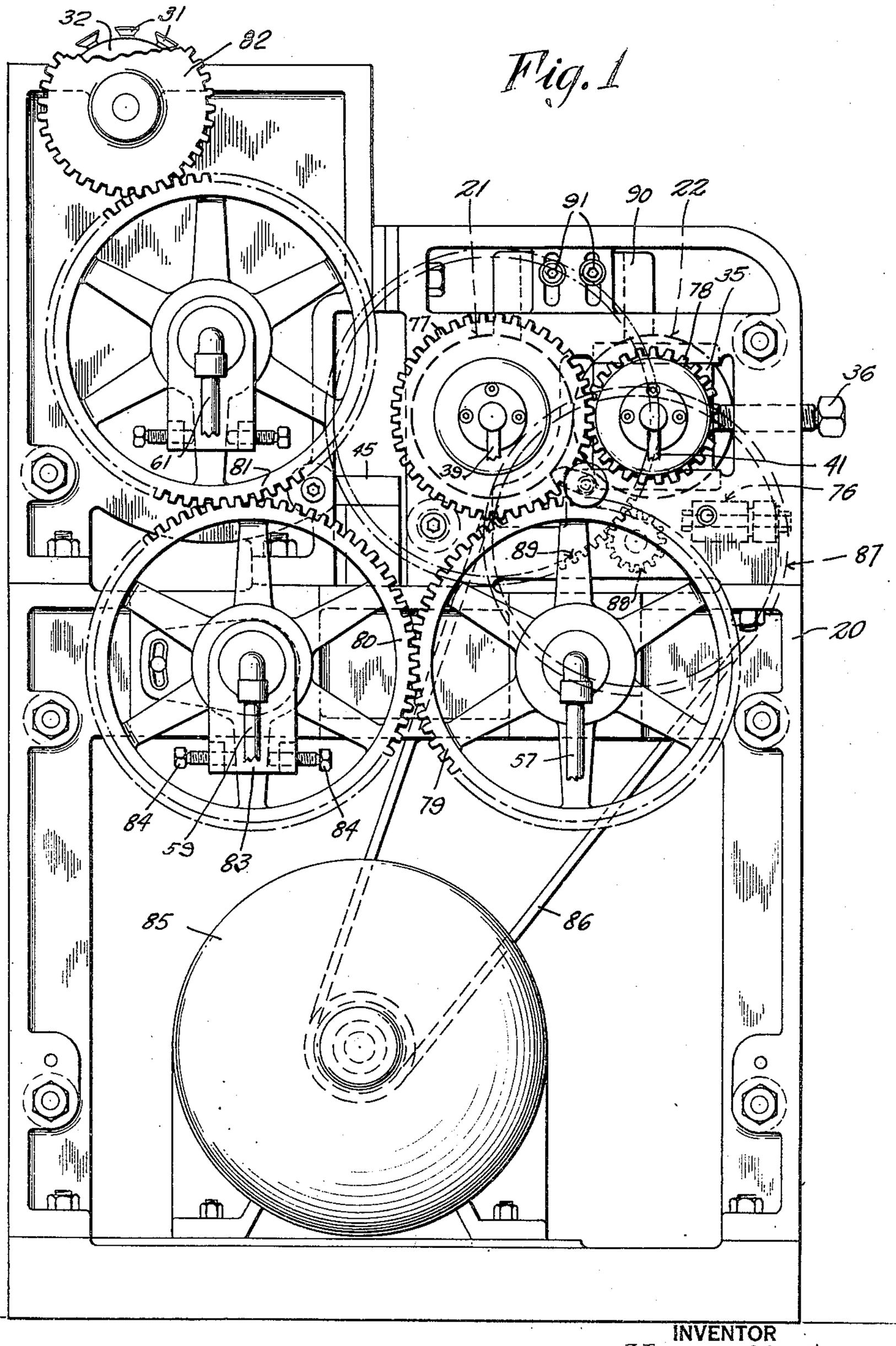
April 10, 1951 H. Z. GORA 2,548,304

MACHINE AND METHOD FOR MAKING SEALING CLOSURES

Filed April 26, 1945 4 Sheets-Sheet 1

Fig. 1



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MACHINE AND METHOD FOR MAKING SEALING CLOSURES

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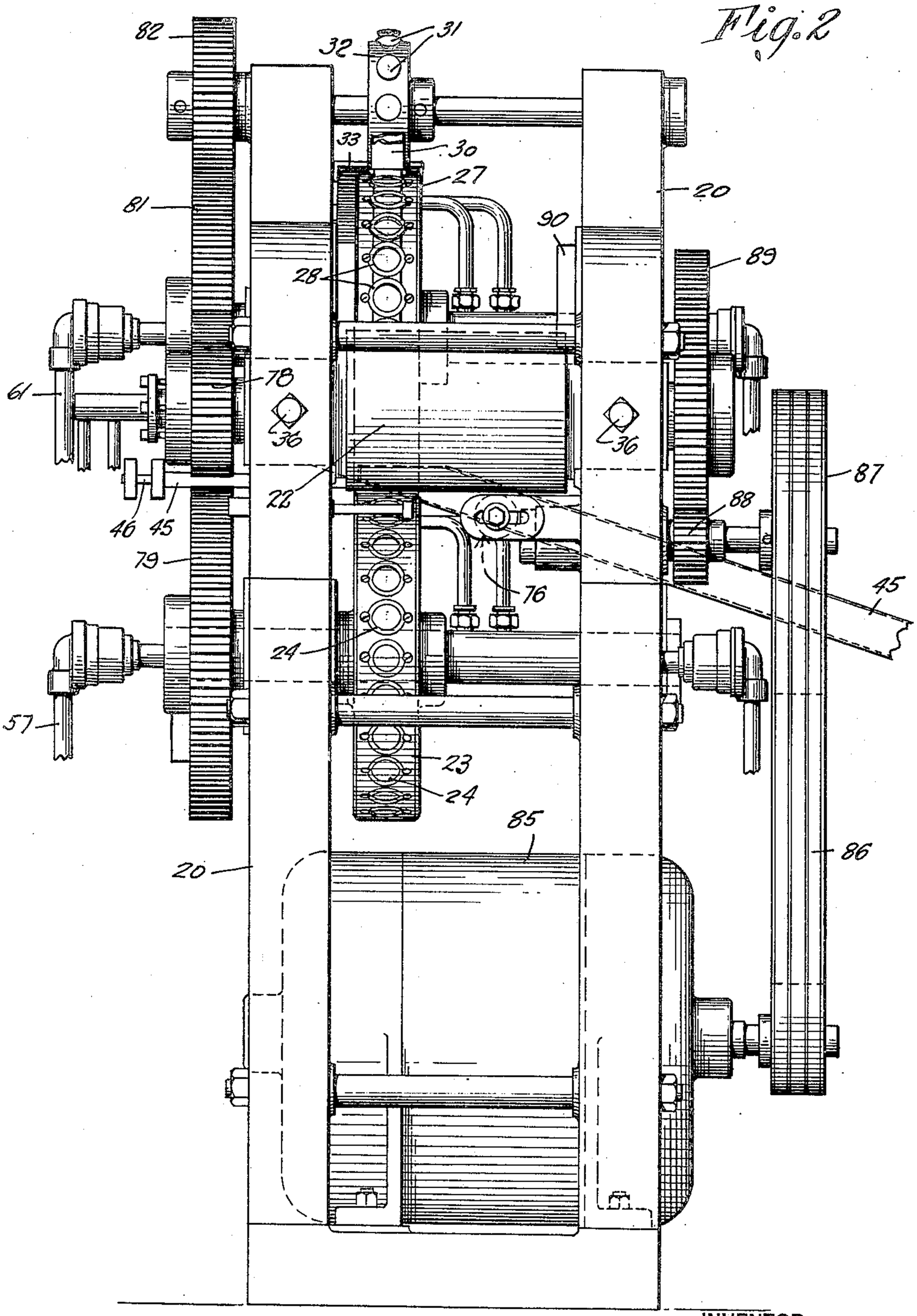
Fig. 2



