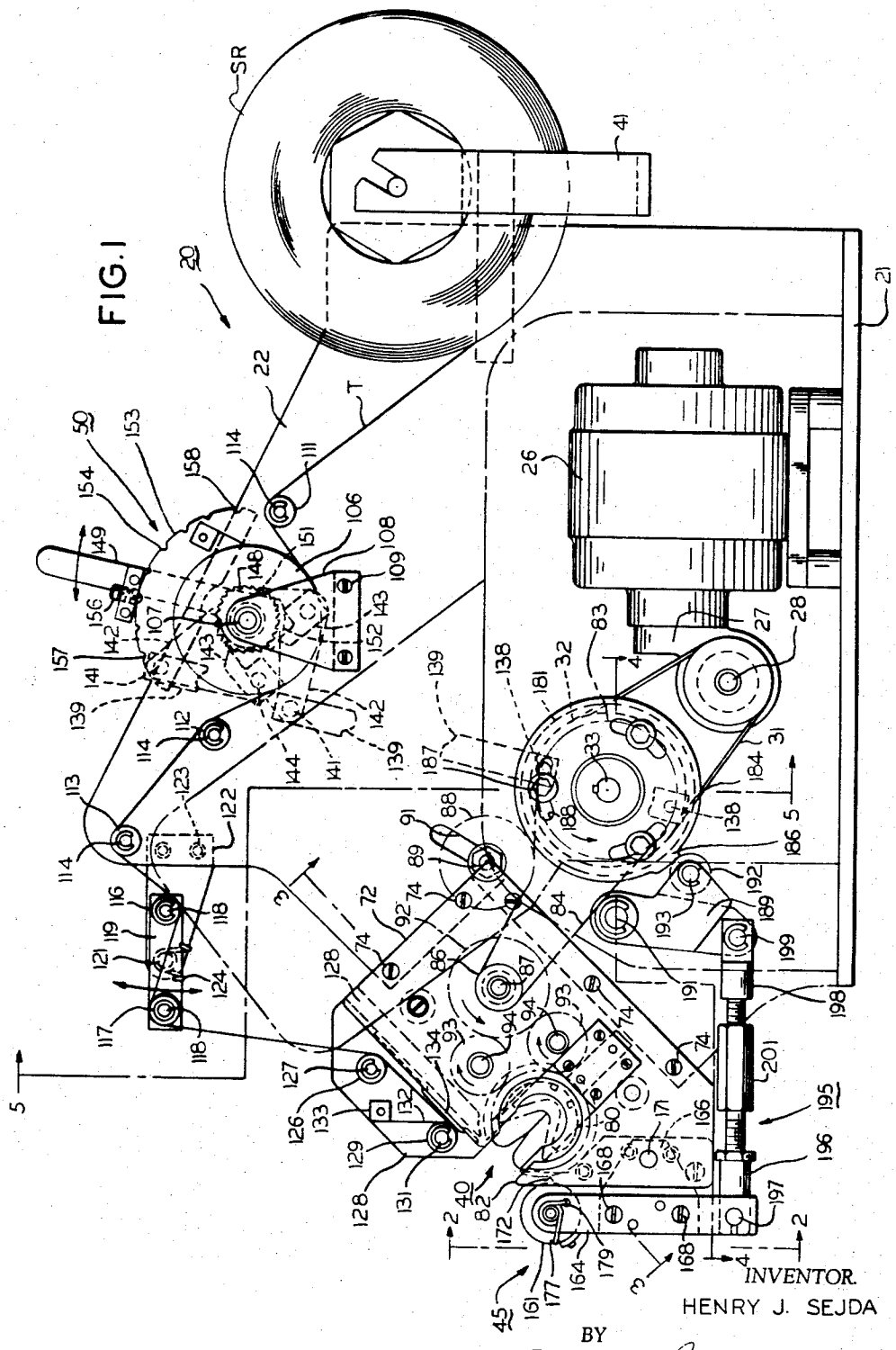
Dec. 24, 1968 H. J. SEJDA 3,418,358

APPARATUS FOR WRAPPING ELONGATE ARTICLES WITH TAPE

Filed April 5, 1963 6 Sheets-Sheet 1

FIG. 1




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APPARATUS FOR WRAPPING ELONGATE ARTICLES WITH TAPE

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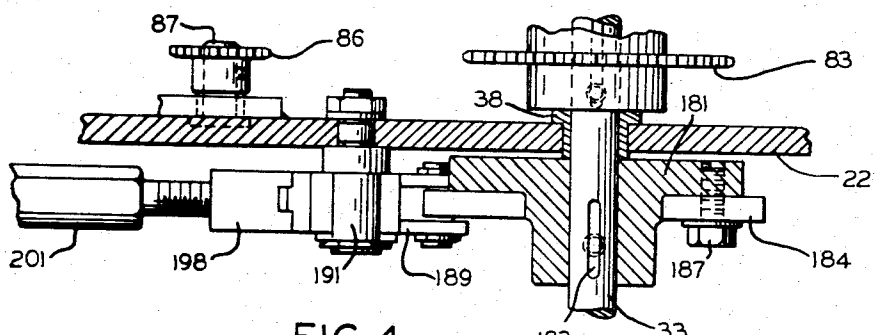



