Jan. 16, 1940. W. H. NEWEY 2,187,429

CLOSURE APPLYING MACHINE

Filed Dec. 17, 1937 2 Sheets-Sheet 1

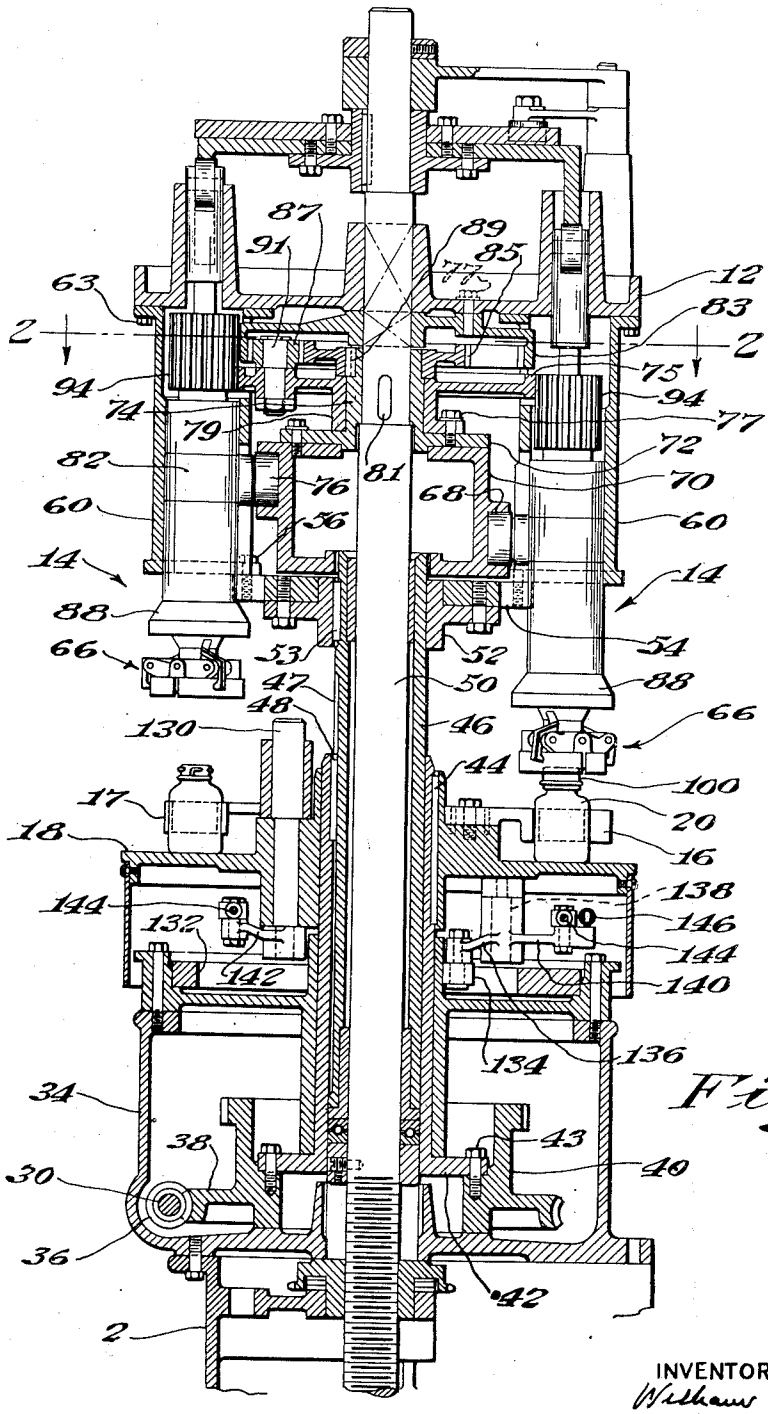


Fig. 1

INVENTOR
William H. Newey
BY J. Stanley Churchill
ATTORNEY

Jan. 16, 1940. W. H. NEWEY 2,187,429

CLOSURE APPLYING MACHINE

Filed Dec. 17, 1937 2 Sheets-Sheet 2

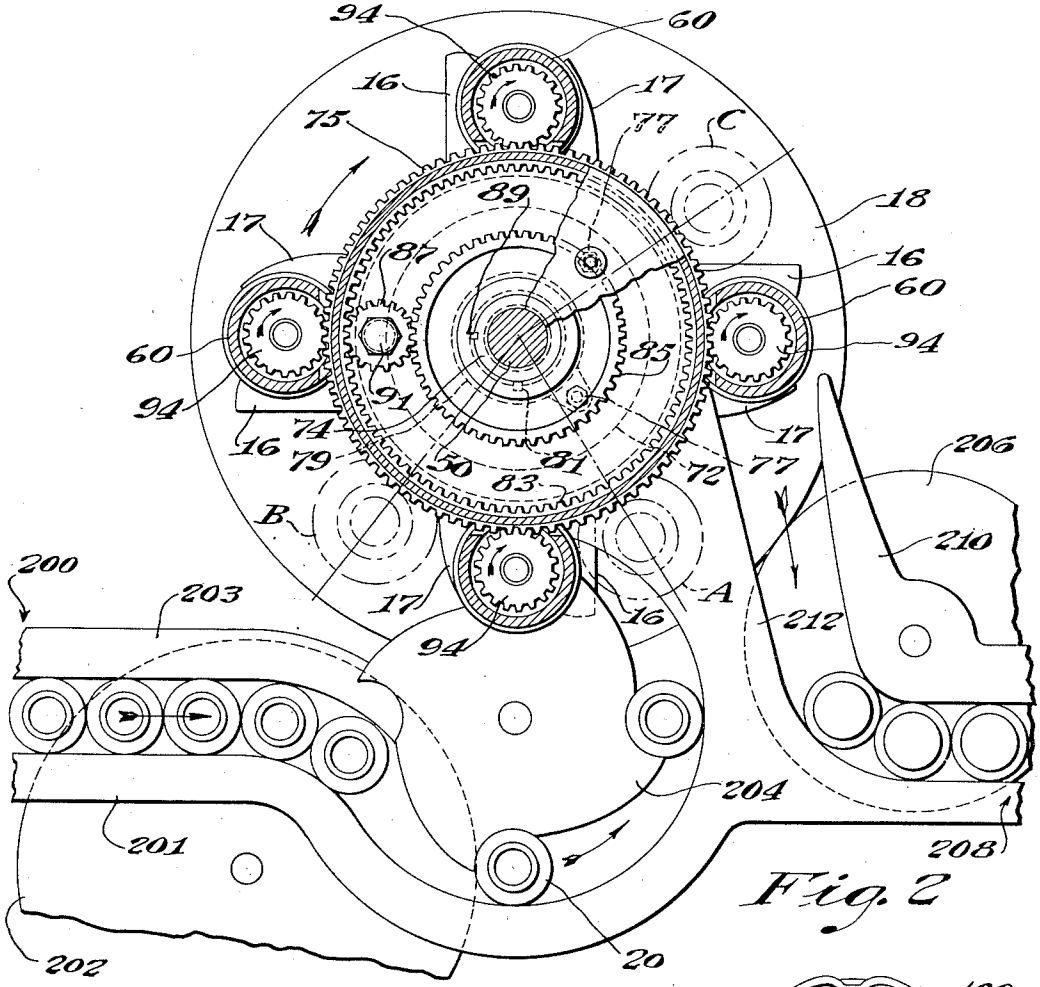


Fig. 2

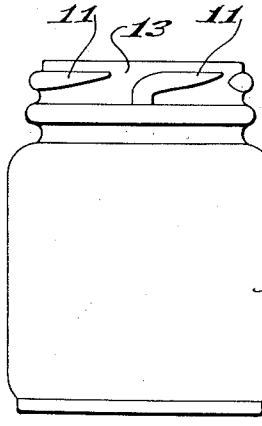


Fig. 3

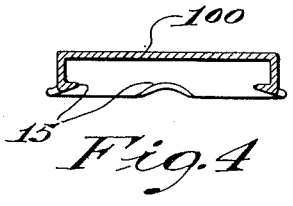


Fig. 4

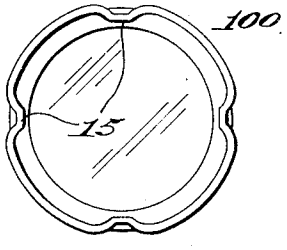


Fig. 5

INVENTOR
William H. Newey
BY J. Stanley Churchill
ATTORNEY

Patented Jan. 16, 1940

2,187,429

UNITED STATES PATENT OFFICE

2,187,429

CLOSURE APPLYING MACHINE

William H. Newey, Hingham, Mass., assignor to Pneumatic Scale Corporation, Limited, Quincy, Mass., a corporation of Massachusetts