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MACHINE AND METHOD FOR MAKING SEALING CLOSURES

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Fig. 11

Fig. 3

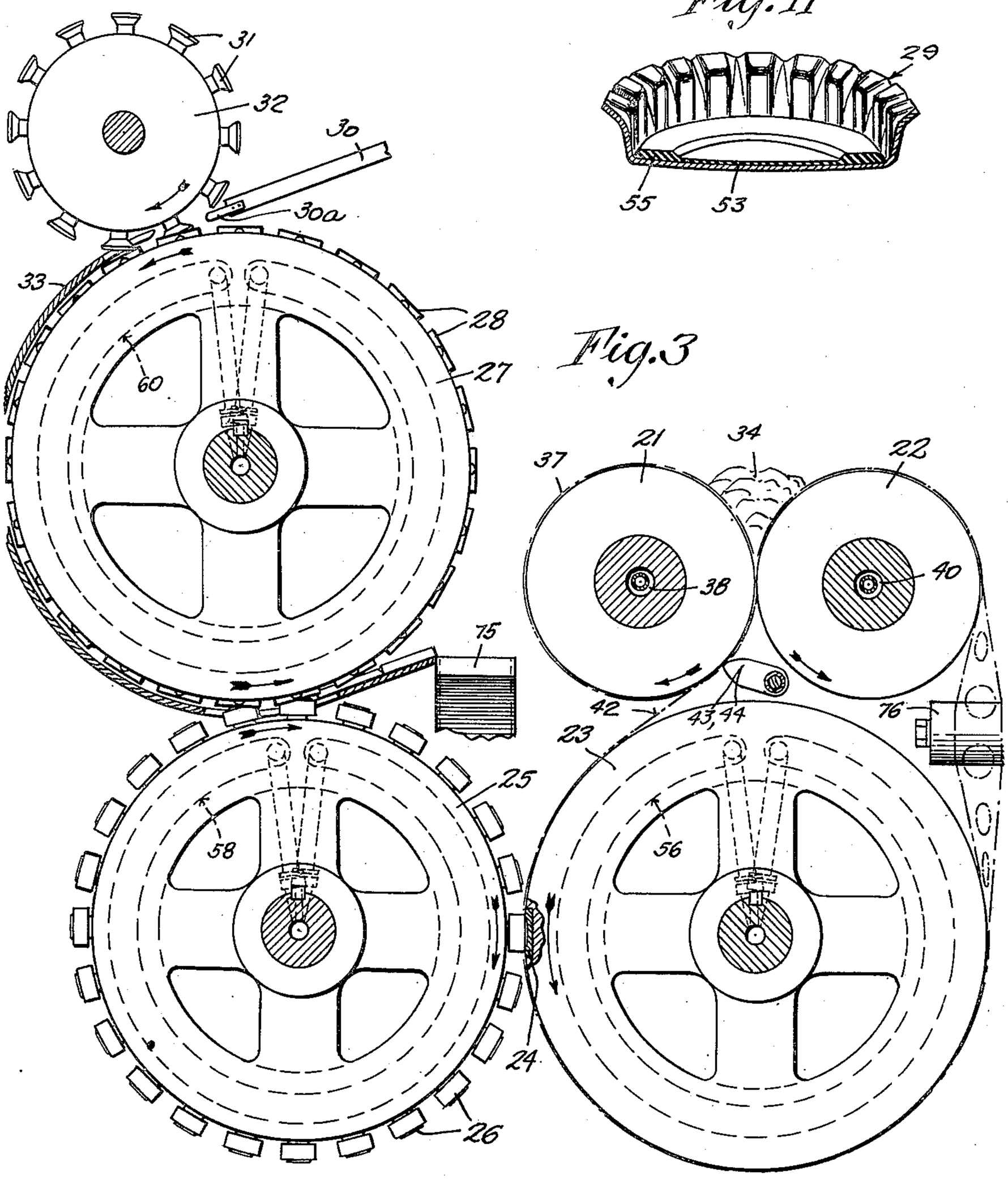
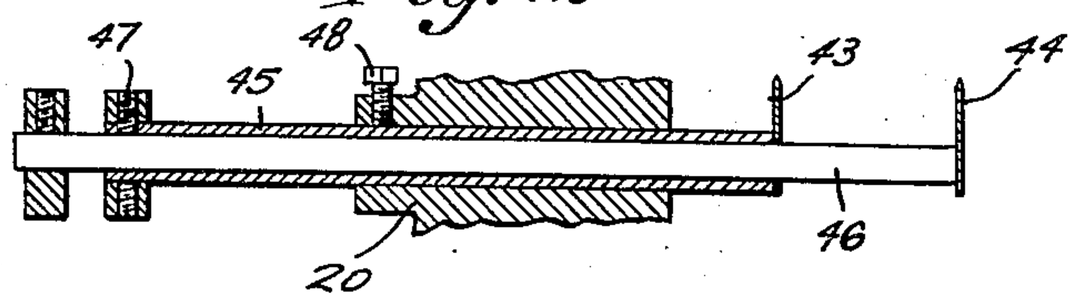