FIG.4

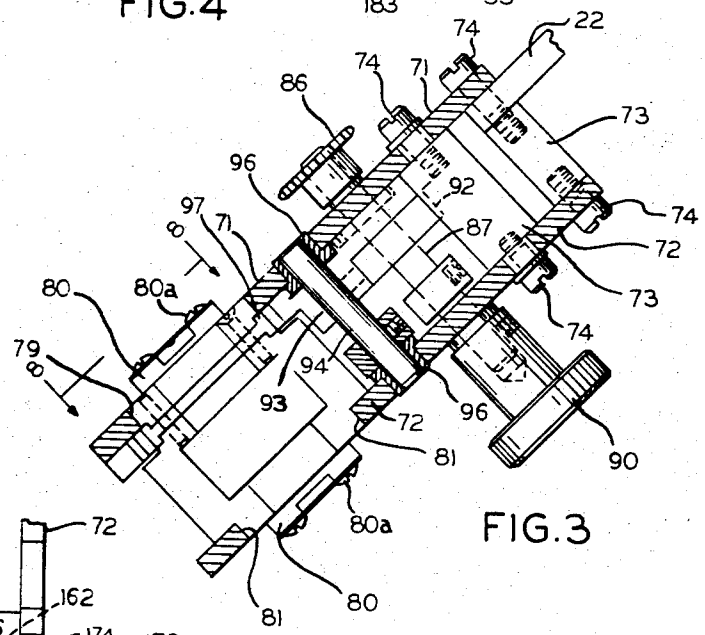



FIG.3

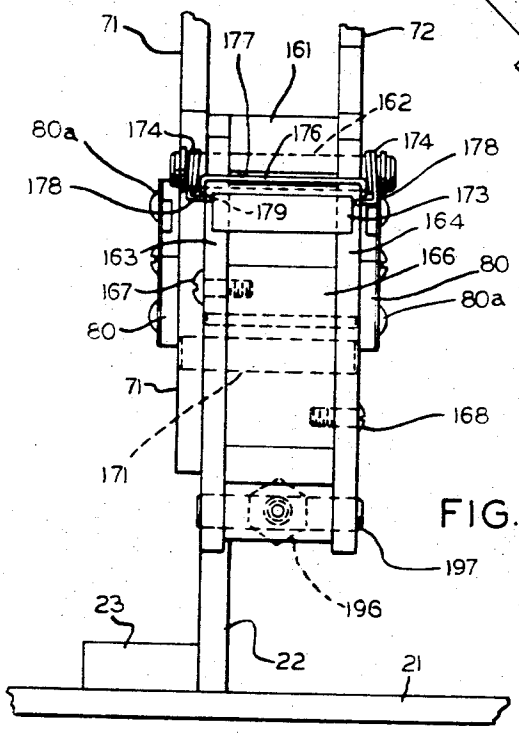



FIG.2

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APPARATUS FOR WRAPPING ELONGATE ARTICLES WITH TAPE

Filed April 5, 1963 6 Sheets-Sheet 3

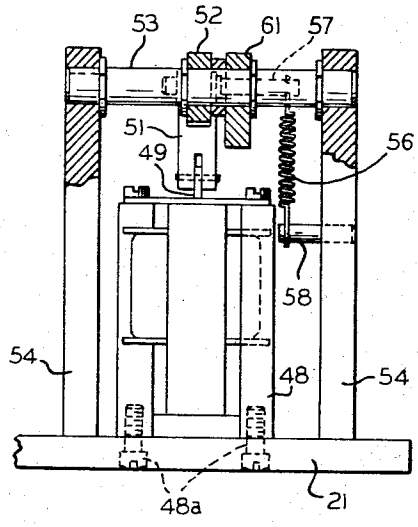



FIG.7




FIG.5

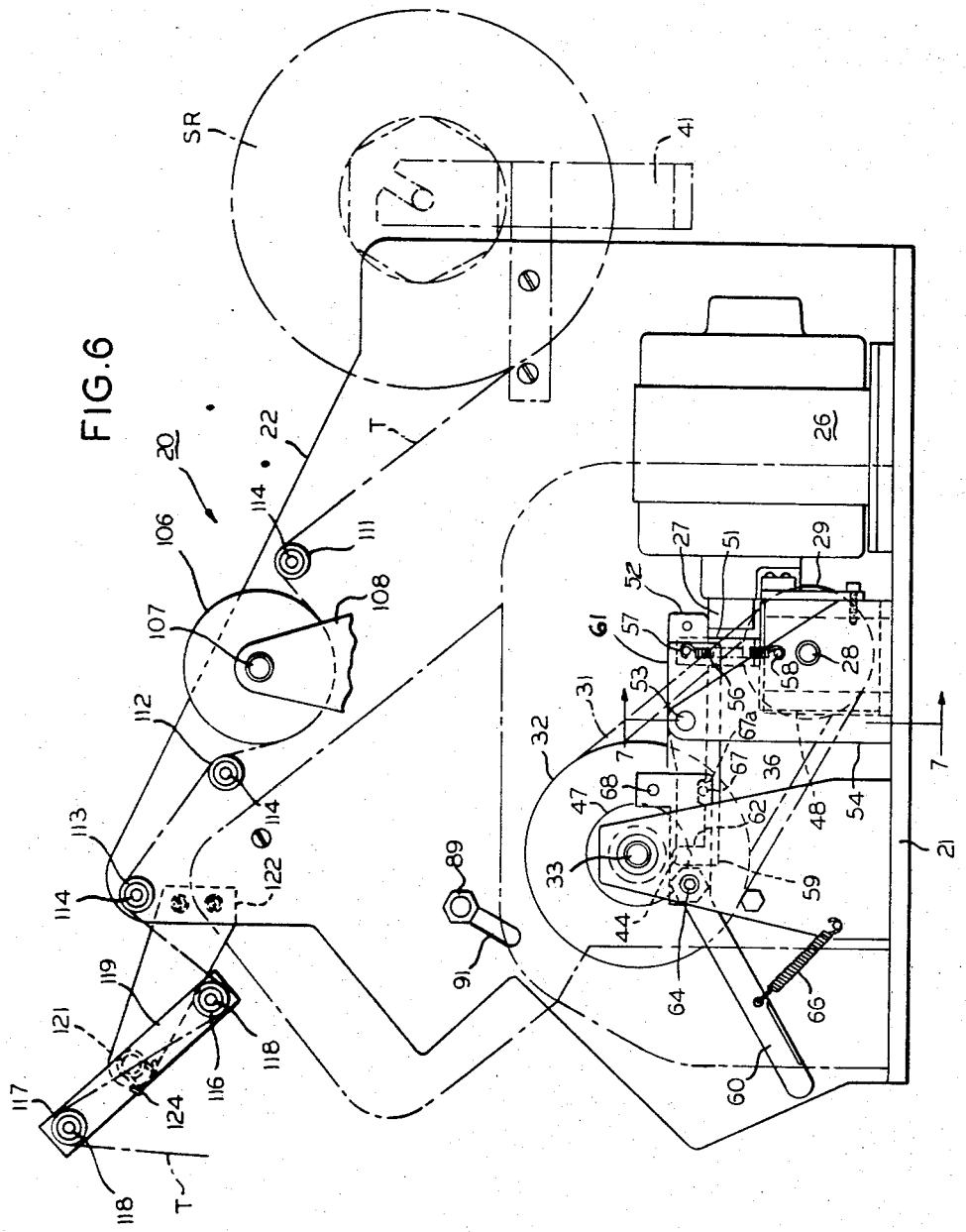
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APPARATUS FOR WRAPPING ELONGATE ARTICLES WITH TAPE

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FIG.6




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APPARATUS FOR WRAPPING ELONGATE ARTICLES WITH TAPE

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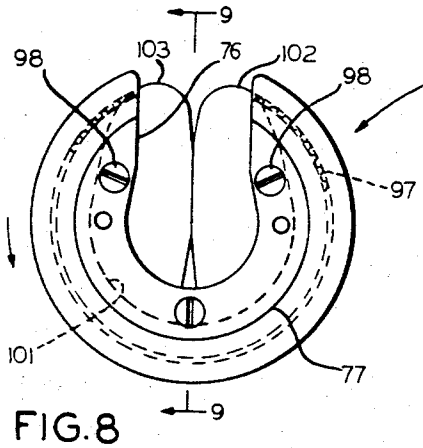



