

Aug. 16, 1927.

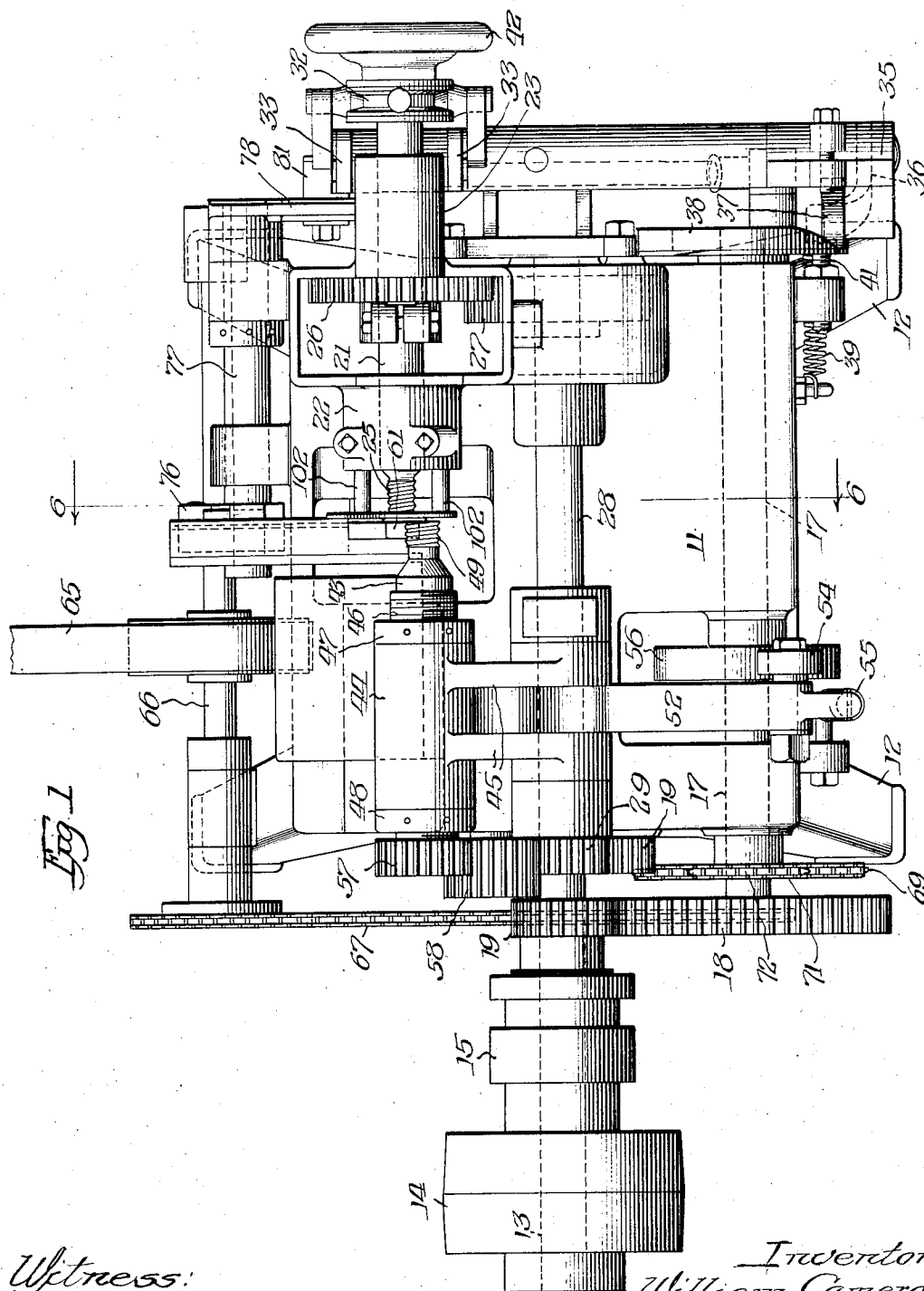
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1,639,367

CAP THREAD ROLLING MACHINE

Filed July 23, 1923

7 Sheets-Sheet 1



Witness:
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Inventor
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Aug. 16, 1927.

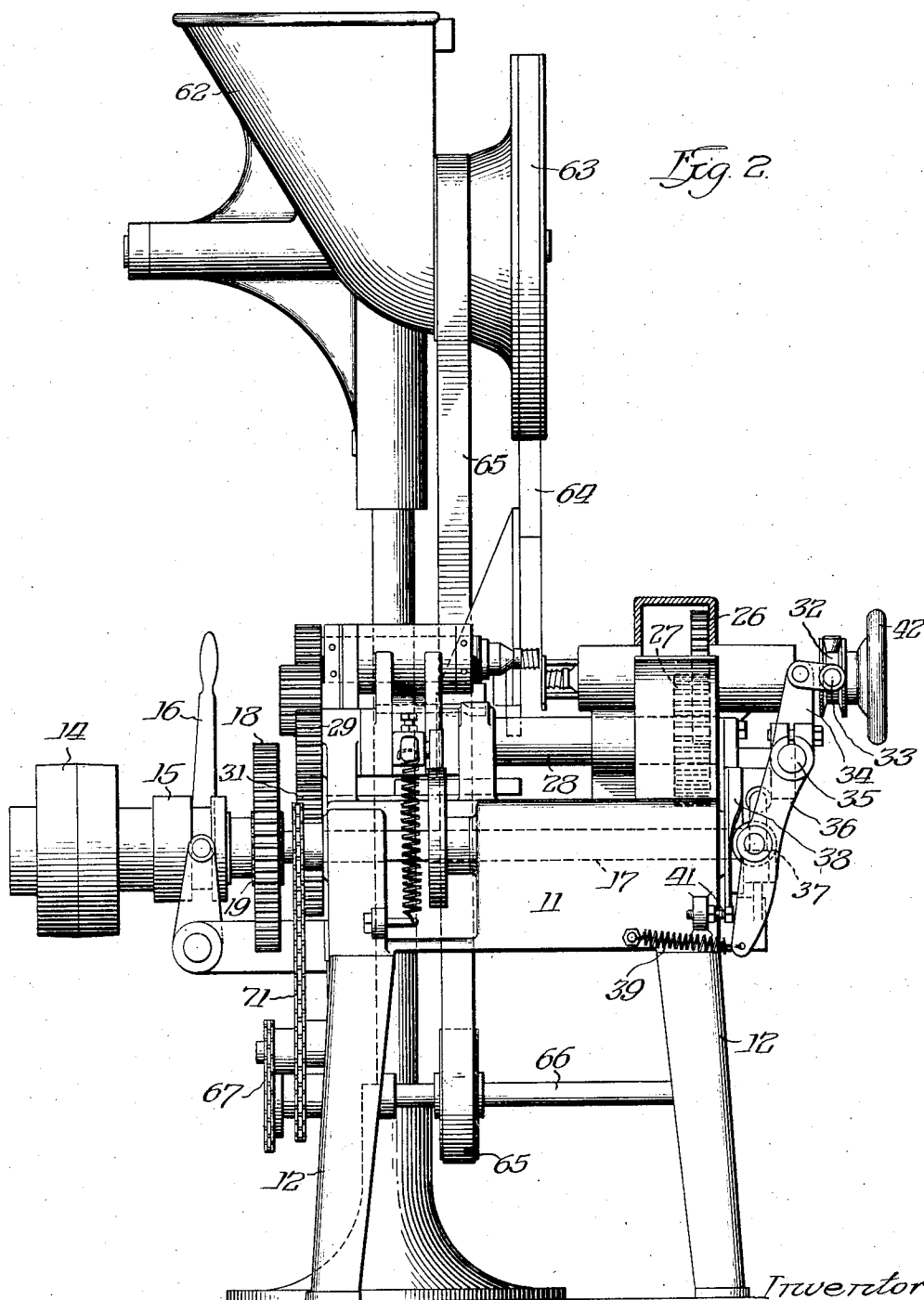
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CAP THREAD ROLLING MACHINE

