June 5, 1934. F. S. VAN VOORHIS 1,961,266

METHOD AND APPARATUS FOR CUTTING AND FOLDING PAPER

Filed Nov. 19, 1931 3 Sheets-Sheet 1

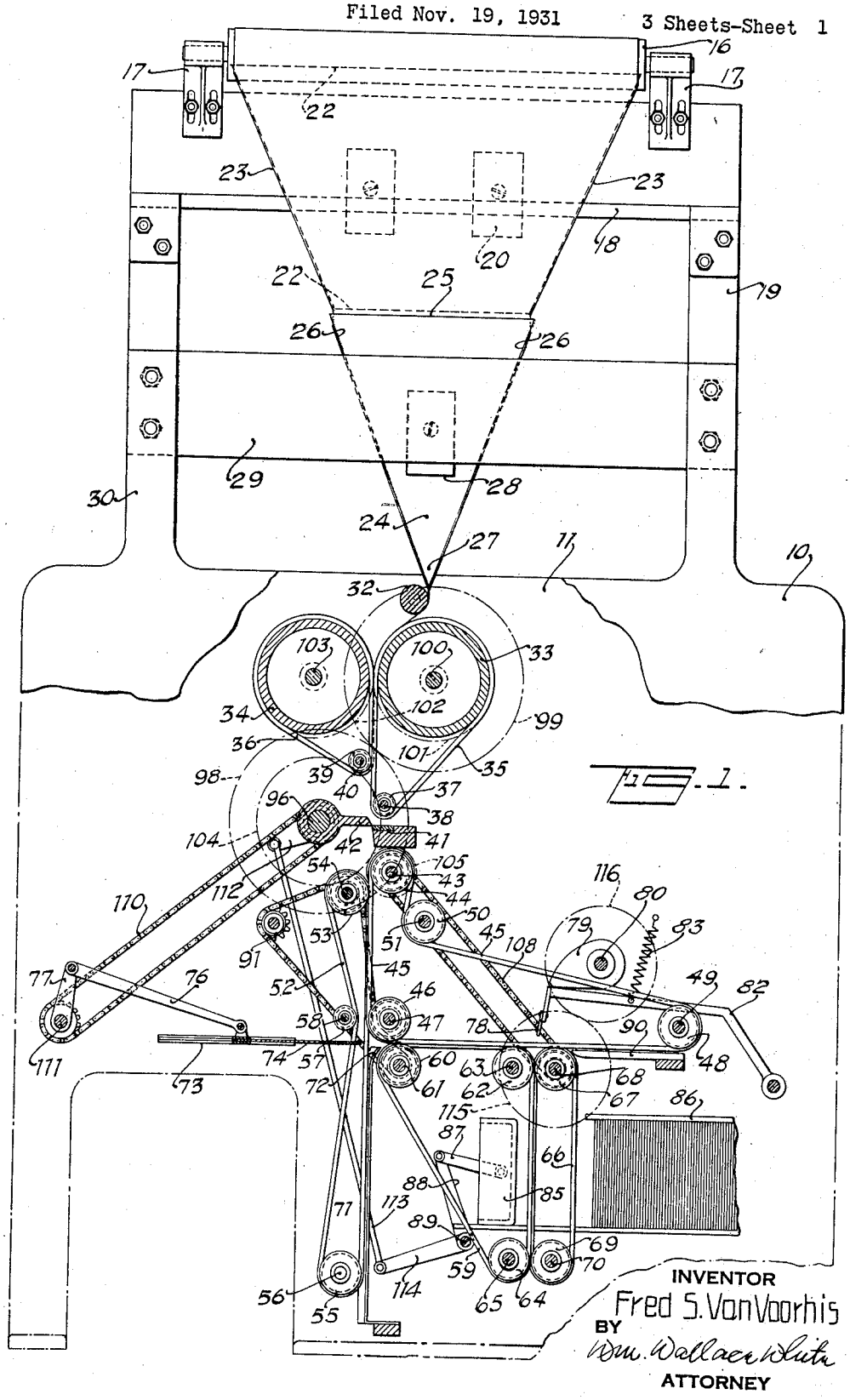


FIG. 1.

