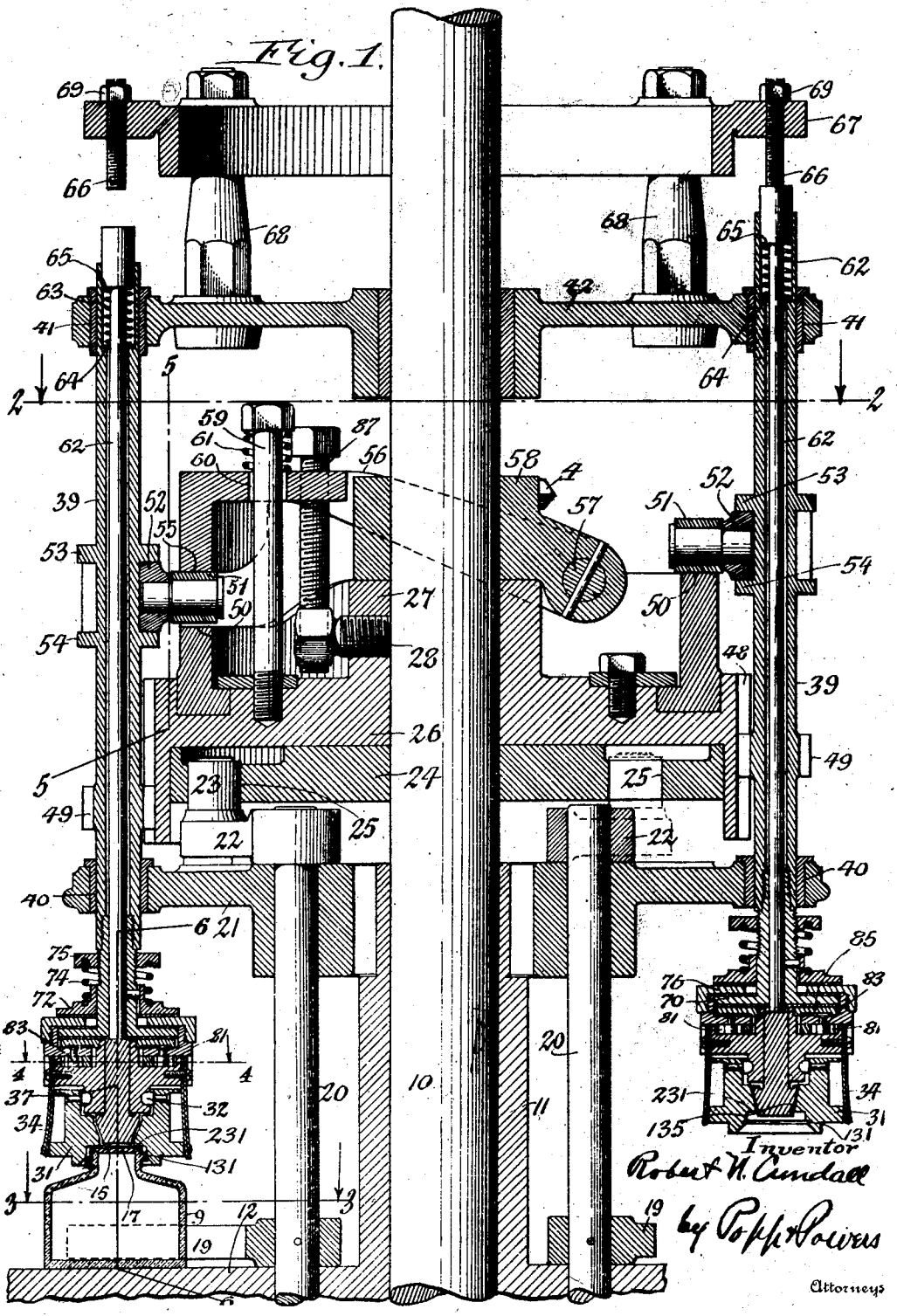
Aug. 26, 1930. R. N. CUNDALL 1,773,960

MACHINE FOR ASSEMBLING SCREW CAPS AND CONTAINERS

Filed Oct. 22, 1928 3 Sheets-Sheet 1

Fig. 1.



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MACHINE FOR ASSEMBLING SCREW CAPS AND CONTAINERS

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Fig. 2.