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7 Sheets-Sheet 2



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CAP THREAD ROLLING MACHINE

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7 Sheets-Sheet 3

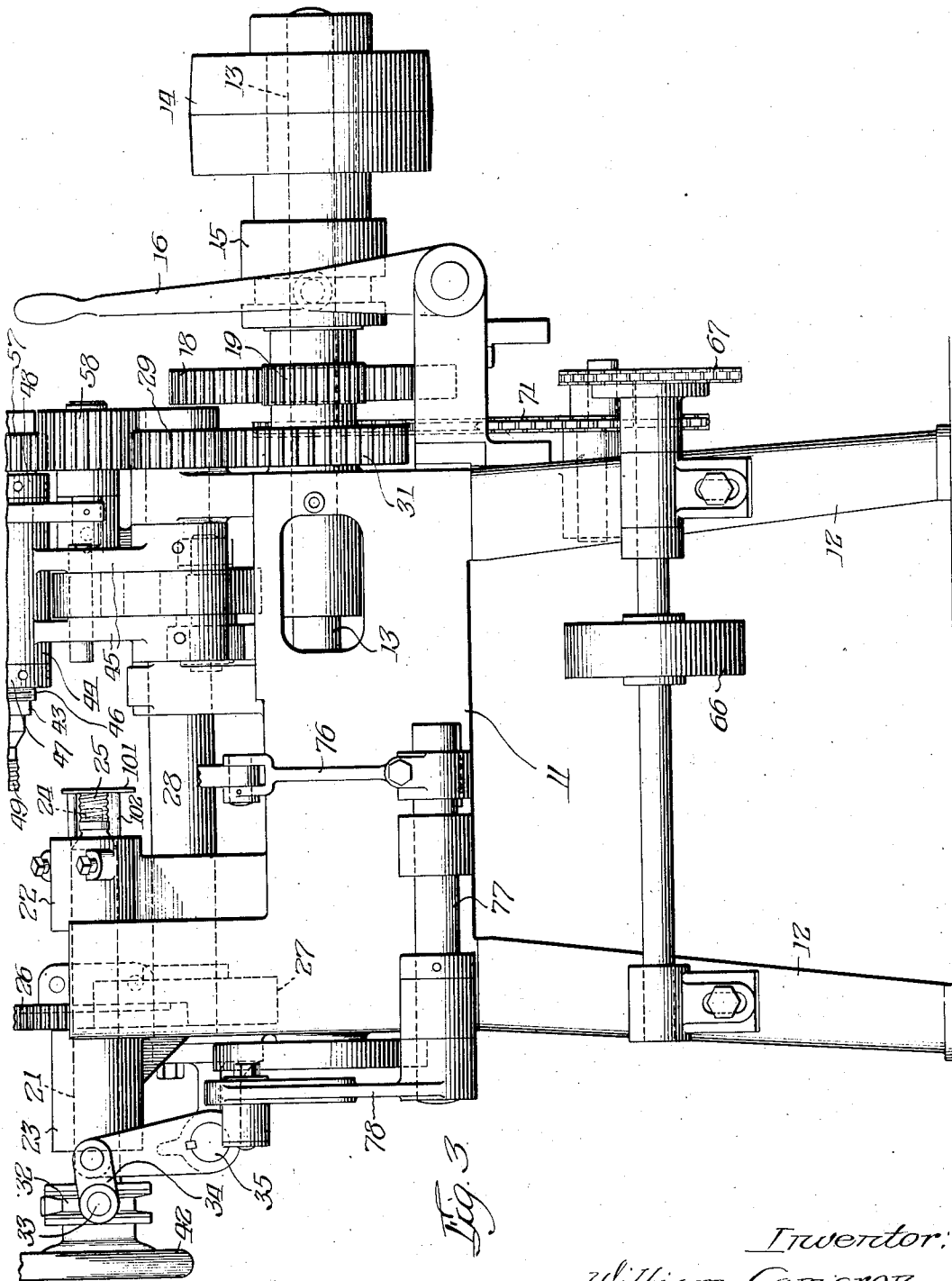


Fig. 3

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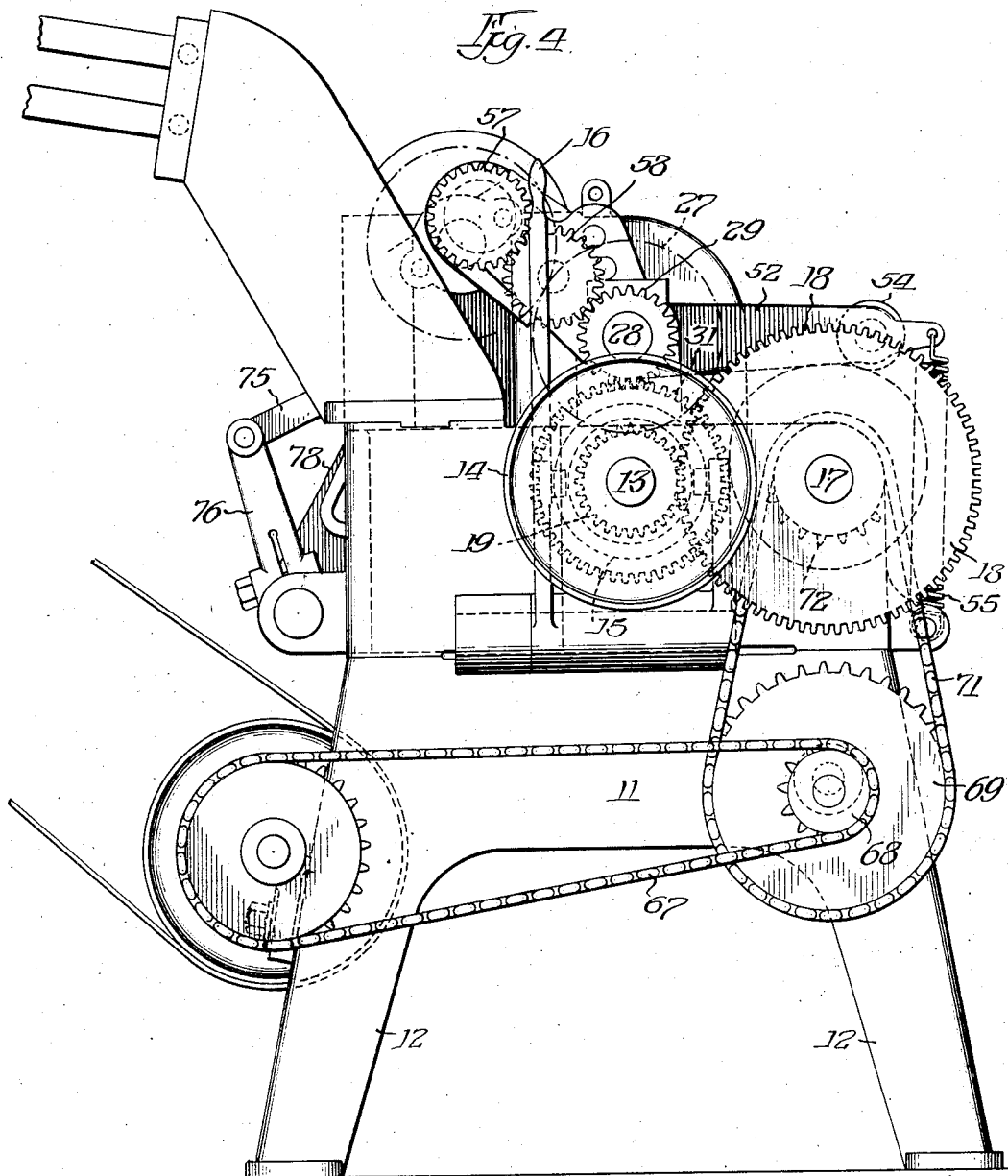
