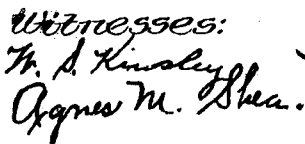


1,104,742.

4 SHEETS-SHEET 1.



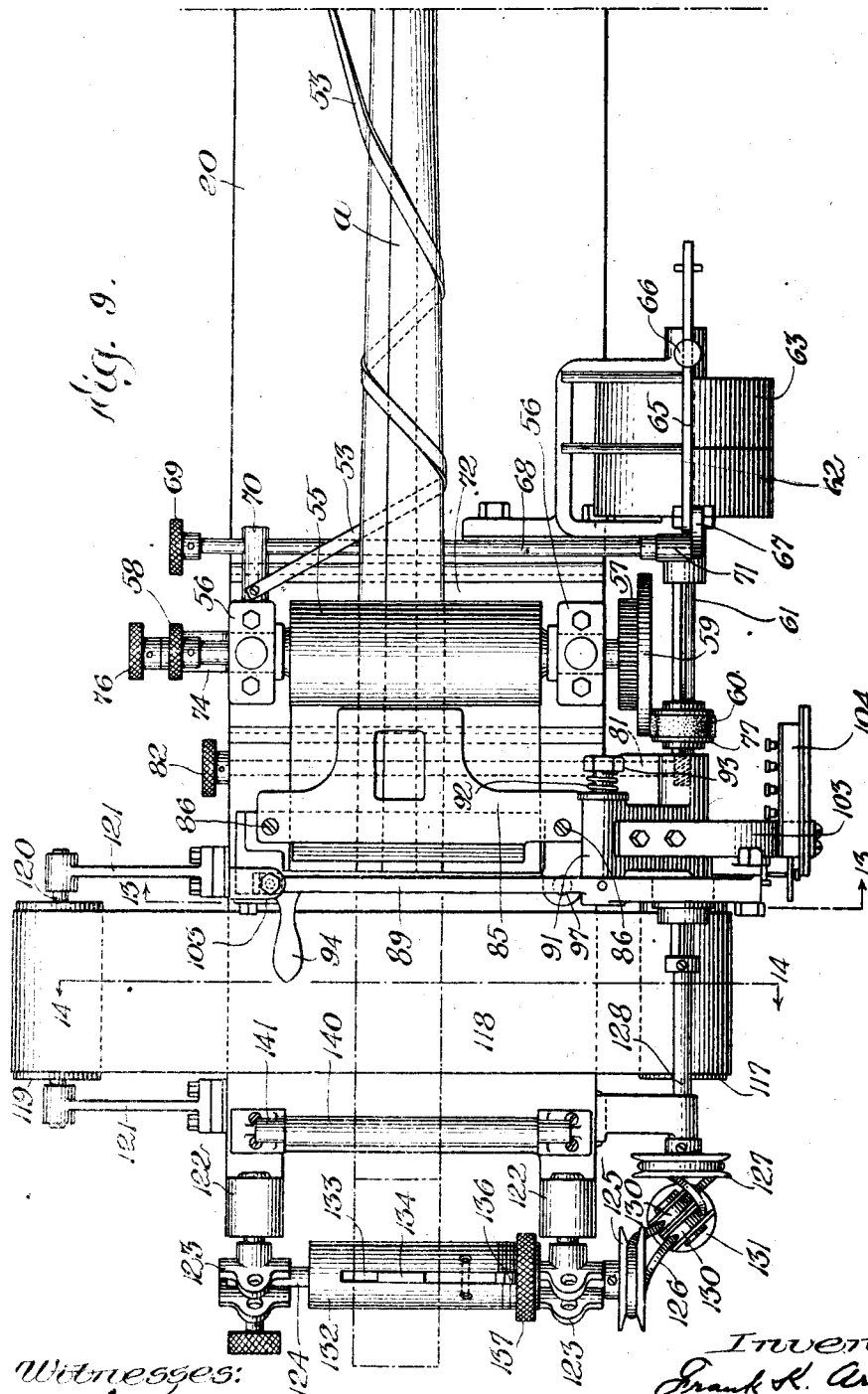
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F. K. ARNOLD.
MACHINE FOR MAKING PAPER TUBE SECTIONS.
APPLICATION FILED JAN. 31, 1914.

