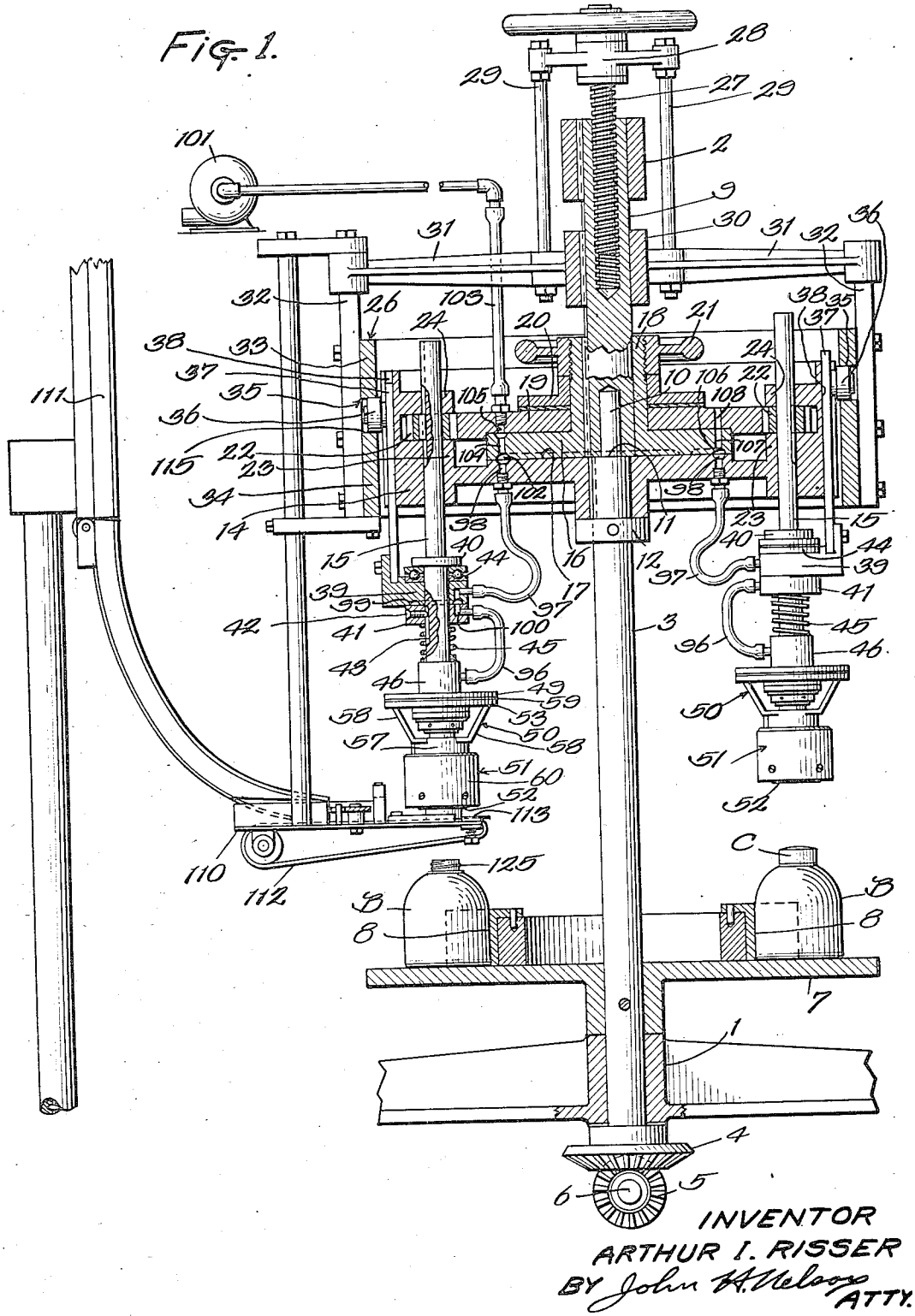
June 2, 1936. A. I. RISSER 2,042,733

SCREW CAP APPLYING MACHINE

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Fig. 1.



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Fig. 2.