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CAP THREAD ROLLING MACHINE

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7 Sheets-Sheet 4



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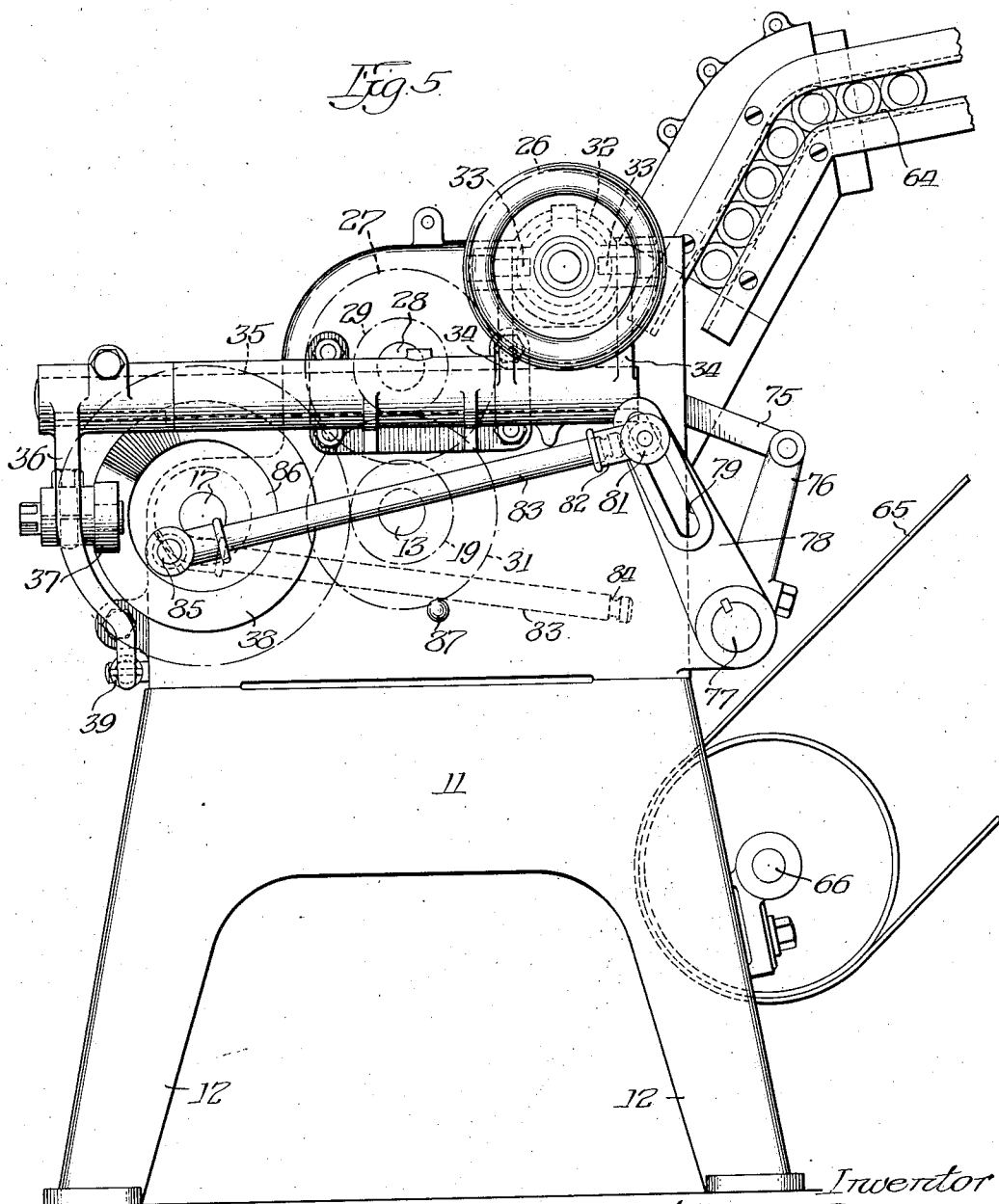
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CAP THREAD ROLLING MACHINE

