Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 1

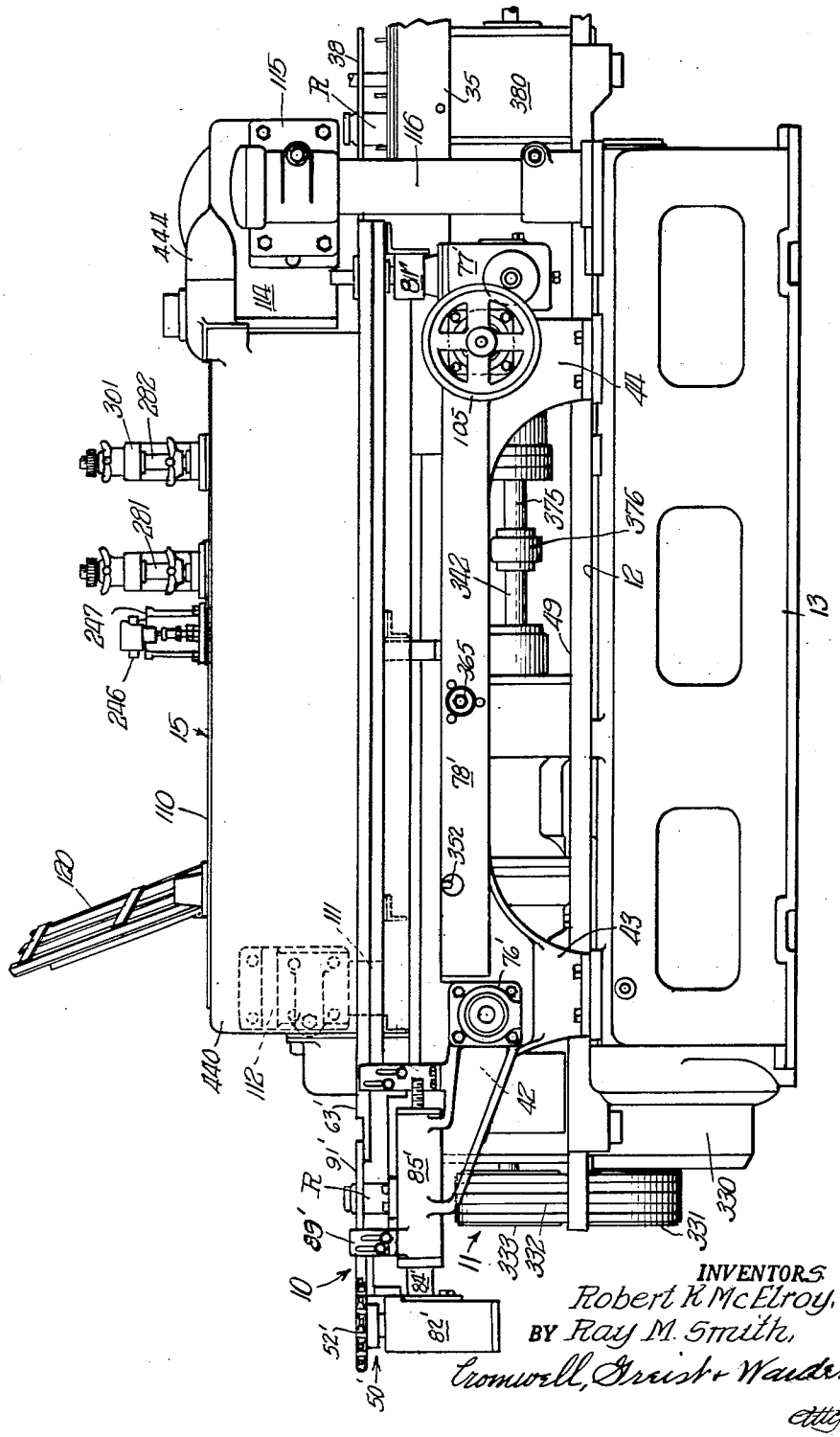


Fig. 1.

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 2

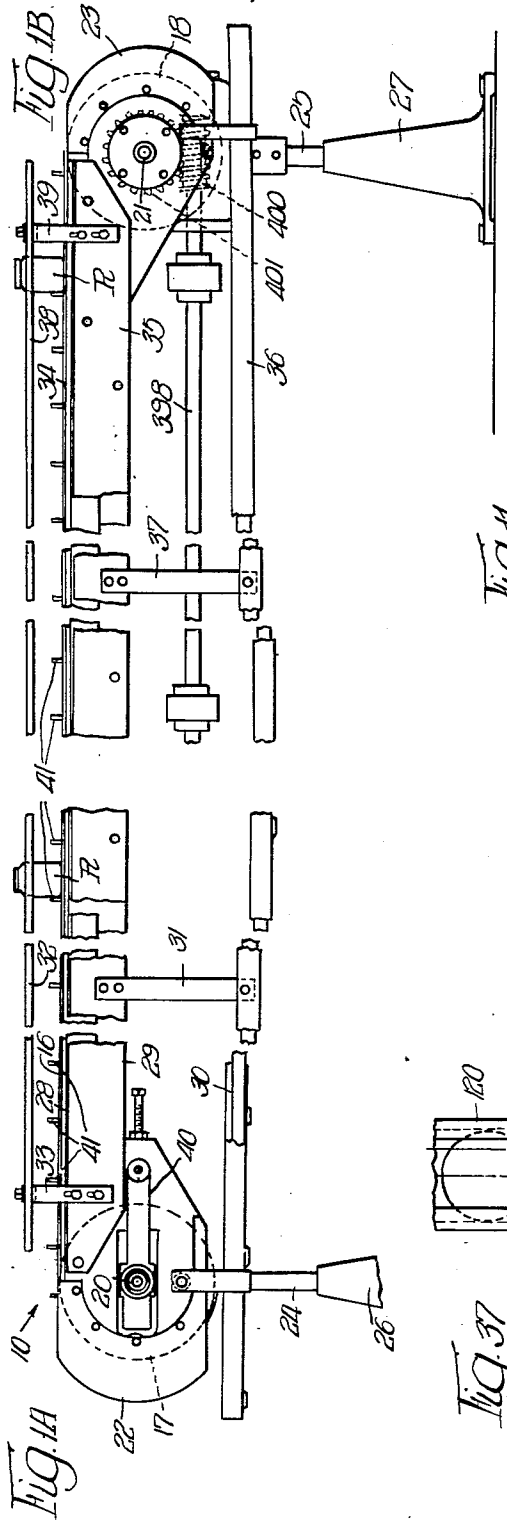


Fig. 1A

Fig. 1B

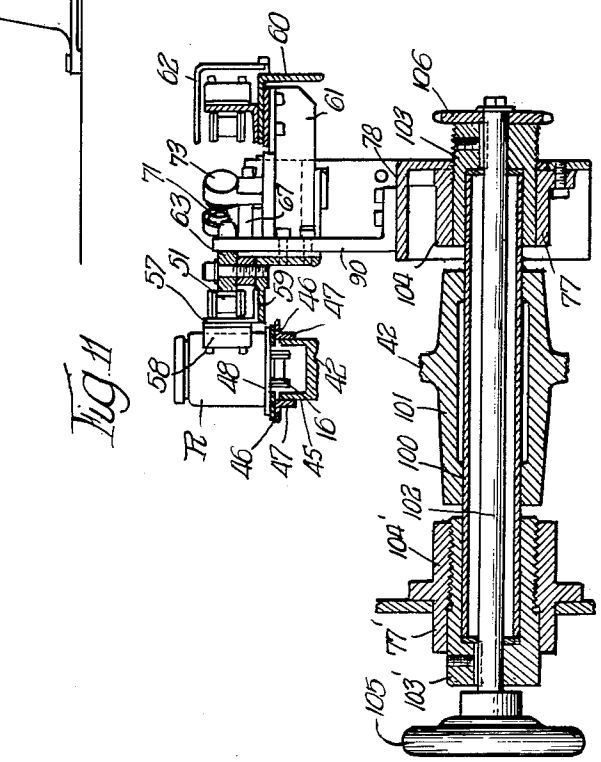


Fig. 1I

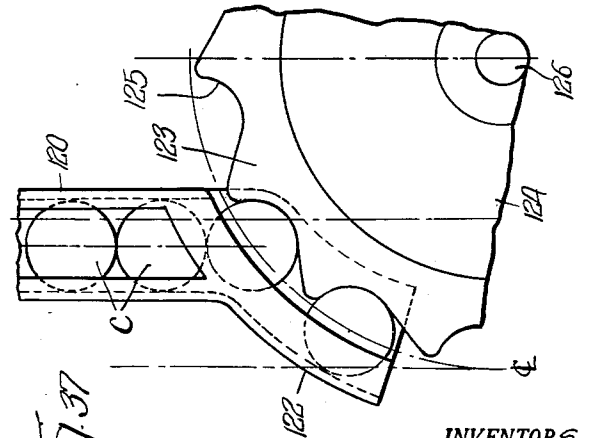


Fig. 3J

INVENTORS.
Robert K. McElroy,
BY Ray M. Smith,
Cromwell Grist & Warden
attys.

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 3

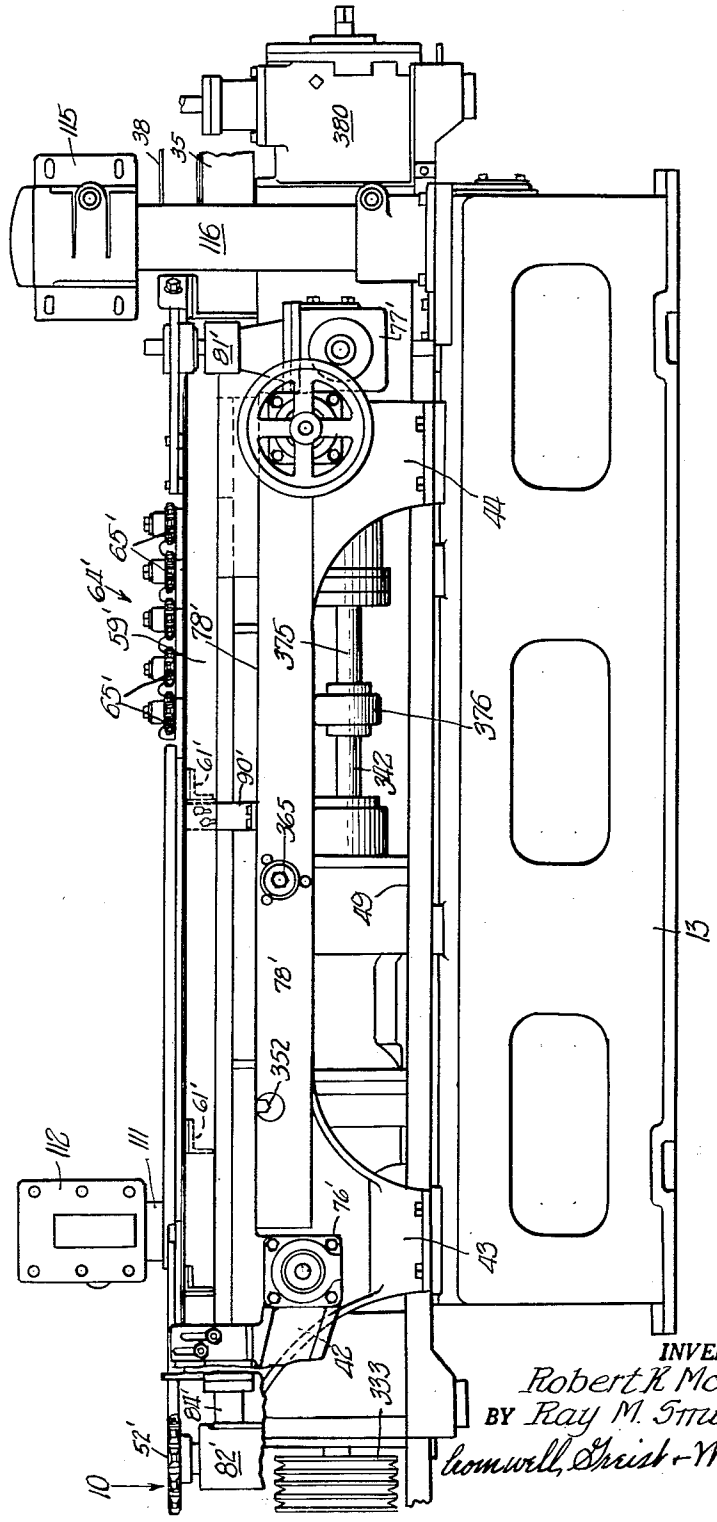


Fig. 2.

INVENTORS.
Robert K. McElroy,
BY Ray M. Smith,
Thomwell, Grist & Warden
attys

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 4

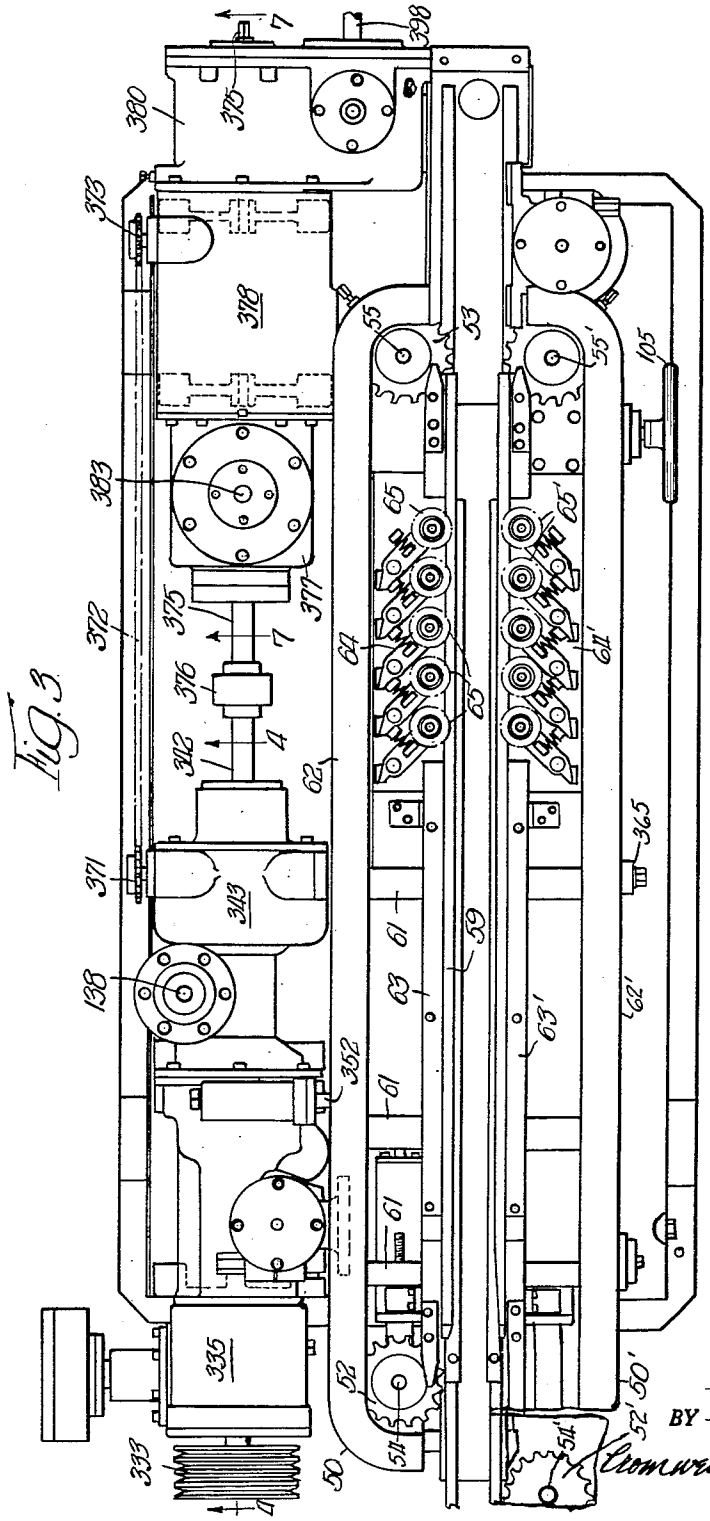


Fig. 3

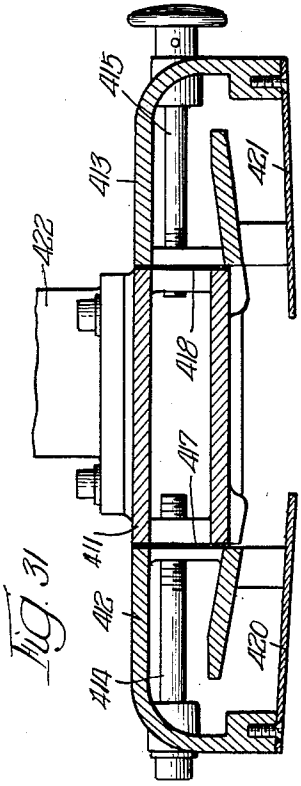


Fig. 31

INVENTORS
Robert K McElroy,
BY Ray M Smith,
Cromwell, Greist + Warden
Attys

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 5

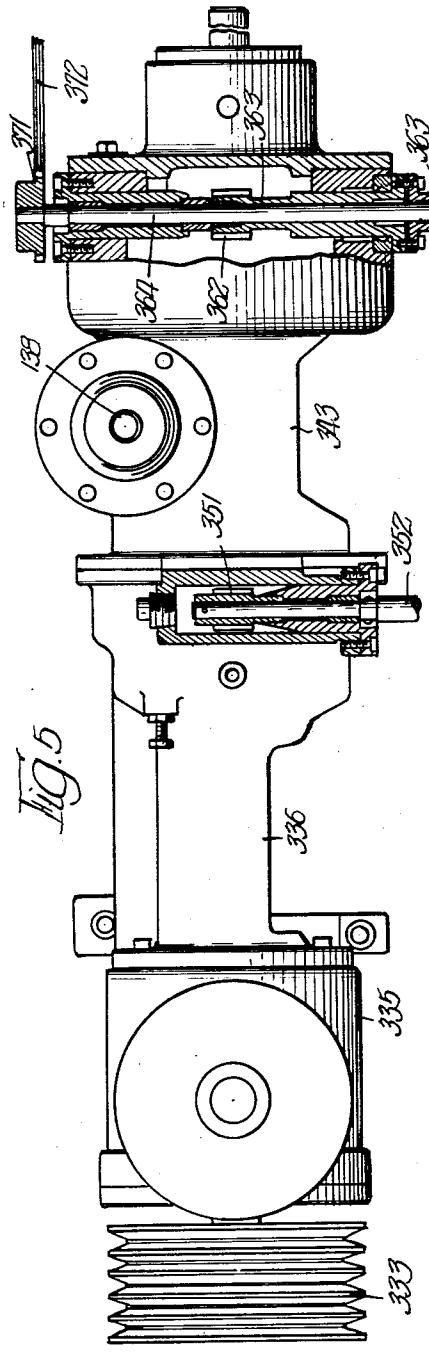


Fig. 5

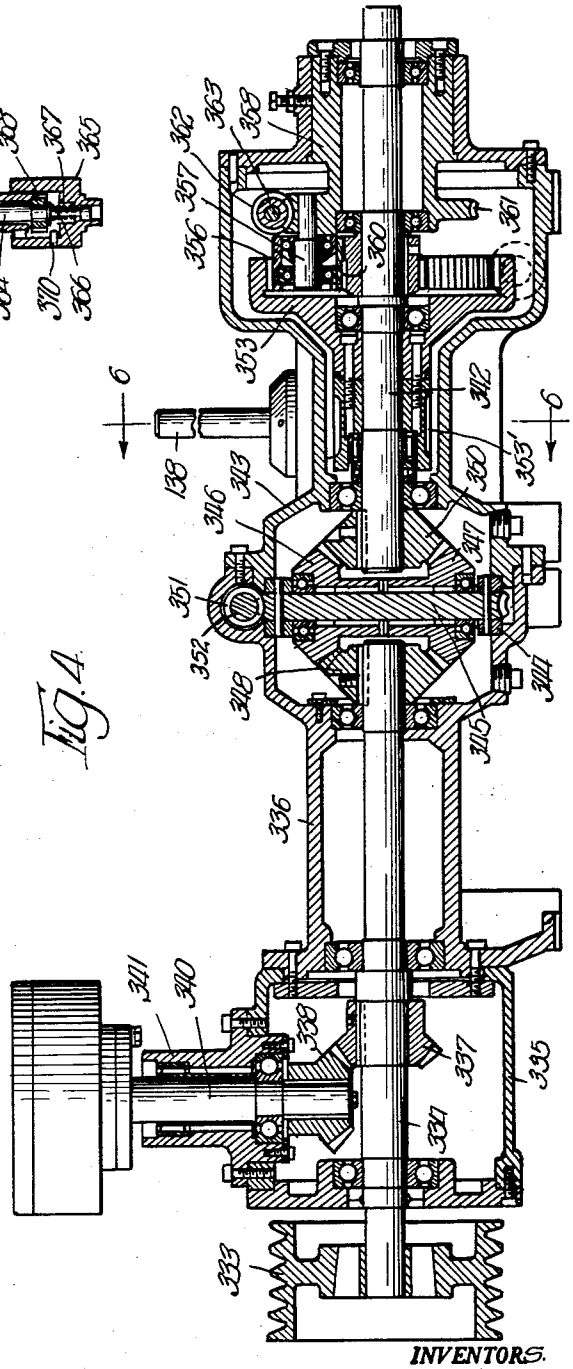


Fig. 4

INVENTORS.
Robert K. McElroy,
BY Ray M. Smith.
Cromwell, Greist & Warden
Attys.