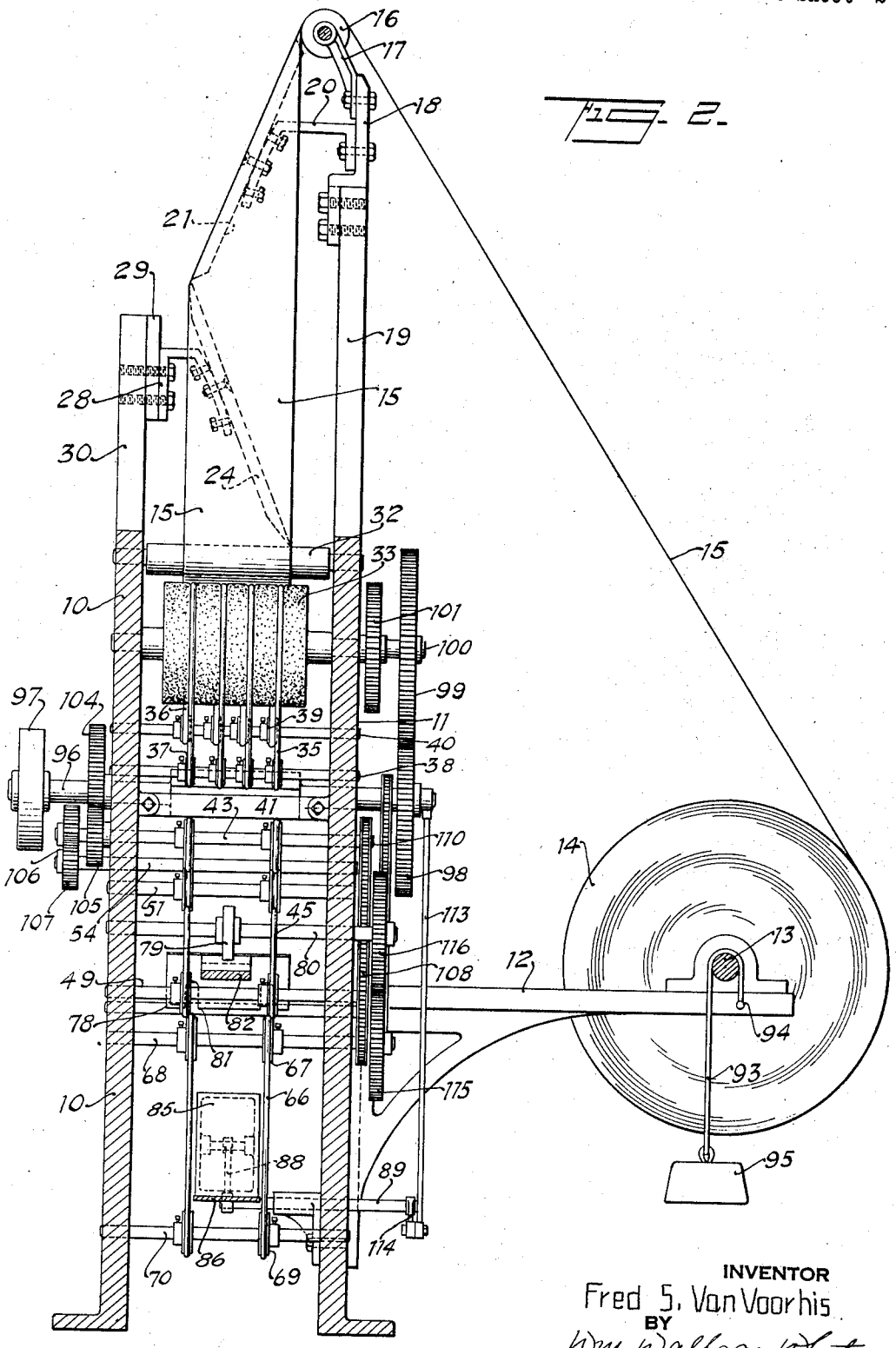
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FIG. 2.