Filed July 23, 1923

7 Sheets-Sheet 5



Witness:
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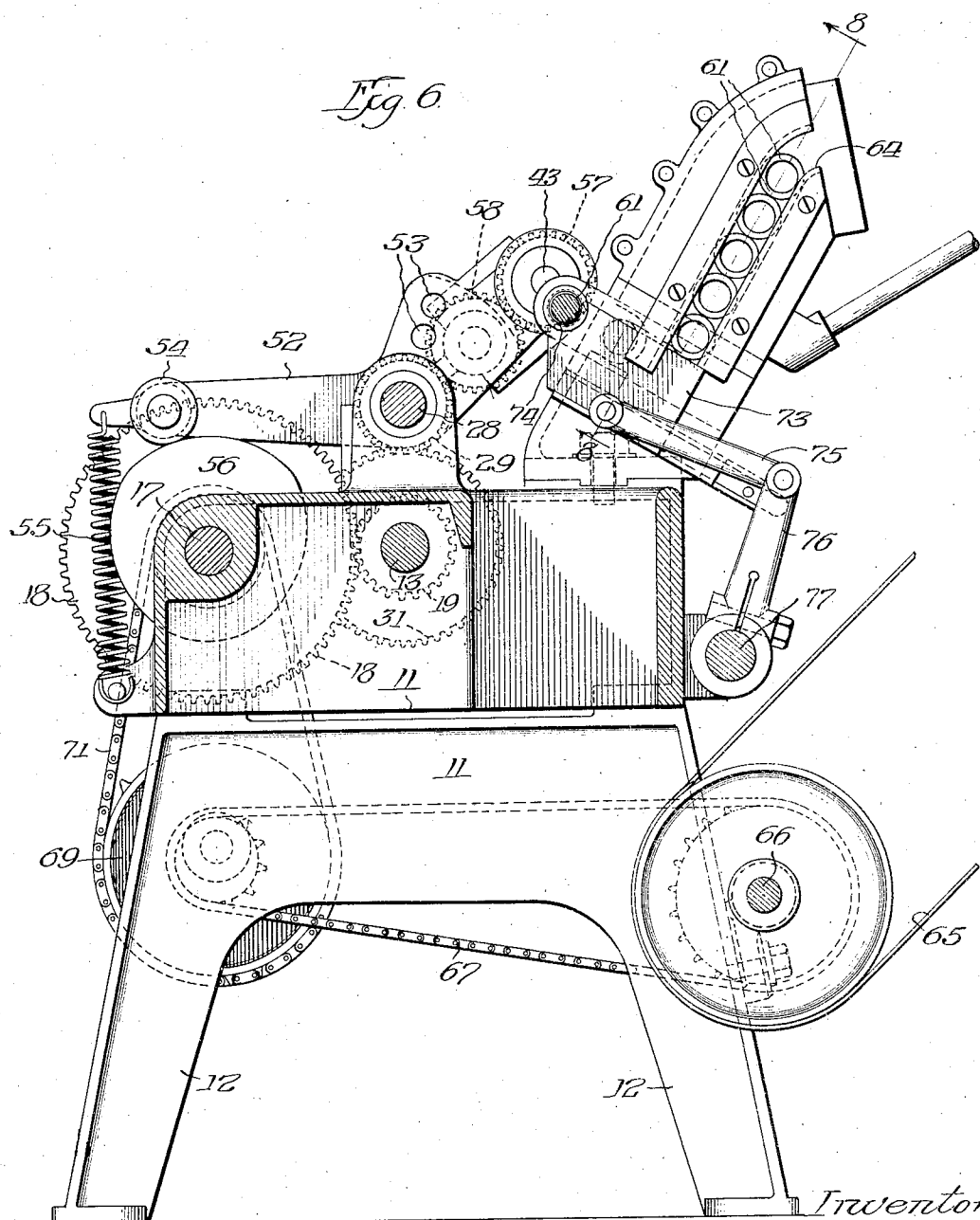
1,639,367