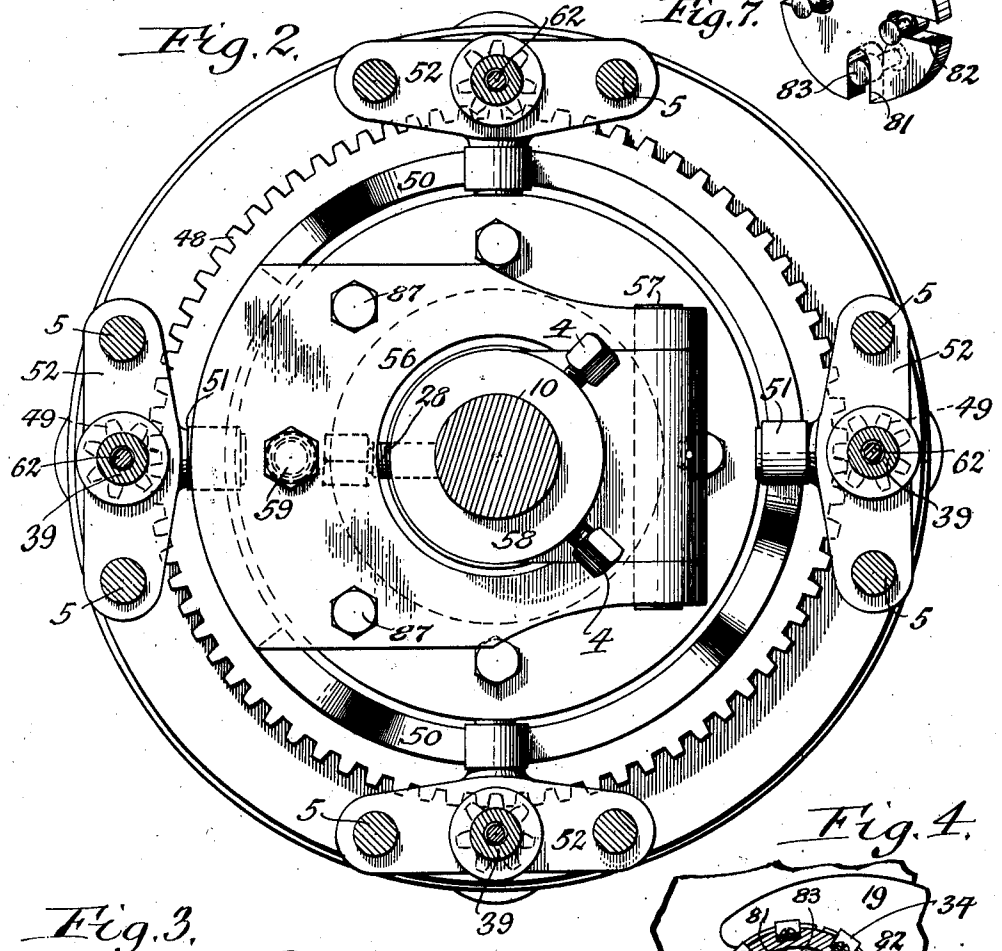


Fig. 7.

Fig. 3.

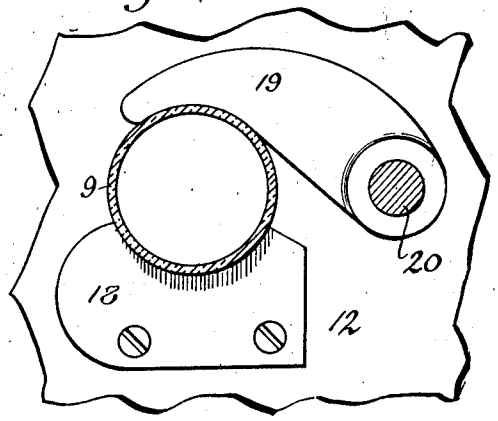
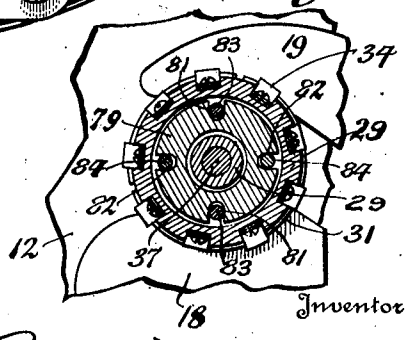


Fig. 4.



