Oct. 1, 1968 E. K. RITTERHOFF 3,404,059

APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 1

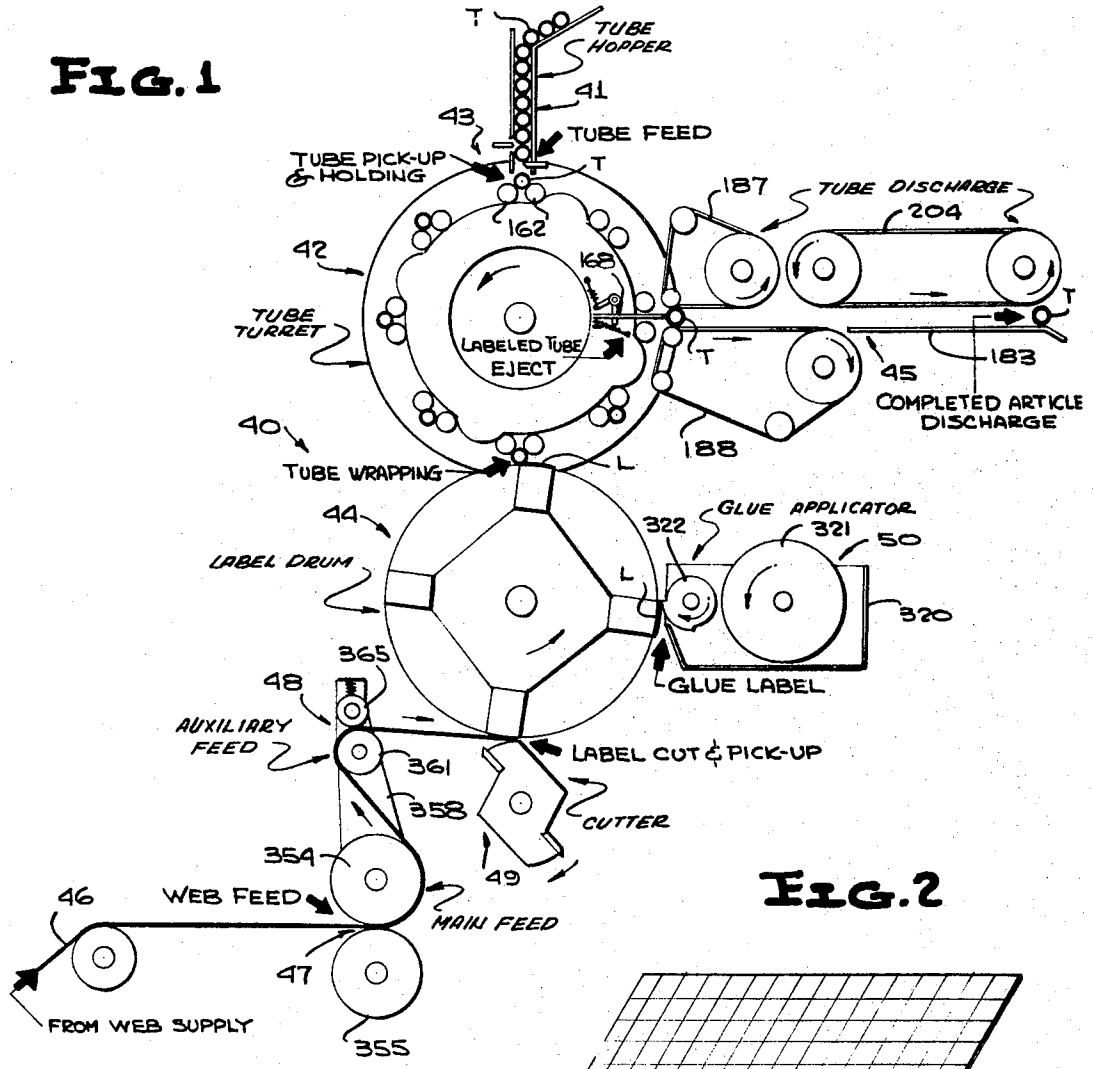


FIG. 2

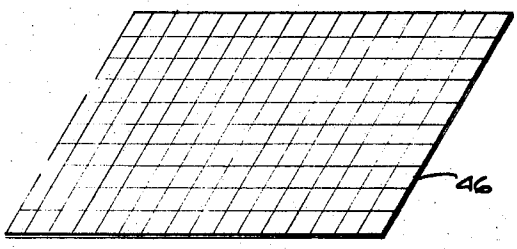


FIG. 3

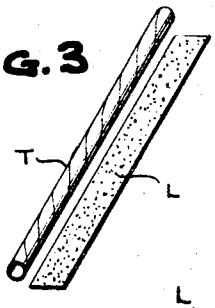
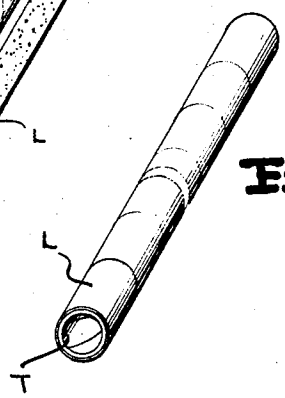


FIG. 4



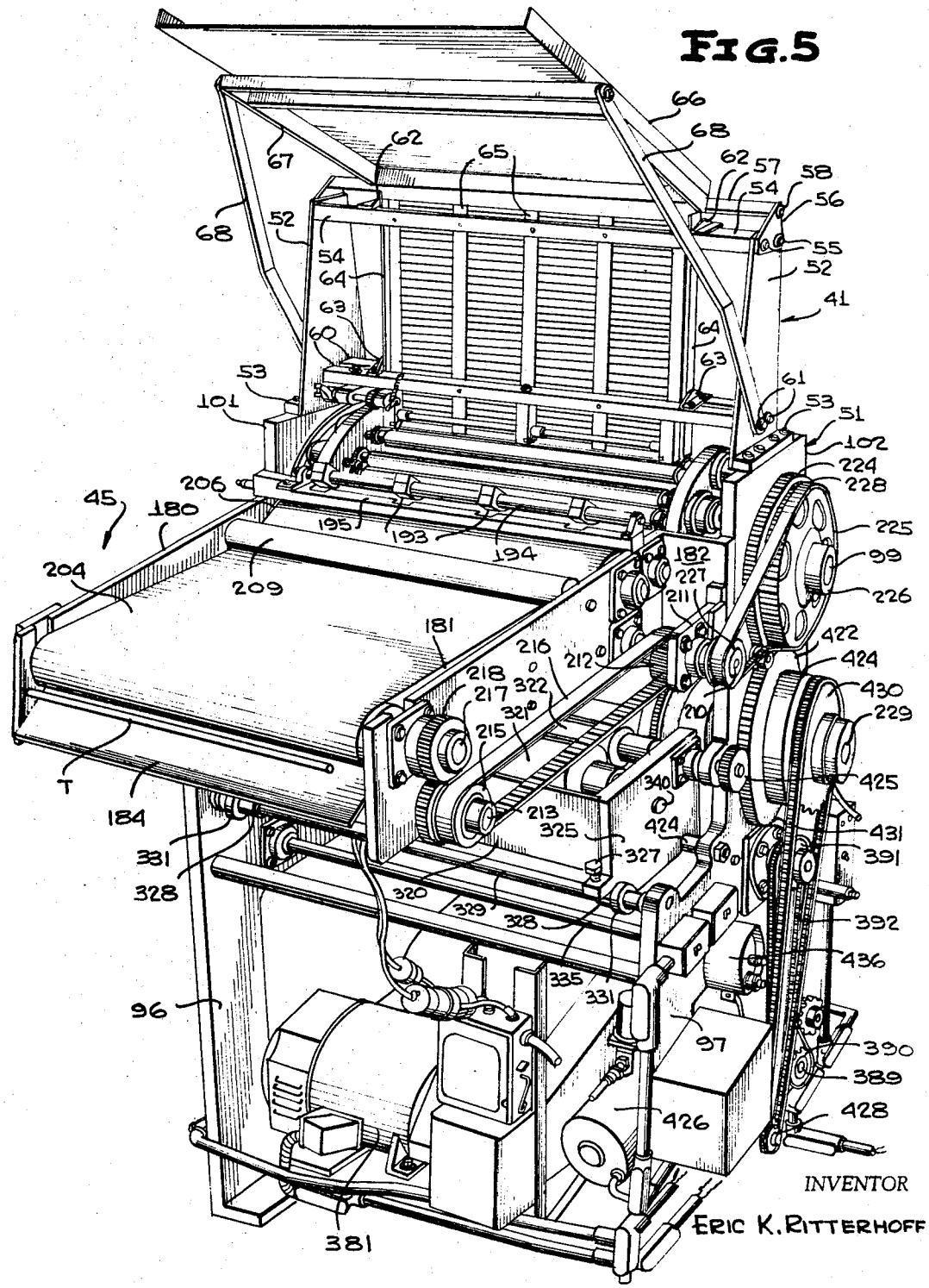
INVENTOR.
ERIC K. RITTERHOFF
BY
Mason, Porter, Miller & Stewart
ATTORNEYS

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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 5



INVENTOR
ERIC K. RITTERHOFF

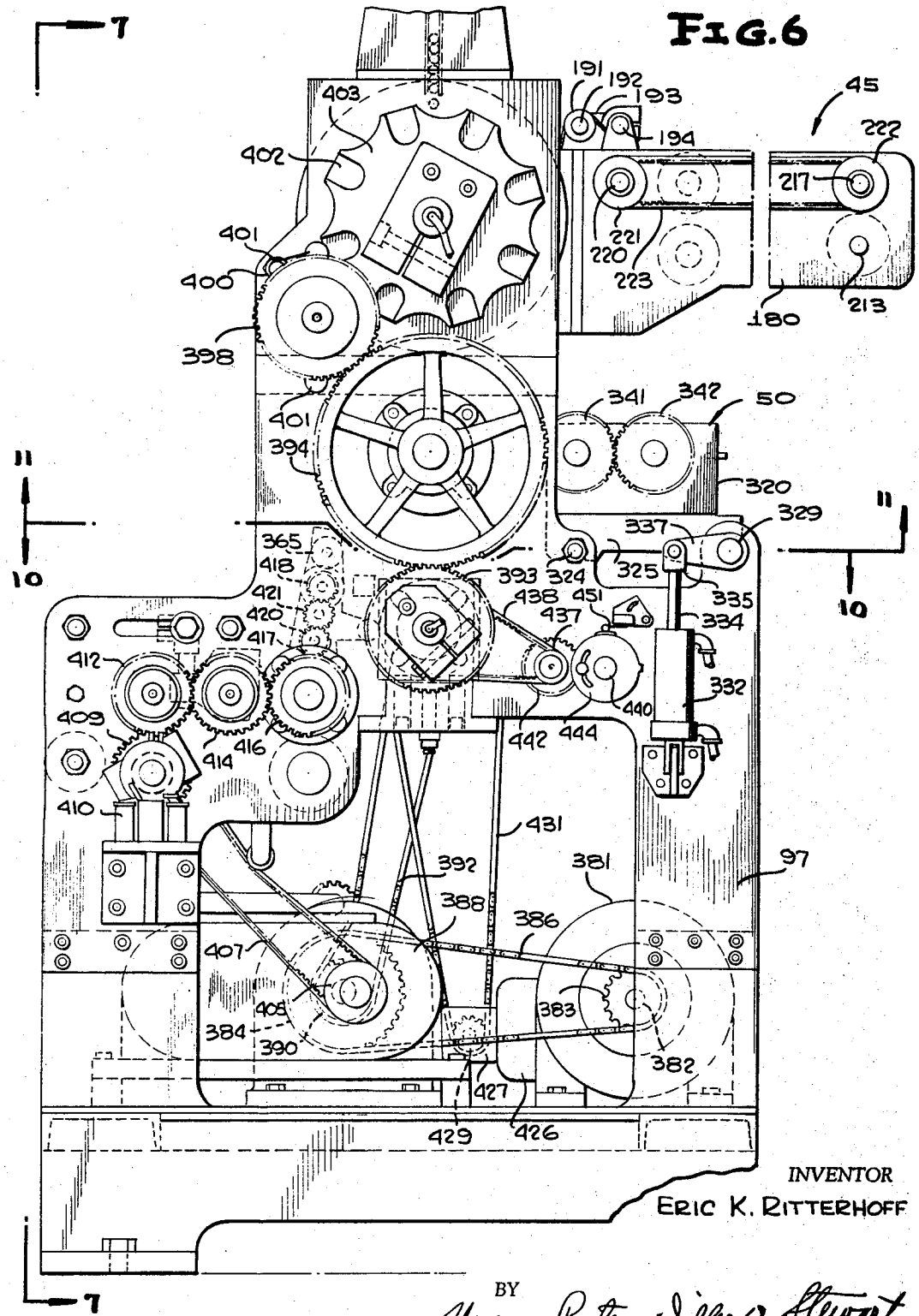
BY
Mason, Porter, Miller & Stewart
ATTORNEYS

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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 6



INVENTOR
ERIC K. RITTERHOFF

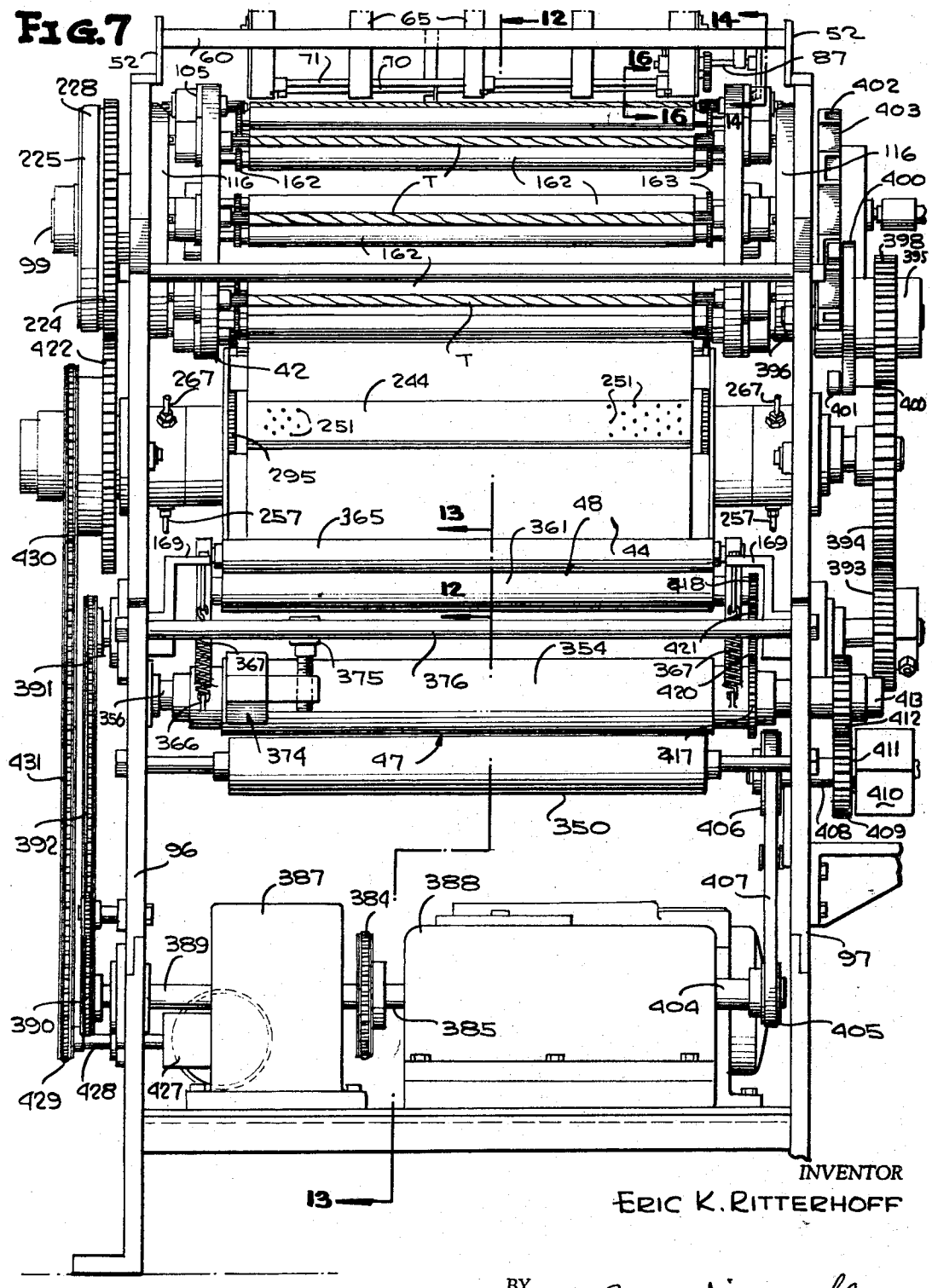
BY
Mason, Porter, Dillar & Stewart
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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 7



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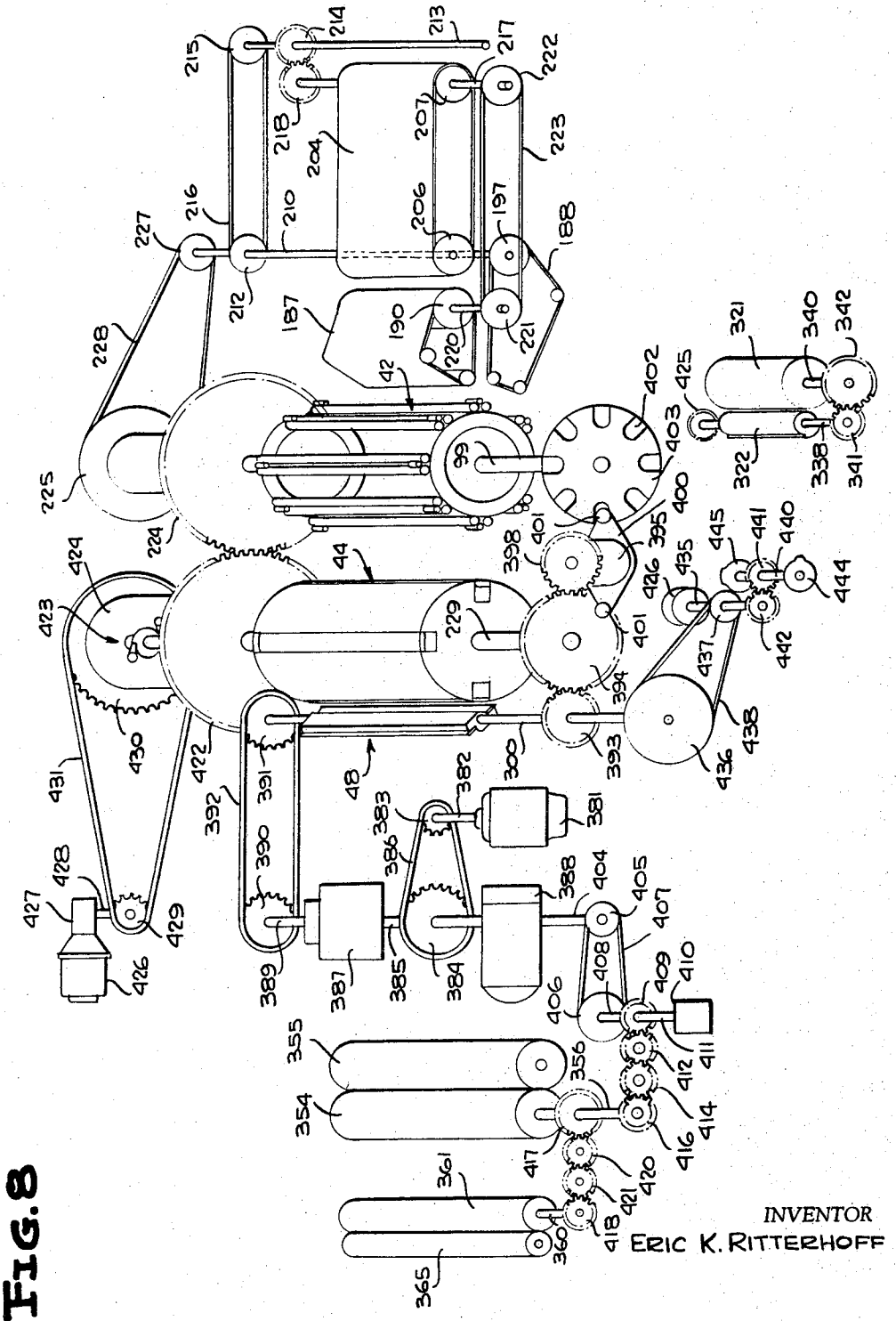