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CAP THREAD ROLLING MACHINE

Filed July 23, 1923

7 Sheets-Sheet 6



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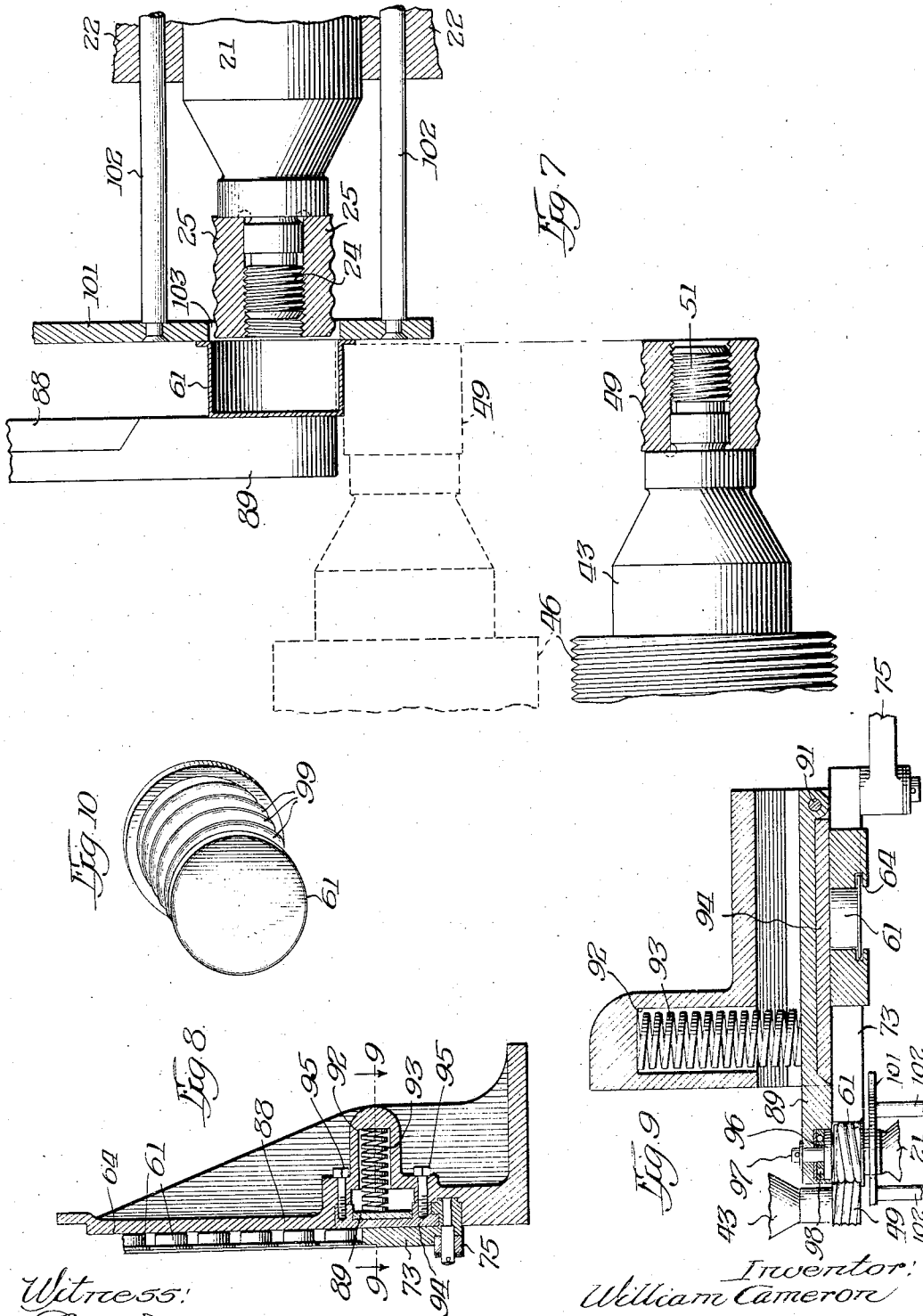
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1,639,367

CAP THREAD ROLLING MACHINE

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7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE.

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CAP-THREAD-ROLLING MACHINE.

Application filed July 23, 1923. Serial No. 653,059.

This invention pertains to machines for operating upon caps, such as are employed for closing tin cans, certain types of threaded bottles, and other containers or receptacles. These caps, which are customarily formed from tin or other light sheet metal, are punched and drawn into cylindrical shape on a die press, and when subjected to the action of my machine, the circumferential walls of the caps are provided with screw threads, and in some instances the outer ends of these walls are knurled and the inner end is provided with a flange. Whether or not the caps are knurled or flanged, or both, in addition to being screw threaded, depends upon the shape and configuration of the threading spindles or dies, and since the spindles may be shaped to produce flanges and knurls whenever such may be desirable, I have shown in the present instance a simple threading spindle, as illustrating the principles of my invention.

One of the primary purposes of this invention is to provide a machine which will be extremely rapid, as well as accurate and reliable in operation; and furthermore, to provide a machine which will be simple in construction, one which can be economically manufactured, and which will be durable in use.

Another object is to provide a machine which will so handle the caps that their tops will not be marred or scratched during the operation of the machine upon the caps.

Still another object is to insure against breakage of the machine by yieldingly mounting the plate which holds the caps against displacement from the threading spindles, so that if a cap should become jammed or otherwise distorted, the holding plate will yield so as to relieve the pressure on the spindle, and thereby prevent breakage of the parts.

A further object is to provide a machine in which the caps are automatically fed in succession into alignment with a threading spindle, which is projected into the aligned cap, whereupon a companion spindle is brought into engagement with the outer periphery of the cap to cooperate with the inner spindle in producing the desired threads on the cap. During the threading

operation the cap is held in position by the yieldable plate, previously mentioned, and after the operation is completed the spindles are withdrawn, permitting the threaded cap to be discharged from the machine.

Other objects and advantages of this invention should be readily appreciated as the same becomes better understood by reference to the following description, when considered in connection with the accompanying drawings.

Referring to the drawings:

Fig. 1 is a plan view of a machine embodying my invention;

Fig. 2 is a front view thereof;

Fig. 3 is a rear view;

Fig. 4 is an end elevation looking toward the right at Fig. 1;

Fig. 5 is an elevation of the opposite end of the machine;

Fig. 6 is a sectional view on the line 6—6 of Fig. 1;

Fig. 7 is an enlarged fragmentary view showing the threading spindles and their relative relation;

Fig. 8 is a sectional view on the line 8—8 of Fig. 6;

Fig. 9 is a sectional view on the line 9—9 of Fig. 8; and

Fig. 10 is a perspective view of a completed cap.

Referring to the drawings, reference character 11 indicates generally the bed of the machine, which is preferably of hollow, box-like construction, as will be apparent from Fig. 6, the bed being supported upon suitable legs 12, and adapted to carry the various operating mechanisms, which will later be described.