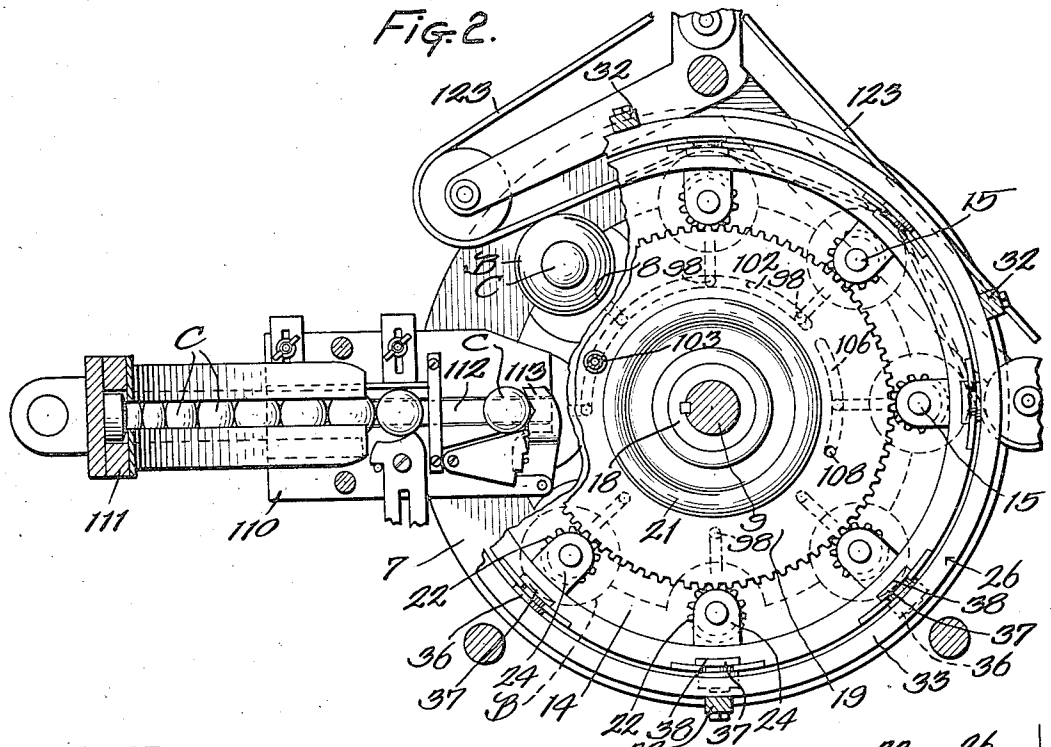
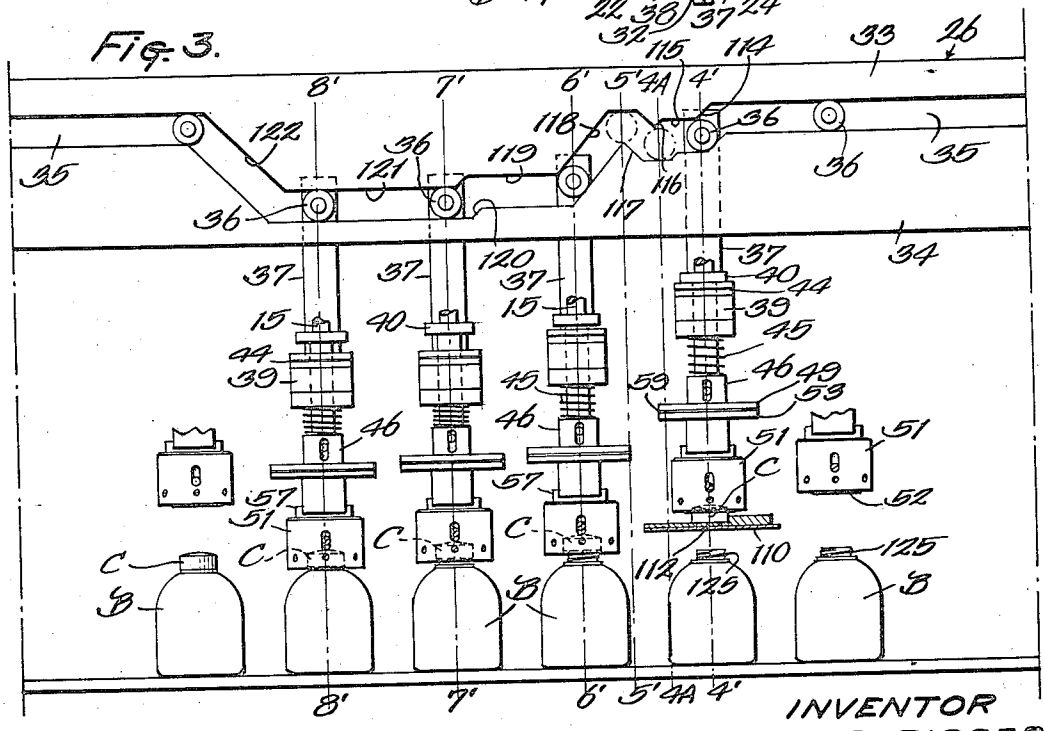


Fig. 3.

