision is also made for rendering such mechanism inoperative to stop the machine in the event that the elevator was caused to remain in its lowered position throughout the cycle by the absence of a container at the receiving station.

Referring now to the drawings and particularly to Fig. 1, the present invention is illustrated as embodied in a rotary type machine having a plurality of continuously rotated platforms 10 arranged to support successive containers 12 transferred thereto by transfer mechanism indicated generally at 14 from a supply line 16 delivered to the machine on a continuously moving conveyer belt 18. In general in the operation of the machine the containers are elevated into operative relation to shrouded vacuum filling heads indicated generally at 20, see Fig. 28, rotated in alignment with the elevating platforms 10. The elevating platforms 10 are arranged to seal the containers in airtight relation to the filling heads to permit evacuation and filling of the containers during the rotation of the machine whereupon the elevating platforms are lowered with their filled containers and transferred from the platforms by transfer means indicated generally at 22 to deliver successive containers onto a discharge belt 24.

The safety control mechanisms embodied in the illustrated machine are indicated generally in Fig. 1 and include a safety device 11 adjacent the transfer station 14 of the machine for preventing elevation of an elevating platform in the event that no container is present in the line to be transferred to the platform; a safety device 13 adjacent station 25 of the machine for terminating operation of the machine if the container has not been fully seated in operative relation to the filling head; and a safety device 15 immediately preceding the discharge station 22 for terminating operation of the machine in the event that a filled container is not withdrawn from operative relation to its filling head during the descending movement of the elevator.

The transfer mechanism 14 is arranged to push successive foremost containers 12 in the continuously advanced line thereof onto successive moving platforms 10 in their lowered positions, and as shown in Figs. 1 and 4, a pusher 26 mounted on a slide 28 supported in a bracket 30 is arranged to be reciprocated in timed relation to the movement of the elevating platforms by a cam 32 fast on a vertical shaft 34 and through linkages including an arm 36 pivotally mounted at 38 and provided with a cam roll 40 cooperating with the cam 32. A spring 37 is provided to urge the roll 40 against its cam 32. The arm 36 is connected by a link 42 to an arm 44 fast on a rocker shaft 46, and a curved arm 48 also fast on the shaft 46 is provided with a pin 50 arranged to cooperate with slots 52 formed in the arms of a depending portion 54 of the slide 28, see Fig. 6.

As illustrated in Figs. 3 and 22, the lower end of the shaft 34 is provided with a bevel gear 55 in mesh with a bevel gear 56 fast on a main drive shaft 58 arranged to be driven from an electric motor 60 connected by a belt 62 to the input shaft of a gear reduction unit 64, the

output shaft 65 of the unit being coupled to the drive shaft 58.

As above described, the pusher 26 is operated in timed relation to the movement of the elevating platforms 10 to deposit a container on to a passing elevating platform, and thereafter the elevating platform is caused to rise to present the container into operative relation to the shrouded vacuum filling head 20. As shown in Fig. 17, each elevating platform 10 is mounted on and secured to the top of a pneumatically operated sleeve or cylinder 66 slidingly supported on a rod 68 having a central bore 67. The rod 68 is supported at its lower end in a flanged member 70 supported in an annular plate 72 attached to the lower end of a supporting bracket 74. The bracket 74 is attached to and rotatable with a spider 76 rotatably supported on a stationary central sleeve 78 mounted at its lower end in a bracket 80 which may be attached to the machine frame. The lower end of the spider is provided with a thrust bearing 82 which rests on a stationary flanged member 84 supported on a shouldered portion 86 of the central sleeve 78. A ring gear 88 secured to the lower end of the rotary spider 76 is arranged to mesh with a pinion 90 fast on the upper end of a vertical shaft 92, the lower end of the vertical shaft 92 being connected by bevel gears 93, 94 to the main drive shaft 58.