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MACHINE FOR ASSEMBLING SCREW CAPS AND CONTAINERS

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Fig. 5.

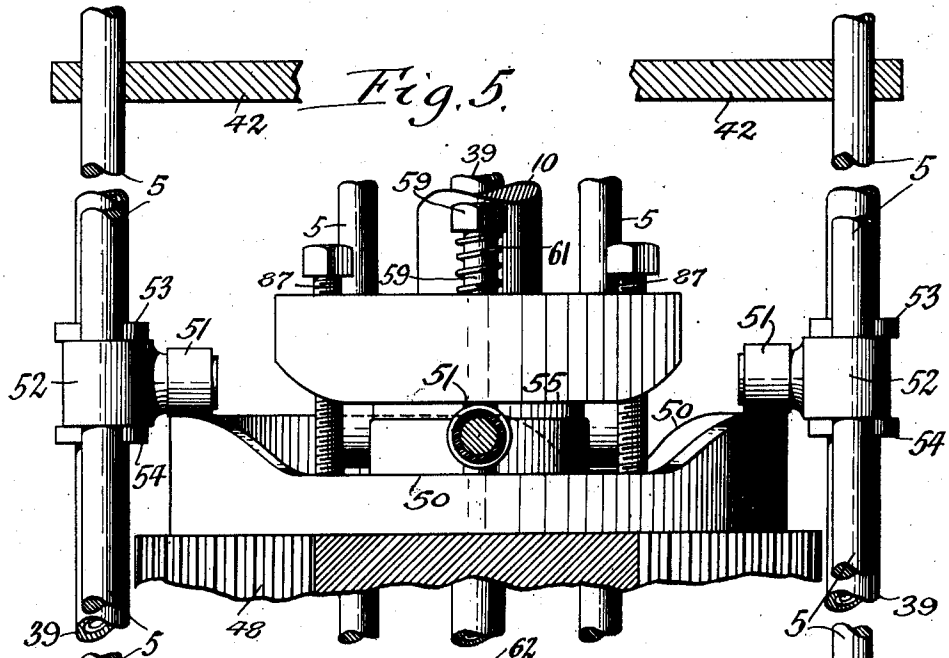


Fig. 6.

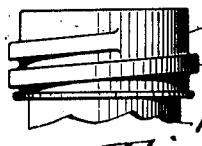


Fig. 8.

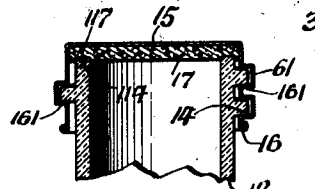


Fig. 9.

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UNITED STATES PATENT OFFICE

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MACHINE FOR ASSEMBLING SCREW CAPS AND CONTAINERS

Application filed October 22, 1928. Serial No. 314,116.

This invention relates to a machine for assembling caps and containers having co-operating surfaces such as screws or the like, and more particularly to caps having liners or packings for engaging the container neck and forming a tight joint therewith.

In machines of this character as heretofore constructed the action of drawing the liner or packing against the neck was produced solely by the action of the screw connection between the cap and neck which at times was not sufficient to cause the neck to properly indent or groove the liner or packing to such an extent as would ensure an air or liquid tight joint therebetween.

It is therefore the purpose of this invention to provide means whereby the cap is subjected to an auxiliary pressure which supplements the action of the screw joint between the cap and neck and preferably bears against the crown of the cap so as to cause the marginal part of the liner to be indented or grooved by engagement with the edge or rim of the container neck, and thereby produce an air and liquid tight joint between the same.

In the accompanying drawings:—

Figure 1 is a fragmentary vertical section of a container capping machine which is equipped with my improvements.

Figures 2, 3 and 4 are horizontal sections taken on the correspondingly numbered lines in Fig. 1.

Figures 5 and 6 are fragmentary vertical sections taken on the correspondingly numbered lines in Fig. 1.

Figure 7 is a perspective view of the floating plate forming part of the universal joint for driving each chuck.

Figure 8 is a side view of the neck of a container and a cap screwed thereon.