1,104,742.

Patented July 21, 1914.

4 SHEETS—SHEET 2.



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1,104,742.

4 SHEETS—SHEET 3.

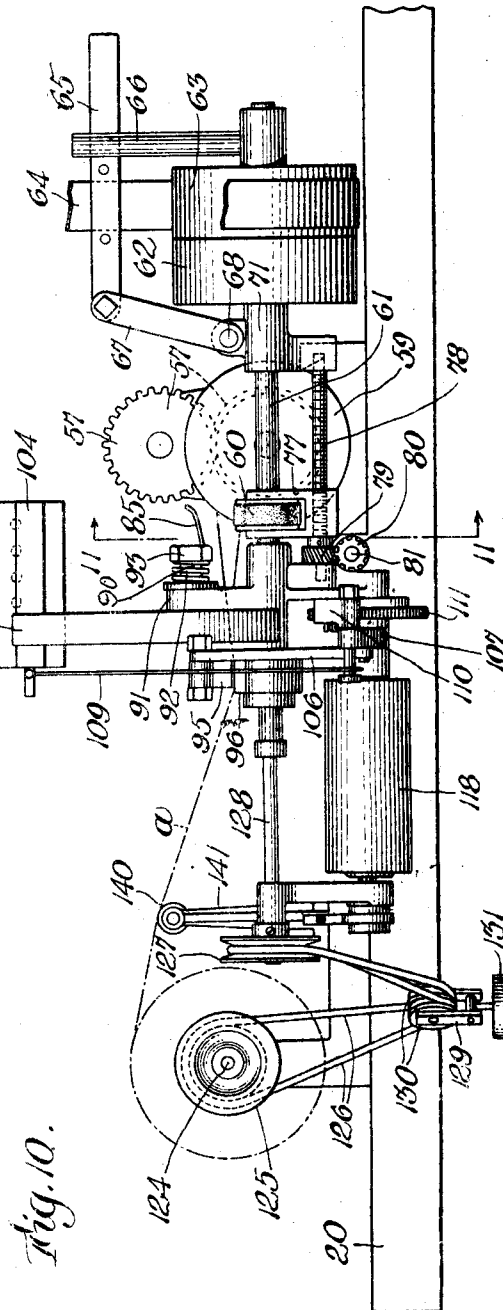


Fig. 10.

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4 SHEETS-SHEET 4.

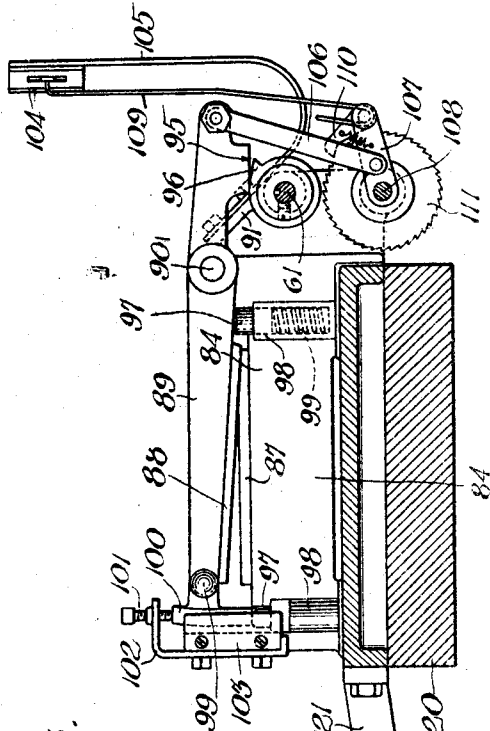


Fig. 13.

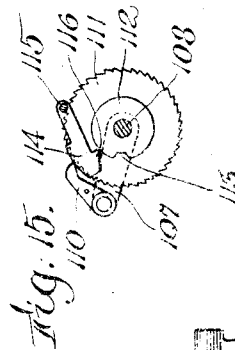


Fig. 15.

Fig. 14.