The air lines to the pneumatically operated platform 10 are diagrammatically illustrated in Figs. 16, 17, 19 and 20, and as therein shown include a central rotary valve comprising a stationary lower ring 96, see Fig. 16, having an elongated arcuate grooved or slotted chamber 98 therein and a rotatable upper ring 100 having a plurality of relatively small arcuate slots 102 therein for cooperation with the slotted chamber 98. As shown in Fig. 17, the lower ring 96 is secured to the stationary member 84 supported on the central sleeve 78, and the rotatable ring 100 is secured to the underside of the rotary spider 76. Air is supplied to the elongated arcuate chamber 98 in the lower ring from a controlled source of compressed air by a supply pipe 104 provided with the usual regulating and lubricating units 106, 108 respectively, and the relatively small arcuate slots 102 in the upper ring 100 are connected by air pipes 110 through individual control valves indicated generally at 112, and pipes 114 leading from the control valves to individual chambers 116 formed in end cap members 118 fitted over the lower end of the flanged member 70 and secured to the annular supporting member 72. As shown in Fig. 17, the chamber 116 communicates with the central bore 67 in the supporting rod 68. The upper end of the bore 67 is flared, as shown, and is closed by the underside of the elevating platform 10 when the latter is in its lower position, and when the compressed air is permitted to enter the chamber 116 the elevating platform with its sleeve 66 is caused to rise on its central supporting rod 68 to elevate a container into operative relation to its individual shrouded vacuum filling head. As also shown in Fig. 17, the lower end of the cylinder 66 is connected by an expansible bellows member 69 to the upper surface of the flanged member, and a breather pipe 71 open to the atmosphere extends from a passageway 73 in the flange 70, which communicates with the interior of the bellows. It will also be observed that the central supporting rod 68 is reduced in diameter immediately below the upper end thereof, forming an annular space between the rod and its sleeve. Thus, in operation when the cylinder 66 is elevated to expand the bellows 69 air may be drawn in through the breather pipe, and conversely, when the cylinder 66 is lowered the air within the bellows may be exhausted through the breather pipe 71. The restricted passageway 73 and the bellows cooperate to form a cushioned descent of the cylinder 66 and its elevating platform.

As diagrammatically indicated in Fig. 23, the 0° position therein shown corresponds substantially to the re-

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ceiving station 14 in Fig. 1 where a container is presented to an elevating platform 10 in its lowered position, and immediately thereafter during the continuous rotation thereof an arcuate slot 102 in the upper valve member 100 comes into communication with the elongated slotted chamber 98 to start elevation of the platform. As shown in Figs. 12 and 13 and diagrammatically in Fig. 20, the elevator is controlled in its upward movement by a stationary cam 120 which cooperates with a roller 122 carried by the sleeve 66. The sleeve with its elevating platform is prevented from rotation on its own axis by a roller 124 movable in a vertical guide formed by angle pieces 126, 128 secured to the supporting bracket 74. Thus, in normal operation the elevator will have been fully extended to present its container in operative filling relation to its vacuum filling head prior to the time it arrives at Station 25 in Fig. 1. The cam 120 is also arranged to control the descent of the cylinder 66 and its elevating platform 10, as indicated in Fig. 20.

In accordance with one feature of the present invention provision is made for preventing elevation of an individual platform 10 in the event that a container is not present in the line to be transferred to the platform. In practice this is accomplished by detecting the presence or absence of a container in operative position to be transferred and by actuating the control valve 112 associated with the particular elevating platform in response to the detecting mechanism to cut off the air to the elevating mechanism in the event that a container is absent. As herein shown, see Fig. 1, the foremost container in the continuously advanced line is arranged to engage and rock a latch arm 130 forming a part of the control mechanism. The arm 130 is pivotally mounted on a stud 132 carried by a bracket 134 attached to the slide supporting bracket 30 and is urged to be rocked by a spring 136 in a counterclockwise direction to present the head portion 131 of the arm in front of the pusher 26 to prevent advancement of the pusher when no container is present. Thus, the linkage connecting the pusher 26 to the cam 32 is retained in its inoperative position, shown in full lines in Fig. 4, the cam lever 36 being held up against the force of its spring 37 to prevent the roll 40 from following its cam 32. Conversely, when a container is advanced in front of the pusher 26 and engages the latch arm 130, the latter is rocked out of the path of the pusher, as shown in full lines in Fig. 1, and the linkage is released to effect transfer of the container onto its elevating platform as shown in dotted lines in Fig. 4.

An individual control unit 112 is provided for each elevating unit, and as shown in detail in Figs. 18 and 19, each control unit includes a rotary valve 140 mounted to be rocked on a pivot 141 in a valve block 142, the valve block being connected in the air line by the pipe 110 from the central valve 96, 100 and by the pipe 114 leading to the cylinder chamber 116 of the platform elevating mechanism. As diagrammatically indicated in Figs. 14 and 15, the valve 140 is provided with a transverse port 144 arranged in one position to effect communication between the pipes 110, 114, as shown in Fig. 14. The valve 140 is also provided with a radial port 146 arranged to connect the pipe 114 from the cylinder with a passageway 148 in the block which is open to the atmosphere, such position being shown in Fig. 15, wherein the air in the pipe 110 is cut off by the face of the rotary valve 140. Thus, air is prevented from being supplied to the chamber 116 so that the elevating platform will remain in its lowered position when the valve 140 is rocked to the position shown in Fig. 15.