As an example of one form of closure capable of being operated on in this machine, Fig. 9 is a vertical section of the same.

In the following description similar characters of reference indicate like parts in the several figures of the drawings:—

Each of the containers has a body 9 which may be of the same diameter throughout its length, or the upper part of the same may be contracted to form a neck 13, as shown in Fig. 1. In either case the body of the container is provided at its upper end with an external screw thread 14. The cap consists of a flat crown 15 and an annular flange or rim 16 depending from the edge of the crown and provided with an internal screw thread 61 and a liner or packing 17 of cork or other material engaging with the underside of the crown and preferably extending to the rim or flange 16.

To hold perishable materials in containers it is necessary that the cap be screwed on the body tightly enough so that the liner 17 will be indented by the rim or edge 114 of the bottle, as shown at 117. Ordinarily the pressure required to make this indentation in the liner is obtained by the screw or wedge action of the thread or wedge on the container, and in the cap, and the amount of this pressure is balanced by an equal pressure between the metal of the cap and the thread of the container at the surfaces 161.

Generally the material of the cap and container, for example sheet metal and glass, is such that the coefficient of friction between these two surfaces is comparatively high and very much effort has to be expended rotatively to accomplish the desired result. The cap must be held by a chuck or similar means to rotate it into place on the container and the frictional resistance at the surfaces 161 is so high that the cap will slip in the chuck before it is screwed down tightly enough to properly indent the liner.

In this invention it is intended to push down on the top of the cap with sufficient pressure to indent the liner properly simultaneously with screwing it on the container. This will not only indent the liner but will relieve the frictional resistance to rotation on the surfaces 161 and permit the entire energy of the chuck to be expended in rotating the cap.

The present machine which embodies the present invention renders it possible to exert a downward pressure on the crown of the cap independently of the action of the jaws of the chuck which bear against the rim so as to produce an indentation or groove in

the marginal part of the lining or liner by the edge or rim of the container which positively seals the joint between the container and cap and effectively excludes air and moisture.

In the preferred embodiment of the machine for accomplishing this purpose the same is constructed as follows:—

The numeral 10 represents a stationary upright post forming a part of the main frame of the machine. Upon the lower part of this post is journaled a hub 11 the lower end of which carries a horizontal table 12 which may be turned in any suitable manner.

At one or more points in the circumference of this table gripper means are provided for holding a container thereon, four such grippers being preferably employed and arranged equidistant around the axis of the table. Each of these grippers may be variously constructed but the same preferably consists of a fixed clamping jaw 18 secured to the top of the table and a movable clamping jaw 19, said jaws being adapted to engage with opposite sides of the lower part of the container and hold the same against turning on the table but compelling the same to move bodily with the table about the axis of the latter.

The movable jaw of the gripper is moved toward and from the stationary jaw for closing the gripper upon a container and also releasing the same, this being accomplished in the present instance by an upright rock shaft 20 journaled at its lower end in a bearing on the table and journaled at its upper end in a bearing on a rotary supporting head or disk 21 mounted on the upper end of the hub 11, a rock arm 22 secured to the upper end of the rock shaft 20 and provided with a roller or pin 23, and a stationary cam plate 24 having a cam slot or groove 25 which receives said roller. As the table 12 and head 21 revolve the roller 23 is moved by the cam slot 25 so as to rock the shaft 20 and thereby open and close the gripper for releasing and grasping the container. The cam plate 24 is preferably mounted on a supporting plate 26 having a collar 27 which is secured to the post by a set screw 28.

The container may be placed on the table in position to be grasped by the grippers and then removed therefrom when released by the gripper in any suitable manner. The caps may also be supplied in any approved way to a chuck which forms part of the means whereby the cap is screwed on the externally threaded upper end of the container. This chuck in its preferred form, as shown in the drawings, is constructed as follows:—

The numeral 29 represents the upper part of the body of the chuck, the lower part 30 of which is reduced and surrounded by a plurality of clamping jaws 31 which move radially toward and from the axis of the chuck. The chuck jaws are pivotally supported by inwardly projecting rounded pins 32 at the upper ends thereof engaging with rounded seats 33 on the reduced part of the chuck body and the jaws are yieldingly pressed inwardly by springs 34 secured at their upper ends to the exterior of the chuck body and engaging their lower ends with the outer side of the jaws, the inward movement of these jaws being limited by an ejecting plunger or presser member 35 movable vertically within the chuck body.