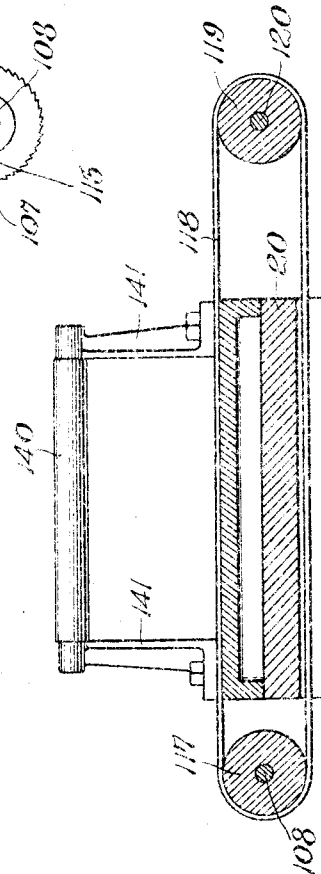
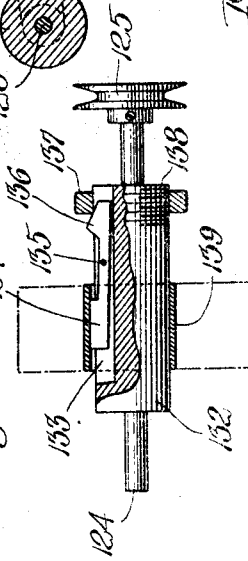


Fig. 10.



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UNITED STATES PATENT OFFICE.

FRANK K. ARNOLD, OF NASHUA, NEW HAMPSHIRE, ASSIGNOR TO NASHUA CARD GUMMED & COATED PAPER COMPANY, OF NASHUA, NEW HAMPSHIRE, A CORPORATION OF MASSACHUSETTS.

MACHINE FOR MAKING PAPER-TUBE SECTIONS.

1,104,742.

Specification of Letters Patent.

Patented July 21, 1914.

Application filed January 31, 1914. Serial No. 815,647.

To all whom it may concern:

Be it known that I, FRANK K. ARNOLD, of Nashua, in the county of Hillsboro and State of New Hampshire, have invented certain new and useful Improvements in Machines for Making Paper-Tube Sections, of which the following is a specification.

This invention relates to machinery for converting a strip of paper or equivalent material into a tube which is then either cut into sections, or coiled for subsequent cutting, the tube or sections being flattened but adapted to be used as cups by holding one end of each section closed.

The object of the invention is to provide a simple and rapidly and continuously operating machine of this character.

The invention consists in the machine and the improvements which I shall now proceed to describe and claim.

Of the accompanying drawings:—Figure 1 is a plan view of the portion of the machine which converts the strip into tubular form. Fig. 2 is an elevation, partly in section of the same. Fig. 3 represents an enlarged section on line 3—3 of Fig. 1. Fig. 4 represents an enlarged section on line 4—4 of Fig. 1. Fig. 5 represents an enlarged section on line 5—5 of Fig. 1. Fig. 6 is a perspective view of one of the cups or tubular sections produced by the machine. Fig. 7 is a plan view of a series of the cups or sections as they are delivered by the machine on to a traveler belt or conveyor. Fig. 8 represents a section on line 8—8 of Fig. 2. Fig. 9 is a plan view of the portion of the machine which is omitted from Fig. 1, said Fig. 9 being on a larger scale than Fig. 1. Said two figures together illustrate the complete machine. Fig. 10 is an elevation of the mechanism shown in Fig. 9. Fig. 11 represents a section on line 11—11 of Fig. 10. Fig. 12 is an elevation from the left of Fig. 11, but partly in vertical section. Fig. 13 represents a section on line 13—13 of Fig. 9 looking in the direction of the arrows. Fig. 14 represents a section on line 14—14 of Fig. 9 looking in the direction of the arrows. Fig. 15 is a detail view of the ratchet mechanism shown in Fig. 13 but viewed from the other side. Fig. 16 is a detail elevation, partly in section of the reeling drum.

The same reference characters indicate the same parts in all the figures.