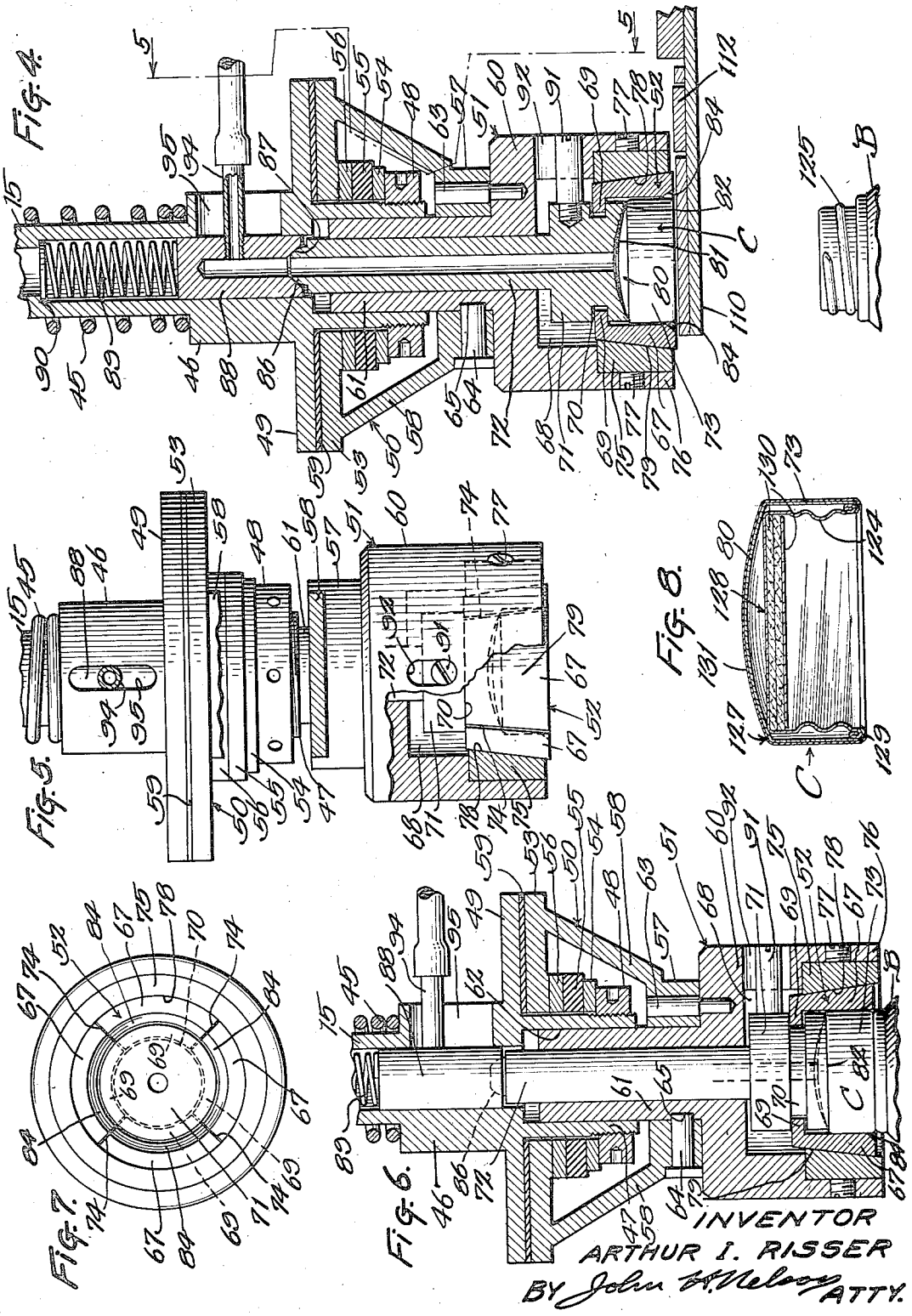


INVENTOR
ARTHUR I. RISSER
BY John A. Maloney
ATTY.