Provision is made for rocking the valve 140 from the position shown in Fig. 14 to the position shown in Fig. 15 through connections from the transfer mechanism 11, and as illustrated in detail in Fig. 18, the valve member 140 is provided with an arm 150 connected by a link 152 to one arm 154 of a bell crank pivotally mounted on a stud 156 carried by a bracket 158 attached to the machine

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frame. The second arm 160 of the bell crank is provided with a cam roll 162. A spring 164 connected between the link pin 166 and the base of the bracket is arranged to retain the linkage in the position shown in Fig. 18 wherein the port 144 connects the air pipes 110, 114, such position being adjustably maintained by a stop screw 161 carried by the bracket 158 and engageable with the arm 160. Referring now to Fig. 4, it will be seen that the cam lever 36 forming a part of the pusher linkage is provided with an arm 168 connected by a link 170 to an arm 172 mounted to rock on a stud 174. The arm 172 is provided with a curved cam piece 176 arranged to be moved into the path of the roller 162 of the valve unit 112 shown in Fig. 18 to effect rocking of the linkage and the rotary valve 140 to cut off the air from the pipe 110 and open the pipe 114 from the cylinder chamber 116 to the atmosphere. The relation between the cam piece 176 and the individual control units 112 is clearly shown in Figs. 3 and 6, and in practice when the pusher is operated to transfer a container from the supply onto an elevating platform, the cam piece 176 is rocked out of the path of the roller 162 so that the valve 140 remains in its open position to permit elevation of the platform. Conversely, when no container is present in the line to be transferred, the pusher 26 and its associated linkage will remain in the full line position shown in Fig. 4 and effect closing of the valve 140 to prevent elevation of the platform. It will be seen that when the linkage shown in Fig. 18 is rocked in a counterclockwise direction by the cam piece 176 it will be retained in its closed position by the spring 164 since the link pin 166 will have passed over dead center of the pivot 156. A second stop stud 163 is arranged to be engaged by a third arm 165 of the bell crank to adjustably limit the movement of the linkage in a counterclockwise direction.

In operation the particular elevating unit rendered inoperative in the manner described will remain in its inoperative position during rotation of the machine, the control unit 112 being reset to return the valve 140 to operative position by a stationary cam piece 168' which is engaged by the roller 162 immediately prior to its return to station 14, as shown in Fig. 3. In order to permit manual resetting of the unit, a vertical upwardly spring-pressed rod 167 is slidably supported above and in alignment with the upper edge of the arm 165 and may be pressed downwardly by the handle 169 to compress the spring and engage the end of the rod with the arm to rock the linkage, as described.

Thus, it will be seen that in the operation of the machine the absence of a container in position to be transferred onto an elevating platform will render the elevating mechanism for the particular platform inoperative while permitting the machine to continue in operation to effect filling and discharge of those containers previously delivered into the machine. In this manner stopping of the machine with a container only partially filled is avoided, and the machine may be cleared of all containers which have been started through the machine. It will also be observed that upon replenishing the supply of containers the machine will automatically continue its normal operation to elevate successive containers into operative relation to their respective shrouded vacuum filling heads 20.

In practice the filling operation is automatically initiated upon elevation of the platform so that when the container is fully seated and sealed in the shrouded vacuum filling head 20 the container will be evacuated and filled, the vacuum being controlled by individual cam-operated valve units 180 associated with each shrouded vacuum filling head 20. As illustrated in detail in Figs. 26 and 31, each filling head 20 includes a head portion 182 provided with a material inlet opening 184 and with two suction openings 186, 188. The head portions 182 are secured to the underside of an annular plate 190 by screws 192, the plate 190 being adjustably

supported from the rotary spider 76 by upright rods 194 secured in radial arms 196 extended from the spider. The upper ends of the rods 194 are threaded and arranged to support the plate 190 between upper and lower nuts 198, as clearly shown in Figs. 27 and 28. It will be observed that the annular supporting plate 190 forms the head bottom of the annular supply hopper 200 secured to the plate, and openings 202 in the plate are aligned with the material inlet openings 184 in the filling head portions 182 to provide communication between the supply and the filling head.

Each filling head 20 further includes a hollow rectangular shroud portion 204 slidably supported in alignment with its head portion on rods 206 depending from the head portion, as shown in Figs. 26, 28 and 31. The upper end of the shroud portion is provided with a flap engaging and sealing section secured to the portion 204 by screws 208, each section including an upper and a lower rectangular hollow portion 210, 212 respectively connected by a flexible band 214 of rubber or other resilient material, the band being cemented or otherwise secured to adjacent ends of the upper and lower portions 210, 212 and leaving the intermediate connecting portion of the flexible band free. A plurality of relatively thin blades 216, one for each side of the rectangular sealing section, are supported upon angle pieces 218 of spring metal attached to the head portion 204, and the thin blades 216 are urged into engagement with the connecting portion of the bands 214. The lower end of the shroud portion 204 is provided with a skirt 217 of rubber or other resilient material for sealing engagement with the elevating platform 10. The lower end of each head portion 182 may be tapered, as shown, to form a guide for the closing flaps 8 of the containers 12 when a container is elevated into operative relation to the filling head.