FIG. 8

INVENTOR
ERIC K. RITTERHOFF

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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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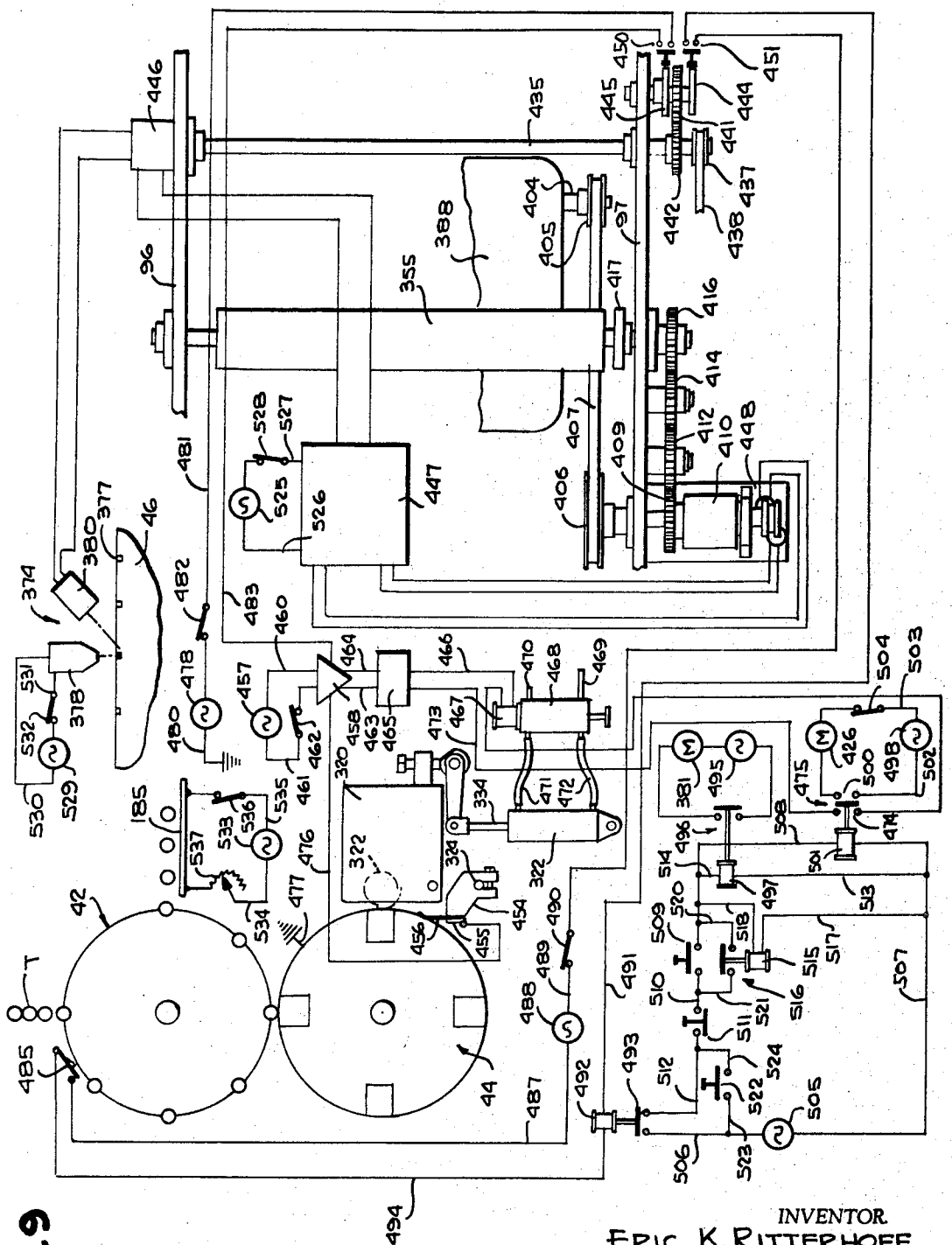


FIG. 9

INVENTOR
ERIC K. RITTERHOFF
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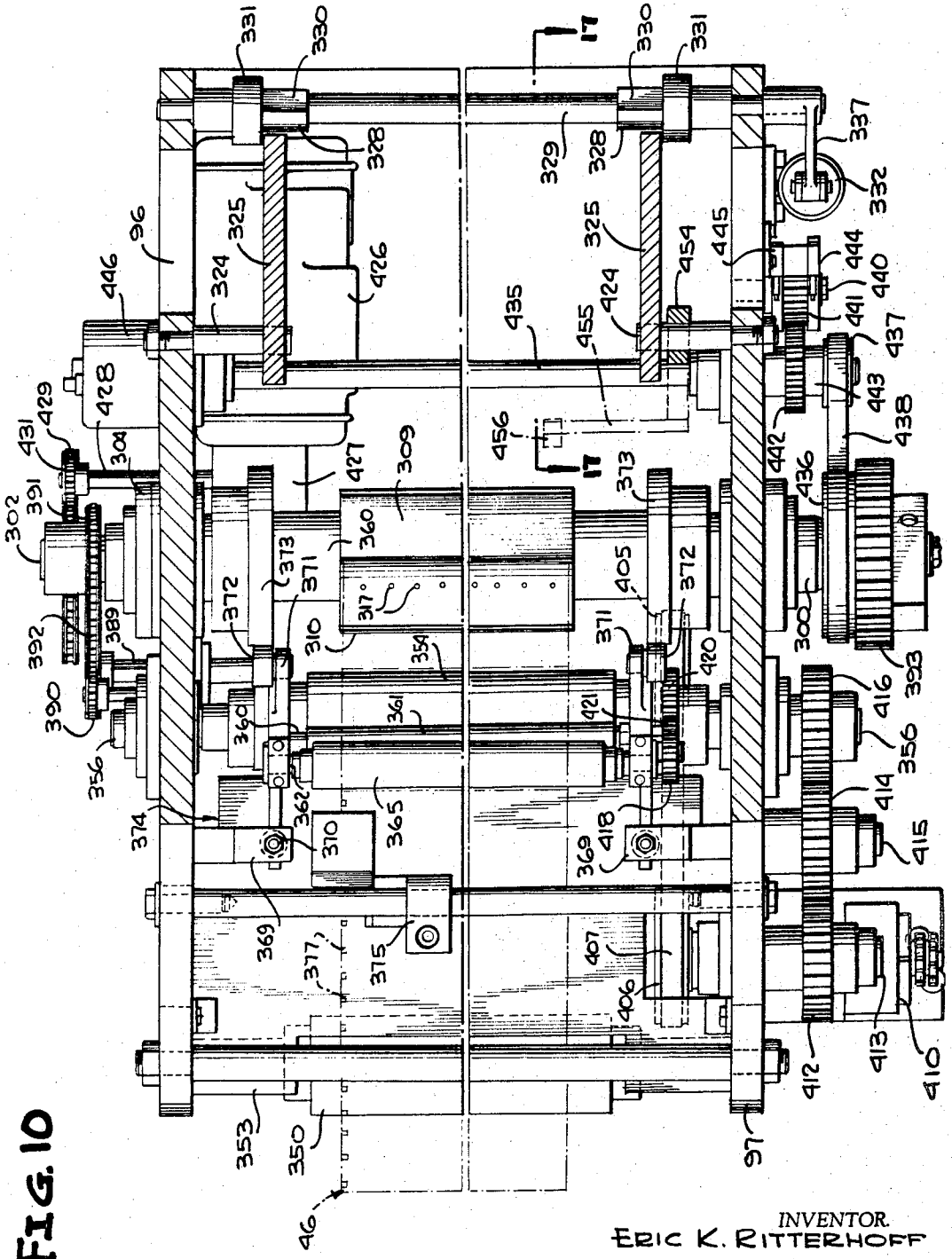


FIG. 10

INVENTOR.
ERIC K. RITTERHOFF

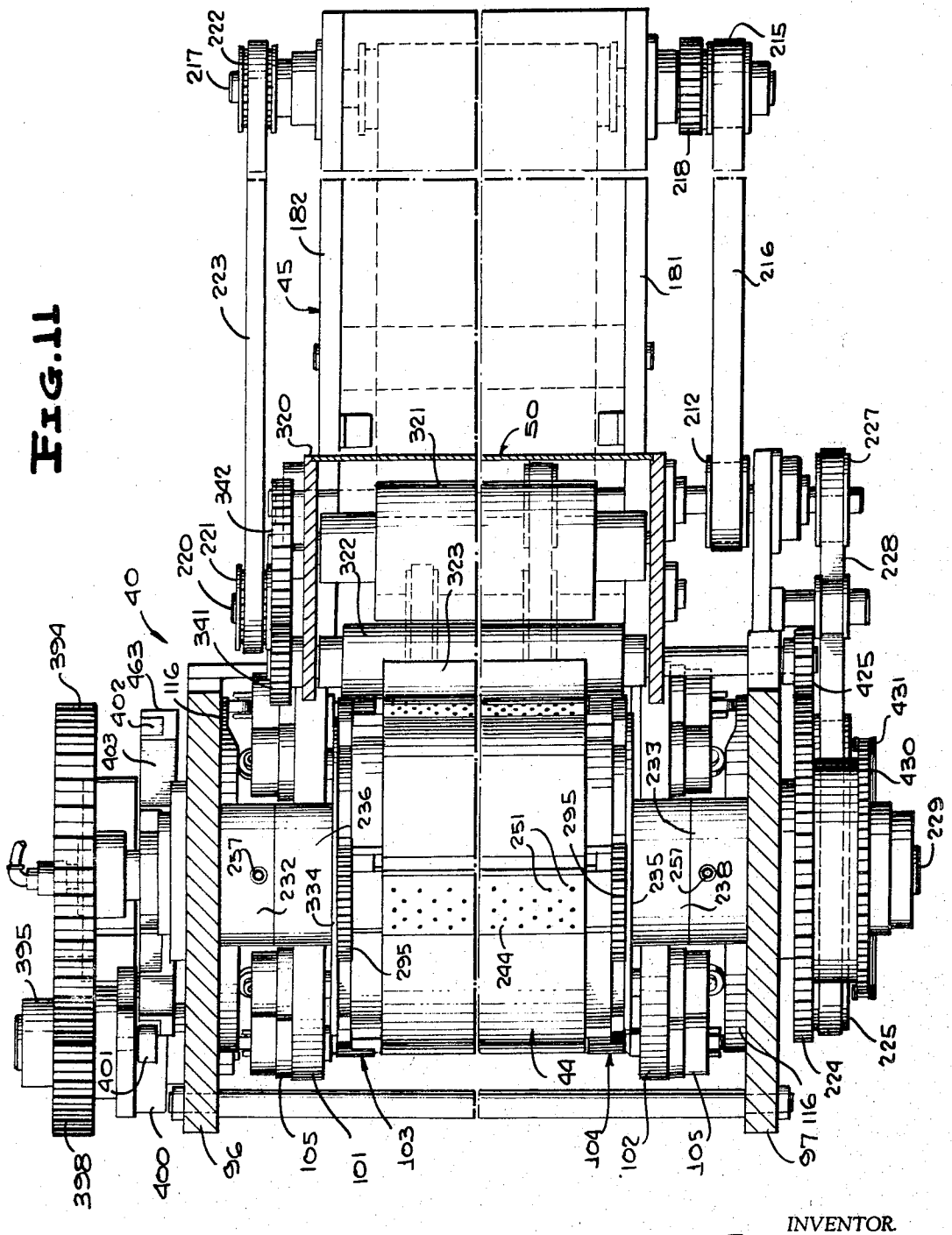
BY

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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 11



INVENTOR.
ERIC K. RITTERHOFF

BY

Mason, Porter, Miller & Stewart

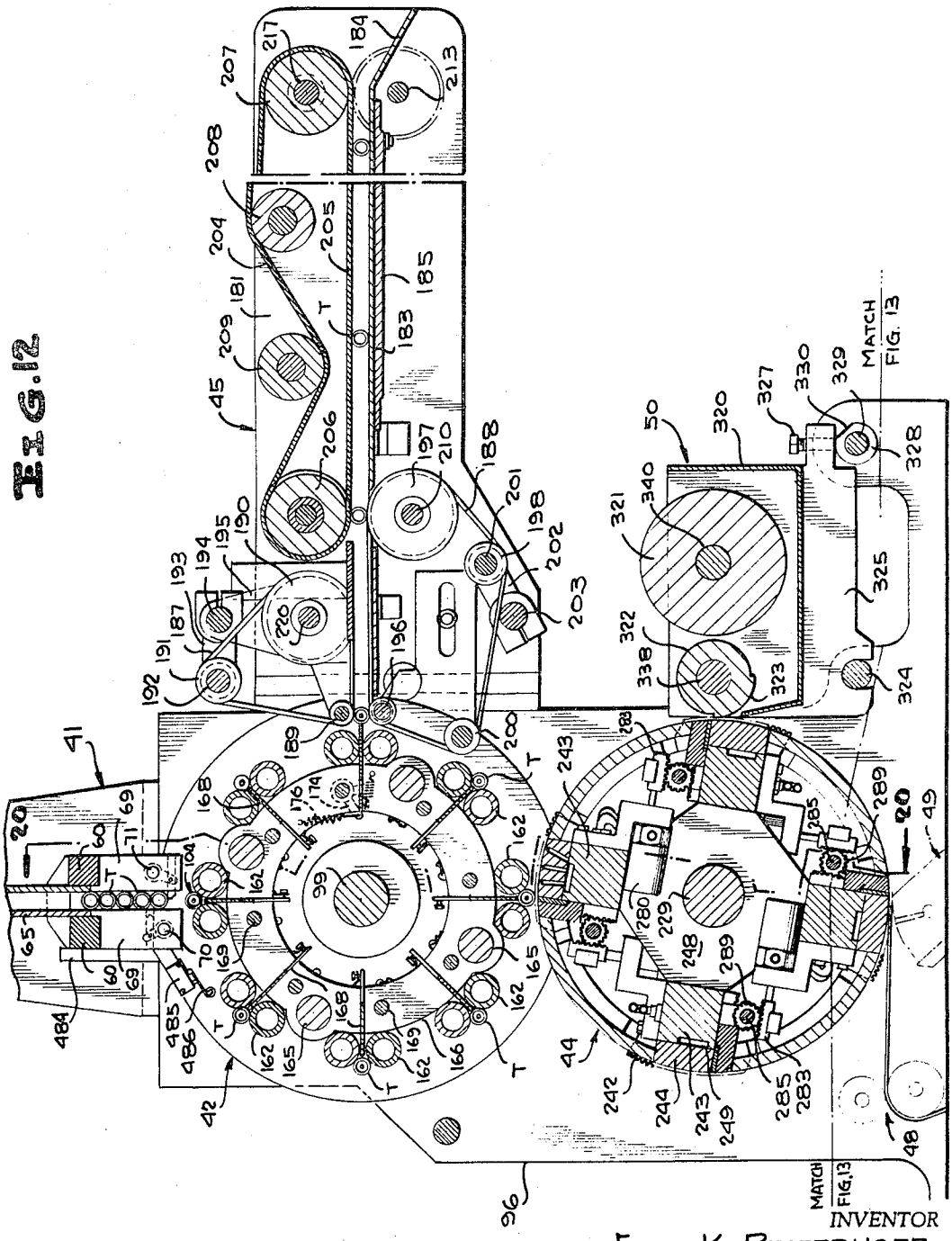
ATTORNEYS

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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 12



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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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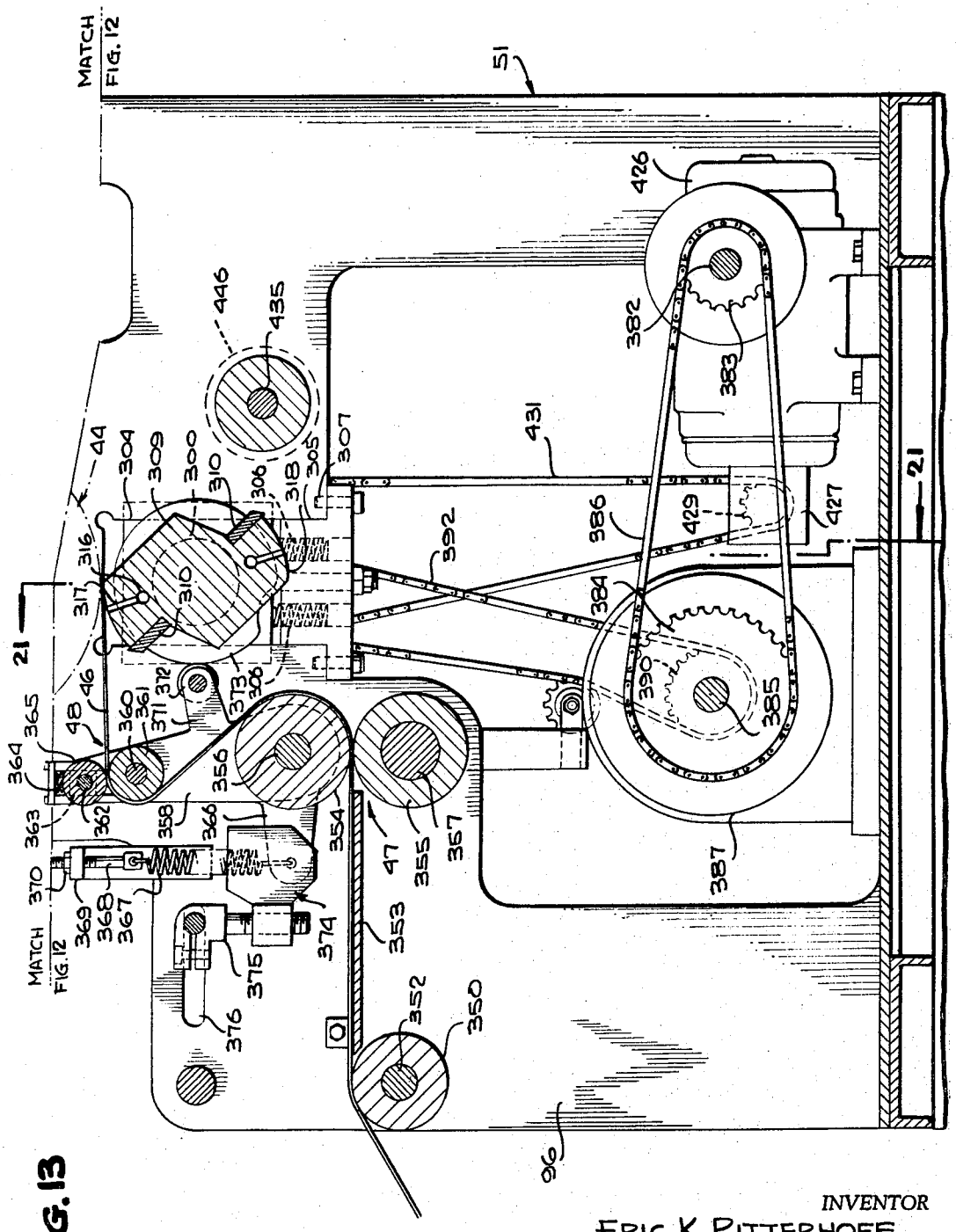


FIG. 13

INVENTOR
ERIC K. RITTERHOFF

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Oct. 1, 1968 E. K. RITTERHOFF 3,404,059

APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 14

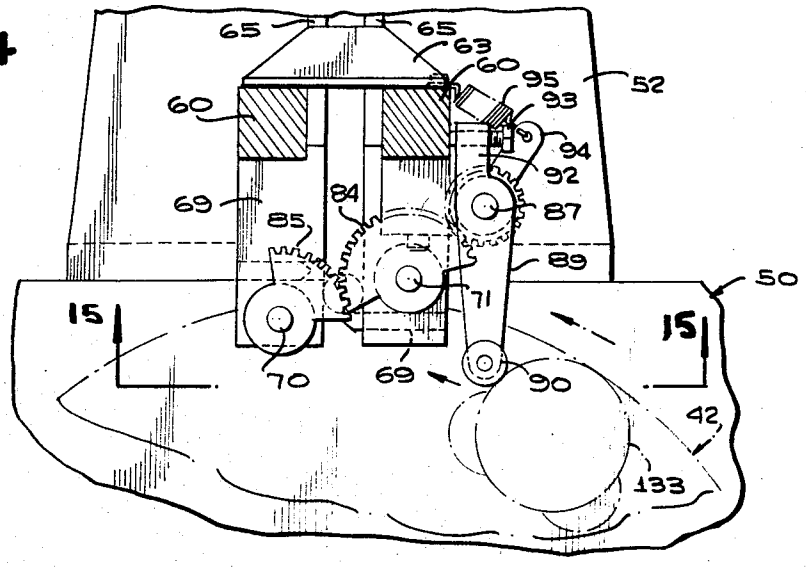


FIG. 15

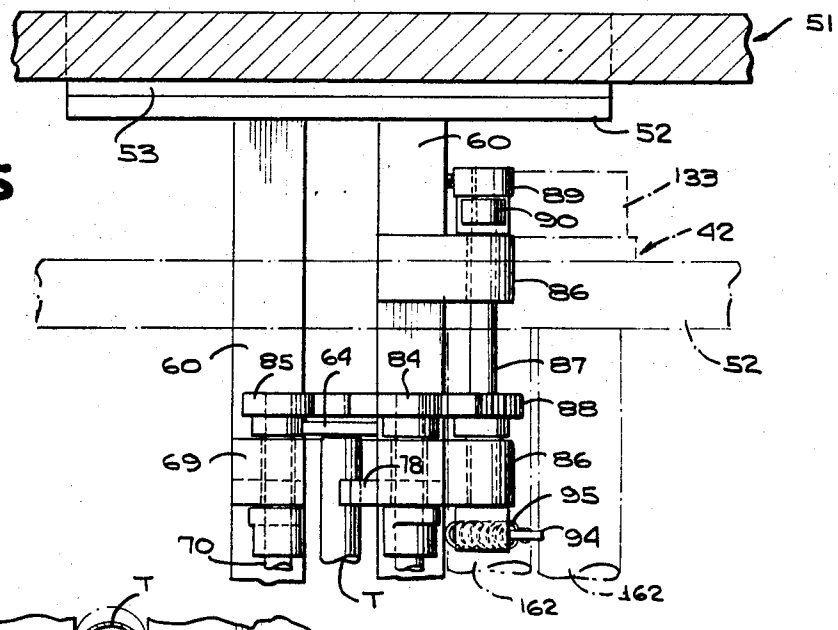
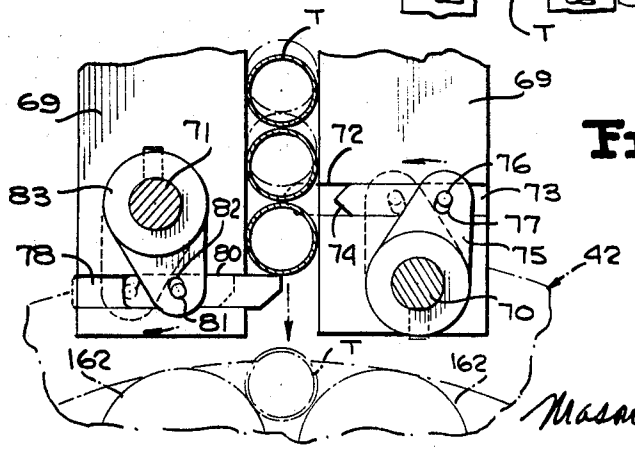


FIG. 16



INVENTOR.
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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 17