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FIG. 3.

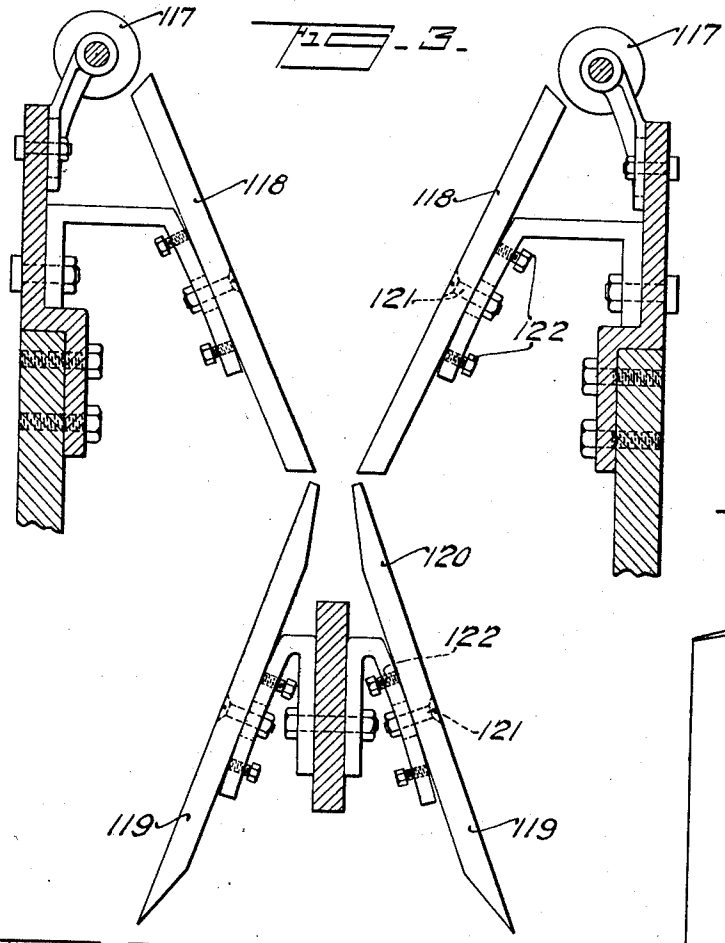


FIG. 4.

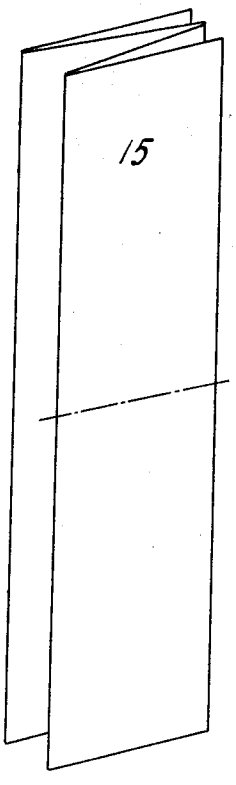


FIG. 5.

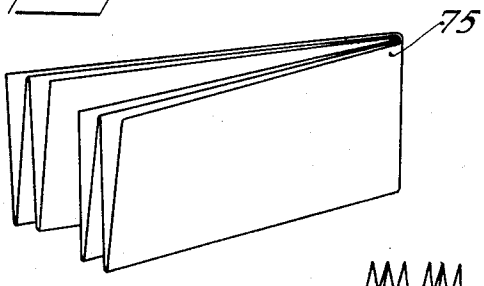
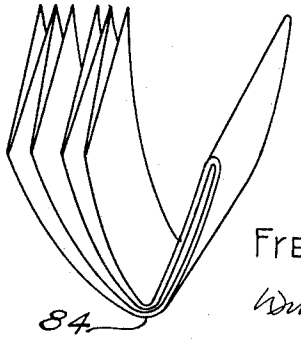


FIG. 6.