Fig. 12



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MACHINE AND METHOD FOR MAKING SEALING CLOSURES

Filed April 26, 1945 4 Sheets-Sheet 4

Fig. 4

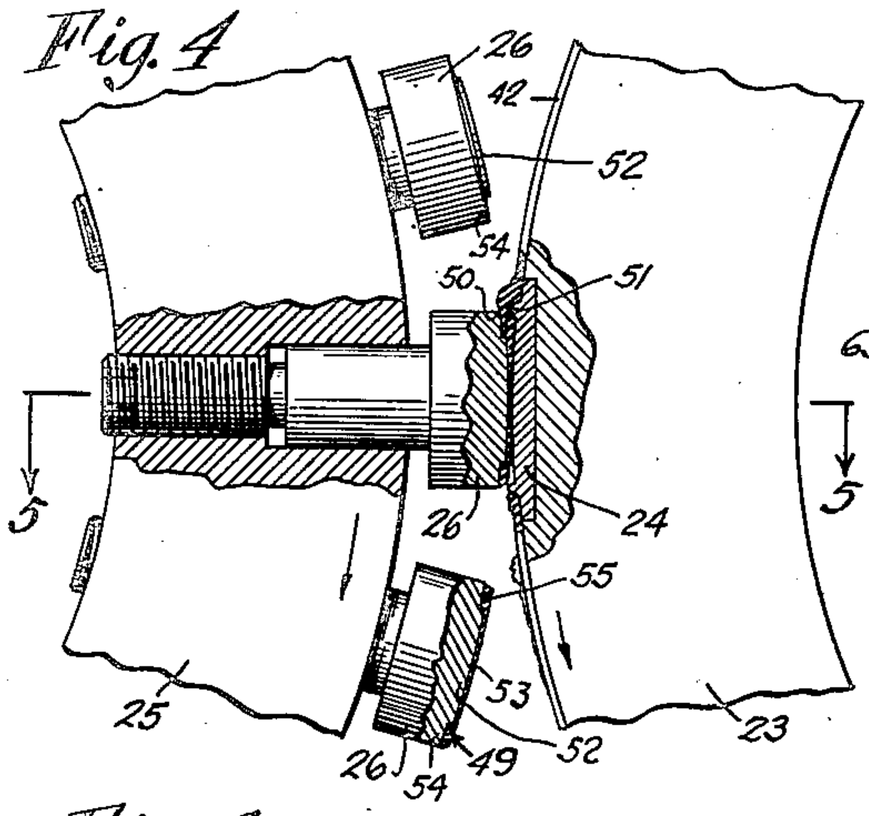


Fig. 5

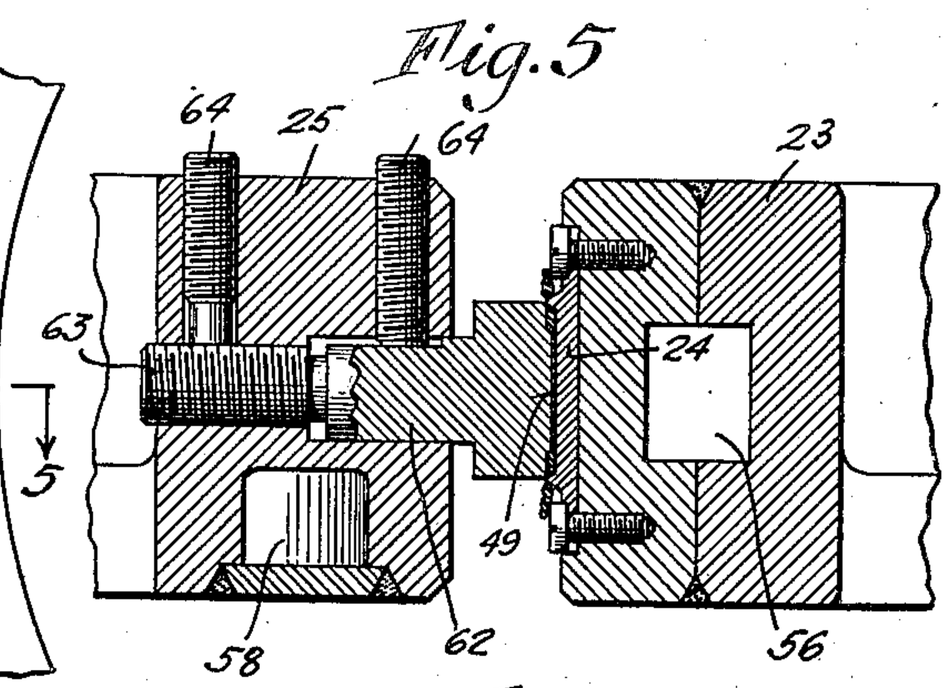


Fig. 6

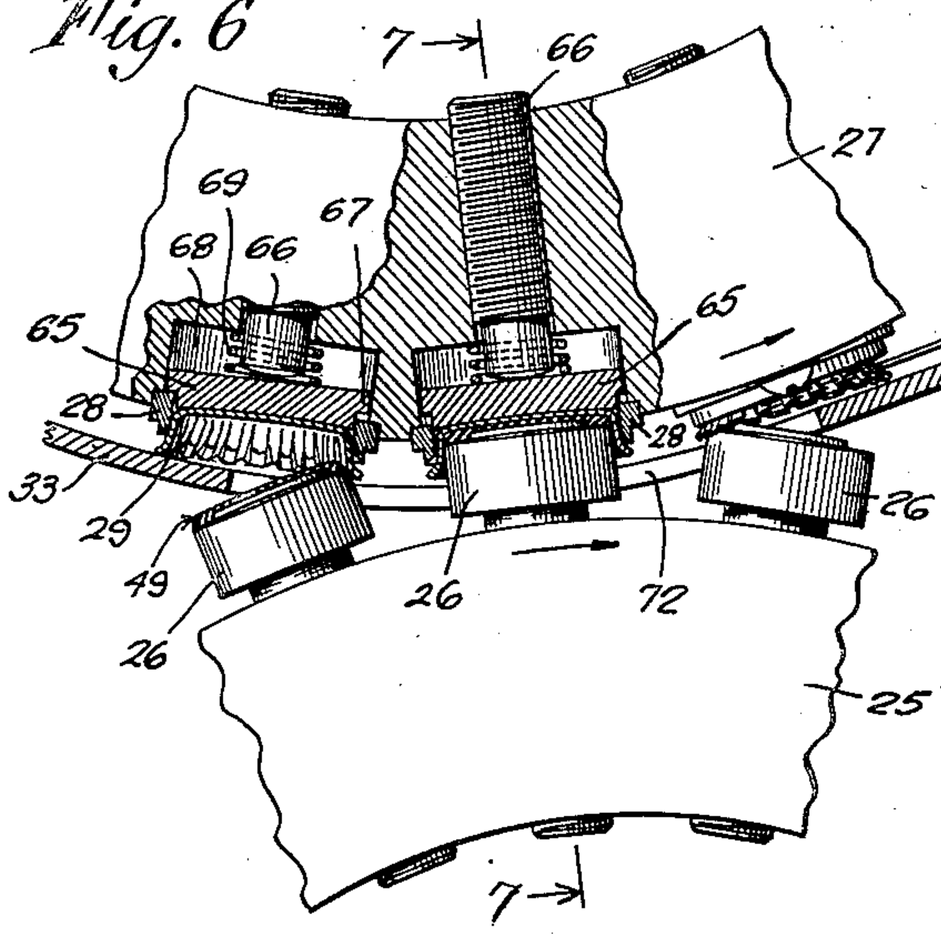


Fig. 7

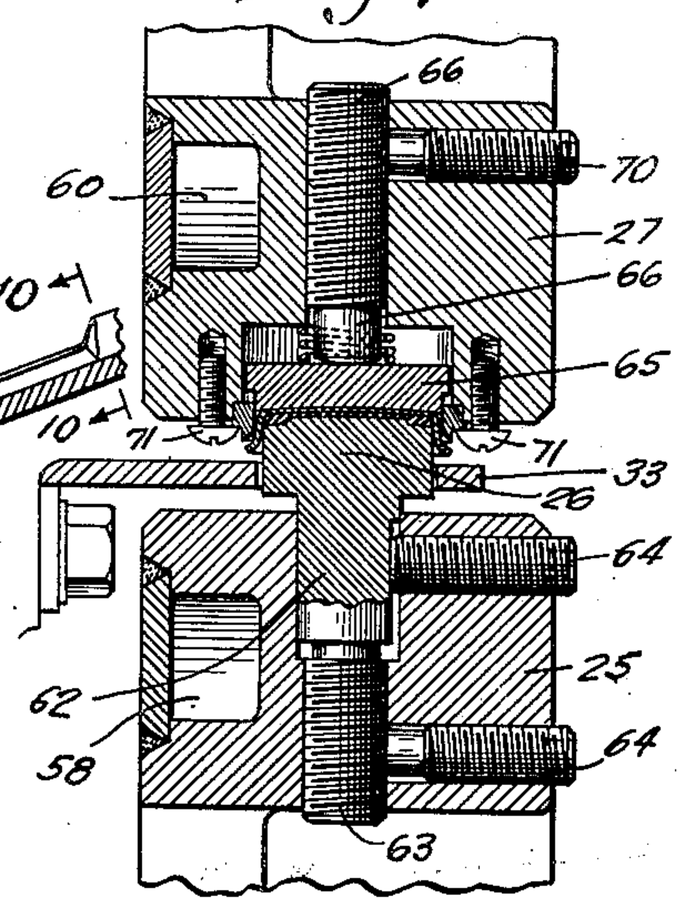


Fig. 8

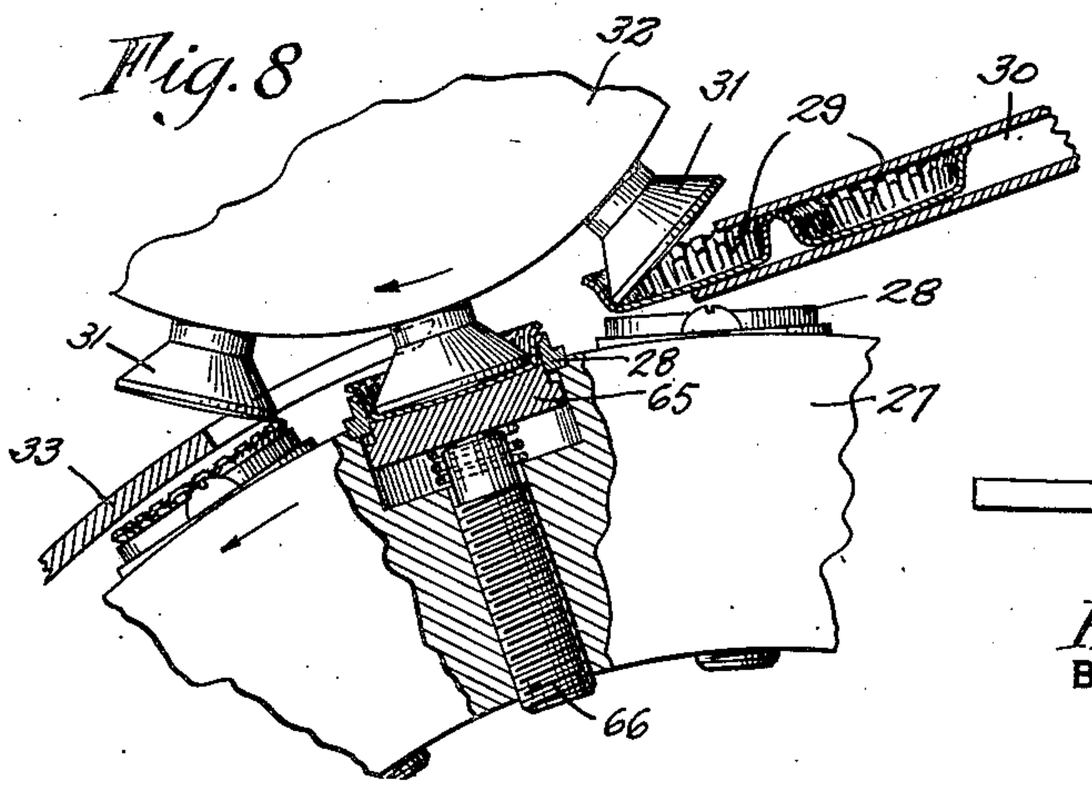


Fig. 9

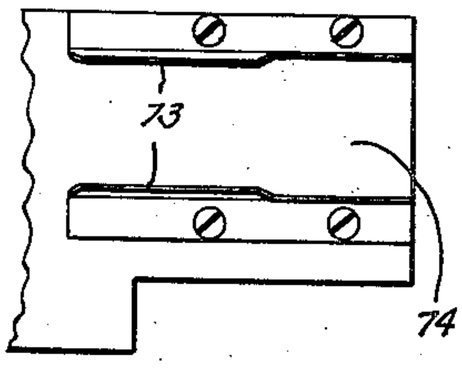
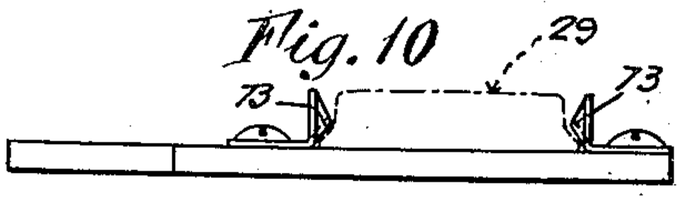


Fig. 10



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Patented Apr. 10, 1951

2,548,304

UNITED STATES PATENT OFFICE

2,548,304

MACHINE AND METHOD FOR MAKING SEALING CLOSURES

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Application April 26, 1945, Serial No. 590,459

18 Claims. (Cl. 18—5)

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This invention relates to the manufacture of closure members for containers such as are used on bottles and jars.

In my copending application Serial No. 574,555, filed January 25, 1945, I have disclosed methods and means for forming and applying to the underside of caps or lids a gasket member comprising a ring portion for engaging the top edge of the jaw or bottle and a membrane-like portion filling the hole of the ring portion to isolate the contents of the jar or bottle from the cap or closure which is usually made of metal or other material.

In the form of my invention disclosed in said application, the gasket member is blanked from a strip of gasket material and the blanked portion is molded directly onto the cover or lid.

Reference is also made to co-pending application Serial No. 607,226, filed July 26, 1945, disclosing other specific and related methods and means for forming and applying gasket members to the undersides of caps or lids and to co-pending application Serial No. 642,193, filed January 19, 1946, which comprises a continuation in part of this and the above-mentioned applications.

The present application discloses another species of my invention for obtaining the same result, and in this species the gasket member is blanked from a continuous strip of gasket material but is not applied to the cap at the time it is blanked. Instead, it is carried by a carrier member which is heated to give the blank the desired degree of plasticity into the range of another