June 2, 1936. A. I. RISSER 2,042,733

SCREW CAP APPLYING MACHINE

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2,042,733

SCREW CAP APPLYING MACHINE

Arthur I. Risser, Chicago, Ill., assignor to U. S. Bottlers Machinery Co., Chicago, Ill., a corporation of Illinois

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12 Claims. (Cl. 226—88)

This invention relates to screw cap applying machines, such as shown in my patents, No. 1,835,335, dated December 8, 1931, and No. 1,748,961, dated March 4, 1930; and this invention more particularly pertains to such a machine for applying screw caps having a skirted portion threaded interiorly with its exterior surface being of straight cylindrical formation.

One of the objects of the invention is to provide an improved capping head which will positively position and maintain a cap, of the type mentioned, in substantially coaxial alignment with the threaded neck of a container or receptacle being capped, prior to and during the capping operation in order to prevent the cap from becoming canted and jammed on the threads of the container.

One type of cap mentioned, as a rule comprises a thin metal inner shell which is threaded, and a thin metal outer shell whose skirt portion is of cylindrical formation, the shell portions being secured together in a suitable manner. It is also customary to provide the cap with a coat of enamel or plating. This type of cap presents a problem in effectively applying same to a container, for the reason that no gripping formations are provided on the exterior of the cap and also, due to the thinness of the metal and the coating thereon, the cap will not stand too great a gripping pressure applied thereto by the ordinary type of clutch. Therefore, it is another object of the invention to provide an improved clutching means for handling such a cap; which will securely grip same during a capping operation without marring or causing its disfiguration.

Although the invention is of particular advantage in applying caps of the type mentioned, this improved machine will handle other types of caps as well, whereupon it will be understood that the invention is not to be limited to the handling of caps of a particular type.

Other objects and advantages will become apparent in the following description, with reference to the accompanying drawings, in which:—

Fig. 1 is a sectional view of the general cap applying mechanism of a turret type of machine, similar to the machine more fully shown and described in said Patent No. 1,835,335, this machine being chosen for the purpose of illustrating this invention; and it is to be understood that the improvements disclosed and pointed out herein may be used in other types of machines.

Fig. 2 is a plan view of parts shown in Fig. 1, with parts broken away, parts omitted and parts shown in section.

Fig. 3 is a diagrammatic view illustrating the operation of the machine.

Fig. 4 is an enlarged cross-sectional view of the capping head, the head being shown in position for picking up the screw cap C, corresponding to the position 4A in Fig. 3.

Fig. 5 is a sectional view of the capping head taken on the section line 5—5 of Fig. 4, with parts broken away.

Fig. 6 is a view similar to Fig. 4 with parts in changed position, parts in full and parts omitted, and showing the capping head in the position where the cap is fully applied to the container or bottle B, as at position 8' in Fig. 3.

Fig. 7 is a bottom view of the capping head, as viewed from Fig. 5, with the cap omitted.

Fig. 8 is an enlarged cross-sectional view of one type of cap handled advantageously by the machine.

This invention is illustrated in one form of embodiment, wherein there is a spider hub 1 and a hub of an upper cross-yoke 2 fixedly supported in the frame of the machine, as fully shown and described in said Patent No. 1,835,335, wherein the corresponding parts are numbered 37 and 41 respectively. The hubs 1 and 2 are in vertical alignment, and in the hub 1 is rotatably mounted the turret shaft 3, which is constantly rotated by a suitable application of power through the bevel gear 4 secured on the lower end of the shaft 3, which gear meshes with a bevel pinion 5 fixed on the drive shaft 6. The circular turret container or bottle support table 7 is pinned to the shaft 3 and rests on the stationary hub 1, thereby supporting the shaft vertically; and to the table 7 are fitted pocketed members 8 for holding the bottles B.

In the fixed hub 2 is keyed a non-rotating support shaft 9, which is bored out to receive the reduced upper end portion 10 of the shaft 3 and is supported on the shoulder 11 formed on the shaft 3.

Keyed on the upper end of the shaft 3, below the reduced portion 10, and supported on a collar 12, pinned on the shaft 3, is a spindle support ring 14 in which the capping head spindles 15 are rotatably and slidably mounted.

Secured to the shaft 9 against rotation, is a flanged support member 16 which rests on a flat circular seat 17 provided at the center of the member 14, and which has a threaded sleeve 18 extending up around the stationary shaft 9. Resting on the upper surface of the flanged portion of the member 16 is a spur gear 19 which is frictionally held from rotation by being pressed

against the member 16 by the flanged ring 20 and hand wheel follower 21 which threads onto the sleeve 18. Then, as the member 14 is turned with the shaft 3, the spindles 15 are rotated by the pinions 22, which mesh with the stationary central gear 19. The pinions 22 are slidably keyed to the spindles and held between lugs 23 and 24 formed in the member 14.