As thus described, it will be seen that when a container, such as a flexible cardboard carton having closing flaps, is elevated into the shrouded portion of the filling head by the elevating platform 10, the closing flaps 8 are guided into the relatively narrow space between the filling head portion 182 and the flexible band 214, as shown in Fig. 31, and upon further upward movement of the elevator 10, the band 214 will be resiliently urged into airtight sealing engagement with the flaps, and the bottom of the shroud will be sealed by engagement of the platform 10 with the resilient skirt 217 to enclose the carton within the shroud. As illustrated, there is a space between the interior of the shroud and the exterior of the carton. One side wall of the shroud portion 204 is also provided with a suction opening 220, and the interior surfaces of the shroud may be provided with longitudinal grooved portions 222, as shown. As illustrated in Figs. 1 and 11, each shrouded vacuum filling head 20 is further provided with a manifold 224 having a chamber 226 connected by a pipe 228 to a vacuum chamber 230 formed in the valve unit 180. The manifold chamber 226 is further connected by passageways 232, 234 to the suction openings 186, 188 respectively and by a passageway 235 to the shroud suction opening 220. The manifold is also connected by a pipe 236 to an atmospheric chamber 238 formed in the valve unit 180 which is open to the atmosphere through an opening 240 formed in the valve block.

As shown in detail in Fig. 8, each valve unit 180 is further provided with a vacuum supply chamber 250 having a valve opening 252 in communication with the vacuum chamber 230 and which is connected by a supply pipe 254 to a hollow cap member 256, see Fig. 17, secured to an upper disk 258 rotatable about the upper end of the central supporting sleeve 78, the hollow cap member 256 being in communication with the upper open end of the hollow sleeve 78. The lower end of the sleeve 78 is closed and is provided with a pipe 258 leading to a

vacuum pump or other source of reduced air pressure, not shown.

The vacuum chamber 250, as shown in Fig. 8, is provided with a valve 260 slidably mounted in the valve block 180 and arranged to close the opening 252 between the chambers 250 and 230. The lower end of the valve stem is provided with a grooved portion arranged to cooperate with the rounded end of one arm 262 of a two-armed lever pivotally mounted at 264 in a bracket 266 attached to the bracket 74. The second arm 268 of the two-armed lever is provided with a spring 270 which tends to urge the valve 260 into a closed position, and the outer end of the arm 268 extends into the path of a lug 272 carried by the sleeve 66 of the elevating mechanism. Thus, when the sleeve or cylinder 66 is elevated with its platform 10 to seal the container in operative relation to the filling head, the lug 272 will rock the two-armed lever, as shown in Fig. 9, to open the valve 260 and permit communication between the chambers 250 and 230. A second lug 251 on the sleeve 66 is arranged to cooperate with a set screw 253 carried by the bracket 74 for limiting the upward movement of the elevating platform 10.

The vacuum chamber 230 is also provided with a valve 274 slidably mounted in the block 180 and arranged to cooperate with the port 231 to which the vacuum pipe 228 is connected. The outer end of the valve stem is provided with an adapter 275 having a roller 276 arranged to cooperate with a cam 278 fast on the stationary supporting sleeve 78, as shown in Fig. 17. A spring 280 interposed between the adapter 275 and the valve block 180 is arranged to urge the valve 274 to the left or open position, as shown in Fig. 8, and the cam 278 is arranged to close the port 231 to cut off the suction to the filling head.

The atmospheric chamber 238 is provided with a similar valve 284 arranged to open and close the pipe line 236 to the atmosphere, the valve stem being provided with a roller 286 arranged to cooperate with a stationary cam 288 fast on the central supporting sleeve 78. A spring 290 is arranged to urge the valve away from its port 285 to open the vacuum filling head to the atmosphere, the valve being shown in its closed position in Fig. 8.

As thus constructed, it will be seen that in the operation of the machine when the elevator platform 10 is elevated between stations 14 and 13 the lug 272 engages the arm 268 of the two-armed lever to open the valve 260 to permit communication between the vacuum supply chamber 250 and the chamber 230. At this time the container is sealed in airtight relation to the shrouded vacuum filling head, and subsequently during the continued rotation of the machine, the cam 278 will effect opening of valve 274 to permit the container to be evacuated and the material withdrawn from the supply through the inlet opening 184 into the container. The space within the shroud is also evacuated at this time to equalize the pressure within and without the flexible container to prevent collapse thereof during the filling operation. Substantially simultaneously with the opening of the valve 274, the cam 288 effects closing of the atmospheric valve 284. The timing of the cams is shown in the cam chart in Fig. 23 with relation to the movement of the elevator. As therein shown, the cam 278 is provided with a plurality of high spots 279, and the cam 288 is provided with a plurality of corresponding low spots 289 whereby to effect alternate opening and closing of the valves 274, 284, subjecting the filling head alternately to the suction and the atmosphere during the filling operation to effect a rapid and uniform filling and packing of the material into the container.