carrier on which a metal cap or closure was deposited. These carriers move in coordination so that the cap and blanked preheated gasket member arrive at an attaching station where the blank is inserted into the cap and pressed against the surface of the cap with bonding pressure. After the gasket is adhered to the cap, the carriers move apart and the lined cap is discharged into a waiting receptacle.

The species of my invention herein disclosed is more advantageous in some respects than that disclosed in the companion application aforesaid, especially where the cap has an irregular edge so that the edge of the cap cannot conveniently form the cutting die for the blank as in my said copending application, and where the downturned flange of the cap is relatively long making the relatively deeper cavity in the cap.

Stated another way, the methods and apparatus of the present application are more efficient and satisfactory for lining so-called crown

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caps for beverages such as beer and soft drinks or waters, because such caps have an irregular edge more or less scalloped and the cavities are relatively deep.

The methods and apparatus of the present application are capable of extremely high production and their practice and use reduce the cost of lining such caps for use.

In addition to the saving in operating cost, the cap of my invention, which is lined with a rubber-like gasket material preferably made of synthetic rubber and comprising a gasket ring and enclosing dam, is a substantial improvement over the previous ways and means for lining such bottle caps. The ground cork cap liner currently in use is not satisfactory since it has a tendency to dry out and permit escape of gases under pressure in the bottle when the bottles are allowed to stand upright for any length of time, thus permitting the contents of the bottle to deteriorate, and permit the escape of the contents of the bottle because of frequent imperfect seals.

To avoid this difficulty, it has been the practice of late to provide a thin disk of aluminum foil or of Vinylite material on the center of the ground cork cap, but this has added to the cost of production, and, in the case of the aluminum foil, which in use to be effective has to be clamped between the cork and the mouth of the bottle by the cap, interferes with the forming of a satisfactory seal.

