

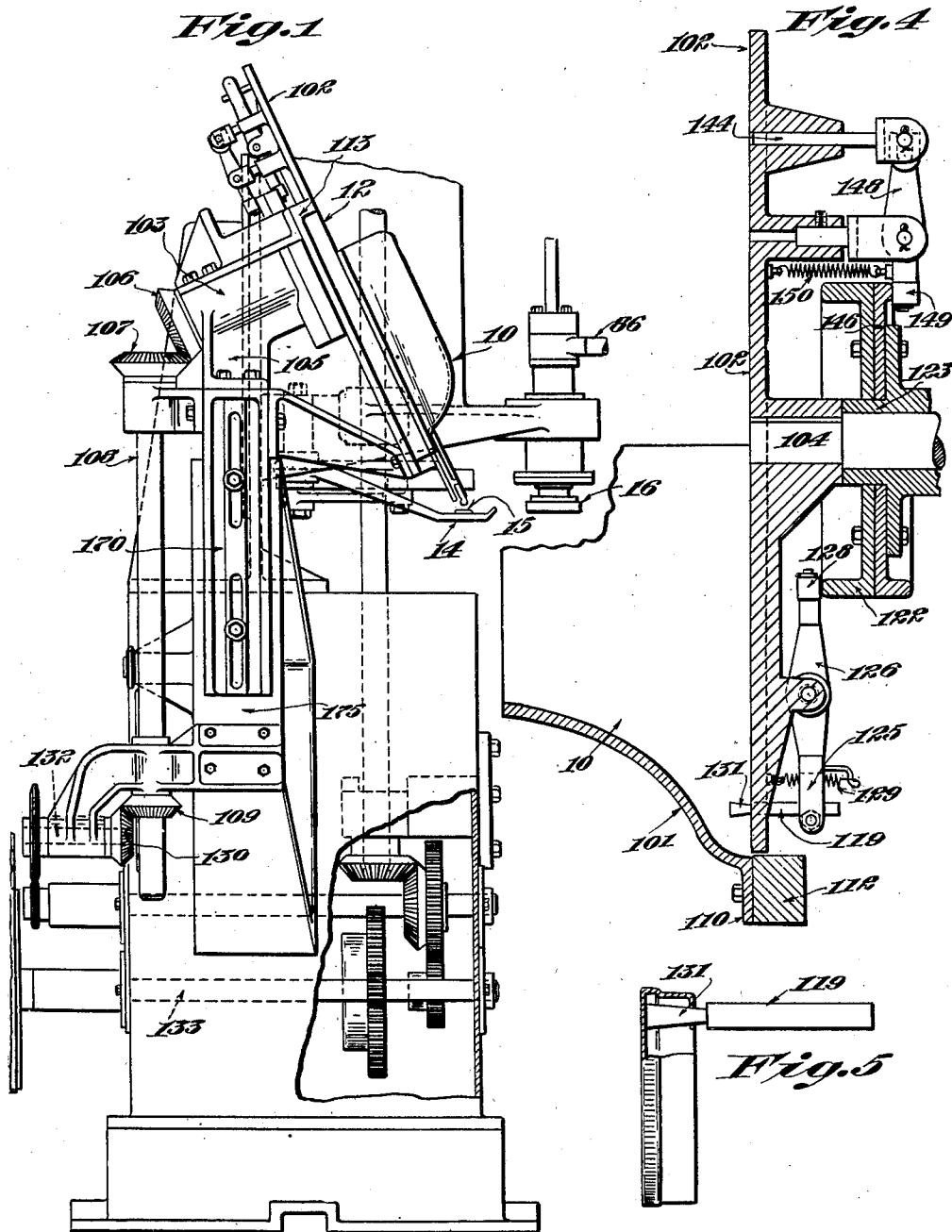
April 21, 1931.