Application December 17, 1937, Serial No. 180,341

10 Claims. (Cl. 226—88)

This invention relates to a closure applying machine.

The invention has for an object to provide a novel and improved machine for applying screw closures to containers and in which provision is made for changing the speed of rotation of the individual closure applying units so that the same machine may be adapted to apply screw closures either to containers in which a relatively great amount of rotation is necessary to seat the closure upon the container or to containers in which a relatively small amount of rotation is necessary to completely seat the closure upon the container.

A further and more specific object of the invention is to provide a novel and improved construction of a closure applying machine which is particularly adapted to apply closures of the type provided with lugs, to containers in a manner such that the lugs are permitted to enter recesses on the container during the rotation of the closure.

With these general objects in view and such others as may hereinafter appear, the invention consists in the closure applying 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 vertical sectional view of the container supporting and closure applying mechanism, Fig. 2 is a sectional plan view on the line 2—2 of Fig. 1, illustrating the gearing for driving the closure applying units; Fig. 3 is a side view of one type of container upon which the present invention is adapted to operate, and Figs. 4, 5, are views in section and plan, respectively of a closure to be applied to the container shown in Fig. 3.

In general, in its preferred form, the present invention contemplates a machine for applying screw closures to containers, such as bottles or jars of a novel construction, adapted to apply not only those closures requiring a relatively large amount of turning to seat the closure upon the container, but also which is adapted for use upon closures and containers having relatively short threaded portions which require but a relatively small amount of rotation in order to seat the closure upon the container. In its preferred form, the machine is constructed so that the amount of rotation of the individual closure applying units may be reduced to adapt the machine to short threaded closures while maintaining a normal production of closed containers from the machine.

Although, in general, the present machine when operated at normal speed is capable of handling closures requiring varying amounts of rotation for seating the closure upon the container and is more or less universal in its nature because of the provision made in closure applying machines of this type for permitting the clutch engaging the closure applying unit to slip when the closure has been completely seated upon the container, yet with certain types of containers and closures and particularly those closures and containers of the type illustrated in Figs. 3 to 5, difficulty has been at times experienced when the machine was operated at normal speed for the reason that when the closure applying unit is rotated at normal operating speed it will not permit the lugs to drop into the recesses provided in the top of the container, the speed of the unit being sufficiently great so that during the rotation of the closure, the lugs are carried beyond the recesses and follow along the top of the threaded portion of the container. It was also found that in some instances one or more of the lugs would engage a container in a manner such that the closure would become cross-threaded upon the container.

In the illustrated machine, provision is made for simply and easily changing the speed of rotation of each closure applying unit so that the same machine may be quickly and easily adapted for operation upon screw closures of either type. By arranging to have the closure applying units rotated at a slower speed for the lug type caps it was found that this type of closure and container could be successfully handled for although the units are continuously rotated, the reduced speed permits the lugs of the closure to drop into the recesses of the container and thereafter seat the closure upon the container. This feature of the invention reduces to a minimum the slippage of the clutch of the closure applying unit when substantial variation occurs in the lengths of the threaded portions of the closures, thus increasing the life of the clutch.

In general, the present invention is illustrated as embodied in a machine for applying screw closures to containers, such as bottles or jars, and except as to such details as are hereinafter pointed out, the illustrated machine may comprise any of the usual forms of closure applying machines now upon the market. Reference is made to the patent to Arthur Clarence Everett, No. 2,082,048 dated June 1, 1937, as disclosing

the details of construction and mode of operation of such prior art closure applying machines.