In the use of the cap of the present invention, the bottle-engaging portion and the membrane-like dam across the bottle-engaging portion are integral so that no leakage can occur provided the cap is properly clinched over the mouth of the bottle. The gasket, being preferably made of synthetic rubber, is tasteless and odorless and resistant to attack by any of the materials used in beverages.

According to the method of the present embodiment of my invention herein disclosed, a quantity of gasket material is worked in a heating mill and a strip therefrom is led between blanking dies carried by coacting drums, one of which is warmer than the other so that the rubber-like blank is carried from the blanking station to the inserting station. Metallic bottle caps are fed to carriers on another drum which is driven in coordination with the blank carrying drum and the caps are heated on this drum as they are brought to an inserting station where they are met by the carriers and blanks carried thereby. These blank carriers are forming dies.

The drums are so placed that when a cap and blank meet, the blank is pressed into the cap with bonding pressure and at the same time the cap is molded by the carrier so that it has the desired annular ring portion with the bridging central portion. After the gaskets are thus molded in and adhered to the cap, the caps are removed from the carrier and are deposited in a receptacle.

Other features and advantages will hereinafter appear.

In the accompanying drawings which illustrate the present invention—

Figure 1 is a side elevation of the cap lining machine.

Fig. 2 is a front elevation of the machine shown in Fig. 1.

Fig. 3 is a schematic view, showing the relation between the warming mill, the blanking drum, the blank-carrying drum, and the cap-carrying drum.

Fig. 4 is a detail side view partly in section, showing the way in which the blank dies cooperate.

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4.

Fig. 6 is a view similar to Fig. 4, but showing the way the cap-carrying member and the blank-carrying dies cooperate to insert the blank and mold it onto the surface of the cap.

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 6.

Fig. 8 is a fragmentary view showing the manner in which the caps are placed in the cap carrier.