FIG.8

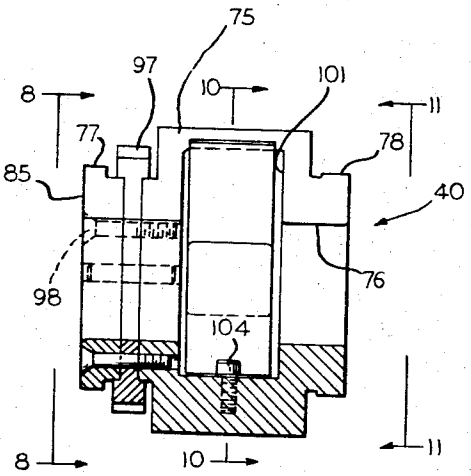



FIG. 9

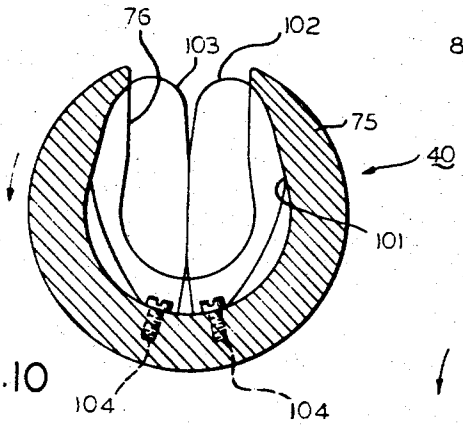



FIG.10

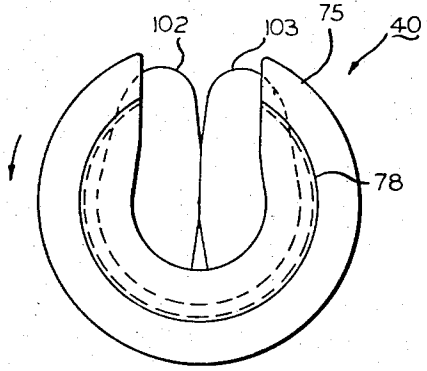



FIG.11

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Dec. 24, 1968 H. J. SEJDA 3,418,358

APPARATUS FOR WRAPPING ELONGATE ARTICLES WITH TAPE

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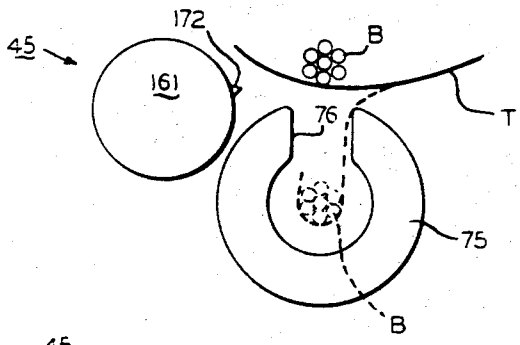



FIG. 12

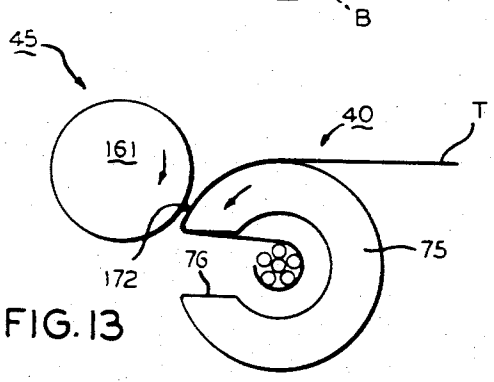



FIG. 13

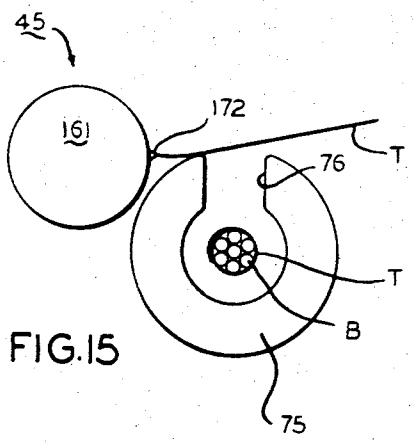



FIG. 15

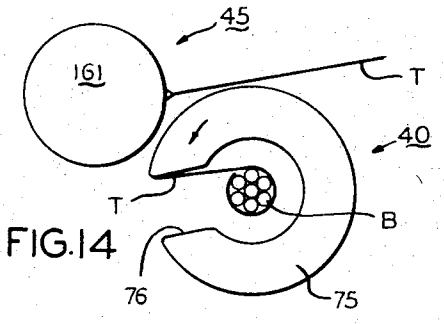



FIG. 14

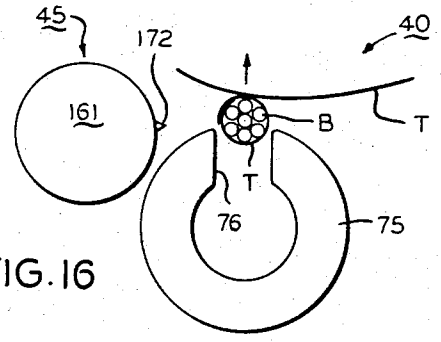



FIG. 16

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United States Patent Office 3,418,358 Patented Dec. 24, 1968



3,418,358

# APPARATUS FOR WRAPPING ELONGATE ARTICLES WITH TAPE

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Filed Apr. 5, 1963, Ser. No. 270,894
13 Claims. (Cl. 156—468)

This invention relates generally to apparatus for wrapping materials such as tape about an elongate object, and has particular reference to an improved machine for wrapping a discrete length of a pressure sensitive tape about an elongate article such as a wiring harness or the like.

Apparatus according to the present invention finds particular application in wrapping a bundle of elongate materials at intervals throughout its length, an example being a wire harness or the like. It is desirable to wrap such harness in such a fashion that a lead can conveniently be extended from the wrapped bundle in a direction lateral to the main axis of the wrapped bundle. By reason of such lateral extending leads, the wrapping about the harness cannot be continuous, and moreover, the wrapping of the harness at points intermediate such leads cannot ordinarily be effected without disturbing the laterally extending leads, particularly if the entire harness must be rotated for the wrapping operation.

The apparatus according to the present invention is characterized by the use of a wrapping tape having a pressure sensitive film thereon, the wrapping tape being initially in a position across a radially extending jaw of a rotating wrapping chuck. The harness or bundle of elongate members is moved against the tape and into the slot so as to provide a starting bight of the tape about the bundle, the rotation of the chuck causing the tape to be wrapped about the bundle prior to cutoff by a tape cutting mechanism cooperating with the rotating chuck.

With the foregoing considerations in mind, it is a principal object of the invention to provide apparatus for wrapping a discrete length of tape about the bundle of elongate members such as a wire harness or the like.

Another object is to provide a wrapping structure characterized by a wrapping chuck having a radially extending jaw for receiving an elongate article, a length of the tape being first placed across the slot, so that the entrance of the article into the jaw provides a bight of the tape about the article, the rotation of the wrapping chuck being accompanied by operation of tape feeding mechanism for an additional length of tape to be in position across the open jaw of the chuck for a subsequent operation, the tape being severed by a rotating knife tool moving into rolling contact with the chuck during its operation. Such knife tool is in a rest position after severing of the tape and holding the tape in position for such subsequent operation.

Still another object is to provide wrapping structure of the kind described wherein the radial jaw of the wrapping chuck is provided with flexible article contacting members which firmly engage the tape with the article as the chuck is rotated.

A yet further object is to provide structure for a wrapping machine of the kind described effective to vary the amount of tape being fed to the wrapping chuck so as to vary the amount of tape wrapped about the article.

Other objects and important features of the invention will be apparent from a study of the following specification taken with the drawings, which together describe and illustrate a preferred embodiment of the invention, and what is now considered to be the best mode of practicing the principles thereof. Other embodiments may be suggested to those having the benefit of the teachings herein and such other embodiments are intended to be reserved



especially as they fall within the scope and spirit of the subjoined claims.