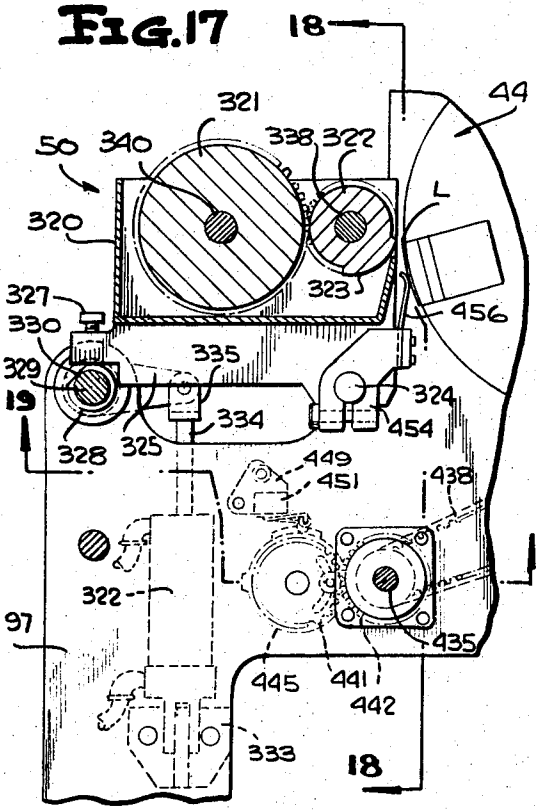


FIG. 18

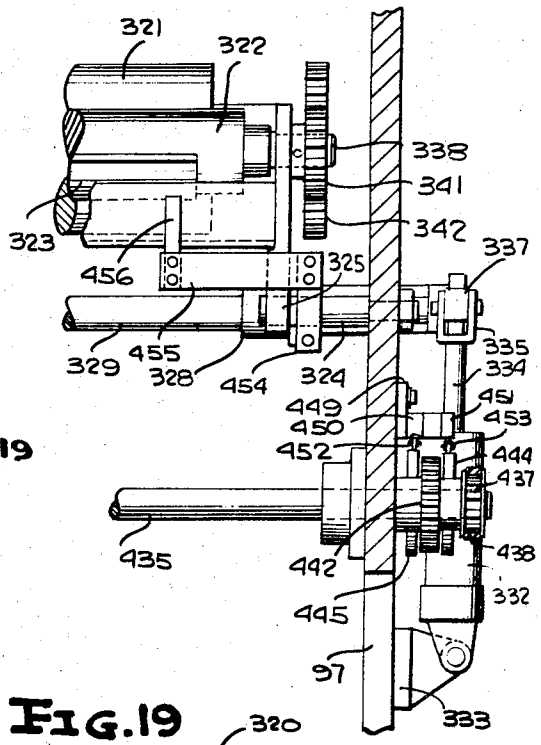
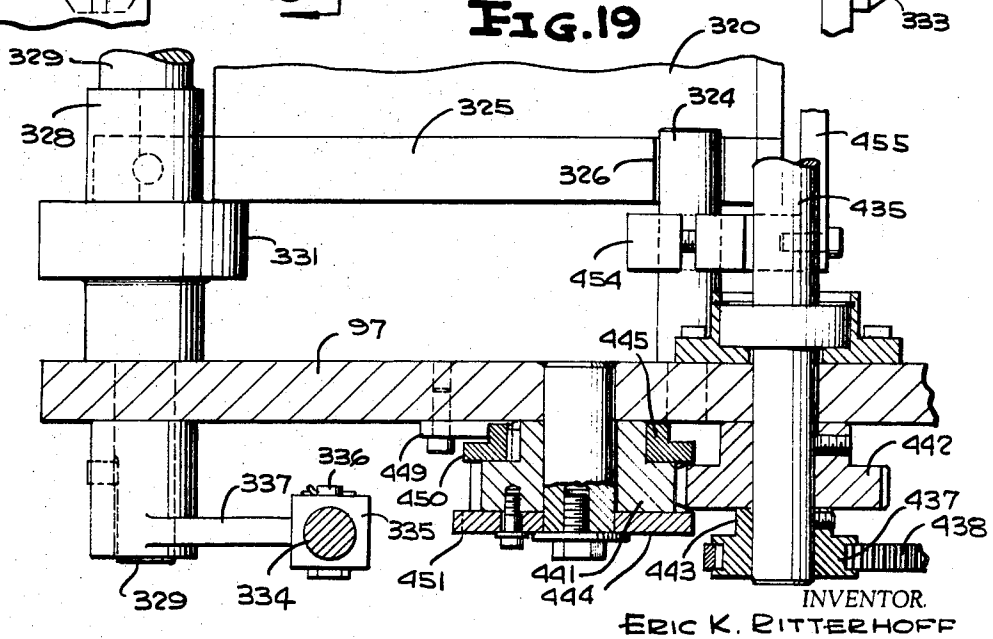


FIG. 19



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Oct. 1, 1968 E. K. RITTERHOFF 3,404,059

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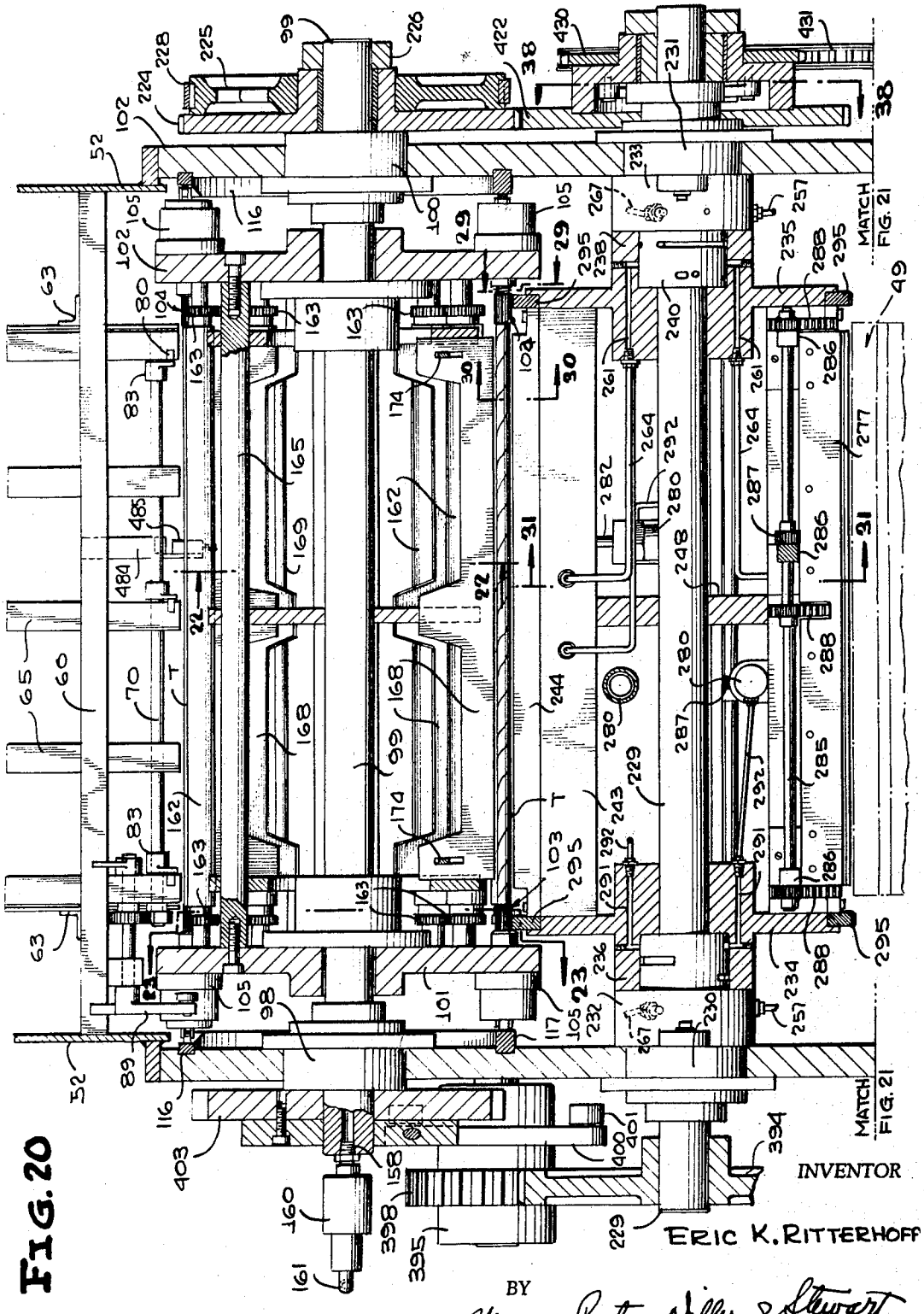


FIG. 20

INVENTOR
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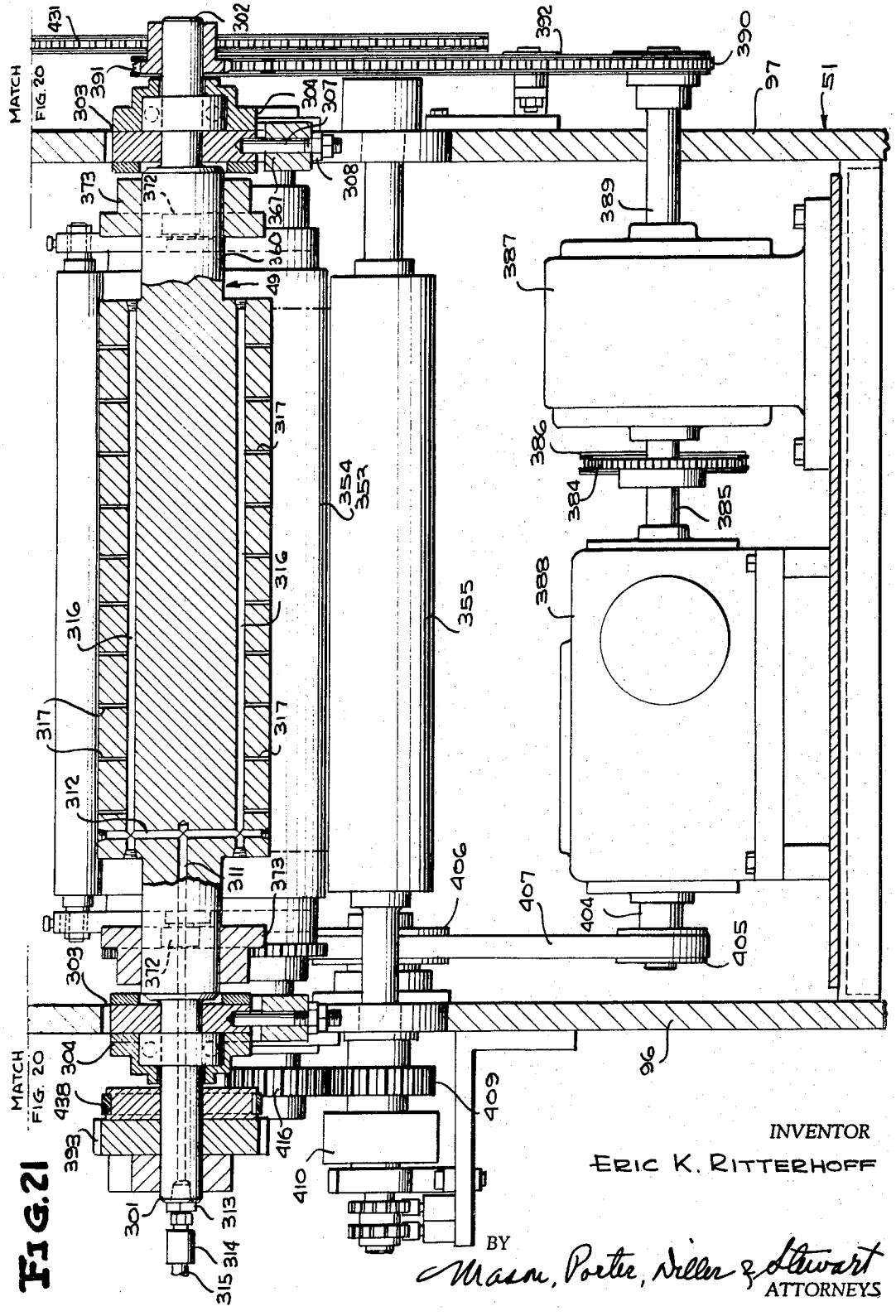


FIG. 21

INVENTOR
ERIC K. RITTERHOFF

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ATTORNEYS

APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 22

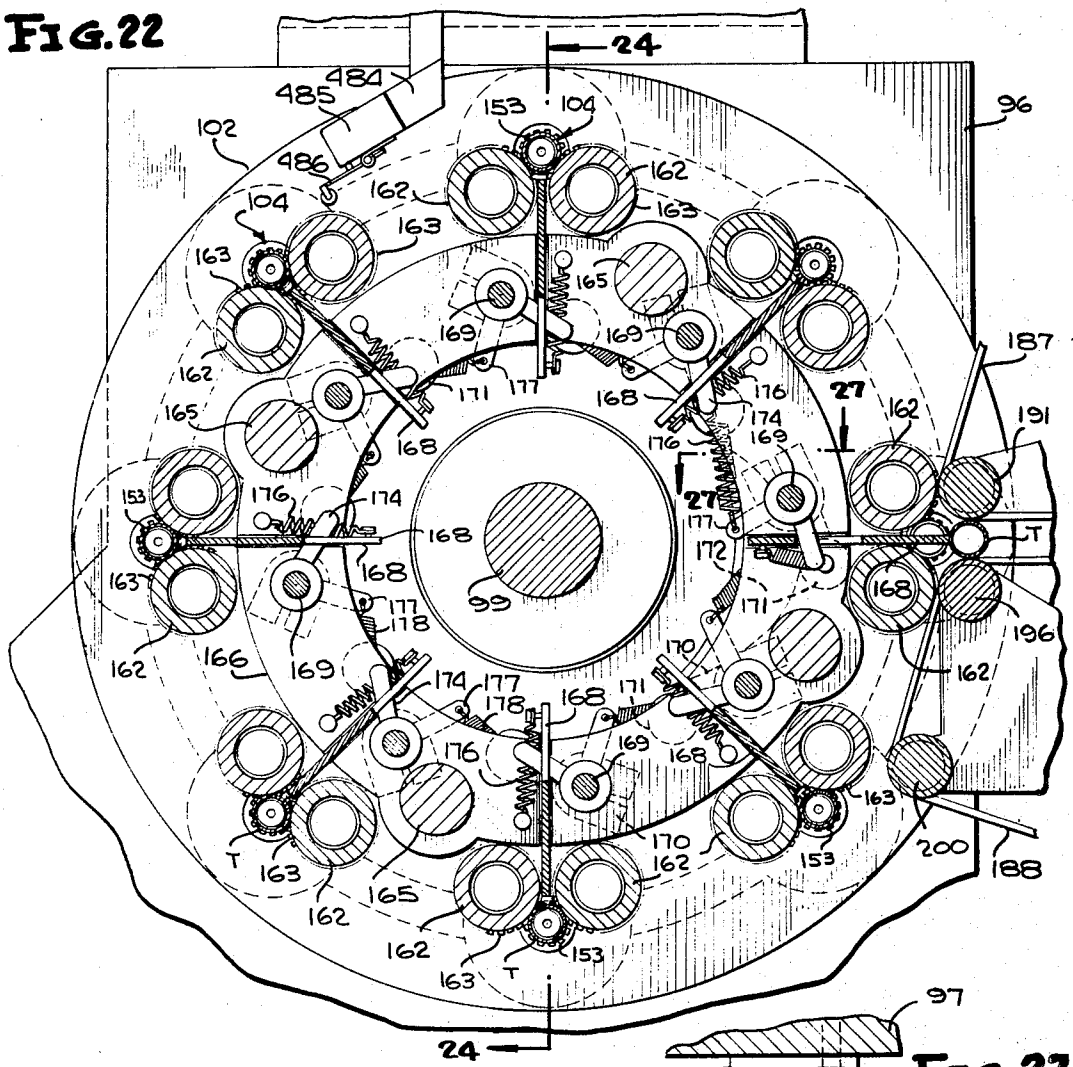


FIG. 28

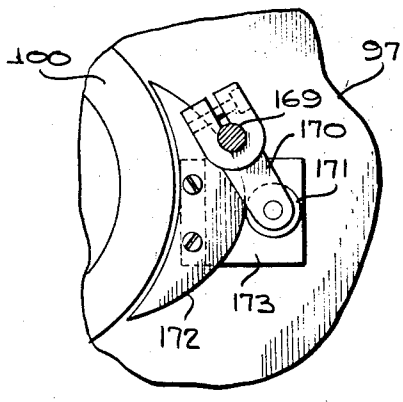
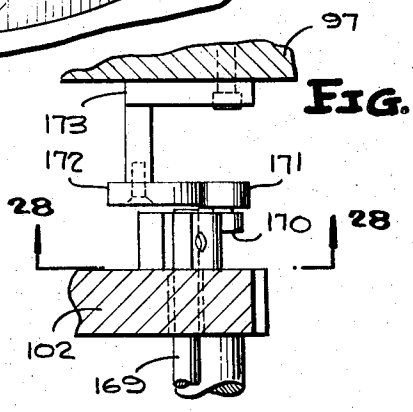


FIG. 27



INVENTOR.
ERIC K. RITTERHOFF
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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 23

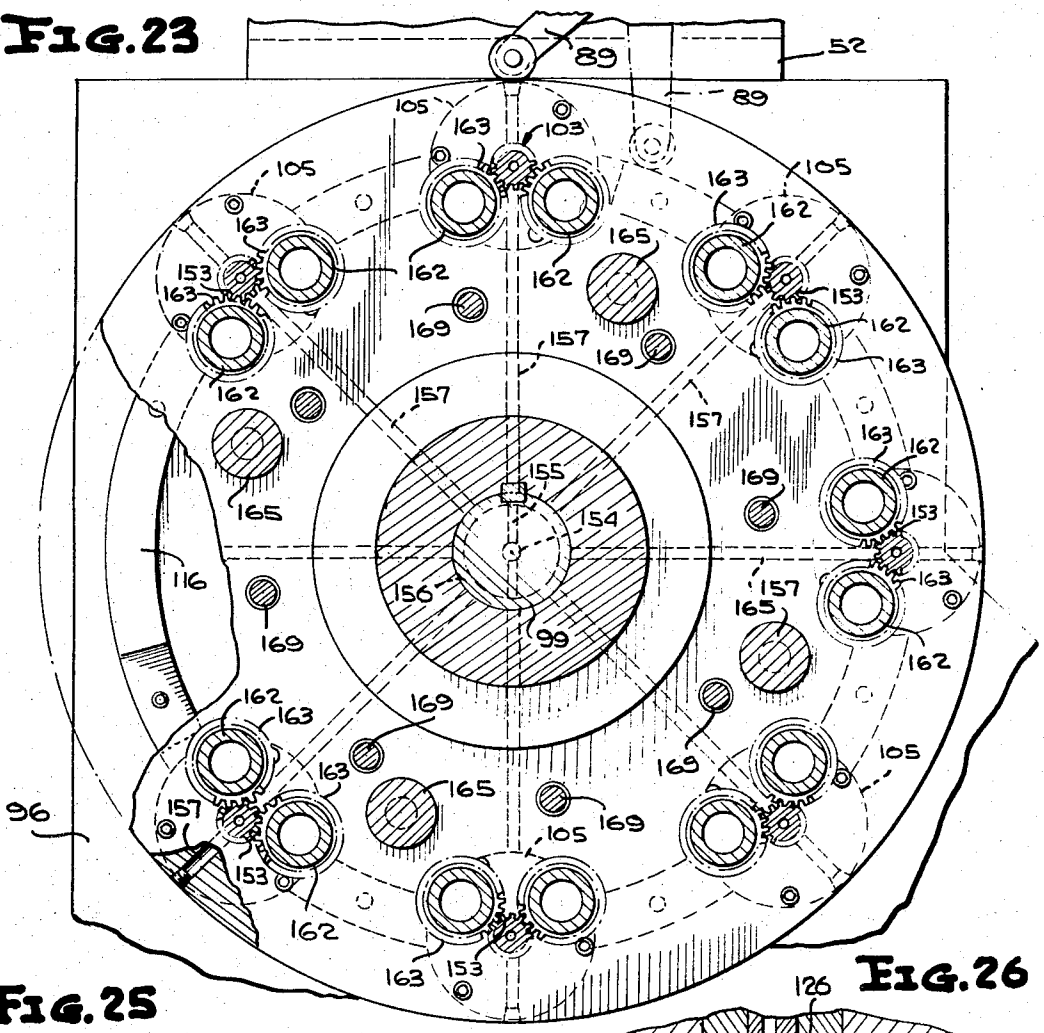


FIG. 25

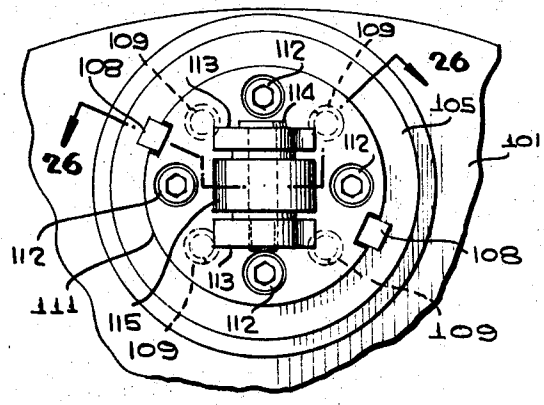
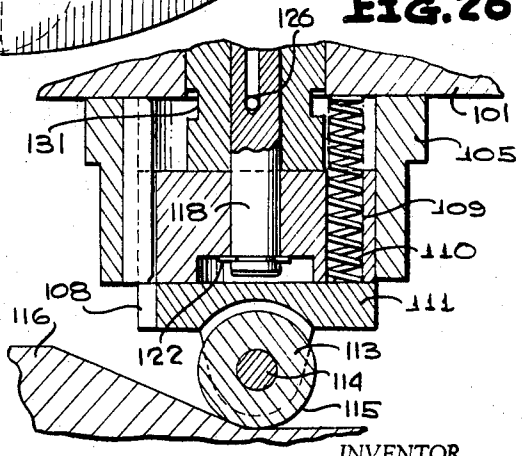