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

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Fig. 6

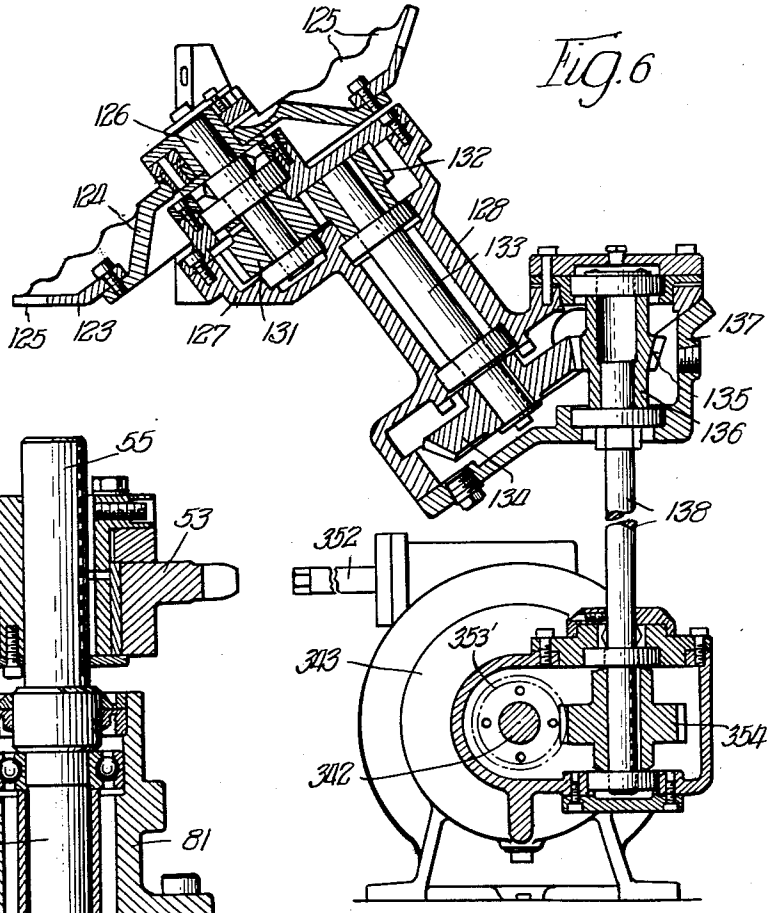
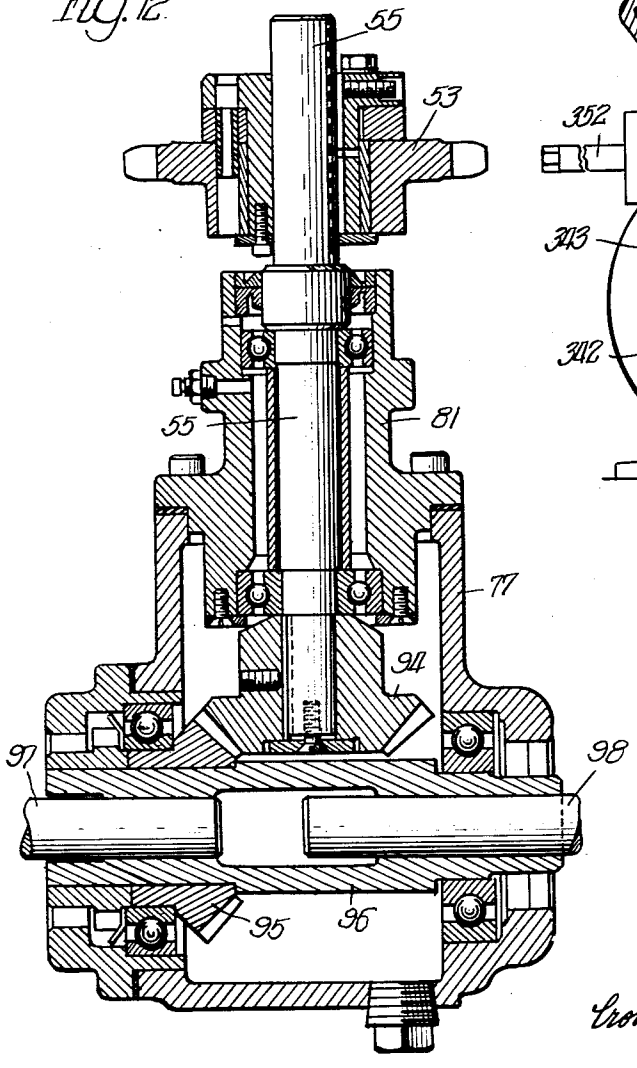


Fig. 12



INVENTORS.
Robert K. McElroy,
BY Ray M. Smith,
Cromwell, Greist & Warden
attys

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 7

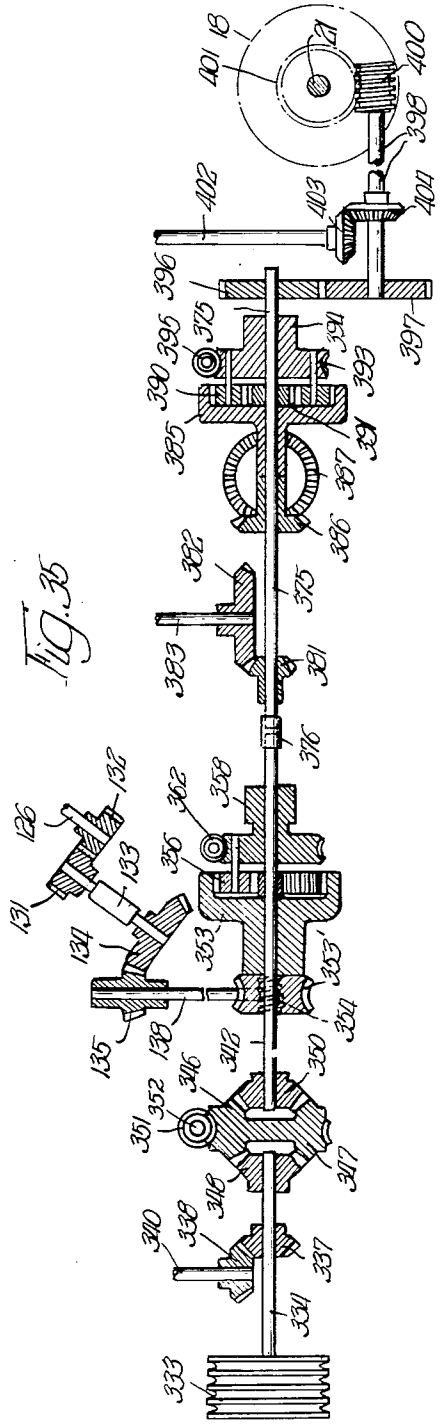


Fig. 35

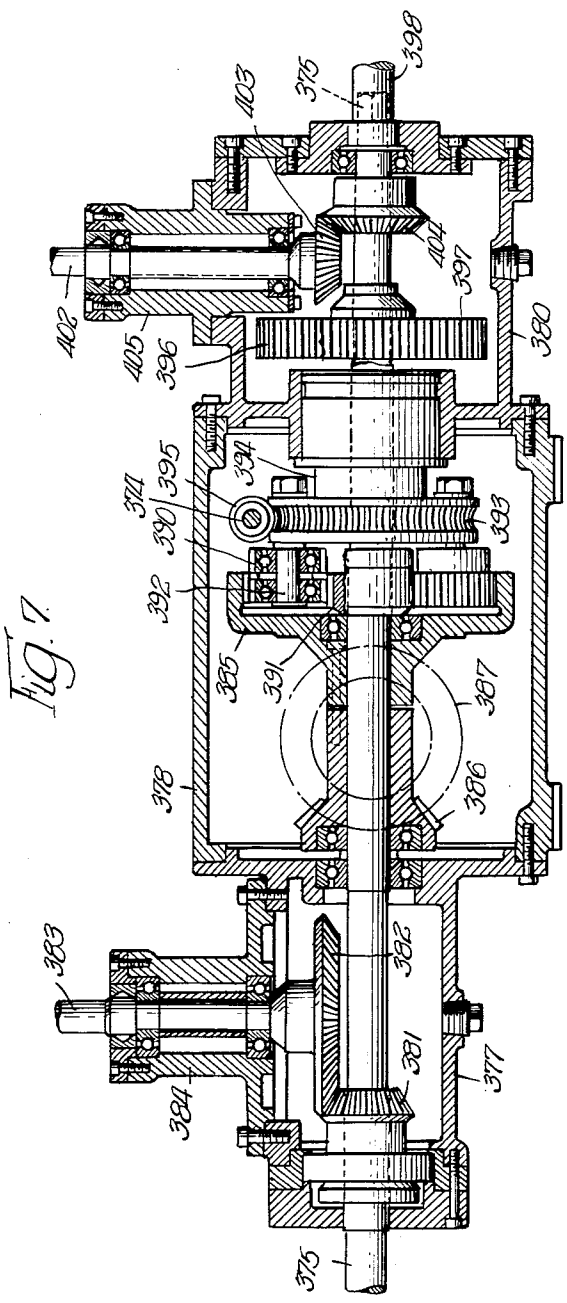


Fig. 7

INVENTORS
Robert K. McElroy,
BY Ray M. Smith,
Cromwell, Frist & Warden
Attys.

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 8

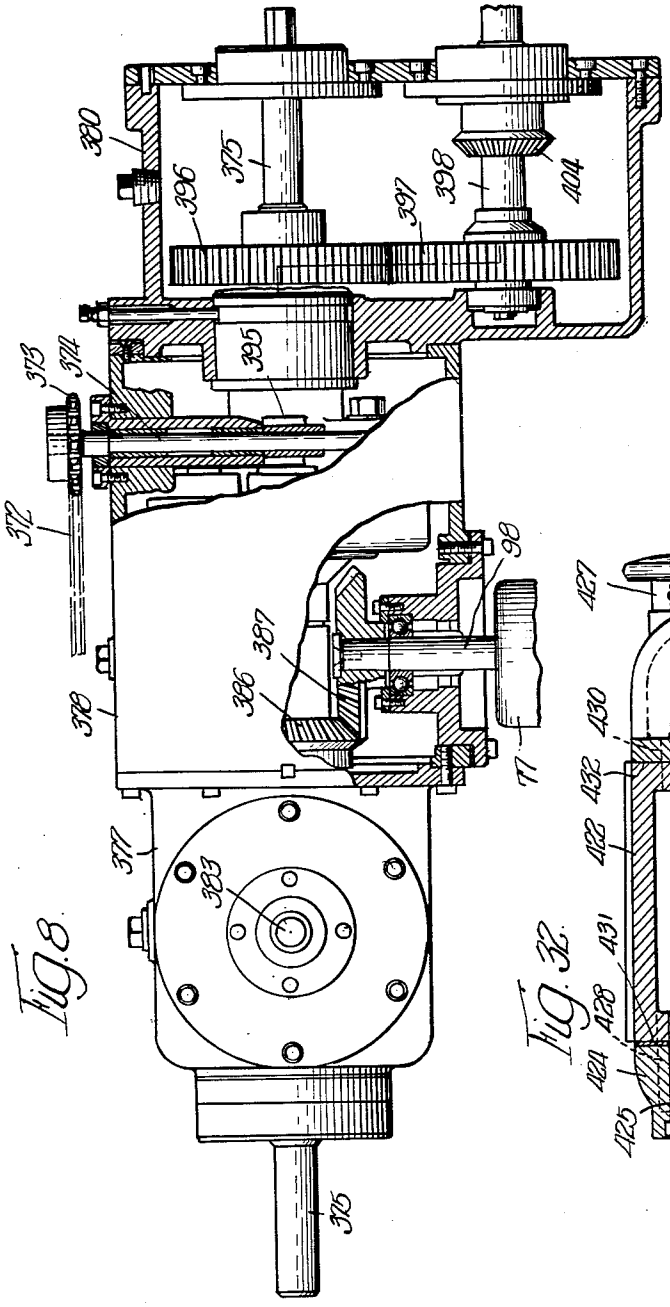


Fig. 8

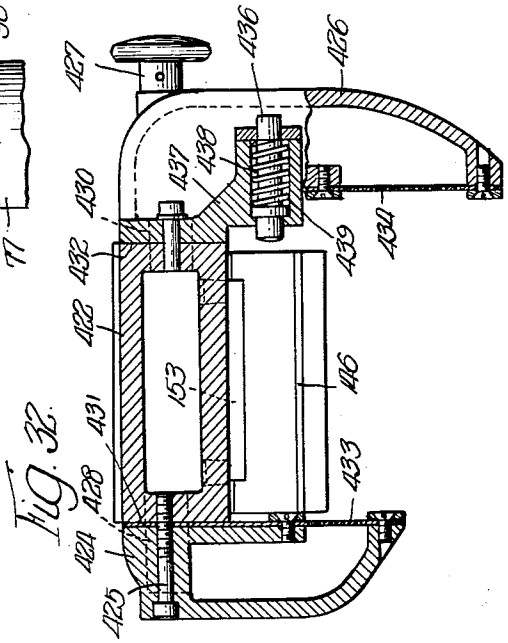


Fig. 32.

INVENTORS:
Robert K. McElroy,
BY Ray M. Smith,
Cromwell, Bristol & Wardrop
Attys.

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 9

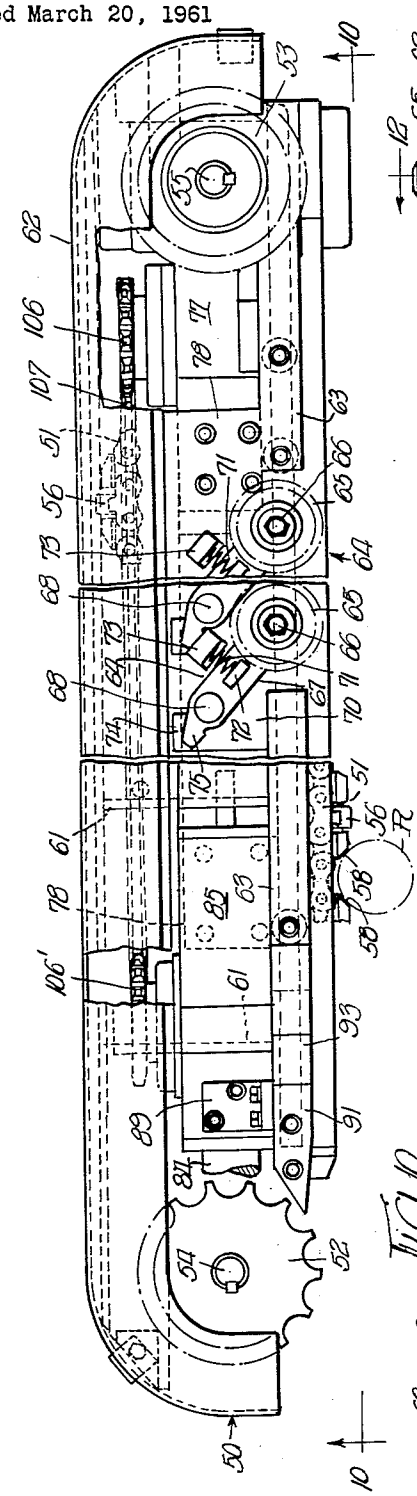


Fig. 9

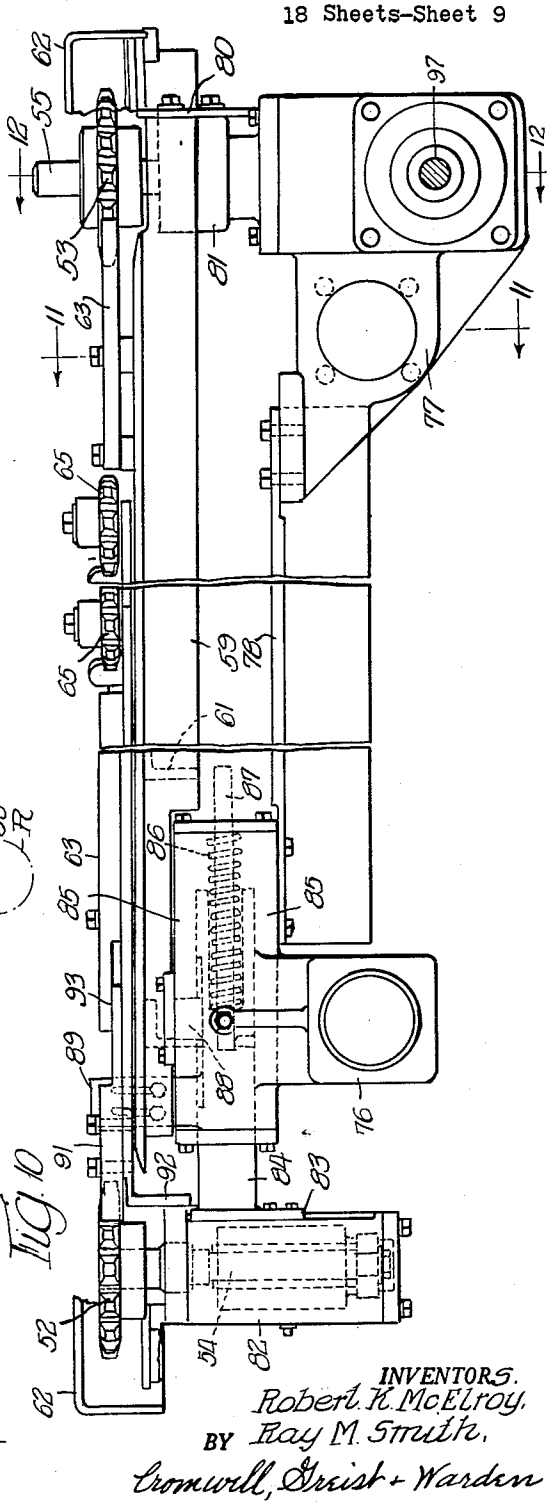


Fig. 10

INVENTORS.
Robert K. McElroy,
BY Ray M. Smith,
Cromwell, Greist & Warden
attys

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 10

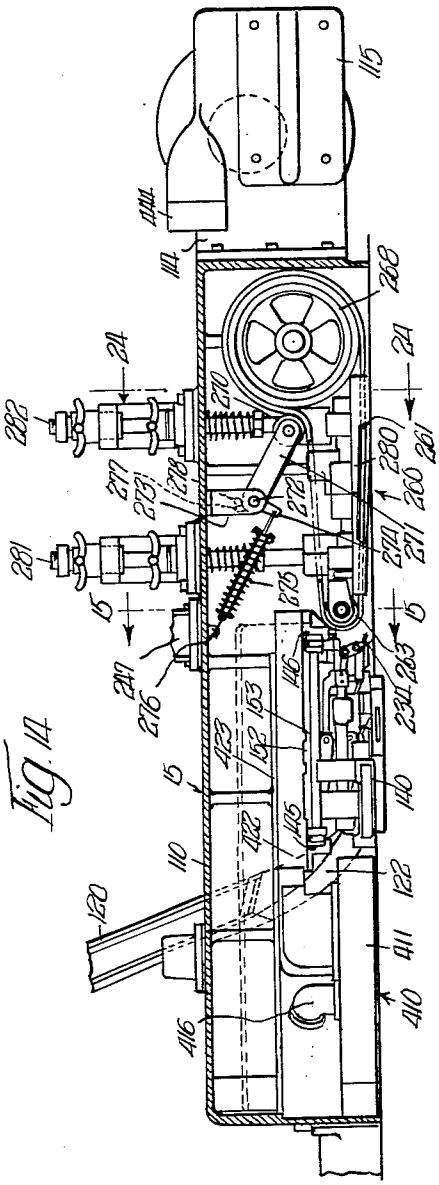


Fig. 14

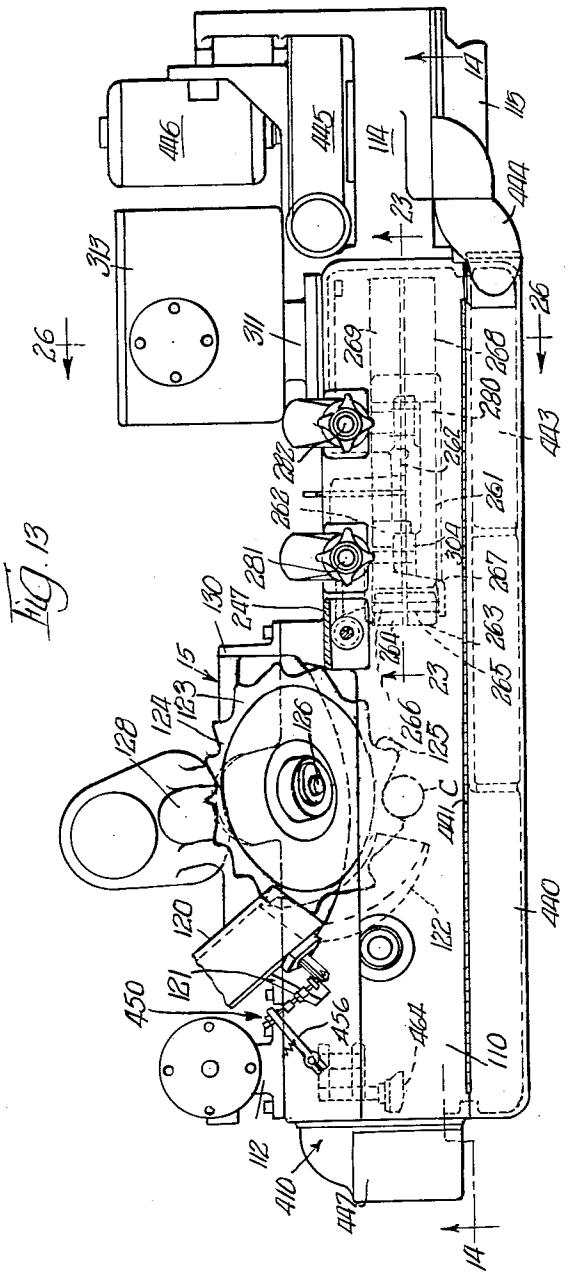


Fig. 13

INVENTORS
Robert K. McElroy,
BY Ray M. Smith,
Cromwell, Greist & Warden
Attys

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

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Fig. 23.