Extending transversely of the bed and journaled therein is a main drive shaft 13 equipped at its projecting end with a drive pulley 14, and with a clutch 15 of any preferred construction, adapted to be operated from a clutch lever 16. A cam shaft 17 extends parallel with the drive shaft and is driven from this shaft through a gear 18 meshing with and driven by a pinion 19 on the drive shaft.

A spindle shaft 21 (Fig. 1) is mounted to rotate and to reciprocate longitudinally in journal bearings 22 and 23. This shaft is

provided at its inner end with a threaded extension 24, upon which the inner threading spindle or die 25 is detachably mounted, as shown in Fig. 7. Upon the spindle shaft 21, intermediate the bearings 22 and 23, is fixed a gear wheel 26, meshing with and driven by a gear 27 fixed upon a shaft 28, which extends parallel with and above the shaft 13, and is driven from said drive shaft through inter-meshing gears 29 and 31, mounted upon the shaft 28 and the drive shaft 13, respectively. The gear 26 being fixed upon the spindle shaft 21, reciprocates therewith, and the gear 27 therefore has a broad face to insure meshing relation between the gears 26 and 27 during this reciprocatory movement. Obviously, however, the gear 26 might be stationarily mounted and splined or otherwise slidably secured to the spindle shaft 21, so as to drive said shaft and at the same time permit of reciprocatory movements of this shaft.

The reciprocatory movements are imparted to the spindle shaft by means of a grooved collar 32 fixed on the shaft and adapted to receive the inwardly projecting pins 33 carried by arms 34 projecting upwardly from a shaft 35, which is mounted to oscillate in suitable bearings at the right-hand end of the machine. At its forward end this shaft is equipped with a depending arm 36, carrying a cam follower 37 which is urged against the face of a cam 38 fixed upon the right-hand end of the cam shaft 17, the follower being urged toward the cam by a tractile spring 39, as shown in Fig. 2. A reciprocatory movement is therefore imparted to the spindle shaft 21 and the threading spindle carried thereby upon rotation of the cam shaft 17, and the extent to which the spindle shaft will be retracted may be regulated by the adjustment of an abutment screw 41 disposed in the path of the lower end of the arm 36, as will be apparent from Figs. 2 and 5. The spindle will be projected inwardly, therefore, to a point determined by the high face of the cam 38, and will be retracted to a point determined by the adjustment of the abutment screw 41. It will be manifest, therefore, that the stroke or length of the reciprocatory movement of the spindle shaft may be regulated in accordance with different lengths or depths of caps to be operated upon by the machine. The handwheel 42 is mounted upon the outer end of the spindle shaft 21, by means of which the spindle shaft may be manually rotated for trial or adjustment purposes.

A companion spindle shaft 43 is rotatably mounted in a bearing 44, carried by arms 45, which are loosely mounted for oscillatory movement upon the shaft 28. The spindle is journaled in a bearing sleeve 46, which may be adjusted longitudinally of

the bearing 44 by means of the adjusting nuts 47 and 48, to thereby regulate the longitudinal projection of the spindle 43, which carries at its inner end a threading spindle or die 49, adapted to cooperate with the spindle 25. The spindle 49 is detachably attached to the shaft 43 by being screwed onto the threaded extension 51 of the spindle shaft, all as shown in Fig. 7.

Swinging movements of the arms 45 to move the spindle 49 from the inoperative position shown in full lines in Fig. 7, to the operative position shown in dotted lines in said figure, are effected by a lever 52 fulcrumed on the shaft 28 between the arms 45, and adjustably connected to said arms by a pin passing through any one of the openings 53, and aligned openings in the arms 45. The position of the spindle 49 with respect to the spindle 25 may be regulated by changing the connecting pin from one to another of the holes 53, so as to vary the approach of the spindle 49 toward the axis of the spindle 25, thereby accommodating the machine to caps of various diameters. Different sizes of caps require spindles themselves of different diameters, and the spindles 25 and 49, shown for illustrative purposes, may be quickly detached and replaced by spindles of larger or smaller diameters, whenever occasion requires, and the stroke of spindle 49 may be correspondingly regulated by the adjustment previously described.

The lever 52 carries a cam follower 54, which is held by a tractile spring 55 against the periphery of a cam 56 mounted on the cam shaft 17. It will be apparent that this cam shaft serves to reciprocate the spindle 25 longitudinally, and also to oscillate the spindle 49 about the shaft 28 toward and from the axis of the spindle 25.

The spindle shaft 43 is provided at its outer end with a gear wheel 57 meshing with an idler gear 58, carried by the arms 45, which idler in turn meshes with and is driven by gear 29 fixed upon the shaft 28 and driven from the gear 31 on the drive shaft 13, as previously explained. It will be observed that the face of the idler gear 58 is considerably broader than the driven gear 57 in order that longitudinal adjustments of the spindle shaft 43 may be made without disturbing the meshing relation between the gears 57 and 58. It will be manifest that continual rotary movement is therefore imparted to both of the spindles 25 and 49, while at the same time the spindle 25 is longitudinally reciprocated and the spindle 49 is moved laterally toward and from the axis of the spindle 25.

The caps to be operated upon, one of which is shown in section in Fig. 7, and indicated by reference character 61, are placed in a magazine 62 at the rear of the machine,

from which they are automatically fed, one at a time, by a feed mechanism 63, of any preferred form, into a chute or channel 64, to the lower end of which the caps travel by gravity. Obviously, the caps may, if preferred, be fed into the chute 64 by hand, but in any event, they must be disposed in the chute with their open ends disposed toward the right, viewing Figs. 2 and 7, in order that the spindle 25 may enter the caps, as will be later explained. The feeding mechanism 63 is designed to deliver caps only which are faced in the proper direction, and to accomplish this result, the mechanism is continuously driven by a belt 65 from a counter-shaft 66, which in turn is driven by a sprocket chain 67, which, through the intermediary of rigidly connected sprocket wheels 68 and 69, and a sprocket chain 71 trained over the sprocket wheel 69 and a driving sprocket 72, is driven from the cam shaft 17.