From the description thus far it will be observed that during the normal operation of the machine the containers are elevated to the shrouded filling heads, the supply chamber 250 in the valve block being opened

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upon elevation of the platform 10, and the valve 274 in the chamber 230 being subsequently opened to evacuate the container and withdraw the material from the supply hopper into the container. It will thus be seen that if the elevating mechanism is rendered inoperative by the safety mechanism 11 at the transfer station 14 the lug 272 will not engage the arm 268, and the vacuum supply chamber port 252 will remain closed by virtue of the spring 270, thus rendering the corresponding vacuum filling head 20 inoperative when no container is delivered to the platform.

Referring now to Figs. 1 and 6, provision is made for terminating operation of the machine in the event that a container does not properly enter the shrouded filling head and becomes jammed therein during the elevating operation, and as a result thereof the elevating platform 10 is stopped in its elevating movement by the jammed container. Provision is made for detecting such a condition as the elevating platform approaches station 25, and as illustrated in Fig. 6, a generally U-shaped detecting arm having a vertically disposed portion 292 is disposed in the path of the elevating platform during its rotary and elevating movement and is arranged to be engaged by the platform in the event the latter has not been elevated beyond a predetermined distance as the platform approaches station 25, thus indicating that the container is not properly seated in airtight relation to its filling head, as described. As seen in Fig. 6, the upper and lower ends of the arm 292 comprising the legs of the U are secured in collars 294, 296 respectively fast on a vertical rocker shaft 298 rotatably supported in brackets 300, 301 secured to the machine frame. As illustrated in detail in Fig. 30, the lower end of the shaft 298 is provided with an arm 302 fast thereon arranged to cooperate with a roller 304 carried by switch arm 306 forming part of a normally closed switch 308. A spring 310 connected between the shaft 298 and the bracket 301 is arranged to rock the shaft in a clockwise direction viewing Fig. 1 to present the arm 292 in the path of an approaching elevator platform 10, and engagement by the elevator platform is arranged to rock the shaft in the opposite direction to open the contacts of the switch 308. As shown in Fig. 2, the switch 308 is included in a circuit 309 to the motor 60.

As illustrated in Fig. 6, it will be seen that in operation a normally elevated platform 10, shown in dotted lines, will have cleared the upper end of the detecting arms 292 so that the arm will not be rocked and the machine will continue in operation. However, if the container is displaced or jammed in the filling head or if for any other reason the platform does not rise above the detecting arm at this point, the platform will engage and rock the arm 292 to open the switch 308 in the motor circuit and discontinue operation of the machine. When the jammed container is removed, or other cause of failure to elevate is corrected, the elevating control unit 112 may be manually operated to open the elevating cylinder to the atmosphere, and the machine may again be started to continue normal operation. It will also be observed that in the event no container is initially transferred to the platform and the latter is caused to remain in its lowered position, such platform is permitted to pass under the detecting arm 292 to permit continued operation of the machine.

Referring now to Figs. 16, 19, 20 and 23, in the normal operation of the machine after the container has been filled, the elevator platform is caused to be lowered with its container from operative relation to the filling head. Provision is made for lowering the cylinder 66 gradually by reducing the operating pressure in progressive stages before opening the cylinders to the exhaust whereby to permit a cushioned descent of the elevator and prevent a rapid lowering thereof which might cause damage to the parts. Thus, as the arcuate ports 102 of the rotary valve member 100 leave the elongated groove

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98 in the valve member 96 they come into communication with an opening 312 in the lower member 96 which is arranged to communicate with the supply line 104 through a pipe 314 having a check valve 316 and a relief valve 318 adjusted to reduce the pressure from the main line momentarily to permit the cam 120 to break the seal and start descent of the elevating cylinder 66. It will be understood that the filling head and the shroud portion are open to the atmosphere at this time, as described, to permit descent of the container with its elevating platform, and immediately thereafter the arcuate port 102 comes into cooperation with a second opening 320 of arcuate shape formed in the valve member 96. The opening 320 is connected by a pipe 322 with a relief valve 324 which permits gradual descent of the cylinder 66 to a lowered position, and finally the port 102 is opened to the atmosphere through an exhaust opening 326 in the valve member 96. The container thus lowered is then engaged by one arm 221 of the discharge spider 22, and is guided by suitable rails, not shown, onto the discharge conveyer 24. As shown in Figs. 1 and 6, the discharge spider 22 is fast on the upper end of a shaft 328 and is arranged to be rotated in timed relation to the movement of the platforms by a gear 330 fast on the shaft 328 in mesh with a pinion 332 fast on the shaft 34.