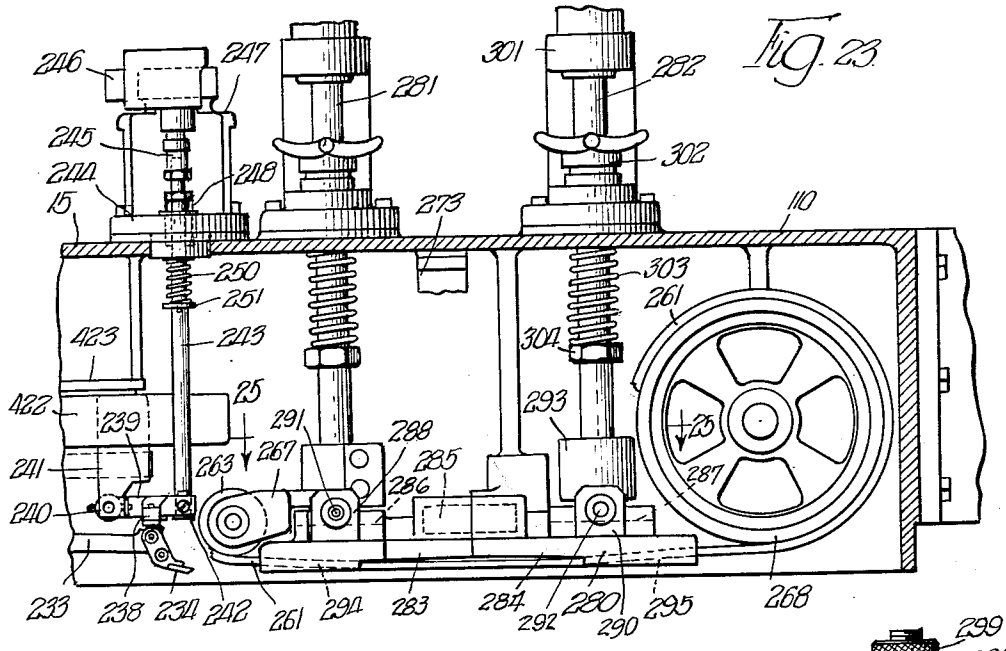


Fig. 15

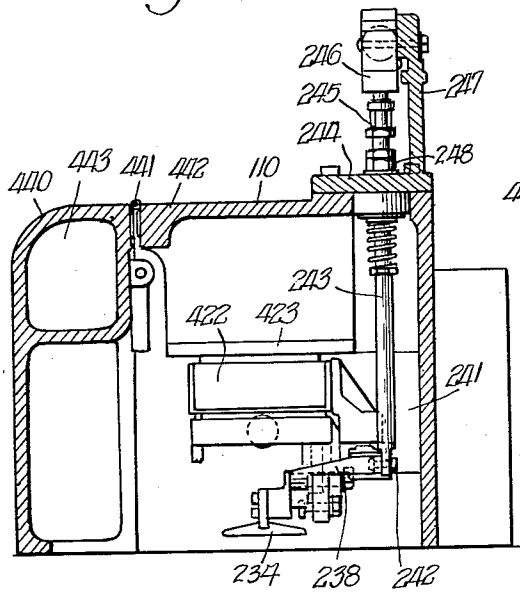
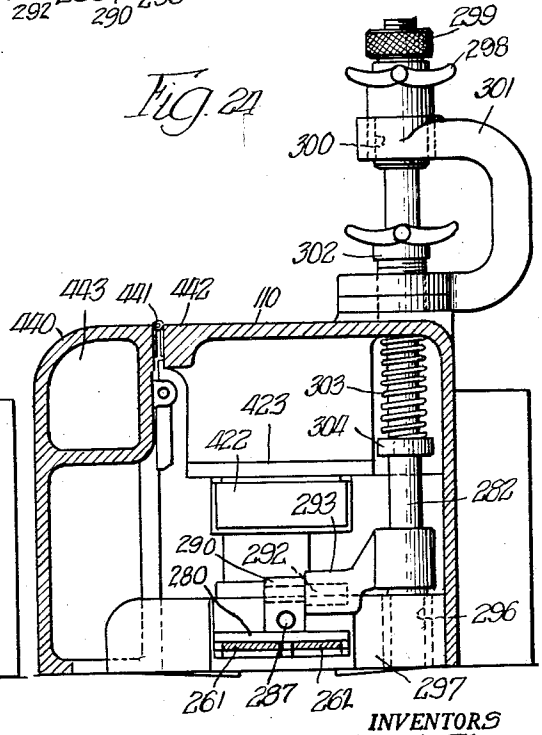


Fig. 24



INVENTORS
Robert K. McElroy,
BY Ray M. Smith,
Cromwell, Greist & Warden
attys

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 12

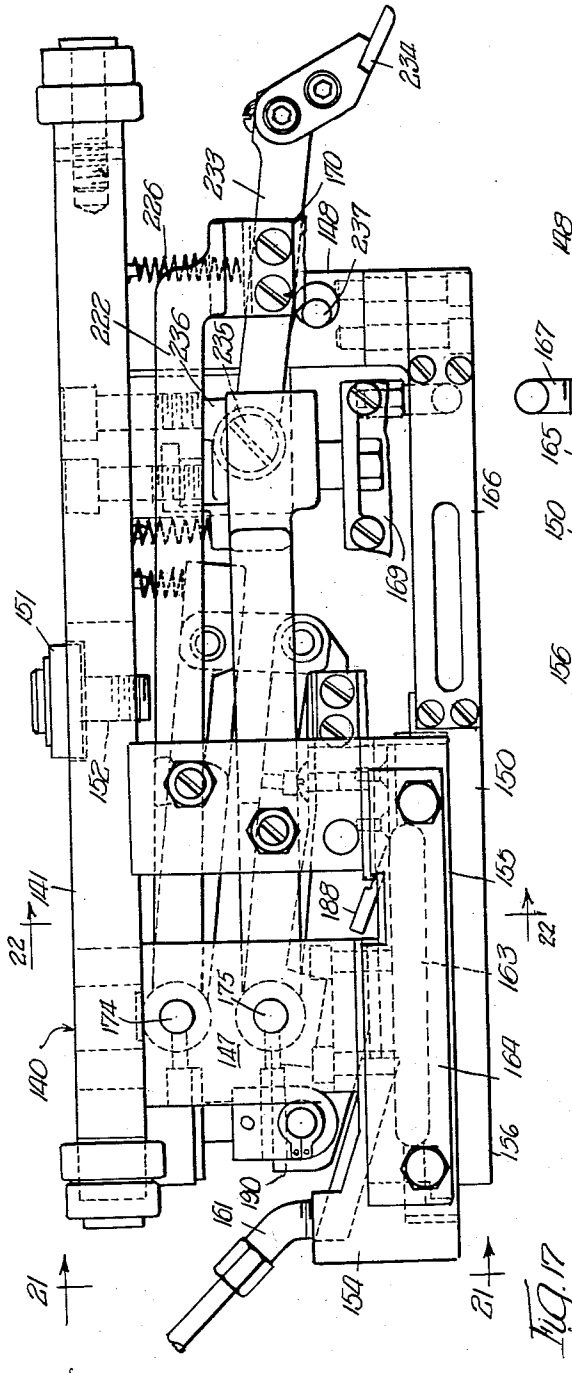


Fig. 16

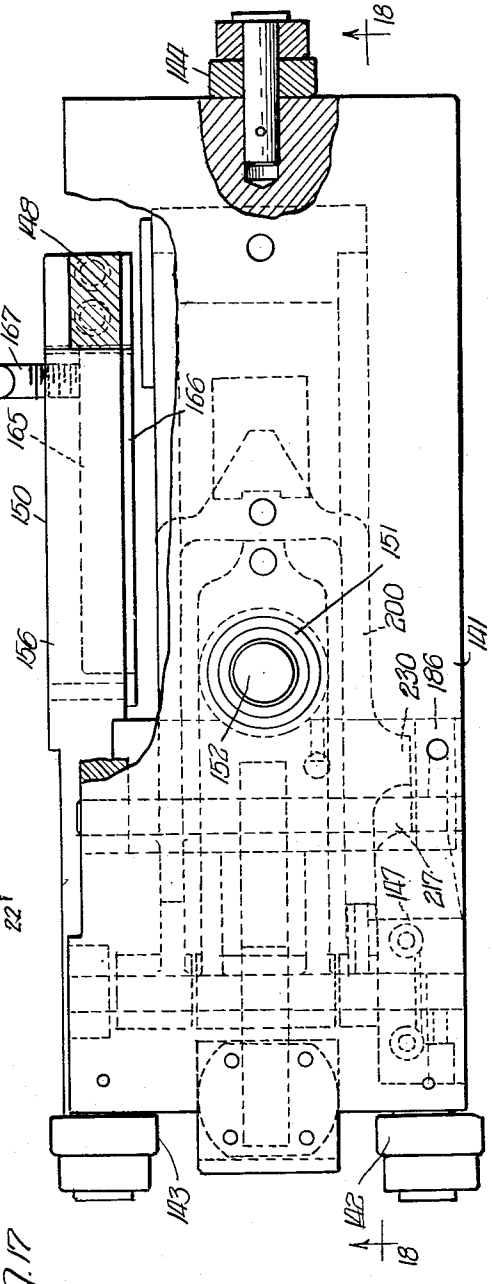


Fig. 17

INVENTORS.
Robert K. McElroy,
BY Ray M Smith,
Cromwell, Greist & Warden.

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

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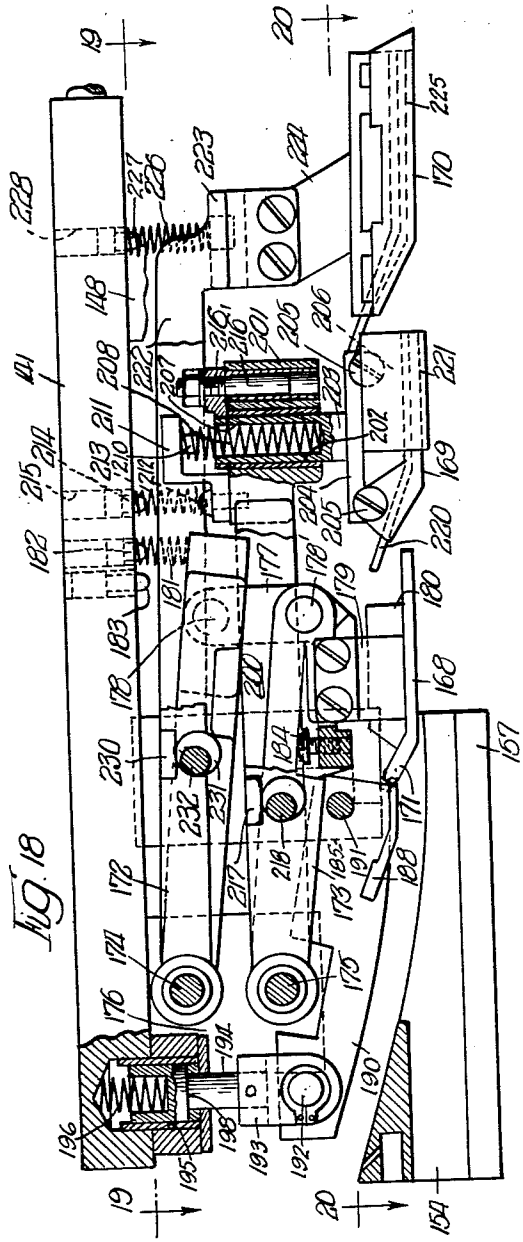


Fig. 18

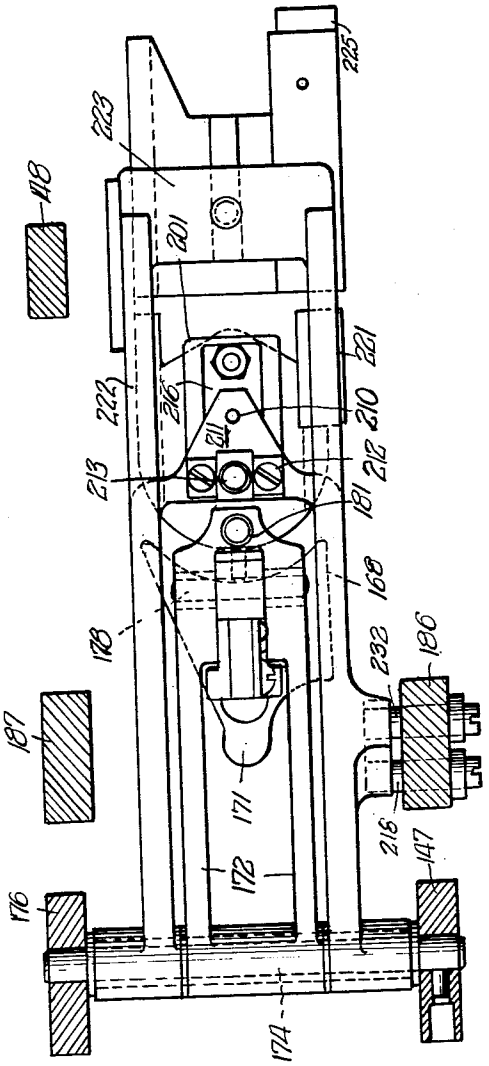


Fig. 19.

INVENTORS.
Robert K. McElroy
BY Ray M. Smith,
Cromwell, Grust + Warden
attys

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

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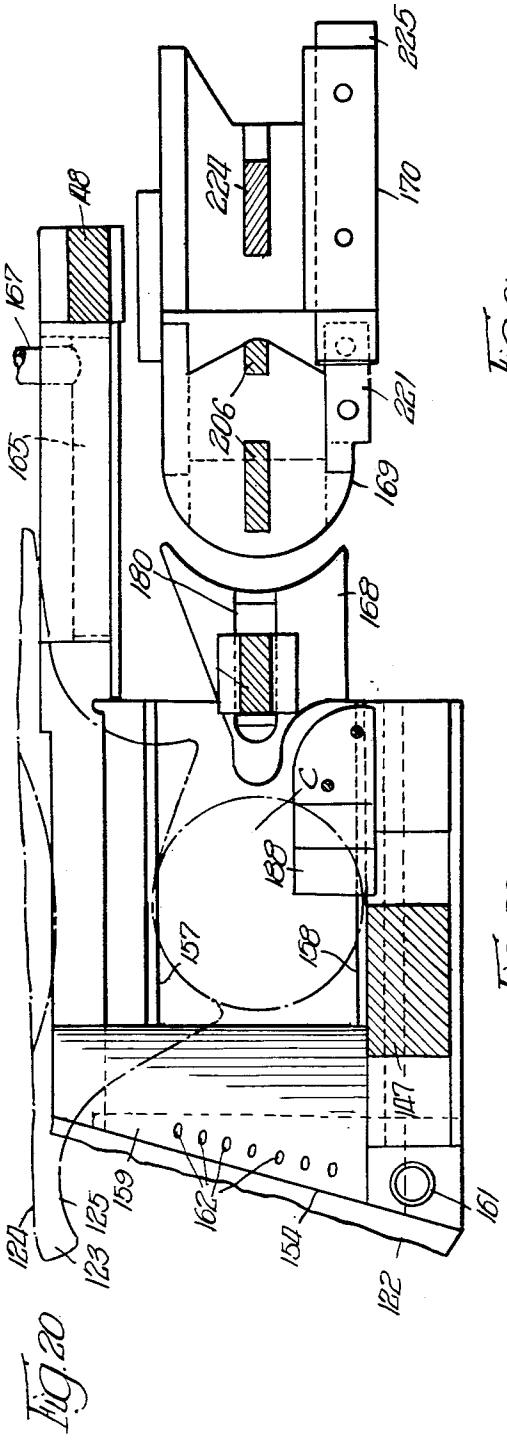


Fig. 20

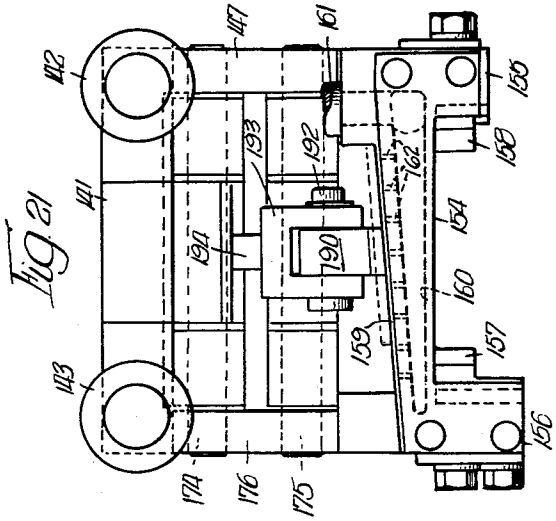


Fig. 21

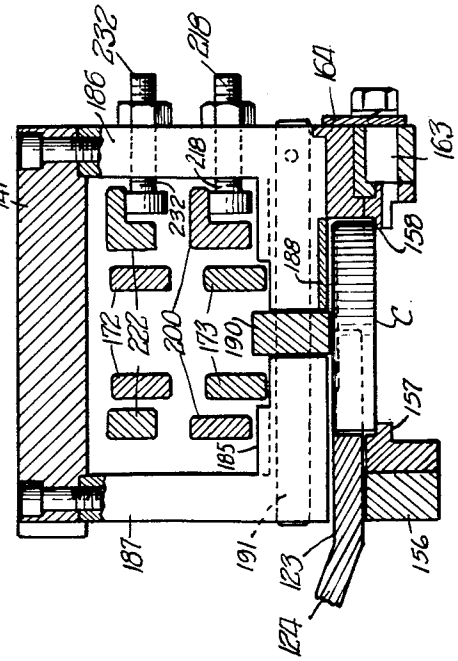


Fig. 22

INVENTORS.
Robert K. McElroy,
BY Ray M. Smith,
Cromwell, Greist & Warden
Attys

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 15

Fig. 26

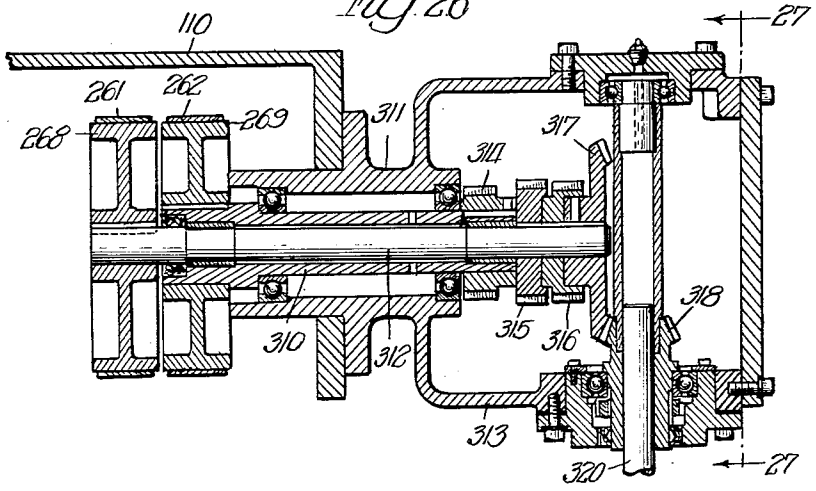


Fig. 28

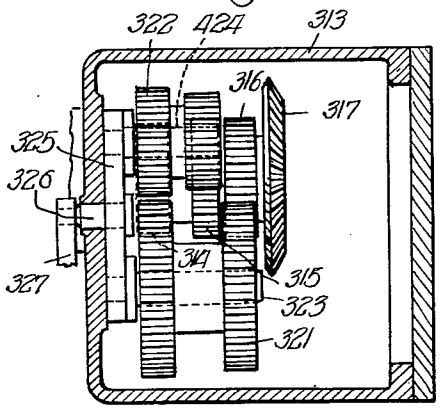
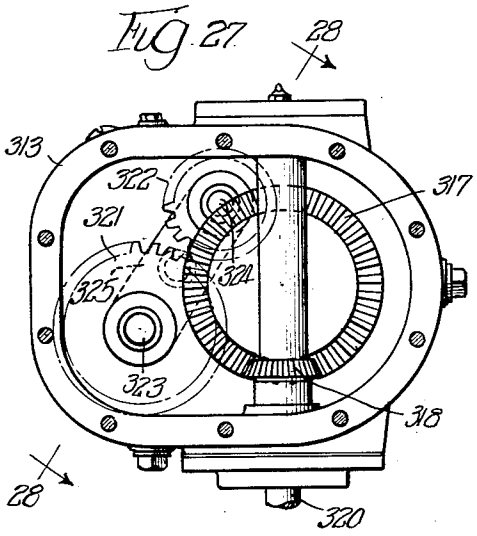


Fig. 27



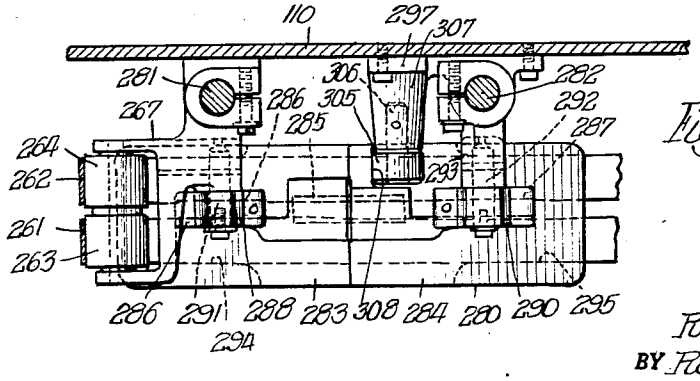


Fig. 25.