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1,801,728

CLOSURE HANDLING MACHINE

Filed Nov. 28, 1927 6 Sheets-Sheet 1



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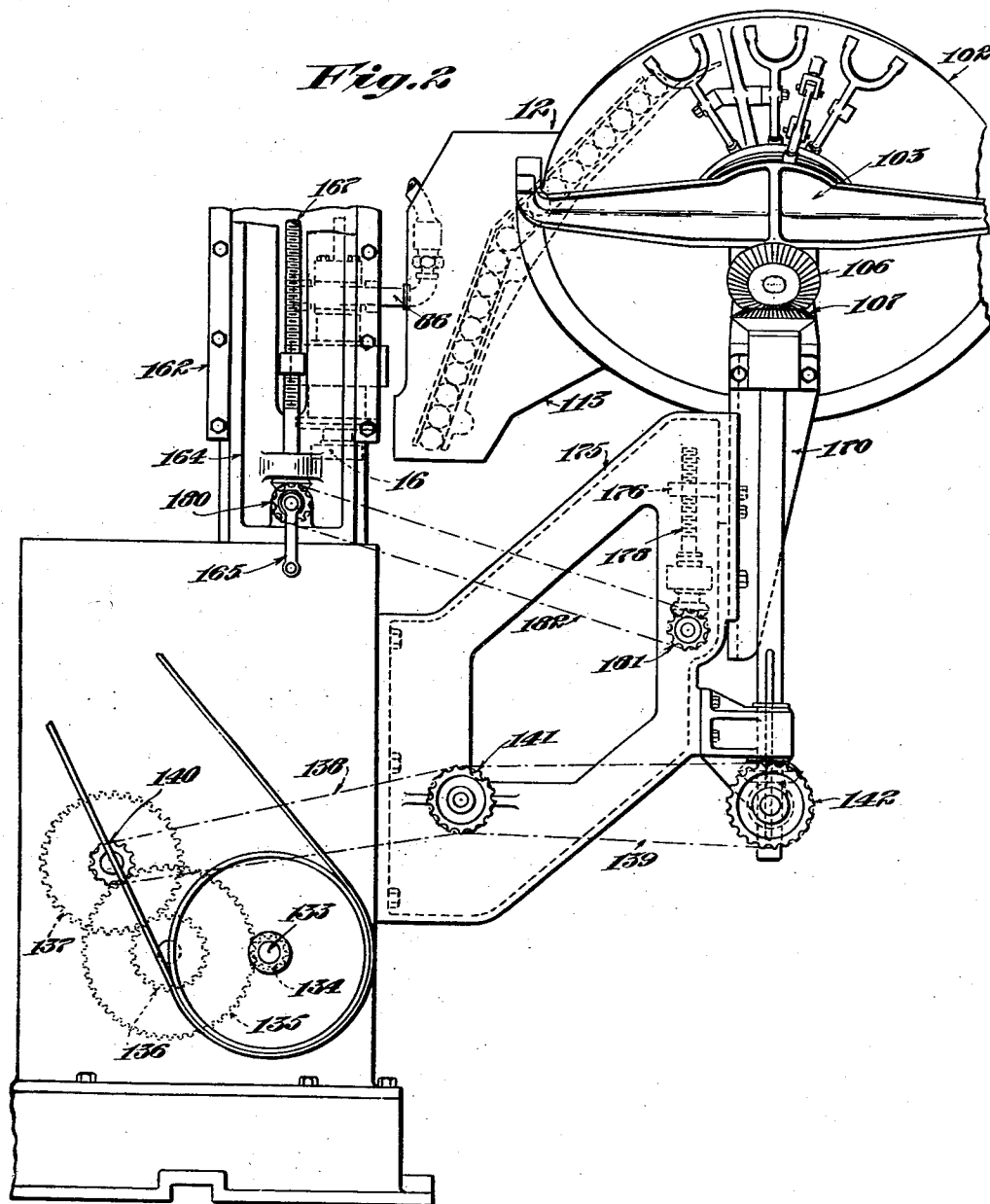
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CLOSURE HANDLING MACHINE

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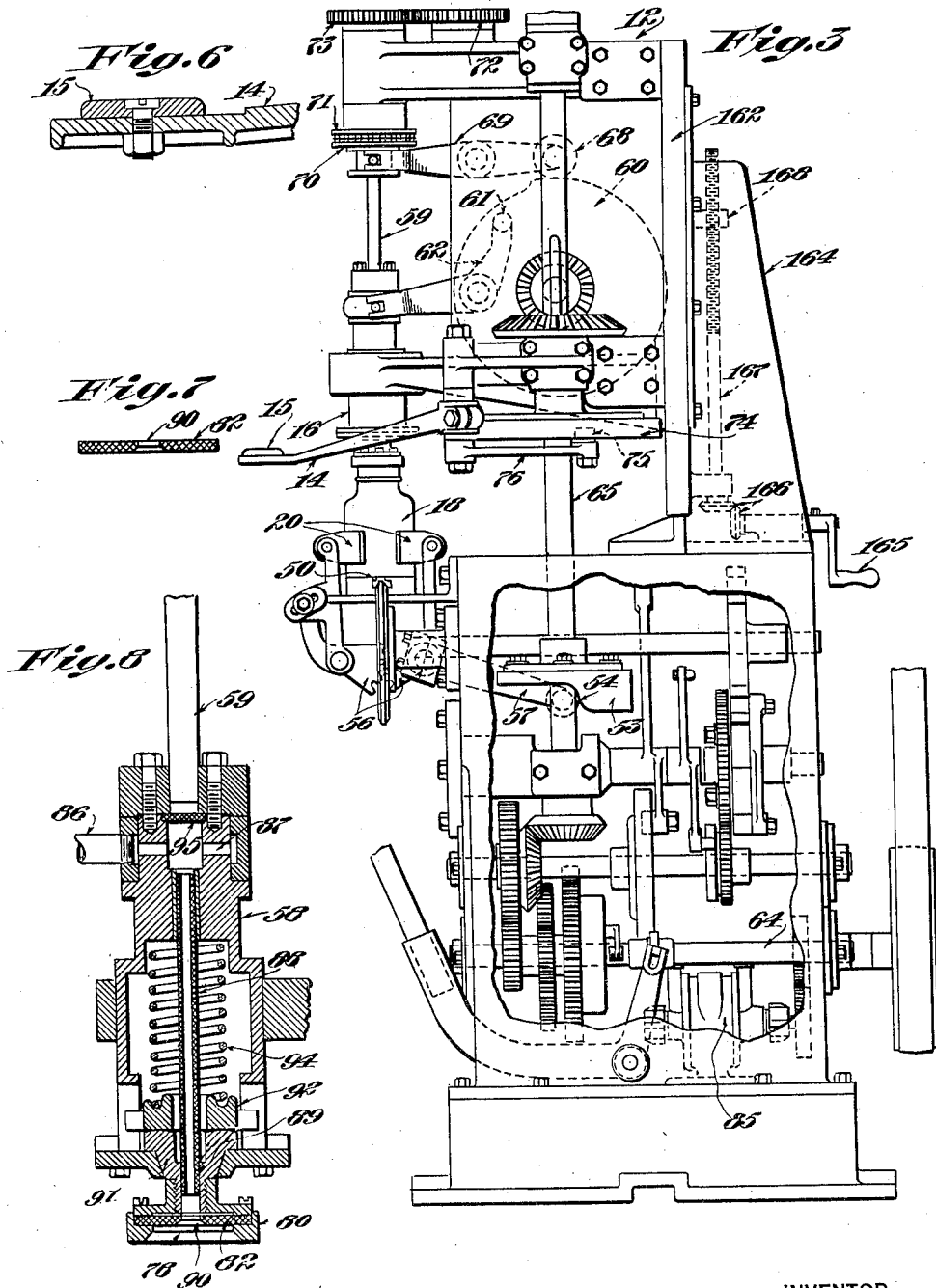
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CLOSURE HANDLING MACHINE