In practice a filled container may fail to be lowered with its platform out of operative relation with the vacuum filling head because of jamming of the container in the shroud or for other reasons, and as a result the container may be carried around to the receiving station where a second container would be elevated and jammed into the shrouded filling head. In order to avoid such condition, provision is made for detecting the absence of a container on the platform during the lowering movement and for terminating the operation of the machine in the event that a container is not present on the platform at such time, such mechanism being indicated generally at 15 in Fig. 1. As illustrated in Figs. 1 and 6 in detail in Fig. 7, the safety mechanism 15 includes a feeler arm 334 connected to an arm 336 loosely mounted on the upper end of a stud 338 supported in the machine frame and is connected by a spring 340 to a second arm 342 clamped to the stud 338. A latch arm 344 also fast on the stud 338 is provided with a spring 346 tending to rock the stud 338 in a direction such as to present the feeler arm in the path of a container being lowered from the filling head on the platform 10. A latch member 348 formed on one arm of a bell crank is arranged to cooperate with the latch arm 344 and is pivotally mounted on a pin 350. The second arm 352 of the bell crank is connected by a link 354 to a bell crank 356 pivoted at 358. The bell crank 356 is connected by a link 360 to a cam lever 362 having a roller 364 arranged to cooperate with a cam 366 fast on the vertical shaft 34, see Figs. 5 and 10. The cam lever 362 is provided with a spring 368 arranged to urge the roller against its cam 366. The vertical cam shaft 34 is rotated at a ratio relative to the rotation of the platforms such as to effect rocking of the latch member 348 each time a container travels therepast if permitted to do so by the feeler arm 334.

In the normal operation of the machine when the feeler arm 334 is engaged by a container withdrawn from its shrouded vacuum filling head, as shown in detail in Fig. 7, the stud 338 is rocked to present the latch arm 344 in front of the latch member 348, thus retaining the linkage in the position shown in Figs. 10 and 24, and preventing the roller 364 from following its cam 366. However, in the event that no container is present on the platform at this time, indicating that the container has failed to follow the platform down and is still disposed within the shroud, as shown in Fig. 25, the latch arm 344 will be rocked out of the path of the latch member 348, permitting the latch linkage to be rocked by the cam

366. When this occurs an extension 370 of one arm of the bell crank 356 is arranged to engage and open the contacts of a normally closed switch 372 to open the circuit to the motor 69, as shown in Fig. 2, and terminate operation of the machine.

Provision is also made for rendering the safety mechanism 15 inoperative to stop the machine in the event that a container is initially absent from the platform 10, and such platform is maintained in its lowered position throughout its travel around the machine. When this occurs it is not desired to stop the machine when such platform arrives at the safety station 15 even though the feeler arm 334 does not detect a container on the platform at this time. For this purpose a normally open switch 374 is provided in a shunt circuit 375 which is arranged to be engaged and closed by the underside of an unelevated platform 10 as it passes station 15, such position being shown in Fig. 29. As shown in Fig. 2, even though the circuit is opened at switch 372 at this time by failure of the feeler arm 334 to detect a container, the circuit will be closed by switch 374 to permit continuation of operation of the machine.

From the above description it will be seen that the present vacuum filling machine is provided with safety control mechanism for preventing elevation of an individual elevating platform in the event that a container is not present in the line to be delivered thereto so that the particular elevating platform will remain in its lowered position during a full cycle of the machine, and as a further result of such failure to elevate a platform the corresponding vacuum filling head 20 will be rendered inoperative for such cycle. It will be also seen that safety control mechanism is provided to discontinue operation of the machine in the event that a container fails to be elevated into a fully seated and airtight relation to its filling head. It will be further observed that safety mechanism is also provided to discontinue operation of the machine in the event that a container fails to be withdrawn from its filling head after the filling operation, and that such mechanism is rendered inoperative to stop the machine in the event a container is initially absent from the machine and the elevating mechanism is maintained in its lowered position.

While the preferred embodiment of the invention has been herein illustrated and described, it will be understood that the invention may be embodied in other forms within the scope of the following claims.