INVENTORS.
Robert K. McElroy,
BY Ray M. Smith
Cromwell, Frist & Warden
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Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 16

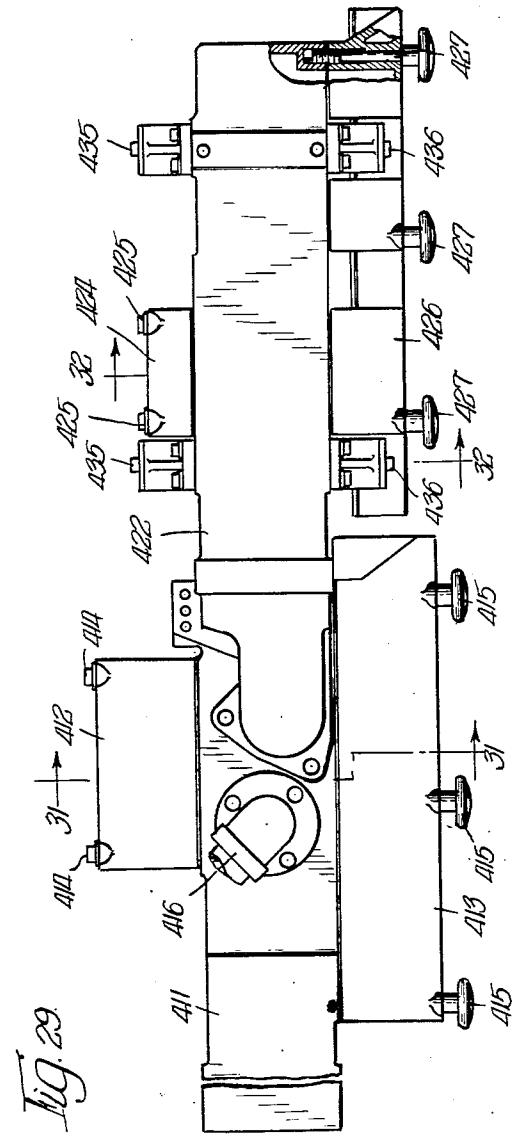


Fig. 29

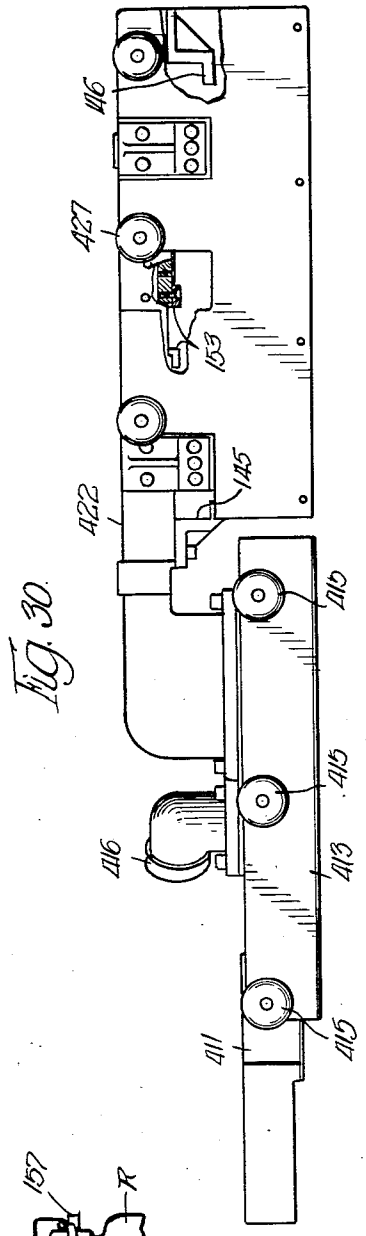


Fig. 30

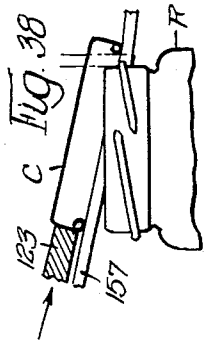


Fig. 38



Fig. 39

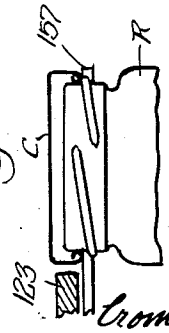


Fig. 40

INVENTORS.
Robert K. McElroy,
BY Ray M. Smith,
Cromwell, Grish & Warden
Attys.

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 17

Fig. 33.

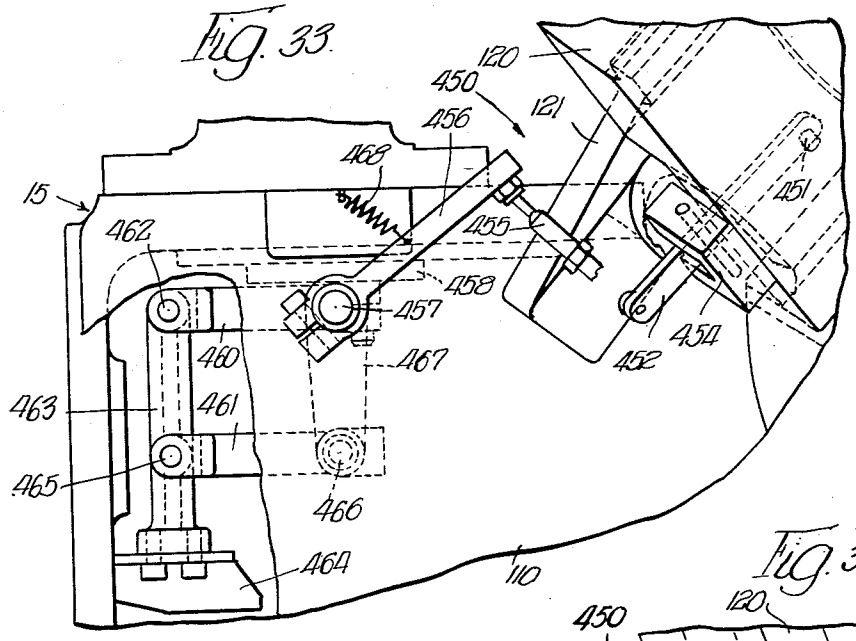
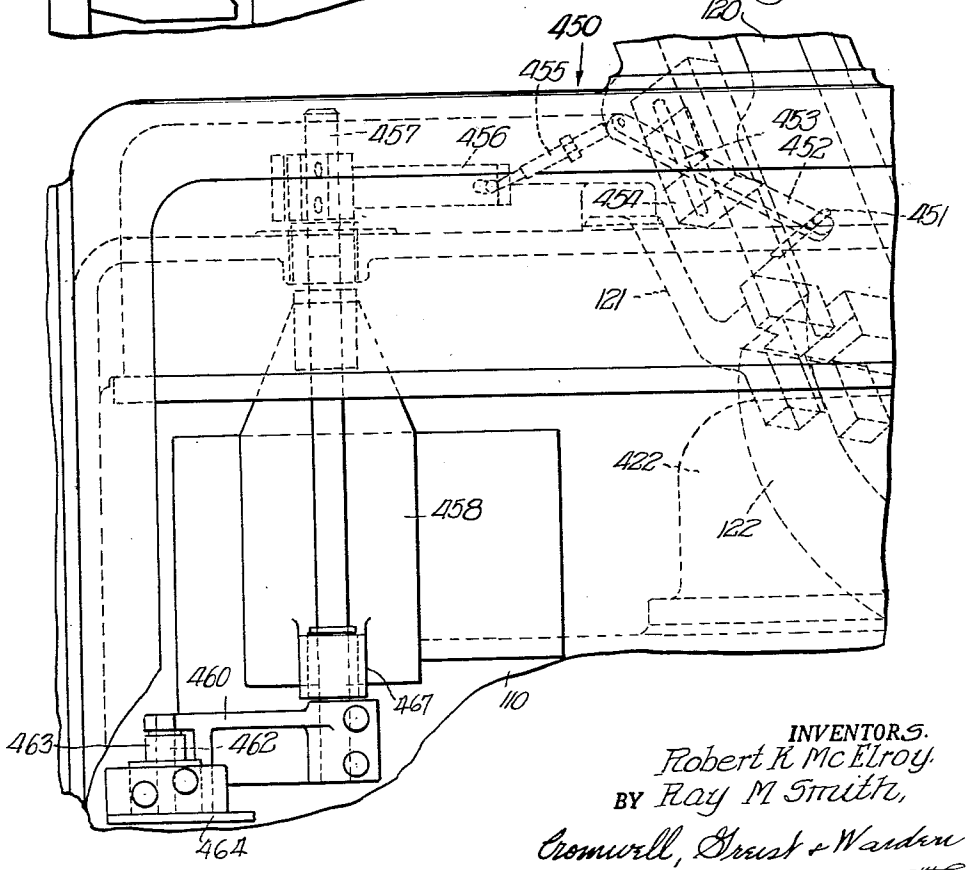


Fig. 34.



INVENTORS.
Robert K. McElroy.
BY Ray M. Smith,
Cromwell, Brust & Warden
Attys.

Aug. 11, 1964 R. K. McELROY ETAL 3,143,835

HIGH SPEED CAPPING MACHINE

Filed March 20, 1961 18 Sheets-Sheet 18

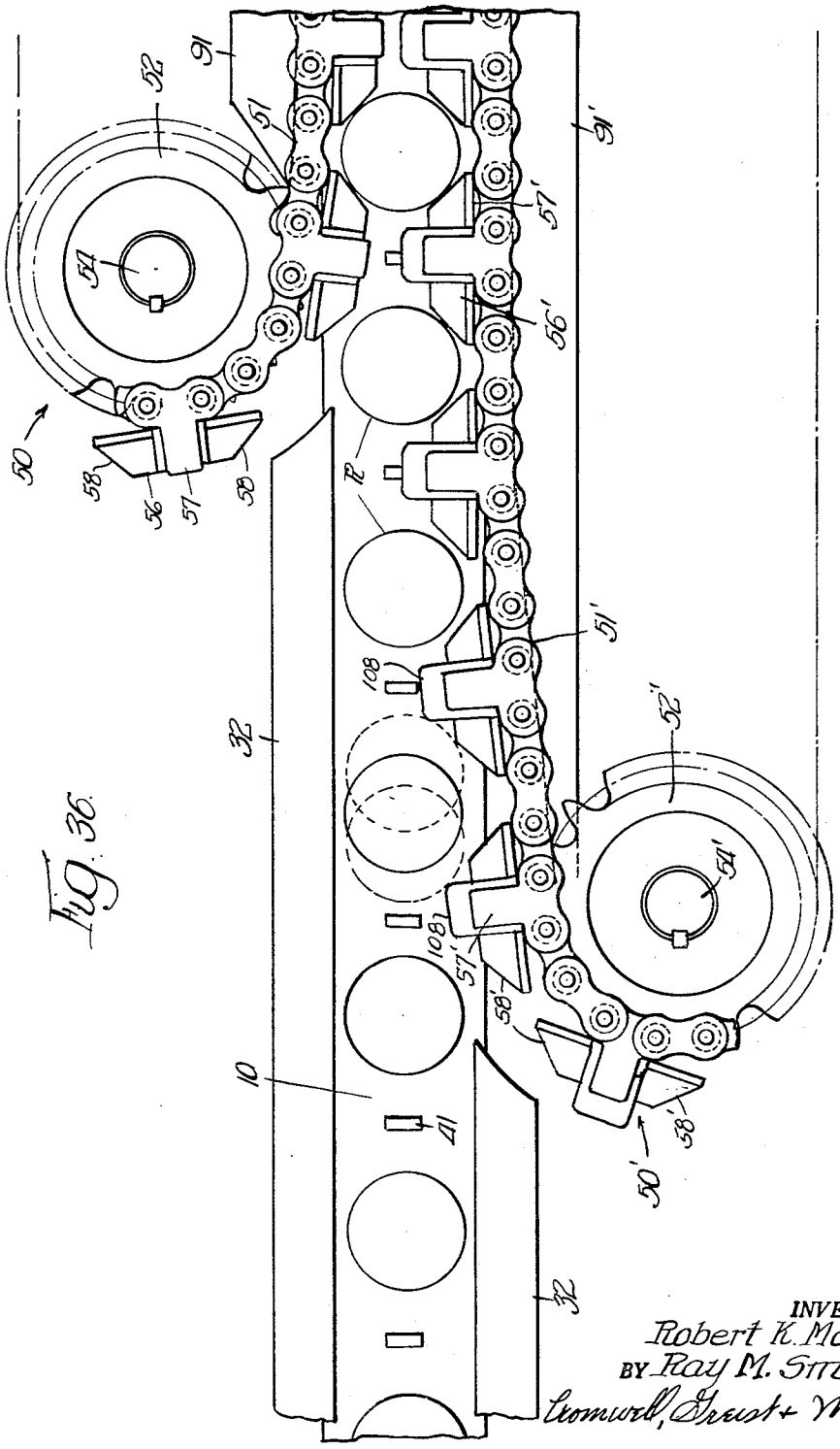


Fig. 36.

INVENTORS.
Robert K. McElroy,
BY Ray M. Smith,
Cromwell, Drust + Warden
attys

United States Patent Office 3,143,835 Patented Aug. 11, 1964

3,143,835

HIGH SPEED CAPPING MACHINE

Robert K. McElroy and Ray M. Smith, Elmhurst, Ill., assignors to Continental Can Company, Inc., New York, N.Y., a corporation of New York

Filed Mar. 20, 1961, Ser. No. 96,934
40 Claims. (Cl. 53—53)

This invention relates to packaging and is more particularly concerned with improvements in machines for applying and sealing closure caps onto jars or like containers which are capable of being operated at a high rate of speed.

It is a general object of the invention to provide an improved closure cap applying and sealing machine of the general type disclosed in Patent No. 2,876,605, in which, a file or procession of containers, e.g., glass jars, is passed rapidly through the machine and each jar receives a closure cap, during its passage, which becomes sealed to the mouth of the jar before it leaves the machine. The prior machine is constructed so as to be adapted for interchangeable use in the application of pressed-on closure caps of the class disclosed in White Patent No. 2,339,827 or rotatable closure caps, such as, lug caps of the type disclosed in Hammer Patent No. 1,805,623, and the present machine is likewise adaptable for such interchangeable use although only the form thereof which is adapted to be employed in the application of the rotatable type caps is illustrated and described herewith.

The rotatable caps to which reference has been made comprise a skirt or flange having either lugs or screw threads which interfit and cooperate with mating locking lugs or threads on the jar or other container. The rapid application of these rotatable caps requires that they first have to be applied to the jars so as to bring them into an initial sealing position regardless of the relative positions of the lugs or screw threads on the cap and those on the container when they are first brought together. If the caps are not applied properly in the first place they will not be properly sealed in the machine and furthermore breakage of containers or faulty seals may result.

The application of the rotatable caps is further complicated by the nature of the gaskets which are now being used in such caps. Many of these caps are now made with so-called "flowed-in" gaskets which are formed of plastisol compositions. When gaskets formed of certain plastisol formulations are warmed or heated sufficiently, as they will be by steam used in the sealing machines, they become sufficiently deformable so that the finish on the rim of the jars will indent the "flowed-in" gaskets and thereby form their own sealing surfaces. The rotatable action wherein the lugs or threads cooperate with mating elements on the container to help pull down the closure caps to a final position serve to assist in the intersealing action between the container and the gasket and to lock the caps in finally sealed position against accidental dislodgement. In order to obtain this intersealing action and properly lock the closure caps in their final and fully seated sealing position on the jars, a considerable degree of rotating action must be applied to the caps and also a substantial downward thrust.

Accordingly, a principal object of the invention is the provision of a cap feeding and leveling mechanism for rapidly feeding and applying rotatable closure caps to a rapidly moving file of jars or like containers so that a cap is presented in timed relation to the movement of each successive jar, applied in a level position to the mouth of the jar, and turned to the proper preliminary sealing position irrespective of the initial relative positions which the threads or lugs of the cap may bear to the interlocking lugs or threads of the jar, and thereafter the caps are rotated down to the final and fully seated and sealed position

on the jars by being subjected simultaneously to a substantial downward thrust as well as a rotating action.

In the machine of the prior patent each successive filled container is passed through an atmosphere of steam as it proceeds through the machine which displaces the air remaining at the mouth of the container so that when the cap is sealed in place and the container is cooled, the steam in the head space condenses and a vacuum is created which serves to further perfect and maintain the final seal of the cap onto the container. The present machine is constructed to accomplish this type of so-called "vapor vacuum" sealing.

Another object of the invention is to provide a machine for applying rotatable closure caps to jars or like containers wherein the movement of the successive caps into position on the jars is controlled relative to the movement of the jars through the machine, with the delivery of the caps being timed so that a cap is presented in proper position for downward rotation onto the mouth of each successive jar as the jars move in uninterrupted, continuous procession, through a cap applying and sealing mechanism.

A further object is to provide a high speed capping machine for association with a jar filling machine which comprises a continuously traveling jar supporting and advancing conveyor, a continuously traveling jar gripping mechanism, a mechanism for advancing successive caps from a supply chute and a common power shaft for operating the filling machine, the jar conveyor, the jar gripping mechanism and the cap advancing mechanism with the power shaft having a driving connection with each of the operating mechanisms which is adjustable while the machine is operating so as to enable the mechanisms to be timed relative to each other to bring each successive jar and a cap therefor into proper alignment for the cap to be turned down onto the jar.

A still further object of the invention is to provide a high speed capping machine which is readily adjustable for operation with different size caps and wherein the mechanism which is provided for applying the caps to the jars and bringing them into initial sealing position is in the form of a removable and replaceable unit, with separate interchangeable units being provided for each size cap.

These and other objects and advantages of the invention will be apparent from a consideration of the capping machine which is shown by way of illustration in the accompanying drawings wherein:

FIGURE 1 is a side elevation with portions thereof broken away or removed, of a machine for applying rotatable closure caps to jars or like containers and for sealing the same thereon, which incorporates the principal features of the invention;

FIGURE 1A is a side elevation with portions broken away of the entrance or receiving end of the container or jar supporting conveyor;

FIGURE 1B is a side elevation of the discharge end of the jar supporting conveyor;

FIGURE 2 is a side elevation to a larger scale, of the bottom portion of the machine as shown in FIGURE 1 with the top section thereof removed and with portions broken away or omitted;

FIGURE 3 is a plan view of the bottom portion of the machine as shown in FIGURE 2 with portions thereof omitted;

FIGURE 4 is a vertical section taken on the line 4—4 of FIGURE 3, to an enlarged scale;

FIGURE 5 is a plan view of the mechanism shown in FIGURE 4 with portions broken away;

FIGURE 6 is a cross section taken on the line 6—6 of FIGURE 4;

FIGURE 7 is a vertical section taken on the line 7—7 of FIGURE 3, to an enlarged scale;

FIGURE 8 is a plan view of the mechanism shown in FIGURE 7, with portions broken away;

FIGURE 9 is a plan view of one of the jar gripper chain assemblies and associated mechanism with portions broken away or omitted;

FIGURE 10 is an elevational view of the mechanism shown in FIGURE 9, the view being taken on the longitudinal center line of the machine, as indicated by the line 10—10 in FIGURE 9, with the jar supporting conveyor and its supporting structure omitted;

FIGURE 11 is a cross section taken on the line 11—11 of FIGURE 10;

FIGURE 12 is a cross section taken on the line 12—12 of FIGURE 10;

FIGURE 13 is a plan view, to an enlarged scale, of the cap feeding, applying and sealing head which constitutes the upper portion of the machine;

FIGURE 14 is a longitudinal vertical section taken on the line 14—14 of FIGURE 13 with portions thereof omitted;

FIGURE 15 is a transverse section taken on the line 15—15 of FIGURE 14;

FIGURE 16 is a side elevation, to an enlarged scale, of the cap leveling and applying unit as it appears when removed from the sealing head;

FIGURE 17 is a plan view of the cap leveling and applying unit with portions thereof broken away;

FIGURE 18 is a longitudinal, side elevation taken on the line 18—18 of FIGURE 17, with parts in section;

FIGURE 19 is a horizontal section taken on the line 19—19 of FIGURE 18;

FIGURE 20 is a horizontal section taken on the line 20—20 of FIGURE 19;

FIGURE 21 is an end elevation of the unit shown in FIGURE 16, the view being taken on the line indicated at 21—21 of FIGURE 16;

FIGURE 22 is a cross section taken on the line 22—22 of FIGURE 16;

FIGURE 23 is a longitudinal, vertical section taken on the line 23—23 of FIGURE 13, to an enlarged scale;

FIGURE 24 is a cross section taken on the line 24—24 of FIGURE 14, to an enlarged scale;

FIGURE 25 is a horizontal section taken on the line 25—25 of FIGURE 23;

FIGURE 26 is a cross section taken on the line 26—26 of FIGURE 13, to an enlarged scale;

FIGURE 27 is a vertical cross section taken on the line 27—27 of FIGURE 26;

FIGURE 28 is a cross section taken on the line 28—28 of FIGURE 27;

FIGURE 29 is a plan view of the steam distributor apparatus as it appears removed from the sealing head;

FIGURE 30 is a side elevation of the steam distributor apparatus;

FIGURE 31 is a vertical cross section taken on the line 31—31 of FIGURE 29, to an enlarged scale and with portions omitted or broken away;

FIGURE 32 is a vertical cross section taken on the line 32—32 of FIGURE 29 to an enlarged scale and with portions broken away;

FIGURE 33 is a fragmentary plan view of a portion of the sealing head at the entrance end thereof;

FIGURE 34 is a fragmentary, longitudinal elevation of the portion of the sealing head which is shown in FIGURE 33;

FIGURE 35 is a schematic view illustrating the power drive for the machine;

FIGURE 36 is a fragmentary plan view, partially schematic, at the entrance end of the machine illustrating the positioning of the jars for engagement by the gripper mechanism;

FIGURE 37 is a fragmentary view illustrating the relationship between the cap feed chute and the rotating cap feeding disc; and

FIGURES 38, 39 and 40 are fragmentary sectional views, partially schematic, illustrating the applying and leveling of the cap on the mouth of a jar.

Referring to the drawings, and particularly to FIGURES 1, 1A and 1B, the machine illustrated comprises a jar supporting and carrying conveyor 10 which has intermediate portions of its upper and lower runs supported on a superstructure 11 mounted on the table forming top 12 of a generally rectangular base 13, the latter also carrying in vertically adjustable relation above the jar supporting top run of the conveyor 10 a cap feeding, leveling and sealing head 15 in which mechanism is mounted for placing caps on successive open top jars R as they advance continuously through the machine.