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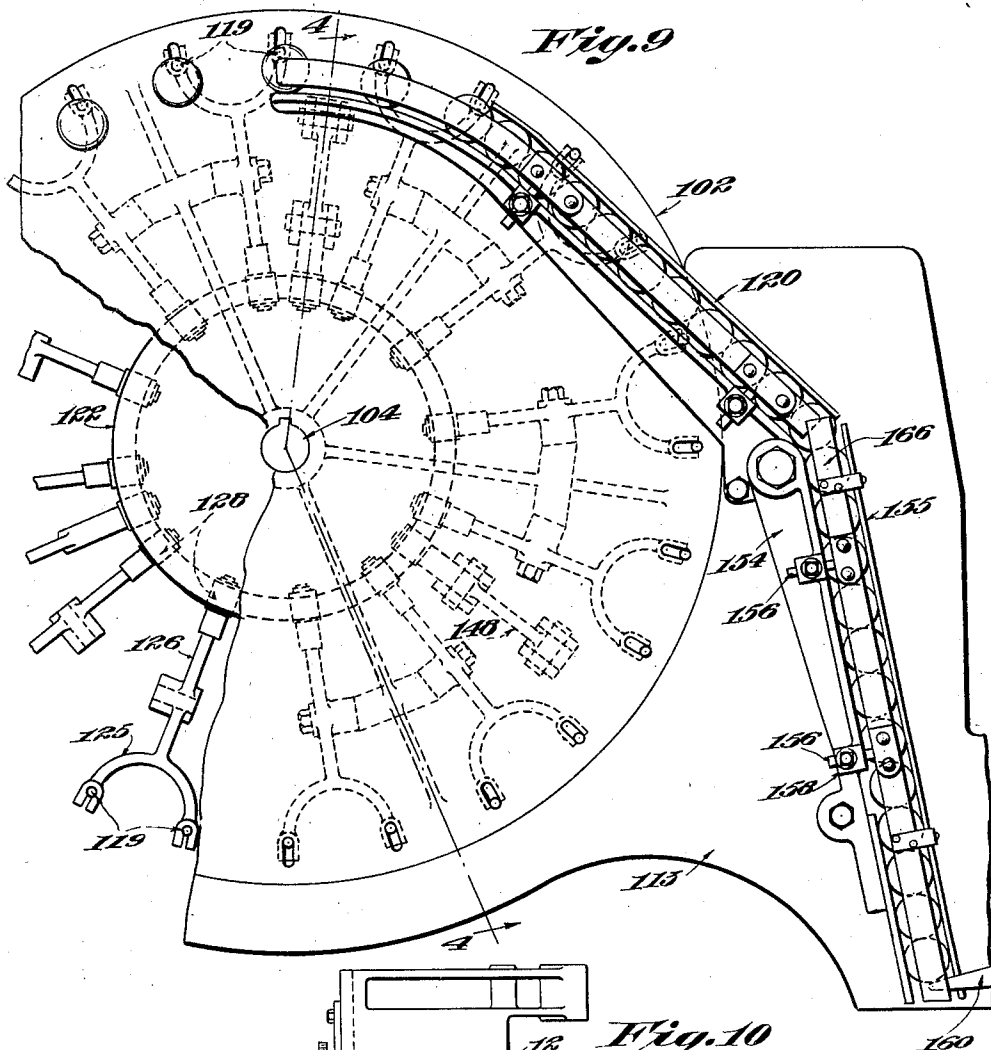
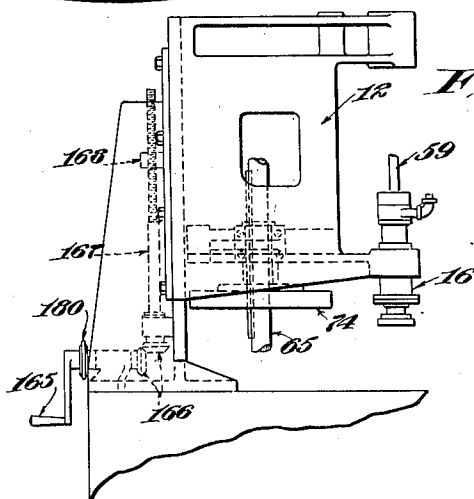
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CLOSURE HANDLING MACHINE