At the lower end of the feed chute 64 there is mounted a reciprocatory feed slide 73, provided at its forward upper end with a semicircular socket 74 adapted to receive the lowermost cap from the chute when the slide is in its fully retracted position. Upon forward movement of the slide, this cap is carried from the chute into position in alignment with the spindle 25, the remainder of the caps in the chute being retained therein by the upper edge of the slide 73, which extends across the lower end of the chute. The slide 73 is reciprocated by a link 75 connecting the slide to an arm 76 mounted upon the inner end of a rock shaft 77, the outer end of which has fixed thereto an operating arm 78. This arm is provided with an elongated slot 79, in which is adjustably mounted a connecting pin 81, upon which is swingingly mounted a socket 82. A connecting rod 83, having one end yieldably connected with the socket 82 by a spring and ball connection (not shown) adapted to engage in a circumferential groove 84 upon the end of the connecting rod, is journaled at its other end upon a wrist pin 85 projecting from the face of a disk 86, mounted upon the outer end of the cam shaft 17. As the cam shaft revolves, the cap feeding slide 73 is reciprocated to transfer the caps in succession from the chute 64 into axial alignment with the spindle 25. The length of the stroke of the feed slide 73 may be regulated to caps of various sizes by adjustment of the connecting pin 81 in the slot 79. Furthermore, should the feed slide jam or become stuck for any reason, the connecting rod 83 will simply withdraw from the socket 82, in which it is yieldingly retained, and drop into the position shown in dotted lines in Fig. 5, in which it is supported by a pin 87. This breaks the driving connection to the feed slide without damage to the ma-

chine or the caps, and when the jam has been relieved, the driving connection can be readily and quickly reestablished by reinserting the end of the rod 83 into the socket 82.

For the purpose of holding the caps in position during the operations thereon, I have pivotally mounted upon the rear wall 88 of the chute 64 a holding plate 89, pivoted to this wall at 91 and projecting beyond the wall into alignment with the spindle shaft 21 as will be apparent from Fig. 9. The wall 88 is shaped, as shown in Fig. 8, to provide a spring socket 92, in which an expansion spring 93 is positioned to normally urge the plate 89 against the guide plate 94, which is rigidly secured to the wall 88 by bolts 95, and serves as a guide along which the feed slide 73 reciprocates. The plate 89 projects beyond the member 94, and its projecting end is widened so that its front face lies flush with the face of the member 94, as will be apparent from Fig. 9.

For the purpose of preventing the ends of the caps from being marred or scratched during the threading operation, a backing plate or disk 96 is rotatably carried by the projecting end of the plate 89 with its face flush with the face of said plate, the disk being rotatably connected to the plate by a pin or stub shaft 97, and being freely rotatable by reason of the ball bearings 98 by which thrust exerted upon the face of the disk is received. The disk, therefore, is free to rotate with the cap during the threading operation, the end thrust exerted thereon by the spindle 25 being taken up by the disk 96, which rotates with the cap so that no marring or scratching of the cap can result. The stroke of the spindle 25 is designed to force the cap snugly against the disk 96, and should the spindle tend to force the cap outwardly beyond the normal plane of the inner face of the disk, such movement will be permitted by the yielding of the plate 89 against the force of the spring 93. Furthermore, should a cap become jammed between the spindle and the plate, the plate 89 will be pushed back against the force of the spring 93 so that no injury to the spindle or other working parts of the machine can result.

The operation of a machine embodying my invention is substantially as follows. The caps are fed into the chute 64 with their open ends disposed toward the right, and travel down the chute by gravity until the lowermost one rests upon the upper edge of the reciprocatory feed slide 73. When this slide is in its fully retracted position, the lowermost cap will drop into the socket 74, and upon forward movement of the slide this cap will be carried to a position in axial alignment with the spindle 25, which at that time is retracted out of the path of the feed slide. This spindle, as soon as the cap is

aligned therewith, is projected by the cam 38 into the cap so as to clamp the top of the cap between the end of the spindle and the yieldable disk 96. The spindle fits loosely in the cap, and as the spindle is continuously rotated, the cap will be rotated therewith. As soon as the spindle 25 has been introduced into the cap, the spindle 49 will be moved laterally into engagement with the perimeter of the cap so as to grip the peripheral wall of the cap between the perimeters of the two spindles. These spindles are peripherally threaded, as will be apparent from Fig. 7, and as they revolve, the walls of the revolving cap will be pressed by the cooperative action of the spindles into threaded formation, the threads being indicated by reference character 99 in Fig. 10. If it be desired that the outer end of the cap be knurled, the spindles are shaped to provide such knurling; and if the flange of the cap is to be shaped, the spindles are shaped to produce the desired flange configuration.

During the threading operation, the feed slide has been retracted to pick up and bring forward the next cap, and as soon as the threading operation is completed, spindle 49 is withdrawn laterally and spindle 25 is withdrawn longitudinally from engagement with the cap, which thereupon drops by gravity into a receptacle or chute beneath the machine. In order to prevent the cap from clinging to the spindle 25, a stripper plate 101 is carried by posts 102 projecting laterally from the bearing 22, and is provided with an opening 103, slightly smaller than the perimeter of the cap but sufficiently large to permit the projection of the spindle 25 therethrough. This plate serves, therefore, to strip the cap from the spindle 25 when the spindle is being retracted. Immediately after the threaded cap has been released, the next succeeding cap is positioned by the feed slide 73, the spindles are moved into operative position, and the operation is repeated.

It will be apparent that the parts are so timed that an exceedingly small interval elapses between the operations upon successive caps, with the result that the operation of the machine is very rapid and its output is extremely high. Should the feed slide become jammed, the automatic release between the connecting rod 83 and the socket 82 stops the feed without injury to the machine; and should the spindle 25 fail to enter a cap by reason of distortion of the cap or failure of the same to be properly aligned with the spindle, the plate 89 will yield, thus obviating any damage to the machine. During the threading operation, the backing disk 96 rotates with the cap, so that scratching or marring of the top of the cap, which would be objectionable, particularly

with enameled or similarly finished caps, is precluded.

The construction, operation, and many of the advantages of this invention should be understood without further description, and while a preferred embodiment of the invention has been illustrated and described, it should be manifest that the structural details may be varied within considerable limits without departing from the essence of the invention, as defined in the following claims.

