Dec. 14, 1965 J. E. KERRIGAN ETAL 3,223,299

BOW-FORMING MACHINE

Filed Sept. 21, 1962 6 Sheets-Sheet 1

Fig. 1.

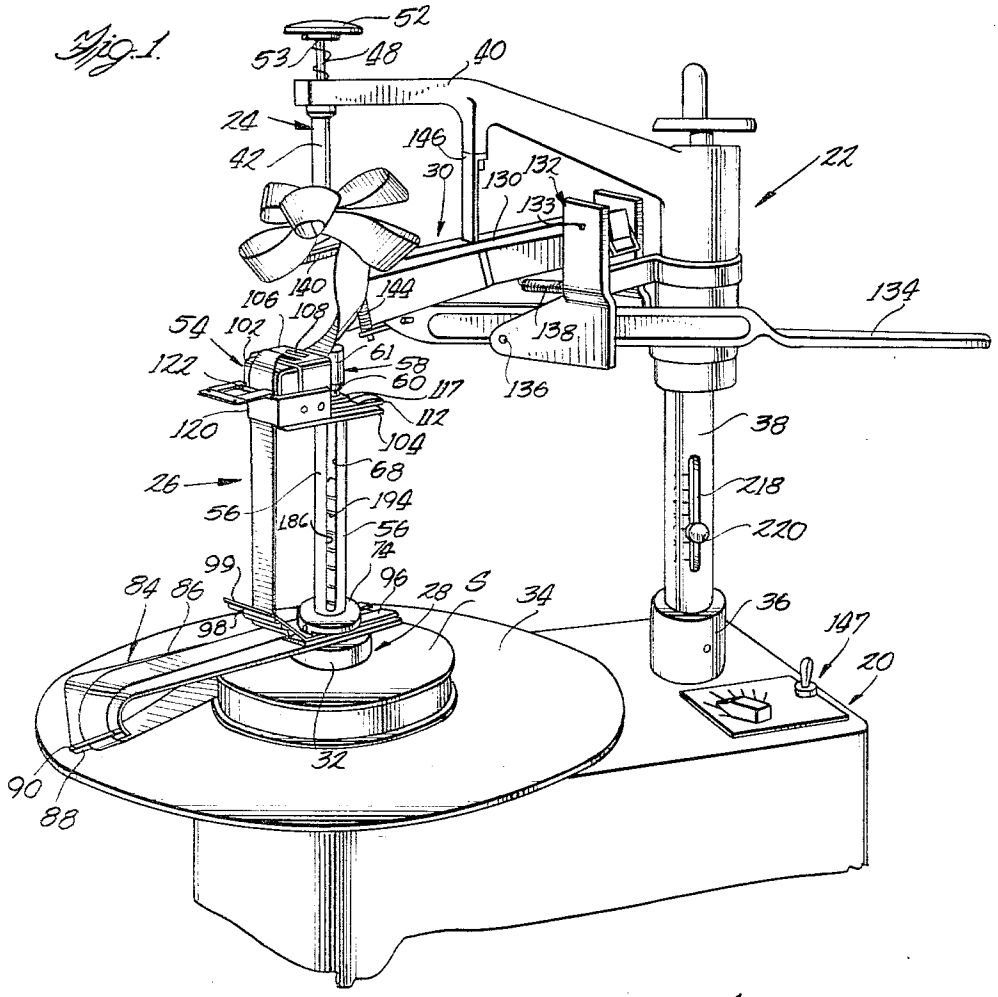


Fig. 12.

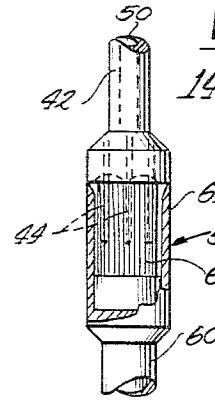


Fig. 13.

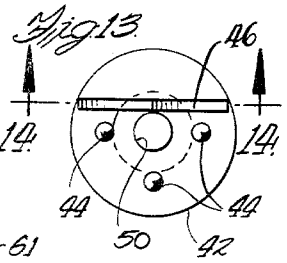
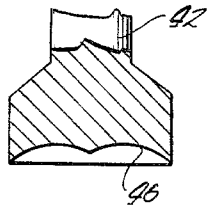


Fig. 14.



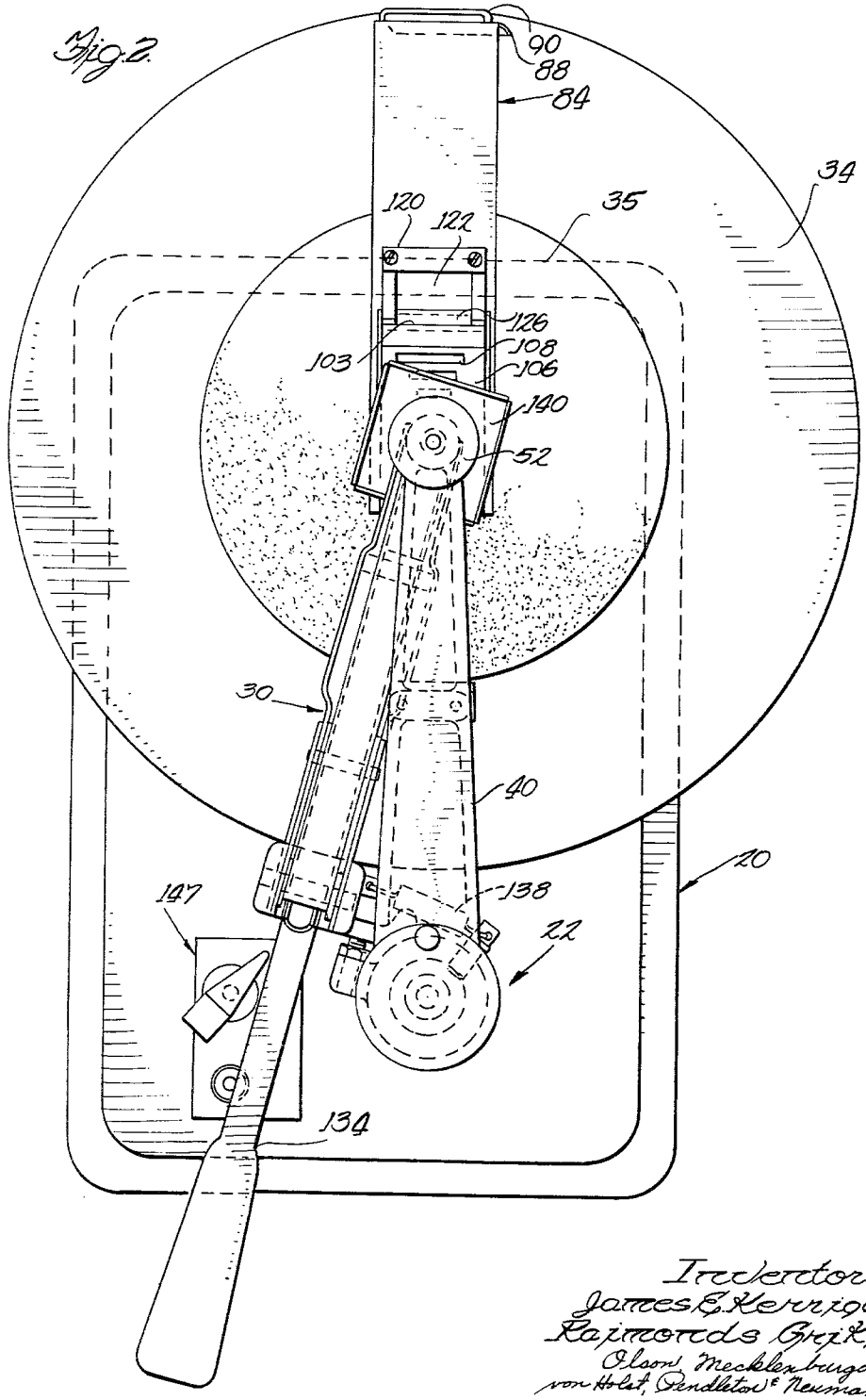
Inventors
James E. Kerrigan
Raimonds Grikis
Olson, Mecklenburger,
von Holst, Gendleton & Neuman
Attorneys