For moving the constantly rotating spindles up and down and positioning them to pick up, carry, start the threading, and screw the cap down on the bottles B, retained in the pockets 8, as shown diagrammatically in Fig. 3, a cam 26 encircles the spindle support ring 14, and is adjustably supported, for accommodating bottles of different heights, by a screw 27 which threads into the upper end of the shaft 9. The arms of the yoke 28, rotatably mounted on the screw 27 are connected by depending rods 29 to a spider 30, slidably keyed to the shaft 9. To the ends of the radially extending arms 31 of the spider 30, are secured depending bars 32 which are bolted to the upper and lower rings 33 and 34 of the cam 26, the rings being spaced to form the cam groove 35 in which ride the rollers 36.

The rollers 36 are journaled on bars 37 which are slidably guided in vertical grooves 38 in the outer periphery of the ring member 14, and to the lower end of the bars 37 are secured collars 39 which loosely embrace the spindles between a flange 40, integrally formed on the spindle, and a collar 41 slidably mounted on the spindle and connected thereto for rotation by a set screw 42 which engages in a slot 43 in the spindle 15. A ball thrust bearing 44 is inserted between the collar 39 and the flange 40 to reduce friction from the pressure of the spring 45 which is compressed between the collar 41 and the shoulder of an enlarged portion 46 of the spindle. The spindle is hollow, and the extreme lower end 47 is threaded to receive the clamping nut 48, and integrally formed near the lower end of the spindle is a circular flange 49.

The capping head of this invention comprises, generally, head support members 50, 51, and a chuck member or vacuum cup 52, which are mounted on the lower end of each spindle 15, as will be described. The head support member 50 has an annular flange 53 which is pressed into frictional engagement with the under side of the spindle flange 49 by the nut 48, threaded on the lower end 47 of the spindle, and the superimposed friction washers 54, 55 and 56. A short hub or sleeve portion 57 of the member 50 is spaced below the nut 48 and integrally connected to the flange 53 by the arms 58. A ring 59, of frictional material, is interposed between the flanges 49 and 53 so that the head support member 50 is frictionally connected to the spindle for rotation.

The head support member 51 comprises a hollow body or holder 60 having a hollow stem 61 which projects through the hub or sleeve portion 57 of the support member 50, and is received within the enlarged bore 62 in the end portion 47 of the spindle. The members 50 and 51 are rigidly connected to function as one piece by a vertically disposed pin 63 and the radial pin 64, as best shown in Fig. 4. The pin 64 is fixed in the hub portion 57 and extends into a notch 65 in the side of the stem 61 of the holder 60.

The vacuum cup or chuck 52 is slidably contained within the holder head 60 substantially coaxial therewith, and is arranged to have a very limited amount of axial movement with respect thereto for causing the application of the chuck to a cap disposed therein. The chuck includes a plurality of substantially concentrically arranged adjacent arcuate sections 67, preferably four, contained within the cylindrical hollow 68 of the holder 60. The inner ends of the sections, which sections constitute jaws, are provided with an inwardly extended concentric flange 69 loosely received within an annular groove 70 in the periphery of the enlarged cylindrical bottom end 71 of a hollow stem 72 which is slidably received within the stem 61 of the holder 60, whereby the jaws are in loose pivotal connection with said end 71, and whereby the jaws form contractible side wall portions of the cup. The inner surface of each jaw forms a section of a cylinder, and the jaws are so proportioned that when they are contracted together to surround and grip the cylindrical skirt 73 of a cap, (see Fig. 7) a very slight space will exist between the adjacent edges of the jaws, as indicated at 74.

For applying the jaws to the cap when the chuck is moved into the holder 60, upon the holder being lowered onto a bottle, a cam ring 75 is provided in the shouldered end 76 of the holder and secured thereto by the set screws 77, the cam surrounding the jaws having a slightly inwardly tapering conical inner cam surface 78, which, when the chuck is moved into the holder, engages the correlatively formed tapering outer surface 79 of each jaw to contract same bodily about the cap.

The type of cap illustrated, although other types of caps can be handled as well, is provided with a convexed top portion 80 which, when received in the chuck, projects into the concaved bottom end 81 of the portion 71, so that upon vacuum being created in the cup for drawing the cap into the chuck, in the manner later described, the peripheral edge 82 of the cup bottom will engage the cap top about its periphery thereby creating a closed vacuum chamber above the cap so the suction will be applied to the entire cap top. Also by virtue of this construction, the cap will be centrically and squarely located in the chuck.