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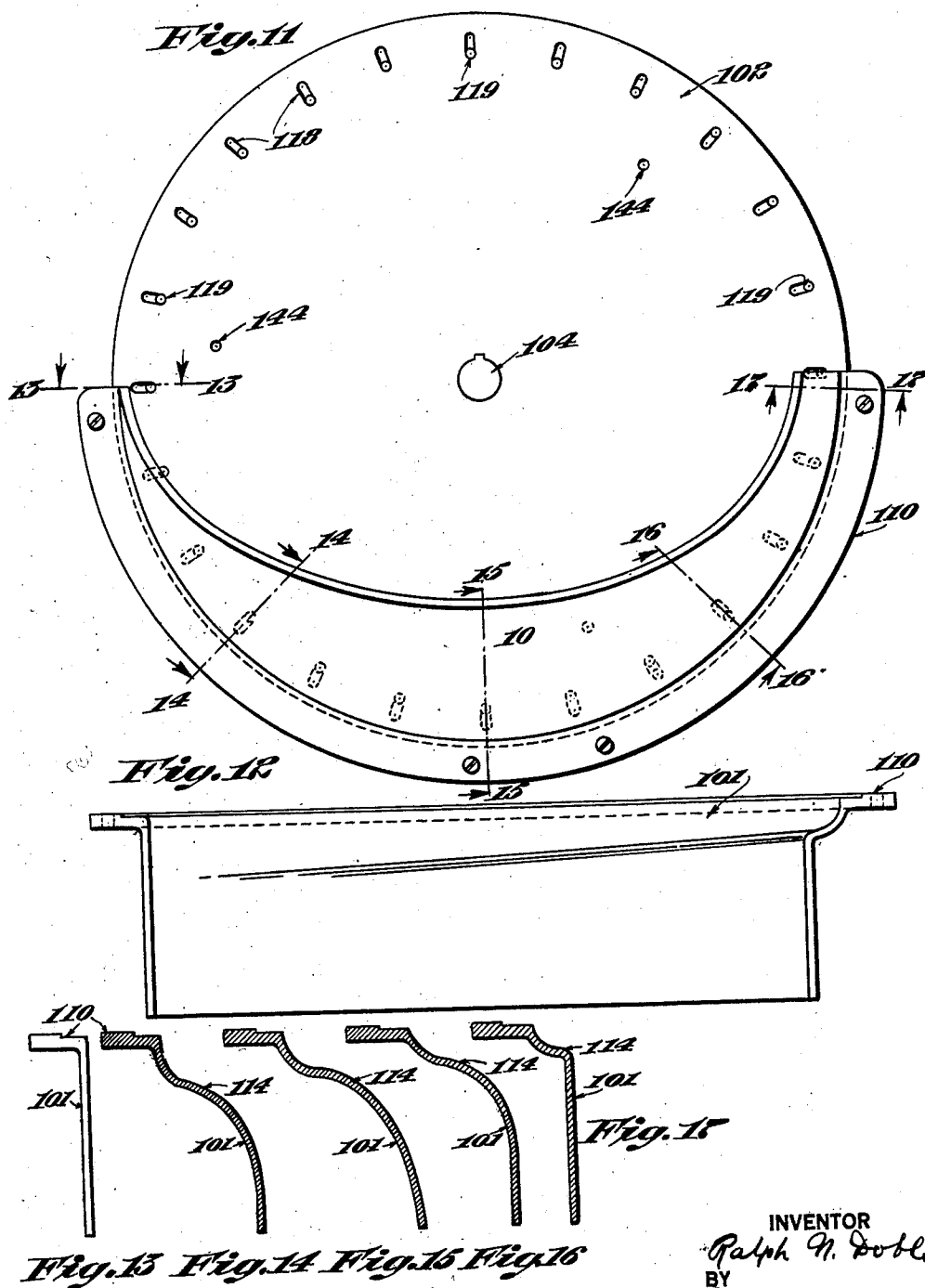
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CLOSURE HANDLING MACHINE

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6 Sheets-Sheet 5



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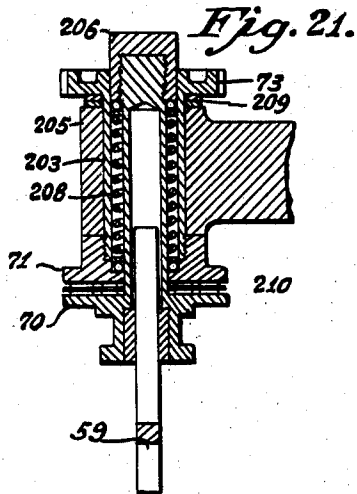
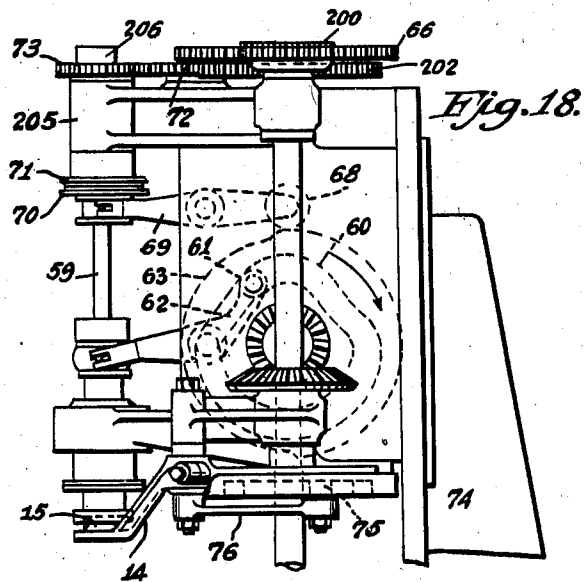
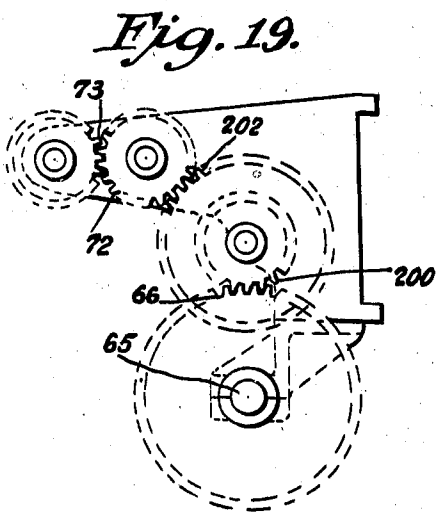
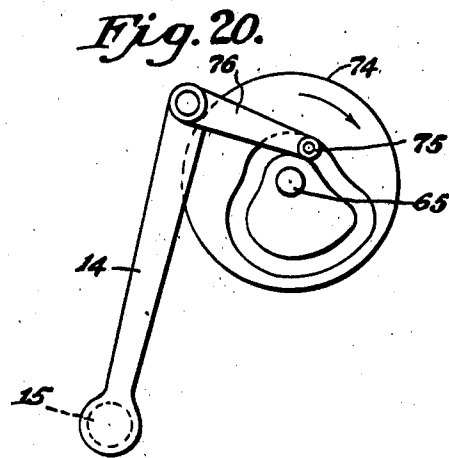
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CLOSURE-HANDLING MACHINE

Application filed November 28, 1927. Serial No. 236,068.