In the drawings:

FIG. 1 is an elevational view of a wrapping machine having the improvements according to the present invention embodied therein;

FIG. 2 is a front elevational view looking in the direction of the arrows **2—2** of FIG. 1, showing details of mechanism for serving a length of tape adapted to be wrapped about an elongate article such as a bundle of wire strands or the like;

FIG. 3 is a plan view thereof looking in the direction of the arrows **3—3** of FIG. 1, showing details of a chuck for wrapping a length of tape about the elongate article;

FIG. 4 is a view, certain parts being shown in section, of cam follower structure for operating the tape severing mechanism seen in FIG. 2, said view looking in the direction of the arrows **4—4** of FIG. 1;

FIG. 5 is an elevational view, certain parts being shown in section, looking in the direction of the arrows **5—5** of FIG. 1, showing details of drive mechanism of the apparatus according to the present invention;

FIG. 6 is an elevational view somewhat similar to FIG. 1, looking in the direction of the arrows **6—6** of FIG. 5;

FIG. 7 is an elevational view showing details of structure for controlling clutching and indexing mechanism for controlling the wrapping chuck seen in FIGS. 1 and 3;

FIG. 8 is a side view of the wrapping chuck seen in FIG. 3, said view looking in the direction of the arrows **8—8** of FIGS. 3 and 9;

FIG. 9 is a section taken along the line **9—9** of FIG. 8, looking in the direction of the arrows;

FIG. 10 is a section taken along the line **10—10** of FIG. 9, looking in the direction of the arrows;

FIG. 11 is an elevational view of the wrapping chuck of FIG. 8 looking in the direction of the arrows **11—11** of FIG. 9;

FIG. 12 is a side elevational view showing somewhat schematically the wrapping chuck at the start of a wrapping operation with an elongate article to be wrapped in position thereat, and showing the relation of the wrapping chuck to the tape severing mechanism at the start of the wrapping operation;

FIG. 13 is a view similar to FIG. 12, but showing the wrapping chuck rotated to a position corresponding to partially complete wrap of the article, and the cutting of the tape by the severing mechanism;

FIG. 14 is a view similar to FIG. 13, and showing the completion of the severing operation, and the "tack" of the tape with the knife of the severing mechanism;

FIG. 15 is a view similar to FIG. 14, but showing the wrapping operation completed about the article, and showing further the "tack" of the tape with the knife mechanism; and

FIG. 16 is a view showing the wrapped elongate article emerging from the jaw of the wrapping chuck, and showing the manner in which the article is moved past an already advanced length of tape in position for subsequent severing and wrapping about the elongate article at another point thereon.

## GENERAL DESCRIPTION OF MACHINE

Referring now particularly to FIGS. 1, 5 and 6 of the drawings, the improved wrapping apparatus according to the present invention is referred to generally by the reference numeral **20**, and includes a base **21** supporting a frame **22** having a foot **23**, foot **23** being secured to the base **21** by means of mounting screws **24**. Base **21** supports a drive motor **26** for the wrapping apparatus, motor **26** drivably connected to a speed

reducer mechanism **27** having an output shaft **28**. A pulley **29** is fast on output shaft **28**, and drives a belt **31** trained about a driven pulley **32** supported on a main driving shaft **33**, and adapted to be clutched thereto by means of a single revolution one-way clutch **34**.

Drive shaft **33** is supported at one end in a standard **36** held by screws **37** to the base plate **21**, the other end of the shaft **33** being supported in a bushing **38** in the frame **22**. Drive shaft **33** is adapted to provide intermittent rotary motion to a wrapping chuck indicated generally by the reference numeral **40**, a tape severing mechanism indicated generally by the reference numeral **45**, and a variable length tape feed mechanism indicated generally by the reference numeral **50**, details of which mechanism will be described in more detail as this specification proceeds.

The aforesaid tape feed mechanism is thus adapted to give intermittent feed motion to a length of tape T which is supplied from a supply reel SR supported on a bracket **41** extending from the main frame **22**, as seen in FIGS. 1 and 6.

The structure for supplying the aforesaid intermittent motion includes the clutch **34** which has an outer clutching member **42** which is fast to the pulley **32** and clutch control members **35***a* and **35***b*, and a driven clutch member **35***c* keyed to drive shaft **33** by key **35***d*. Clutch control member **35***a* has a pin extending therefrom, and clutching engagement beetween pulley **32** and shaft **33** is had only when no restraint is imposed on pin **44**. Clutch **34** is a one revolution one-way type such as is manufactured by the Hilliard Corporation of Elmira, N.Y., and the details of operation of such clutch form no part of the invention herein, and it is sufficient to say that any controllable one-way one revolution clutch of any other form will suffice as well.

Clutch control member **35***b* is fast to the driven shaft **33** by means of a key **46**, which also keys an indexing member **47** to the shaft **33**. Clutch **34** is ordinarily released, except during the tape feeding, article wrapping and tape severing operations, and shaft **33** is maintained in an indexed position corresponding to an indexed position of the wrapping chuck **40** to receive an elongate article for the wrapping operation. The elongate article is referred to by the reference letter B in FIGS. 12 to 16, inclusive.

In order to provide for the proper index position of the shaft **33** and the proper index position of the wrapping chuck **40**, structure is provided for disengaging the one-way clutch **34**, and its driven clutch member **35***c*, and to index the position of the index member **47** fast on driven shaft **33**. To this end a push type solenoid **48** is provided, see also FIG. 7, solenoid **48** being secured to base **21** by securing screws **48***a*, and having an armature **49** connected to a link **51**. A first pawl arm **52** is connected to link **51**, and pawl arm **52** is pivotally mounted on a pin **53** extending between spaced standards **54**, **54** flanking the solenoid **48**. The end of pawl arm **52** is normally in engagement with pin **44** to release clutch **34**, except when solenoid **48** is energized at which time pawl arm **52** is rocked in a counterclockwise direction as seen in FIG. 6, when pin **44** is disengaged and clutch **34** is engaged.

A second pawl arm **61** is likewise mounted for swivelling movement about the support shaft **53**, see also FIG. 7, and has an end **62** thereof adapted to engage a detent slot **63** in the indexing member **47**. Pawl arm **61** is normally in a position where its end **62** engages detent slot **63** to index shaft **33** properly, at which time clutch **34** is disengaged.

Pawl arm **61** is biased in a clockwise direction as seen in FIG. 6 by a return spring **56** constrained between a pin **57** extending from pawl arm **61** and a pin **58** extending from the right hand standard **54** seen in FIG. 7. Pawl arm **61** has a pin **67** extending therefrom which extends into a cutout portion **67***a* in pawl arm **52**, so that the clockwise rocking movement of pawl arm **61** will rock pawl arm **52** in a similar direction. Upon energization of solenoid **48**, counter clockwise rotation of pawl arm **52** will rock pawl arm **61** in a similar direction through the pin **67**. The pawl arms **52** and **61** can be manually released for operation without the use of the solenoid **48**, and a release lever **60** is accordingly provided. Release lever **60** is pivoted upon the frame **36** on a stub shaft **64**. Release lever **60** is adapted to be rocked about the pin shaft **64** in a clockwise direction against the bias of a spring **66** connected between the release lever **60** and shaft support bracket **36**. Release lever **60** has a pin **68** extending therefrom which is normally out of engagement, the pawl arms **52** and **61** at such time being urged in a clockwise direction to effect contact of pawl arm **52** with the pin **44**, and engagement of pawl arm **61** with the detent slot **63**. Release lever **60** can be rocked in a clockwise direction to release the engagement of pawl arms **52** and **61** to effect the driving connection between the motor **26** and the driven shaft **33**, the rocking movement of arm **60** in a clockwise direction causing the pin **68** extending therefrom to move into engagement with the two pawl arms **61** and **52**, at which time the driving connection is established as desired. During normal operation arm **60** is not operated, and the solenoid **48** is employed as sole control of rotation of shaft **33**.