Referring now to the drawings, the illustrated machine is provided with a base 2 having mounted thereon a revoluble head 12 upon which are mounted to revolve therewith a plurality of and, as herein shown, four individual closure applying devices 14. Each closure applying device is arranged to be individually rotated during the revolution of the head to screw a closure 100 upon the threaded neck of a container 20 held by clamping members 16, 17 of a revoluble container supporting table 18. The table 18 is arranged to revolve with the closure applying devices, and provision is made for engaging and releasing the containers at different stations in the revolution of the container supporting table.

The revolution of the revoluble head 12 and also the container supporting table 18, is effected by a driving motor not shown arranged to drive a shaft 30 through the usual connections, such as a belt and pulleys, not shown. The driving shaft 30 is journalled in suitable bearings in a casing 34 secured to and supported by the base of the machine, and is provided with a worm 36 which cooperates with a worm wheel 38 formed on the lower portion of a cylindrical drum 40, see Fig. 1. A sleeve 42 is attached at its lower end to the inside of the cylindrical drum by the bolts 43, and at its upper end to the circular container supporting table 18, by a key 44. The clamping jaws 16, 17 above referred to for clamping the containers are mounted upon the revoluble table to rotate therewith.

Provision is made for effecting the revolution of the closure applying devices 14 about a central supporting shaft 50 through connections between the closure applying devices and the sleeve 42, including, as shown in Fig. 1 an inner sleeve 46 having an elongated keyway 47 within which an elongated key 48 secured to the outer sleeve is slidably fitted whereby to effect rotation of the inner sleeve while permitting the vertical adjustment of the sleeve for the purpose of adjusting the vertical position of the closure applying devices to accommodate the machine to different heights of containers.

The closure applying devices 14 are mounted upon the top of the inner sleeve 46 by a supporting bracket 52 held by a key 53 to the upper end of the sleeve. The bracket 52 has attached to it a plate 54 which forms a supporting member for the individual capping head casings 60 and to which they are fastened at their lower ends by screws 56. The individual capping head casings 60 are secured at their upper ends to the revoluble head 12 by screws 63 so that the rotations of the inner sleeve 46 are transmitted directly to the capping head casings and head 12 to cause the casings 60 to revolve about the stationary shaft 50, as will be apparent from an inspection of Fig. 1.

Each closure applying device is provided with a chuck indicated generally at 66 and is mounted to slide vertically within the capping head casing 60. A vertical motion is imparted to each individual device from a cam path 68 in a cylindrical drum 70, the upper end of which is secured to a flange 72 of a sleeve 74 keyed to the stationary shaft 50, as illustrated in Fig. 1. Each capping device is provided with a cam roller 76 which rides in the cam path 68, and each cam roller 76 is rotatably mounted on a stud secured in an annular collar 82 as fully disclosed in the United States Patent No. 2,032,048 above referred to.

During the application of the caps, the containers are supported on the table 18 and are firmly gripped and held from rotation by the clamping members 16 and 17. The clamping members are arranged to engage and release the containers at the different stations in the revolution of the table 18 and as herein shown each set of clamping members comprises a stationary jaw 16 and a movable jaw 17. The stationary jaw is secured directly to the table and the movable jaw is fastened to a vertical stud 130 pivotally mounted in the table 18. The movable jaw is arranged to be moved by an inner cam surface 132 through a roller 134 on a lever 136 pivoted on a pin 138 secured to the under side of the table 18. A second arm 140 of the lever 136 is connected to a lever 142 secured to the lower end of the vertical stud 130 by a connecting rod 144. The roller 136 is held against the cam 132 by a spring 146 which is connected at its other end to a stud extending from the underside of the table. In operation, as the table 18 revolves, the cam roller 134 acting on the cam 132 causes the movable gripping jaw 17 to close and yieldingly hold the container in position to permit the closure applying operation to be performed during one portion of the revolution of the table and to release the containers so that they may be discharged during another portion of the revolution of the table.

The mechanism for feeding the closures to the closure applying units including a supply hopper for storing a bulk supply of caps and from which successive caps are selected and delivered right side up through a feed chute, not shown, may comprise any suitable or known form of cap feeding mechanism, reference being made to the U. S. Patent to R. N. Doble, No. 1,801,721, as illustrating one form of such cap feeding mechanism.