The cap applying machine is designed for association with a jar filling machine (not shown) of standard construction with a common power drive mechanism for operating the filling machine and the present machine, and having mechanism, as hereinafter described, for synchronizing the operation of the two machines. The filling machine is arranged adjacent the entrance end of the capping machine and is of a type which will deliver filled jars in upright position to the continuously traveling conveyor 10 of the present machine at the end thereof which is shown in FIGURE 1A.

The jar supporting or carrying conveyor 10 comprises an endless articulated conveyor belt or chain 16 (FIGURES 1A and 1B) which is mounted for operation in a vertical plane. The chain 16 is carried at its opposite ends on sprockets 17 and 18 which are mounted on cross shafts 20 and 21, which cross shafts are mounted in suitable bearings in housings 22 and 23. The conveyor end housings 22 and 23 are carried at the upper ends of vertical posts 24 and 25 which are mounted for vertical adjustment in upright floor supported stands 26 and 27. The stands 26 and 27 are spaced at opposite ends of the machine and the conveyor 10 is of sufficient length so that the intermediate or center portions of the upper and lower runs of the chain 16 are supported on the base 12 and the frame structure 11 while one end portion (FIGURE 1A) extends to the filling machine for receiving the jars and delivering them to the capping mechanism and the other end portion extends at the other end of the machine for discharging the capped jars therefrom.

At the jar receiving end of the conveyor 10 (FIGURE 1A), the top run of the chain 16 is supported on a platform formed on the table forming top 28 of a framework 29 which extends longitudinally and is supported at one end on the frame structure 11 and at the other end on the conveyor housing 22. The lower or return run of the conveyor 16 is carried on a supporting table structure 30 suspended by vertically disposed hanger brackets 31 from the upper framework 29. A pair of laterally spaced side guide rails 32 are adjustably mounted above the table 28 on vertically disposed supporting brackets 33 attached to the frame 29.

At the discharge end (FIGURE 1B) of the machine, the upper run of the chain 16 is supported in like manner on the table forming top 34 of a longitudinally extending framework 35 carried at one end on the main frame structure 11 and at the other end on the conveyor housing 23 while the lower or return run of the chain 16 is supported on a table structure 36 suspended from the frame 35 by hangers 37. Laterally spaced guide rails 38 are adjustably mounted at this end of the conveyor above the frame structure 35 by means of the vertically disposed brackets 39 attached to the frame 35. The sprocket 18 at the discharge end of the conveyor is driven from the main drive of the machine in a manner which will be hereinafter described. The shaft 20 for the sprocket 17 which constitutes the idler sprocket for the chain 16 is mounted for adjustment longitudinally of the machine by the mechanism indicated

at 40 so as to provide for tensioning of the chain 16.

The chain 16 is arranged on the longitudinal center line of the machine with its top run supported in a horizontal plane and has a series of longitudinally spaced lugs or fingers 41 which are spaced so as to form pockets for receiving successive jars R positioned thereon. The movement of the chain 16 is timed relative to the discharge of the filled jars from the filling machine onto the conveyor 16 so as to insure that each successive jar is discharged between successive fingers 41 on the conveyor. Special provision is made for synchronizing the power drive for the chain and the filling machine and the mechanism for accomplishing this synchronization will be hereinafter discribed.

The jars R are maintained in vertically disposed relation and supported for travel in a horizontal plane as they pass through the machine and beneath the capping head 15. The intermediate portion of the top run of the jar supporting conveyor 16 is carried on the frame structure 11 which comprises primarily a longitudinally extending casting 42 having pedestal-like sections 43 and 44 at opposite ends with laterally spaced flanged bottom leg formations bolted to the top face 12 of the base 13 and having a rail-like upper edge 45 (FIGURE 11) on which a pair of longitudinally extending wear plates 46 are secured in parallel, transversely spaced relation by the angle members 47 which wear plates form a track for supporting the link plates 48 constituting the jar supporting surface of the conveyor chain 16. The lower return run of the conveyor chain 16 is supported in a suitable guide track 49 on the top 12 of the base 13, which guide track extends between the flanged leg forming bottom portions of the end sections 43 and 44 on the support casting 42.

The jars are gripped so that they are held in vertically disposed relation and also restrained against rotation about their vertical axis as they are advanced through the machine on the upper run of the conveyor 10 by a gripper mechanism which comprises cooperating endless gripper chain assemblies 50 and 50' (FIGURE 3) also carried on the support casting 42 and operating in a horizontal plane. The gripper chain assemblies 50 and 50' are constructed in a similar manner and only one will be described in detail with corresponding parts of the other being indicated by the same numerals primed and with differences in the details of the two assemblies being pointed out.

The rear gripper assembly 50 comprises an endless chain 51 (FIGURES 3, 9, 10 and 11) which is carried on end sprockets 52 and 53 which sprockets are supported on the upper ends of vertically disposed shafts 54 and 55 at the trailing and leading ends of the assembly. A series of jar engaging gripper assemblies 56 are mounted on the chain 51 by means of brackets 57 which are attached in spaced relation along the length of the chain. Each of the gripper assemblies 56 is provided with a pair of spaced jar engaging faces 58 which extend in vertical planes diagonal relative to the direction of travel of the chain so that each jar is engaged on one side by the trailing and leading diagonal gripper faces on two adjoining gripper assemblies, thereby providing for engagement of each jar at four spaced points around the periphery thereof as it passes between the two gripper chain assemblies 50 and 50'. The chain 51 is supported along the inner jar gripping run thereof in a horizontal plane by the horizontally disposed track forming top flange of a longitudinally extending angle guide member 59. The return or rear run of the chain 51 is supported in a similar manner on the horizontally disposed upper flange of a longitudinally extending angle member 60 which is secured in parallel, laterally or rearwardly spaced relation to the angle guide member 59 by suitable transversely extending connecting angle braces 61. A covering or guard member 62 for the rear run of the chain 51 is secured to the angle member 60. The gripper chain 51 is guided along a portion of its forward run by a horizontally disposed, longitudinally extending guide bar 63 which is mounted on the supporting guide member 59 and spaced above the latter so that its forward edge engages the back of the chain links. Provision is made for applying increased lateral pressure on the chain 51 while the jars travel beneath the sealing mechanism in the head 15, to increase the friction between the gripper faces 58 and the jars R. The guide bar 63 is interrupted in this area to accommodate a pressure applying apparatus 64 (FIGURES 3 and 9) which comprises a series of longitudinally spaced pressure sprockets 65, each rotatably mounted on a vertically disposed pin 66 in the one end of a horizontal support arm 67. The arm 67 is carried at its other end on a pivot 68 which extends above a mounting plate or bracket 70, the latter forming a base for the pressure apparatus which is secured between the chain supporting angle members 59 an 60. The pressure sprockets 65 are each urged in the direction of the chain 51 by a compression spring 71 which is seated at one end in a socket in an upstanding embossment 72 on the sprocket carrying arm 67 and at the other end in a socket in an upstanding embossment 73 on the base plate 70 so that the sprockets 65 apply lateral pressure to the gripper assemblies 56 as they advance beneath the sealing head 15. Each of the pressure sprockets 65 is limited in its movement in the pressure applying direction by an upstanding abutment stop 74 on the base plate 70 which is in the path of a tail piece 75 on the supporting arm 67.

The gripper chain 51 and its associated guide and support rails together with the pressure applying mechanism 64 are supported for vertical adjustment at opposite ends of the assembly on two longitudinally spaced castings 76 and 77 (FIGURE 10) which are connected together by a longitudinally extending rail forming angle member 78, the latter being bolted or otherwise connected at its opposite ends to the respective castings. At the leading end of the chain assembly the sprocket 53 is mounted for vertical adjustment on the vertically disposed shaft 55 to which it is keyed and which forms the drive for the chain. The chain supporting and guiding members are mounted at the leading end of the assembly on the upper portion of the casting 77 by means of the vertically disposed angle bracket 80 which is connected at its upper end to the ends of the angle members 59 and 60 and which has a bolt and slot connection with the bearing forming member 81 on the top of the casting 77, so that vertical adjustment of the sprocket 53 can be accompanied by a corresponding adjustment of the associated chain supporting and guiding members through the bracket 80. At the entrance end of the assembly the sprocket shaft 54 is mounted in suitable bearings in a vertically disposed shaft housing 82 and the latter has a bolt and slot connection with the vertically extending flange 83 on the end of a horizontally disposed cylindrical support member 84 which extends in sliding relation into a spring housing 85 formed in the upper portion of the casting 76. The support member 84 is urged in the direction of the trailing end of the chain assembly by a compression spring 86 mounted within the housing 85. The spring 86 has one end seated in an axial recess in the end of the member 84 and the other end bearing against a cover plate at the end of the housing. A guide rod 87 supports the spring and extends through a suitable aperture in the housing end plate. A key 88 holds the member 84 against rotation in the housing and the spring 86 operates to urge the sprocket 52 in a direction to apply tension in the chain 51. The angle member 59 which supports the chain 51 between the end sprockets 52 and 53 is adjustably supported at this end of the assembly by a bolt and slot connection with the upstanding leg of an angle bracket 89 which has its lower horizontal leg bolted or otherwise secured on the top of the housing 85. A simi-

lar angle bracket **90** is provided in the middle of the machine with an upstanding leg having a bolt and slot connection with the vertical flange of the angle member **59** and a horizontal lower leg bolted to the longitudinal rail member **78**. The chain guide rail **63** has an end section **91** which is secured by means of the angle bracket **92** to the top portion of the shaft housing **82** so that it moves with the sprocket and shaft assembly and which has a sliding connection at **93** with the main portion of the guide rail.

The shaft **55** (FIGURES 9, 10 and 12) which drives the gripper chain **51** is mounted in vertically disposed relation in vertically spaced bearings in the bearing support **81** on the top of the housing **77**. The shaft **55** carries a bevel gear **94** on its lower end which has a driving connection with a cooperating bevel gear **95** mounted on a transversely extending hollow drive shaft or sleeve **96** which is mounted in suitable bearings in the housing **77**. The drive sleeve **96** receives in axially sliding splined relation in the front end thereof the end of a cross shaft **97** which extends from the housing **77'** of the front gripper chain assembly **50'** and connects the same in driving relation with the drive shaft for the front chain assembly. At the other end the drive sleeve **96** receives in axially sliding splined relation the drive shaft **98** which connects the same with the main drive shaft for the machine (FIGURE 8).

The two gripper chain assemblies **50** and **50'** are adjustable simultaneously laterally of the machine and on opposite sides of the casting **42** on which they are supported. The supporting and adjusting structures at the two ends of the chain assemblies are substantially identical. At the jar receiving end of the gripper mechanisms the housing **76** of the rear chain assembly **50** is connected with the corresponding housing **76'** of the front chain assembly **50'** while at the other end of the mechanism (FIGURE 11) the housing **77** of the rear chain assembly **50** is connected to the corresponding housing **77'** (FIGURE 11) of the front gripper assembly **46**. The connecting structure between the rear housing **77** and the front housing **77'** comprises a horizontally extending hollow supporting shaft or sleeve member **100** which is mounted in a hub forming member **101** at the end of the main support casting **42** and an adjusting shaft **102** extending in rotatable relation therethrough with its opposite ends projecting beyond the ends of the supporting sleeve **100**. The shaft **102** has secured on its ends nut forming members **103** and **103'** each of which has an inner portion rotatably mounted on the end of the sleeve **100**. The nut members **103** and **103'** have external threads on their outer ends which engage with the internal threads provided in hub-like formations **104** and **104'** in the housings **77** and **77'** in which the nut members **103** and **103'** are received with the threads being right and left handed so that rotation of the members **103** and **103'** by operation of the shaft **102** moves the hub formations **104** and **104'** and the housings **77** and **77'** of which they form a part toward and from each other. The shaft **102** is provided with a hand wheel **105** at the forward end and at the rearward end a sprocket **106** is mounted thereon which is connected by a chain **107** (FIGURE 9) with a like sprocket **106'** on the adjusting shaft at the other end of the gripper chain assemblies. Rotation of the hand wheel **105** moves both ends of the gripper chain assemblies simultaneously toward and from each other with the distance each assembly is moved relative to the center line of the housing and the supporting casting **42** being the same.

The front gripper chain assembly **50'** differs somewhat from the rear gripper chain assembly **50** at the entrance end of the machine as illustrated in FIGURE 36. In order to allow for some variation in the positioning of the jars R on the carrying conveyor **10** and to insure proper gripping of the same when the gripper assemblies **56** and **56'** close on the jar the end sprocket **52'** of the front gripper chain assembly **50'** is moved as shown in FIGURE 36 so that it is spaced laterally of the center line of travel of the jar supporting conveyor **10** a greater distance than the sprocket **52** of the rear gripper chain assembly **50** and also some distance in the longitudinal direction from the sprocket **52** whereby the oncoming jars R are engaged by the gripper assemblies **56'** on the front gripper chain **51'** and centered before they reach the gripper assemblies **56** on the rear gripper chain **51**. The end extension **91'** on the chain guide bar **63'** has a taper on its chain engaging edge which progressively moves the gripper assemblies **56'** toward the jars R and the rear guide rail **32** as they are advanced by the conveyor **10**. The successive gripper assemblies **56'** move around the end sprocket **52'** and in behind a jar R so as to form with the preceeding assembly **56'** a pocket in which the jar is centered by engagement with the gripper faces **58'**. The bracket **57'** has a knob-like projection **108** which has edge surfaces approximately in the plane of the faces **58'**, **58'** so as to extend the effective jar engaging surfaces and help in moving into proper position improperly spaced jars which may not be in position for engagement by either of the two gripper faces **58'**, **58'** on each of the assemblies **56'**. This arrangement insures that each jar is properly located or centered for effective gripping by the faces **58**, **58** and **58'**, **58'** of the gripper assemblies without damage to the jars.

The cap feeding, applying and sealing head **15** (FIGURES 1, 2, 13 and 14) comprises a housing **110** which is mounted at one end thereof on a vertical post **111** upstanding from the rear side of the base **13** by means of the bracket **112**. At the other end of the housing **110** there is an extension member **114** which is bolted to the end of the housing **110** and connected by a bracket **115** with a vertical post **116** upstanding from the front side of the base **13**. The two posts **111** and **116** are provided with a suitable elevating mechanism (not shown) by means of which the head **15** may be raised and lowered relative to the base **13** to adjust the same for different height jars.

The caps C are fed to the head **15** through a chute **120** (FIGURE 14) which has its discharge end supported on the housing **110** by means of an angle bracket **121** (FIGURE 13). A curved extension **122** is connected to the lower end of the chute **120** which is open at the top and rear sides to permit the pocketed flange **123** of a rotating cap feeding disc or wheel **124** to feed the caps C to the applying mechanism. The disc **124** is mounted for rotation on an inclined vertical axis and the peripheral flange **123** extends at an angle to the plane of the body of the disc. The flange **123** is recessed or cut away at its edge to provide a series of peripherally spaced cap receiving pockets **125**. The disc **124** is mounted on the upper end of the inclined shaft **126** adjacent the housing **110** so that the pocketed flange **123**, at the lowest point traversed in the rotation thereof, moves in a horizontal plane. The chute extension **122** is curved to conform to the path of travel of the cap feeding flange **123** on the disc **124** and the caps C are picked up in the successive oncoming pockets **125** and fed forward to the cap applying and leveling mechanism. The cap feeding disc **124** is arranged at the bottom end of the feed chute **120** as shown particularly in FIGURE 37 so as to give a very smooth flow of caps to the feed disc and from the feed disc to the applying mechanism. The feed chute axis, at least at its lower end, is located generally midway between and parallel to a radial plane which passes through the axis of the disc and is perpendicular to the plane of the disc and a plane which is parallel to said radial plane and tangent to the center point arc of the caps in the pockets of the disc. As illustrated in FIGURE 37, the axis of the feed chute is displaced from the midway plane slightly toward the tangent plane.

The drive shaft **126** for the feeding disc **124** is mounted in spaced bearings in a support member **127** (FIGURE

6) at the upper end of an inclined shaft housing **128** which is secured on the housing **110** by means of the supporting bracket formation **130** (FIGURE 13). The shaft **126** carries a gear **131** which is in driving engagement with a pinion **132** on the upper end of a drive shaft **133** which is supported by suitable bearings in the housing **128** and carries at its lower end a bevel gear **134**. The bevel gear **134** is driven by a cooperating bevel gear **135** on a vertically disposed hollow shaft or drive sleeve **136** which is journaled in an extension **137** of the housing **128** and receives in telescoped splined engagement the upper end of a vertically extending drive shaft **138**, the latter having its lower end connected to the main drive of the machine in a manner which will be hereinafter described.

The cap leveling and applying mechanism **140** (FIGURE 14) is mounted in the head **15** and is in the form of a removable unit which is located, when in operating position, at the lower end of the chute extension **122**. The mechanism **140** comprises a generally rectangular top plate **141** (FIGURES 14 and 16 to 22) which forms the support or base for the mechanism and which has a pair of guide rollers **142** and **143** at one end and a single guide roller **144** at the other end for supporting the unit in longitudinally spaced track formations **145** and **146** extending transversely in the housing **110**. The top plate **141** which forms the upper side of a frame of substantially rectangular cross section is connected adjacent oppositely disposed corners thereof by depending side plates **147** and **148** with a bottom track forming frame member **150** so that the latter is suspended in vertically spaced relation below the base or supporting plate **141** and the cap leveling and applying devices are mounted between these two frame members. The top member **141** carries on its upper surface a thrust member **151** which is in the form of a roller mounted on a vertically disposed pin **152** and adapted to seat in a transversely extending, forwardly opening slot **153** which is provided in the housing **110** between the tracks **145** and **146** so as to prevent forward movement of the unit **140** in response to forward thrust resulting from movement of the caps through the unit. The bottom frame member **150** comprises a cross piece **154** at the trailing end (the left end as viewed in FIGURES 16 to 20) and front and rear side rails **155** and **156**, the rear rail **156** extending almost the full length of the unit and the front rail **155** extending approximately one-half the length thereof. The rails **155** and **156** are spaced laterally and carry track forming inserts **157** and **158** (FIGURES 20 to 22). The end cross piece **154** has a top face **159** which is inclined to the right and also the the rear as viewed in FIGURE 16 so as to form a continuation of the cap supporting surface of the chute extension **122** which it adjoints. The inclination of the top surface **159** conforms to the path of movement of the cap feeding disc **124** as it delivers the caps out of the chute extension **122** and across the surface **159**. The end cross member **154** is provided with a steam chamber **160** having a connection at **161** to the steam supply line for supplying steam to the chamber **160** and through the apertures **162** leading to the surface **159** to scavenge the air out of the caps C as they are delivered by the feeding disc **124** across the surface **159** to the applying devices. A connecting steam chamber **163** (FIGURES 16 and 22) is provided in the front side rail **155** of the frame member **150** which opens inwardly and has an outside cover plate **164**. The rear side rail **156** also has a steam chamber **165** with an apertured inside cover plate **166** and a connection at **167** with a separate steam supply line. The steam vapor is provided for vapor-vacuum sealing. Each cap C is advanced into the unit **140** by the disc **124** and moved over the guide surface **159** and along the tracks **157** and **158** to the first one of three longitudinally aligned duck bills **168**, **169** and **170** (FIGURES 18, 19 and 20).

The first duck bill **168** is in the form of a plate provided at its trailing end with an upturned portion **171** which is centered on the longitudinal center line of the machine along which the cap C is moved. The duck bill **168** is supported for vertical movement on a parallel linkage which comprises upper and lower link forming arms **172** and **173** which are in the form of horizontally disposed rectangular frames pivotally mounted at one end on transversely extending, vertically spaced and vertically aligned supporting cross shafts **174** and **175**. The cross shafts **174** and **175** are mounted at the front end of the frame in the vertical side plate **147**. At the rear end these shafts are mounted in a relatively short depending side plate **176** which terminates in spaced relation above the back rail **156** of the bottom frame member **150** so as to leave an opening in the back wall of the frame for movement therethrough of the cap feeding flange **123** on the disc **124**. The duck bill **168** is carried on the free ends of the link members **172** and **173** by an L-shaped bracket **177** which has its vertical leg connected to the ends of the links **172** and **173**, by vertically spaced pivots **178** and **178'**, which are equidistant from the cross shafts **174** and **175**. The horizontal leg of the bracket **177** is connected to the upper portion of a bracket **179** which has its lower portion bifurcated so as to straddle a magnet **180**, with the bracket and the magnet being connected to the top surface of the horizontally disposed duck bill plate **168**. The duck bill **168** and its supporting arms are urged in a downward direction by a compression spring **181** which has its lower end seated in a suitable recess in the upper face of the end portion of the uppermost link **172** and its upper end seated on a guide pin **182** having a threaded head portion mounted in a threaded vertical socket in the top plate **141**. A stop pin forming set screw **183** is adjustably mounted in a threaded bore in the plate **141** adjacent the spring **181** to limit the upward movement of the duck bill. The downward movement of the duck bill **168** is limited by a stop forming set screw **184** which is mounted in a threaded socket in a bottom cross bar **185** which is part of a U-shaped frame member extending transversely of the frame and having its legs forming front and rear side plate members **186** and **187** which are secured at their upper ends to the top plate **141**. The front side plate **186** is also secured at its bottom edge to the front rail **155** of the bottom frame member **150** at the leading end thereof. The rear side plate **187** terminates at its lower edge in vertically spaced relation to the top of the rear rail **156** of the bottom member **150** so as to provide sufficient clearance for movement of the disc **124**. A cap guide plate **188** (FIGURE 20) is secured to the bottom face of the cross bar **185** at the rear side of the duck bill **168** adjacent the upturned trailing edge **171** thereof, the guide plate **188** having an upwardly turned trailing edge so as to insure that the caps pass beneath the same and into proper position beneath the duck bill plate **168** against the bottom surface of which they are held by the magnet for leveling the same while each successive cap is moved down onto the jar by pressure of the spring **181** and its forward movement is continued through rotational movement of the feeding disc **124** and when free of the disc by forward movement of the jar on which it is applied. The cross bar **185** also carries the leading end of a cap guide bar or holddown member **190**. The guide bar **190** is pivoted at the leading end on a cross pin **191** (FIGURES 18 and 22) which is seated in a horizontal bore in the cross bar **185**. At its other end the bar **190** is pivoted on the cross pin **192** (FIGURES 18 and 21) which is mounted in the bifurcated lower end of a support bracket **193**. The bracket **193** has an upwardly extending guide pin forming portion **194** which is slidably received in a downwardly opening, vertical socket **195** provided in the end of the top plate **141**. The guide pin **194** has an enlarged upper end portion which is axially bored to provide a socket for receiving the lower end of a compression spring **196**. The spring **196** has its upper end seated in

the bottom of the bore 195. The enlarged end of the pin 194 provides a stop shoulder 198 which bears against an apertured cap plate secured at the lower end of the bore 195 so as to limit the downward movement of the trailing end of the bar 190. The cap holddown bar 190 is located on the longitudinal center line of the machine so as to bear on the center diameter of the caps as they are moved beneath the bar 190 by operation of the feed disc 124. The pivoted and vertically movable end of bar 190 is located immediately above the guide surface 159 as shown in FIGURE 21, and the lower face of the bar 190 is curved to conform generally to the curvature of the bottom cap supporting elements beneath the same.