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METHOD AND APPARATUS FOR CUTTING AND FOLDING PAPER

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Application November 19, 1931, Serial No. 576,083

10 Claims. (Cl. 270—66)

This invention relates to an apparatus for the cutting and folding of crape paper napkins, towels, and the like.

It is well known in the art that ordinary crape paper of this character permanently loses its crape when subjected to excessive tension in a direction longitudinal of the strip or web but it is characteristic of this type of paper that it will resist a very considerable pull or tension in a transverse direction without any harmful effect.

One object of the present invention is to provide an improved apparatus in which the crape paper has a plurality of longitudinal folds formed therein while being conveyed under tension without permanently distorting the same or destroying the crape thereof.

Another object of this invention is to provide means whereby the paper is folded into a four-fold strip while being conveyed through the apparatus and is kept under tension in a direction transverse of the strip or web, as well as in a longitudinal direction.

A still further object of my invention is to provide an improved apparatus comprising series of endless conveying belts constructed and arranged so as to convey the paper while subjecting same to tension in directions both longitudinal and transverse of the strip or web, and means for folding the paper longitudinally in opposite directions while being so conveyed.

With these and other objects in view the invention consists in the novel construction, arrangement and operation of the machine hereinafter described illustrated in the accompanying drawings and particularly pointed out in the appended claims, it being understood that various changes in the form and arrangement and in minor details may be made without departing from the spirit of the invention or sacrificing any of the advantages thereof.

In the drawings: Fig. 1 is a vertical section of the apparatus; Fig. 2 is a view looking on the right hand side of Fig. 1 and shown partly in section; Fig. 3 is a detail view on an enlarged scale showing an arrangement of longitudinal formers for folding two strips simultaneously; Figs. 4, 5 and 6 are perspective views showing three different stages in production of the finished article.

The improved method consists in conveying under tension the paper strip or web, or a plurality of strips or webs, from a roll or rolls passing the paper over folders or forming members arranged so as to fold the paper longitudinally into "M" form while the four fold strip, thus produced is kept under tension in a transverse direction as it is being conveyed from the said folders; the strip being then cut and folded transversely to form sixteen-fold napkins, as hereinafter more fully described.

The apparatus illustrated at Figs. 1 and 2 of the drawings is constructed with side frames 10, 11 between which the paper conveying means are accommodated. Projecting outwardly from the frame 11 are two similar brackets 12 (Fig. 2) which carry a spindle 13 for the paper roll 14. The paper strip 15 from the said roll 14 passes over a guide roll 16 rotatably mounted between brackets 17 carried by a cross-bar 18 mounted upon side extensions or uprights 19 on the upper part of the frame 11. The cross-bar 18 also carries a pair of brackets 20 for the support of an inclined former plate 21 having parallel upper and lower edges 22 and downwardly converging side edges 23. Arranged beneath the plate 21 is a second but oppositely inclined formed plate 24 having an upper edge 25 spaced from the lower edge 22 of the plate 21 just sufficient to permit the passage of the paper and having side edges 26 converging to a point 27 at the lower extremity; and as the paper passes over the plates 21, 24 the two lower corners of the upper plate 21 mark two longitudinal side folds while the point 27 of the lower plate 24 marks a central fold and a four-fold paper strip of "M" form is thus produced. The plate 24 is carried by a bracket 28 mounted on a cross-bar 29 secured between upper extensions 30 on the frame 10. From the plates 21, 24 the four-fold strip thus produced is passed around an idle roll 32 and over the surface of a positively driven roll 33 and between the latter and a cooperating roll 34 which latter is also driven and at the same surface speed as the roll 33. The rolls 33 and 34 are both grooved circumferentially for the accommodation of a plurality of endless paper-conveying belts 35, 36. In the example shown four such belts are mounted on each roll. Between the belt grooves in the periphery thereof the roll 33 is covered with emery or like material while the cooperating roll 34 is covered between its circumferential grooves with a layer of felt so as to ensure proper uniform and reliable conveyance of the paper gripped between these surfaces. The belts 35 also pass around grooved pulleys 37 on a shaft 38 while the belts 36 also pass around similar pulleys 39 on a shaft 40 and the adjacent strands of the belts 35, 36 converge towards each other in a downward direction and are arranged in staggered relation and in close contact so that the