The mechanism for transferring the caps from the cap feeding mechanism to the cap applying chucks 66 while the latter are revolving may comprise the transferring mechanism disclosed in the Everett patent hereinbefore referred to and, as illustrated in said patent, each closure applying device is provided with an oscillatory transferring arm mounted to revolve about the central shaft 50 with the closure applying units as the latter revolve. Provision is made for effecting the oscillations of the closure applying devices about the shaft 50 as to enable the successive caps or closures to be withdrawn from the end of the closure feeding chute and to be transferred to a position under the chuck 66 to be engaged by the latter during the revolution of the closure applying devices.

As clearly disclosed and fully described in the aforesaid U. S. Patent to Arthur Clarence Everett, each closure applying device comprises a housing 88 slidably and rotatably mounted in the casing 60. The housing 88 is provided at its lower end with the cap gripping mechanism, generally indicated at 66 which is arranged to pick up a cap, apply it to a container, and thereafter release the cap to permit the closed container to be delivered from the machine. Inasmuch as the cap gripping mechanism of itself constitutes no part of the present invention, it is sufficient to state that provision is made in the gripping mechanism for permitting the driving connections, hereinbefore referred to as the clutch, to slip when the cap has been screwed down to the limit

of its threads, reference being made to the aforesaid patent for a complete description thereof.

In the operation of the illustrated machine, each closure applying unit 14 is lowered to receive a cap when it arrives at a position indicated by dotted lines at A, see Fig. 2. The unit is then raised and again lowered when it arrives at dotted line position B. The unit remains in its lowered or cap applying position until it arrives at the position indicated by dotted lines at C whereupon the grip on the cap is released and the unit raised to permit the completely closed container to be delivered from the machine.

Referring now to Figs. 1 and 2, during the revolution of the cap applying chuck 66 about the shaft 50, each cap applying unit is caused to rotate about its own axis in order to effect the application of the caps to the containers, and as herein shown, each cap applying unit is provided with a pinion 94 keyed to the top of the chuck housing 88 and each pinion meshes with a gear 75 rotatably mounted but normally stationary upon the sleeve 74. The pinion 94 is made of sufficient length to permit the gear and pinion to remain in mesh in the various vertical positions into which the pinion and chuck housing are moved during the operation of the machine.

From the description thus far, it will be observed that each closure applying unit 14 is arranged to be driven in a clockwise direction viewing Fig. 2 by the engagement of the pinions 94 with the normally stationary gear 75 as the units are revolved by the rotatable head 12 also traveling in a clockwise direction. During the normal operation of the machine or when it is desired to have the units 14 rotated at their maximum speed, upon their own axes, the gear 75 is held stationary by a bolt 77 which secures the hub 79 of the gear 75 to the flange 72 of the sleeve 74 fixed to the stationary shaft 50 by a key 81.

Provision is made for enabling the rate of rotation of the closure applying unit or units to be substantially reduced as compared to the normal rate of rotation thereof in a novel and simple manner. To this end in the illustrated machine the rotatable head 12 may be regarded as the driving member and the pinions 94 can be regarded as the driven member of a gear train which normally includes the stationary gear 75. In accordance with the present invention the machine is provided with additional gearing elements mounted to be normally inoperative during operation of the machine at normal speeds but which may be rendered operative in a simple and practical manner and when rendered operative serve to effect rotation of the pinions 94 and consequently of the closure applying units at a substantially reduced rate of speed.

In order to effect the above described result, it is preferred to use an epicyclic train of gears, which as herein shown, comprises an internal gear 83, sun pinion 85 and planet pinion 87. In the operation of the machine when it is desired to change over from high speed to low speed operation of the units, it is simply necessary to remove the bolt 77 from the position shown in full lines in Fig. 1, in order to permit the gear 75 to rotate on the sleeve 74, and then to replace the bolt 77 in the position shown in dotted lines in Fig. 1 in order to secure the internal gear 83 to the rotatable head 12. The sun pinion 85 is stationary, being fixed to the sleeve 74 by a key 89. The planet pinion 87, in mesh with the internal gear and the sun pinion, is rotatably mounted upon a stud 91 which is fixed to the large gear 75.