Each of the chuck jaws is provided at its lower end with a vertical face 131 adapted to engage the periphery of the threaded flange of the cap and a horizontal face 231 arranged at the upper end of the vertical face and adapted to engage the upper marginal part of the crown, as shown in Figs. 1 and 6.

The ejecting member 35 is provided on its periphery with a downwardly tapering conical face 135 which is engaged by correspondingly inclined faces 36 on the central parts of the chuck jaws so that the pressure of the springs 34 tends to wedge the ejecting plunger or presser member upwardly and hold the same yieldingly in an elevated position. On its central part the ejecting member 35 is provided with an upwardly projecting guide pin 37 which slides in a central opening 38 on the body of the chuck.

As a cap is presented successively to the chucks each of the latter is lowered so that its cavity receives the cap and the jaws thereof engage with the exterior of the screw threaded rim and the marginal part of the crown of the cap and thereby yieldingly retain the same in the chuck. After the cap is received by the chuck the latter is elevated and thereafter the chuck is lowered for engaging the cap with the container, said chuck being rotated so that the cap will be screwed downwardly on the container.

The rotary and vertically reciprocating motion may be imparted to the chuck in various ways, for example, by the means which are shown in the drawings and which are constructed as follows:—

The numeral 39 represents a hollow upright spindle arranged axially above each of the chucks and capable of sliding vertically and also turning in a lower bearing 40 formed on the marginal part of the lower supporting head 21 and an upper bearing 41 on the marginal part of an upper supporting head 42 which turns about the upper part of the post 10.

Means are provided for frictionally transmitting a rotary motion from the driving spindle to the chuck and also permit the chuck to adapt itself to any irregularities in the position of the neck relative to the body, which means in their preferred form are constructed as follows:—

At its lower end each driving spindle is provided with a driving disk 70 having an upwardly projecting tubular hub 71 connected by a screw joint with the lower end of the respective spindle. Above the driving disk is arranged a clamping disk 72 which is connected by a spline or key 73 with the hub of the driving disk so as to be compelled to turn therewith but be free to slide vertically, this clamping disk being yieldingly held in its depressed position by a spring 74 surrounding the hub 71 and engaging its lower end with the top of the clamping disk and its upper end with an adjustable tightening disk 75 which is connected by a screw joint with the hub of the driving disk.

Between the driving disk and the clamping disk is arranged a driven disk 76 which is frictionally gripped by the same, this grip being preferably increased by providing the upper face of the driving disk with a facing 77 of fibre and the underside of the clamping disk with a facing 78 of fibre.

A connection is provided between the driven disk and the chuck body which in effect serves as a universal joint and permits the chuck to shift its position laterally relative to the axis of the spindle and thus permit the chuck to properly grasp a cap and apply the same to a container neck which may be slightly eccentric relative to the axis of its body and thereby prevent breakage notwithstanding that the body of the container is held rigidly in a definite position on the table 12 by means of the jaws 18, 19.

In its preferred form this universal joint or coupling comprises a floating coupling disk or plate 79 arranged between the upper side of the chuck body and an intermediate driving disk 80 secured at its outer edge to the driven friction disk by a screw joint, as shown, or in any other suitable manner. The floating coupling disk is provided with a plurality of radial slots 81, 82 preferably four in number, two of which 81 being engaged by driving pins 83 on the underside of the intermediate driving disk 80 and the other two 82 being engaged by driven pins 84 on the upper side of the chuck body. By these means a positive driving connection is provided between the chuck body and the driven disk of the friction coupling which permits the chuck to adapt itself freely to the position of the container neck and effectively turn the cap thereon, and a friction drive between the chuck and spindle is provided which permits the spindle to slip on the chuck when the latter has turned the cap until it is tight, thereby preventing the chuck from slipping on the cap and mutilating the same.

For the purpose of holding the chuck in its assembled position relative to the universal joint coupling and the friction drive, a retaining means is provided consisting of a retaining disk 85 secured to the upper end of the chuck body and overhanging the intermediate driving disk 80. Downward pressure is transmitted directly from the spindle to the chuck body by engaging the driving disk with the retaining disk, a friction facing 86 of fibre being preferably arranged on the underside of the driving disk so as to transmit additional driving effect from the spindle to the chuck.