I claim:

1. In a cap threading machine, the combination of a cap magazine, a movable feed member cooperating therewith and adapted to convey one of said caps to a required position, reciprocal die means operable in a direction normal to the movement of said member adapted to project into said cap when the same is in said position, and means for engaging the outer wall of said cap to thread the same.

2. In a cap threading machine, the combination of a cap magazine, a longitudinally reciprocating feed member cooperating therewith and adapted to convey one of said caps to a required position and to be retracted to secure another cap while the former is being acted upon, reciprocable means operable in a direction normal to the movement of said member adapted to project into said cap when in said position, and means for engaging the outer wall of said cap to thread the same.

3. In a cap threading machine, the combination of a cap magazine, a movable feed member cooperating therewith and adapted to convey one of said caps to a required position, a reciprocable member adapted to project into said cap after the same has been conveyed to said required position by said member, means for engaging the outer wall of said cap to operate thereon, and means for retracting said feed member to secure another cap while the former cap is being threaded.

4. In a cap threading machine, the combination of a cap magazine, a movable feed member cooperating therewith and adapted to convey one of said caps to a required position, a reciprocable die mounted on a spindle and adapted to project into said cap after the same has been brought to said required position by said feed member, an external die member for engaging the outer wall of said cap whereby a thread is rolled onto said cap by the cooperation of said dies, and means for retracting said feed member to secure another cap while said former cap is being threaded.

5. In a cap threading machine, the combination of a cap magazine, a movable feed member adapted to convey the lowermost cap to a required position while sealing the

magazine against the feeding of additional caps, a reciprocable die mounted on a spindle and adapted to project into said cap when in said required position, an external die adapted to engage the outer wall of said cap whereby a thread is rolled onto said cap by the cooperation of said dies, and means for retracting said feed member to secure another cap while said former cap is being threaded.

6. In a machine of the character described, a longitudinally movable die and a cooperating outer die, a feed mechanism consisting of a cap magazine, a feed member having a socket for receiving the lowermost cap from the magazine, means associated with said member for retaining the remainder of said caps in said magazine upon the movement of said member, and means for reciprocating said feed member to position the cap therein and for retracting said member to secure another cap while the die members are acting on the positioned cap.

7. In a machine of the character described, a longitudinally movable die and a cooperating outer die, a feed mechanism consisting of a cap magazine, a reciprocating feed member having a socket for receiving the lowermost cap from the magazine, means on said member for retaining the remainder of said caps in said magazine during the forward movement of said member to position said cap, said reciprocating member being adapted to return and secure another cap for positioning during the threading of said positioned cap.

8. In a machine of the character described, a longitudinally movable die and a cooperating outer die, feed means adapted to position a cap to receive the longitudinally movable die therein, means for retaining the positioned cap upon the withdrawal of said feed means whereby said feed means may reciprocate and bring forward another cap for positioning during the threading of said positioned cap by said dies.

9. In combination with a cap threading machine having a longitudinally movable inner die and an outer die, of a feeding mechanism for positioning a cap to receive the inner die, a resilient member for preventing injury to the top of said cap, and means for stripping the cap from the inner die upon its withdrawal therefrom.

10. In a cap threading machine, a reciprocating inner die adapted to enter a positioned cap, an outer die adapted to cooperate with said inner die to roll a thread on said cap, a cap magazine and a longitudinal slidable feed member cooperating therewith and operable in a direction normal to the movement of said inner die to position a succeeding cap for threading immediately said inner die is withdrawn from the threaded cap.

11. In a cap threading machine, a reciprocating inner die adapted to enter a positioned cap, an outer die adapted to cooperate with said inner die to perform work upon the same, means at the back of said positioned cap to prevent distortion thereof and to prevent marring of said surface, and feeding mechanism adapted to position a succeeding cap to be acted upon immediately said die is withdrawn from the finished cap.

12. In a cap threading machine, a reciprocating inner die adapted to enter a positioned cap, an outer die adapted to cooperate with said inner die to perform work upon the same, means at the back of said positioned cap to prevent distortion thereof and to prevent marring of said surface, and feeding mechanism adapted to position a succeeding cap to be acted upon immediately said die is withdrawn from the finished cap.

13. In a cap threading machine, a reciprocating inner die adapted to enter a positioned cap, an outer die adapted to cooperate with said inner die to perform work upon the same, yieldable and rotatable means at the back of said positioned cap to prevent distortion thereof and to prevent marring of said surface, and feeding mechanism adapted to position a succeeding cap to be acted upon immediately said die is withdrawn from the finished cap.

14. A machine for threading caps, comprising a reciprocating die adapted to project into said cap, an outer die engaging the periphery thereof to thread the same, and a yielding support at the rear of said cap to prevent distortion thereof and injury to said inner die.

15. A machine for threading caps, comprising a reciprocating die adapted to project into said cap, an outer die engaging the periphery thereof to thread the same, and a yielding support at the rear of said cap to prevent distortion thereof and injury to said inner die, said support being rotatable to prevent marring the top of said cap.

16. In a cap threading machine, an inner die adapted to project into a positioned cap, an outer die adapted to cooperate with said inner die to roll a thread on said cap, a rotatable bearing cooperating with said inner die for holding the cap therebetween, a pivoted plate for supporting said bearing, yieldable means for the plate acting to hold the bearing against the cap, and feeding mechanism for positioning said cap.

17. In a cap threading machine, an inner die adapted to project into a positioned cap, an outer die adapted to cooperate with said inner die to perform work on said cap, a rotatable bearing cooperating with said inner die for holding the cap therebetween, a plate for supporting said bearing, yieldable means for the plate acting to hold the bearing against the cap, a guide plate for limiting the movement of the first plate by said yieldable means to permit the position-

ing of said cap, and feeding mechanism for positioning said cap.

18. In a cap threading machine, the combination of a cap magazine, a longitudinally
5 reciprocable feed member cooperating with said magazine and adapted to convey one of said caps to a required position, recip-

rocable die means operable in a direction normal to the movement of said member and adapted to project into said cap when the
same is in said position, and die means for
engaging the outer wall of said cap. 10

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