The inner edge of the free end of each jaw is chamfered as at 84, for directing a cap into the chuck when the cap is picked up thereby through the application of vacuum therein, as in the manner later described.

For creating a vacuum in the cup 52 to pick up and retain a bottle cap therein, when the cup is placed over a cap, as shown in Fig. 4, provisions are made as follows: On the upper end of the stem 72 is provided a spherical nipple 86 which enters a conical recess 87 provided in the lower end of a short hollow plunger 88 closed at its top end. The plunger 88 is loosely contained in the bore of the spindle and is pressed into contact with the stem 72 by the spring 89 which is seated on a shoulder 90 formed in said bore. The spring thereby urges the vacuum cup downward so that normally it projects slightly from the bottom end of the holder 60, this downward movement being stopped by the radial pin 91, secured to the cup bottom portion, contacting with the bottom end of the slot 92 in the side wall of the holder 60 through which the pin projects. This pin and slot connection also connects the cup bottom portion and the holder for rotation and permitting relative axial movement therebetween.

In the side of the plunger 88 is threaded a pipe fitting 94 which projects loosely through a slot

95 provided in the spindle portion 46. The pipe fitting is connected by flexible pipes 96 and 97 to a port 98 in the upper surface of the seat 17 of the member 14, the pipes being connected so that the lower pipe 96 can rotate with the spindle through suitable cooperating passages 99 and 100 formed respectively in the collars 39 and 41.

As the spindle support member 14 rotates, the port 98 therein is brought into and out of communication with a source of vacuum of a pump 101 for creating a vacuum in the cup at the desired time by means of a segmental concentric groove 102 provided in the lower surface of the normally stationary member 16, the groove 102 being in constant communication with the pump line 103 of the pump through the cooperating passages 104 and 105 formed respectively in the member 16 and the gear 19. After the port 98 is moved out of communication with the groove 102 in rotation of the member 14, it is brought into register with a short arcuate groove 106 formed in the lower surface of the member 16, which groove is open to the atmosphere through the aligned passages 107 and 108 formed in the member 16 and the gear 19, respectively, and the vacuum in the cup is thereby broken.

To review briefly the construction and general arrangement of the machine, more fully described in said patent, as the table 7 and the spindles, in axial alignment with the bottle pockets 8, are rotating about the shaft 3, the bottles B are placed in the pockets at the front of the machine, as viewed in Fig. 2. The bottles are carried around clockwise, and removed fully capped when they are brought around to the front of the machine.

The bottles pass under a fixedly mounted shelf 110 to which the caps are supplied from a magazine 111, the caps being carried out from the end of the magazine by a traveling belt 112 which moves the cap up against a stop 113, mounted on the shelf, and in alignment with the spindles moving thereover. The spindles are held in raised position at the front of the machine by the rollers 36 riding in the higher portion of the cam groove 35. As the spindle moves over the shelf, it is lowered by the cam depression 114 to the cam dwell 115, then lowered slightly further by the dwell 116, as the spindle moves beyond the belt and over the surface of the shelf at the side of the belt, during which time the cap is picked up. Then the spindle is lifted by the cam rise 117, and lowered by the depression 118, to the lower cam dwell 119 in close relation to the bottle, during the thread-finding operation. At the cam depression 120 the spindle is fully lowered to the screwing-down position, with the cam roller in the lowermost dwell 121. Then the spindle is raised by the cam rise 122 to the uppermost position as it is moved around to the front of the machine.

The vacuum is applied as the spindle is over the feed belt 112, and released at the end of the lowermost dwell 121, and at the rear of the machine is provided a belt 123 which is suitably guided to contact with the sides of the bottles to prevent them from turning while the spindles are in cap-applying relation therewith.

Thus in this new arrangement shown herein, at the front of the machine with the spindle raised, the vacuum cup is in its lowered position in the spindle. Then as the spindle is moved around about the axis of the shaft 3 and over the belt 112, as at position 4', Fig. 3, the spindle is lowered so that the cup 52 sits lightly over the awaiting cap on the shelf, whereupon at this point vacuum is then applied to draw the cap up into the cup or chuck.

The clamping movement of the chuck jaws about a cap, from their expanded to contracted positions, is so slight, due to the very gradual taper of the cam surface 78 of the cam ring 75 which contracts the jaws, that even in their expanded relation, the adjacent edges of the jaws are so close together that the slight leakage created thereby is not enough to hinder the action of the vacuum in drawing the cap into the chuck.