As each cap C is moved into position above the mouth of an oncoming jar R it also moves downwardly so that the leading edge of the skirt or flange of the cap is below the top edge of the mouth of the jar as illustrated in FIGURE 38. The jar R is advancing at a faster speed than the speed of advance of the cap and the movement is timed so that the cap is ahead of the jar (FIGURE 38) and the latter catches up and engages with the skirt of the cap which is down over the jar mouth so that the advancing jar picks up the cap and moves it ahead out of the pocket 125 of the feed disc so that there is no interference with further rotation of the disc (FIGURES 39 and 40). The cap is leveled and moved down on the jar as far as it will go without turning by the cushioned movement of the first duck bill 168 which partially overlaps the track or guideway formed by the rails 157 and 158. The cap is under the control of the feed disc 124 up to the point where it is taken over by the jar which is advanced by the jar conveyor 10 beneath the duck bill 168 where it is held level on the duck bill by the magnet 180. The assembled cap and jar are advanced from beneath the first duck bill 168 to the second duck bill 169 which is supported for vertical movement on the end of a horizontally disposed U-shaped frame 200. The frame 200 has the free ends of its legs pivotally mounted on the lower cross shaft 175 outboard of the lower link member 173 which forms one of the links for supporting the first duck bill 168. The cross bar of the frame 200 at the non-pivoted end thereof is provided with a vertically extending socket formation 201 which has a vertical bore 202 with a sleeve bearing for slidably receiving an upwardly extending pin 203. The pin 203 has its lower end secured to a bracket 204 which in turn is secured by means of the spaced screws 205 to an upwardly projecting flange 206 on the top face of the duck bill 169. The upper end of the supporting pin or post 203 is bored to provide a socekt 207 for receiving the lower end of a compression spring 208 which has its upper end seated on a guide pin 210 depending from the overhanging horizontal arm of a Z bracket 211. The bracket 211 has a bottom horizontal leg secured to the supporting frame member 201 by screws 212, between which is a recess for receiving the bottom end of a compression spring 213. The spring 213 has its upper end seated on a guide pin 214 which has an externally threaded head portion seated in a threaded bore 215 in the top plate 141. A guide member 216 is attached to the top of the pin 203. The guide member 216 has a depending pin 216' attached thereto which slides in a bore in socket formation 201 to prevent rotation of pin 203. The bracket 211 is spaced from the bottom face of the top support plate 141 a sufficient distance so as to provide a stop for limiting the upward movement of the swinging end of the frame 200. Downward movement of this frame is limited by a stop lug 217 which extends laterally of the front leg of the frame 200 and is adapted to engage with the enlarged end of a stop pin 218. The enlarged end is eccentric on the stop pin 218 and the latter is mounted for adjustment in the front side plate 186. The second duck bill 169 is held in a generally horizontal plane and has a marginal portion 220 at the trailing end thereof which is inclined upwardly so as to insure passage of the cap and jar assembly beneath the same. A relatively narrow elongate drag member 221 is secured along the front side of the duck bill 169 which frictionally engages and turns the cap on lightly so as to properly seat the same on the mouth of the jar as the jar advances. The spring pressed plunger mounting assembly insures light engagement of the duck bill 169 with the oncoming caps and fast retractive movement or action. The weight of the duck bill assembly and the force of the spring are balanced or adjusted so that the pressure on the cap is light enough to keep the cap from upsetting as it enters beneath the duck bill and the retractive movement is fast enough to avoid a cap passing under the same without the drag member 221 engaging the cap surface.

The third duck bill 170 is supported on a horizontally disposed, U-shaped frame 222 having the free ends of its legs pivotally mounted on the uppermost cross shaft 174 outboard of the upper member 172 which forms part of the linkage for supporting the first duck bill 168. The support frame 222 has a downwardly offset cross bar 223 with a depending center bracket formation which is bifurcated and secured by spaced screws to an upstanding bracket plate 224 on the upper face of the duck bill plate 170. The duck bill 170 is flanged along the side edges and a relatively narrow, elongate drag member 225 is secured on the flange at the front side edge. The drag member 225 is formed of a material which frictionally grips the cap so as to further rotate the cap and insure that it is turned down on the jar mouth before it moves into the cap sealing or tightening mechanism which adjoins the leveling and applying mechanism 140. The support frame 222 is urged in a downward direction by a compression spring 226 which has its lower end seated in a socket provided in the cross bar 223 and its upper end seated on a guide pin 227 which has an externally threaded head adjustably mounted in a threaded socket or bore 228 in the top plate 141. The downward movement of the duck bill 170 is limited by a laterally extending stop lug 230 carried on the front side arm of the support frame 222 which engages with the head 231 of a stop pin 232 which is eccentrically mounted for rotational adjustment in the front side frame plate 186.

The cap leveling and applying mechanism 140 also carries a sensing arm of a device for detecting improperly applied caps so that jars which are not properly sealed may be removed from the line after they leave the machine. This tilted cap detector comprises a vertically swingable lever arm 233 (FIGURE 16) having a cap engaging finger 234 mounted on its free end. The lever 233 is rotatably mounted at its other end on a pivot pin 235 which is secured in an angle bracket 236 fastened to the rear margin of the top plate 141 so that the finger 234 is held in the path of the forwardly moving jars and will be engaged by the jar cap as each jar moves beneath the same. The downward movement of the detector finger 234 is limited by engagement of the lever arm 233 with the enlarged head of an eccentrically mounted stop pin 237 which extends laterally inwardly of the vertical frame plate 148. When the cap leveling and applying mechanism 140 is in operaive position in the head 15, the lever arm 233 is posiitoned beneath a transversely extending arm 238 (FIGURES 15 and 23) carried intermediate the ends of a horizontally disposed, longitudinally extending lever 238 which is pivotally mounted at one end on the transversely extending pivot pin 240 in depending support bracket 241 which is secured on the housing 110 at the rear side thereof. The lever 239 is pivoted at 242 to the lower end of a vertically extending rod 243 which has its upper end slidably mounted in a horizontally disposed bracket plate 244. The terminal end portion of the rod 243 is connected at 245 to the operating

arm of a microswitch 246, the latter being mounted on the bracket forming flange 247 upstanding along one side edge of the bracket plate 244. The downward movement of the rod 243 is limited by a stop nut 248 which engages the bracket plate 244 and a compression spring 250 is mounted on the rod 243 with one end seated against the bottom of the bracket plate 244 and the other end engaging the stop collar 251 fixed on the rod 243. The spring 250 normally urges the rod 243 in a downward direction and holds the detector plate or sensing finger 234 in its lowermost position. When a cocked cap passes beneath the finger 234 the lever 233 is raised sufficiently to actuate the switch 246 which in turn is connected to a memory device for operating a jar ejector mechanism (not shown) located along the jar conveyor 10 at the discharge end of the machine.

As the assembled jars and caps are advanced from the cap applying and seating unit 140, they move into the sealing mechanism which is indicated at 260 (FIGURES 13, 14 and 23 to 28) in the leading end of the housing 110 of the head 15. The jars are, of course, held against rotation by the gripper chain assemblies 50 and 50' as they are advanced on the conveyor 10. The sealing mechanism 260 comprises a pair of parallel belts 261 and 262 which are mounted to travel in parallel vertical planes on opposite sides of the longitudinal center line of the machine along which the capped jars are advanced by the conveyor 10. The belts 261, 262 are arranged so that the lower runs thereof are in a plane above the path of travel of the jars and are operated at speeds which differ from each other and from the speed of the jar conveyor 10 so that as the jars advance a twisting or turning force is applied to the top surfaces of the caps by engagement therewith of the traveling belts 261 and 262. The two belts 261 and 262 are mounted on relatively small idler pulleys 263 and 264 at the trailing end of the apparatus, which pulleys are supported on small shafts 265 and 266 extending inwardly of the parallel arms of a U-shaped portion of a supporting bracket 267. At the leading ends the belts 261 and 262 are mounted on relatively large driven pulleys 268 and 269. Each of the belts is provided with a tensioning device which comprises a belt engaging roller 270 on the forked end of a support lever 271 which is pivoted at 272 to a bracket 273 depending from the top wall of the housing 110. The lever 271 is provided adjacent the pivot 272 with a radially extending lug 274 to which one end of a spring tensioning device 275 is connected with the other end thereof connected to a hook 276 on the undersurface of the top wall of the housing 110. A cooperating radial lug 277 on the pivoted end of the support lever 271 and a stop pin 278 on the bracket 273 limits movement of lever 271 when the belts are removed for replacement.

A pressure applying shoe 280 (FIGURES 13, 14, 23, 24 and 25) is associated with the lowermost runs of the belts 261 and 262 between the drive pulleys 268, 269 and the idler pulleys 263, 264 which pressure shoe 280 is supported on a pair of vertically disposed, longitudinally spaced, post forming rods or shafts 281 and 282 which are mounted in one side of the housing 110. The pressure shoe 280 is made in two longitudinally aligned sections 283 and 284 which are connected together by a longitudinally extending pivot pin 285 so that the two sections 283 and 284 may be rotated on the longitudinal axis of the pin 285 relative to each other. At opposite ends of the shoe the two sections 283 and 284 are pivotally mounted by means of longitudinally extending pins 286 and 287 on link forming center support members 288 and 290. The link member 288 is connected by a transversely extending pivot pin 291 to the guide roller support bracket 267 which is in turn clamped to the supporting post 281. The link member 290 is connected by a transversely extending pin 292 to the bracket 293 which is in turn clamped to the supporting post 282. The shoe 280 is cut away on its lower face to provide at opposite ends thereof guideways 294 and 295 for the belts 261 and 262 thereof through which pressure is applied to the belts. A portion of the shoe is cut away between the guideways 294 and 295 where the belt is not supported.

The support posts 281 and 282 are mounted on the housing 110 for limited vertical movement so as to apply the desired degree of resilient pressure to the belts and to adjust the height of the shoe 280. The post 282 (FIGURES 23 and 24) has its lower end slidably mounted in a vertically disposed bore 296 in a bracket 297 extending inwardly of the rear side wall of the housing 110. At its upper end the post 282 is threaded to receive an adjusting knob 298 and a locking nut 299 with the adjusting knob 298 having a lower portion of reduced diameter which is mounted for vertical sliding movement in a vertically disposed bearing 300 extending through the upper leg of a C-shaped bracket 301. The bracket 301 has its lower leg secured to the top of the housing 110 and provided with a threaded bore for receiving a pressure nut which is in the form of a sleeve 302 through which the post 282 extends and which engages the upper end of a compression spring 303 having its lower end seated against a stop collar 304 secured on the post 282. The post 281 is mounted in a similar manner so that both posts are free to move upwardly against the resistance of the compression springs which normally hold them in the down position. The height of each of the posts is independently adjustable and also the tension in each of the compression springs is independently adjustable.

To resist the forward thrust on the shoe 280 resulting from the drag of the belts across the bottom guide surfaces 294 and 295, an eccentrically mounted thrust bushing in the form of a roller 305 is provided which is carried on a transversely extending pin or shaft 306 projecting from a boss 307 provided on the post supporting bracket 297. The thrust roller 305 engages in a pocket 308 provided in the upper face of the section 284 of the shoe 280.

The belt pulleys 268 and 269 at the leading end of the belt assemblies are driven by connection with the main drive of the machine. The pulley 269 at the rear side of the machine, on which the rear belt 262 is supported, is keyed to the end of a hollow shaft 310 (FIGURE 26) which is rotatably mounted in a shaft housing 311 secured on the rear wall of the housing 110. The pulley 268 for the front belt 261 is keyed to a shaft 312 which is rotatably mounted within the hollow shaft 310. The two shafts 310 and 312 extend into a gear box 313 which is integrally connected with the shaft housing 311. The hollow shaft 310 carries on its end a gear 314 and the inner shaft 312 extends beyond the end of the shaft 310 and carries gears 315, 316 and 317, the gear 317 being a bevel gear which is in driving relation with a bevel gear 318 mounted on the upper end of a vertically disposed drive shaft 320 which is journaled in the gear box 313 and which is connected by an adjustable coupling (not shown) with the main drive of the machine in a manner which will be hereinafter described. A manually operable coupling mechanism is provided for driving the two shafts 310 and 312 either at a differential speed or at the same speed so as to adapt the machine for application and sealing of caps of either type referred to as, e.g., caps which require rotation on the jar top for final sealing and caps which do not require rotation for final sealing. The coupling mechanism comprises two coupling gear members 321 and 322 (FIGURES 27 and 28) which are mounted on parallel stub shafts 323 and 324 extending in parallel relation from a mounting plate or frame 325. The mounting plate 325 is secured in pivotal relation on the side wall of the housing 313 by the shaft of pin 326 which extends through the housing wall and carries an operating lever 327 on the outside thereof. The plate 325 is swingable by operation of the lever 327, in a counterclockwise direction, as viewed in FIGURE 27, to bring the coupling gear 321 into driving relation with the gears 314 and 316 so that the hollow shaft 310 is driven by the inner shaft 312 at the same speed, or the plate 325 may be swung in an opposite direction to bring

the coupling gear 322 into driving relation with the gears 314 and 315 which results in the two shafts 310 and 312 being driven at different speeds. The shafts 310 and 312 are, of course, driven at different speeds for operation on screw caps or lug caps which require rotation on the jar mouth for sealing, the belt on the rear side of the machine being driven in the same direction and at a faster speed than the movement of the jar conveyor 10 while the belt 261 on the front side of the machine is driven in the same direction and at a speed which is slower than the speed of the jar conveyor 10.

The main drive for the machine comprises a series of connected drive shafts extending along the rear side of the machine and supported in suitable housings and gear boxes on the base 13. The machine is powered by a motor 330 (FIGURE 1) which has an output pulley 331 connected by a belt drive 332 with a pulley 333 on the end of drive shaft 334 (FIGURES 4 and 5). The shaft 334 extends longitudinally of the machine and is journaled in suitable bearings in a gear box 335 and an adjoining shaft housing 336. This shaft carries a bevel gear 337 in the gear box 335 which drives a bevel gear 338 on the lower end of a vertically disposed shaft 340 which is mounted in an upwardly projecting shaft housing 341 on the top of the gear box 335 and which is connected by a suitable driving connection with the jar filling machine (not shown) with which the present aparatus is associated so that the delivery of the jars from the filling machine may be timed for proper pick up by the jar conveyor 10. This is accomplished by driving the present mechanism and the jar filling machine from the same power source and adjusting the timing of the conveyor 10 relative to the operation of the filling machine so that each successive filled jar which is delivered from the filling machine into the conveyor 10 is placed in an open space between the pocket forming lugs or fingers 41 on the conveyor. A second or intermediate drive shaft section 342 is mounted in suitable bearings in the supporting housing 343 which adjoins the housing 336 so that the shaft 342 is in axial alignment with the end shaft 334. The two shafts 334 and 342 are connected in driving relation by an in-motion timing device which comprises a ring member 344 (FIGURE 4) mounted for rotational or turning movement in the connecting ends of the housings 336 and 343 in which a diametrically extending shaft 345 is mounted. A pair of beveled gears 346 and 347 are mounted for rotation on the shaft 345 and in toothed engagement with bevel gears 348 and 350 carried on the adjoining ends of the shafts 334 and 342, respectively. The ring member 344 is provided on its outer periphery with teeth engaging with a worm 351 mounted on the end of a shaft 352 which extends transversely of the machine and which has its rear end journaled in a suitable bearing in the top of the end portion of the housing 336. The shaft 352 extends to the front of the machine where it is adapted to receive a tool for rotating the same to adjust the phasing of the two shafts 342 and 334 and thereby adjust the timing of the conveyor 10 which is driven by the shaft 342 relative to the operation of the filling machine which is driven by the shaft 334 through the bevel gear connection 337 and 338.

The shaft section 342 supports in rotatable relation thereon and in the housing 343 a ring gear 353 which forms a part of an epicyclic gear reduction device. The gear 353 is provided on its left end, as viewed in FIGURE 4, with a helical gear 353' which is in driving engagement with a gear 354 (FIGURE 6) mounted on the lower end of the vertically disposed shaft 138 for the cap feeding disc 124. The shaft 138 has its lower end journaled in bearing formations incorporated in the rear side of the housing 343. The ring gear 353 has internal teeth engaging with a plurality of pinions 356 which are mounted on relatively short shafts 357 extending in parallel relation from and peripherally spaced about the end of a sleeve-like supporting member 358. The pinions 356 are driven by the gear 360 which is keyed on the shaft 342. The supporting member 358 is mounted for rotation on the shaft 342 within the end of the housing 343 and has peripheral teeth 361 engaging with a pinion 362 on an adjusting shaft 363. Rotation of the shaft 363 turns the ring gear 353 about the shaft 342 and changes the phasing of the shaft 138 and the drive shaft 342 so as to permit adjustment of the timing of the cap feeding disc 124 relative to the advancing movement of the jar conveyor 10 while the machine is running, the conveyor 10 being driven by the shaft 342 as hereinafter described.

The adjusting shaft 363 is hollow and extends through the front frame of the machine. It houses an internal shaft 364 which also extends through the front frame of the machine and a mechanism is provided at the front ends of these two shafts for coupling the same for simultaneous operation. This coupling mechanism comprises a cap-like sleeve 365 (FIGURE 5) which telescopes the end of the hollow shaft 363 and has an axially sliding splined connection therewith. The shaft 364 has an end portion of reduced diameter 366 which extends through an axial bore in the cap member 365 and is headed so as to limit the axial movement in the outward direction of the cap 365 and a compression spring 367 is arranged on the shaft end portion 366 which normally urges the cap 365 toward its outermost position. The shaft 364 carries on its end a pinion 368 which in the outward position of the cap 365 is free of engagement with the cap 365. The cap 365 carries an internal key or tooth 370 which is adapted to engage with the pinion 368 when the cap 365 is moved axially inwardly over the end of the hollow shaft 363 so as to connect the two shafts together for simultaneous rotation. The internal shaft 364 is provided on its other end with a sprocket 371 (FIGURES 3 and 5) having a chain connection 372 with a corresponding sprocket 373 (FIGURES 3 and 8) on the end of a transverse shaft 374 which forms part of a corresponding gear reduction mechanism associated with a third section 375 of the main drive shaft.

The drive shaft section 375 is connected in relatively fixed axial alignment with the drive shaft section 342 by a suitable coupling 376 and mounted by means of suitable bearings in the three connected housings or gear boxes 377, 378 and 380 at the discharge end of the machine. The shaft section 375 carries a bevel gear 381 in the housing 377 which is in driving relation with a bevel gear 382 on the end of vertically extending shaft 383. The shaft 383 is journaled by means of suitable bearings in a shaft housing 384 secured on the top of the housing 377 and is connected in driving relation with the sealing pulley drive shaft 320 (FIGURE 26). The shaft 375 has a ring gear 385 rotatably mounted thereon in the gear box 378 which has connected thereto at one end a bevel gear 386 which is in driving relation with the bevel gear 387 on the end of the drive shaft 98 for operating the gripper chain assemblies 50 and 50'. The ring gear 385, which forms part of an epicyclic gear reduction device, is connected in driven relation with the shaft 375 through peripherally spaced pinions 390 which engage with the internal teeth on the ring gear 385 and the gear 391 fixed on the shaft 375. The pinions 390 are mounted on stub shafts 392 extending from the flange 393 of a sleeve member 394 which is mounted for rotation within the end of the gear box 380 and within which the shaft 375 is mounted on suitable bearings. The flange 393 has spiral teeth on its outer periphery which engage with pinion 395 on the adjusting shaft 374. With the two speed adjusting or timing devices connected by the chain 372 and sprockets 371 and 373 the timing of the gripper chains relative to the jar conveyor 10 may be adjusted simultaneously with the timing of the cap feeding disc 124 relative to the jar conveyor 10.

The shaft section 375 extends into the end housing or gear box 380 (FIGURES 7 and 8) and carries a gear 396 which drives a gear 397 on a parallel drive shaft 398

also mounted in the gear box 380 and connected in driving relation with the end supporting cross shaft 21 for the jar conveyor 10, by a worm gear 400 and pinion 401. The drive shaft 398 may also have a driving connection with a vertically disposed shaft 402 for a coding or marking device (not shown), by means of a bevel gear 403 on the lower end of the shaft 402 and a bevel gear 404 on the shaft 398. The shaft 402 is journaled in a suitable shaft housing and bearing support 405 which is mounted in the top of the gear box 380.