FIG. 26



INVENTOR
ERIC K. RITTERHOFF

BY

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ATTORNEYS

Oct. 1, 1968 E. K. RITTERHOFF 3,404,059

APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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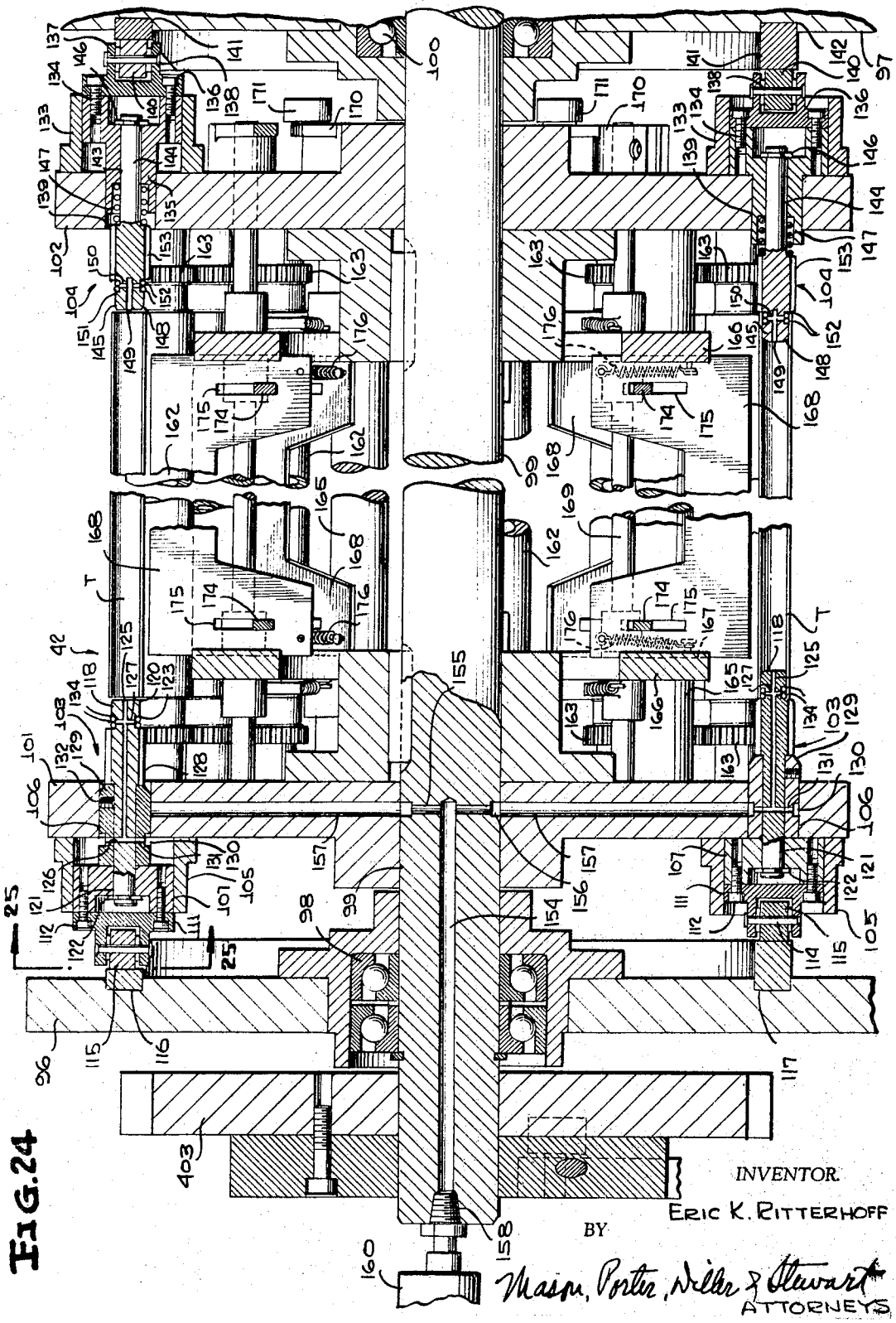


FIG. 24

INVENTOR.
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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 29

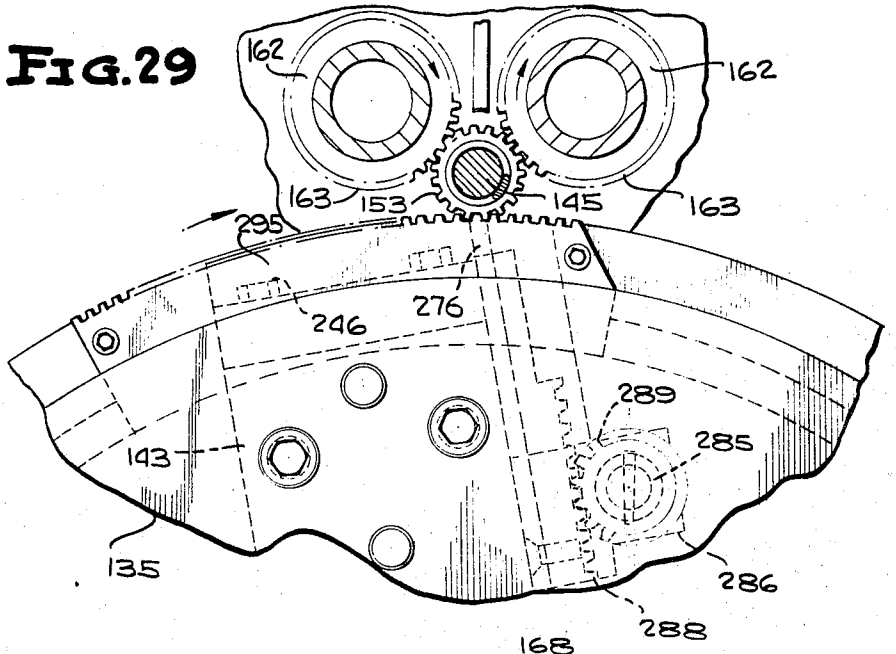
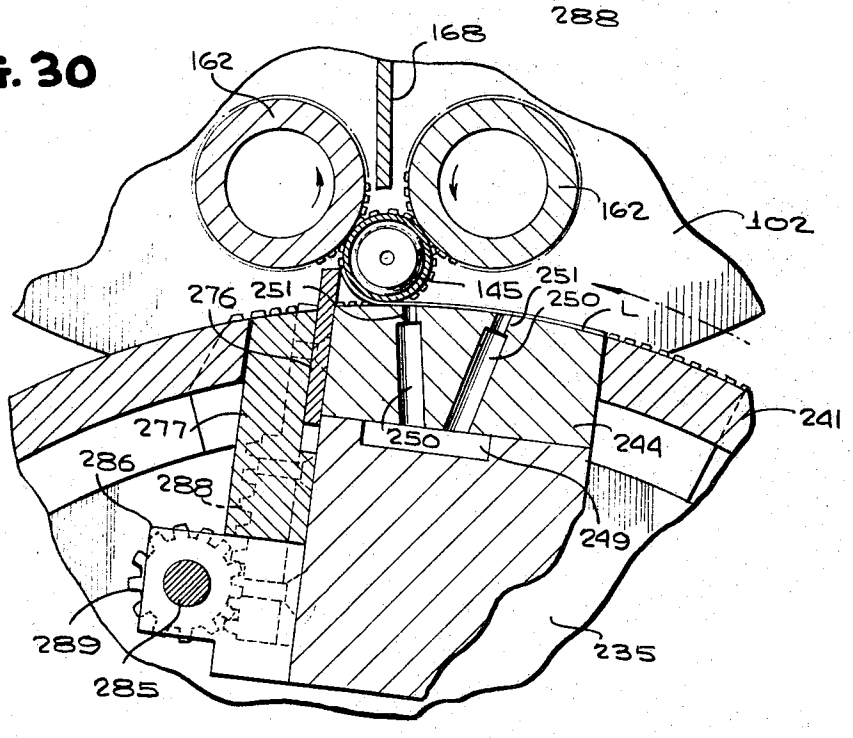


FIG. 30



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ERIC K. RITTERHOFF
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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 31

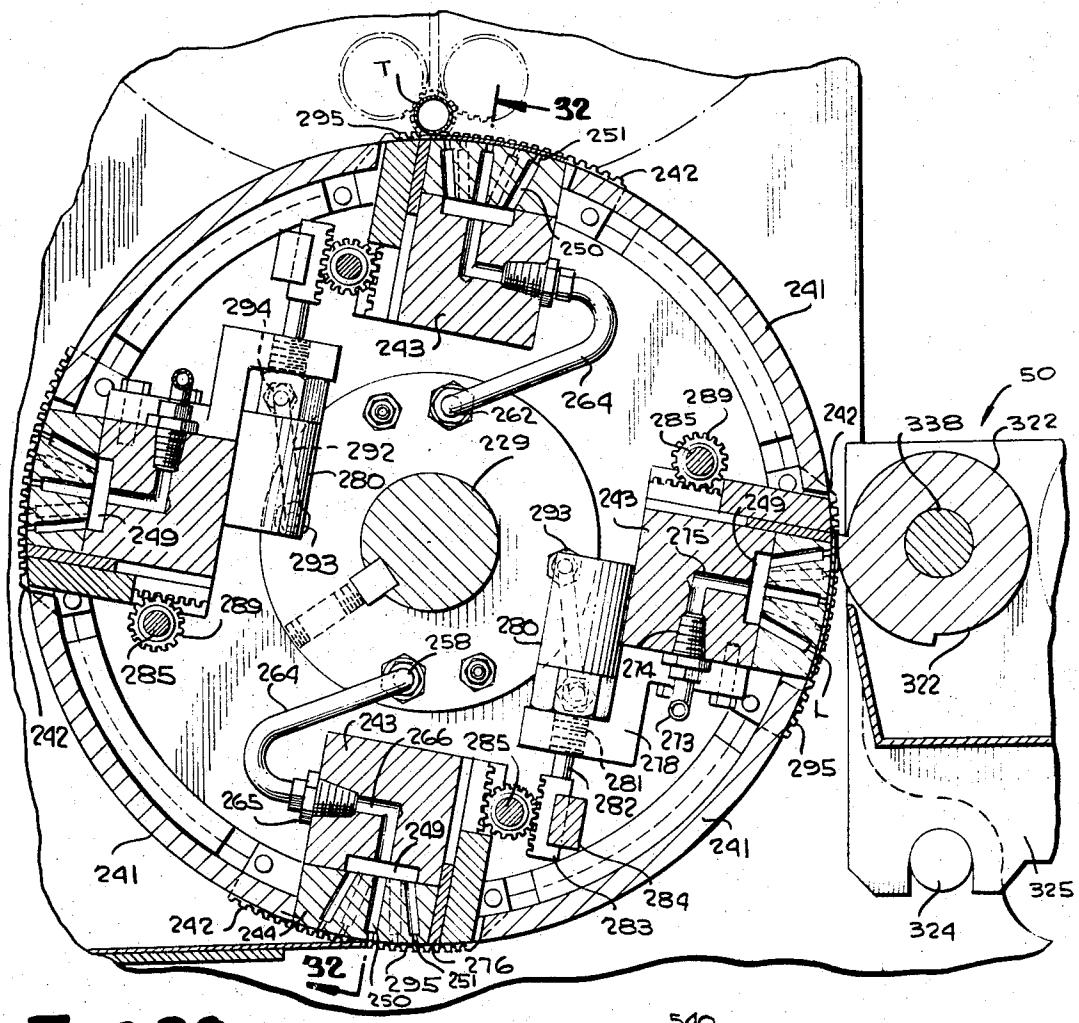


FIG. 39

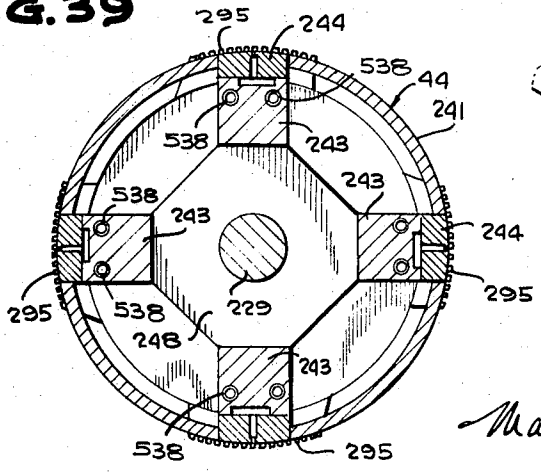
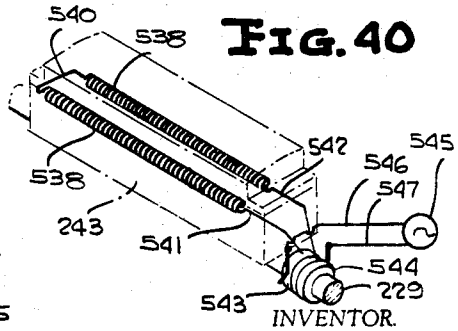


FIG. 40



INVENTOR.
ERIC K. RITTERHOFF

BY

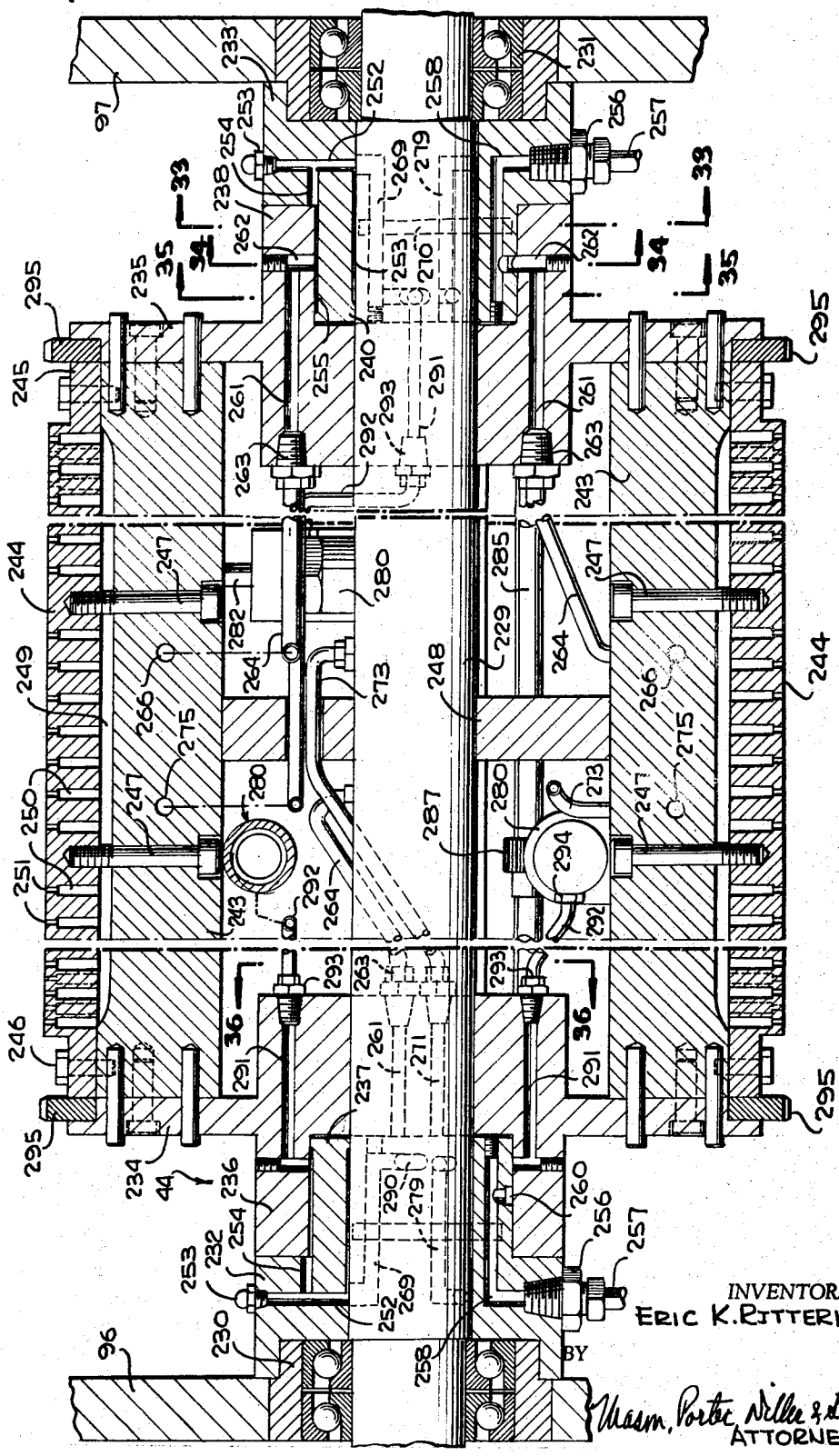
Mason, Porter, Miller & Stewart
ATTORNEYS

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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 32



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APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 33

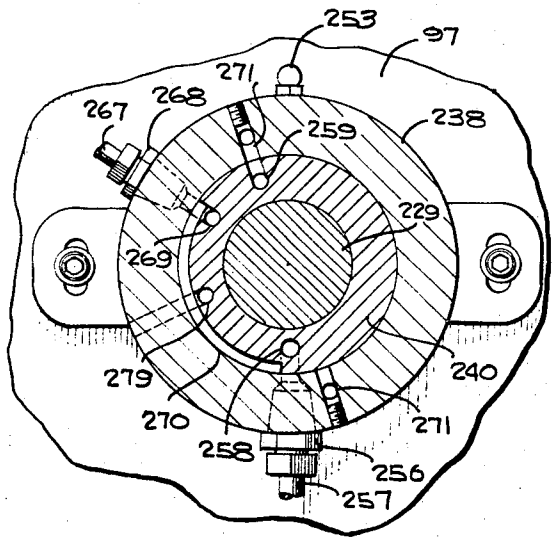
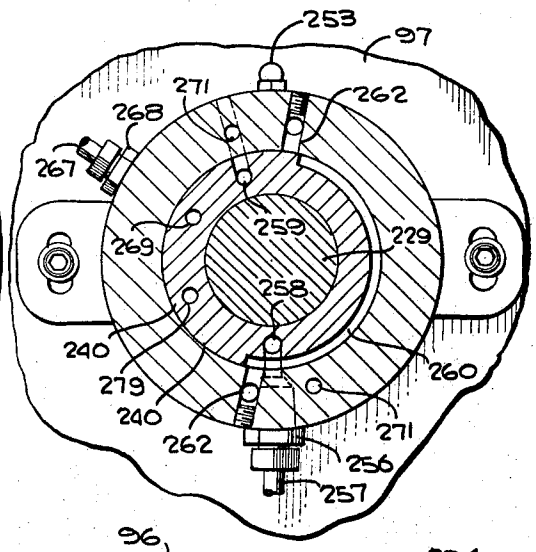


FIG. 34



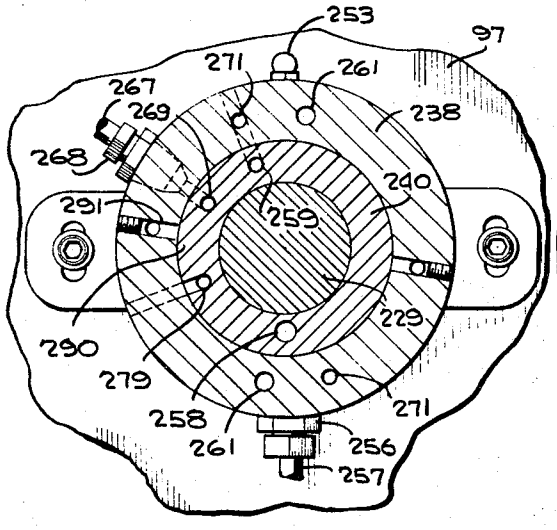


FIG. 35

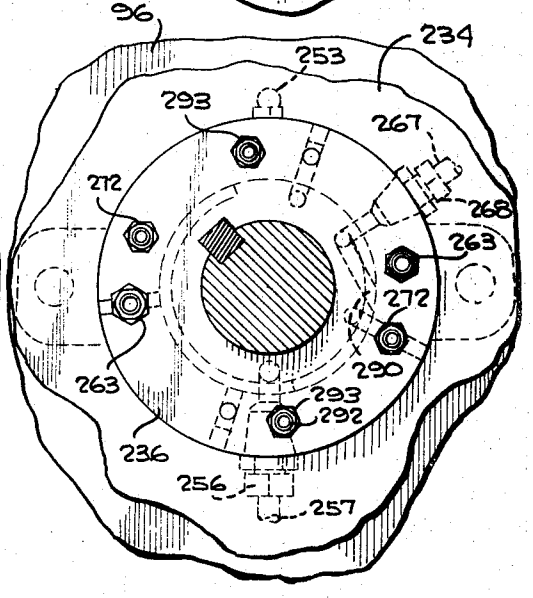


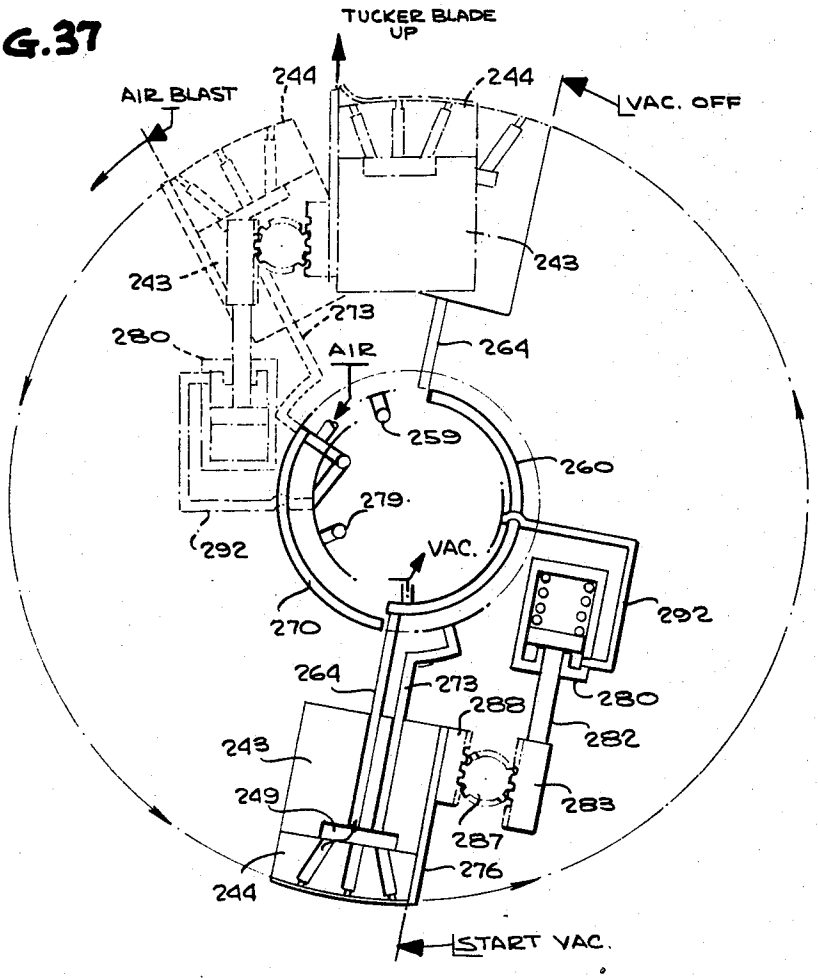
FIG. 36

INVENTOR.
ERIC K. RITTERHOFF
BY
Mason, Porter, Diller & Stewart
ATTORNEYS

APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

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FIG. 37



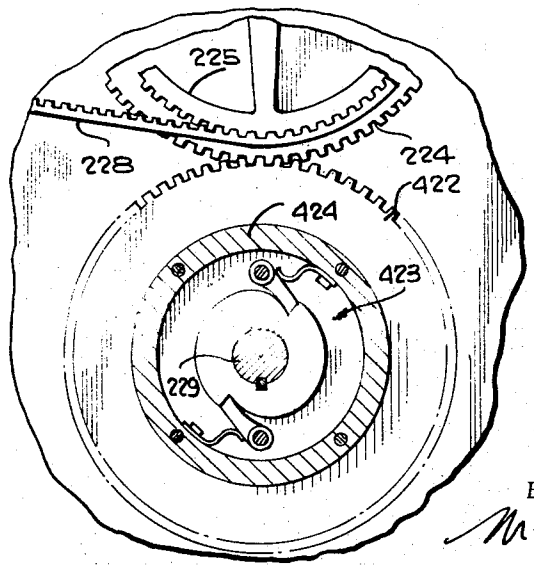


FIG. 38

INVENTOR
ERIC K. RITTERHOFF

BY Mason, Porter, Diller & Stewart
ATTORNEYS

United States Patent Office 3,404,059 Patented Oct. 1, 1968

3,404,059

APPARATUS FOR LABELLING CYLINDRICAL OBJECTS

Eric K. Ritterhoff, Hinsdale, Ill., assignor to Continental Can Company, Inc., New York, N.Y., a corporation of New York

Filed Sept. 19, 1962, Ser. No. 224,660
53 Claims. (Cl. 156—363)

This invention relates in general to new and useful improvements in the method of labelling cylindrical objects and the apparatus for accomplishing such method, and more particularly relates to the application of a label to a thin flexible tube such as a tube normally utilized for encasing flashlight batteries.