paper strip passing between such belts is put under tension in a transverse or lateral direction and positive conveyance of the strip is ensured at all times.

Mounted between the inner faces of the side frames 10, 11 is a stationary knife 41 adapted to cooperate with a rotary knife-blade 42 to cut the paper strip into lengths. Mounted beneath the fixed knife 41 is a shaft 43 carrying a pair (or other suitable number) of grooved pulleys 44 for the accommodation of endless belts 45 which also pass around similar pulleys 46 on a shaft 47 around pulleys 48 on a shaft 49 and around guide pulleys 50 on a shaft 51. The vertical strands of the belt 45 between the pulleys 44 and 46 cooperate with similar belts 52 which pass around grooved pulleys 53 on a shaft 54, grooved pulleys 55 on a shaft 56 and grooved guide pulleys 57 on a shaft 58, and the cooperating portions of the belts 45, 52 are arranged in staggered relation to each other and in such manner that the adjacent sides of the belts grip the paper and hold same taut in a transverse direction. The lower strands of the belts 45 similarly cooperate with belts 59 that pass around grooved pulleys 60 on a shaft 61, grooved pulleys 62 on a shaft 63 and grooved pulleys 64 on a shaft 65. The right hand vertical strands of the belts 59 cooperate in the same manner with belts 66 that pass over grooved pulleys 67 on a shaft 68 and over grooved pulleys 69 on a shaft 70.

As the four-fold paper strip is conveyed downwardly from the belts 35, 36 it is received between and is positively conveyed by the belts 45 and 52. The lower portions of the belts 52 cooperate with a guide plate 71 whose upper extremity is curved at 72 to facilitate entry of the folded paper between the belts 45, 59 in the manner hereinafter described.

Adapted to reciprocate between suitable guides 73 on the side frames is a folding blade 74 suitably recessed for the accommodation of the belts 52 and adapted to fold the paper and introduce the folded edge 75 (Fig. 5) between the cooperating belts 45, 59 in the well known manner; and as the folded edge is received by the said belts, the lower part of the paper is drawn from between the belts 52 and the guide 71 and passes over the curved upper extremity 72 of the said guide while the upper portion of the paper is fed downwardly by the vertical cooperating portions of the belts 52, 45. The blade 74 is reciprocated by a connecting rod 76 and a crank 77 in proper timed relation to the paper cutting knife 42 in such manner that the leading edge of the blade 74 engages the paper at the same instant as the knife severs the same or preferably at a short predetermined time interval after such severance of the paper.

Also in proper timed relation to the operation of the above mechanism a swinging blade 78 is operated by means of a cam 79 on a shaft 80. This blade 78 is carried on a pivoted arm 82 directly engaged by the cam 79 and retained in engagement by means of a pull spring 83. The blade is slotted at 81, (Fig. 2) for the accommodation of the belts 45 and is adapted to engage the eight-fold paper and to fold the same and introduce the folded edge 84 (Fig. 6) between the belts 59, 66. Also in properly timed relation a horizontally reciprocating plunger 85 moves between suitable guides, passes between the belts 59, 66 and forces the napkin from between such belts and delivers the napkins individually to the stack accumulated in the magazine 86 from which the folded napkins may be conveniently removed from the opposite end of the magazine or in any other suitable or well known manner. The plunger 85 is operated by a connecting rod 87 from a lever 88 on a shaft 89 and is so timed that it engages each napkin when the latter is exactly in alignment with the magazine 86.