In the operation of the epicyclic train when the rotatable head 12 is turned, the internal gear 83, being secured to the head, turns with the latter and transmits motion to the planet pinion 87 causing the latter to revolve about the stationary sun pinion 85. The planet pinion, being mounted on the large gear 75, causes the latter to rotate and thus the closure applying unit pinions 94 being revolved about the large gear 75 by the rotatable head 12 are caused to rotate at a slower rate of speed.

During the normal or high speed operation of the closure applying units, the bolt 77 is removed from the position shown in dotted lines and again replaced to the position shown in full lines in Fig. 1 in order to hold the large gear 75 stationary. Thus, the bolt being removed from the rotatable head 12, the planetary train remains idle during the high speed operation.

In the illustrated machine the containers are carried into the machine on a conveyor 200 of any suitable construction, such as parallel chains running over sprockets, not shown, and as the containers are received by the machine, provision is made for delivering the containers to the clamping jaws 16, 17 as the latter are moved into a receiving position. As herein shown, see Fig. 2, the containers are delivered into a rotating disk 202 and thence conveyed by a toothed rotary member 204 to a position to be delivered onto the revoluble table 18 and to be received by the clamping jaws 16, 17 which have previously been opened ready to receive a container. The jaws close about the container and as described the container is moved through successive stations where the closure is screwed onto the container whereupon the jaws 16, 17 are opened and the container is guided to a rotary disk 206 which conveys the containers to a discharge conveyor 208. The latter may comprise a belt or any other usual or preferred form of conveyor for continuously removing the containers from the machine.

In the operation of the embodiment of the invention thus far described, the containers are guided between rails 201, 203 onto the rotary disk 202 and then carried by the toothed member 204 to a position to be received by the clamping members 16, 17. During the rotation of the revoluble head 12, a closure has been transferred to the point designated at A where the chuck 66 is opened and lowered to receive the closure. The chuck is then closed around the cap and raised to remove the cap from the transferring arm. As the machine continues in operation, with the cap and container in vertical alignment, the chuck 66 is rotated by the engagement of the pinions 94 with the large gear 75 and at the point designated at B, the chuck is lowered to apply the cap to the container. When the cap has been screwed all the way down, the clutch members are arranged to slip until finally, at a point designated at C the chuck releases the cap and the container is ejected from the machine, between the guides 210, 212 onto the rotary disk 206 which carries the containers to the discharge conveyor 208.

From the description it will be observed that a definite period in the revolution of each closure applying unit is reserved for the cap applying operation and, as herein indicated, see Fig. 2, this period extends from the position B to the position C which is approximately 190 degrees.

In a commercial machine during the normal or high speed operation thereof, each closure applying unit rotates upon its own axis about two and one-half turns between the positions B and C. When the machine is operated at low speed or through the planetary train, as above described, this rotation of the closure applying unit between the positions B and C is reduced to about one turn in the 190 degrees period. It will readily be seen from the above that when operating upon closures which require less than one turn in order to seat the same upon a container, the reduction in the turning movement greatly reduces the required slipping time of the clutch of the unit, resulting in increasing the life thereof.

It will be observed that the present closure applying machine is capable of successful operation upon screw closures having either long or short threaded portions and particularly upon closures and containers such as illustrated in Figs. 3, 4 and 5. The container **20** illustrated therein is provided with threaded portions **11** having recesses **13** between each portion into which lugs **15** provided upon the closure **100** are arranged to enter before the turning movement is effective to seat the closure upon the container. The present closure applying machine having provision for reducing the speed of operation of each unit permits the lug type of closure to be successfully handled while maintaining the normal output of closed containers from the machine.

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 closure applying machine, in combination, a revoluble closure applying device, container holding means, means for relatively moving the container and the closure applying device toward and from each other, means for effecting rotation of the closure applying device about its own axis at one rate of speed, and means normally inoperative but capable of operation to effect rotation of the closure applying device about its own axis at a different rate of speed while maintaining the same rate of revoluble movement of the closure applying device during both speeds.

2. In a closure applying machine, in combination, a revoluble closure applying device, revoluble container holding means, means for relatively moving the container and said closure applying device toward and from each other, means for effecting the rotation of the closure applying device about its own axis during its revoluble movement, and means for changing the speed of rotation of said closure applying device about its own axis while maintaining the same rate of revoluble movement of the closure applying device.