This invention particularly relates to the application of a label to a thin wall flexible tube which has insufficient rigidity to be supported in a normal manner for the reception of a label. A typical tube is that used as a casing for small diameter flashlight batteries, such as pen-light cells. In accordance with this invention, it is proposed to supply labels in the form of a continuous web which is directed to a label applying drum and which is cut into strips extending transversely of the web, after which each strip is wrapped around a tube followed by the later cutting off of the tube into lengths corresponding to the label arrangement.

In accordance with this invention, it is the primary object to provide an apparatus for applying a label to an elongated flexible tube wherein the apparatus includes chuck means for engaging opposite ends of a tube and supporting the same, and means for effecting the rotation of the tube carried by the chuck means while other means apply a label to the rotating tube.

In view of the fact that the tube to which this invention relates is a flexible tube incapable of self-support as is required in the application of labels thereto, it is another object of this invention to provide a novel apparatus for applying a label to an elongated flexible tube wherein in addition to chuck means for engaging opposite ends of a tube to effect the supporting of the tube, means are provided for internally pressurizing the tube so as to make the same rigid during the application of a label.

Another object of this invention is to provide a novel apparatus for applying labels to elongated flexible tubes, the apparatus including a turret having a plurality of chuck means thereon for engaging tubes, the turret being of the indexing type and there being associated with the turret means for supplying tubes to the chuck means, means for applying labels to the tubes and effecting the rotation of the tubes during the application of labels thereto, and further means for ejecting and discharging labeled tubes.

Still another object of this invention is to provide a novel tube feed hopper for use in conjunction with a tube turret wherein the tube feed hopper is operated in timed relation to the indexing of the turret and the tube hopper is provided with a plurality of reciprocating gates which permit but a single tube to be released at a time for the reception by chuck means of the tube turret.

A further object of this invention is to provide a novel label applying drum for use in applying a label to a rotating tube, the drum being provided with means for holding an elongated label strip to the exterior thereof, and there being associated with each label strip holding means a tucker blade which is projected in timed relation to the positioning of the label applying drum with respect to a tube so as to direct a leading edge of the label strip into engagement with the rotating tube so that the rotating tube may wrap the label strip thereabout.

Another object of this invention is to provide in a label

applying apparatus for applying labels to tubes a label applying drum which is provided about the periphery thereof with means for releasably holding elongated strip labels thereto, the label applying drum being adapted to receive the strip labels from a continuous web and having associated therewith cutter means for effecting the cutting of a strip of labels from the web in timed relation to the rotation of the label applying drum, and further being provided with means for assuring the application of a strip label to a tube as the label applying drum is positioned relative to a rotating tube.

Another object of this invention is to provide in a label applying apparatus an adhesive applicator for applying adhesive to an elongated strip of labels carried by a label applying drum, and there being provided means for shifting the position of the adhesive applicator whereby when no label is at a particular station on the label applying drum, the adhesive applicator is rendered inoperative to apply adhesive whereby the unintentional application of adhesive to the label applying drum where a label should have been, is prevented.

Still another object of this invention is to provide a label applying apparatus for applying labels to tubes, the apparatus including a tube turret for supporting the tubes during the application of labels thereto, a label applying drum for holding and transferring labels to rotating tubes carried by the tube turret, an adhesive applicator for applying adhesive to labels carried by the label applying drum, a labeled tube discharge including conveyor means, and there being provided a control system which includes a main drive unit for driving all of the aforementioned apparatus, and an auxiliary drive unit for driving only the adhesive applicator and the tube discharge, there being additionally control means for rendering the main drive unit inoperative when a tube is not delivered to the tube turret and making the auxiliary drive unit operative so as to continue to drive the adhesive applicator and the tube discharge.

A still further object of this invention is to provide a novel method of applying labels to thin flexible tubes wherein the labels are furnished in the form of a continuous web, which web is cut into elongated strips extending transversely of the web and at the same time are received by a label applying drum, after which adhesive is applied to the label strips and the label strips wound around tubes.

Yet another object of this invention is to provide a novel adhesive applicator for use with a rotating article carrier wherein the articles are spaced on the article carrier and there being provided means for rendering the adhesive applicator inoperative in the absence of an article from a particular station of the article carrier.

Still another object of this invention is to provide a novel tube discharge for use in a tube labelling machine wherein flexible readily crushable tubes are received and transferred by the tube discharge.

With the above and other objects in view that will hereinafter appear, the nature of the invention will be more clearly understood by a reference to the following detailed description, the appended claims and the several views illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a schematic elevational view showing generally the details of the apparatus which is the subject of this invention.

FIGURE 2 is a fragmentary perspective view of a web of labels which is to be applied in accordance with this invention.

FIGURE 3 is a schematic view showing a tube to be wrapped with a label and an associated label strip.

FIGURE 4 is an enlarged perspective view showing a labelled tube formed in accordance with this invention.

FIGURE 5 is a rear perspective view of the label applying apparatus and shows the specific details thereof.

FIGURE 6 is a side elevational view of the label applying apparatus and shows more specifically the details thereof.

FIGURE 7 is an elevational view of the label applying apparatus of FIGURE 6 taken along the line **7—7** of FIGURE 6 and shows more specifically the details of label applying apparatus.

FIGURE 8 is a schematic view showing the details of the drive of the label applying apparatus.

FIGURE 9 is a schematic view showing the details of the control for the label applying apparatus.

FIGURE 10 is a horizontal sectional view on a large scale taken through the label applying apparatus along the line **10—10** of FIGURE 6 and shows more specifically the details of construction of the means for feeding a web of labels to the label applying drum of the apparatus and cutting strips of labels from the web.

FIGURE 11 is a horizontal sectional view taken along the line **11—11** of FIGURE 6 looking up under the label applying drum and showing generally the details thereof.

FIGURE 12 is an enlarged longitudinal vertical sectional view taken along the line **12—12** of FIGURE 7 and shows more specifically the details of the apparatus for applying a label to a tube.

FIGURE 13 is a vertical sectional view similar to FIGURE 12 but taken through the lower portion of the label applying apparatus along the line **13—13** of FIGURE 7 and shows further the details of the label applying apparatus.

FIGURE 14 is an enlarged fragmentary vertical sectional view taken along the line **14—14** of FIGURE 7 and shows the details of the drive operating the tube hopper release mechanism.

FIGURE 15 is an enlarged fragmentary horizontal sectional view taken along the line **15—15** of FIGURE 14 and shows further the details of the release mechanism for the tube hopper.

FIGURE 16 is an enlarged fragmentary vertical sectional view taken along the line **16—16** of FIGURE 7 and shows the specific arrangement of the gates of the tube release mechanism.

FIGURE 17 is an enlarged fragmentary vertical sectional view taken along the line **17—17** of FIGURE 10 and shows more specifically the details of the glue applicator and the control means therefor.

FIGURE 18 is an enlarged fragmentary vertical sectional view taken along the line **18—18** of FIGURE 17 and shows more specifically the details of the drive for the adhesive applicator.

FIGURE 19 is an enlarged fragmentary horizontal sectional view taken along the line **19—19** of FIGURE 17 and shows further the details of the adhesive applicator.

FIGURE 20 is a vertical sectional view taken through the upper portion of the label applying apparatus along the line **20—20** of FIGURE 12 and shows specifically the details of the tube turret and the label applying drum.

FIGURE 21 is a vertical sectional view taken through the lower portion of the label applying apparatus along the line **21—21** of FIGURE 13 and shows further the details of the apparatus including the specific details of the web cutter.

FIGURE 22 is an enlarged fragmentary transverse vertical sectional view taken through the tube turret and shows the specific details of the means for holding tubes and ejecting tubes at the discharge station.

FIGURE 23 is an enlarged fragmentary vertical sectional view taken along the line **23—23** of FIGURE 20 and shows further the details of the tube turret at one end thereof.

FIGURE 24 is an enlarged fragmentary vertical sectional view taken along the line **24—24** of FIGURE 22 and shows further the details of the tube turret.

FIGURE 25 is an enlarged fragmentary vertical sectional view taken along the line **25—25** of FIGURE 24 and shows the general details of the mechanism for controlling the position of a tube engaging chuck.

FIGURE 26 is another enlarged fragmentary sectional view showing the details of the means for positioning the tube engaging chuck and is taken along the line **26—26** of FIGURE 25.

FIGURE 27 is an enlarged fragmentary horizontal sectional view taken along the line **27—27** of FIGURE 22 and shows the details of the means for effecting the movement of an ejector blade of the tube turret for ejecting a tube therefrom.

FIGURE 28 is an enlarged fragmentary vertical sectional view taken along the line **28—28** of FIGURE 27 and shows further the details of the drive for the tube ejector blade.

FIGURE 29 is an enlarged fragmentary vertical sectional view taken along the line **29—29** of FIGURE 20 and shows the manner in which the tube rotating rolls are driven from the label applying drum.

FIGURE 30 is an enlarged fragmentary vertical sectional view taken along the line **30—30** of FIGURE 20 and shows the manner in which a tucker blade of the label applying drum directs a label into engagement with a tube so that the label may be wrapped around the tube.

FIGURE 31 is an enlarged transverse vertical sectional view taken along the line **31—31** of FIGURE 20 through the label applying drum and shows the specific details of the internal construction of the label applying drum.

FIGURE 32 is a longitudinal sectional view along the line **32—32** of FIGURE 31 and shows further the internal construction of the label applying drum.

FIGURE 33 is an enlarged fragmentary vertical sectional view taken through one end of the shaft of the label applying drum of FIGURE 32 and shows the specific details of a control valve arrangement thereof.

FIGURE 34 is a vertical sectional view similar to FIGURE 33 and taken along the line **34—34** of FIGURE 32, the view showing an additional valve structure.

FIGURE 35 is a vertical sectional view along the line **35—35** of FIGURE 32 along the shaft of the label applying drum and shows the general details of passages therethrough.

FIGURE 36 is an enlarged fragmentary vertical sectional view taken along the line **36—36** of FIGURE 32 and shows further the details of the shaft of the label applying drum.

FIGURE 37 is a schematic view showing the arrangement of the various passages for controlling the operation of the components of the label applying drum.

FIGURE 38 is a fragmentary vertical sectional view on an enlarged scale showing the means for driving components of the label applying apparatus utilizing the auxiliary drive unit.

FIGURE 39 is a fragmentary vertical sectional view through a modified form of label applying drum and shows the same provided with heater elements for facilitating the melting and setting of previously applied adhesives.

FIGURE 40 is a schematic perspective view with parts shown in phantom lines of a typical heater and connection thereof to a power source.

Referring now to the drawings in detail, reference is first made to FIGURE 1 wherein there are shown the over-all details of the label applying apparatus, which apparatus is generally referred to by the numeral **40**. In accordance with the invention, tubes to which labels are to be applied, which tubes are generally referred to by the letter T, are supplied from a tube hopper **41**. The tubes T are delivered to a tube turret, generally referred to by the numeral **42**, as the tube turret **42** is indexed by means of a hopper discharge control or gate mechanism, generally referred to by the numeral **43**. The tubes T supported by the tube turret **42** are indexed therewith and a label applying drum, generally referred to by the numeral

44, applies a strip label L to the tube with the label L being wrapped around the tube T. As the tube turret 42 continues to rotate in the indexing thereof, the labelled tube is ejected into a tube discharge unit, generally referred to by the numeral 45.

The label L which is wrapped about each tube is obtained from a continuous web 46 which is pre-decorated. The web 46 is fed by a main web feed 47 and an auxiliary web feed 48 of a conventional type with the web feed 47 being driven in a manner to provide for registration of the web 46. It is to be understood that the alignment of web 46 is periodically adjusted during feeding thereof by the web feed 47 with the adjustments being made by a suitable conventional mechanism so as to obtain the desired web registration. The properly registered web 46 passes beneath and into engagement with the label applying drum 44 where a transverse section of the web 46 is cut as it is fed by means of a cutter generally referred to by the numeral 49. The cut-off label L is retained on the label applying drum 44 and adhesive or glue is applied thereto by means of an adhesive applicator, generally referred to by the numeral 50. It is this label with the adhesive or glue applied to the outer facing surface thereof which is wrapped about each tube carried by the tube turret 42.

Reference is now made to FIGURE 3 wherein the general details of a tube T are illustrated. The tube T may be of any construction although the illustrated tube is a spirally wound tube. It is to be understood that the tube T is normally an elongated flexible tube of small diameter which is incapable of being self-supporting. However, there is no reason why the invention could not be utilized to apply labels to rigid tubes. After the label L is applied to the tube T, the labelled tube appears as is shown in FIGURE 4.

Tube hopper and tube feed control

The tube applying apparatus 40 includes a frame generally referred to by the numeral 51. The tube hopper 41 includes a pair of upstanding side plates 52 which are provided at the lower ends thereof with feet 53 which, in turn, are secured to the upper part of the frame 51. A pair of bars 54 extend between upper ends of the side plates 52 and are secured thereto by means of fasteners 55 which also serve to secure triangular plates 56 to the upper ends of the side plates 52. A bar 57 extends between the upper ends of the triangular plates 56 and is secured thereto by means of fasteners 58. A second set of bars 60 extends between the lower portions of the side plates 52 and is secured thereto by means of fasteners 61.

A pair of brackets 62 is secured to the upper surfaces of the bars 54 and a similar pair of brackets 63 is secured to the upper surfaces of the bars 60. The brackets 62 and 63 support side plates 64 which are spaced apart in accordance with the length of the tubes T to which labels are to be applied. A plurality of vertical straps 65 extend between the bars 54 and 60, the straps 65 being vertically disposed and projecting above the bars 54 and below the bars 60. It is to be understood that there are two sets of the straps 65 in opposed relation with the space between the straps 65 being determined by the diameters of the tubes T.

The tube hopper 41 also includes a chute 66 for directing tubes down in between the straps 65. The chute 66 has the lower end thereof secured to the bar 57 which is part of a supporting frame 67. The upper rear part of the frame 67 is braced by diagonal braces 68.

Referring now to FIGURES 14, 15 and 16, it will be seen that there are illustrated the specific details of the tube release or feed mechanism 43. The tube feed mechanism includes a plurality of depending blocks 69 which are secured to the undersides of the bars 60 in alignment with certain of the straps 65 and with the lower ends of the straps 65 terminating at the blocks 69. The blocks 69 have opposed faces which are aligned with the like faces of the guide straps 65 and there is a shaft 70 which extends through one set of blocks 69 while a shaft 71 extends through the second set of blocks 69. It is to be noted that the shaft 71 lies in a plane disposed above the plane of the shaft 70. The blocks 69 carrying the shaft 70 are each provided with a groove 72 in a side face thereof. In each groove 72 there is disposed a gate member 73 which is movable longitudinally into the path of descending tubes T. The gate members 73 each has a pointed end 74 to be forced in a position between two adjacent tubes in a manner to be described in detail hereinafter. The shaft 70 carries a plurality of levers 75 with each lever 75 having a pin 76 disposed within an elongated opening 77 therein, the pins 76 being carried by the gate members 73. The blocks 69 carrying the shaft 71 carry lower gate members 78, each gate member 78 being seated in a groove 80 formed in its associated block 69. Each gate member 80 has a pin 81 disposed in an elongated opening 82 formed in a lever 83 carried by the shaft 71, there being one lever 83 for each of the gate members 78. It will be noted that when the gate members 78 are projected into the space through which the tube T passes, the associated gate members 73 are in a retracted position. On the other hand, as is shown by dotted lines in FIGURE 16, when the gate members 78 are retracted to permit the lowermost tube T to drop out of the tube hopper, the upper gate members 73 are projected into the path of the tubes and prevent additional tubes from dropping out of the tube hopper.

In order to accomplish the desired relative movement of the gate members 73 and 78, the shaft 71 is provided with a gear segment 84 which is meshed with a gear segment 85. Thus when the shaft 71 is turned in a clockwise direction to effect the releasing of the gate members 78, the shaft 70 is turned in a counter-clockwise direction to force the gate members 73 into the tube retaining position. It is to be noted that due to the pointed end construction of each gate member 73, as the lowermost tube T is being lowered by the withdrawal of the gate members 78, the ends of the gate members 73 are being forced beneath the next upper tube T so as to force the whole column of tubes upwardly a slight distance, as is shown by dotted lines in FIGURE 16.

It is pointed out at this time that the gear segments 84 and 85 are disposed generally at one end of the tube hopper 41. It is also pointed out that the gate members 73 and 78 are automatically actuated by the tube turret 42 as it is indexed beneath the tube hopper 41. In order to effect the automatic feeding of tubes in timed relation to the indexing of the tube turret, a pair of brackets 86 is secured to one of the bars 60 adjacent the gear segment 84. A shaft 87 extends through and is rotatably journaled within the brackets 86. A gear 88 is secured to the intermediate portion of the shaft 87 and is meshed with the gear segment 84. A lever 89 is secured to one end of the shaft 87 and is provided at the lower end thereof with a cam follower 90 which is engageable with one of a plurality of housings 133 carried by the tube turret 42. As is best shown in FIGURE 14, the lever 89 is provided with an upper extension 92 which carries an adjustable stop member 93. The stop member 93 is engageable with an associated one of the bars 60 to limit the counterclockwise swinging of the lever 89, as viewed in FIGURE 14, to the position shown in FIGURE 14 so as to maintain the proper at rest position of the gate members 73 and 78. An arm 94 is secured to the opposite end of the shaft 87 and carries a tension spring 95 which is secured to the associated bar 60 in the manner best shown in FIGURE 14. The tension spring 95 is a return spring and always returns the lever 89 to the position shown in FIGURE 14 although resiliently permitting the swinging of the lever due to its engagement with the cam 91.

Tube turret

The frame 51 basically includes a pair of parallel side plates 96 and 97 which are suitably tied together. As is

best illustrated in FIGURE 24, the upper portion of the side plate **96** is provided with a bearing assembly **98** which is transversely aligned with a bearing assembly **100** carried by the plate **97**. A shaft **99** extends through the side plates **96** and **97** and is rotatably journaled within the bearing assemblies **98** and **100**. The shaft **99** is the support shaft of the tube turret **42**.

The tube turret **42** includes a pair of end plates **101** and **102** which are rigidly secured on the shaft **99** in spaced aligned relation. The end plates **101** and **102** carry chuck assemblies **103** and **104**, respectively. Each chuck assembly **103** is in opposed relation with a like chuck assembly **104**.

Each of the chuck assemblies **103** includes a housing **105** suitably secured to the outer surface of the end plate **101** in alignment with a bore **106** through the end plate **101**. A block **107** is slidably mounted within the housing **105** and is keyed thereto to prevent rotation by means of keys **108**, as is best shown in FIGURE 25. Each block **107** is provided with a plurality of circumferentially spaced bores **109** in which there are mounted coil springs **110**. The outer ends of the bores **109** are closed by a cover plate **111** against which the outer ends of the springs **110** bear. The inner ends of the springs **110** engage the end plate **101** and the springs **110** serve to partially force the blocks **107** to the left, as viewed in FIGURE 24.

Each end plate **111** is secured to its respective block **107** by means of a plurality of fasteners **112**. Further, each end or cover plate **111** has an integral bifurcated fitting **113** which carries a shaft **114** on which there is mounted a cam follower **115**. The cam follower **115** is engaged with a circular cam **116** which is suitably seated in an annular recess **117** in the side plate **96** of the frame **51**.

A chuck member **118** is carried by each block **107**. Each chuck member **118** is provided with a rounded end **120** adapted to be engaged within a tube T and the opposite end of each chuck member **118** passes through a bore **121** in the associated block **107** so as to be rotatable with respect to the respective block **107**. Each chuck member **118** is held against movement to the right, as viewed in FIGURE 24, relative to the respective block **107** by a locking ring **122**.

Each chuck member **118** is provided adjacent the rounded end thereof with an annular groove **123** in which there is seated a pair of spaced apart O-rings **124**. The chuck member **118** has a longitudinal bore **125** therethrough which opens through the right end thereof, as shown in FIGURE 24, and which terminates spaced from the left in the chuck member **118** in a transverse bore **126**. The chuck member **118** is also provided with a transverse bore **127** which intersects the bore **125** and which opens into the recess **123** intermediate the O-rings **124**.