Dec. 14, 1965 J. E. KERRIGAN ETAL 3,223,299

BOW-FORMING MACHINE

Filed Sept. 21, 1962 6 Sheets-Sheet 2

Fig. 2.



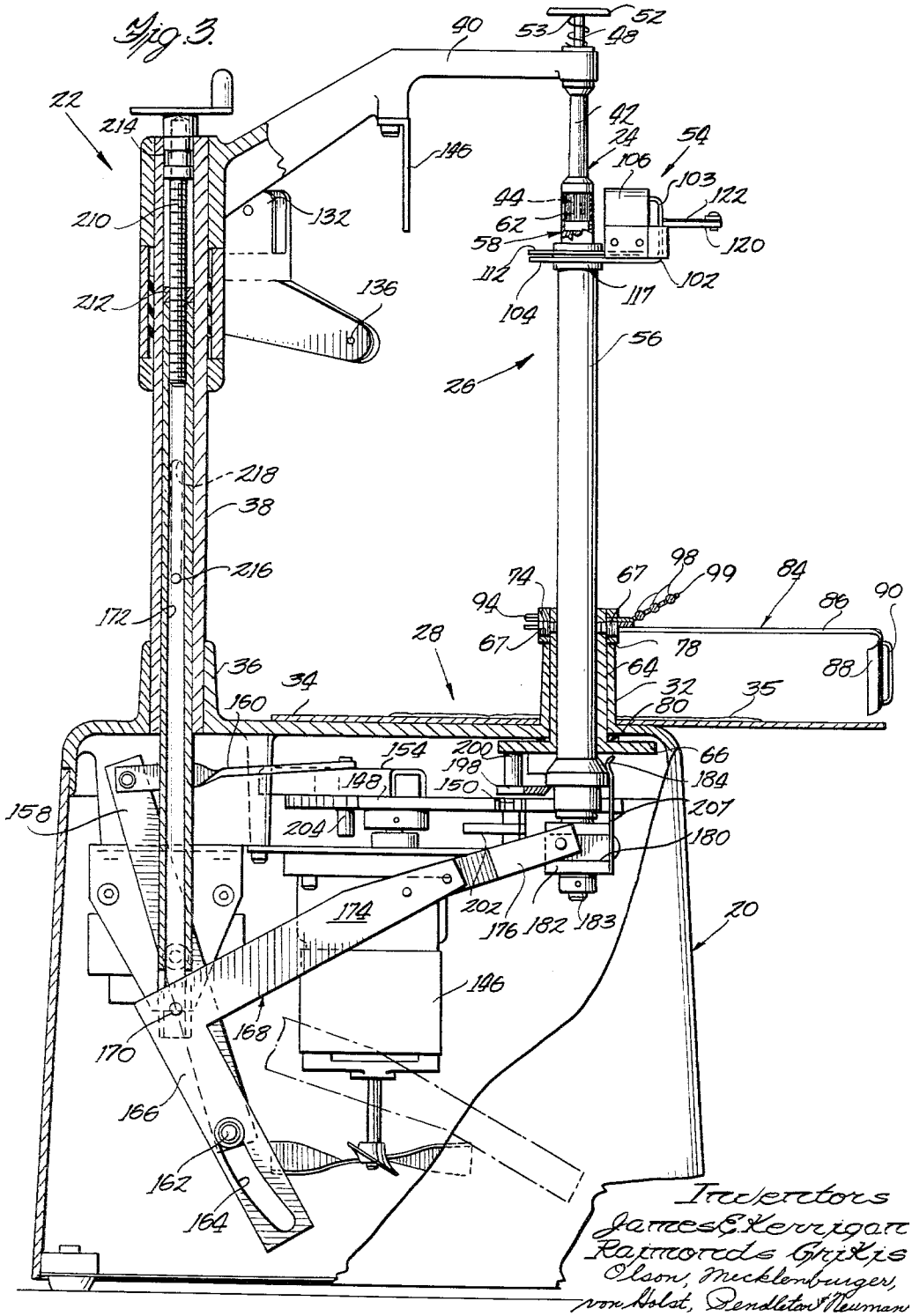
Inventors
James E. Kerrigan
Raimonds Grikis
Olson, Mecklenburger,
von Holst, Pendleton & Neuman
Attorneys

Dec. 14, 1965 J. E. KERRIGAN ETAL 3,223,299

BOW-FORMING MACHINE

Filed Sept. 21, 1962 6 Sheets-Sheet 3

Fig. 3.



Inventors
James E. Kerrigan
Raimonds Grikis
Olson, Mucklenburger,
von Holst, Pendleton & Neuman
Attorneys