## DESCRIPTION OF ARTICLE WRAPPING CHUCK

Referring now particularly to FIGS. 1, 3 and 8 to 11 of the drawings, the article wrapping chuck **40** is mounted for rotation in a pair of spaced bearing support plates **71** and **72** secured to the main frame **22**. As seen particularly in FIG. 3, the two plates **71** and **72** are held in spaced relationship by a plurality of spacer members **73**, and the bearing support plates **71** and **72** are secured to the support frame **22** and the space members **73** by means of cap screws **74**.

As seen in FIGS. 8 to 11, inclusive, the wrapping chuck **40** includes an essentially barrel shaped body member **75** having a radially extending elongate receiving jaw **76** adapted to receive the elongate article B, which is adapted to be wrapped with a length of tape T. The wrapping chuck **40** has a bearing member **85** with a bearing surface **77** and a further bearing surface **78** which cooperate with complimentary bearing surfaces **79** and **81** in the respective support plates **71** and **72**, and as seen in FIG. 1, the support plates **71** and **72** have slots **82** therein which are arranged to provide passage for the elongate article B into the jaw **76** of the wrapping chuck **40**. The ends of the chuck member **75** and the support plates **71** and **72** are flanked by guide jaws **80**, see also FIG. 2, held to the support plates **71** and **72** by screws **80***a*. The size of guide jaws **80** and their position can be varied as desired according to the size of the article B.

Structure is provided for imparting rotative movement to the article wrapping chuck **40**, and to this end the driven shaft **33** has a driving sprocket **83** fast thereto, see also FIG. 5. Sprocket **83** is engaged with a sprocket chain **84** which turns a driven sprocket **86** fast on a shaft **87** journalled in the spaced support plates **71** and **72**, see FIG. 3. Shaft **87** can also be turned by a hand wheel **90**, if desired, if motor **26** is not operating. An idler chain takeup sprocket **88** is mounted on a stub shaft **89** supported in the main frame **22**, and idler sprocket **88** is arranged for movement so as to take up slack in the chain **84**, since stub shaft **89** is adjustably mounted in a slot **91** in the main frame **22**, see particularly FIG. 1.

A driving gear **92** for wrapping chuck **40** is fast on the shaft **87** and meshes with a pair of idler gears **93** mounted on idler shafts **94** held at their ends in bushings **96** in the support plates **71** and **72**. Idler gears **93**, see again FIG. 1, mesh with a driven gear **97** fast on the chuck **40**, driven gear **97** being held in position as seen in FIG. 9 between the body member **75** and bearing member **85** by means of countersunk screws **98**.

The body member **75** of wrapping chuck **40** provides a cavity **101** in which a pair of resilient fingers **102** and **103** are housed. Resilient fingers **102** and **103** are preferably made of flat clock spring stock and are secured at their ends remote from jaw **76** to the body member **75** by cap screws **104**. The two spring members **102** and **103** are arranged to wrap the length of tape T tightly about the object to be wrapped as the chuck **40** rotates in a counterclockwise direction as seen in FIGS. 1, 8, 10 and 11.

## DETAILS OF TAPE FEEDING STRUCTURE

As seen particularly in FIG. 1, the tape T which is stored on the supply roll SR is adapted to be advanced by a feed roller **106** which has a knurled or other tape gripping surface. It should be borne in mind that the tape T is unreeled from supply roll SR with its pressure sensitive or adhesive surface on the upper side thereof. Feed roller **106** is mounted fast on a shaft **107** supported at one end in the frame **22** and at the other end on a bracket **108** secured by screws **109** to the frame **22**. The tape T is led from the supply roll SR around a first idler roll **111** and beneath the feed roll **106** and over spaced idler rolls **112** and **113**, the rollers **111**, **112** and **113** being supported on stub shafts **114** extending from the frame **22**. The length of tape T is further guided under and over rolls **116** and **117** turning on pin shafts **118** extending from a slack takeup arm **119**. Slack takeup arm **119** is mounted on a pivot pin **121** extending from a bracket **122** held by screws **123** to the frame **22**. A torsion spring **124** is wrapped about the pin **121** supporting the takeup arm **119** on the bracket **122**, and the torsion spring **124** tends at all times to rock the takeup arm **119** in a clockwise direction as seen in FIG. 1 to take up any slack of the tape T.

After thus being trained about the rollers **116** and **117** of the takeup arm **119**, the tape T is trained beneath an idler roller **126** supported on a pin shaft **127** extending from a support bracket **128** extending upward from the bearing plate **71** forming one of the supports for the wrapping chuck **40**. The bracket **128** also supports a second idler roller **129** mounted on a stub shaft **131** extending from the aforesaid bracket **128**.

Idler roller **129** has a knurled surface which cooperates with a length of clock spring **132** supported on a block **133** secured in any convenient fashion to the support bracket **128**. The knurled surface on roller **129** and clock spring **132** prevents reverse movement of roller **129**. The tape T which is fed beneath the idler rollers **126** and **129** is led across a spring shelf **134** extending laterally from the bracket **128**, and supported therefrom in any convenient fashion. The tape T is thus lightly constrained between knurled roll **129** and spring shelf **134**, and is prevented from having reverse movement by reason of clock spring **132** and knurled roll **129**.

It should be remembered that tape T has its pressure sensitive surface in contact with the idler rollers **126** and **129**, said surface being uppermost as seen in FIG. 1. It should be remembered also that the arm **119** and the torsion spring **124** is operable to remove the slack from the tape T which has been advanced by the feed roller **106**.

Structure is provided for giving feed movement to the roller **106** in prescribed amounts, and to this end, see FIGS. 1 and 5, drive shaft **33** has a crank member **136** mounted fast thereto by means of a key **137**. Crank **136** is connected by a crank pin **138** to a connecting rod **139** pivotally connected at **141** to a rocker member **142** mounted on the shaft **107** and adapted to rock thereon. Rocker member **142** carries a pawl **143** pivotally connected at **144** to the rocker arm **142**, pawl **143** cooperating with a ratchet wheel **148** fast to the feed roller shaft **107**. It will be seen that the pawl **143** when engaged with the ratchet wheel **148** will turn the feed roller **106** in a clockwise direction upon upward movement of connecting rod **139** to feed a length of tape T from the supply roll SR and advance same, the slack therein being taken up by the takeup arm **119** previously described.

Mechanism is provided for varying the amount of feed movement of the feed roller **106** by determining the point at which the pawl **143** comes into contact with the ratchet wheel **148** upon upward movement of connecting rod **139**. A tape feed regulating arm **149** accordingly has a hub **151** centered on the shaft **107**, and hub **151** has an arcuate segment **152** of a radius greater than the radius of the ratchet wheel **148**. The arm **149** is adapted to be rotated around the shaft **107**, and its position is referenced with respect to a notched detent plate **153** which is secured in any convenient manner to the top of the frame **22** adjacent the feed roller **106**. Detent plate **153** has a plurality of notches **154** therein, these cooperating with a detent **156** secured to the arm **149**.