This invention relates to a closure handling machine and more particularly to a closure applying machine.

One object of the invention is to provide a novel and highly efficient machine for handling various commercial closure members of the general type of bottle caps, which is adapted to efficiently withdraw successive closure members from a bulk supply thereof irrespective of the size, shape or design of the individual closure members and to present successive closure members to a position from which they may be conveniently and readily transferred to operative position with respect to other instrumentalities.

A further and more specific object of the invention is to provide a novel and highly efficient automatic machine for applying closure members to containers which is capable of successful and universal operation upon closure members of the general type of bottle caps, of the different commercial sizes, shapes and designs.

With these objects in view, the invention consists in the closure handling machine, in the closure applying machine, and in the structures, arrangements and combinations of parts hereinafter described and particularly defined in the claims at the end of this specification.

The accompanying drawings illustrate the different features of the invention as embodied in an automatic machine for applying closures to containers, wherein Figure 1 is an end elevation with parts in section of a sufficient portion of a bottle capping machine embodying the present invention to enable the same to be understood; Fig. 2 is a side elevation of the machine shown in Fig. 1 viewed from the left hand side of the machine; Fig. 3 is a side elevation of the machine with a portion broken away; Fig. 4 is a sectional view taken on the line 4—4 of Fig. 9; Fig. 5 is a sectional detail view, illustrating the manner of selecting and withdrawing a cap from the mass or bulk supply thereof; Fig. 6 is a sectional detail of the cap transfer arm; Fig. 7 is a detail in section of one of the friction diaphragms preferably employed in the cap holding chuck; Fig. 8

is a sectional view of the chuck itself; Fig. 9 is a side elevation of a portion of the improved feeding mechanism; Fig. 10 is a detail in side elevation to be referred to; Fig. 11 is a front elevation of a portion of the cap feeding mechanism; Fig. 12 is a plan of the mechanism shown in Fig. 11; and Figs. 13, 14, 15, 16 and 17 are sectional details taken on the lines 13—13, 14—14, 15—15, 16—16 and 17—17 of Fig. 11, of a guard member forming a hopper for holding the bulk supply of the closures or other articles to be fed, illustrating the preferred curvature and shape of the guard at the different sections; Fig. 18 is a side elevation of the upper portion of the machine showing the gears which drive the cap holding chuck; Fig. 19 is a plan view of the gear train shown in Fig. 18; Fig. 20 is an inverted view of the cap feeding arm and mechanism for oscillating the same; and Fig. 21 is a sectional view of the friction clutch.

In general one feature of the present invention contemplates the provision of a novel and highly efficient machine capable of withdrawing successive container closure members of the general type of bottle caps, from a mass or bulk supply thereof, which is capable of successful or universal operation with a minimum adjustment upon all of the different commercial types of such closure members irrespective of the particular size, shape or design of the same. In all prior machines of which I am aware for performing this operation, the mechanism has been designed and has been capable of operating upon practically only one particular design, size or shape of commercial cap or other closure and such machines have not been adapted for universal use for all of the different designs, shapes or sizes of commercial closure members such as bottle caps. In order to adapt a particular machine to a materially different size or design of cap or other closure, extensive alterations have heretofore been required in the machine with the result that in practice several machines are required to handle several different sizes and designs of bottle caps.

The present closure handling machine is,

as above stated, adapted for general and universal operation upon all of the different sizes, shapes and designs of commercial closure members of the general type of bottle caps, with little or no adjustment, and such adjustments as may be required, may be readily made with minimum loss of time or production. Whether this feature of the invention be utilized alone in the form of a unitary machine for selecting and withdrawing successive closure members from a bulk supply and for conveying them to a position from which they may be readily and conveniently transferred to other instrumentalities, or whether the same be embodied in an automatic machine for selecting, withdrawing, and then applying the closure members to successive containers, the utility of the invention broadly considered is considerably increased by reason of its adaptability for universal operation upon all of the different commercial sizes, shapes and designs of such closure members.

Another feature of the present invention resides in the provision of a fully automatic machine for applying closures to containers in which the mechanism for withdrawing successive closure members from a bulk supply thereof and the mechanism for applying the closure members thus withdrawn to successive containers cooperate to render the machine capable of universal operation, with a minimum adjustment of the machine to adapt it to the different closures at present used in practice.

In its preferred form the invention is embodied in a bottle capping machine in which provision is made for automatically feeding successive caps from a bulk supply by novel mechanism including a hopper for containing the bulk supply of the caps, and a movable member insertable into the interior of the cap whereby the cap is hung upon the member and is moved with the member to be withdrawn from the bulk supply thereof. Provision is made for transferring the caps thus withdrawn, into operative relation with respect to a cap holding device, the latter preferably being of special design which renders it adapted for holding caps of different sizes and designs within a relatively large range, and which may be adjusted for all different sizes in a minimum time and with minimum effort. After a cap has been transferred to the cap holding device, provision is made for relatively moving the cap holding device and a container to apply the cap to the container.

Referring to the drawings, which illustrate the invention as embodied in an automatic bottle capping machine for the application to successive bottles, of caps of either the continuous screw thread or the interrupted thread type, a sufficient portion of such bottle capping machine is shown to

clearly illustrate the different features of the invention.

Referring particularly to Figs. 1 and 2, in general in the illustrated machine, a bulk supply of the caps are stored in a hopper 10 forming part of a novel automatic feeding mechanism, indicated generally at 12 and from the hopper, successive caps are automatically withdrawn by such feeding mechanism and transferred by an oscillatory arm 14 having a hub 15 over which the cap is placed, to an operative position beneath a cap holding device or chuck 16. The cap holding chuck 16 is preferably of special design, construction and mode of operation, as will be described, and functions to automatically pick up the cap from the arm 14 and to hold it, until during a subsequent part of a cycle of operation of the machine, the cap holding device is caused to descend and place the cap upon a container 18, the latter having been fed into position and gripped by gripping devices 20. Provision is then made for imparting the necessary relative movement between the cap holding device 16 and container 18 to perform the cap applying operation.