Having thus described the invention, what is claimed is:

1. In a vacuum filling machine of the character described, in combination, a vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms, means for transferring successive containers from a supply thereof onto successive platforms, means for elevating the platforms to present the containers into operative relation to said vacuum filling heads, said elevating platforms being lowered to remove the containers from operative relation to said vacuum filling heads after the filling operation, and control means including a movable element for detecting the presence of a container on a platform in its partially lowered position, and means responsive to movement of said element when a platform lowers without a container thereon for terminating the operation of the machine in the event that a container is not present on the platform at such time indicating that such container has failed to be lowered from operative relation to its filling head.

2. In a vacuum filling machine of the character described, in combination, vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms, means for transferring successive containers from a supply thereof onto successive platforms, means for elevating the platforms to present the containers into operative relation to said vacuum filling heads, control means including means for detecting the presence

of a container about to be transferred onto an elevating platform, and means responsive to said detecting means for rendering the elevating means inoperative in the event that a container is not present to be transferred, said elevating platforms being lowered to remove the containers from operative relation to said vacuum filling heads after the filling operation, and a second control means including means for detecting the presence of a container on a platform in its partially lowered position, and means responsive to said detecting means for terminating the operation of the machine in the event that a container is not present on the platform at such time, and means for rendering said second control means inoperative in the event that no container was initially transferred to an elevating platform and such elevating platform was caused to remain in its lowered position in response to said first-named control means.

3. In a continuously operated rotary vacuum filling machine of the character described, in combination, vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms associated with said filling heads, means for transferring successive containers from a supply thereof onto successive platforms, pneumatically operated means for elevating successive platforms to present the containers into operative relation to their respective filling heads during rotation of the machine, and control means for preventing elevation of a platform when a container is not present to be transferred including an air supply associated with each pneumatically operated platform, means operatively connected to said transfer means disposed in a position to close said air supply when the transfer means is in a retracted position, and means for retaining the transfer means in its retracted position when a container is not present to be transferred.

4. In a continuously operated rotary vacuum filling machine of the character described, in combination, vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms associated with said filling heads, a pusher for transferring successive containers from a supply thereof onto successive platforms, pneumatically operated means for elevating successive platforms to present the containers into operative relation to their respective filling heads during the rotation of the machine, control means for preventing elevation of a platform when a container is not present to be transferred including an air supply having a valve associated with each pneumatically operated platform, valve operating means operatively connected to said pusher disposed in a position to close said valves when the pusher is in a retracted position, and a latch for retaining the pusher in its retracted position to effect closing of a valve when a container is not present to be transferred, the presence of a container effecting release of said latch to permit operation of the pusher and retraction of the valve operating means to permit elevation of a platform.

5. In a rotary vacuum filling machine of the character described, in combination, driving means including an electric motor and a circuit for said motor, vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms for supporting containers, means for elevating the platforms to present the containers into operative relation to their respective vacuum filling heads, said platforms being arranged to be arrested in their elevating movement by obstruction of the same prior to reaching said operative position, and control means for discontinuing the operation of the machine in the event that a platform is obstructed in its upward movement and fails to reach a predetermined position relative to its filling head prior to the filling operation, said control means including a switch in said circuit arranged to be opened when the platform fails to reach said predetermined position.

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6. In a rotary vacuum filling machine of the character described, in combination, driving means including an electric motor and a circuit for said motor, vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms for supporting containers, means for elevating the platforms to present the containers into operative relation to their respective vacuum filling heads, control means for discontinuing the operation of the machine in the event that a platform is obstructed in its upward movement and fails to reach a predetermined position relative to its filling head prior to the filling operation, said control means including a pivotal member disposed in the path of a partially elevated platform, and a normally closed switch in said circuit arranged to be opened by movement of said pivotal member when engaged by a partially elevated platform whereby to effect opening of the circuit to the motor and termination of operation of the machine.

7. In a rotary vacuum filling machine of the character described, in combination, driving means including an electric motor and a circuit for said motor, vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms for supporting containers, means for elevating the platforms to present the containers into operative relation to their respective vacuum filling heads to be evacuated and filled and for thereafter lowering the platforms to remove the containers from the filling heads after the filling operation, and control means for terminating operation of the machine in the event that a container fails to be removed from its filling head during the platform lowering operation, said control means including a movable element for detecting the presence of a container on a platform in its partially lowered position, and a switch in said circuit arranged to be opened in response to movement of said element when a container is not present on the platform at such time.

8. In a rotary vacuum filling machine of the character described, in combination, driving means including an electric motor and a circuit for said motor, vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms for supporting containers, means for elevating the platforms to present the containers into operative relation to their respective vacuum filling heads to be evacuated and filled and for thereafter lowering the platforms to remove the containers from the filling heads after the filling operation, control means for terminating operation of the machine in the event that a container fails to be removed from its filling head during the platform lowering operation, said control means including detecting means comprising a feeler arm disposed in the path of a partially lowered container, and a switch in said circuit arranged to be opened when said feeler arm fails to engage a container in such partially lowered position.