Fig. 9 is a plan view of the stripper for removing the lined caps from the cap-carrying drum.

Fig. 10 is a view of the stripper mechanism as viewed from the line 10—10 of Fig. 6.

Fig. 11 is a sectional view showing in perspective one half of a crown type cap with the gasket of the present invention secured in the same.

Fig. 12 is another sectional view showing the manner in which the knives for cutting the strip of gasket material from the warming mill may be mounted and adjusted in order to increase or decrease the width of the strip.

While, for the purpose of illustration, the machine and methods of the present application are shown and described as applied to a beverage bottle cap, it should be understood, of course, that the machine may be used and the methods employed for lining any type of cap, lid, or other closure for any kind of bottle, jar or container.

As shown in the accompanying drawings, the machine of the present invention comprises a framework 20 carrying rollers 21 and 22 of a warming mill, a drum 23 carrying on its periphery blanking dies 24, a drum 25 carrying on its periphery punches 26, and a drum 27 carrying on its periphery cap holders 28. The holders 28 receive unlined metal caps 29 which are fed to it by a guide 30 having retaining spring fingers 30*a*. From the latter the caps are pressed one by one into successive cap holders 28, see Fig. 8, by presser members 31 carried on the periphery of a drum 32. The cap holders 28 are in the form of cups slightly larger than the exterior of the caps so that they will be carried around to the liner-inserting station by the holders. To guard against the caps falling out of the holders as the drum 27 rotates, there is provided an arcuate guard 33 shown in Figs. 3, 6 and 8.

A mass 34 of the material of which the gasket is to be formed is placed in the bight of the

rollers 21 and 22 which work and heat the material in the usual manner. The rollers 21 and 22 have their adjacent surfaces spaced an amount determined by the position of adjustable bearings 35 for the roller 22 and fixed by a lock screw 36 so that there is formed around the surface of the roller 21 a layer 37 of the material. The roller 21 is cooled by water passing through passages 38 and being supplied by a pipe 39, while the roller 22 is cooled but to a lower temperature than the roller 21 by water passing through passages 40 and supplied by a pipe 41 so that the material will form a layer 37 on the roller 21 in the well-known manner. From the layer 37 of heated and worked gasket material on the hotter roller 21 is cut a web or strip 42 of material and this may be done by means of cutting knives 43 and 44 mounted in the framework 20.

The knife 43 is carried by a sleeve 45 while the knife 44 is carried by a rod 46. In order to predetermine the width of the strip 42 cut from the roller, a set screw 47 carried by a sleeve 45 is loosened and the knife 44 is moved closer to or farther from the knife 43. Then the set screw 47 is tightened. To predetermine the location of the strip 42 of material to be cut relative to the rollers, the set screw 48 which anchors the sleeve 45 in the frame is loosened and the rod 46 and sleeve 45 are adjusted bodily longitudinally to the desired position and the set screw is then tightened.

The strip of gasket material as shown in Fig. 3 then passes downwardly following the surface of the die carrying drum 23 with the strip lying over the dies 24. When a die 24 reaches a point of cooperation with a punch 26 carried by the drum 25, that is to say, approximately the position shown in Figs. 4 and 5, the gasket material is firmly pressed against the surface of the punch and then part of the gasket material is blanked out of the strip 42 to form a disk 49 by the cooperation of the edges 50 and 51 of the punch 25 and die 24. The shapes of the punch 26 and die 24 and their relative locations and movements are such that the disk 49 is formed or molded while it is being blanked from the strip 42, the high portion 52 of the punch producing a relatively thin central membrane 53, see Fig. 11, while the lower portion 54 forms a thicker annular ring 55. This ring 55, as will be seen by reference to Fig. 11, forms the outer bottle-engaging portion of the gasket while the membrane 53 being integral with the ring 55 closes the space between the inner edges of the ring.

The drum 23 and dies 24 carried thereby are cooled by water flowing through passages 56 in the drum supplied by piping 57 while the punch-carrying drum 25 is heated by hot water or steam passing through passages 58 in the drum supplied by piping 59. This causes the punch to be hotter than the die, and as a result the blank 49 will adhere to the punch 26 to be carried thereby around with the drum until it meets a cap body 29 carried by the drum 27. Rotation of the punch-carrying drum 25 and the cap-carrying drum 27 is so coordinated that as the cap and blank approach alignment the blank is inserted into the cap, see Fig. 6, and firmly pressed by the punch against the surface of the cap with sufficient pressure to cause the blank to be bonded to the metal of the cap.

The drum 27 is heated by steam flowing through passages 60 from a supply piping 61 so as to make the drum 27 and caps hotter than the drum 25 and punches 26. The cap being hotter than the punch, the blank transfers to the cap and remains

with the cap as adjacent surfaces of the drums move apart from the inserting position.

Since the blank is carried to the cap by the punch 26 which forms it and is not disturbed, when the blank is inserted in the cap it retains exactly the desired shape or is made to have the desired shape at that time by the pressure produced between the blank-carrying punch 26 and the cap.

In order to regulate this pressure and make it substantially uniform for all the cooperating punches and cap holders, in spite of the unavoidable slight differences in the manufacture of the various parts, each punch includes a shank 62 having a screw 63 which can be rotated to move the end of the punch radially inwardly and outwardly. The shank and screw, when set to the desired position, are fixed in that position by set screws 64.

In order to permit limited rocking movement of the caps 29 in their holders 28 when the punch with the blank thereon approaches and leaves the cap, each cap holder is provided with a pad 65 which is backed up by the round end of a stud 66 threaded in the drum as shown in Figs. 6 and 7. The pad has a limiting flange 67 which engages the annular cap holder 28 and thus is retained in the cavity 68. A spring 69 between the pad and the bottom of the cavity 68 tends to hold the pad and the cap backed by it at right angles to the axis of the drum. When, however, the leading edge of the punch and blank thereon engage the leading edge of the underside of the cap, the pad permits the cap to tilt slightly about the round end stud 66 and to assume a condition of substantial parallelism when the cap and punch are opposite each other and the blank is being pressed into the cap. In the same way, when the cap with its liner leaves the punch, a similar teetering of the pad is permitted. The threaded stud 66 may be adjusted so that all of the studs and caps backed thereby are on the same circular line and it may be locked in this position by a set screw 70. The ring 28 forming the cap holder is locked in a recess in the drum by screws 71 in the particular embodiment of the invention shown in Figs. 6 and 7. Also, as shown in these figures, the arcuate guard member 33 has a slot 72 through which the ends of the punches pass to reach the caps on the drum 27.