Referring to Fig. 3, the bottles to be capped are preferably fed into the machine on an incoming conveyor 50 and when the foremost bottle arrives into operative position, provision is made for holding it firmly and for preventing rotation of the same during the bottle capping operation. As herein shown, the bottle is gripped by a pair of gripping jaws 20, actuated from a cam 53 through connections including the cam roll 54, lever 57 and cooperating segments 56, as is illustrated in Fig. 3.

During the time that a bottle is being fed into operative position and clamped by the gripping jaws 20, provision is made for automatically placing a cap in the jaw or mouth of the chuck 16 and for lowering the chuck into position to cause the cap to engage the mouth of the bottle, and for then rotating the chuck to screw the cap onto the bottle.

As herein shown the chuck 16 is mounted for vertical and rotary movement, being supported in a housing 58, as will be described, fixed upon the lower end of a shaft 59, the latter being square and mounted to be capable of being moved vertically from a cam 60 through a cam roll 61 and connections 62 as shown in Fig. 3. The cam is driven from the main driving shaft 64 of the machine through suitable gearing connections and through the vertical drive shaft 65, see Fig. 3. Provision is made for controlling the rotary movement of the shaft 59, and consequently of the chuck 16, and as herein shown the cam 63 has cooperating with it a cam roll 68 mounted on the end of a lever 69, the latter actuating a friction clutch 70. The driving member 71 of the friction clutch is rotated

from the vertical driving shaft 65 through the gear 66, pinion 200, gear 202, idler gear 72, and gear 73, see Fig. 19. The friction clutch is preferably of the construction illustrated in Fig. 21. The sleeve 203 on the gear 73 extends through the hub 205 and has fixed to its lower end the driving member 71. The driven member 70 extends through the sleeve 203 and has fixed to its upper end a cap 206 which is arranged to slide vertically in the sleeve 203. Between the cap 206 and the driving member 71, a coiled spring 208 is held compressed. Suitable oil rings 209 are provided to reduce the friction between the gear 73 and the hub 205. Between the parts 70 and 71 a friction member 210 is provided.

With this construction when the cam roll 68 is on the high part of the cam 63, the driven member 70 is held away from the driving member 71. When the roll 68 is released the spring 208 forces the cap 206 and with it the driven member 70 up against the driving member 71, thereby causing the square shaft 59 and consequently the chuck 16 to rotate. The square shaft 59 is capable of vertical movement in the part 70 and rotary movement with it. With this arrangement the chuck 16 at the proper time in the operation of the machine is lowered to a position where it picks up the cap, is raised again to permit the cap feeding arm 14 to withdraw, and then is caused to descend to place the cap upon the container and rotary movement is imparted to the chuck by the operation of the friction clutch 70 to cause the cap to be screwed onto the container. The oscillatory cap feeding arm 14 is arranged to be oscillated from a cam 74 upon the vertical driving shaft 65, the cam having cooperating with it a cam roll 75 on the end of an arm 76, see Fig. 20.

The chuck 16 is preferably of the construction illustrated in detail in Fig. 8 and comprises the housing 58 mounted upon the end of the shaft 59. The cap is received within an opening 78 in a mouth-piece 80, the latter having mounted therein a friction member 82 for engaging the top of the cap to frictionally exert a torque upon the cap as the chuck is rotated during the capping operation. Provision is made for holding a cap in the chuck and preferably by suction exerted upon the top side of the cap while the latter is in the chuck. As herein shown, suction is supplied from a suction pump 85 through suitable piping connections to the chuck including a pipe 86 screwed into the chuck housing and connected with the mouth-piece of the chuck by an annular air passage 87 and through flexible tubing 88, the latter being preferably tightly fitted into a hole 89 in a supporting piece 91 upon which the mouth-piece 80 is detachably screwed, as illustrated in Fig. 8. The diaphragm 82 is preferably of rubber and of the construction

illustrated in Fig. 7, having an opening 90 which is adapted to align with the hole 89 above referred to. With this construction, suction is supplied to the space above the diaphragm within the mouthpiece, and as a result when the cap has been transferred by the oscillatory arm 14 to a position immediately below the mouth-piece of the chuck, and the latter is moved down until the top surface of the cap contacts with the frictional diaphragm 82, then the suction exerted upon the top of the cap through the opening 90 in the diaphragm serves to efficiently hold the cap in the mouth-piece. As the chuck descends and the cap is forced onto the mouth of the container, the friction between the diaphragm and the top of the cap is sufficient to insure rotation of the cap on the container. In the illustrated construction of chuck the supporting piece upon which the mouth-piece is screwed has provision for universal movement, and accordingly its upper surface is rounded and is adapted to engage an annular member 92 against which a coil spring 94 bears to yieldingly hold the mouth-piece in a downward position while permitting a yielding swivel motion in the event that varying heights of bottles or containers are encountered. A suitable gasket 95 is provided for sealing the space within the housing immediately below the end of the shaft so as to preserve the suction.

From the description of the preferred construction of chuck, it will be observed that the construction is such that the mouth-piece may be of a size capable of operating successfully to hold and apply a wide range of sizes of commercial caps. The particular design of the rim portion or the design or shape of the cap in general does not affect the successful operation of the chuck inasmuch as it is only necessary for the top of the cap to contact with the rubber diaphragm to enable the suction to hold the cap within the chuck. In some instances with special sizes of caps it may be necessary or desirable to apply a different size of mouth-piece 80, and with the construction illustrated this may be accomplished in a minimum time and with minimum effort on the part of the operator by simply unscrewing the mouth-piece 80 from its supporting piece 91 so that the change may be made readily without interfering appreciably with the production of the machine.