When the arm **149** is turned in a counterclockwise direction as seen in FIG. 1, so that the detent **156** is in engagement with a detent notch **157** on the detent plate **153**, the arcuate segment **152** will be in a position where pawl **143** can engage one of the teeth of the ratchet **148** for the longest possible angular travel of ratchet wheel **148**. On the other hand, when detent arm **149** is rocked to a position with its detent **156** in engagement with a detent notch **158** on the detent plate **153**, the engagement of the pawl **143** with the ratchet wheel **148** will be transferred to another point thereon by reason of the arcuate segment **152** which regulates such engagement, thereby reducing the amount of angular movement of the ratchet wheel **148** and the angular and feed movement of the feed roller **106**.

## DETAILS OF TAPE CUTTING STRUCTURE

Structure is provided for severing a length of tape T which has been fed by the feed roller **106**, and which has been wrapped about the article B inserted into the chuck **40**. As will be described, in the aforesaid wrapping operation within the chuck **40**, and during the wrapping operation, the tape will be wrapped to a small degree about the outer periphery of chuck **40**, and while having such slight wrap about the chuck and partially complete wrap about the article B, the tape is severed into a discrete length, and after such tape severing operation the wrapping is completed about the article B. To this end the tape severing mechanism **45** includes a tape cutting roller **161**, see FIGS. 1 and 2, which is adapted to have limited rotation about a roller supporting shaft **162** supported at each end in bearing plates **163** and **164**. A pivot block **166** holds the two bearing plates **163** and **164** thereto by means of holding screws **167** and **168**. The pivot block **166** is mounted for pivotal movement together with the two frames **163** and **164** on a pivot pin **171** which is supported at the ends in the frame members **71** and **72** supporting the wrapping chuck **40**.

The tape cutting roller **161** supported in the bearing plate members **163** and **164** includes a cutting means in the form of a knife edge **172**, as seen in FIG. 1, the knife edge **172** being adapted at times to come into contact with the periphery of the wrapping chuck **40**, as seen in FIGS. 12 to 16 inclusive, with the tape T between knife edge **172** and the periphery of wrapping chuck **40**. The roller **161** is adapted to have limited rotative movement in its support arms **163** and **164** when in rolling contact with wrapping chuck **40**, and is arranged to be returned to a start position after its rolling contact after removal of contact therewith. To this end, roller **161** is provided with a stop finger **173**. The stop finger **173** is adapted to move with roller **161** into contact with the frames **163** and **164**. Roller **161** is biased in such movement to the position described with the stop **173** in contact with the arms **163** and **164** by a pair of torsion springs **174** mounted at each end of the shaft **162** supporting the knife roller **161**. Torsion springs **174** have a common connecting element **176** which engages a slot **177** in the knife edge roller **161**. The other end of each torsion spring **174** has a

finger **178**, each of which extends into a retaining hole **179** in the respective arms **163** and **164**. Rolling contact of roller **161** with chuck **40** is against the bias of springs **174**, so that at all times roller **161** moves rotatively only with prescribed limits.

Mechanism is provided for giving pivoting movement to the arms **163** and **164** supporting knife roller **161** so that the roller **161** can move into contact with a length of tape T having a slight wrap about chuck **40** to cut the tape into a predetermined length. Such movement of the knife roller is timed in accordance with the wrapping movement of the chuck **40**.

Referring now to FIGS. 1 and 5 particularly, drive shaft **33** supports a cam member **181** including a hub **182** held fast to shaft **33** by a key **183**. Cam member **181** affords a support for an adjustable cam plate **184** having a lobe **186** thereon. The position of cam plate **184** with respect to the cam member **181**, so as to adjust the position of the lobe **186**, is varied by means of cap screws **187** extending through arcuate slots **188** in cam plate **184**, and tapped into the cam member **181**.

Cam lobe **186** cooperates with a cam follower **189** arranged to pivot about a pin **191** supported at its end in the frame member **22**, see also FIG. 4. Cam follower **189** supports a cam follower roller **192** supported on a stub shaft **193** extending from follower **189**, cam roller **192** being in contact with the cam plate **184** and co-acting with the lobe **186** as seen in FIG. 1 to rock the cam follower **189** once during each revolution of shaft **33**.

The two roller support arms **163** and **164** are connected for movement with cam follower **189** by means of a connector indicated generally by the reference numeral **195**, and comprising an abutment member **196** connected by a pin **197**, see also FIG. 2, and by a second abutment member **198** pivotally connected at **199** to the cam follower **189**, there being a right and left hand adjustment member **201** connecting the two abutment members **196** and **198** to vary the distance therebetween and to control the adjustment of the knife roller **161** with respect to the wrapping chuck **40**.

## OPERATION

Operation of the wrapping machine according to the present invention will be best understood with reference to FIGS. 12 to 16, inclusive, which illustrate the steps of making an initial wrap of the tape about the bundle B, and completely wrapping the bundle B with tape while within the rotating chuck **40**, severing a fed length of tape, maintaining the fed and unsevered tape in position for a subsequent wrapping cycle by means of the tape cutting roller, and removing the wrapped bundle B from the wrapping chuck.

FIG. 12 shows a start or index position of both the knife roller **161** and the wrapping chuck **40**. In this position of roller **161** and chuck **40**, the parts are immobile, and a length of tape T has started across the open jaws **76** of the chuck **40**. This may be done by simply pulling on tape T and stripping same from supply roll SR. The article to be wrapped, which has been designated by the reference letter B, may consist of a plurality of side by side wires forming a part of a wire harness or the like, or may be a group of elongate members of any kind.

As seen in FIG. 12, the bundle B is moved in a downward direction across the tape T into the jaw **76** of chuck member **75**. Since the tape T has its pressure sensitive material on the upper side thereof, the tape will engage with the bundle B, the tape being forced against the bundle by means of the resilient fingers **102** and **103** seen in FIGS. 8, 10 and 11. This downward movement of the bundle B into the chuck **75** with the initial wrap of the tape T therearound, is enabled to be done by reason of the yielding movement of the tension of the slack takeup arm **119**, which is enabled to have counter clockwise movement as seen in FIG. 1 for the movement of the tape T into the chuck **75**. Such movement of the tape T into the chuck **75** is done past the guide rollers **126** and **129**.

With the parts in position as seen in FIG. 12, the solenoid **48** is energized, which provides a driving connection between the motor **26** and the shaft **33**. The energization of the solenoid **48** causes the pawl arm **52** operated thereby to move out of engagement with the pin **44** on the clutch **34**. At the same time the pawl arm **61** moves out of index position with the detent slot **63** on the member **47**.

At such time the chuck **75** rotates through a number of revolutions in a counter clockwise direction to complete a wrapping operation, but at an appropriate time during such rotation as determined by the position of the cam lobe **186**, the cutoff mechanism **45** is caused to rock slightly about its pivot shaft **171**. During the initial movement of the knife roller **161** into contact with the periphery of the chuck **75**, the knife edge **172** is out of contact with the roller **161**, the knife edge **172** moving into contact with the tape T as seen in FIG. 13, to sever the tape T at the periphery of the chuck **75**. When the cam lobe **186** moves past the follower roller **192**, the cutoff mechanism **45** is rocked slightly in a counter clockwise direction out of contact with the periphery of the chuck **75**, and the torsion springs **174** on the knife roller **161** cause same to be rotated in a counter clockwise direction on its support arms **163** and **164** until the roller **161** stops in a position as seen in FIG. 14.