Rotary motion is imparted to the chucks through their spindles by means of an annular stationary gear rim 48 arranged on the supporting plate 26 and meshing with gear pinions 49 on the adjacent parts of the hollow driving spindles of the chuck. By these means the spindles are revolved as the same rotate about the stationary gear rim and each chuck and the cap held thereby is revolved. When the screw cap has been attached to the container sufficiently tight to overcome the friction coupling, then the chuck ceases to rotate but the spindle continues to turn independently of the chuck.

The raising and lowering of the spindles and the chucks mounted thereon is effected at intervals by a cam mechanism consisting preferably of a lower annular lifting cam or cam section 50 mounted on the stationary supporting plate 26 and engaging with the underside of rollers 51, and yokes 52, each yoke carrying one of said rollers and secured to vertical rods 5 sliding in the lower and upper supporting heads 21, 42, and embracing the adjacent spindle between annular collars 53, 54 thereon so that the spindle can turn but is compelled to rise and fall with the respective yoke.

The construction of the cam 50 is such that during each complete rotation of a chuck around the post 10 the same is lowered to engage a cap, then raised and passed over a container placed in the companion gripper, then lowered for applying the cap to the respective container, and then raised for disengaging the chuck from the cap which has been applied to the container to permit the latter to be removed from the table. While the chuck is in the cap receiving and container discharging positions the vertical position of the chucks is controlled solely by the lower lifting cam 50 upon which the rollers 51 of the yokes rest by gravity. When, however, the chuck is in the position in which the cap is being screwed on the container the upper side of each yoke roller is engaged by an auxiliary depressing cam 55 which causes the crown of the cap to be pressed downwardly against the end of the container for ensuring an air and liquid tight joint between the container and cap. This auxiliary cam is preferably mounted on a vertically swinging forked cam arm 56 which is pivoted at its inner end by means of a horizontal pin 57 in a collar 58 which is secured to the post by a screw 4, and spring means for

yieldingly holding said auxiliary cam in its depressed position consisting of an upright tension bolt 59 passing through an opening 60 in this cam arm and connected at its lower end with the supporting plate 26, and a spring 61 surrounding said tension bolt and bearing at its lower end against the top of said cam arm and at its upper end against the head of said bolt 59.

Downward movement of the auxiliary cam is limited by a stop consisting preferably of vertical screws 87 which are adjustably mounted on the arm 56 and are adapted to engage with the upper side of the plate 26. The auxiliary cam is so positioned that it comes into engagement with the spindle roller 51 of the chuck spindle and applies a downward pressure through the same and the chuck jaws against the crown of the cap at the time the lining or liner in the cap comes in contact with the upper edge or rim of the container or after engagement of the liner with said rim, so that during the continued rotary motion of the cap for completing the operation of securing the cap on the container the marginal part of the lining will be pressed, independently of the effect of the screw joint between the cap and container, against the upper edge of the container sufficiently hard to form an annular indentation or groove in the lining 17 in which the edge of the container is seated and forms an air and liquid tight joint between the container and cap.

By this means it is possible to apply much greater sealing pressure on the cap than can be obtained if the downward pull on the lining is effected solely by the wedge action of the cooperating threads on the cap and the container during the rotation of the cap. By yieldingly supporting the auxiliary cam the latter can adapt itself to any variation in the height of the container and thus automatically compensate for the same. Upon tightening or loosening the bolt 59 the tension of the spring 61 can be increased or decreased for varying the amount of auxiliary pressure which is applied to the chuck to suit different conditions and requirements.

After the cap has been screwed on the container as tightly as is possible by the frictional connection between the continuously rotating spindle and the chuck body, the chuck body ceases to rotate and the driving spindle rotates independently of the chuck body during which time the spindle slips relative to the chuck body. Thereafter the chuck is raised and disengaged from the cap leaving the latter attached to the container while the gripper is still grasping the container. After the chuck has been thus detached from the cap the chuck is raised into its elevated position and during the last part of this movement the jaws of the chuck are opened and a cap is positively ejected therefrom if the same has not been applied to a container due to the failure in placing a container in the capping position.