In order to adapt the machine for handling all of the different sizes, shapes and designs of commercial caps, it is preferably provided with an automatic cap feeding mechanism which is capable of operating upon any of the different sizes, shapes or designs of commercial caps. This feeding mechanism cooperates with the chuck 16 to adapt the machine for universal operation with minimum adjustment, upon all of the different commercial caps.

As herein shown the automatic cap feeding mechanism, indicated generally at 12, includes the hopper 10 formed between a guard 101 and the face of a disk 102, the latter being keyed upon a shaft 104 rotatably mounted in suitable bearings 103 affixed to an upright 105 forming part of the machine frame. The disk 102 is rotated through cooperating bevel gears 106, 107, the latter being mounted on the upper end of a vertical shaft 108. The shaft 108 carries upon its lower end, a bevel gear 109 which cooperates with a bevel gear 130 on a counter shaft 132, the latter being driven from a main driving shaft 133 through cooperating gears 134, 135, 136, 137, and through chains 138, 139 running around sprockets 140, 141, and 142, as shown in Fig. 2. The guard 101 comprises a metal piece having a flange portion 110 which is bolted to a rim 112 constituting a part of a bracket 113 secured to the machine frame, and the guard 101 is also provided with a portion 114 whose curvature gradually changes in the manner illustrated by the various views in Figs. 13 to 16 so as to progressively flare from the right hand end of the guard as viewed in Fig. 11 toward the left hand end thereof. As a result of the shape of the guard 101, a flaring hopper is formed between the face of the disk and the portion 114 of the guard.

The disk 102 is provided with a relatively large number of elongated slots 118 therein, through which pins 119 are caused to project during the interval that a particular portion of the disk is passing through the hopper, and for a period of time thereafter, until the particular pin 119 arrives at the upper part of the disk, in a position from which the cap may be deposited in the upper end of a raceway 120 as will be described. The movements of the pins 119 into and from their projecting positions are controlled by an operating cam 122 mounted upon a sleeve 123 forming part of the bracket 103, the latter being bolted to the machine frame, as illustrated in Fig. 1, and as herein shown successive pairs of the pins 119 are clamped in yokes 125 formed in the ends of levers 126 pivoted upon the rear face of the disk and each lever 126 having at its inner end, a cam roll 128 which cooperates with the face of the cam 122. A spring 129 is provided for holding each cam roll against the face of the cam. The individual pins 119 are preferably shaped as illustrated in Fig. 5, each having a portion 131 which tapers away from the end of the pin in order to resist displacement of the cap from its position as it hangs on the end of the pin. In addition to the pins 119, stirring pins 144, herein shown as three in number, are preferably arranged to be projected from the face of the disk during the interval of time that the particular pin 144 is passing through the hopper, and the movements of the stirring pins are controlled from a cam 146 also

mounted upon the sleeve 123 and herein shown as bolted upon the rear face of the cam 122. Each pin 144 is secured upon the end of a lever 148 pivotally secured to the rear face of the disk and each having a cam roll 149 upon its inner end, arranged to cooperate with the face of the cam 146. A spring 150 is provided for holding each cam roll against the cam 146.

In operation a mass of bulk supply of the caps are dumped into the hopper 10 by the operator and the supply is replenished from time to time, maintaining a relatively large mass of the caps in the hopper. As the disk 102 rotates, the pins 119 are caused to project from the disk at about the time that the pins reach the right-hand end of the hopper, as viewed in Fig. 11. The projecting pins are moved through the hopper and during the course of their movement a cap becomes hung upon a pin in the manner illustrated in detail in Fig. 5. As above stated the pins 119 are tapered inwardly, assisting in retaining the caps thereon, and in addition the shape of the hopper is such that it flares in the direction of travel of the pins thus maintaining the mass of caps within the hopper in a loose condition such that the caps suspended upon the pins are not dislodged therefrom during the movement of the pins through the hopper. In some instances a pin will pass through the hopper without having a cap suspended thereon, but in practice it has been found that a sufficient number of caps are picked up by the pins so that when carried upwardly with the disk as the latter is rotated, and deposited in the upper end of the raceway 120 an ample number of caps are fed to the raceway to insure a continuous supply to the bottle capping mechanism. The pins 119 are permitted to be withdrawn by their cam when the cap has been brought to the upper end of the raceway. As herein shown, the raceway 120 is formed by a supporting member or rail 154 bolted to the bracket 113 and having a front guide rail 155 and a side guide rail 166 secured together and adjustably mounted by means of rods 156 secured in hubs 158 on the rail 154 to enable the raceway to be adjusted to accommodate a wide range of sizes of caps.

The automatic cap feeding mechanism is preferably arranged to supply a sufficient number of the caps to the raceway 120, so as to maintain the latter filled, and this is accomplished by rotating the disk 102 at a speed sufficient to secure this result. Any surplus caps carried up to the filled raceway by the pins 119 fall, as the pins are withdrawn, down the face of the disk 102 and into the hopper.

It will be observed that the present automatic feeding mechanism automatically withdraws successive caps from the bulk supply thereof, by the introduction of one of the

pins 119 into the interior of each cap, and that by reason of this mode of operation, the feeding mechanism is adapted for universal operation upon all different styles, size and designs of caps or similar closure members. In addition the type of cap holding chuck preferably employed in the present machine is adapted for successful operation on caps of different styles, designs and shapes, and that a single size of chuck is adapted for holding a wide range of sizes of commercial caps. For extreme sizes of caps a larger or smaller mouth-piece may be readily substituted for the standard mouth-piece, and as a result by the cooperation of the improved cap feeding mechanism and the improved chuck, the machine is rendered universal in its operation upon practically all of the different commercial caps.