Referring first to Figs. 1 and 2, the machine has a suitable frame of which the base is indicated at 20, said base having uprights 21 at one end for a spindle supporting a roll of paper or other material *a*. From the supply roll the paper leads under a guide roll 22 mounted in bearings 23, and then passes under and around a former 24 which at its larger end is secured to a cross bar 25 carried by uprights 26. At a point farther along the base 20 are uprights 27 for a cross bar 28 which is slotted as at 29 (Fig. 8). A bolt 30 passing through said slot supports a bracket or ear 31 which is attached to and rises from the upper surface of the former 24. The attachment of the former to the bar 25 is not so rigid as to prevent the former from being adjusted slightly to the right or left by means of the bolt 30 and the slotted cross bar 28. This lateral adjustment of the former is advantageous in that by means of it I can cause the former to occupy a position inclined more or less to the right or left to meet and obviate tendency of the paper strip to "creep" around the former or to become askew. The paper strip *a* next passes inside of a tension device or smoother 32 (Figs. 1 and 2), said tension device comprising a flexible strap of suitable material secured at one end to the top of the former as by screws or tacks 33, the other end of the strap having a clip or loop 34 connected by a spring 35 with an end clip 36 having a series of holes either one of which may engage a pin 37 carried by an ear 38 connected to the base 20. By shifting the end clip 36 so that one or another of its holes may engage the pin 37, the tension exerted by the spring 35 upon the tension strap, may be varied. The separable connection provided by said end strip 36 and pin 37 enables the tension strap or drag 32 to be readily unwrapped from about the former 24 to enable a new strip of paper to be started through the machine. The strap 32 acts as a drag upon the paper which is being drawn along toward the left in Figs. 1 and 2 by mechanism hereinafter described, so that the paper strip will be wrapped smoothly about the former which latter, as shown by comparing Figs. 1 and

2, tapers toward the delivery end and is wider or flared laterally so that the strip of paper will be caused to leave the tip of the former in flattened and smooth condition.

At a point beyond the tension device or drag 32 (in the direction of travel of the paper strip) I mount a reservoir 39 for a suitable adhesive, said reservoir having a nozzle 40, the outlet of which is controlled by a spherical valve or ball 41 (see Figs. 4 and 5). The ball 41 prevents too free flow of the adhesive, and at the same time said ball is caused to revolve by the movement of the edge portion of the paper under it so that said ball will act as a roll to apply a narrow stripe of adhesive to the surface of paper beneath it. As the reservoir is adjustable as hereinafter described, even to the extent of moving it entirely away from operative position, the ball 41 acts as a valve to completely close the opening in the lower end of the nozzle 40 whenever there is nothing under the ball to hold it raised. As a matter of fact, the reservoir and its nozzle is capable of such accurate adjustment that the ball 41 is raised as soon as the front edge of a new strip of paper is passed under it, the ball falling to its seat and closing the outlet for adhesive as soon as the last end of a strip of paper has passed it, so that no adhesive can escape toward the former excepting when the machine is in use. As shown in Fig. 5, the adjustment of the reservoir nozzle is such that the paper itself will so fill up the space between the former 24 and the lower end of the nozzle 40 that the adhesive will not escape if the feed of the paper should be stopped.

I will now describe the means of obtaining the accurate adjustment of the reservoir nozzle:—The reservoir is provided with a stud 42 (Figs. 2 and 4) into which an arm 43 extends, a screw 44 passing upwardly through the stud 42 and engaging the arm 43 enabling the reservoir to be secured to said arm in a more or less laterally inclined position. Of course, any adjustment of lateral inclination of the reservoir will also vary the lateral inclination of the nozzle 40. The arm 43 projects from a block 45 which is mounted on a depending rod 46 and held in vertical adjusted position on said rod by a binding screw 47. The rod 46 depends from a block 48 which is mounted upon a cross rod 49 and secured in lateral position upon the latter by a binding screw 50. The cross rod 49 is supported by suitable uprights 51. If an adhesive is employed which requires being kept warm, the means for heating the reservoir 39 may consist of a suitable gas burner and means for directing the heat to the reservoir, conventionally illustrated at 52 in Fig. 2.

As best shown in Figs. 1 and 5 the nozzle 40 acts to deflect one of the edges of the paper strip, or in other words, to hold that edge up while the ball 41 is applying the stripe of adhesive, the paper immediately after passing the nozzle and deflector 40 returning to contact with the opposite edge portion of the strip so that the paper flap will descend upon the stripe of adhesive.