After the blank 49 has been inserted in the cap body 29 by rotation of the drums 25 and 27, continued movement of the drum 27 causes the cap to be gripped by stripping fingers 73 and pulled from the sockets or nests 28 and deposited on a table 74 where one after another they will be pushed into a receptacle or chute 75.

Depending upon the kind of material of which the cap lining gasket is made, the lined caps may or may not be given heat treating to cure the material if necessary.

The strip of gasket material 42 from which the blanks 49 have been punched continues to follow the curvature of the drum 23 to the opposite side of the drum where it is led up to the mill roll 22 to be added to the mass 34 of material between the rollers 21 and 22. In order to divert the scrap portion of the strip 42 to the end of the roller remote from the part from which it came, a guide roller 76 is placed in the path of the strip between the drum 23 and the roller 22. There is thus created at one side of the rollers, the right side as viewed in Fig. 2, a mass of material which is gradually worked out

and toward the left end at which point the strip 42 is cut in the particular form of the invention illustrated.

The mill rollers 21 and 22, the die carrying drum 23, the punch carrying drum 25, the cap carrying drum 27, and the plunger carrying drum 32 are connected to be driven together in synchronism. The mill roll 21 is provided with a gear 77, and the mill roll 22 is driven by a gear 78 meshing with a gear 77. The drum 23 is connected with a gear 79 meshing with a gear 80 carried by the drum 25. This gear 80 meshes with a gear 81 connected to the drum 27 and the gear 81 meshes with a gear 82 connected to the drum 32. In order that the drums 25 and 27 may be angularly adjusted relative to the gearing so that the cooperating parts on the respective drums will meet exactly, the gear 80 is not fastened to the shaft carrying the drum but is connected to it by an arm 83 which has screws 84, the ends of which engage one of the spokes or other projecting part of the drum. By loosening one screw and tightening the other, the angular position of the gear on the drum shaft can be varied. The machine may be operated by a motor 85 through a belt or other suitable drive 86 to a pulley 87 having a pinion 88 driving a gear 89 on a shaft for the mill roll 21.

The space between the mill rollers at the ends thereof from which the strip 42 is cut may be closed by a plate 90 adjustably held in place by screws 91.

In the form of the invention herein disclosed, the process of preparing the gasket material, blanking it, and applying it to the caps is continuous process, and experience has shown that the apparatus may be operated at high speeds and thus may economically line the caps. It should be understood, of course, that the apparatus is susceptible of considerable variation and modification, and that the process may be carried out by some automatic or entirely manually operable apparatus.

Other variations and modifications may be made within the scope of this invention and portions of the improvements may be used without others.

I claim:

1. In the process of producing sealing closures for containers, the steps of forming a gasket blank from a continuous strip of rubber-like gasket material with a heated tool, transporting the blank on said tool into proximity with a cap structure of higher temperature than the tool, and causing said tool to press the blank against said structure to be adhesively bonded thereto so that a liner is formed on the structure.

2. In the process of producing sealing closures for containers, the steps of milling a quantity of plastic gasket material, removing a continuous strip of material from said milled quantity, cutting a gasket blank from said strip by a molding tool, transporting the blank on said tool into proximity with a cap structure and causing said tool to press the blank therein to adhesively bond it thereto so that a liner is molded on the said structure, and discharging the lined cap structure.

3. In the process of producing sealing closures for containers, the steps of milling a quantity of plastic gasket material, removing a continuous strip of material from said milled quantity, cutting a gasket blank from said strip and molding said blank to produce substantially the cross-sectional configuration of the finished gasket,

transporting the molded gasket into proximity with a closure member and pressing the molded gasket therein to adhesively bond it thereto so that a liner is formed on the said member.

4. In the process of producing sealing closures for containers, the steps of milling a quantity of plastic gasket material, removing a continuous strip of material from said milled quantity, passing said strip between approaching punches and dies to cut a gasket blank therefrom and mold the material of said blank to produce substantially the cross-sectional configuration of the finished gasket, transporting said molded gasket by one of said punches into proximity with a closure member and causing said punch to press the molded gasket therein into bonding engagement with said member so as to form a liner on the latter.

5. In the process of producing sealing closures for containers, the steps of milling a quantity of plastic gasket material to the desired degree of plasticity; cutting from the quantity on the mill a continuous strip of gasket material, passing said strip between punch and die carriers to cut a gasket disk therefrom and mold the material of said disk to produce substantially the cross-sectional configuration of the finished gasket, transporting said molded gasket on one of said carriers to a cap holder and cap supported thereon, inserting the molded gasket in the cap and pressing the gasket into bonding contact with the underside of the cap between the cap carrier and the gasket carrier, and discharging the lined cap from the cap carrier.

6. In the process of producing sealing closures for containers, the steps of milling a quantity of plastic gasket material to the desired degree of plasticity, cutting from the quantity on the mill a continuous strip of gasket material, passing said strip between punch and die carriers to cut a gasket disk therefrom and mold said disk to produce substantially the cross-sectional configuration of the finished gasket, transporting said molded gasket on the punch to a cap holder and cap supported thereon, inserting the molded gasket in the cap and pressing the gasket into bonding contact with the underside of the cap between the cap carrier and the punch, and discharging the lined cap from the cap carrier.

7. In the process of producing sealing closures for containers, the steps of milling a quantity of plastic gasket material to the desired degree of plasticity, cutting from the quantity on the mill a continuous strip of gasket material, passing said strip between a pair of carrier drums having thereon a succession of matching punches and dies to cut a succession of gasket disks therefrom and mold the material of said disks to produce substantially the cross-sectional configuration of the finished gasket, transporting said molded gasket on one of said carrier drums to a drum having thereon a succession of cap holders each supporting a cap, inserting each molded gasket in a cap and pressing each gasket successively into bonding contact with the underside of its cap between the cap carrier drum and the gasket carrier drum, and discharging the lined caps from the cap carrier.

8. In the process of producing sealing closures for containers, the steps of passing a continuous strip of plasticized gasket material between punch and die carriers to cut a gasket disk therefrom and apply molding pressure to the material of said disk so as to cause the material to flow to produce substantially the cross-sectional configuration of the finished gasket, transporting said molded gasket on said punch to a cap holder and cap supported thereon, causing said punch to insert the molded gasket in the cap, and press the gasket into bonding contact with the underside of its cap between the cap carrier and the punch, and discharging the lined cap from the cap carrier.