When the machine is so organized that the containers and caps are supplied automatically it sometimes happens that the container feeding mechanism will fail to place a container in a gripper and when this occurs it is necessary to remove the cap of the chuck which corresponds to an empty gripper in order to avoid jamming the machine by attempting to feed an additional cap at the cap feeding station into a chuck from which the cap has not been removed by a transferring operation to a container.

To avoid such a contingency means are associated with each chuck which will automatically eject from a chuck any cap which is not removed therefrom to a container, this ejecting mechanism being preferably constructed as follows:—

The numeral 62 represents an upright ejecting rod which is slidable lengthwise in each hollow driving spindle and which bears loosely at its lower end against the central pin of the plunger 35. This ejecting rod is yieldingly held in its elevated position by a spring 63 surrounding the upper part of the ejecting rod and bearing at its lower end against an upwardly facing shoulder 64 in the respective spindle and at its upper end against a downwardly facing shoulder 65 on the ejecting rod, as shown in Fig. 1. Immediately above the upper end of each ejecting rod is arranged a stop 66 having preferably the form of a screw which engages with a threaded opening in a supporting ring 67 which is connected by struts 68 with the upper supporting head 42 so as to turn therewith, this screw being held in its adjusted position by a jamb nut 69.

During the downward movement of each chuck and its spindle the respective ejecting rod moves away from the adjacent stop 66 but during the last part of the upward movement of the spindle the upper end of the ejecting rod is arrested and the spindle completes its upward movement independently of the ejecting rod, whereby the plunger is pushed slightly downward in the chuck, as shown at the right in Fig. 1, thereby causing a cap which may be held in the chuck, to be discharged downwardly therefrom and leave the chuck free to receive a cap from an automatic cap feeding mechanism.

The jaws of the chuck remain in this open position until the chuck is again lowered over a cap which is presented by a feeding mechanism or otherwise, and at this time the cone 35 is pushed upwardly by the cap and thereby permits the jaws to automatically grip the cap without requiring any separate means to open and close the jaws for this purpose.

By adjusting the stop screw 66 the operation of the ejecting rod may be set properly

when assembling the machine and for adapting the same to different conditions.

It is to be understood that in the foregoing description the word "thread" is intended to include any cooperation surfaces on the container and cap, whereby the cap is locked on the container by a rotary movement of one of these members relative to the other.

I claim as my invention:—

1. A machine for applying an internally lined screw cap to a screw container, comprising a gripper for holding said container, a chuck for holding said cap and having a rotary and longitudinally reciprocating movement relatively to said gripper, an ejecting member arranged within the chuck and adapted to bear on the exterior of said cap, a hollow spindle connected with said chuck, means for rotating and reciprocating said spindle, an ejecting rod arranged in said spindle and operating on said ejecting member, and means for operating said ejecting rod.

2. A machine for applying an internally lined screw cap to a screw container, comprising a gripper for holding the container, a chuck for holding said cap having a body, a plurality of spring pressed jaws mounted on said body and bearing against said cap, an ejecting disk arranged in said body and bearing axially against the crown of said cap independently of said jaws, upper and lower driven friction disks mounted on said body, a driving spindle provided at its lower end with a friction driving disk arranged between said driven friction disks, and means for rotating and reciprocating said spindle.

3. A machine for applying an internally lined screw cap to a screw container, comprising a gripper for holding the container, a chuck for holding said cap, a plurality of spring pressed jaws mounted on said body and bearing against said cap, an ejecting disk arranged in said body and bearing against the crown of said cap independently of said jaws, upper and lower driven friction disks mounted on said body, a driving spindle provided at its lower end with a friction driving disk arranged between said driven friction disks, means for rotating and reciprocating said spindle, and a universal joint connecting said driven friction disks with said chuck.

4. A machine for applying an internally lined screw cap to a screw container, comprising a gripper adapted to hold the container, a chuck body having jaws adapted to grasp said cap, a spindle upon which said chuck body is mounted, means for rotating said spindle, and means for raising and lowering said spindle including a shifting member mounted on the spindle, a cam having a rigid lower section engaging with the underside of said shifting member, a yielding upper section engaging with the upper side of said shifting member, a tension bolt connected with said lower cam section, and a spring interposed between said upper cam section and the head of said tension bolt.