Dec. 14, 1965 J. E. KERRIGAN ETAL 3,223,299

BOW-FORMING MACHINE

Filed Sept. 21, 1962 6 Sheets-Sheet 4

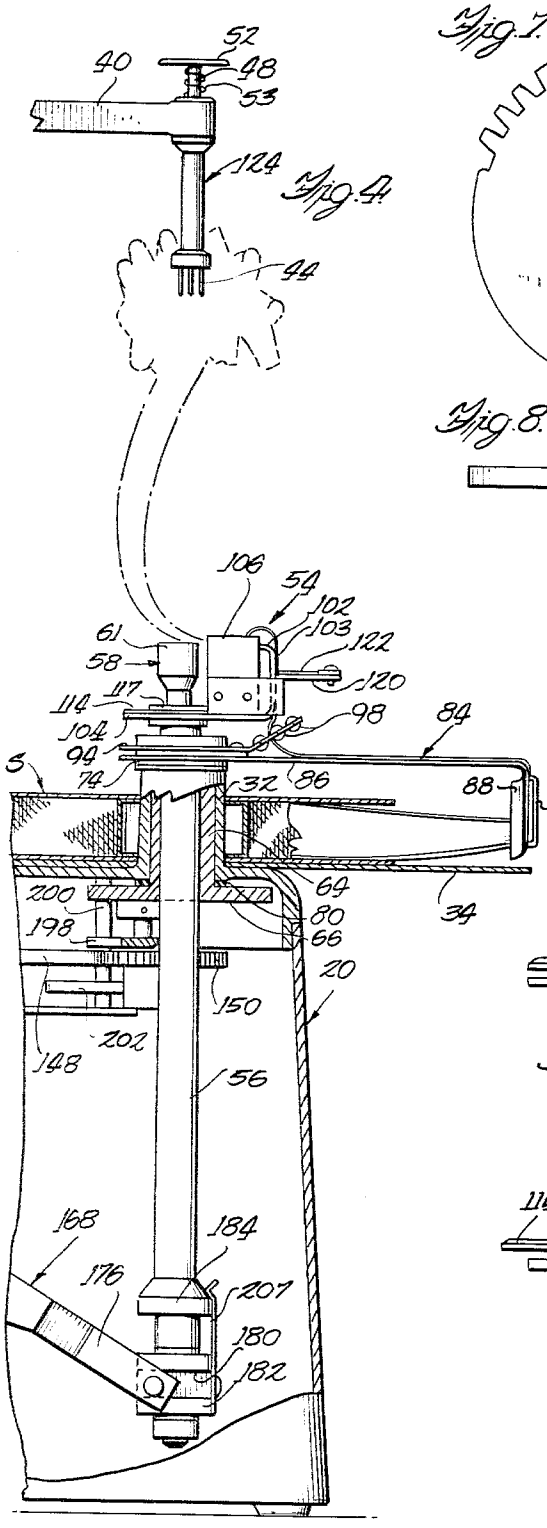


Fig. 4.

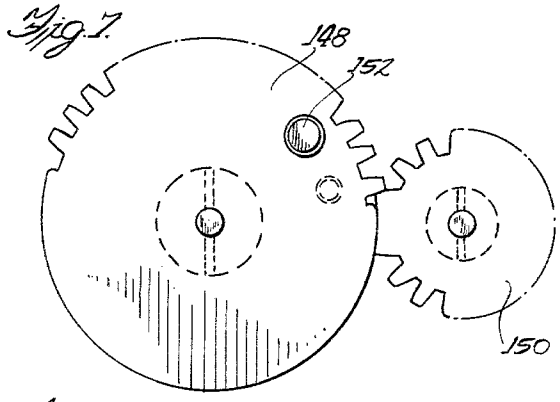


Fig. 7.

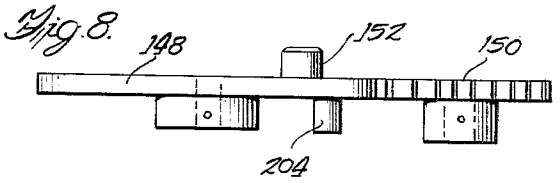


Fig. 8.

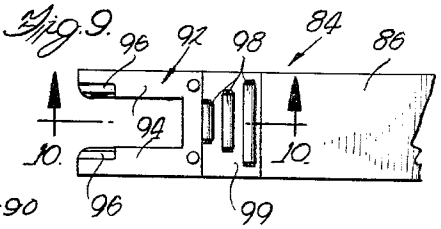


Fig. 9.

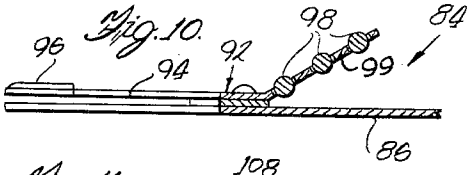


Fig. 10.

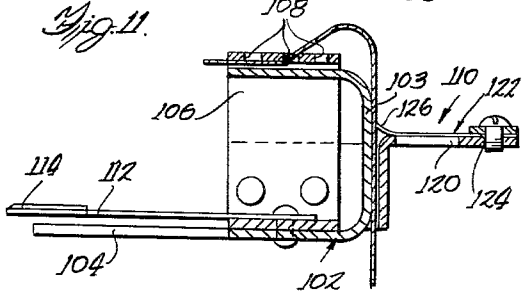


Fig. 11.

Inventors
James E. Kerrigan
Raimonds Grikis
Olson, Mecklenburger,
von Holst, Pendleton & Neuman
Attorneys

Dec. 14, 1965 J. E. KERRIGAN ETAL 3,223,299

BOW-FORMING MACHINE

Filed Sept. 21, 1962 6 Sheets-Sheet 5

Fig. 5.

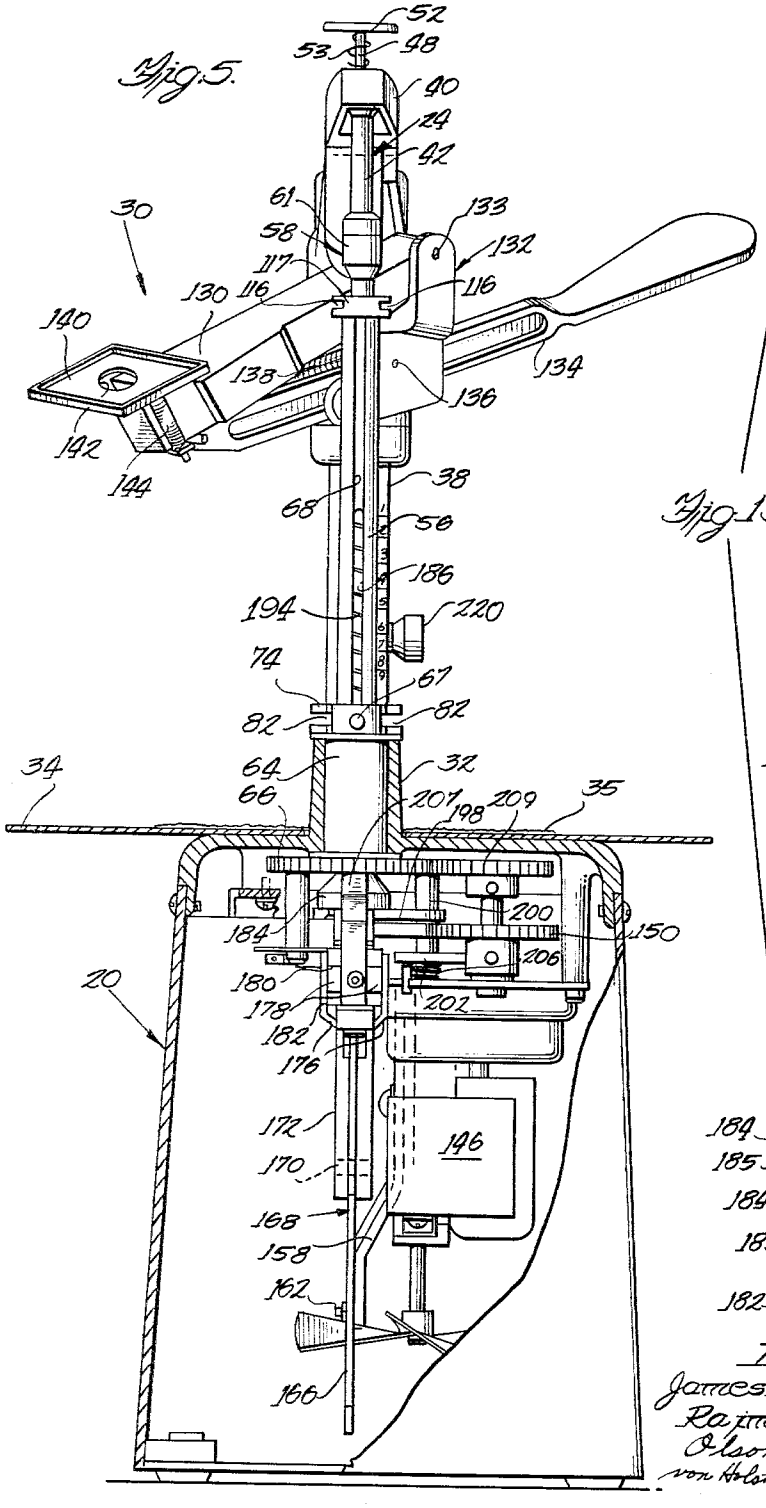
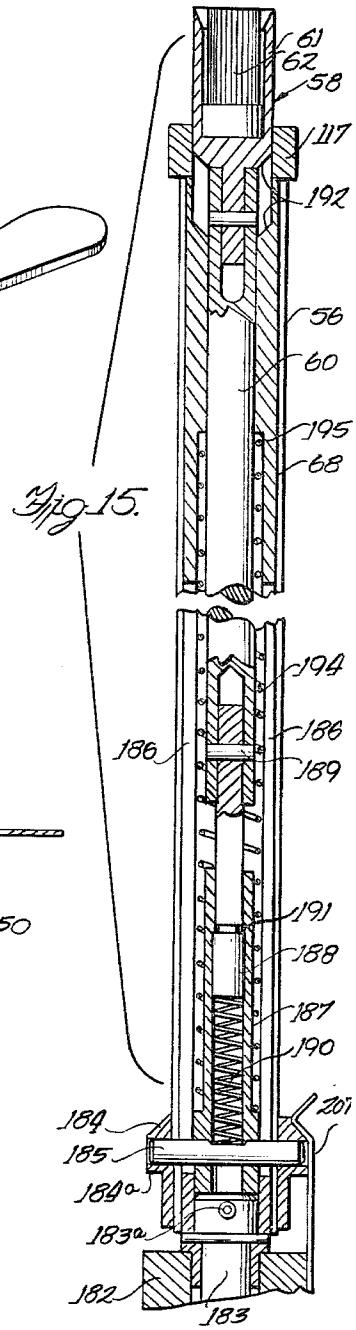