In order that the strip of paper will be caused to follow the contour of the tapering former and to run smoothly and without wrinkling there-over in the direction of the length of said former, I provide a flexible member 53 which may be properly referred to as a folder or smoother because it insures a complete folding of the strip to tubular form and to insure its passing to the feed or drawing and pressing rolls smoothly. This folder or smoother comprises a strap of suitable flexible material such as leather, said strap having a loop 54 at one end which may be conveniently engaged with one of the uprights 51, the said strap being wound spirally around the paper upon the former 24 and attached at its other end as by a screw to any suitable fixed point. This latter point of attachment is best shown in Fig. 9, Fig. 1 merely indicating it diagrammatically. Of course, one end or the other of the strap 53 must be detachable from its fastening, and the strap unwrapped, whenever a new strip of paper is to be started through the machine, the strap 53 being then returned to the position indicated in Figs. 1, 2 and 9.

The extreme tip of the former 24 extends almost to the nip of two rolls 55 (see Figs. 1, 2, 9, 10, 11 and 12) having their bearings in suitable brackets 56, the upper roll having its bearings preferably spring-pressed in a well known manner such as indicated in Figs. 11 and 12. The two rolls have intermeshing gears 57, and the shaft on the upper roll has a handle or thumb wheel 58 by means of which the rolls can be moved manually, as when a new strip of paper is being introduced.

The shaft on the lower roll has a friction disk 59, the outer face of which is engaged by a friction driver 60 mounted upon shaft 61 and connected to said shaft so as to rotate therewith, although adjustable along the shaft by the mechanism herein-after described.

The shaft 61 is the power shaft of the machine and has fast and loose pulleys 62, 63, for the driving belt 64. A shipper bar 65 is mounted to slide in an upright guide 66 (Fig. 10), said bar 65 being shifted in the direction of its length by an arm 67 of a rock shaft 68 mounted in suitable bearings and having a handle or thumb wheel 69 (Fig. 9). The shaft 68 is mounted at

one end in a stud bearing 70 (Fig. 9) to which one end of the flexible folder or smoothing strap 53 is shown as connected, and at its other end in a frame bracket 71.

Paper so frequently varies in its nature that it cannot always be relied upon to travel smoothly when fed through any mechanism similar to what is employed in this machine, if the different members which act upon the paper always occupy the same relative positions. I have found that accuracy and smoothness in the travel of the paper are far more readily attained by adjusting the feed or delivering rolls 55 relatively to the former. To this end I provide a sliding base 72 for the brackets 56 of the rolls 55, said base being mounted in transverse ways (Figs. 11 and 12) of a casting 73 mounted upon base 20. Projecting from the slide 72 is an ear 74 which extends downwardly and has an opening for an adjusting screw 75 which engages a threaded hole in the casting 73. The screw 75 has a thumb wheel 76 by means of which the lateral position of the base 72 and the feeding or delivering rolls 55 can be accurately adjusted, during the operation of the machine if necessary, and if it is seen that the paper is not traveling smoothly. In order that the operating connections between the friction members 59, 60, may be maintained when such adjustment of the rolls is effected, the bearings for shaft 61 may be formed in brackets of the slide base 72 or may be supported by independently adjustable means.

To adjust the position of the friction driver 60 (Fig. 10) along the shaft 61 so as to vary the speed of rotation of the feed or drawing rolls, the sides of said driver 60 are engaged by the arms of a yoke 77 having a threaded aperture engaging a screw 78, said screw having a spiral pinion 79 which is engaged by a spiral pinion 80 on a shaft 81 having a handle or thumb wheel 82 (Fig. 9). As will be hereinafter described, the speed of operation of the knife is uniform, the tube of paper passing to said knife from the rolls 55. Whenever it is desired to vary the length of the sections being cut off from the tube, the attendant attains the desired result with utmost accuracy by simply rotating the shaft 81 by means of the thumb wheel 82, so as to shift the driver pinion 80 toward or from the axis of rotation of the friction disk 59.