After the spindle leaves the position 4', Fig. 3, in the event the cap is not properly drawn into the cup, the spindle is lowered further as it moves over the shelf to position 4A of Fig. 3, at the side of the belt 112, and the cup is thereby lowered completely over the cap. With the cap held in the cup by the vacuum, the spindle is raised up from the shelf to position 5' of Fig. 3, then lowered over the end of the bottle which is in a pocket below the spindle, as at position 6' of the spindle as seen in Fig. 3.

The threads 124 in the cap strike the threads 125 on the bottle in the beginning of the dwell 119, and the vacuum cup is pressed up lightly into the holder and the jaws 67 thereof are cammed inwardly to clamp the bottle cap. Then, as the spindle is constantly rotated, and by reason of the jaws being friction-connected to the cam ring 75, in whose slightly tapered conical cam interior surface the jaws are tightly wedged, the jaws are rotated with the spindle to rotate the cap therein until the threads of the cap engage the threads of the bottle and are threaded down thereover.

At the end of the dwell 119, the spindle is moved all the way down to the dwell position 121, as at position 7' of Fig. 3. In this position the spindle is pressed down forcibly against the action of the spring 45, the jaws pressed tightly against the cap, and the cap is thereby screwed firmly in position on the bottle, upon the spindle reaching its position 8', as seen in Fig. 3.

The vacuum is then released and the spindle raised, thus restoring the chuck or vacuum cup to the hanging position, and releasing the jaws for the next cycle of operation.

One of the outstanding features of the invention is that the cam not only causes the contraction of the jaws, but also cooperates to properly position same so that their inner clamping surfaces snugly surround a cap skirt. This construction thus allows the jaws to be so arranged as to be in loose connection with the spindle normally to the extent of being free as to not rotate therewith prior to the insertion of a cap into the cup. This arrangement expedites the picking up of a cap by the chuck, in that the jaws will adjust themselves in various ways in the picking up of a cap that happens to be improperly positioned on the feed shelf, and at the same time not hindering the action of the vacuum in drawing the cap up into the cup.

The machine is of especial utility in the handling of caps of very thin metal construction, such as that illustrated in Fig. 8. This type of cap comprises an outer shell 127 forming the top 80 and the skirt 73, and an inner shell 128 is provided in whose skirted portion the threads of the cap are formed. The edge of the outer shell is spun over the edge of the inner shell, as at 129, for connecting the portions, and washers 130 are placed in the cap for acting as a seal. Also the

cap is as a rule provided with a coat of enamel, as at 131.

By virtue of the looseness of the jaws, during the picking up of a cap, the enamel coating of the cap will not be scratched or marred; and due to the jaws substantially surrounding the cap skirt, during the applying operation, less gripping pressure is required of the jaws in firmly screwing the cap on the bottle, which precludes the possibility of the thin metal outer shell of the cap being kinked or distorted in any way.

Thus a very dependable means is provided for picking up the cap off from the feed shelf; which positions the cap squarely and positively located in the chuck, and which ensures quick engagement of the threads of the cap and bottle, at least within one revolution of the cap on the bottle.

Having thus described my invention, I claim:

1. In a screw capping machine, a rotating chuck holder, a cup shaped chuck loosely connected substantially coaxial with the holder and adapted to snugly receive a skirted cap therein, wherein the chuck includes a plurality of circularly arranged adjacent sections forming at least the side wall of the chuck, being loosely mounted with respect to each other and normally rotatable with respect to the holder, means for contracting the sections to clamp a cap and causing same to rotate with the holder, and means for producing a vacuum in the chuck.

2. In a screw capping machine, a rotating chuck holder, a cup shaped chuck loosely connected substantially coaxial with the holder and adapted to snugly receive a skirted cap therein, wherein the chuck includes a bottom portion connected to rotate with the holder, a plurality of circularly arranged adjacent sections forming the side wall of the chuck and being loosely connected with the bottom portion so as to be contractible and rotatable with respect thereto, means for contracting the sections to clamp a cap and causing same to rotate with the bottom portion, and means for producing a vacuum in the chuck.

3. In a screw capping machine, a cup shaped chuck adapted to receive a skirted cap therein, wherein the chuck includes a bottom portion mounted to rotate, a plurality of adjacent sections forming the side wall of the chuck and being loosely connected with the bottom portion so as to be contractible and rotatable with respect thereto, means for contracting the sections to clamp a cap and causing same to rotate with the bottom portion, and means for producing a vacuum in the chuck.