In the operation of the illustrated capping machine the flow of caps through the raceway 120 may be controlled by any suitable form of control mechanism operated from the incoming containers being fed into the machine, and inasmuch as such control mechanism of itself forms no part of the present invention merely the finger 160, see Fig. 9, has been shown herein, it being understood that this finger is withdrawn each time that a container is fed into operative position in the machine ready for the application of a cap thereto so as to permit a single cap to fall from the end of the raceway 120, and in the event that no container is fed into capping position, then the flow of caps from the raceway 120 is prevented by the finger 160.

In order to adapt the machine for capping all sizes and heights of containers the chuck 16 and its mechanism for controlling the vertical and rotary movements thereof are mounted upon a slide 162. The slide 162 is arranged to carry the arm 14 for transferring the caps from the raceway 120 to the chuck and the slide 162 is adjustably secured upon an upright 164 to permit the chuck and its associated mechanism to be bodily moved up or down accordingly as it is desired to operate the machine upon tall or short containers. As herein shown a crank 165 is provided whose rotations are transmitted through bevel gears 166 to a vertical screw shaft 167 threaded through a boss 168 projecting from the slide. In this manner the operator may conveniently adjust the position of the chuck and its operating parts by turning the crank 165. Likewise provision is made for automatically varying the vertical position of the automatic feed mechanism including the hopper 10, the disk 102, and the raceway 120 in order to enable the raceway to be positioned in proper relation to the transfer arm 14 and the chuck 16 into different vertical positions of the arm and chuck, and as herein shown the hopper 10 and the bracket 113 carrying the raceway 120 are mounted as a unit

upon a vertical slide 170 arranged to slide in guideways in a bracket 175, see Fig. 2, and the slide is provided with a boss 176 projecting therefrom having a threaded hole through which a screw shaft 178 is screwed and the latter is arranged to be rotated in synchronism with the rotations of the crank 165 by sprockets 180, 181, and a chain 182 running thereover.

While the preferred embodiment of the invention has been herein illustrated and described, it is to be understood that the different features of 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 closure handling machine, in combination, a hopper for containing a bulk supply of the closures, and means for automatically withdrawing successive closures therefrom including a rotatable disk arranged so that the lower portion thereof forms one wall of the hopper, a plurality of pins mounted upon the disk to be capable of being projected from the face of the disk into the hopper, and means for projecting and withdrawing said pins.

2. In a closure handling machine, in combination, a hopper, a raceway for the closures, and means for withdrawing successive closures from the hopper and depositing them in the raceway including a rotatable disk arranged so that the lower portion thereof forms one wall of the hopper, a plurality of pins mounted upon the disk to be capable of being projected from the face of the disk into the hopper, and means for projecting and withdrawing said pins.

3. In a closure handling machine, in combination, a rotatable disk, a plurality of pins disposed around the periphery of the disk, means for controlling the movements of the pins to cause them to project from the disk during their movement with the disk through the lower part of its path of revolution and to be thereafter withdrawn to remove the closure, a guard member forming with the disk a hopper through which the pins are caused to travel while in their projecting position, and a raceway disposed at the top of the disk in a position to receive the closures when the pins are withdrawn from their projecting position.

4. In a closure handling machine, in combination, a rotatable disk, pins mounted on the rear of the disk and capable of being projected beyond and withdrawn from the face of the disk, cam means for operating the pins, and a hopper for a bulk supply of the closures through which said pins when projected are caused to pass as the disk is rotated, said hopper having sectional dimensions increasing in the direction of movement of the pins therethrough.

5. In a closure applying machine, in combination, an automatic closure feeding mechanism having provision for automatically withdrawing successive closures from a bulk supply including a flaring hopper and a movable member insertable into the interior of a closure to suspend the closure thereon and movable through the hopper toward the flaring end thereof, means for applying successive closures thus withdrawn to successive containers including container feeding means and closure holding means. 70

6. In a closure handling machine, in combination, a hopper for containing a mass of closure members, a plurality of pins insertable into the hopper and movable there-through in a definite path to cause closures to be suspended upon said pins, a guideway, and means for automatically removing the closures from said pins and depositing them in said guideway, said hopper being of increased sectional dimension transversely with relation to and at successive points along the path of movement of a pin through said mass to form in effect a flaring hopper for the purpose specified. 75

7. In a closure handling machine, in combination, a hopper for containing a mass of closure members, a plurality of closure engaging members insertable into the hopper and movable therethrough in a definite path, a guideway, and means for automatically depositing successive closures in said guideway, said hopper being of increased sectional dimension transversely with relation to and at successive points in the path of movement of a closure engaging member through said mass to form in effect a flaring hopper for the purpose specified. 80

8. In a closure handling machine, in combination, a hopper for containing a mass of closure members and means insertable into a closure member and movable through the hopper for withdrawing closures therefrom, said hopper being constructed of increasing sectional dimensions in the direction of movement of said withdrawing means, whereby any tendency of the mass of closures in the hopper to become compacted is avoided. 85

9. In a closure handling machine, in combination, a hopper for containing a mass of closure members, a plurality of closure engaging members rotatable successively through said hopper for successively withdrawing closures therefrom, said hopper being constructed of increasing sectional dimensions in the direction of rotation of said closure engaging members, whereby any tendency of the mass of closures in the hopper to become compacted is avoided. 90

10. In a closure handling machine, in combination, a hopper for containing a mass of closure members and a plurality of closure engaging members rotatable successively through said hopper for withdrawing suc- 95

cessive closures therefrom, and means for automatically removing the closure members from the closure engaging members, said hopper being constructed of increasing sectional dimensions in the direction in which said closure engaging members are rotated, whereby any tendency of the mass of closures in the hopper to become compacted is avoided. 100

In testimony whereof I have signed my name to this specification. 105

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