The belts 45 cooperate (at the right hand side of Fig. 1) with a guide plate 90 and, when the blade 78 forces the napkin between the belts 59, 66 the right hand portion of the napkin is drawn from between the belts 45 and the said plate 90.

Crape paper of the character above referred to can be pulled from its roll under considerable tension so long as such tension remains evenly distributed throughout the entire width of the web or strip and is applied with complete uniformity, and in order to give the desired tension a short length of cable 93, Fig. 2 is secured to one of the brackets 12 at 94 and is passed over or around the spindle 13 which rotates with the roll 14 and a weight 95 is hung on the opposite end of the cable to retard the free rotation of the spindle.

Between the roll 14 and the rollers 33, 34 the paper strip is kept under uniform tension without distortion, and the mechanical drive is preferably such that the surface speed of the belts 45, 52 is slightly greater than the surface speed of the rollers 33, 34 and belts 35, 36 so that the desired longitudinal tension is ensured.

For the operation of the various parts of the machine the main shaft 96 carries the knife 42 and is driven by means of a belt pulley 97 (Fig. 2) or otherwise. Secured on the said shaft 96 is a gear wheel 98 which meshes with and drives a similar wheel 99 keyed on the shaft 100 of the roller 33 while a second gear wheel 101 on the said shaft 100 meshes with and drives a similar wheel 102 keyed on the shaft 103 of the roller 34. The main shaft 96 also carries a gear wheel 104 which meshes with and drives a pinion 105 on the shaft 43 so that movement is imparted to the belts 45 whose pulleys 44 are secured upon said shaft 43. A second pinion 106 on the shaft 43 meshes with and drives a pinion 107 on the shaft 54 so that motion is transmitted to the belts 52 whose pulleys 53 are secured upon said shaft 54. A sprocket chain 108 engages sprocket wheels keyed on the shafts 43 and 68, and a sprocket chain 109 engages sprocket wheels on the shafts 54, 47 and 61 and a suitably mounted idle sprocket wheel 91 with the result that the belts 45, 52, 59 and 66 are all simultaneously operated at the same surface speed. The said wheel 104 and the pinion 105 are preferably of such a ratio that—as above referred to—the surface speed of the belts 45, 52, 59 and 66 is slightly greater than that of the belts 35, 36. The main shaft 96 is also provided with sprocket gear 110 by means of which its motion is transmitted to a shaft 111 carrying the crank 77 for the operation of the folding blade 74. Also mounted on said shaft 96 is a crank arm 112 connected by means of a rod 113 to a rocking arm 114 secured on the shaft 89 carrying the lever 88 for the operation of the plunger 85 for the delivery of the folded napkins. For the operation of the cam 79 motion is transmitted from the shaft 68 to the shaft 80 through the medium of meshing gear wheels 115, 116 on said shafts.

The endless belts 35, 36, 45, 52, 59 and 66 are preferably made of leather of round cross-section

and are all adapted to engage in correspondingly shaped grooves in the rollers and pulleys so that they are prevented from shifting in an axial direction. The grooved pulleys are all capable of being shifted in an axial direction upon their shafts and may be clamped thereon so that the belts may be set to suit the handling of paper of varying widths and the belts may also be readily adjusted in an axial direction to vary the side pressure between the engaging faces of the belts.

In the arrangement shown at Fig. 3 longitudinal folding means are provided whereby two independent strips or webs of paper are simultaneously folded so as to increase the output of the machine which, in this case, is made sufficiently wide to accommodate two four-fold strips and has provision for the support of two paper supply rolls. Two guide rolls 117—similar to the guide roll 16 above described—convey the paper to opposed inclined former plates 118—each similar to the said plates 21—and from these plates 118 the paper strips pass to lower former plates 119—each similar to the plates 24—the plates 119 being similarly mounted on a central single or double cross-bar 120 suitably supported on the machine and from the formers 119 both strips pass to a common roller such as 32, Figs. 1 and 2.