As the feed or drawing rolls operate continuously while the knife operates intermittently, the portion of the tube which is between said rolls and the knife will necessarily be somewhat "buckled" when the knife is cutting off a section. To insure retention in proper position, of the portion of the tube between the rolls and knife during operation of the latter, I provide a block 83 (Fig. 12) the upper surface of which is

inclined upwardly toward the knife, said block 83 being held in place by a cross bracket 84. An upper guide plate 85 is inclined downwardly toward the knife and is removably held in position by suitable means such as screws 86 (Fig. 9), the screws entering a suitable portion of the frame. The bracket 84 supports a fixed lower bar 87 of the shears or cutting mechanism; the upper co-acting shearing member consisting of the plate or knife 88 which is carried by a bar 89 (Figs. 12 and 13), said bar being mounted upon a pivot pin 90 which is supported by an ear 91 of the bracket 84. A spring 92 mounted upon the pin 90 between the ear 91 and a nut 93 on said pin (Fig. 10), serves to yieldingly hold the bar 89 so that the shear members 88, 87, will properly co-act. In order that the knife may be manually operated if desired, the bar 89 is provided with a handle 94 (Figs. 9 and 13).

The outer or shorter arm of the bar 89 is provided with a lug 95 (Fig. 13) which rests upon a cam 96 carried by shaft 61 so that every rotation of the shaft 61 will cause the cam 96 to act upon the lug 95 to depress the knife 88, and cause it to co-act with the member 87 in shearing off the portion of the tube which has been projected between the shearing members by the rolls 55. To return the knife 88 to normal or upper position, the instant that the cam 96 passes lug 95 I provide one or more plungers 97 (Fig. 13) mounted in sockets 98 and resting upon springs 99 in said sockets, one of said springs being indicated by dotted lines in Fig. 13. The plunger 97 at the left in Fig. 13 is shown as in position to engage the lower end of a head 100 of the bar 89, the upper end of said head 100 being adapted to contact with a stop screw 101 to adjustably limit the normal upper position for the bar 89. The stop screw 101 is carried by a bracket 102, a suitably fixed guide 103 being preferably employed to bear against the side face of head 100 to steady the knife bar 89 in its vertical oscillating movements.

A counter of any suitable construction is conventionally illustrated at 104 (Figs. 9, 10, and 13) said counter being carried by a bracket 105 secured to the ear 91.

A link 106 connects the end of the short arm of the knife bar 89 with a lever 107 loosely mounted upon shaft 108 which latter is mounted in suitable bracket arms. The lever 107 is connected by a link 109 with the operating mechanism of the counter so that every actuation of the knife advances the indication made by the counter. The lever 107 has a pawl 110 pivoted to it (Figs. 13 and 15), said pawl being drawn by a suitable spring toward a ratchet wheel 111 fast upon shaft 108. Also fast upon the shaft 120

108 is a disk 112 having a peripheral notch or recess 113. A shield 114 pivotally supported at 115 to a suitably fixed point, has a tooth or lug 116, the outer face or edge of the shield being curved concentrically with the ratchet wheel.

Before describing the object of this construction, I will explain that the same shaft 108 carries and rotates a roll 117 (Fig. 14) which supports one end of a conveyor belt 118, the other end of said belt being mounted upon a roll 119 upon a shaft 120 supported by bracket arms 121 (Figs. 9 and 13). As each tubular section is cut off, it drops on to the belt 118, said belt being given an intermittent motion so that the successively deposited sections will over-lap as indicated in Fig. 7, wherein each of the series of the tubular series is indicated at *a'*. The shield 114, when in the position shown in Fig. 15, permits the pawl 110 to advance the ratchet wheel, and consequently the conveyor belt, a distance of one tooth of the ratchet wheel. This is because the said shield holds the end of the pawl 110 with said pawl riding along the outer curved face of the shield until it escapes from the inner end of said curved portion so as to drop into engagement with the ratchet wheel, the point of dropping being such that only the last portion of movement of lever 107 will cause the pawl to actuate the ratchet wheel a distance of one tooth. The notched disk 112, however, is also rotating with the shaft 108 and the ratchet wheel. When the notch or recess 113 arrives underneath the lug 116 of the shield, said shield drops and thereby permits the pawl 110 to engage a tooth of the ratchet wheel farther away from the pivot 115 of the shield so that the next movement of the lever 107 will cause the pawl to actuate the ratchet a distance of several teeth. This therefore imparts an excess of motion to the belt 118 so that all of the tubular sections previously deposited will be advanced with the belt and leave a space readily perceptible to the attendant to enable the latter to gather up in one bunch all of the uniformly and closely deposited sections. If desired, since the number of sections in the group will be predetermined, such as 50 or 100, they can be then packaged. In other words, the machine provides for separating the deposited sections as they are produced by the machine, into groups having predetermined quantities.