9. In a rotary vacuum filling machine of the character described, in combination, driving means including an electric motor and a circuit for said motor, vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms for supporting containers, means for elevating the platforms to present the containers into operative relation to their respective vacuum filling heads to be evacuated and filled and for thereafter lowering the platforms to remove the containers from the filling heads after the filling operation, and control means for terminating operation of the machine in the event that a container fails to be removed from its filling head during the platform lowering operation, said control means including a switch in said circuit, means for periodically opening said switch during the lowering operation, a feeler arm arranged to engage a container in its partially lowered position, and connections between the feeler arm and the switch opening means for preventing opening of the switch when the feeler arm engages a container.

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10. In a rotary vacuum filling machine of the character described, in combination, driving means including an electric motor and a circuit for said motor, vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms for supporting containers, means for elevating the platforms to present the containers into operative relation to their respective vacuum filling heads to be evacuated and filled and for thereafter lowering the platforms to remove the containers from the filling heads after the filling operation, control means for terminating operation of the machine in the event that a container fails to be removed from its filling head during the platform lowering operation, said control means including detecting means comprising a feeler arm disposed in the path of a partially lowered container, a switch in said circuit arranged to be opened when said feeler arm fails to engage a container in such partially lowered position, and means for rendering said control means inoperative to terminate operation of the machine in the event that an initially unelevated platform passes said detecting means including a shunt circuit to said motor having a normally open switch arranged to be closed when engaged by said unelevated platform.

11. In a rotary vacuum filling machine of the character described, in combination, vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms for supporting containers, pneumatically operated means including air cylinders for elevating the platforms to present the containers into operative relation to their respective vacuum filling heads to be evacuated and filled and for thereafter lowering the platforms to remove the containers from their filling heads, said pneumatically operated means including, a main air supply, a valve comprising a stationary member having an air supply chamber operatively connected to said main air supply, and a rotatable member having individual ports for cooperation with said supply chamber during the rotation of the machine for opening and closing the supply to the air cylinders, and means for controlling the descent of the air cylinders including a plurality of ports in the stationary valve member for cooperation with said individual ports after the latter have moved beyond said supply chamber, said ports comprising a first port operatively connected to said main air supply through a relief valve to permit initial lowering of successive air cylinders, a second port disconnected from said main air supply and operatively connected to a relief valve to permit further gradual lowering of the air cylinder, and a final port open to the atmosphere to permit complete lowering of said air cylinders.

12. In a vacuum filling machine of the character described, in combination, vacuum filling means including a plurality of elevating platforms, means including a reciprocable transfer member for transferring successive containers from a supply thereof onto successive platforms while the latter are in their lowered position, pneumatically operated means for elevating the platforms to present the containers into operative relation to said vacuum filling heads, and control means for preventing elevation of a platform in the event that a container is not present in the path of said transfer member to be transferred from the supply to its elevating platform, said control means including a normally open valve member forming a part of said pneumatically operated means and associated with said platform, a container controlled latch member operative to lock said transfer member in its retracted position when no container is present, and means controlled by said transfer member and cooperating with said valve member for closing the valve member to retain the platform in its lowered position in the event that said transfer member is latched in its retracted position.

13. A vacuum filling machine as defined in claim 12 which includes means for automatically resetting said

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valve member as it approaches the end of a cycle of operation.

14. A vacuum filling machine as defined in claim 12 wherein the vacuum filling means includes a normally closed suction line associated with each filling head, and means actuated by the elevation of a platform for opening and operatively connecting the suction line to its filling head whereby the filling head associated with an unelevated platform will remain in its normally closed position.

15. In a vacuum filling machine of the character described, in combination, vacuum filling means including a plurality of vacuum filling heads, a plurality of elevating platforms, means for transferring successive containers from a supply thereof onto successive platforms, means for elevating the platforms to present the containers into operative relation to said vacuum filling heads, and control means for terminating operation of the machine in the event that a container being elevated is im-

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properly engaged and jammed by said filling head so as to arrest the elevating movement of its platforms, said control means including a pivotal detecting arm disposed to be engaged and rocked by said platform in any position of elevation short of its fully elevated position in operative relation with its vacuum filling head, and means responsive to rocking of said pivotal arm for discontinuing the operation of the machine in the event that a platform has been arrested in its elevating movement by a jammed container.

References Cited in the file of this patent

UNITED STATES PATENTS

15	2,145,765	Huntley et al.	Jan. 31, 1939
	2,202,033	Stewart et al.	May 28, 1940
	2,360,198	Carter	Oct. 10, 1944
	2,603,398	Fischer et al.	July 15, 1952
	2,634,894	Fischer et al.	Apr. 4, 1953