Following the operations described with reference to FIGS. 13 and 14, chuck **40** continues to rotate in a counter clockwise direction to complete a wrapping operation about the bundle B, enough turns being provided for the chuck **75** to complete a wrapping operation on the bundle B until the same is wrapped as seen in FIG. 15.

It should be borne in mind that the solenoid **48** is energized only for a period of time sufficient to cause the pawl arms **52** and **61** operated thereby respectively to move out of the contact with pin **44** on the clutch **34**, and out of engagement with the detent slot **63** on the indexing member **47**. Clutch **34**, being a one revolution clutch, will give clutching engagement for one revolution of shaft **33** until pawl arm **52** comes into engagement with the pin **44**, at which time the clutch is released. This release of the clutch takes place a small time interval prior to the engagement of the pawl arm **61** with the detent slot **63**, at which time chuck member **75** occupies the position seen in FIG. 15.

It should be borne in mind that at the commencement of the wrapping movement of chuck member **75**, and during the interval between the positions seen in FIGS. 12 and 13, the slack takeup arm **119** is rockable in a counter clockwise direction as seen in FIG. 6 to feed an additional length of tape about the periphery of chuck member **75**. The length of tape to be fed by feed mechanism **50** is adjusted by means of feed ratchet mechanism previously described, and mounted upon the shaft **107** turning with the feed roller **106**. Since the shaft **33** is intermittently operated, the feed movement provided by means of the crank **136** and connecting rod **139** is intermittently operated as well.

As seen in FIG. 15, at the conclusion of the wrapping operation, the additional length of tape T is across the open jaw **76** of the chuck **75**, it having been advanced by means of rotation of chuck **75**. By reason of the "tack" of the tape T it stays in contact with the knife **172** as seen in FIG. 15, across the jaw **76** of chuck member **75**.

As seen in FIG. 16, the wrapped bundle B can be moved from chuck member **75** upward as seen, past the new length of tape T which lies in the path of the wrapped bundle B in its upward movement. However, and by reason of the fact that the pressure sensitive surface of the tape T is on the upper side thereof, there is no contact of the wrapped length of tape T, and it can be moved

therepast in a simple and expeditious manner. At the conclusion of the bundle removing operation, the tape falls across the open jaws **76** of chuck member **75**, as seen in FIG. 12, the series of operations just described being continued once more.

The mechanism which has been described provides an efficient and useful means for wrapping elongate articles such as wire harnesses or the like at spaced intervals throughout its length.

While the invention has been described in terms of a preferred embodiment thereof, it is not intended that the invention be limited by the precise embodiment herein shown, the scope of the invention being intended to be limited only by the claims here appended.

I claim:

**1.** In apparatus for wrapping a length of pressure sensitive tape about an elongate article, a rotatable wrapping chuck including driving means therefor, said wrapping chuck having a radially extending jaw adapted to receive said elongate article for wrapping thereof with a length of tape while said article is constrained against rotation in said jaw, tape feeding means driven from said driving means for feeding a length of tape across said jaw, means for constraining the so fed tape as an initial bight thereof about said article when the same is moved with said length of tape into the jaw of said chuck, tape slack takeup means interposed between said tape feeding means and said chuck operable to feed additional tape during forming of said bight, said chuck being rotatable by said driving means while said article is held against rotation to effect further wrap of said article, said tape feeding means being operable by said driving means to feed tape about the periphery of said chuck, means cooperating with said tape feeding means for varying the length of the tape fed thereby, a knife supporting roller having a knife thereon including means for mounting said roller for movement toward said chuck to sever the tap fed over the periphery of said chuck, said last named means including cam and follower means coacting with said driving means for moving said knife supporting roller into contact with the periphery of said chuck in timed relation therewith to sever said tape, said driving means rotating said chuck through a distance to complete a wrapping operation of the severed tape about said article, said knife roller after the severing movement holding the tape in position releasably across the jaw of said chuck.

**2.** In apparatus for wrapping a length of pressure sensitive tape about an elongate article, a rotatable wrapping chuck including driving means therefor, said wrapping chuck having a radially extending jaw adapted to receive said elongate article for wrapping thereof with a length of tape while said article is constrained against rotation in said jaw, tape feeding means driven from said driving means for feeding a length of tape across said jaw, means for constraining the so fed tape as an initial bight thereof about said article when the same is moved with said length of tape into the jaw of said chuck, tape slack takeup means interposed between said tape feeding means and said chuck and operable to feed additional tape during forming of said bight, said chuck being rotatable by said driving means while said article is held against rotation to effect further wrap of said article, said tape feeding means being operable by said driving means to feed tape about periphery of said chuck, means cooperating with said tape feeding means for varying the length of tape fed thereby, a knife supporting roller having a knife thereon including means for mounting said roller for movement toward said chuck to sever the tape fed over the periphery of said chuck, said last named means including means coacting with said driving means for moving said knife supporting roller into contact with the periphery of said chuck in timed relation therewith to sever said tape, said driving means rotating said chuck through a distance to complete a wrapping operation of the severed tape about said article, said knife roller after the severing movement holding the tape in position releasably across the jaw of said chuck.

**3.** In apparatus for wrapping a length of pressure sensitive tape about an elongate article, a rotatable wrapping chuck including driving means therefor, said wrapping chuck having a radially extending jaw adapted to receive said elongate article for wrapping thereof with a length of tape while said article is constrained against rotation in said jaw, tape feeding means driven from said driving means for feeding a length of tape across said jaw, means for constraining the so fed tape as an initial bight thereof about said article when the same is moved with said length of tape into the jaw of said chuck, tape slack takeup means interposed between said tape feeding means and said chuck and operable to feed additional tape during forming of said bight, said chuck being rotatable by said driving means while said article is held against rotation to effect further wrap of said article, said tape feeding means being operable by said driving means to feed tape about the periphery of said chuck, a knife supporting roller having a knife thereon including means for mounting said roller for movement toward said chuck to sever the tape fed over the periphery of said chuck, said last named means including means coacting with said driving means for moving said knife supporting roller into contact with the periphery of said chuck in timed relation therewith to sever said tape, said driving means rotating said chuck through a distance to complete a wrapping operation of the severed tape about said article, said knife roller after the severing movement holding the tape in position releasably across the jaw of said chuck.

**4.** In apparatus for wrapping a length of pressure sensitive tape about an elongate article, a rotatable wrapping chuck including driving means therefor, said wrapping chuck having a radially extending jaw adapted to receive said elongate article for wrapping thereof with a length of tape while said article is constrained against rotation in said jaw, tape feeding means driven from said driving means for feeding a length of tape across said jaw, means for constraining the so fed tape as an initial bight thereof about said article when the same is moved with said length of tape into the jaw of said chuck, said chuck being rotatable by said driving means while said article is held against rotation to effect further wrap of said article, said tape feeding means being operable by said driving means to feed tape about the periphery of said chuck, means cooperating with said tape feeding means for varying the length of tape fed thereby, a knife supporting roller having a knife thereon including means for mounting said roller for movement toward said chuck to sever the tape fed over the periphery of said chuck, said last named means including means coacting with said driving means for moving said knife supporting roller into contact with the periphery of said chuck in timed relation therewith to sever said tape, said driving means rotating said chuck through a distance to complete a wrapping operation of the severed tape about said article, said knife roller after the severing movement holding the tape in position releasably across the jaw of said chuck.