Fig. 15.



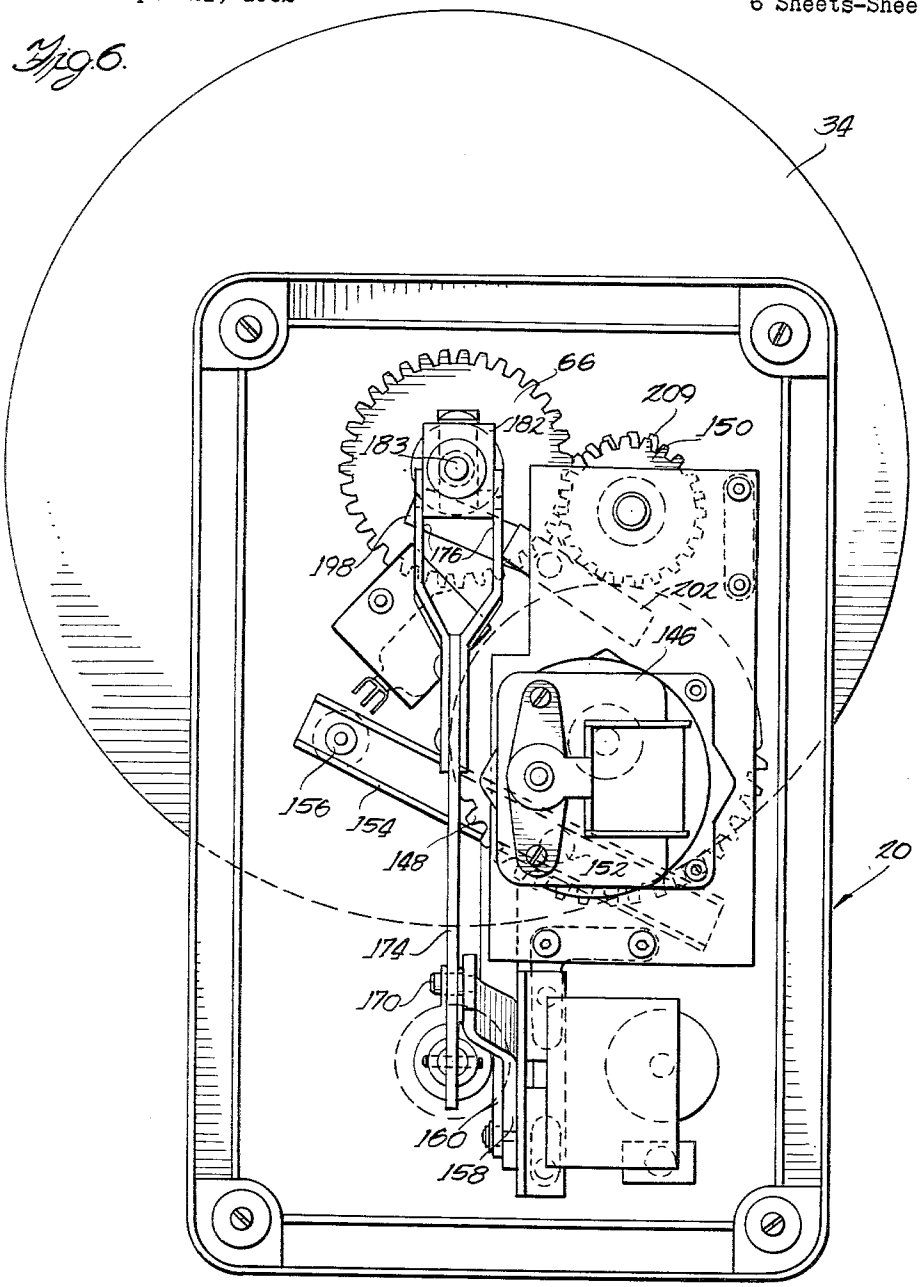
Inventors
James E. Kerrigan
Raimonds Grikis
Olson, Mecklenburger,
von Holst, Gendleton & Neuman
Attorneys

Dec. 14, 1965 J. E. KERRIGAN ETAL 3,223,299

BOW-FORMING MACHINE

Filed Sept. 21, 1962 6 Sheets-Sheet 6

Fig. 6.