It is sometimes desirable that the strip of paper converted into a flattened tube shall not be cut into sections but be wound in a roll which can be supplied to a customer who will then cut off sections as desired. For this purpose I provide the following mechanism, it being understood, of course, that when the tube is to be wound up into a roll,

the knife will be put out of operation as by loosening the screw which holds the cam 96 in place and shifting said cam along the shaft out of position to contact with the lug 95 of the knife bar.

Referring especially to Figs. 9 and 10, the base or frame of the machine is provided with brackets 122 having socket bearings 123 for the shaft 124 of a reel or core. Said shaft 124 is removably supported in the sockets 123, and has at one end a pulley 125 engaged by a belt 126 which also engages a pulley 127 carried by an extension 128 of the shaft 61. A yoke pendant 129 having pulleys 130 engaging the belt 126 is provided with variable weights 131. This drive connection permits the belt to slip so as to compensate for the gradually increasing diameter of the roll being wound up. The relative sizes of the pulleys 125, 127 are such that when the winding of the roll is first commenced it will have sufficient peripheral speed to take up the tubing advanced by the feed rolls 55. As the diameter of the wound up roll increases, the belt 126 will begin to slip on one or the other of the pulleys, the construction therefore providing for a frictional drive of the reel shaft 124.

Secured to the shaft 124 is a drum 132 (Figs. 9 and 16) having a longitudinal recess 133 in which a lever 134 is pivoted at 135, said lever having a cam end 136 which is engaged by an adjusting ring 137 which is preferably externally milled as shown in Fig. 9. This ring is internally threaded to fit threads 138 at one end of drum 132 so that as said ring is shifted inwardly along the drum, it will engage the cam 136 and cause the inner end of the lever 134 to be projected from the recess 133 so as to bind against the inner wall of a core 139. In the operation of this portion of the machine, a core 139 is slipped to the position shown in Fig. 16 and one end of the tube that is being made, is suitably secured to said core. The ring 137 is adjusted so as to actuate the lever 134 as described to engage the core 139 and cause it to rotate with the drum 132 and shaft 124. The guide roll 140 (Figs. 10 and 14) is supported by uprights 141 to direct the tube of paper *a* to the reeling or coiling device.

As the operations of the several parts of the machine have been explained in connection with the description of the structure, further explanation of the operation of the machine as a whole will not be necessary.

I claim:—

1. A machine of the character described, having a single stationary former, means for drawing a strip of paper lengthwise of the former and folding the strip around the former, said means including a flexible

spiral strap for wrapping the strip closely to the former, and means for applying an adhesive material to the strip.

2. A machine of the character described, having a former, means for drawing a strip of paper lengthwise of the former and wrapping it around said former, a flexible spiral strap closely inclosing the strip and former, and means for adhesively connecting the edges of the strip.

3. A machine of the character described, having a former, means for drawing a strip of paper lengthwise of the former and wrapping it around said former, a flexible tension or drag inclosing the strip and former, and means for adhesively connecting the edges of the strip, said tension or drag comprising a strip secured at one end to the former and having means for connecting its other end to a fixed point.

4. A machine of the character described, having a former, means for drawing a strip of paper lengthwise of the former and wrapping it around said former, a flexible tension or drag inclosing the strip and former, and means for adhesively connecting the edges of the strip, said tension or drag comprising a strip secured at one end to the former, the other end of the strip having a

spring and means for adjustably connecting it with a fixed support.

5. A machine of the character described, having a former, means for drawing a strip of paper lengthwise of the former and folding the strip around the former with the edges of the strip overlapping, two separated flexible smoothers between which and the former the strip is drawn, and a deflector and adhesive applier between said smoothers.

6. A machine of the character described, comprising a former having a tapered and flattened delivering end, drawing and creasing rolls adjacent the tip of the former, means for applying an adhesive to the surface of a strip of paper on the former near one edge of the strip, and means for holding the strip wrapped around the delivering end of the former said means including a flexible spiral strap for wrapping the strip closely to the former.

In testimony whereof I have affixed my signature, in presence of two witnesses,

FRANK K. ARNOLD.

Witnesses:

A. W. HARRISON,
GEORGE A. ROCKWELL.