3. In a closure applying machine, in combination, a revoluble closure applying device, revoluble container holding means, means for relatively moving the container and said closure applying device toward and from each other, and means for effecting the rotation of the closure applying device about its own axis at different rates of speed during its revoluble movement, said last named means including a pinion connected to the closure applying device and a normally stationary gear adapted to engage said pinion to effect rotation thereof at one rate of speed and mounted to be capable of movement during rotation thereof at a different rate of speed.

4. In a closure applying machine, in combination, a revoluble closure applying device, revoluble container holding means, means for relatively moving the container and said closure applying device toward and from each other, and means for effecting the rotation of the closure applying device about its own axis at different rates of speed during its revoluble movement, said last named means including a pinion connected to the closure applying device and a normally stationary gear adapted to engage said pinion to effect rotation at one speed and means normally inoperative and capable of connection to effect movement of said normally stationary gear to effect a reduction in the speed of rotation of said revoluble closure applying device while maintaining a constant rate of revoluble movement of the latter.

5. In a closure applying machine, in combination, a revoluble closure applying device, revoluble container holding means, means for relatively moving the container and said closure applying device toward and from each other, and means for effecting the rotation of the closure applying device about its own axis at different rates of speed during its revoluble movement, said last named means including a pinion connected to the closure applying device and a normally stationary gear adapted to engage said pinion to effect rotation at one speed and means normally inoperative and capable of connection to effect movement of said normally stationary gear to effect a reduction in the speed of rotation of said revoluble closure applying device.

6. In a closure applying machine, in combination, a revoluble closure applying device, revoluble container holding means, means for relatively moving the container and said closure applying device toward and from each other, and means for effecting the rotation of the closure applying device about its own axis at different rates of speed during its revoluble movement, said last named means including a pinion connected to the closure applying device and a normally stationary gear adapted to engage said pinion to effect said rotation at a relatively high speed, and means for effecting movement of said normally stationary gear cooperating to effect rotation of said revoluble closure applying device at a relatively low speed.

7. In a closure applying machine, in combination, a revoluble closure applying device, revoluble container holding means, means for relatively moving the container and said closure applying device toward and from each other, and means for effecting the rotation of the closure applying device about its own axis at different rates of speed during its revoluble movement, said last named means including a pinion connected to the closure applying device and a normally stationary gear adapted to engage said pinion to effect said rotation at a relatively high speed, and means for effecting movement of said normally stationary gear to effect rotation of said revoluble closure applying device at a relatively low speed while maintaining a fixed rate of revoluble movement during both speeds.

8. In a closure applying machine, in combination, a revoluble closure applying device, means for effecting the rotation of the closure applying device upon its own axis at different rates of speed during its revoluble movement, said means including a pinion connected to the closure applying device, a normally stationary gear adapted to

engage said pinion to effect rotation at one rate of speed and normally inoperative elements capable of forming with said gear an epicyclic train of gears for effecting rotation of said closure applying device at another rate of speed, and revoluble container holding means for operatively supporting the container during the closure applying operation.

9. In a closure applying machine, in combination, a revoluble closure applying device, means for effecting the rotation of the closure applying device upon its own axis at different rates of speed during its revoluble movement, said means including a pinion connected to the closure applying device, a normally stationary gear adapted to engage said pinion to effect rotation at one rate of speed and an epicyclic train of gears adapted to cooperate with said normally stationary gear to effect movement thereof for effecting rotation of said closure applying devices at another rate of speed, and revoluble container holding means for operatively supporting the container during the closure applying operation while maintaining a fixed rate of revoluble movement during both speeds.

10. In a closure applying machine, in combination, a closure applying device mounted to rotate about its own axis, container holding means, means for effecting rotation of the closure applying device about its own axis including a driven vertical shaft, a normally stationary gear mounted upon the shaft adapted to rotate therewith, a gear carried by the closure applying device and variable speed varying connections between said gears whereby to permit rotation of the closure applying device about its own axis at different rates of speed while maintaining a constant rate of rotation of the driven vertical shaft.

WILLIAM H. NEWEY.