Inventors
James E. Kerrigan
Raymond S. Gryks
Olson, Mecklenburger,
von Holst, Pendleton & Neiman
Attorneys

United States Patent Office 3,223,299 Patented Dec. 14, 1965

3,223,299

BOW-FORMING MACHINE

James E. Kerrigan, Arlington Heights, and Raimonds Grikis, Chicago, Ill., assignors to Chicago Printed String Company, Chicago, Ill., a corporation of Delaware

Filed Sept. 21, 1962, Ser. No. 225,224
10 Claims. (Cl. 223—46)

This invention relates to mechanical devices adapted for forming decorative bows. More particularly, this invention pertains to new and improved machines adapted for forming decorative bows comprising several loops of strip material such as ribbon, tape or the like.

One facet of the presently large and apparently expanding demand for decorative wrappings, trimmings and other packaging accessories is a demand for a small semi-automatic machine adapted for mechanized formation of bows at the point of sale, such as in department stores. Several machines have heretofore been proposed for such purposes, including machines for making a currently popular bow comprising several conoidal loops or ribbon formed by twisting and securing successive portions of a length of ribbon generally in the form illustrated in FIG. 7 of U.S. Patent No. 2,841,905 issued to G. Wanchek on July 8, 1958. Various machines have been proposed and/or designed for forming such bows wherein the feeding, twisting and securing operations are carried out by cooperative manipulation of both the feed mechanism and the securing or holding apparatus. It has also been proposed that such bows be formed by a machine in which the necessary relative motion for feeding and twisting the ribbon is supplied solely by a ribbon feeding and applying apparatus; however this required that the supply source, e.g., a spool of ribbon, be mounted for rotation about the feeding mechanism and resulted in undesirable and/or unacceptable eccentric loads on this mechanism.

It is an object of this invention to provide a novel machine adapted for forming bows, particularly bows requiring unidirectional twisting of successive portions of a continuous length of ribbon.

It is another object of this invention to provide a novel bow-forming machine adapted for forming twisted loop bows wherein the twisting and feed operations are performed by the same mechanism, and avoiding eccentric mounting of the ribbon supply.

It is another object of this invention to provide a novel bow-forming machine including a rotatable ribbon feed mechanism and a concentric mount for spool of ribbon.

It is another object of this invention to provide a bow-forming machine with a novel adjustable feed drive arrangement.

It is a further object of this invention to provide a machine meeting the aforementioned objects and which is compact, sturdy in construction, simple to operate, reliable in operation and economical to produce.

Further and additional objects will become apparent to those skilled in this art in light of the embodiment illustrated in the attached drawings and the following description, and from the appended claims.

In carrying out this invention in one illustrative form, a machine is provided which includes stationary ribbon engaging pins for engaging and retaining successive portions of ribbon placed thereon, a hub for supporting a hollow-center spool in alignment with the pins, and feed apparatus mounted on shafts extending axially through the hub. The feed means is rotatably and reciprocally mounted for stripping successive lengths of ribbon from a spool on the hub, and feeding these lengths of ribbon to the pins with a rotary motion to form successive twisted loops of ribbon thereon. A drive arrangement is provided for reciprocating and rotating the feed means. The reciprocating drive includes a bell crank arm mounted for adjustable movement of its pivot axis whereby the stroke of the feed means may be varied while maintaining one end position constant, to thereby vary the size of bows formed with this machine.

By way of illustration and example, one embodiment of this invention is disclosed in the drawings, wherein:

FIG. 1 is a partial perspective view of an improved bow-forming machine employing teachings of this invention, with a supply of ribbon thereon and in the process of forming a bow;

FIG. 2 is an enlarged top plan view of the machine of FIG. 1;

FIG. 3 is an enlarged side elevation view, partially in section, of the machine of FIG. 1 and including the drive mechanism but omitting the fastening apparatus;

FIG. 4 is a side elevation view, partially in section, of a portion of the machine as in FIG. 3, with a supply of ribbon and illustrating the feed mechanism in changed position;

FIG. 5 is an end elevation view, partially in section, of the machine of FIG. 1, with the ribbon guides and gripper removed;

FIG. 6 is a bottom plan view of the machine of FIG. 1;

FIGS. 7 and 8 are a top plan view and a side elevation view, respectively, of the intermittent drive gears of the machine of FIG. 1;

FIG. 9 is an enlarged partial top plan view of the lower ribbon guide of the machine in FIG. 1;

FIG. 10 is a cross-sectional view taken along line 10—10 of FIG. 9 and looking in the direction of the arrows;

FIG. 11 is an enlarged cross-sectional view of the upper ribbon guide and gripper assembly of the machine in FIG. 1;

FIG. 12 is an enlarged side elevation view of the cooperative portions of the ribbon holder and applicator of the machine of FIG. 1;

FIG. 13 is an enlarged bottom plan view of the ribbon holder;

FIG. 14 is a partial cross-sectional view taken along line 14—14 of FIG. 13, and looking in the direction of the arrows; and

FIG. 15 is an enlarged cross-sectional view of the ribbon feed and indexing shaft assembly of the machine in FIG. 1.

Referring now to the drawings, and particularly to FIGS. 1 and 3, the illustrated machine includes a housing 20, a support 22, ribbon-holding apparatus 24, feed mechanism 26, a spool support at 28, a fastener 30, and related drive mechanism disposed primarily within housing 20 and support 22.

A hub or center post 32 extends upward from the upper surface of housing 20 and together with a circular disc 34 serves as the support 28 for an open-core ribbon spool S. The disc or plate 34 may be somewhat larger in diameter than the spools S to insure support for the ribbon as it is stripped from the spool and to serve as a guard for the lower guide or flyer 84. A rough surface or brake covering 35 is preferably included on the inner annular portion of plate 34 to serve as a retarder or brake for the spool resting thereon.

Support 22 comprises a collar 36 extending upward from the upper surface of housing 20, in spaced relation to hub 32, a hollow standard 38 supported in collar 36, and a support arm 40 mounted on standard 38.

The ribbon holding apparatus 24 includes a support 42 fixed to to distal end of arm 40, directly over and in axial alignment with hub 32. The holder 42 is provided with a plurality of surface roughened pins 44 extending

downwardly from its lower surface, and is also provided with an arcuate anvil or staple clenching recess **46**, as illustrated in FIGS. 13 and 14. A bow-release mechanism is also provided comprising a push rod **48** reciprocably mounted in and adapted to extend through a central bore **50** of member **42**, together with a pressure plate **52** at the upper end of rod **48** and a compression spring **53** biasing the rod **48** to its retracted position as illustrated.

Referring now more particularly to FIGS. 3 and 15, as well as to FIGS. 1, 4 and 5, the feed mechanism **26** includes a one-way clutch gripper and guide **54** mounted on a hollow shaft **56**, and a presser member or ribbon applicator **58** mounted on the upper end of a shaft **60** reciprocably supported in the hollow center of shaft **56**. The applicator **58** is appropriately formed to mate with the pins **44**, and in the illustrated form comprises a hollow cup-shaped member **61** in which is secured a group of upwardly extending stiff bristles **62**. Shaft **56** is mounted for axial reciprocation through a sleeve **64**, which is integral with an indexing gear **66**, and is keyed to sleeve **64** for rotation therewith as by pins or dogs **67** extending through sleeve **64** into longitudinal grooves **68** in shaft **56** (see FIG. 1). The pins **67** also extend through a collar **74** which is in rotatable bearing engagement with the upper edge of hub **32** and thereby rotatably supports the sleeve **64**. Suitable bearing means such as a bearing washer may be inserted at **78** between collar **74** and hub **32**, as well as at **80** between gear **66** and the inner surface of the housing **10**.