The sealing head 15 (FIGURES 13, 14 and 29 to 32) is provided with a distributor assembly 410 for supplying steam for effecting vacuum vapor sealing of the jars. The distributor apparatus 410 comprises an upper steam chamber or header 411 and lower or side chambers or distributors 412 and 413 which are detachably supported on the rear and front sides of the main chamber by means of bolts 414 and 415, respectively. The main distributor is provided with a steam inlet 416 at the top thereof and has openings in the side walls which mate with similar openings in the side walls of the side distributors 412 and 413, with perforated metal plates 417 and 418 (FIGURE 31) between the same, through which the steam passes. The side distributor members 412 and 413 are provided with baffle forming bottom wall plates 420 and 421 which direct the steam into the path traversed by the top of the jar as it approaches the cap applying unit 140. A third steam distributor member 422 is connected to the forward end of the header 411 and extends above the cap applying unit 140. This member is bolted to a horizontal mounting plate 423 (FIGURES 14 and 15) secured in the housing 110 which forms the mounting for the entire steam distributor assembly in the head 15. The track forming members 145 and 146 for the cap leveling and applying unit 140 are mounted on the lower face of the steam distributor member 422 (FIGURES 30 and 32). A rear side steam distributor member 424 is fastened by bolts 425 to the rear side wall of the distributor member 422 and extends along the rear of the unit 140. A front side steam distributor member 426 is detachably secured by bolts 427 to the front side wall of the distributor member 422 and extends along the cap leveling and applying unit 140. The rear distributor member 424 has its lower edge above the path of the caps to permit movement of the cap feeding disc 124. The two side distributor members 424 and 426 have openings 428 and 430 in the upper portions of their inside oppositely disposed walls or faces 431 and 432 which mate with corresponding openings in the main distributor member 422 so as to provide for passage of steam into the members and perforated plates 433 and 434 covering discharge openings in the lower portions of these inside walls which extend below the distributor member 422 through which steam is supplied in the cap applying area or zone of operations.

The steam distributor member 422 supports a centering mechanism for the cap leveling and applying unit 140 which comprises two pairs of transversely disposed centerig pins 435 and 436 (FIGURE 29), with the pins 435 being longitudinally spaced along the rear side of the member 422 and the pins 436 being transversely aligned therewith on the front side of the member 422. Each of these pins is supported in an angle bracket 437 (FIGURE 32) which is secured to the side wall of the member 422 and which has a transversely extending bore 438 for receiving the pin and a compression spring 439 which urges the spring in the direction of the longitudinal center line of the machine. The spring pressed pins 435 and 436 are adapted to engage opposite side edges of the top support plate 141 and the cap leveling and applying unit 140 for centering the same.

The head 15 (FIGURES 13 and 15) has a front side portion 440 of the housing 110 which is hinged at 441 to the front edge of the top wall 442 thereof so as to form a cover which may be swung to an out-of-the-way position and provide ready access to the mechanism mounted in the head. The top portion of the cover 440 has a longitudinally extending chamber 443 which is adapted to be connected by conduit 444 to an exhaust chamber formed in the head extension 114, which exhaust chamber is connected with an exhaust fan indicated at 445 (FIGURE 13) driven by a motor 446. The tunnel-like chamber 443 in the cover 440 is connected to a hood 447 at the entrance end of the head and the housing 110 has an aperture in the leading end wall which connects the same with the exhaust chamber in the head extension 114 so that escaping steam is carried away and the top portion of the jar is protected from outside air currents from the time the jar enters the head until it is capped and sealed.

A no-jar no-cap control mechanism 450 (FIGURES 13, 14, 33 and 34) is associated with the cap feeding chute 120 which comprises a cap engaging or movement arresting stop pin 451 (FIGURE 34) mounted on the end of the arm 452 and movable transversely of the path of travel of the caps at the bottom end of chute 120 and in the bottom wall of the latter so as to be positioned for engagement within successive caps as they approach the cap feeding disc 124 when the pin 451 is moved by the arm 452 into the chute 120. The arm 452 is pivoted on a pin 453 which is journaled in a bearing bracket 454 so that it extends parallel with the side wall of the chute 120. The other end of arm 452 is connected to a link bar 455 by a ball and socket joint and the link bar 455 is connected at the opposite end to a horizontally extending arm 456 by a like joint so that swinging movement of the arm 456 moves the pin 451 into and out of the path of the caps in the chute 120. The arm 456 is pivoted at its other end to the top of a vertical shaft 457. The shaft 457 is journaled in vertically spaced bearing ears on a bracket plate 458 which is secured to the inside of the rear side wall of the housing 110. At its lower end the vertical shaft 457 is secured to one end of bar member 460 (FIGURE 33) which constitutes one of a pair of parallel link bars 460 and 461. The other end of the link bar 460 is pivotally connected at 462 to a supporting arm or bar 463 carrying a jar engaging finger or sensing member 464 at its forward end which extends above the conveyor 10 in the path of the oncoming jars at the entrance end of the head 15. The link bar 461 is pivotally connected at 465 to the arm 463 and at 466 to a fixed support arm 467 extending from the bracket plate 458. A tension spring 468 is connected at one end to the arm 456 and anchored at its other end to a post or pin on the housing 110 so as to normally hold the jar sensing member 464 in the path of travel of the jars. The jar sensing member 464 is engaged by each jar as it moves past the same on the conveyor 10 and is moved laterally by passage of the jar against the force of the spring 468, which movement depresses the stop pin 451 and clears the chute for a cap to move down the chute for delivery by the feeding disc 124 to the jar as the jar arrives beneath the cap delivery point. When there is a failure in the supply of jars, the jar sensing member 464 is held by tension spring 468 in extended position and the stop pin 451 remains in extended position in the chute where it will engage within a cap so that the feed of the caps is interrupted until the delivery of the jars is resumed.

In the operation of the machine the necessary initial adjustments are made for the size of the jar or other container R and the closure cap C which is to be applied to the container by the machine. The cap applying and sealing head 15 is raised the proper elevation above the jar conveyor 10 and the gripper chain assemblies 50 and 50' are adjusted vertically and laterally of the jar conveyor 10 to provide the proper height and spacing for gripping the jars R by the gripper members 56 and 56'. The cap leveling and applying unit 140 of the proper size is mounted on the tracks 145 and 146 and properly centered. The cap engaging duck bills 168, 169 and 170 in the unit 140 are adjusted to apply the desired down-

ward pressure on the top of the cap. The sealing belts **261** and **262** are adjusted so that they are properly tensioned and the sealing shoe **280** is raised or lowered by adjustment of the supporting hanger members **281** and **282** to the proper elevation for the downward pressure desired. The various drive mechanisms are then adjusted or timed for proper operation. Since the shaft **340** which connects the main drive with the drive for the filling machine is driven by a direct connection with the main drive shaft **334** the first adjustment is the timing of the conveyor **10** relative to the operation of the filling machine so that each filled jar delivered by the filling machine is deposited on the conveyor **10** immediately ahead of one of the conveyor jar engaging fingers **41** so that it is in the pocket defined by each pair thereof. This adjustment is accomplished by changing the relative position of the ring **345** (FIGURE 4) which carries the bevel gears **346** and **347** so as to change the phasing between the shafts **334** and **342**, the latter having a fixed drive connection with cross shaft **21** at the discharge end of the conveyor **10**. All other timing adjustments are then made in the drives which are connected to the drive shaft sections **342** and **375**. The timing of the cap feeding disc **324** is adjusted by changing the position of the member **352** and this adjustment is coupled by sprockets **371**, **372** and chain **373** with member **385** which drives the shaft **98** and the gripper assemblies **50** and **50'**. These timing adjustments may all be made while the various mechanisms are in motion.

The caps C are fed from the chute **120** over the downwardly curved floor of the chute extension **122** by the feed disc **124** and moved by the rotation of the disc **124** into the applying and leveling unit **140**. The feed disc **124** operates in the open back side of the chute **120** and chute extension **122** and in a slot-like opening in the back side of the cap applying and leveling unit **140** and positively advances successive caps C onto the guide rails **157** and **158** where each successive cap C onto the guide rails **157** and **158** where each successive cap moves into a substantially leveled position and is aligned vertically over an oncoming jar with the flange of the cap encompassing the mouth forming rim of the jar. The cap is held down on the bottom support rails **157** and **158** by the spring pressed top pressure bar **190** while it is moved by the disc **124** of the leading end of the rails and beneath the first duck bill **168**, the latter overlapping the rails somewhat so that the cap is assembled on the mouth of the jar as it is leveled and moves beneath the duck bill. The duck bill **168** is spring pressed and held in a level position. The caps are gripped by the force of the magnet **180** on the duck bill **168** so that they are lowered by downward movement of the duck bill **168** onto the jar top as they advance with the jar beyond the ends of the guide rails and are held in a level position. The jar engages the cap rim or flange and carries the cap with it as illustrated in FIGURES 38 and 39. The jar is traveling a little faster than the cap and is behind the cap in FIGURE 37. As the leading edge of the cap advances and moves below the leading edge of the jar top (FIGURE 38) the jar catches up to the cap and engages the cap rim (FIGURE 39) moving the cap ahead (FIGURES 39 and 40) so as to clear the disc pocket **125** and insure that the cap will not be jammed between the feeding disc and the jar. The jar and cap assembly advances beneath the second duck bill **169** where the cap is initially rotated to interengage the threads or lugs and turned down toward sealing position by engagement of the drag member **221** with one side of the cap. From the duck bill **169** the jar and cap assembly advance to beneath the duck bill **170** where a further rotating force is applied to the cap by the drag member **225** to insure that the cap is turned downward completely into position for final sealing. As the jar and cap assembly is advanced by the supporting conveyor **10** beyond the duck bill **170** it passes beneath the sealing belts **161**, **162** and the pressure shoe **280** and is simultaneously subjected to downward pressure and to a twisting force by operation of the belts **261** and **262** which are traveling at different speeds relative to each other and to the jar conveyor **10** and which rotate the cap while the assembly is advancing. If the cap is cocked or not in proper position for final sealing as it leaves the cap applying and leveling unit **140**, the sensing arm **234** is raised a sufficient distance to operate the switch **246** and the mechanism for subsequently ejecting the improperly capped jar is actuated. The jar and cap assembly is carried by the conveyor **10** beyond the sealing belts **261** and **262**, after the sealing of the cap is completed and properly capped and sealed jars are advanced beyond the discharge end of the machine for removal from the same while defectively sealed jars are ejected by the mechanism which is actuated by sensing arm **234**.

In the operation of the machine for vapor-vacuum sealing, the steam distributor head **411** and the other steam chambers referred to are supplied with steam to scavenge the air out of the top of the jar and the cap and replace the same with steam so that vapor-vacuum sealing results when the jar is cooled. Any excess of steam is drawn off from the head and the flow of air currents around the head is prevented by the air exhaust system which has been described.

The machine may be adapted for the application of caps which do not require rotation for sealing by eliminating the drag members **221** and **225** on the duck bills **169** and **170** and adjusting the speed of the sealing belts **261** and **262** so that they travel the same speed as the conveyor **10**. This permits the caps to be placed on the jars and pass through the head **15** without any turning or twisting and with the pressure adjusted to force the caps downwardly into proper sealing relation on the jar tops.

While specific materials and particular details of construction have been referred to in describing the illustrated form of the capper, it will be understood that other materials and equivalent structural details may be resorted to within the invention.

We claim:

1. A machine for applying and sealing closure caps onto the mouths of containers comprising an endless traveling conveyor mounted on a base frame for supporting and advancing the containers in upright, uniformly spaced file forming relation, a cap applying and sealing head structure mounted for vertical adjustment above said base frame, said head structure comprising a downwardly opening housing extending above said conveyor, a cap feeding mechanism at an entrance forming end of said housing which comprises a supply chute and an individual cap forwarding disc at the bottom end of said supply chute, and a cap sealing mechanism at a discharge forming end of said housing, a cap leveling and applying apparatus mounted on a side opening frame unit, track means extending transversely in the head structure for supporting said frame unit so as to permit ready removal and replacment thereof laterally of the head, means for centering the unit to align it above the path of movement of the containers, and means to absorb the forward thrust of the frame unit resulting from the passage of the caps through the same.

2. In apparatus for applying rotatable closure caps onto the mouths of containers wherein the containers in single file are conveyed through the machine by a horizontally disposed bottom support conveyor and held against turning by cooperating clamping elements carried on transversely spaced, endless conveyor assemblies having parallel opposed runs disposed above the container support conveyor, a generally vertical cap feed chute having a cap supporting guideway extending at the bottom end thereof, a cap advancing disc rotatably mounted adjacent the guideway and timed relative to the advancing movement of said container support conveyor to advance a cap along said guideway and into position above the

mouth of a container for deposit thereon as the container is advanced by said support conveyor, cap leveling and applying means for supporting each cap in at least an approximately level position on the mouth of a container as the container and cap assembly are advanced beyond said cap supporting guideway and for moving said cap down onto the mouth of the jar, means for engaging the top of the cap so as to rotate the cap and initially seat the same on the mouth of the container as it leaves the cap leveling and applying means, and means for finally rotating the cap to seal the same on the container.

3. In apparatus for applying rotatable closure caps onto the mouths of containers wherein the containers in single file are conveyed through the machine by a horizontally disposed bottom support conveyor and held against turning by cooperating clamping members carried on transversely spaced, endless conveyor assemblies having parallel opposed runs disposed above the container support conveyor, a generally vertical cap feed chute having its bottom end terminating at a cap supporting guideway extending in advance of the bottom end thereof, a cap engaging disc rotatably mounted on an upwardly extending axis adjacent the guideway and timed relative to the advancing movement of said container support conveyor to advance a cap across said guideway and into position above the mouth of a container for deposit thereon, said guideway supporting each cap in an approximately level position as a container moves beneath the traveling cap to receive the cap on the mouth thereof, means for holding the cap level on the container mouth as the container and cap assembly are advanced beyond said cap supporting guideway and for moving said cap down onto the mouth of the container, means for engaging the top of the cap along laterally spaced lines so as to initially rotate the cap and seat the same on the mouth of the container, and means for frictionally engaging the cap at opposite sides of the top surface and rotating the cap to seal the same on the container.

4. An apparatus for applying rotatable closure caps onto the mouths of containers wherein a single file procession of the containers is conveyed to the apparatus by conveyor means comprising a horizontally disposed, bottom support conveyor and a pair of side conveyor assemblies having container gripping members thereon which are driven at the same speed and in the same direction as the bottom support conveyor and which grip the opposite sides of the containers so as to prevent them from turning, a feed chute adapted to be filled with closure caps, means for supporting each cap in at least approximately level position as the cap is advanced from the bottom end of the feed chute and applied to the mouth of the container, a cap feeding means at the bottom end of the feed chute and acting independently of the containers for advancing each successive cap to a position where it partially telescopes the mouth of a container and to the leveling means, a hold down shoe member positioned adjacent the leveling means, drag means on the shoe member for frictionally engaging each cap on one side of the top thereof as it is held in a level position so as to cause the cap to rotate down to sealing position as it is advanced with its associated container under said drag means and means for further rotating the cap to seal the same on the container.

5. An apparatus for applying closure caps onto the mouths of containers wherein a single file procession of containers is conveyed through the apparatus and each container in turn receives a closure cap discharged from the bottom of a feed chute, said apparatus comprising means for feeding each closure cap onto the mouth of a container comprising a downwardly curved discharge end portion on the bottom of the feed chute with a track formation at the terminal end thereof which supports the caps in approximately level position, a resiliently pressed hold-down bar for urging each cap farther down onto the mouth of a container, and a cap feeding disc having a marginal portion which is notched to form pockets for the caps, said marginal portion of said disc receiving the caps from the feed chute and traveling in a path conforming to the curvature of the discharge end of the feed chute for advancing each successive cap into mouth encompassing position on an oncoming container conveyed beneath the same, said feed disc advancing each cap beyond the track formation where the cap is freed to move downwardly onto the mouth of the associated container.

6. In an apparatus for applying closure caps onto the mouths of containers wherein a single file procession of containers is conveyed through the apparatus and each container in turn receives a closure cap from the bottom of a supply chute, means for feeding each closure cap onto the mouth of a container comprising a curved discharge end on the bottom of the chute with a cap supporting guide formation at the terminal end thereof on which the cap is moved to an approximately level position, a hold-down bar pivotally supported at its leading end and having its trailing end resiliently pressed toward said guide formation so as to urge the cap in a downward direction onto the mouth of the container, and a cap feeding disc having a marginal portion which is notched to receive successive caps from the feed chute and which travels in a path conforming to the curvature of the discharge end of the feed chute for advancing each successive cap across said guide formation and onto an oncoming container conveyed beneath the same, said feed disc advancing each cap at a speed relative to the advancing container so that the cap is freed as it moves beyond the guide formation to drop down onto the mouth of the associated container and to be advanced by engagement with the container.

7. An apparatus for applying closure caps to successive traveling containers which are carried in an upright position through the apparatus by a horizontally disposed traveling conveyor and held against rotation by a parallel gripper mechanism, said apparatus comprising a cap applying and sealing head having an entrance end with a feed chute adapted to receive a supply of caps, said feed chute having its lower end terminating at a pair of laterally spaced, cap supporting rails, a notched feeding disc rotatably mounted and traveling in a path so as to advance the successive caps in timed relation to the movement of the containers to a position where the cap is aligned with an oncoming container, a cap leveling and applying mechanism adjacent the end of said cap supporting rails for seating the cap on the mouth of the container and means for preliminarily rotating the same into position for sealing, a sealing mechanism comprising a pair of sealing belts extending parallel with the path of the containers and adapted to engage the caps on opposite sides of the center thereof, means for driving the sealing belts at different speeds so as to rotate the caps into sealing position, means for driving the container carrying conveyor, means for rotating the cap feeding disc, and means for adjusting the timing of said mechanisms.

8. An apparatus for feeding closure caps and leveling and applying said caps onto successive traveling containers which are carried in a horizontal position through the apparatus by a traveling conveyor having a horizontally disposed run and which containers are held against rotation by gripper means traveling with said container carrying conveyor, said apparatus comprising a cap applying and sealing head having an entrance end and a feed chute adapted to receive a supply of caps at said entrance end, said feed chute having its lower end terminating in a pair of laterally spaced, horizontal guide rails, a rotatably mounted notched feeding disc for advancing the successive caps in timed relation to the movement of the containers so as to align each cap with an oncoming container, a cap leveling and applying mechanism adjacent the end of said guide rails for seating each cap on the mouth of a container and preliminarily rotat-

ing the same into position for sealing, a sealing mechanism comprising a pair of sealing belts which travel at different speeds and extend parallel with the path of the containers and which are positioned to engage the caps on opposite sides of the center of the top surface thereof, a single power drive means for the container carrying conveyor, the cap feeding disc and the sealing belts, and means for adjustably connecting the power means with said container carrying conveyor, said cap feeding disc and said sealing belts.

9. An apparatus for applying rotatable closure caps onto the mouths of containers wherein a single file procession of the containers is carried through the apparatus by conveyor means comprising a horizontally disposed bottom support conveyor and a pair of side conveyor assemblies having container gripping members thereon which are driven at the same speed and direction as the bottom support conveyor and which resiliently grip the opposite sides of the containers at spaced points thereon so as to prevent them from turning, a generally vertical feed chute adapted to be filled with closure caps, a leveling means for supporting each cap in at least approximately level poistion on the mouth of a container as the cap is advanced from the bottom end of the feed chute and applied to the mouth of the container, a cap engaging means mounted at the bottom end of the feed chute which operates independently of the container conveying means for advancing each successive cap to a position where it is aligned with the mouth of a container and for delivering the cap beneath the leveling means which levels the cap while allowing the cap to move down onto the container for subsequent engagement by the container, a hold-down shoe member poistioned adjacent the leveling means, drag means on the shoe member for frictionally engaging each cap on one side of the top thereof as it is held down in a level position so as to cause the cap to rotate down to sealing position as it is carried with its associated container under said drag means and means for further rotating the cap to seal the same on the container comprising a pair of sealing belts which are operated at different speeds and which engage at opposite sides of the top surface of the cap.

10. An apparatus as recited in claim 9, and said means for rotating the cap to seal the same on the container comprising a pressure shoe having belt receiving guideways on the lower face and resilient means urging the shoe downwardly.

11. In apparatus for applying rotatable closure caps onto the mouths of containers wherein the containers in single file are conveyed through the machine in upright position by a bottom support conveyor and held against turning by cooperating clamping elements carried on transversely spaced conveyor assemblies having parallel opposed runs disposed above the container support conveyor, a generally vertical feed chute for closure caps having a cap supporting guideway extending at the bottom end thereof, a cap feeding means mounted adjacent the guideway and timed relative to the advancing movement of said container support conveyor to feed a cap onto the mouth of each successive container, cap leveling and applying means for supporting each cap in at least an approximately level position as it is moved onto the mouth of a container and thereafter advanced beyond said cap supporting guideway and for moving said cap farther down onto the mouth of the container, means for engaging the top of the cap and initially rotating the cap to seat the same on the mouth of the container as it leaves the cap leveling and applying means, and a pair of endless traveling belts having lower runs generally parallel with the container support conveyor and positioned to engage on opposite sides of the top surface of the cap, said belts being operated at different speeds for finally rotating the cap to seal the same on the container.

12. In an apparatus as recited in claim 11, and a pressure applying shoe associated with the lower runs of said sealing belts which shoe is mounted on vertically movable supports having compression springs which are adjustable to urge the shoe downwardly and force the belts against the top surface of the caps with resilient pressure.

13. In an apparatus as recited in claim 12, and said pressure applying shoe being formed in two sections which are connected by a longitudinally extending pivot so that the shoe sections may move relative to each other about a longitudinal axis.