9. Apparatus for applying liners of moldable gasket material to the undersides of caps or lids, comprising a mill for working the gasket material and supplying the same in continuous strip form; means for cutting gasket blanks from said strip and molding each blank to produce substantially a finished gasket; and means for transporting said molded gaskets respectively into proximity with cap structures and pressing the gaskets therein to be bonded thereto so that liners are formed on the said structures.

10. Apparatus for applying liners of moldable gasket material to the undersides of caps or lids, comprising a mill for working the gasket material and supplying the same in continuous strip form; means for cutting gasket blanks successively from said strip and successively molding the material of said blanks to produce substantially the cross-sectional configuration of the finished gasket; means for feeding the blanked-out strip back into the mill; and means for transporting said molded gaskets in succession into proximity with successive cap structures and pressing the gaskets therein to be bonded thereto so that liners are formed on the said structures.

11. Apparatus for applying to the underside of a cap or lid a liner of moldable gasket material, comprising a warming mill; a drum having a succession of dies on its periphery over which a strip of gasket material issuing from the mill passes; a second drum cooperating with the first-named drum and having a succession of punches on its periphery cooperating with said dies on said first drum for punching circular cap liner gasket blanks from said strip of gasket material and subjecting each gasket blank to a molding operation sufficient to produce substantially the cross-sectional configuration of the finished gasket as the punches and dies coact during rotation of said drums, said molded gaskets being carried by one of said drums to an applying station; and a third drum adapted to carry a succession of caps on its periphery and cooperating with the other drums to cause said punches to press the gaskets into and against the undersides of the caps successively during rotation of the drums, each gasket to be bonded to the underside of a cap.

12. Apparatus for applying to the underside of a cap or lid a liner of moldable gasket material, comprising a warming mill; a drum having a succession of dies on its periphery, a strip of gasket material issuing from the mill passing around the drum over the said dies; a second drum cooperating with the first-named drum and having a succession of punches on its periphery cooperating with said dies on said first drum for punching circular cap liner gasket blanks from said strip of gasket material and subjecting the material of each gasket blank to a molding operation sufficient to produce substantially the cross-sectional configuration of the finished gasket as the punches and dies coact during rotation of said drums, said molded gaskets being carried by one of said drums to an applying station; means for returning the blanked strip, after it leaves the periphery of the first drum, to the warming mill to be re-mixed; and a third drum adapted to carry a succession of caps on its

periphery and cooperating with the other drums to cause said punches to press the gaskets into and against the undersides of the caps successively during rotation of the drums, each gasket to be bonded to the underside of a cap.

13. The process of making closures which comprises, providing a moldable gasket-forming material, operating a punch to blank out a portion of said material and subjecting said blanked out portion to a molding pressure on said punch sufficient to modify the cross-sectional configuration therof to form a gasket ring, and subsequently employing the punch to assemble the molded gasket ring in a closure member and cause said gasket ring to adhere to said member.

14. The process of making closures which comprises, providing a moldable gasket-forming material, operating a punch to blank out a portion of said material and subjecting said blanked out portion to a molding operation on said punch to modify the cross-sectional configuration thereof to form a closure lining gasket having a gasket ring and a center membrane of less thickness than said ring, and subsequently employing the punch to assemble the molded gasket in a closure member and cause said gasket to adhere to said member.

15. A machine comprising in combination, a cooperating punch and die for cutting and blanking gasket-forming material and molding said blank under sufficient pressure to cause the material to flow to modify the cross-sectional configuration thereof to form a gasket ring having a membrane of less thickness than said ring closing the center of said ring; means for supporting a closure member; and means for operating said punch to move said ring and membrane into engagement with a closure member and adhere the same thereto.

16. A machine comprising in combination, a series of cooperating punch and die members for successively cutting from a strip of moldable gasket-forming material gasket blanks of predetermined form, means for holding a flanged closure member to receive a blank, each blank being carried by one of said punch members to said holding means and closure member, and means for causing said blank-carrying punch to position said blank in said closure member with a molding pressure sufficient to press the blank into intimate contact with a surface of the closure and cause the same to be bonded thereto as a gasket of predetermined thickness and form within the space surrounded by the flange thereof.

17. The process of making lined closures which comprises, plasticizing a batch of gasket forming material in a plasticizing mill, continuously forming a strip of said plasticized material and conducting said strip through a path of travel extending away from and spaced a substantial distance from said mill, continuously blanking out

successive portions of said strip material and subjecting each blanked out portion to a molding operation simultaneously with said blanking operation for the purpose of modifying the cross-sectional configuration of each successive portion to form a closure lining gasket having a gasket ring and a center membrance of less thickness than said ring, continuously assembling said successive molded gaskets in successive closure members and pressing them into adhering relation with said members to form succesive lined closures, and returning the skeletonized strip for reworking directly to the batch of material in said mill without contacting the strip material with a working surface in said mill.

18. The process of making lined closures which comprises, plasticizing a batch of gasket forming material in a plasticizing mill, continuously forming a strip of said plasticizing material and conducting said strip through a path of travel extending away from and spaced a substantial distance from said mill, continuously blanking out successive portions of said strip material and subjecting each blanked out portion to a molding operation simultaneously with said blanking operation for the purpose of modifying the cross-sectional configuration of each successive portion to form a closure lining gasket having a gasket ring and a center membrane of less thickness than said ring, continuously assembling said successive molded gaskets in successive closure members and pressing them into adhering relation with said members to form successive lined closures, and returning the skeletonized strip for reworking directly to the batch of material in said mill without contacting the strip material with a working surface in said mill, and discharging the lined closures and passing them through a curing zone to harden the molded gaskets.

HENRY Z. GORA.

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1,486,937	Taliaferro	Mar. 18, 1924
1,664,273	Theroux	Mar. 27, 1928
1,996,048	Madina	Mar. 26, 1935
2,059,554	Cohn	Nov. 3, 1936
2,103,860	Mazzeo	Dec. 28, 1937
2,167,734	Zonino	Aug. 1, 1939
2,298,057	Kelm	Oct. 6, 1942
2,319,040	Conklin	May 11, 1943
2,358,176	MacDonald	Sept. 12, 1944
2,443,826	Johnson	June 22, 1948