Collar **74** is provided with a pair of opposed slots **82** (FIG. 5) to detachably receive the bifurcated end of another ribbon guide **84** of the feed mechanism. This guide or flyer **84**, illustrated in greater detail in FIGS. 9 and 10, includes an elongated guide member **86** which is bifurcated at its inner end and provided with a downwardly extending outer end terminating in a curved surface **88** carrying a guide member **90**, both of which are disposed at an angle of about 45° to the horizontal, as best seeen in FIG. 1. A guide and catch plate **92** is secured on the upper side of plate **86** near its inner end and includes a pair of resilient fingers **94** disposed over the bifurcated end portion of member **86**, these fingers having upwardly extending strike-outs **96** formed in the inner ends thereof. The flyer **84** is detachably engaged on collar **74** by pressing fingers **94** toward the corresponding portions of plate **86** and sliding the bifurcated members through slots **82**. The struck-out portions **96** snap up on the opposite or backside of collar **76** to retain the unit **84** in place. A series of rollers **98** of various suitable lengths, corresponding generally to the widths of ribbon to be utilized, are mounted in appropriate slots in the angularly upwardly extending outer end **99** of plate **92**.

The ribbon-gripper and guide assembly **54** is illustrated in FIGS. 1, 3 and 4, and shown in cross section in FIG. 11. This assembly includes a generally J-shaped support **102** including a bight **103** and bifurcated end portion **104**, a guide **106** having an upper portion defining a plurality of slots **108** spaced above the upper or short leg portion of support **102**, a one-way clutch assembly **110**, and resilient fingers **112**. The fingers **112** include struck-out portions **114** and are spaced above the bifurcated end portion **104** whereby the gripper unit **54** may be detachably mounted in a pair of slits **116**, formed in a block **117** secured to the upper end of shaft **56** (see FIG. 5), in the same general manner as in mounting flyer **84**. The one-way clutch assembly **110** includes a support **120** and a resilient gripper finger **122** disposed on the upper surface of support **120**, with one end **124** secured to the support and the opposite free end **126** extending angularly upward to contact the exposed surface of the bight portion **103**, as illustrated. The finger **122** thus permits free relative movement of ribbon upward between bight **103** and end **126**, but securely clamps ribbon against relative movement in an opposite direction.

Bow-forming operation

The operation of the ribbon manipulative, bow-forming apparatus described above is as follows:

Preliminarily, flyer **84** and assembly **54** are removed and a spool of ribbon S is mounted on hub **32** in the manner illustrated in FIG. 1, whereupon the units **54** and **84** are returned to their operative positions in engagement with the collar **74** and disc **117**. The spool is placed so that the ribbon is wound in the direction of rotation of the feed mechanism, i.e., as illustrated in FIG. 1 assuming the feed mechanism rotates counterclockwise. The ribbon is then threaded around surface **88** through guide **90**, over the appropriate roller **98** corresponding to the width of the ribbon, thence upwardly between finger **122** and bight portion **103**, above guide **106**, downwardly through the appropriate slot **108** corresponding to the ribbon width, outwardly between the upper portion of plate **106** and the upper leg of member **102**, and over the upper end of the applicator **58**.

In the forming of a bow, feed assembly **26** is reciprocated upwardly until applicator **58** forces the extended end of the ribbon onto pins **44**, see FIG. 3. The arbor **60** then remains in its upper position while shaft **56** and attached gripper mechanism **54** retract to their lower end positions. During this downward movement of the gripper mechanism, the finger end **126** automatically releases from bight **103** to permit free sliding movement of the gripper along the ribbon extending between pins **44** and guide rollers **98**, while applicator **58** engages the ribbon against holder **42** to insure that the engaged ribbon will not be pulled off of pins **44**. After gripper **54** reaches its lower position, arbor **60** and applicator **58** also reciprocate to their lower end positions as illustrated in FIG. 4. The entire reciprocating feed mechanism, including applicator **58** and gripper **54**, then commences its return travel to the upper position. During this upward movement, finger end **126** grips the ribbon against bight portion **103** and thus pulls ribbon from the spool S through the guides **90** and **98**, while shaft **56** and the units **54** and **84** mounted thereon rotate to strip ribbon from the spool S and to twist the length of ribbon extending between pins **44** and gripper-guide unit **54**. Assuming that the angle of rotation of shaft **56** is somewhat greater than 180°, for instance about 225°, the portion of ribbon between pins **44** and gripper **54** will form a conoidal loop when the gripper and arbor reach their upper position. The portion of ribbon now over applicator **58** (the second leg of the newly formed loop) is pressed onto pins **44** by the applicator, thus placing the newly formed loop on the pins. Thereafter the arbor again remains in an upper ribbon holding position while the gripper mechanism reciprocates, and the cycle is repeated to form the desired number of loops for a bow on pins **44**. The ribbon is then cut between pins **44** and guide **54** and the loops are permanently secured together to form a bow, as by use of a fastening mechanism **30**.

The release mechanism may then be pressed downwardly whereby rod **48** pushes the completed bow off of pins **44**.

Fastener

Referring particularly to FIGS. 1, 2 and 5, the fastening mechanism **30** comprises an inverted stapler **130** of conventional construction for applying two-prong wire staples and clenching the staples against the anvil surface of slot **46** (FIG. 13). The stapler **130** is mounted on framework **132** at **133** for pivotal movement in a vertical plane, and the framework is in turn pivotally mounted on support **22** for rotation in a horizontal plane. An operating handle **134** is pivotally mounted on framework **132** as at **136** and bears against the lower side of stapler **130** to pivot the stapler upwardly and to operate the stapler when the outer end of the handle is pressed downwardly. A tension spring **138** may be provided to bias the stapler to its retracted position illustrated in FIG. 5.

To permanently secure a collected group of loops into a bow, the stapler **130** is swung to its operative position illustrated in FIG. 2, with the staple applicator in alignment with slot **46**, and handle **134** is pressed downward to apply a staple through the collected ribbon loop legs adjacent pins **44**.

Where it is deemed desirable to place a mounting member on each bow, such as a square of paperboard or the like bearing a pressure sensitive adhesive, an open center holder **140** for such mounting members may be disposed over the outer end of the stapler. The open center **142** permits application of the staples through the holder. Compression springs may be provided as at **144** to preload the stapler and thereby to insure that the mounting members will be forced over the pins and tightly upward against the accumulated loops before the staple driving mechanism is actuated during operation of the stapler. A guide or stop member **146** insures proper positioning of the stapler with the staple applying mechanism in line with the staple clinching groove **46**.

Drive mechanism

The illustrated drive apparatus is designed to provide semiautomatic operation of the ribbon manipulative bow-forming apparatus and includes provision for adjusting the stroke of the ribbon feed elements and to thereby vary the size of loops which may be formed.