4. In a screw capping machine, a cup shaped chuck adapted to receive a cap therein, wherein the chuck includes a bottom portion mounted to rotate, a plurality of arcuate sections forming the side wall of the chuck and depending from in loose pivotal connection with the bottom portion, means for contracting the sections so as to concentrically locate same about a cap in clamping relation therewith, and means for producing a vacuum in the chuck.

5. In a screw capping machine, a cup shaped chuck adapted to snugly receive a cylindrically skirted cap therein, wherein the chuck includes a plurality of arcuate sections in loose connection with each other and forming the side wall of the chuck, a ring portion surrounding the sections, said ring and sections connected for limited relative axial movement, said ring and sections having correlatively formed cam surfaces cooperating to contract the sections in clamping a cap and for locating the sections concentrically therewith when the ring and sections are relatively moved axially, and means for producing a vacuum in the chuck.

6. In a screw capping machine, a cup shaped chuck adapted to snugly receive a cylindrically skirted cap therein, wherein the chuck includes a plurality of arcuate sections in slightly loose connection with each other and forming the side wall of the chuck, each section having an inner cylindrical clamping surface conforming to the cap skirt, a rotating ring portion surrounding the sections, said ring and sections connected for limited axial movement, the ring having a slightly conically formed inner cam surface, the sections having an outer surface conforming to the ring cam surface for engagement therewith to contract the sections in clamping a cap and for locating the inner surfaces of the sections concentrically therewith when the ring and sections are relatively moved, and means for producing a vacuum in the chuck.

7. In a screw capping machine, a cup shaped chuck adapted to snugly receive a cylindrically skirted cap therein, wherein the chuck includes a bottom portion mounted to rotate and having a peripheral groove, a plurality of closely adjacent arcuate sections forming the side wall of the chuck and each having an inner flange at one end loosely confined in the groove of the bottom portion, means for contracting the sections to clamp a cap so as to be located concentric therewith and for causing same to rotate with the bottom portion, and means for producing a vacuum in the chuck.

8. In a screw capping machine, a cup shaped chuck adapted to receive snugly a cylindrically skirted cap therein, wherein the chuck includes a bottom portion mounted to rotate and having a peripheral groove, a plurality of closely adjacent arcuate sections forming the side wall of the chuck and each having an inner flange at one end loosely confined in the bottom portion groove, a cam ring portion surrounding the sections to which ring the bottom portion is connected to rotate in limited axial movement with respect thereto, and the ring portion and sections having correlatively formed cooperating cam surfaces to contract the sections in clamping a cap and for locating the sections concentrically therewith when the bottom portion is moved axially with respect to the ring.

9. The structure as defined in claim 8, including means for producing a vacuum in the chuck.

10. In a screw capping machine, a cup shaped chuck adapted to snugly receive a cylindrically skirted cap therein, the chuck including a cylindrical bottom portion mounted to rotate and having a peripheral groove, a plurality of closely adjacent arcuate sections forming the side wall of the chuck and each having an inner flange at one end loosely confined in the bottom portion groove, each section having an inner cylindrically formed clamping surface conforming to the formation of the cap skirt, a cam ring portion surrounding the sections connected to rotate with the bottom portion and arranged whereby the portions have limited axial movement with respect to each other, the ring having a slightly conical inner cam surface and the sections having an outer surface conforming to the cam surface of the ring for engagement therewith to contract the sections in clamping a cap and locating the inner surfaces of the sections concentrically therewith when the ring and bottom portion are relatively moved axially.

11. The structure as defined in claim 10, including means for producing a vacuum in the chuck.

12. In a screw capping machine, a cup shaped chuck adapted to receive snugly a cylindrically skirted cap therein, wherein the chuck includes a bottom portion mounted to rotate, a plurality of closely adjacent arcuate sections forming the side wall of the chuck, means for loosely connecting the sections with the bottom portion whereby the sections are loosely carried thereby so as to be capable of free movement bodily to expanded and contracted positions with respect to each other and capable of relative rotation bodily with respect to the bottom portion about the axis thereof, a cam surrounding the sections to which cam the bottom portion is connected to rotate in limited axial movement with respect thereto, and the cam and sections having correlatively formed co-operating cam surfaces to contract the sections bodily in clamping a cap and for locating the sections concentrically therewith when the bottom portion is moved axially with respect to the cam.

ARTHUR I. RISSER.