Each chuck member **118** is provided with gear teeth **128** on the periphery thereof adjacent the recess **123**. Also, each chuck member **118** is carried by a bearing sleeve **129** which is rotatably journaled in the bore **106** of the end plate **101**. The bearing sleeve **129** is provided with an annular recess **130** aligned with the transverse bore **126**. Also, the bearing sleeve **129** is provided with a transverse bore **131** which is aligned with the transverse bore **126** and which opens into the annular recess **130**. A set screw **132** is carried by the bearing sleeve **129** to retain the same in an oriented position with respect to the chuck member **118**.

Each chuck assembly **104** also includes a housing **133** which corresponds to the housing **105**. The housings **133** are secured to the outer surfaces of the end plate **102** in alignment with bores **139** formed therethrough. Each housing **133** carries a block **134** which is resiliently mounted within the respective housing **133** in the same manner as is the block **107** in its respective housing **105**. Further, each block **134** is keyed to its respective housing against rotation. On the other hand, each block **134** has a bearing sleeve extension **135** which extends into the associated bore **139**. An end plate **136** is secured to each block **134**, and each end plate **136** has a bifurcated fitting portion **137** carrying a shaft **138** on which there is mounted a cam follower **140**. The cam follower **140** is engaged with a cam **141** which is carried by the respective side plate **97** of the frame **50** and is seated in an annular recess **142** formed in the face of the side plate **97**. The bearing sleeve **135** has a bore **143** therethrough in which there is rotatably journaled a shaft portion **144** of a chuck member **145**. The chuck member **145** is restrained against movement to the left relative to the bearing sleeve **135** by a locking ring **146**. A coil spring **147** extends around the shaft portion **144** and bears against both the chuck member **145** and the bearing sleeve **135** to resiliently urge the chuck member **145** to the left, as is shown in FIGURE 24. The chuck member **145** has a rounded end **148** which is adapted to be received within a tube T. An axial bore **149** opens through the left end of the chuck member **145** and a transverse bore **150** intersects the axial bore **149**. The transverse bore **150** opens into an annular recess **151** in which there is seated a pair of O-rings **152**. The chuck member **145** also has an integral gear portion **153**.

The shaft **99** is provided with an axial bore **154** in the left portions thereof and a transverse bore **155** intersects the right end of the bore **154**. The transverse bore **155** opens outwardly at its upper end into an annular recess **156** in the outer surface of the shaft **99**. A plurality of radial bores **157** are formed in the end plate **101** and open into the bores **106**. A fitting **158** is threaded into the left end of the shaft **99** for supplying air to the bore **154** and a swivel **160** is connected to the fitting **158**. A suitable air line **161** is connected to the swivel fitting **160**, as is best shown in FIGURE 20.

In the operation of the chuck assemblies **103** and **104**, while a tube T is supported in alignment with the chuck assemblies, the chuck members **118** and **145** are moved towards one another by the coaction of the cam followers **115** and **140** with the cams **116** and **141**, respectively. As a result, the rounded ends of the chuck members **118** and **145** enter into the tube T until the ends of the tube T engage the gear rings **128** and **153** at which time the spring **147** is slightly compressed and should there be further urging of the chuck members **118** and **145** together, the chuck member **145** will remain stationary against the resiliency of the spring **147**. Air is introduced into the tube T through the chuck member **118** with the air also serving to spread apart the O-rings **124** and the O-rings **152** to effect the desired seal at the opposite ends of the tube T.

In order to support a tube intermediate the chuck assemblies **103** and **104**, for each pair of chuck assemblies **103** and **104** there is provided a pair of back-up rolls **162**. The back-up rolls **162** extend between the end plates **101** and **102** and are suitably journaled therein. Each back-up roll **162** is provided with a gear ring **163** adjacent each end thereof with the gear rings being meshed with the gear rings **128** and **153** of the chuck assemblies **103** and **104**, respectively. In this manner the back-up rolls **162** not only serve to support the central portion of a tube but also cooperate with the chuck assemblies **103** and **104** to rotate a tube carried by the chuck assemblies. The manner in which the chuck assemblies and the back-up rolls are driven will be described in detail hereinafter.

A plurality of rods **165** extend between and are secured to the end plates **101** and **102**. The rods **165** carry a pair of rings **166**, as is best shown in FIGURE 22. The opposed faces of the rings **166** are formed with recesses **167** in which there are seated ends of ejector plates **168** for radial movement. As is clearly shown in FIGURE 22, there is one ejector plate for each pair of back-up rolls **162** and each ejector plate **168** is posi-

tioned for passage between the associated pair of back-up rolls **162**.

In order to retract and project the ejector plates **168**, there is provided for each ejector plate **168** a shaft **169** which extends through the rings **166** and is journaled in the end plates **101** and **102**, the shaft **169** also passing through the end plate **102**. As is best shown in FIGURES 27 and 28, the end of the shaft **169** which projects through the end plate **102** is provided with a lever **170** which is adjustably mounted on the shaft **169** and which carries a cam follower **171**. A fixed cam **172** is secured to the side plate **97** of the frame by means of a mounting bracket **173** in position for effecting the rotation of each shaft **169** as the respective ejector plate **168** approaches the tube discharge assembly of the tube labelling apparatus.

Each shaft **169** is provided with a pair of fingers **174** which pass through slots **175** in the respective ejector plate **168**. The fingers **174** act upon the respective ejector plate **168** upon the rotation of the respective shaft **169** to project and retract the ejector plate **168**.

The ejector plates **168** are constantly urged outwardly by springs **176** which are anchored to inner portions of the ejector plates **168** and to the rings **166**. Thus, the fingers **174** function as stops limiting the outward movement of the ejector plates **168**.

In order to prevent the pivoting of the shafts **169**, each shaft **169** is provided with a pair of levers **177** to which there are secured tension springs **178**, the opposite ends of which are secured to the rings **166**. The tension springs **178** act upon the levers **177** to rotate the associated shafts **169** in a clockwise direction, as viewed in FIGURE 22. It will be understood that the springs **178** overbalance the springs **176**.

Tube discharge assembly

Referring now to FIGURE 5 in particular, it will be seen that the tube discharge assembly **45** includes a pair of side plates **180** and **181** which are supported from the frame **51**. Each side plate **180** and **181** is secured by means of an angle bracket **182** to a respective one of the side plates **96** and **97** of the frame **51**. A tube support plate **183** extends transversely between the two side plates **180** and **181** and is suitably secured thereto in the position shown in FIGURE 12. The tube support plate **183** has a downwardly sloping rear portion **184** off of which labelled tubes T roll into any suitable receptacle including a chute (not shown). The tube support plate **183** may be provided with a suitable heater **185** for heating the labelled tubes to effect the setting of the adhesive used in applying the lebels L to the tubes T.

A labelled tube discharged from the tube turret **44** is delivered between two endless conveyor belts **187** and **188** of the tube discharge assembly **45**. The conveyor belt **187** passes around a small diameter roll **189** disposed adjacent the tube turret **44**, then around a larger diameter roll **190** and finally around an upper intermediate diameter roll **191**. The roll **191** is adjustable and is carried by a shaft **192** which, in turn, is supported by a plurality of brackets **193** adjustably mounted on a fixed rod **194** which extends between a pair of brackets **195** extending upwardly from the side plates **180** and **181**.

The conveyor belt **188** passes around a small diameter roll **196** which is disposed in opposed relation to the roll **189**. The conveyor belt **188** then passes around a larger diameter roll **197**, after which it passes around the intermediate diameter roll **198** and then around a roll **200**. The roll **198** is a slack take-up roll and is mounted on a shaft **201** which is carried by a plurality of brackets **202** adjustably mounted on a transverse rod **203** which extends between the side plates **180** and **181**.

The tube discharge assembly **45** also includes a third endless belt conveyor which includes a conveyor belt **204** having a lower run **205** disposed parallel to the upper surface of the plate **183**. The belt **204** is supported by a pair of large diameter rolls **206** and **207** and the upper portion of the run of the endless belt **204** passes first over a roll **208** and then beneath a roll **209**.

The roll **197** is carried by a shaft **210** which is not only journalled by bearing means carried by side plates **180** and **181**, but is also journalled in a bearing assembly **211** which is supported from the angle bracket **182** carrying the side plate **181**, as is shown in FIGURE 5. The shaft **210** is a main drive shaft for the tube discharge assembly **45** and carries a drive sprocket **212** intermediate the bearing assembly **211** and the side plate **181**. A shaft **213** extends between and is suitably journalled in bearing assemblies carried by the side plates **180** and **181**. The shaft **213** projects beyond the side plate **181**, as is shown in FIGURE 5. The projecting end of the shaft **213** is provided with a gear **214** and a sprocket **215**. The sprocket **215** is aligned with the sprocket **212** and the two sprockets are connected together by a drive belt **216**.

The roll **207** is a drive roll for the conveyor belt **204** and is carried by a shaft **217** which extends through the side plates **180** and **181** and is suitably journalled in bearing assemblies carried thereby. The shaft **217** projects beyond the side plate **181** and is provided with a gear **218** which is meshed with the gear **214**. The shaft **217** is thus driven from the shaft **213**.

The roll **190** is carried by a shaft **220** which extends through the side plates **180** and **181** and is suitably journalled in bearings carried thereby. The shaft **220** projects outwardly beyond the side plate **180** and, as is best shown in FIGURE 8, is provided with a sprocket **221** which is aligned with a sprocket **222** on the shaft **217**. A drive belt **223** is entrained over and connects the sprockets **221** and **222**.

Referring now to FIGURES 5 and 20 in particular, it will be seen that the shaft **99** of the tube turret projects beyond the bearing assembly **100** of the side plate **97** and has rotatably journalled thereon a gear **224** to which there is connected a drive sprocket **225**. The gear **224** and the drive sprocket **225** are retained on the shaft **99** by means of a collar **226**. The sprocket **225** is aligned with a sprocket **227** carried by the shaft **210**. A drive belt **228** is entrained over the sprockets **225** and **227** to drive the shaft **210** from the sprocket **225**.

Label applying drum

The label applying drum **44** is positioned between side plates **96** and **97** of the frame **51** below the tube turret **42** for the purpose of applying elongated label strips L to the tubes T carried by the tube turret **42**. As is best shown in FIGURE 32, the label applying drum **44** includes a shaft **229** which extends through the side plates **96** and **97** and is rotatably journalled in bearing assemblies **230** and **231**, respectively. The plate **96** carries a sleeve **232** in which the shaft **229** is snugly received. The plate **97** carries a similar sleeve **233**. The sleeves **232** and **233** are identical except for being left and right hand sleeves.

A pair of end plates **234** and **235** are keyed on the shaft **229** for rotation therewith. The end plates **234** and **235** are also identical except for being left and right hand and are disposed 90 degrees out of phase. The end plate **234** includes a hub **236** which is telescoped over a reduced end portion **237** of the sleeve **232**. The hub **236** also projects inwardly from the main plane of the end plate **234**. The end plate **235** includes a hub **238** which is telescoped over a reduced end portion **240** of the sleeve **233**. Like the hub **236**, the hub **238** also projects inwardly from the main plane of the end plate **235**.

As is best shown in FIGURE 31, the label applying drum **44** includes a drum element **241** which extends between and is suitably secured to the end plates **234** and **235**. The drum element **241** is interrupted at four circumferentially spaced points by openings **242** which extend the full length of the drum element **241**. A bar **243**

extends between the end plates 234 and 235 in alignment with each of the openings 242 and inwardly thereof, as is clearly shown in FIGURES 31 and 32. The bars 243 are rigidly secured to the end plates 234 and 235.

A label engaging plate 244 overlies each of the bars 243 and has recessed end portions 245 receiving fasteners 246 to releasably secure the same in overlying relation to the respective bars 243. The plates 244 are further secured to the bars 243 by means of fasteners 247. At this time it is pointed out that the bars 243 are reinforced intermediate their ends by a web plate 248 which is carried by a central portion of the shaft 249 and which engages the inner surfaces of the bars 243.

The plates 244 may be considered vacuum plates in that vacuum means are provided in the plates 244 for the purpose of releasably holding a label strip in place on the label applying drum 44. Each of the bars 243 is provided with an elongated chamber 249 in the outer face thereof. The overlying portions of the plates 244 are provided with radiating bores 250 which open inwardly into the chamber 249 and which terminate at their outer ends in reduced diameter orifices 251. Thus when a vacuum is drawn in the chambers 249, label strips engaging the outer surfaces of the plates 244 are held in place by a vacuum drawn through the orifices 251.

Referring once again to the sleeves 232 and 233 and the hubs 236 and 238, since the sleeves 232 and 233 do not rotate and since it is desired to maintain a good seal between the sleeves 232 and 233 and the shaft 229, as well as a suitable seal between the sleeves and the hubs 236 and 238, it is necessary that the abutting faces of these components be lubricated and sealed. To this end, each of the sleeves 232 and 233 is provided with a radial bore 252 which has the outer end thereof closed by a grease fitting 253 to permit the introduction of grease thereinto. The radial bore 252 opens at its inner end against the shaft 229 and into an elongated groove 253 whereby grease may be distributed between the sleeves 232 and 233 and the shaft 229. Further, each of the sleeves is provided with a longitudinal bore 254 which intersects the radial bore 252 therein and which opens into the intersection between each sleeve and its respective hub. The bore 254 opens into a longitudinal recess 255 in the outer surface of the reduced portion of the respective sleeve so as to provide lubrication and a seal between the reduced portion 237 and the hub 236 on one hand and the reduced portion 240 and the hub 238 on the other hand.

Referring now to FIGURES 32 through 35, it will be seen that the sleeve 233 is provided with a vacuum line fitting 256 which connects a vacuum line 257 to the sleeve 233. The fitting 256 opens into a passage 258 in the sleeve 233. The passage 258 is generally L-shaped, as is best shown in FIGURE 32, and it extends into the reduced portion 240 of the sleeve 233. The passage 258 opens into a peripheral passage 260 which extends about the outer surface of the reduced portion 240 of the sleeve 233, as is best shown in FIGURE 34. The extent of the passage 260, which is shown in FIGURE 34, controls the time during which vacuum is applied to certain of the plates 244. The hub 238 is provided with a pair of longitudinal passages 261 which terminate at their inner ends in radial passages 262. The radial passages 262 open through the inner surface of the hub 238 in alignment with the passage 260, as is best shown in FIGURES 32 and 34. Fittings 263 are disposed at the inner ends of the passages 261 and vacuum lines 264 are connected to the hub 238 by the fittings 263. The opposite ends of the vacuum lines 264 are connected to two diametrically opposite ones of the bars 243 and through suitable passages in the bars are communicated with the chambers 249. Reference is made to FIGURE 31 wheren it is shown that the vacuum lines 264 are connected to the blocks 243 by means of fittings 265. It is further noted that the fittings 265 are disposed at the ends of L-shaped passages 266 which open into the chambers 249. Thus, in timed sequence, a vacuum is applied in the chambers 249 of two of the diametrically opposite blocks or bars 243. At this time it is pointed out that while the sleeves 233 and the hub 238 apply a vacuum to two of the bars 243, the sleeve 232 and the hub 236 serve to apply a vacuum to the other two of the bars 243 in exactly the same manner. The fact that the hub 236 is disposed 90 degrees out of phase from the hub 238 is shown in FIGURE 36. In view of the fact that the parts are alike on opposite sides of the center of the label applying drum 44, like reference numerals will be applied thereto. The chambers 249 are vented by means of a U-shaped passage 259 in each of the sleeves 232 and 233 to release a label in timed relation to the application thereof to a tube.

In accordance with the invention, it is also desired to direct an air blast through the chambers 249 of the bars 243. To this end, there is connected to each of the sleeves 232 and 233 an air line 267 by means of a fitting 268. The fitting 268 opens into an L-shaped passage 269 which has a portion thereof extending longitudinally into the reduced portion 240 of the sleeve 233. The passage 269 opens into a peripheral passage 270 in the outer surface of the reduced portion 240 with the extent of the peripheral passage 270 being shown in FIGURE 33.

The hub 238 is provided with a passage 271 which has an outer part opening radially inwardly therethrough into alignment with the passage 270 for receiving air from the passage 270. The inner end of the passage 271 has a fitting 272 in alignment therewith. An air line 273 extends from the fitting 272 to a respective one of the bars 243 and is connected to the respective bar 243 by means of a fitting 274, as is best shown in FIGURE 31. Each bar 243 is provided with an L-shaped passage 275 extending from the associated fitting 274 into the respective chamber 249.

It is to be understood that the sleeve 233 and the hub 238 supply air to the cavities 249 of only two of the bars 243. The similar construction of the sleeve 232 and the hub 236 with the 90 degrees out of phase arrangement of the hub 236 permits the like application of air to the cavities 249 of the other of the two bars 243.

In accordance with the invention, a label strip is applied to each of the plates 244 in its respective turn in a manner to be described hereinafter, after which the label strip is held in place on the respective plates 244 by vacuum being drawn through the orifices 251 until such time as the label applying drum 44 has rotated to position the label strip L against a tube T held by the tube turret 42. As the label strip rotates with the label applying drum 44, adhesive is normally applied thereto in a manner also to be described hereinafter. As the label strip approaches the tube T to which it is to be applied, it is necessary that the leading edge of the label be forced into engagement with and partially around the tube T which is rotating to insure the wrapping of the label strip around the tube. To this end, there is provided adjacent each of the plates 244 a tucker blade 276. The tucker blade 276 is disposed along the advancing edge of the associated plate 244 and also bears against an associated bar 243, as is clearly shown in FIGURES 29 and 30. Each bar 243 also carries an elongated guide 277 which is best shown in FIGURE 20. It is to be noted that while the tucker blade 276 moves inwardly and outwardly, the movement thereof is not quite radial and is such to provide for the proper movement of the leading edge of a label strip L around the associated tube T, as is best shown in FIGURE 30.

Each of the bars 243, as is shown for example in FIGURE 31, is provided with a Z-shaped bracket 278 which is utilized to support a single acting air cylinder 280. Each air cylinder 280 is of a conventional spring-return type and has an externally threaded neck portion 281 which is threaded into a flange of the associated bracket 278. A piston shaft 282 extends out through the neck portion 281 and has a rack 283 secured thereto for

reciprocating movement therewith. Each of the racks **283** is guided by a suitable guide block **284** which is fixedly mounted with respect to the structure of the label applying drum **44**.

For each of the tucker blades **276** there is a shaft **285** which extends alongside the inner part of the respective tucker blade **276**. The shaft **285** is supported in bearing brackets **286** carried by the adjacent bar **243**, as is shown in FIGURE 30. The bearing brackets **286** are spaced longitudinally of the shaft **285** in the manner best shown in FIGURE 20.

The shaft **285** is provided intermediate its ends with a gear **287** which is meshed with the rack **283**. In this manner, the air cylinder **280** serves to rotate the shaft **285** first in one direction and then in the other.

The tucker blade **276** is provided with three racks **288**, as is shown in FIGURE 20. The racks **288** are aligned with and meshed with gears **289** on the shaft **285** so that when the shaft **285** is rotated, the associated tucker blade **276** is reciprocated.

At this time it is pointed out that the air cylinder **280** carried by a bar **243** serves to actuate a tucker blade **276** carried by an adjacent one of the bars **243**. Further, it is to be noted that the air cylinders **280** are arranged in pairs on opposite sides of the longitudinal center of the label applying drum. Air is directed through two of the air cylinders **280** through the sleeve **232** and the hub **236** and to the other two of the air cylinders **280** through the sleeve **233** and the hub **238**. The air cylinders **280** are vented through vent passages **279** in the sleeves **232** and **233** to permit the return operation thereof.

Referring now to FIGURE 35 in particular, it will be seen that the lower passage **269** in the reduced portion **240** of the sleeve **233** is intersected by an air passage **290** which is disposed in angular relation and which opens out through the peripheral surface of the end portion **240**. The hub **238** is provided with an air passage **291** which opens inwardly through the surface of the hub **238** and to which there is connected an air line **292** by means of a fitting **293**. The opposite end of the passage **291** opens radially inwardly to the inner peripheral surface of the hub **238** for alignment with the passage **290** to receive air therefrom. The air line **292** extends from the fitting **293** to a fitting **294** on the respective air cylinders **280**. It is to be noted that the hubs **236** and **238** each have two fittings **293** and two air lines **292** extending therefrom.

At this time it is pointed out that the chuck assemblies **103** and **104** are rotated by the rotating label applying drum **44**. In order to accomplish this, for each of the plates **244** there is a pair of gear segments **295**. The gear segments **295** are positioned at the ends of the plates **244** and are secured to the end plates **234** and **235** in the manner generally shown in FIGURE 32. The gear segments **295** are aligned with the gears **128** and **153** of the chuck members **118** and **145**, respectively.

Cutter assembly

The general assembly details of the cutter assembly **49** are best shown in FIGURES 13 and 21. The cutter assembly **49** includes a shaft **300** having reduced end portions **301** and **302** which extend through the side plates **96** and **97** of the frame of the label applying apparatus. The side plates **96** and **97** have openings **303** therein in which there are mounted for very limited vertical movement bearing assemblies **304** in which the reduced ends **301** and **302** of the shaft **300** are rotatably journaled. It is to be understood that the movement of the bearing assemblies **304** relative to the side plates **96** and **97** is limited to a vertical movement. Each of the side plates **96** and **97** also carries a mounting block assembly **305** associated with each bearing assembly **304**. The mounting block assembly **305** carries a plurality of compression springs **306** which bear against the respective bearing assembly **304**. The compression springs **306** normally hold the shaft **300** in an uppermost position, but permit very limited downward movement thereof during the operation of the cutter assembly **49**. The mounting block assembly **305** also includes elongated bolts **307** which pass therethrough and which are carried by the bearing assemblies **305**. The bolts **307** carry stop nuts **308** which are adjustably mounted thereon and which limit the upward movement of the bearing assemblies **304** by the compression springs **306**. It is to be understood that the vertical movement of the shaft **300** is not sufficient to preclude the use thereof as a drive shaft in a manner to be described hereinafter.

The shaft **300** includes an elongated central hub portion **309** which is specifically configurated, as is shown in FIGURE 13, for the reception of two knives **310**. The knives **310** are disposed in diametrically opposite relation and are suitably bolted to the hub **309**. It is to be understood that the knives **310** contact a hardened surface on the label applying drum **44** and cooperate therewith to effect the cutting of the label strip from the web **46**.