The drive comprises an electric motor **146** connected to an interrupted gear **148** of an intermittent drive including the gear **148** and a cooperating interrupted gear **150** (FIGS. 1, 7 and 8). A pin **152** extends from the top surface of gear **148** into and is slidably engaged in a slotted lever **154** which is pivotally mounted to one side of gear **148** at **156** (FIG. 6) to provide a variable speed-quick return feed motion of lever **154**. Lever **154** is connected to a pivotally mounted operating link **158** by a connecting bar **160** (FIG. 3). A pin **162** on the opposite end of link **158** extends into a slot **164** formed in one arm **166** of a bell crank lever **168** pivotally mounted at **170** on a vertically adjustable shaft **172** extending upward through support **38**. The other arm **174** of bell crank lever **168** is provided with a bifurcated yoke portion **176** mounting a pair of rollers **178** which have sliding or rolling contact in a pair of opposed horizontal slots **180** formed in a bearing block **182** (FIGS. 3 and 5). Bearing block **182** engages the lower end of a pivot shaft **183** in a manner to permit rotation of the shaft within the bearing block, and the shaft **183** is secured to shaft **56** as by a pin **183***a* (FIG. 15). Rotation of drive gear **148** thus operates through the pin and slotted lever mechanism **152**, **154**, and links **158**, **160**, to oscillate bell crank **168** about pivot axis **170**, and thereby to reciprocate shaft **56**.

Referring now particularly to FIG. 15, relative reciprocation between arbor **60** and shaft **56** is provided for in the illustrated machine by supporting the arbor on a catch ring **184** disposed in circumannular relation to and sliding engagement with the shaft **56**. A roll pin **185** extends through opposed longitudinal slots **186** in shaft **56** communicating with groove **68** (see FIG. 5) and engages ring **184** as well as a spring rod guide **187** that is slidingly disposed within the center bore of hollow shaft **56**. A spring rod **188** is slidably engaged within the upper end of guide **187** and connected to the lower end of arbor **60** as by pin **189**. A compression spring **190** is confined between pin **185** and rod **188** to yieldably bias the rod upwardly toward an end limit position wherein an annular shoulder **191** on rod **188** engages a corresponding inner annular shoulder of guide **187** as illustrated. The spring **190** and the slidable connection between guide **187** and rod **188** provide for yieldable contact between the applicator **58** and support **42** at the upper end of the feed stroke of the feed assembly, within the clearance provided for applicator **58** in the upper end of shaft **56**, as at **192**. Another compression spring **194** is confined between an internal shoulder **195** on shaft **56** and a shoulder **196** on guide **184** to urge the guide and hence the arbor **60** and applicator **58** to the retracted position illustrated in FIG. 15.

A catch finger **198** secured to an oscillatable shaft **200** is positionable to engage the underside of the shoulder **184***a* on catch ring **184** when the feed assembly is in its upper position, as illustrated in FIG. 3. An operating finger **202** is also secured to shaft **200** at the underside of gear **148** where it is periodically engaged by a pin **204** secured to gear **148** (FIG. 8). A torsion spring **206** (FIG. 5) biases shaft **200** to a position wherein finger **198** will engage ring **184**, and finger **202** is in position to be engaged by pin **204** to disengage finger **198** from beneath the catch ring.

After gear **148** has operated the drive mechanism previously described to move the feed apparatus to the upper position as illustrated in FIG. 3, finger **198** engages the underside of catch ring **184** whereupon pin **185**, guide **187**, rod **188** and compression spring **190** maintain the arbor **60** and hence the applicator **58** in its upper or loop holding position as gear **148** continues to rotate and thus to operate bell crank **168** to lower shaft **56** and gripper assembly **54**. After shaft **56** has been lowered, pin **204** engages finger **202** and rotates shaft **200** to disengage finger **198** from catch ring **184** whereupon compression spring **194** and the weight of the arbor **60** cause the arbor to drop to its lower position as in FIG. 4. A spring finger **207** mounted on bearing block **182** engages catch ring **184** to minimize bouncing of the arbor and the related support assembly as they drop to their lowermost position.

During the aforedescribed reciprocating feed operations, the toothed sector of interrupted gear **148** engages the toothed sector of gear **150** in the intermittent drive and thereby rotates gear **150** one full revolution. A spur gear **209** (FIGS. 5 and 6) is secured to the same shaft as gear **150** and engages indexing gear **66** whereby gear **66**, sleeve **64**, and the feed mechanism **26** are rotated through a predetermined angle, as governed by and therefore variable with the ratios between the various gears, in timed sequence with the reciprocating feed as described above during each revolution of gear **148**. As one example, in forming a bow of the type heretofore referred to, the angle of each successive rotation of the feed mechanism should be between 180° and 360°, and normally is about 225°.

Suitable controls and switches may be provided for starting, operating and stopping motor **146**. Such controls may include an automatic counter-switch arrangement as at **147** whereby upon initiation of operation of the machine it will operate through a preselected number of cycles to form a predetermined number of loops of a bow and will then automatically stop, such as by the use of a stepping relay and auxiliary switch control.

Feed stroke adjustment

It will be appreciated that gear **148** drives operating link **158** and more particularly pin **162** through a fixed arc during each revolution. However, it is desirable that the length of stroke of the gripper **54** be varied to thereby vary the length of ribbon utilized in forming each loop and consequently to vary the diameter of the bow which is being formed. A condition of this adjustability is that one end of the stroke, namely the end corresponding to the upper position of the arbor **60** must be constant to insure proper engagement between applicator **58** and the holding mechanism **24** at the upper end of each stroke, regardless of the length of the stroke. In the illustrated apparatus, the desired adjustable drive is obtained by pivotally mounting bell crank arm **168** on a pin **170** which is carried on a shaft **172** that extends upward through and is vertically adjustable in support **38**. Support for and adjustment of shaft **172** is provided by a threaded member **210** rotatably supported in the upper end of shaft **38** as at **214** and threadably engaging a nut **212** secured to the upper end of shaft **172**. A pin **216** is secured to shaft

172 and extends through a suitable longitudinal slot 218 in support 38 to prevent relative rotation of shaft 172 and to provide a visible indexing means for indicating the position of pin 170 or, more appropriately, the size of bow for which the machine is adjusted (see FIG. 1). A lock knob 220 may be provided on the outward end of pin 216.

Slot 164 is of a configuration to insure that rollers 178 will position shaft 56 to place applicator 58 in contact with holder 24 regardless of relative vertical adjustment of pivot pin 170. A graphical solution of the linkage illustrated indicates that slot 164 is a section of a limaçon curve ($r=2a\cos\theta\pm d$, where $a=\frac{1}{2}$ the length of arm 174, and $d=$ the distance between pin 162 and the intersection of the axes of shaft 172 and the slots 180). However, the slot may follow other mathematical curves if the type of connecton between arm 174 and block 182 is varied, for instance if arm 174 varies in effective length by sliding engagement with a point support on block 182. As a practical matter, within the usual range of adjustment slot 164 may constitute an arc of a circle. For instance, in one machine with the axes of shafts 56 and 172 parallel and spaced 7¾", slots 180 being normal to such axes, and the effective length of arm 174 being about 8" and arm 166 being between 2⅜" and 4⅝", a slot 164 comprising an arc of a circle of 4" radius and centered 3.000" from a line through the pivot axis 170 and parallel to arm 174, and 3.687" from a line through pivot axis 170 and parallel to arm 166 was found satisfactory.