5. A machine for applying an internally lined screw cap to a screw container, comprising a gripper adapted to hold the container, a chuck body having jaws adapted to grasp said cap, a spindle upon which said chuck body is mounted, means for rotating said spindle, and means for raising and lowering said spindle including a shifting member mounted on the spindle, a cam having a rigid lower section engaging with the underside of said shifting member, a yielding upper section engaging with the upper side of said shifting member, a tension bolt connected with said lower cam section, a spring interposed between said upper cam section and the head of said tension bolt, a stationary post to which said rigid section is secured, and a bracket which is secured to said post and to which said yielding cam section is pivoted.

6. A machine for applying an internally lined screw cap to a screw container, comprising a gripper for holding the container, a chuck body having a rotary and reciprocating motion, jaws mounted on said body and adapted to grasp the cap, an ejecting member arranged on the body and adapted to bear axially against the crown of the cap independently of said jaws, and means for moving said ejecting member downwardly relatively to said jaws upon raising said body for ejecting the cap which may be held by the chuck.

7. A machine for applying an internally lined screw cap to a screw container, comprising a gripper for holding the container, a chuck body having a rotary and reciprocating motion, jaws mounted on said body and adapted to grasp the cap, an ejecting member arranged on the body and adapted to bear axially against the crown of the cap independently of said jaws, and means for moving said ejecting member downwardly relatively to said jaws upon raising said body for ejecting the cap which may be held by the chuck, including a vertical ejecting rod engaging its lower end with said ejecting member, and a stop adapted to be engaged by said ejecting rod upon raising the latter.

8. A machine for applying an internally lined screw cap to a screw container, comprising a gripper adapted to hold said container, a chuck body having a rotary and a reciprocating movement relative to said gripper, jaws arranged on said body and adapted to grasp said cap, a hollow spindle connected with said body, an ejecting member arranged in the body and adapted to bear axially against the crown of said cap independently of said jaws, a vertically movable ejecting

rod bearing at its lower end against said ejecting member, a spring interposed between shoulders on said spindle and rod and operating to hold the latter yieldingly in an elevated position, and a stop screw mounted on an adjacent support and adapted to be engaged by the upper end of the shifting rod during the last part of the upward movement of the spindle for causing the ejecting member to be depressed relatively to the chuck body and ejecting a cap which may be held by the chuck jaws.

9. A machine for applying screw caps to screw containers comprising means for holding the container, a chuck body having a rotary and a reciprocating movement relative to the container holding means, radially movable jaws arranged on the chuck body and adapted to engage with said cap and provided with inclines, and an ejecting member arranged within the chuck body and adapted to bear axially against the crown of said cap and provided with a downwardly inclined side adapted to engage with the inclines of said jaws.

10. A machine for applying screw caps to screw containers comprising means for holding the containers, a chuck body having a rotary and a reciprocating movement relative to the container holding means, radially movable jaws arranged on the chuck body and adapted to engage with said cap and provided with inclines, an ejecting member arranged within the chuck body and adapted to bear axially against the crown of said cap and provided with a downwardly inclined side adapted to engage with the inclines of said jaws, and vertically movable shifting means adapted to engage with said ejecting member.

11. A machine for assembling screw caps and containers, comprising a chuck adapted to grasp the cap, a driving spindle and means for transmitting motion from said spindle to said chuck including a friction coupling connected with said spindle, and driving means operatively connecting said friction coupling with said chuck and permitting lateral movement of said chuck relative to said spindle.

12. A machine for assembling screw caps and containers, comprising a chuck adapted to grasp a cap, a driving spindle, a friction coupling including a driving disk connected with the spindle, a clamping disk turning with said spindle but capable of moving lengthwise thereon, a spring urging the clamping disk toward the driving disk, and a driven disk arranged between the driving and clamping disks, and a universal joint interposed between said friction coupling and consisting of an intermediate driving disk, a floating disk having a plurality of radial slots and arranged between said chuck and intermediate disk, driving pins arranged on the intermediate disk and engaging with some of the slots in said floating disk, and driven pins arranged on the chuck and engaging with others of said slots in said floating disk.

In testimony whereof I affix my signature.

ROBERT N. CUNDALL.