In order to assure the movement of the leading edge of the web **46** against a respective plate **244** of the label applying drum **44** whereby the cut off label strip L may be retained on the label applying drum **44**, the cutter assembly **49** also includes an air blast unit. The air blast unit includes an air passage **311** which extends through the reduced end **301** of the shaft **300** and which is intersected at its inner end by a transverse passage **312**. A fitting **313** is threaded into the reduced end **301** at the extreme end thereof and in communication with the passage **311**. The fitting **313** is part of a swivel **314** to which an air supply line **315** is connected.

The hub **309** is provided with a pair of longitudinally extending passages **316** which intersect the passage **312** and thus receive air from the passage **311** through the passage **312**. A plurality of longitudinally spaced, radially extending passages **317** open through the peripheral surface of the hub **309** for the purpose of directing air against the underside of the web **46** in the manner generally shown in FIGURE 13. It is to be noted that the passages **317** are of a smaller size than the other air passages. It is also to be noted that the hub **309** has arcuate surfaces **318** through which the passages **317** open and which arcuate surfaces **318** are centered on the center of the shaft **300** to assure an even contact with the underside of the web **47**. The air blast from the passages **317** assure the proper engagement of the leading edge portion of the web **47** with the label applying drum **44**.

At this time it is pointed out that the cutter assembly **49** may be varied to utilize a different type knife blade. If it is desired to omit the resilient mounting of the shaft **300**, the knife mlade **310**, which is of the dinking type, may be replaced by a slightly modified form of knife blade which will merely kiss the corresponding surface of the label applying drum **44** and effect a pinching off of a label strip L from the web **47** as opposed to the cutting off thereof as occurs with the knife blades **310**.

Adhesive or glue applicator

After an individual label strip L has been sheared from the web **46** by the cutter assembly **49**, the label strip is carried by the label applying drum in a counter-clockwise direction, as viewed in FIGURE 1, past the adhesive or glue applicator **50** where adhesive is applied to the outermost exposed surface thereof. The adhesive applicator includes a conventional type of glue pot **320** in which there is mounted for rotation a glue pick-up roll **321**, as is best shown in FIGURE 17. The glue pick-up roll applies glue to a glue applying roll **322** which has a raised segment **323**. The raised segment **323** corresponds approximately in peripheral length to the width of the label strip L and is the only portion of the glue applicator roll which is engaged by the glue pick-up roll **321** and to which the glue is transferred. It is to be understood that

as the label applying drum 44 rotates and presents a label strip L to the glue applying roll 322, the projecting portion 323 of the glue applying roll 322 comes into contact with the exposed surface of the label strip and applies the desired adhesive or glue thereto.

There are times when it is not desired to apply adhesive or glue for reasons to be described hereinafter. For this reason, the glue pot 320 is mounted for swinging movement away from the label applying drum 44. The glue pot 320 is supported from the frame of the label applying apparatus by means of two pins 324 which are disposed in opposed relation and which extend from the side plates 96 and 97 of the frame 51. The glue pot 320 has secured to the underside thereof two longitudinally extending frame members 325. The forward ends of the frame members 325 are notched so as to receive the pins 324, as at 326 in FIGURE 19. The rear end of each of the frame members 325 is provided with a vertically adjustable screw 327 which projects through the lower end of the respective frame member 325 and bears against a cam 328 carried by a transverse shaft 329 which is suitably supported by the side plates 96 and 97. The cam 328 has a flat spot 330 which, when turned under the screw 327, lowers the rear end of the glue pot 320 and pulls the glue applying roll 322 away from the label applying drum 44. The cam 328 has a shoulder 331 which bears against the outer face of the associated frame member 324, as is shown in FIGURE 19, to retain the glue pot 320 in longitudinal alignment with the label applying drum 44.

The rocking of the shaft 329 to raise and lower the glue pot 320 is accomplished by means of a double acting air cylinder 332. The lower end of the air cylinder 332 is supported by a bracket 333 which is secured to the outer face of the side plate 97. The air cylinder 332 has a piston shaft 334 which is provided at the upper end thereof with a bifurcated fitting 335 which is, in turn, connected by a pin 336 to a lever 337 secured on the outer end of the shaft 329. It will be readily apparent that when the piston shaft 334 moves downwardly, as viewed in FIGURE 17, the cam 328 will be rotated so that the flat 330 will be aligned with the screw 327 to thus lower the glue pot 320. At this time it is pointed out that the shaft 329 carries two of the cams 328, there being one cam for each of the frame members 325.

It is to be noted that the glue applying roll 322 is mounted on a shaft 338 while the glue pick-up roll 321 is carried by a shaft 340. The shafts 338 and 340 are suitably journalled by bearing means carried by the glue pot 320. The shaft 338 carries a gear 341 which is in mesh with a gear 342 on the shaft 340 to drive the glue pick-up roll 321 from the shaft 338. The shaft 338 is driven in a manner to be described hereinafter.

Web feed

It is to be understood that the web 47 is continuously printed with the printing being so spaced on the web whereby the label strip L which is to be cut therefrom will be of a proper width for wrapping around a tube T. The web 47 enters the label applying apparatus 40 over an idler roll 350 which is carried by a shaft 352 that is suitably journalled in bearings carried by the side plates 96 and 97 of the frame of the label applying apparatus. The web 46 passes over a support plate 353 and then around a main feed roll 354 of the web feed 47. The main feed roll 354 is backed up by a feed roll 355. The feed roll 354 is carried by a shaft 356 which is suitably journaled in bearings carried by the side plates 96 and 97. The feed roll 355 is carried by a shaft 357 which is also suitably journalled in bearings carried by the side plates 96 and 97.

A pair of arms 358 extend upwardly at opposite ends of the feed roll 354 with the arms 358 being jornalled on the shaft 356 for rotation. The arms 358 carry a shaft 360 which extends between the arms 358 and which is suitably journalled in bearings carried by the arms 358. The shaft 360 supports an auxiliary feed roll 361 which is a part of the auxiliary web feed 48. The web 46 passes around and over the feed roll 361 after it passes around and over the feed roll 354.

The arms 358 also carry a transverse shaft 362. The shaft 362 is resiliently mounted in bearing assemblies 363 which are spring-loaded downwardly by means of spring means 364. The shaft 362 carries a web engaging roll 365 which engages the web 46 and clamps the same against the feed roll 361.

The arms 358 have levers 366 secured to the lower portions thereof. To each lever 366 there is connected the lower end of a tension spring 367 which has the upper end thereof carried by an adjustable screw 368 which, in turn, is carried by a bracket 369. The brackets 369 are carried by the side plates 96 and 97. The adjusting bolts or screws 368 pass through the brackets 369 and have nuts 370 which are adjusted to vary the tension of the respective spring 367.

The arms 358 also have ears 371 projecting therefrom. Each ear 371 carries a cam follower 372. The cam followers 372 are engaged with cams 373 which are carried by the shaft 300 of the cutter assembly, as is best shown in FIGURE 21. The cam followers 372 and the cams 373 cooperate to normally retain the arms 358 in the position shown in FIGURE 13. However, it is desirable that the upper ends of the arms 358 move to the right at the time a label strip L is being cut from the web 46. It is pointed out at this time that the peripheral speed of the label applying drum 44 and the knife blade 310 is much greater than that of the web 46. Accordingly, it is desirable that the portion of the web 46 engaged by the blades 310 momentarily speed up during the cutting operation so that there will be no relative movement between the blades and the web during the cutting operations. This is accomplished by contouring the cams 373 to permit the cam followers 372 to move to the right, as viewed in FIGURE 13, due to the urgence of the springs 367.

It is to be understood that the shearing of the label strip L from the web 37 must be in registration with the printing on the web 46. To this end, registration of the web 46 is controlled by a suitable conventional type of mechanism which may include an electric eye illustrated in block form in FIGURE 13 and referred to by the numeral 374. The electric eye 374 is carried by a suitable support 375 which, in turn, is carried by shaft members 376 extending from the side plates 96 and 97. It is to be noted that the electric eye 374 overlies the web 46 in advance of the main web feed 47. It is also to be understood that the web 46 will be provided with some suitable registration means to be picked up by the electric eye 374 in order to facilitate the automatic determination of the registration of the web 46.

Referring now to FIGURE 9 in particular, it will be seen that there is schematically illustrated the web 46 with the web having imprinted thereon registration marks 377. Also, the electric eye 374 is illustrated as including a suitable light source 378 and a pick-up head 380, the light source 378 and the pick-up head 380 being of a conventional type. The light source 378 and the pick-up head 380 are properly positioned with respect to the registration marks 377 to determine registration of the web 46.

Drive system

The drive system of the label applying apparatus 40 includes a main drive motor 381 which is suitably mounted on the frame 51. The main drive motor 381 includes an armature shaft 382 on which there is mounted a drive sprocket 383. The drive sprocket 383 is aligned with a driven sprocket 384 which, in turn, is mounted on a shaft 385. The sprockets 383 and 384 are connected together by a drive chain 386 which is entrained thereover.

One end of the driven shaft 385 is coupled to a gear box

while the other end thereof is connected to a variable speed gear box 388.

The gear box 387 has an output shaft 389 on which there is mounted a drive sprocket 390. The drive sprocket 390 is aligned with a sprocket 391 carried by the shaft 300 of the cutter assembly 49. A drive chain 392 is entrained over the sprockets 390 and 391 to drive the shaft 300 of the cutter assembly 49.

The shaft 300 carries a gear 393 on the end thereof remote from the sprocket 391. The gear 393 is meshed with a gear 394 which is secured to the shaft 229 for driving the label applying drum 44.

A hub 395 is disposed outwardly of the side plate 97 adjacent the gear 394 and is suitably mounted for rotation on a stub support 396, see FIGURE 7, carried by the side plate 97. The hub 395 carries a gear 398 which is in mesh with the gear 394 to drive the hub 395. The hub 395 also includes a Geneva drive element 400 having a pair of diametrically disposed drive pins 401. The drive pins 401 are engageable in suitable slots 402 of a Geneva drive wheel 403 which is secured to the shaft 99 of the tube turret 42. The Geneva drive provides for the indexing of the tube turret 42 in timed relation to the rotation of the label applying drum 44.

The variable speed gear box 388 has an output shaft 404 on which there is mounted a drive sprocket 405. A sprocket 406 is aligned with the drive sprocket 405 and is driven therefrom by means of a drive belt 407. The sprocket 406 is secured to a shaft 408 which is suitably journalled in bearings carried by the side plate 97. The shaft 408 passes through a gear 409 and is coupled to a conventional type of remotely controllable differential 410 which, in turn, has an output shaft 411 disposed around and concentric to the shaft 408. The output shaft 411 is secured to the gear 409 for rotating the same.

Referring to FIGURES 7, 8, and 10, it will be seen that there is a gear 412 disposed above and meshed with the gear 409. The gear 412 is carried by a stub shaft 413 which is mounted on the side plate 97.

As is clearly shown in FIGURE 10, a gear 414 is disposed horizontally adjacent the gear 412 in meshing engagement therewith. The gear 414 is an idler gear and is carried by a stub shaft 415 suitably supported by the side plate 97. The gear 414 is meshed with a gear 416 carried by the shaft 356 of the main drive roll 354. The adjustable differential is automatically controlled by a control unit depending upon the reading picked up by the electric eye device 374 so as to cause the web 46 to be slightly longitudinally repositioned, or shifted. It is to be understood that by so controlling the driving of the main drive roll 354, registration of the web 46 with respect to the remainder of the label applying apparatus 40 may be obtained.

The shaft 356 is provided with another gear 417 which is utilized to drive the shaft 360 of an auxiliary feed roll 361. The shaft 360 is provided with a gear 418 which is aligned with the gear 417. The gear 418 is driven from the gear 417 by means of a pair of intermediate idler gears 420 and 421 which are suitably journaled on stub shafts (not shown) carried by one of the arms 358.

A gear 422 is carried on the shaft 229 at the end thereof remote from the gear 394. The gear 422 is rotatable relative to the shaft 229 and is driven from the shaft 229 by means of a dog clutch unit, generally referred to by the numeral 423 and best shown in FIGURE 38. The dog clutch unit 423 is mounted within a hub 424 secured to the gear 422.

The gear 422 is meshed with the gear 224 for driving the same.

The shaft 338 of the adhesive or glue applicator 50 is also driven from the gear 422. The shaft 338 is provided with a gear 425 which is meshed with the gear 422.

In a manner to be described in detail hereinafter, the operation of the label applying apparatus 40 is to be automatically stopped upon the failure of a tube T to be delivered to the tube turret 42. However, it is not desired to stop the rotation of the rolls of adhesive applicator 50 or the tube discharge assembly 45. If rotation of the rolls of the adhesive applicator 50 is discontinued, there can result a caking or drying out of the adhesive on the rolls. It is desirable that the tube discharge assembly continue to operate so as to discharge any tubes carried thereby and to prevent overheating of such tubes when the heater for setting the adhesive is utilized.

In order to accomplish the continued driving of the adhesive applicator 50 and the tube discharge assembly 45, the label applying apparatus 40 also includes an auxiliary motor 426 which has a gear box 427. The gear box 427 is provided with an output shaft 428 on which there is mounted a sprocket 429. The sprocket 429 is aligned with a sprocket 430 which is carried by the hub 424. The sprockets 429 and 430 are connected together by a drive chain 431. It is to be understood that the clutch assembly 423 is of a construction wherein the gear 422 is normally driven by the shaft 229. However, when driving of the shaft 229 is discontinued, the gear 422 may be driven by the sprocket 430 through the clutch assembly 423.

Control system

The label applying apparatus 40 also includes an automatic control system. The control system includes a timing shaft 435 which extends through the side plates 96 and 97 and is suitably journaled in bearings carried thereby. The timing shaft 435 is driven from the shaft 300 of the cutter assembly by means of a sprocket 436 on the shaft 300. The timing shaft 435 is provided with a sprocket 437 and the sprockets 436 and 437 are connected together by a drive belt 438.

The side plate 97 carries a stub shaft 440 adjacent the timing shaft 435. The stub shaft 440 has mounted thereon a gear 441 which is meshed with a gear 442 on the timing shaft 435. It is to be noted that the gear 442 abuts the hub 443 of the sprocket 437. The gear 441 has secured to opposite sides thereof a pair of adjustable cams 444 and 445 for a purpose to be described hereinafter.

A photoelectric cell timing device 446 is mounted on the outer surface of the plate 96 and is driven by the timing shaft 435. Referring now to FIGURE 9 in particular, it will be seen that the photoelectric cell timing unit 446 is electrically connected to the photoelectric cell pickup head 380. The timing unit 446 is also connected to a conventional type of control unit 447 which, in turn, is connected to the controls 448 of the adjustable differential 410. It is to be understood that the phtoelectric cell registration unit including the driving controls for the adjustable differential 410 are conventional and in themselves not a part of this invention.

Referring now to FIGURES 17, 18 and 19 in particular, it will be seen that there is mounted on the outer surface of the side plate 97 a support bracket 449 which carries a pair of switches 450 and 451 which are operated by the cams 445 and 444, respectively. The switch 450 has a follower 452 which rides on the cam 445 while the switch 451 has a follower 453 which rides on the cam 444.

Referring now to FIGURE 17 in particular, it will be seen that a bracket 454 is mounted on the rod 324. The bracket 454 carries a contact 456 which is suitably electrically insulatedly attached at 455 and is engageable with the peripheral surface of the label applying drum 44. The contact 456 is part of a grounded circuit which is normally rendered inoperative by the existence of a label strip L in place on the label applying drum 44 ready for the application of adhesive thereto. Referring now to FIGURE 9, it will be seen that there is illustrated an electrical system which includes a power source 457 to which an amplifier 458 is connected by means of wires 460 and 461. A control switch 462 is incorporated in the wire 461. Wires 463 and 464 lead from the amplifier 458 to a time delay device 465 of a conventional type. One wire 466

leads from the time delay device **465** to a solenoid **467** of a solenoid control valve **468** which is normally urged in one direction so as to project the piston rod **334** of the air cylinder **332**. The valve **468** has an air line **469** connected thereto. The valve **468** is also provided with an exhaust **470**. The valve **468** is suitably connected to the air cylinder **332** by means of air lines **471** and **472**.

A wire **473** also leads from the time delay device **465** to the solenoid **467**. However, there is incorporated in the wire **473** a normally closed half **474** of a multiple switch **475**. The purpose of the switch **475** will be described hereinafter.

A wire **476** leads from the contact **456** to the amplifier **458**. Another wire **477** leads from the label applying drum **44** to a suitable ground. The control for the amplifier **458** also includes a power source **478** which is grounded by means of a wire **480**. A wire **481** leads from the power source **478** and is connected to one terminal of the switch **450**. A circuit control link switch **482** is incorporated in the wire **481**. Another wire **483** leads from the switch **450** to the amplifier **458**.

It will be understood that a label strip carried by the label applying drum **44** will normally prevent the completion of the circuit to the amplifier **458**. However, in the event there is no label in place ready to receive glue from the glue applying roll **322**, the contact **456** will ground through the label applying drum **44** and complete the control circuit for the amplifier **458** when the switch **450** is closed. The closing of the switch **450**, which is normally open, is in timed relation to the period when a label strip L should underlie the contact **456**. If a label is not in position for receiving adhesive or glue, the valve **468** will be actuated to effect the operation of the air cylinder **332** in a manner to tilt the glue pot **320** and move the glue applying roll **322** away from the label applying drum **44** to prevent the application of glue or adhesive to the surface of the label applying drum.

Referring now to FIGURE 22 in particular, it will be seen that the upper part of the side plate **96** is provided with a bracket **484** on which there is mounted a switch **485**. The switch **485** is of the normally closed type and is provided with an actuator **486** which is engageable by the tubes T as they pass beneath.

Referring once again to FIGURE 9 in particular, it will be seen that a wire **487** extends from one side of the switch **485** to a power source **488**. A wire **489** extends from the power source **488** to one contact of the switch **451**. A circuit controlling switch **490** is incorporated in the wire **489**. A wire **491** extends from the switch **451** through a solenoid **492** of a solenoid actuated switch **493**. Another wire **494** extends between the solenoid **492** and the switch **485**.

It will be seen that the motor **381**, which is the main drive motor, is part of an electrical circuit which includes a power source **495**. Energization of the motor **381** from the power source **395** is controlled by a solenoid controlled switch **496** which includes a solenoid **497**.

The motor **426** of the auxiliary drive unit is energized through an electrical power supply **498** by means of a switch half **500** of the switch **475**, the switch half **500** being normally open. The operation of the switch **475** is controlled by a solenoid **501**. The switch **500** is incorporated in a wire **502** leading between the power source **498** and the motor **426**. Another wire **503** leads from the power source **498** to the motor **50** and has a manually controllable circuit controlling switch **504** incorporated therein.

The automatic controls for the label applying apparatus **40** include a power source **505** which is connected to the switch **493** by means of a wire **506**. A wire **507** leads from the power source **505** to the solenoid **501**. A wire **508** extends from the opposite terminal of the solenoid **501** to a normally opened starting switch **509**. A wire **510** leads from the switch **509** to a normally closed circuit controlling switch **511**. A wire **512** extends between the switches **493** and **511**.

The solenoid **497** is placed in parallel with the solenoid **501** by wires **513** and **514** which are connected to the wires **507** and **508**, respectively. A solenoid **515** of a circuit maintaining switch **516** is also disposed in parallel to the solenoid **501** and is connected to the wires **507** and **508** by means of wires **517** and **518**, respectively. The switch **516** bypasses the starting switch **509** and is connected to the wires **508** and **510** by means of wires **520** and **521**, respectively.

A manually closable drive switch **522**, which is normally open, bypasses the switch **493**. The switch **522** is connected to the wire **506** and the wire **512** by means of wires **523** and **524**.

At this time, it is pointed out that the timing device **447** is energized from a power source **525** which is connected to the timing device **447** by means of wires **526** and **527**. A circuit controlling switch **528** is incorporated in the wire **527**.

The photoelectric cell device **374** is energized from a power source **529**. Wires **530** and **531** extend from the power source **529** to the light source **378**. A control switch **532** is incorporated in the wire **531**.

The heater **185** is connected to a power source **533** by wires **534** and **535**. A control switch **536** is incorporated in the wire **535**, and a variable resistor **537** is incorporated in the wire **534** to control the temperature of the heater **185**.

Before describing the operation of the invention, reference is made to FIGURES 39 and 40. Although special emphasis has been made on the details of the adhesive applicator **50**, it is to be understood that the web **46** may be supplied with a heat meltable adhesive in advance of its delivery to the label applying drum **44**. In this event, the adhesive applicator **50** is dispensed with. When the web is provided with a heat meltable adhesive, the bars **243** will be provided with heating elements **538**, as is generally shown in FIGURES 39 and 40.

In FIGURE 40 there is illustrated a typical electrical circuit for the heating element **538**. The two heating elements **538** of one of the bars **243** are connected in series by a wire **540**. The two opposite ends of the heating elements **538** are connected by means of wires **541** and **542** to insulated slip rings **543** and **544**, respectively, on the shaft **229**. Electrical current is supplied to the slip rings **543** and **544** from a power source **545** by means of wires **546** and **547**, respectively.

Operation

In accordance with the invention, in the operation of the label applying apparatus **40**, a previously printed continuous web **46** is supplied. The web is maintained in registration by an automatic feed device which includes the main web feed **47** and the auxiliary web feed **48**. The leading edge of the web **46** underlies the label applying drum **44** and an air blast from the cutter assembly **49** urges the leading portion of the web **46** up into engagement with an associated vacuum plate **244** of the label applying drum **44**. As the respective vacuum plate **244** comes into alignment with the leading portion of the web **46**, the valve means for the respective vacuum plate **244** communicates the chamber **249** underlying the vacuum plate **244** with the vacuum source. Thus, a vacuum is drawn through the orifices **251** of the vacuum plate **244** and the leading portion of the web **46** is accurately oriented with respect to the label applying drum.

As the label applying drum **44** rotates and the leading portion of the web **46** begins to adhere to the vacuum plate **244**, the cutter assembly **49** cooperates with the label applying drum **44** to sever the leading portion of the web **46**. That portion of the web **46** which is severed is a predetermined portion which is to be wrapped around a tube T and is in the form of a plurality of longitudinally aligned labels, the labels extending transversely across the web **46**.

That portion of the web **46** removed by the cutter assembly **49** and adhering to the respective vacuum plate **244** of the label applying drum **44** is considered a label strip L, as has been described herebefore.