14. In an apparatus for applying rotatable closure caps onto the mouths of containers wherein the containers in single file are conveyed through the apparatus by a horizontally disposed bottom support conveyor and the containers are held against rotation by conveyor carried side clamping elements which are driven at the same speed as the container support conveyor and wherein the mouth of each container in turn receives a closure cap advanced from the bottom end of an overhead feed chute, a downwardly curved portion on the bottom end of the feed chute terminating in laterally spaced side rails which are arranged to support each cap from the underside in a level position, and a cap leveling and applying means which comprises a horizontally disposed shoe, a parallel linkage supporting said shoe and spring means urging said shoe to a downward position at the end of the support rails, said shoe having a magnet therein for releasably gripping the top of the cap as it moves beneath the same, means including a pocketed wheel for advancing the cap over the support rails to a position beneath the shoe in timed relation to the movement of an oncoming container which is brought into vertical alignment beneath the cap, a second cap top engaging shoe, a pivoted arm supporting said second shoe, resilient means urging said second shoe in a downward direction, a drag member on said second shoe positioned for engaging one side of the top of the cap so as to rotate the cap down to a preliminary sealing position as it is advanced with its associated container under said second shoe, a third cap top engaging shoe, a pivoted arm supporting said third shoe and resilient means urging said third shoe in a downward direction for frictionally engaging the top surface of the cap and a drag member on said third shoe positioned for engaging the top of the cap at one side thereof to rotate the cap so that it is fully seated on the mouth of the container for final sealing thereon.

15. In an apparatus as recited in claim 14 and said cap leveling and applying shoe overlapping the leading ends of said cap support rails.

16. A machine for rapidly feeding and applying closure caps to a rapidly moving file of upright containers, means for feeding successive caps in a downwardly curved path onto the tops of the containers, means for leveling the caps as they are advanced by said feeding means so that each cap is disposed by operation of the feeding means in telescoping relation and in substantially level position on the container top while the cap and container are advanced independently of each other into vertical alignment, means for applying the caps to the containers while they are in leveled position and advancing in vertically aligned relation, said caps being released by said cap feeding means and advanced after their application by engagement of the containers with the caps, means for preliminarily forcing the caps into proper position for sealing, and means for thereafter forcing the caps downwardly into fully sealed position on the containers.

17. A machine for applying and sealing closure caps onto the mouths of containers comprising a base having an endless conveyor for supporting and advancing the containers in upright, uniformly spaced, file forming relation, a cap applying and sealing head structure mounted for vertical adjustment above said conveyor, said head structure having a downwardly inclined cap supply chute with an open sided bottom end which provides a curved guideway for guiding caps into a path above the container support conveyor, a rotatable feed disc having cap receiv-

ing pockets for advancing caps on the bottom end of said supply chute, a cap leveling and applying apparatus mounted on the head structure and having tracks for supporting the caps as they are advanced thereto from said chute, and said cap leveling and applying structure having an opening in a side thereof extending along said cap supporting tracks for accommodating the pocketed portion of said cap feed disc and means for holding the caps on said supporting tracks as they are advanced by said feed disc.

18. An apparatus for applying closure caps onto the mouths of containers wherein a single file procession of containers is carried by an endless conveyor through the apparatus and each container in turn receives a closure cap discharged from the bottom of a feed chute, means for feeding each closure cap onto the mouth of a container comprising an end portion on the bottom of the feed chute with a track formation at the bottom end thereof which curves downwardly and laterally of the path of movement of the containers and which guides the caps into the path of the containers in an approximately level position, a resiliently pressed means for urging each cap farther down onto the mouth of an oncoming container, and a cap feeding disc having a marginal portion which is cut out to form pockets for the caps, said marginal portion of said disc receiving the caps from the feed chute and traveling in a path conforming to the curvature of the guideway forming track at the discharge end of the feed chute for advancing each successive cap onto the mouth of an oncoming container conveyed beneath the same, said feed disc advancing each cap beyond the track formation where the cap is freed to move downwardly onto the mouth of the associated container.

19. An apparatus as recited in claim 18, and a common drive means connected to the container conveyor and the cap feeding disc with means for adjusting the timing of the operation thereof.

20. In an apparatus for applying rotatable closure caps onto the mouths of containers wherein the containers are conveyed in single file through the apparatus by a continuously traveling horizontal bottom support conveyor and the containers are held against rotation by conveyor carried clamping elements driven at the same speed as the container support conveyor and wherein the mouth of each container in turn receives a closure cap advanced from the bottom end of a feed chute, means forming a downwardly curved guideway at the bottom end of the feed chute which terminates in laterally spaced guide rails which support each cap from the underside in a substantially level position, and means for applying the cap to the mouth of the container in generally level position which comprises a horizontally disposed shoe, a parallel linkage supporting said shoe for vertical movement while holding the shoe substantially level and spring means urging said shoe to a downward position at the end of said guide rails, said shoe having a magnet for releasably gripping the top surface of the cap as it moves beneath the same, means acting independently of the containers for advancing the cap out of the chute and over the rails to a position beneath the shoe in timed relation to the movement of a container which is brought into vertical alignment immediately beneath the cap by said support conveyor, a second cap top engaging shoe, a pivoted arm supporting said second shoe, resilient means urging said second shoe in a downward direction, a drag member on said second shoe positioned for engaging one side of the top of the cap so as to rotate the cap down to a preliminary sealing position as it is conveyed with its associated container under said second shoe, and means to rotate the cap so that it is fully seated on the mouth of the container in final sealed relation thereon.

21. In an apparatus for applying rotatable closure caps onto the mouths of containers wherein the containers in single file are conveyed through the apparatus by a continuously traveling horizontal bottom support conveyor and the containers are held against rotation by conveyor carried clamping elements driven at the same speed as the container support conveyor and wherein the mouth of each container in turn receives a closure cap advanced from the bottom end of a feed chute, means forming a downwardly curved cap guideway on the bottom end of the feed chute which terminates in laterally spaced rails for supporting each cap from the underside in substantially level position, a horizontally disposed shoe, a parallel linkage supporting said shoe and means resiliently urging said shoe to a downward position adjacent the end of the support rails, said shoe having means for releasably gripping the cap as it moves beneath the same, means including a rotatably mounted pocketed disc for advancing each successive cap onto the rails and beneath the shoe in timed relation to the movement of a container which is advanced beneath the cap by said support conveyor and positioned to receive the cap for further advance with said container, a second shoe, a pivotally mounted arm supporting said second shoe, means urging said second shoe in a downward direction, a drag means on said second shoe engaging one side of the top of the advancing cap so as to rotate the cap down to a preliminary sealing position as it is conveyed with its associated container under said second shoe, a pair of longitudinally extending sealing belts mounted on end supports and driven at speeds which are slower and faster, respectively, than the speed of the container support conveyor, and a pressure shoe engaging the tops of said belts and urging them in a downward direction for frictionally engaging the top surface of the cap so as to rotate the cap into fully seated final sealing position.

22. An apparatus for leveling and applying closure caps to successive traveling containers which are carried in a horizontal position through the apparatus by a horizontally disposed traveling conveyor, said apparatus comprising a cap applying and sealing head comprising a downwardly opening housing disposed above said container conveyor, means forming steam distributing chambers in the top of said housing, a feed chute adapted to receive a supply of caps at the entrance end of the head with the lower end of the chute terminating in a pair of laterally spaced guide rails below one of said steam chambers, a feeding disc for advancing the successive caps in timed relation to the movement of the containers so as to place each cap onto the mouth of an oncoming container, a cap leveling and applying mechanism mounted in said housing adjacent the end of said feed chute for seating the cap on the mouth of the container and rotating the same into position for sealing, said leveling and applying mechanism extending beneath said steam chambers and said steam chambers having steam outlets along the path of the container tops so as to supply steam to the tops of the containers and caps during the application of the caps to the containers.

23. An apparatus as recited in claim 22, and an exhaust apparatus mounted at one end of said housing and having connections at both ends thereof for withdrawing air and excess steam from the cap applying and sealing areas beneath said housing.

24. A machine for applying and sealing closure caps onto the mouths of containers comprising a base having a traveling conveyor for supporting and advancing the containers in upright, uniformly spaced, file forming relation, a cap applying and sealing head structure mounted above said base, said sealing head having a cap feeding mechanism at an entrance forming end thereof and a cap sealing mechanism at a discharge forming end thereof, a readily removable and replaceable cap leveling and applying device comprising a generally rectangular frame, a cap supporting guideway extending lengthwise along the bottom of said frame, said frame having a longitudinally extending slot-like opening in the one side thereof along said guideway, tracks on the head structure for supporting said cap leveling and applying device, and said

cap feeding mechanism comprising a rotatably mounted feed wheel adjacent the entrance forming end of said sealing head, said feed wheel extending into the opening in the side of said cap leveling and applying device and having peripherally spaced pockets for feeding caps onto said guideway.

25. In an apparatus for applying caps to containers wherein the caps are fed into the apparatus by a rotating disc having cap receiving pockets on its periphery: a feed chute with its longitudinal axis inclined from the horizontal and arranged to receive caps in processional order in flange abutting, sliding relationship, said feed chute having a lower exit end adjacent the periphery of the rotating disc for dispensing caps into the pockets thereof, said feed chute longitudinal axis at the exit end being parallel to and substantially between a radial plane of the rotating disc and a plane parallel to the radial plane and tangent to the arc described by the outer points of the caps as the caps are revolved in the pockets of the rotating disc.

26. In an apparatus for applying rotatable closure caps onto the mouths of containers wherein the containers are conveyed in single file through the apparatus by a horizontal bottom support conveyor and the containers are held against rotation by conveyor carried clamping elements driven at the same speed as the container support conveyor and wherein the mouth of each container in turn receives a closure cap from a downwardly curved portion on the lower end of a cap feed chute which terminates in laterally spaced rails which support each cap from the underside in a level position, a cap top engaging means adjacent the end of the rails which comprises a horizontally disposed shoe carried on the end of a parallel linkage and resiliently urged downward, said shoe having means for releasably gripping the cap as it moves beneath the same, means acting independently of the container support conveyor for advancing the cap over the rails to a position beneath the shoe in timed relation to the movement of a container which is advanced into vertical alignment beneath the cap for receiving the cap from said cap top engaging means, and a cap rotating shoe mounted on the end of a pivoted arm in advance of said cap top engaging means and having spring means for urging the same in a downward direction, a drag member on said cap rotating shoe for engaging the top of the cap at one side thereof so as to rotate the cap down to a preliminary sealing position as it is advanced with its associated container under said cap rotating shoe, said cap rotating shoe having its spring means adjusted so as to resiliently urge said shoe into frictional engagement with the top of the cap and render its drag member effective for turning the cap.

27. In an apparatus for applying rotatable closure caps onto the mouths of containers wherein the containers in single file are conveyed through the machine by a horizontally disposed bottom support conveyor and held against turning by cooperating clamping elements carried on transversely spaced endless conveyor assemblies having parallel opposed runs disposed above the container support conveyor, an upwardly extending feed chute for closure caps having a cap supporting guideway at the bottom end thereof, a cap feeding disc rotatably mounted adjacent the guideway and at one side of the path of travel of the containers, said disc being timed relative to the advancing movement of said container support conveyor to feed a cap into the path of travel of the containers and in vertical alignment with the mouth of an oncoming container for deposit thereon and said disc having peripherally spaced, cap receiving pockets which are open at the leading sides thereof so as to permit the caps to advance with the containers without interference with the continued rotation of said disc.

28. In a machine for rapidly feeding and applying rotatable closure caps to a rapidly moving file of upright containers, the caps and containers having telescoping portions with cooperating thread-like members which interlock upon rotation of the cap on the mouth of the container and force the cap down onto the container, means for feeding each successive cap into a position where it encompasses the top of a container, means for leveling the caps as they are moved by said feeding means into said container top encompassing position so that each cap is substantially level thereby to permit movement downwardly on the mouth of the container, means for holding the caps on the containers in leveled position for further advance with the containers, means for preliminarily turning each cap to proper sealing position irrespective of the initial relative position of the thread-like members on a cap and its associated container, sealing means for thereafter rotating the caps downwardly to fully seated and sealed position on the containers and a cocked cap sensing member in the path of the containers between the cap applying and leveling means and said sealing means, which sensing member is connected to a control switch for actuating a mechanism to remove from the machine a container on which the cap is cocked.

29. In an apparatus for applying rotatable closure caps onto the mouths of containers wherein a single file procession of the containers is conveyed to the apparatus by conveyor means comprising a horizontally disposed bottom support conveyor and a pair of side conveyor assemblies having container gripping members thereon which are driven at the same speed and in the same direction as the bottom support conveyor and which grip the opposite sides of the containers so as to prevent them from turning, an upwardly extending feed chute adapted to be filled with closure caps, guide means at the bottom end of said feed chute for supporting each cap and bringing it into approximately level position as it is advanced, a cap feeding means acting independently of said container support conveyor at the bottom end of the feed chute for advancing each successive cap over said guide means to a position where it encompasses the top of a container and thereafter is further advanced by engagement with said contaner, and a duck bill mounted in overlapping relation at the leading end of said guide means and resiliently urged in a downward direction for engaging on the top of the cap to move the cap down onto the container while holding the cap in a level position thereon.

30. In an apparatus for applying rotatable closure caps onto the mouths of containers wherein a single file procession of the containers is moved through the apparatus by a horizontally disposed bottom support conveyor and a pair of side conveyor assemblies having container gripping members thereon which are driven at the same speed and in the same direction as the bottom support conveyor and which grip the opposite sides of the containers so as to prevent them from turning, an upwardly inclined feed chute adapted to be filled with closure caps, means for supporting each cap in at least approximately level position on the mouth of a container as the cap is advanced from the bottom end of the feed chute and applied to the mouth of the container and a cap feeding disc mounted at the bottom end of the feed chute along the side of the container conveyor for advancing each successive cap onto the mouth of a container, said disc having peripherally spaced pockets which move through the end of said feed chute to receive the caps and advance the caps in a circular path to the containers, said disc and said feed chute being arranged relative to the path of movement of said containers so that the axis of the feed chute, at least at the lower end thereof, is located generally midway between and parallel to a radial plane through the disc axis and perpendicular to the disc and a plane parallel to the radial plane and tangent to the center point arc of the caps in the pockets of the disc with the path of travel of said containers being in a plane tangent to the center point arc of the caps in the disc.

31. A machine for rapidly feeding and applying rotatable closure caps to a rapidly moving file of upright con-

tainers, the caps and containers having telescoping portions with cooperating members which interlock upon rotation of the cap on the mouth of the container, said machine comprising means for advancing the containers in upright single file relation, means acting independently of the containers for feeding successive caps into vertically aligned, partially telescoping position on the tops of the containers, means for leveling the caps as they are advanced by said feeding means so that each cap encompasses the mouth of a container in substantially level position when it is released by said feeding means and initially engaged by the container for further advance with the container and downward movement thereon to engage said interlocking members, means for preliminarily turning the caps to proper sealing position irrespective of the initial relative positions of the interlocking members on a cap and its associated container, and means for thereafter rotating the caps to fully seated and sealed position on the containers.

32. A machine as recited in claim 31, and means for holding the containers against turning comprising transversely spaced, endless conveyor assemblies mounted for movement in a horizontal plane disposed above the container advancing means and having parallel opposed runs, a series of container gripper devices mounted in spaced relation on each assembly, each of said gripper devices arranged to extend between and engage two successive containers and to co-operate with like gripper devices on the opposite assembly so that each container is engaged by four of said gripper devices at four peripherally spaced points, one of said assemblies having the receiving end thereof extended and offset outwardly of the path of travel of the containers so that the gripper devices at said receiving end move on a path which is inclined inwardly toward the containers as they advance in timed relation therewith whereby said containers are engaged by the gripper devices thereon and centered between successive pairs of said gripper devices for movement into engagement with the gripper devices on the other one of said assemblies.

33. A machine as recited in claim 31, and container gripping apparatus comprising a pair of laterally spaced, horizontally disposed side conveyors adjustably mounted above said container advancing means and having opposed runs between which the containers travel, co-operating container gripping members mounted in spaced relation along said side conveyors, said side conveyors being driven at the same speed and in the same direction as said container conveyor and said gripping members each having a pair of surfaces which are in vertical planes converging in the direction outwardly of the path of travel of the conveyor on which the gripping member is mounted and which are disposed so that when the grippers are traveling between opposed conveyor runs each gripper member extends between successive containers with the vertical surfaces engaging the sides of said successive containers and with each surface in transversely aligned relation with a corresponding surface of a gripper on the opposite conveyor whereby each container is engaged by four gripper members at four peripherally spaced points so as to center the containers between successive pairs of gripping members and to grip the containers with sufficient pressure to prevent them from turning while they are advanced between said opposed runs.

34. In an apparatus as recited in claim 33, and said side conveyors comprising endless chains mounted on supporting end sprockets and a plurality of spring pressed sprockets spaced along the opposed runs of the chains for resiliently urging the container gripping members into engagement with the containers.

35. A machine for rapidly feeding and applying rotatable closure caps to a rapidly moving file of upright containers which caps and containers have telescoping rim and mouth portions with cooperating thread-like members which interlock upon rotation of the caps on the mouth of the container and force the cap down onto the container, said machine comprising means for advancing the containers, cap feeding means acting independently of the containers for engaging each successive cap and moving it into vertically aligned and partially telescoping relation on the top of a moving container, means for leveling the caps as they are moved by said feeding means into said aligned position so that said caps are substantially level when initially engaged by the containers, means for holding the caps on the containers in leveled position for further advance with the containers, means for preliminarily turning each cap to proper sealing position irrespective of the initial relative position of the thread-like members on a cap and its associated container, and sealing means for thereafter rotating the caps downwardly to fully seated and sealed position on the containers.

36. A machine for rapidly feeding and applying rotatable closure caps to a rapidly moving file of upright containers, the caps and containers having cooperating members which interengage and force the caps downwardly upon rotation of the caps on the containers, said machine comprising means acting independently of the containers for advancing each successive cap into partially telescoping relation on the mouth of a container, means for supporting the caps as they are advanced by said feeding means into alignment with said containers so that the caps are presented in substantially level position when they are initially engaged by the containers and thereafter moved downwardly onto the mouth of the container, means for holding the caps in substantially leveled position for further advance by engagement of the container with the rim of the cap, means for preliminarily turning the caps to proper sealing position irrespective of the initial relative position of a cap on its associated container, and means for thereafter rotating the caps to fully seated and sealed position on the containers.

37. A machine for applying and sealing closure caps onto the mouths of containers comprising a base frame having a traveling conveyor for supporting and advancing the containers in upright, uniformly spaced, file forming relation, a cap applying and sealing structure including a supporting frame mounted for vertical adjustment above said traveling conveyor, said sealing head structure having mechanism at an entrance forming end thereof for engaging and advancing successive caps independently of the containers and in a path above the containers and having a cap sealing mechanism at a discharge forming end thereof, a cap leveling and applying apparatus mounted on a separate supporting frame, track means extending transversely of the supporting frame for said head structure between the entrance and discharge forming ends thereof, means on the supporting frame of said cap leveling and applying apparatus co-operating with said track means for removably mounting said cap leveling and applying apparatus thereby permitting ready removal and replacement of said cap leveling and applying apparatus as a unit.

38. A machine as recited in claim 37, and means for centering said cap leveling and applying apparatus as a unit relative to the path of movement of the caps through said head structure and to align the same above the path of movement of the containers.

39. In a machine for high speed application and sealing of closure caps onto the mouths of aligned traveling containers, a continuously traveling conveyor for supporting and advancing containers in an upright position, a continuously traveling gripper mechanism for engaging containers so as to hold them against axial rotation, a chute extending above the traveling container for receiving a supply of caps and having its bottom end terminating above the path of travel of the tops of the containers, side edge guiding and supporting means extending from the bottom end of said chute in which the caps are advanced, a cap feeding mechanism at the bottom end of said chute, means for operating said cap feeding mecha-

nism independently of the container conveyor and in timed relation to the advancing movement of the containers, said cap feeding mechanism engaging each successive cap and advancing it out of the bottom end of the chute and along said cap guiding and supporting means to a point where the cap is positioned on a container aligned beneath the same, cap leveling means at the leading end of said side edge guiding and supporting means for engaging the top of each successive cap so as to level the cap, and means in advance of said cap leveling means for supporting the cap in a substantial level position as it is advanced beyond the point where it is positioned on the container.

40. In a machine for high speed application and sealing of closure caps onto the mouths of a line of traveling containers, a continuously traveling conveyor for supporting and advancing the containers in an upright position, a continuously traveling gripper mechanism for engaging the containers so as to hold them against axial rotation, a chute for receiving a supply of caps which chute has its bottom end terminating above the path of travel of the tops of the containers, cap guiding and supporting means extending from the bottom end of said chute, a cap feeding mechanism acting independently of the containers for moving each successive cap from the bottom of the chute along said guiding and supporting means in timed relation to the movement of the container so as to deposit the cap in substantially level position on the container, and means for supporting the cap in a substantially level position as it is advanced beyond the point where it is deposited on the container comprising a relatively small plate-like member for engaging the cap, a swinging arm for supporting the plate-like member, a spring urging the plate-like member in a downward direction, and a magnet for drawing the cap against the bottom surface of the plate-like member.

References Cited in the file of this patent

UNITED STATES PATENTS

1,835,335	Risser	Dec. 8, 1931
2,357,826	Hohl	Sept. 12, 1944
2,364,523	Gantzer	Dec. 5, 1944
2,440,030	Thomas	Apr. 20, 1948
2,618,426	Stover	Nov. 18, 1952
2,876,605	McElroy et al.	Mar. 10, 1959

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,143,835 August 11, 1964

Robert K. McElroy et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 6, line 20, for "an" read -- and --; column 12, line 65, for "posiitoned" read -- positioned --; column 15, line 27, for "aparatus" read -- apparatus --; column 17, lines 58 and 59, for "centerig" read -- centering --; line 70, for "and", first occurrence, read -- on --; column 19, lines 38 and 39, strike out "where each successive cap C onto the guide rails 157 and 158"; column 28, lines 39 and 40, for "contaner" read -- container --.

Signed and sealed this 8th day of December 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
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