While the term "ribbon" has been utilized in describing the operation of the illustrated embodiment of this invention, it will be appreciated that machines in accordance with the invention may be operated with ribbon, tapes and other strip materials of similar characteristics. As one specific example, an adhesive bonded, parallel, aligned yarn ribbon product "Satintone," produced and sold by Chicago Printed String Company of Chicago, Illinois, has been found satisfactory for forming bows in a machine as illustrated in the drawings herein.

It will be obvious to those skilled in this art that various modifications may be made of the illustrated embodiment of the invention in light of teachings herein, without departing from the spirit and scope of this invention. For example, various fastening means may be utilized for retaining the collected loops in a permanent bow form, a hand-operated drive may be substituted for the motor, mounting member applicators may be incorporated, or eliminated, in accordance with the type of mounting members to be placed on the formed bows, elements of the drive mechanism may be varied or rearranged, and various mechanically equivalent elements may be substituted for those shown.

It will thus be seen that an invention in bow-forming machines has been made and disclosed herein, whereby novel improved bow-forming machines may be constructed by those skilled in this art. Machines according to the invention are adapted to form twisted-loop bows with the feeding and twisting operations being carried out solely by the feed mechanism, and with the ribbon supply positioned on the axis of rotation of the feed mechanism thereby avoiding eccentric loads on the rotating apparatus. Further, an adjustable drive for the reciprocable feed arrangement is taught whereby the feed stroke and, consequently, the size of the individual loop and the size of the resulting bows may be conveniently adjusted, all in a machine which is compact, sturdy, simple to operate, reliable, and economical to produce.

While a particular embodiment of this invention is shown and described above, it will be understood of course that the invention is not to be limited thereto, since many modifications may be made by those skilled in this art in light of the foregoing teachings. Therefore, it is contemplated by the appended claims to cover any such modifications as fall within the true spirit and scope of this invention.

We claim:

1. In a machine adapted for forming bows from ribbon, holding means for engaging and holding ribbon fed thereto, reciprocable feed means engageable with said holding means upon reciprocation for feeding successive lengths of ribbon to said holding means, said reciprocable feed means being rotatable about the locus of its reciprocation whereby successive lengths of ribbon may be twisted as they are fed to said holding means by said feed means, support means for supporting a ribbon spool for independent rotation about the axis of rotation of said feed means, and drive means for reciprocating and rotating said feed means to withdraw successive lengths of ribbon from a ribbon supply on said support means, twist such lengths and engage such twisted lengths on said holding means to form the loops of a bow.

2. In a machine adapted for forming bows from ribbon, holding means for engaging and holding ribbon fed thereto, a reciprocable applicator engageable with said holding means upon reciprocation for engaging successive lengths of ribbon on said holding means, support means for supporting a ribbon spool for independent rotation about the locus of reciprocation of said applicator, a gripper member reciprocable relative to said applicator for withdrawing successive lengths of ribbon from a ribbon supply on said support means and positioning such lengths for engagement with said holding means by said applicator, said gripper member being rotatable about said locus of reciprocation whereby successive lengths of ribbon may be twisted as they are fed to said holding means, and drive means for reciprocating said applicator and reciprocating and rotating said gripper member to withdraw successive lengths of ribbon from a ribbon supply on said support means, twist such lengths and engage such twisted lengths on said holding means to form the loops of a bow.

3. In a machine as in claim 1, said holding means being stationary relative to the remainder of said machine.

4. In a machine as in claim 2 and wherein said gripper member comprises a one-way clutch, means for advancing said gripper toward said holding means with said applicator and for retracting said gripper independently of said applicator while said applicator engages said holding means.

5. In a machine as in claim 1, said drive means including a drive link, a pivotally mounted bell crank link having one arm connected to said feed means and a second arm slidably connected to said drive link, and means for moving the pivotal mounting of said bell crank link relative to said drive link to vary the effective length of said second arm.

6. In a machine adapted for forming bows from ribbon, support means including a hub adapted to receive a hollow-center spool, holding means for engaging and holding ribbon fed thereto, feed means extending through said hub for feeding successive lengths of ribbon from a spool on said hub to said holding means, said feed means being rotatable whereby successive lengths of ribbon may be twisted as they are fed from such spool to said holding means by said feed means to form loops of ribbon on said holding means, and drive means for rotating said feed means.

7. In a machine as in claim 6, a ribbon guide rotatable with said feed means and mounted to extend over a spool disposed on said hub.

8. In a machine adapted for forming bows from ribbon, support means including a hub adapted to receive a hollow-center spool, holding means aligned with said hub for engaging and holding ribbon fed thereto, reciprocable feed means extending axially of said hub for feeding successive lengths of ribbon from a spool on said hub to said holding means, said feed means being rotatable whereby successive lengths of ribbon may be twisted as they are fed to said engaging means by said feed means,

and drive means for reciprocating and rotating said feed means to form loops of ribbon on said holding means.

9. In a machine adapted for forming bows from ribbon, support means including a hub adapted for receiving a hollow-center spool, holding means aligned with said hub for engaging and holding ribbon fed thereto, feed means including a gripper member mounted on a support extending through said hub and movable for feeding successive lengths of ribbon from a spool on said hub to said holding means, said gripper member being rotatable whereby successive lengths of ribbon may be twisted as they are fed from such spool to said holding means by said feed means to form loops of ribbon on said holding means, a ribbon guide mounted to extend over a spool disposed on said hub and rotatable with said gripper member, said gripper member and said guide being detachably mounted to permit mounting of spools on said hub over said feed means, and means for driving said feed means and ribbon guide.

10. In a machine adapted for forming bows from ribbon, support means including a hub adapted to receive a hollow-center spool, holding means aligned with said hub for engaging and holding ribbon fed thereto, an applicator mounted on a reciprocable arbor extending

through said hub, a gripper member mounted on a shaft coaxial with said arbor and extending through said hub, said shaft being rotatably and reciprocably supported, drive means for rotating and reciprocating said shaft to withdraw successive lengths of ribbon from a spool on said hub, form ribbon loops therefrom, and feed such loops to said holding means, said arbor being movable with said shaft as said gripper is moved toward said holding means to engage ribbon on said holding means, and latch means for maintaining said applicator in a position adjacent said holding means as said shaft moves to retract said gripper therefrom.

References Cited by the Examiner

UNITED STATES PATENTS

2,933,223	8/1960	Kravig et al.	223—46
2,982,452	5/1961	Anderson	223—46
3,061,153	10/1962	Rector	223—46
3,129,861	4/1964	Napier	223—46

JORDAN FRANKLIN, *Primary Examiner.*

DAVID WILLIAMOWSKY, *Examiner.*