The label strip L is carried by the label applying drum **44** in a counterclockwise direction, as is viewed in FIGURE 1, past the adhesive applicator **50**. As the label strip L passes the adhesive applicator **50**, adhesive is applied to the outer face thereof by the glue applying roll **322** in the manner best shown in FIGURE 31. The label strip L, with the glue or adhesive applied thereto, is then continued to be moved upwardly in a counterclockwise direction by the label applying drum **44** to a position underlying the tube turret **42**.

The tube turret **42** receives tubes T from the tube hopper **41**. As the tube turret **42** is automatically indexed in timed relation to the rotation of the label applying drum **44**, the tube feed mechanism **43** is automatically tripped so as to drop a tube T down onto the pair of backup rolls **162** underlying the tube hopper **41**. As the tube turret **42** begins to index, the cams **116** and **141** move the chuck members **118** and **145**, respectively, into opposite ends of the tube T. As the chuck member **118** enters into the tube T, the air passage therethrough comes into communication with the pressurized air supply with the result that the tube T carried by the chuck members **118** and **145** is internally pressurized.

As the tube turret **42** is indexed, a tube T is brought into register with the label applying drum as a label strip L carried by the label applying drum **44** approaches the tube. When the label applying drum **44** reaches the position illustrated in FIGURE 1, the vacuum source to the respective vacuum plate **244** is discontinued and air under pressure is directed to the respective air cylinder **280** to effect the outward movement of the respective tucker blade **276**. As the label applying drum **44** passes beneath the tube T to which a label strip L is being applied, the tucker blade **276** continues to project outwardly from the label applying drum **44** to wrap the leading edge of the label strip L around the tube T, as is best shown in FIGURE 30. At the same time, the respective gears **295** on the label applying drum **44** rotates the chuck members **118** and **145** and the backup rolls **162** to rotate the tube carried thereby. Once the label strip L has been initially started on the tube T, as is shown in FIGURE 30, the continued rotation of the tube T will result in the complete wrapping of the label strip L therearound with the backup rolls **162** cooperating in pressing the label strip L against the surface of the tube T.

It is to be understood that the label applying drum **44** moves in the same direction as the tube turret **42**, a counterclockwise direction as the drum and turret are viewed in FIGURE 1, with the result that adjacent portions of the label applying drum **44** and the tube turret **42** move in opposite directions, the label applying drum **44** moving to the left and the tube turret **42** moving to the right.

After the initial application of the label strip L to a tube, T the air supply to the respective air cylinder **280** is discontinued, and the respective tucker blade **276** is withdrawn. As the label applying drum **44** continues to rotate, a pressurized air supply is communicated with the cavity **249** of the respective vacuum plate **244** to clean the surface thereof and to remove a label strip therefrom in the event the label strip is not transferred to a tube.

As the tube turret **42** continues to rotate, the labelled tube is indexed into alignment with the tube discharge assembly **45**. At this point, the chuck members **118** and **145** have been withdrawn, and as they are withdrawn, the ejector blade **168** at the particular station forces the labelled tube into the tube discharge assembly between the conveyor belts thereof for the eventual discharge of the labelled tube by the tube discharge assembly.

It is to be understood that in the event for some reason the particular vacuum plate **244** which is presented to the glue applying roll **322** does not contain a label strip, the automatic control for positioning the glue pot of the adhesive applicator **50** functions to move the glue applying roll **322** away from the label applying drum **44** to prevent the application of glue or adhesive to the surface of the respective vacuum plate **244**.

Should a tube T not be supplied to any particular station of the tube turret **42**, the switch **485** will remain closed at the time the switch **451** is closed, with the result that the solenoid **492** would be energized and the switch **493** will open. This will break the circuit to the motor **381** and automatically tend to stop the complete operation of the label applying apparatus **40**. However, when the circuit to the motor **381** is broken, the solenoid **501** is de-energized with the result that the switch **475** moves to a position to close the switch portion **500** and energize the auxiliary motor **426**. The auxiliary motor **426** would then continue to drive the tube discharge assembly **45** and the rolls of the adhesive applicator **50**. In this manner, the setting of the adhesive or glue on the rolls of the adhesive applicator **50** would be prevented, and there would be no overheating of tubes by the heater of the tube discharge assembly **45**. The switch portion **474** would, at the same time, be caused to open to de-energize the solenoid **467** to cause the glue applying roll **322** to be moved away from the label applying drum **44**.

Due to the flexibility of the tubes T, the operator of the tube label applying apparatus **40** may slightly bend or flex a tube and engage the same over a pair of chuck members **118** and **145** even though the two have advanced towards one another. The spring **147** of chuck assembly **104** aids loading the chucks by compressing. If the operator of the label applying apparatus **40** desires to advance the tube turret **42** slightly in order to place the empty chuck members **118** and **145** in more favorable positions, he may jog the apparatus by momentarily closing the switch **522** and the switch **509**. This hand loading operation would be performed whenever a tube is not delivered to a station of the tube turret **42** by the gate mechanism **43**.

From the foregoing, it will be readily apparent that the label applying apparatus **40** is automatic in operation and perfect alignment of the label strips with the tubes is assured. After the label strips L have been applied to the tubes T, the tubes T are then cut into individual short sections in a manner which is not a part of this invention.

Although only a preferred embodiment of the invention has been illustrated and specifically described herein, it is to be understood that minor modifications may be made in the label applying apparatus within the spirit and scope of the invention, as defined in the appended claims.

What is claimed is:

1. An apparatus for applying a label to an elongated flexible tube comprising chuck means for engaging opposite ends of a tube and supporting the same, means for effecting the rotation of a tube carried by said chuck means, and a label applying drum for applying a label to a tube carried by said chuck means, said label applying drum including label retaining means, and means for directing a leading edge of a label into engagement with a tube.

2. The apparatus of claim **1** wherein said label retaining means includes a perforated area of said label applying drum, and a vacuum source connected to said perforated area.

3. The apparatus of claim **1** wherein the last mentioned means includes an edge tucking blade.

4. The apparatus of claim **1** wherein said label retaining means includes a perforated area of said label applying drum, and a vacuum source connected to said perforated area, said means for directing a leading edge of a label into engagement with a tube being an edge tucking blade disposed in advance of said perforated area.

5. The apparatus of claim **1** wherein the labels to be applied are supplied in a continuous web, and cutter

means associated with said label applying drum for severing labels from the web.

6. The apparatus of claim 1 wherein the labels to be applied are supplied in a continuous web in timed relation to the rotation of said label applying drum, and cutter means associated with said label applying drum for severing labels from the web.

7. An apparatus for applying a label to an elongated flexible tube comprising chuck means for engaging opposite ends of a tube and supporting the same, means for effecting the rotation of a tube carried by said chuck means, a label applying drum for applying a label to a tube carried by said chuck means, said label applying drum including label retaining means, and means for directing a leading edge of a label into engagement with a tube, and an adhesive applicator positioned alongside said label applying drum for applying adhesive to labels carried by said label applying drum.

8. The apparatus of claim 7 together with means for operating said adhesive applicator in timed relation to the rotation of said label applying drum.

9. The apparatus of claim 7 together with means for operating said adhesive applicator in timed relation to the rotation of said label applying drum, and means for rendering said adhesive applicator inoperative in the absence of a label on said label applying drum.

10. An apparatus for applying labels to elongated flexible tubes comprising a turret, a plurality of chuck means carried by said turret for engaging opposite ends of tubes for rotation with said turret, means for rotating said turret, means for rotating tubes carried by said chuck means during at least one portion of the rotation of each tube by said turret, means disposed adjacent said turret for supplying tubes to said turret, means disposed adjacent said turret for applying labels to tubes carried by said turret, means disposed adjacent said turret for receiving labelled tubes from said turret, and means for rendering said turret rotating means inoperative upon the failure of said tube supplying means to supply a tube to any one of said chuck means.

11. An apparatus for applying labels to elongated flexible tubes comprising a turret, a plurality of chuck means carried by said turret for engaging opposite ends of tubes for rotation with said turret, means for rotating said turret, means for rotating tubes carried by said chuck means during at least one portion of the rotation of each tube by said turret, means disposed adjacent said turret for supplying tubes to said turret, means disposed adjacent said turret for applying labels to tubes carried by said turret, and means disposed adjacent said turret for receiving labelled tubes from said turret, said tube supplying means including a tube reservoir of the gravity feed type, and gate means actuated by said turret in timed relation to the rotation of said turret for releasing and positioning tubes for engagement by said chuck means.

12. An apparatus for applying labels to elongated flexible tubes comprising a turret, a plurality of chuck means carried by said turret for engaging opposite ends of tubes for rotation with said turret, means for rotating said turret, means for rotating tubes carried by said chuck means during at least one portion of the rotation of each tube by said turret, means disposed adjacent said turret for supplying tubes to said turret, a label applying drum cooperative with said turret to apply labels to tubes during the rotation thereof, means for rotating said label applying drum in timed relation to the rotation of said turret, and means disposed adjacent said turret for receiving labelled tubes from said turret, said label applying drum including label retaining means, and means for directing a leading edge of a label into engagement with a tube.

13. The apparatus of claim 12 wherein said label retaining means includes a perforated area of said label applying drum, and a vacuum source connected to said perforated area.

14. The apparatus of claim 12 wherein the last mentioned means includes an edge tucking blade.

15. The apparatus of claim 12 wherein the labels to be applied are supplied in a continuous web, and cutter means associated with said label applying drum for severing labels from the web.

16. An apparatus for applying labels to elongated flexible tubes comprising a turret, a plurality of chuck means carried by said turret for engaging opposite ends of tubes for rotation with said turret, means for rotating said turret, means for rotating tubes carried by said chuck means during at least one portion of the rotation of each tube by said turret, means disposed adjacent said turret for supplying tubes to said turret, a label applying drum cooperative with said turret to apply labels to tubes during the rotation thereof, means for rotating said label applying drum in timed relation to the rotation of said turret, and means disposed adjacent said turret for receiving laballel tubes from said turret, and a driven adhesive applicator positioned alongside said label applying drum for applying adhesive to labels carried by said label applying drum.

17. The apparatus of claim 16 together with means for rendering said turret rotating means inoperative upon the failure of said tube supplying means to supply a tube to any one of said chuck means.

18. The apparatus of claim 16 together with a main drive unit for driving said turret, said label applying drum, said labelled tube receiving means and said adhesive applicator; an auxiliary drive unit for driving said labelled tube receiving means and said adhesive applicator independently of said turret and said label applying drum, and means for rendering said main drive unit inoperative and said auxiliary drive unit operative upon the failure of said tube supplying means to supply a tube to any one of said chuck means.

19. A tube feed unit comprising a tube holder positioned for the gravity discharge of tubes, and gate means on said tube holder for the releasing of a selected number of tubes, said gate means comprising support members disposed on opposite sides of a path of movement of tubes through said tube holder, oppositely directed upper and lower gate members carried by said support members for movement transversely of and into intersecting relation to the path of movement of tubes through said tube holder, drive means connected to said gate members for moving the same simultaneously in like directions to release lower tubes and retain others of said tubes, and control means connected to said drive means for effecting the movement of said gate members thereby.

20. The tube feed unit of claim 19 wherein said gate members are mounted for linear movement and said drive means include rotatable shafts having fingers engaged within said gate members, and gears interconnect said shafts for rotation in unison.

21. In combination with a rotating drum having tube holding means, a tube feed unit, said tube feed unit comprising a tube holder positioned above said drum for the gravity discharge of tubes, gate means on said tube holder for the releasing of a lowermost tube, said gate means comprising support members disposed on opposite sides of a path of movement of tubes through said tube holder, oppositely directed upper and lower gate members carried by said support members for movement transversely of and into intersecting relation to the path of movement of tubes through said tube holder, drive means connected to said gate members for moving the same simultaneously in like directions to release lower tubes and retain others of said tubes, and control means connected to said drive means and operable in timed relation to the movement of said drum for effecting the movement of said gate members to release a tube to said drum.

22. The combination of claim 21 wherein said control means includes a lever connected to said drive means and

an abutment carried by said drum for engaging and swinging said lever.

23. The combination of claim 21 wherein said upper gate member has a wedge-shaped edge for wedging below and forcing tubes stacked in said tube holder upwardly into overlying relation to said upper gate member.

24. In combination with an apparatus for adhesively securing wrappings to tubes, a tube discharge unit including a heated discharge plate for curing the adhesive and a conveyor belt having a run disposed parallel to and opposing said plate for rolling tubes along said discharge plate.

25. In combination with a tube turret having circumferentially spaced tube holding means, a tube discharge unit comprising a pair of conveyor belts having opposed parallel runs moving in like directions, means sequentially presenting said tube holding means to said tube discharge unit, and tube ejector means carried by said tube turret for ejecting tubes in between said conveyor belt runs.

26. A discharge unit for tubes comprising a pair of endless conveyor belts having opposed parallel runs moving in like directions and spaced a distance generally corresponding to the diameter of tubes to be carried thereby, a discharge plate having a tube engaging surface aligned with the aforesaid run of one of said conveyor belts, a third endless conveyor belt having a run parallel to said discharge plate and aligned with the other of said conveyor runs for moving tubes along said discharge plate, and means for driving all of said conveyor belts in unison.

27. The tube discharge unit of claim 26 together with heater means for said discharge plate to effect the curing of adhesive on tubes passing thereover.

28. A tube turret for use in the application of labels to tubes, said tube turret having a plurality of stations and being mounted for rotation, a pair of opposed chuck assemblies at each of said stations, said chuck assemblies including aligned chuck members for entering into ends of tubes and resilient means urging said chuck members apart, fixed cams at opposite ends of said tube turret and cam followers connected to said chuck members for facilitating the movement of said chuck members together and apart in response to rotation of said turret, and means for rotating said chuck members at a predetermined time during the rotation of said turret.

29. A tube turret for use in the application of labels to tubes, said tube turret having a plurality of stations and being mounted for rotation, a pair of opposed chuck assemblies at each of said stations, said chuck assemblies including aligned chuck members for entering into ends of tubes and resilient means urging said chuck members apart, fixed cams at opposite ends of said tube turret and cam followers connected to said chuck members for facilitating the movement of said chuck members together and apart in response to rotation of said turret, one of said chuck members having a passage therethrough, and pressurized air means connected to said one chuck member to internally pressurize a tube carried thereby.

30. The tube turret of claim 29 wherein each of said chuck members has pressure actuated seal means for internally engaging and sealing opposite end portions of tubes.

31. The tube turret of claim 29 wherein each of said chuck members has a sealing ring for engaging the interiors of tubes, and air pressure passages through said chuck members leading to said sealing rings for effecting the pressure contact thereof with tubes.

32. A tube turret for use in the application of labels to tubes, said tube turret having a plurality of stations and being mounted for rotation, a pair of opposed chuck assemblies at each of said stations, said chuck assemblies including aligned chuck members for entering into ends of tubes and resilient means urging said chuck members apart, fixed cams at opposite ends of said tube turret and cam followers connected to said chuck members for facilitating the movement of said chuck members together and apart in response to rotation of said turret, and a pair of back-up rolls associated with each pair of chuck assemblies for aid in the support of tubes during the application of labels thereto.

33. The tube turret of claim 32 wherein said back-up rolls are disposed radially inwardly of said chuck members to support tubes prior to the insertion of said chuck members into the tubes.

34. The tube turret of claim 32 wherein said backup rolls and said chuck members have cooperating drive means for rotation in unison.

35. The tube turret of claim 32 wherein said backup rolls are circumferentially spaced, and a tube ejector is carried by said turret for movement between each pair of backup rolls for movement therebetween to eject tubes bearing thereagainst.

36. The tube turret of claim 32 wherein said backup rolls are circumferentially spaced, and a tube ejector is carried by said turret for movement between each pair of backup rolls for movement therebetween to eject tubes bearing thereagainst, said tube ejector being in the form of a plate mounted for sliding movement, and actuating means connected to each tube ejector for ejecting tubes in timed relation to the rotation of said tube turret.

37. The combination of a tube turret and a label applying drum for applying labels to tubes carried by said tube turret, said tube turret having a plurality of stations and being mounted for rotation, a pair of opposed chuck assemblies at each of said stations, said chuck assemblies including aligned chuck members for entering into ends of tubes and resilient means urging said chuck members apart, fixed cams at opposite ends of said tube turret and cam followers connected to said chuck members for facilitating the movement of said chuck members together and apart in response to rotation of said turret, said label applying drum having means for retaining and applying a label to a tube carried by said tube turret, drive means for driving said tube turret and said label applying drum in unison, and cooperating means on said chuck members and said label applying drum for rotating tubes during the application of labels thereto.

38. The combination of a tube turret and a label applying drum for applying labels to tubes carried by said tube turret, said tube turret having a plurality of stations and being mounted for rotation, a pair of opposed chuck assemblies at each of said stations, said chuck assemblies including aligned chuck members for entering into ends of tubes and resilient means urging said chuck members apart, fixed cams at opposite ends of said tube turret and cam followers connected to said chuck members for facilitating the movement of said chuck members together and apart in response to rotation of said turret, said label applying drum having means for retaining and applying a label to a tube carried by said tube turret, drive means for driving said tube turret and said label applying drum in unison, and cooperating means on said chuck members and said label applying drum for rotating tubes during the application of labels thereto, one of said chuck members having a passage therethrough, and pressurized air means connected to said one chuck member to internally pressurize a tube carried thereby.

39. The tube turret of claim 38 wherein each of said chuck members has pressure actuated seal means for internally engaging and sealing opposite end portions of tubes.

40. The tube turret of claim 38 wherein each of said chuck members has a sealing ring for engaging the interiors of tubes, and air pressure passages through said chuck members leading to said sealing rings for effecting the pressure contact thereof with tubes.

41. The combination of a tube turret and a label applying drum for applying labels to tubes carried by said tube turret, said tube turret having a plurality of stations and being mounted for rotation, a pair of opposed chuck assemblies at each of said stations, said chuck assemblies

including aligned chuck members for entering into ends of tubes and resilient means urging said chuck members apart, fixed cams at opposite ends of said tube turret and cam followers connected to said chuck members for facilitating the movement of said chuck members together and apart in response to rotation of said turret, said label applying drum having means for retaining and applying a label to a tube carried by said tube turret, drive means for driving said tube turret and said label applying drum in unison, and cooperating means on said chuck members and said label applying drum for rotating tubes during the application of labels thereto, and a pair of back-up rolls associated with each pair of chuck assemblies for aid in the support of tubes during the application of labels thereto.

42. The tube turret of claim **41** wherein said backup rolls are disposed radially inwardly of said chuck members to support tubes prior to the insertion of said chuck members into the tubes.

43. The tube turret of claim **41** wherein said backup rolls and said chuck members have cooperating drive means for rotation in unison.

44. The tube turret of claim **41** wherein said backup rolls are circumferentially spaced, and a tube ejector is carried by said turret for movement between each pair of backup rolls for movement therebetween to eject tubes bearing thereagainst.

45. The combination of a tube turret and a label applying drum for applying labels to tubes carried by said tube turret, said tube turret having a plurality of stations and being mounted for rotation, a pair of opposed chuck assemblies at each of said stations, said chuck assemblies including aligned chuck members for entering into ends of tubes and resilient means urging said chuck members apart, fixed cams at opposite ends of said tube turret and cam followers connected to said chuck members for facilitating the movement of said chuck members together and apart in response to rotation of said turret, said label applying drum having means for retaining and applying a label to a tube carried by said tube turret, drive means for driving said tube turret and said label applying drum in unison, and cooperating means on said chuck members and said label applying drum for rotating tubes during the application of labels thereto, and a tucker blade on said label applying drum adjacent each label retaining means for leading an edge of a label around a tube to effect the start of the application of a label to a tube.

46. In an apparatus for applying strips from a continuous web, a drum having strip retaining areas thereon, a cutter cooperating with said drum for severing strips from the web, feed means for feeding the web generally between said drum and said cutter, and an air blast means carried by said cutter for forcing a leading edge portion of the web into engagement with said drum.

47. The apparatus of claim **46** wherein said strip retaining means are in the form of vacuum plates in said drum.

48. In an apparatus for applying strips from a continuous web, a drum having strip retaining areas thereon, a cutter cooperating with said drum for severing strips from the web, feed means for feeding the web generally between said drum and said cutter, and means for driving said drum and said cutter at the same peripheral speed and said feed means at a lesser speed whereby the amount of the web to be removed in forming of a strip is advanced during the interval of advancement of said drum from one strip retaining means to the next and means for temporarily advancing the web at the same speed as the peripheral speed of the cutter at the time a strip is being cut from the web to prevent relative movement between said cutter and the web.

49. In an apparatus for applying strips from a continuous web, a drum having strip retaining areas thereon, a cutter cooperating with said drum for severing strips from the web, feed means for feeding the web generally between said drum and said cutter, and means for driving said drum and said cutter at the same peripheral speed and said feed means at a lesser speed whereby the amount of the web to be removed in forming of a strip is advanced during the interval of advancement of said drum from one strip retaining means to the next, said web feed means including a pair of feed rolls, arms supporting said feed rolls for movement generally towards said cutter and said drum, and means for swinging said arms for temporarily advancing the web at the same speed as the peripheral speed of the cutter at the time a strip is being cut from the web to prevent relative movement between said cutter and the web.

50. In an apparatus for applying strips from a continuous web, a drum having strip retaining areas thereon, a cutter cooperating with said drum for severing strips from the web, feed means for feeding the web generally between said drum and said cutter, and means for driving said drum and said cutter at the same peripheral speed and said feed means at a lesser speed whereby the amount of the web to be removed in forming of a strip is advanced during the interval of advancement of said drum from one strip retaining means to the next, and air blast means carried by said cutter for forcing a leading edge portion of the web into engagement with said drum.

51. A label applying drum comprising a drum member mounted for rotation, a plurality of vacuum plates set in said drum member for temporarily retaining labels on the exterior surface of said drum member, valve means for controlling the application of vacuum to a label, and means for projecting a leading edge of a label away from each of said vacuum plates in timed relation to the rotation of said drum member.

52. The label applying drum of claim **51** together with heater means for heat activating adhesive of labels.

53. A label applying drum comprising a drum member mounted for rotation, a plurality of vacuum plates set in said drum member for temporarily retaining labels on the exterior surface of said drum member, valve means for controlling the application of a vacuum to a label, and means for projecting a leading edge of a label away from each of said vacuum plates in timed relation to the rotation of said drum member, said last mentioned means being in the form of a tucker blade movable generally radially outwardly of said drum member.

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