**5.** In apparatus for wrapping a length of pressure sensitive tape about an elongate article, a rotatable wrapping chuck including driving means therefor, said wrapping chuck having a radially extending jaw adapted to receive said elongate article for wrapping thereof with a length of tape while said article is constrained against rotation in said jaw, tape feeding means driven from said driving means for feeding a length of tape across said jaw, means for constraining the so fed tape as an initial bight thereof about said article when the same is moved with said length of tape into the jaw of said chuck, said chuck being rotatable by said driving means while said article is held against rotation to effect further wrap of said article, said tape feeding means being operable by said driving means to feed tape about the periphery of said chuck, a knife supporting roller having a knife thereon including means for

mounting said roller for movement toward said chuck to sever the tape fed over the periphery of said chuck, means for mounting said knife supporting roller for limited rotative movement of said roller with respect to said last named means, said last named means including means coacting with said driving means for moving said knife supporting roller into contact with the periphery of said chuck in timed relation therewith to sever said tape, said driving means rotating said chuck through a distance to complete a wrapping operation of the severed tape about said article, said knife roller after the severing movement holding the tape in position releasably across the jaw of said chuck.

6. In apparatus for wrapping a length of pressure sensitive tape about an elongate article, a rotatable wrapping chuck including driving means therefor, said wrapping chuck having a radially extending jaw adapted to receive said elongate article for wrapping thereof with a length of tape while said article is constrained against rotation in said jaw, tape feeding means driven from said driving means for feeding a length of tape across said jaw, means for constraining the so fed tape as an initial bight thereof about said article when the same is moved with said length of tape into the jaw of said chuck, said chuck being rotatable by said driving means while said article is held against rotation to effect further wrap of said article, said tape feeding means being operable by said driving means to feed tape about the periphery of said chuck, a knife supporting roller having a knife thereon including means for mounting said roller for movement toward said chuck to sever the tape fed over the periphery of said chuck, said last named means including means coacting with said driving means for moving said knife supporting roller into contact with the periphery of said chuck in timed relation therewith to sever said tape, said driving means rotating said chuck through a distance to complete a wrapping operation of the severed tape about said article, said knife roller after the severing movement holding the tape in position releasably across the jaw of said chuck.

7. In apparatus for wrapping a length of pressure sensitive tape about an elongate article, a rotatable wrapping chuck having a radially extending jaw adapted to receive said elongate article, means for feeding a length of said tape across said jaw, means cooperating with said tape feeding means for varying the length of the tape fed thereby, means within said jaw for constraining said tape as an initial bight thereof about said article when the same is moved with said length of tape into the jaw of said chuck, means for rotating said chuck while the article is held against rotation within said chuck so as to effect further wrap of said tape about said article, said chuck having a peripheral surface over which said tape is led during the rotation of said chuck, a knife supporting roller having a knife thereon including means for mounting said roller for motion toward said chuck to sever the tape led over said peripheral surface, means for moving said knife supporting roller against said chuck in timed relation thereto for rolling action of said knife into severing contact with said tape, said knife supporting roller being adapted after severing of said tape to hold the same thereto, said means rotating said chuck being operable to complete a wrapping operation about said article, said wrapped article being removable from said chuck in a direction to release said tape from said knife supporting roller.

8. In apparatus for wrapping a length of pressure sensitive tape about an elongate article, a rotatable wrapping chuck having a radially extending jaw adapted to receive said elongate article, means for feeding a length of said tape across said jaw, means within said jaw for constraining said tape as an initial bight thereof about said article when the same is moved with said length of tape into the jaw of said chuck, means for rotating said chuck while the article is held against rotation within said chuck so as to effect further wrap of said tape about said article, said chuck having a peripheral surface over which said tape is led during the rotation of said chuck, a knife supporting roller having a knife thereon including means for mounting said roller for motion toward said chuck to sever the tape led over said peripheral surface, cam and follower means for moving said knife supporting roller against said chuck in timed relation thereto for rolling action of said knife into severing contact with said tape, said knife supporting roller being adapted after severing of said tape to hold the same thereto, said means rotating said chuck being operable to complete a wrapping operation about said article, said wrapped article being removable from said chuck in a direction to release said tape from said knife supporting roller.

9. In apparatus for wrapping a length of pressure sensitive tape about an elongate article, a rotatable wrapping chuck having a radially extending jaw adapted to receive said elongate article while said wrapping chuck is in an initial position prior to the rotation of the same, said article being inserted into said jaw with an inltial bight of the tape thereon;

drive means for rotating said wrapping chuck to wrap tape around the article;

tape feed means to feed tape along a tape feed path toward the wrapping chuck, the trailing adge of said tape being adjacent said tape feed path;

tape severing means including knife means, said knife means severing said tape for wrapping said article, said knife means and said tape feed path being adjacent opposite sides of said jaw when the chuck is in said initial position, said wrapping chuck rotatable toward the knife means to bring the trailing edge of said tape thereto and simultaneously pull a second length of tape across the chuck into position across the jaw when the chuck is in said initial position, said knife means cutting said first-mentioned length of tape along the trailing edge thereof on the periphery of the chuck.

10. The apparatus of claim 9 whehein constraining means is disposed within said jaw to receive said article annd to securely maintain said initial bight of the first-metnioned length of tape thereon as the second length of tape is being brought across the wrapping chuck when the same is rotating toward the knife means.

11. The apparatus of claim 9 wherein said tape severing means comprises positioning means to move said knife means into contact with the trailing edge of the first-mentioned length of tape, said knife means cutting said first-mentioned length of tape on the periphery of the wrapping chuck, the severing of the tape occurring after the chuck has traveled through a predetermined arcuate path to carry said second length of tape across the chuck.

12. The apparatus of claim 11 wherein said positioning means comprises:

a cam associated with said drive means; and

a cam follower trained on said cam and associated with said knife means, the cooperation of said cam with said cam follower causing the knife means to move toward the periphery of the chuck after the same has rotated through said predetermined arcuate path to sever said first length of tape and to move away from the wrapping chuck after the severing of the tape.

13. The apparatus of claim 12 wherein:

said constraining means comprises a pair of leaf springs resiliently biased toward each other, said leaf springs being spread apart as said article with the initial bight thereon is inserted therebetween, said leaf springs rotating with said wrapping chuck and thereby enabling a secure wrap to be formed around the article as the same is held outside the chuck to prevent rotation of the article;

said knife means rotatively mounted between a pair of support arms;

said cam including a lobe extending outward from the periphery thereof, said cam follower varying in position when moving on and off said lobe; and

connecting means interposed between said arms and said cam follower to transmit said variation of position of the cam follower to said support arms thereby causing the same to move in response thereto, the responsive movement of said arms bringing said knife means into contact with the tape on the periphery of the chuck and out of contact with the chuck upon completion of severing of the length of tape, said knife means rotating around its own axis when cutting the tape on the periphery of the rotating wrapping chuck due to the frictional force of the rotating chuck.



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