In order that the former plates 21, 24, 118, 119 may each be accurately adjusted so as to fold the paper evenly and uniformly each plate is attached to its supporting bracket or each of its supporting brackets by means of a bolt or pin 121 and the plate is adapted to rock thereon and to be adjusted and locked in adjusted position by means of screws 122 mounted in screw-threaded holes in the brackets and engaging the backs of the plates as best shown at Fig. 3.

Although the drawings and the above specification disclose the best mode in which I have contemplated embodying my invention, I desire to be in no way limited to the details of such disclosure for in the further practical application of my invention many changes in form and construction may be made, as circumstances require or experience suggests, without departing from the spirit of the invention within the scope of the appended claims, and it will be understood that the arrangement and combination of the cutting, folding, and paper-conveying elements may be modified to suit the nature of the work being handled and the mechanism may be adapted for the production of goods of various sizes.

What I claim is:—

1. A machine for folding and cutting crepe paper of the character described comprising paper conveying means whereby a strip of paper is subjected to tension, means for forming a plurality of longitudinal parallel folds in the paper, means for cutting the paper while held taut, means for folding the paper transversely while under tension, and means for again folding the paper as it passes from the first mentioned folding means.

2. A machine for cutting and folding paper of the character described comprising means for folding the paper longitudinally into a four-fold strip, endless belts for conveying a paper strip and for subjecting the paper to tension in a transverse direction, means for cutting the paper into lengths while under tension, means for transversely folding and delivering the lengths of paper, means for again folding the paper and means for delivering the same.

3. A paper cutting and folding machine of the character described comprising means for feeding a strip of crape paper under longitudinal and transverse tension, means for folding the strip longitudinally into M form, means for cutting the strip into lengths while under tension, means for folding and delivering the lengths of paper, means for again folding the paper and means for delivering the same.

4. A paper cutting and folding machine of the character described comprising means for pulling a strip of crape paper from a roll under uniform tension, means for folding the paper into a four-fold strip, means for cutting the said strip into lengths, means for conveying the strip of paper under tension, means for folding the lengths of paper transversely in two directions at right angles to each other while still under tension and means for delivering the finished product from the conveying means.

5. A machine for folding and cutting crape paper of the character described comprising paper conveying means whereby a strip of paper is subjected to tension in a transverse and longitudinal direction, means for folding the paper strip longitudinally into a four-fold strip, means for cutting the said strip into lengths while held taut longitudinally and transversely and means for folding the lengths of paper transversely in two directions while under tension.

6. A machine for cutting and folding paper of the character described comprising means for folding the paper into a four-fold strip, a series of staggered endless belts for subjecting the paper to tension in a transverse direction while being so folded, means for cutting the paper while under such tension, and means for folding the paper transversely in two direction at right angles to each other while under tension.

7. A crape paper handling machine of the character described comprising a pair of cooperating rolls, for drawing a strip of paper from a supply roll under uniform tension, two folding members between said cooperating rolls and the supply roll for longitudinally folding the paper into a four-fold strip, endless belts mounted on and extending in advance of the said cooperating rolls for conveying the said strip, feed means for receiving the strip from said belts, a rotary knife between the said feed means and said belts for cutting the strip into lengths to form napkins, and two folding members to form the said lengths into sixteen-fold napkins.

8. A crape paper handling machine of the character described comprising a pair of cooperating friction rolls, for drawing a strip of paper from a supply roll under tension, means between said cooperating rolls and the supply roll for longitudinally folding the paper along three parallel lines to form a four-fold strip, endless belts mounted on and extending in advance of the said cooperating rolls and converging towards each other for conveying the said strip under transverse tension, feed means for receiving the strip from said belts, a rotary knife between the feed means and said belts for cutting the strip into lengths, means for folding the lengths of paper first to eight-fold and then to sixteen-fold, and means for conveying the folded lengths of paper under transverse tension.

9. A crape paper handling machine of the character described comprising a pair of cooperating rolls for pulling a strip of paper under tension from a supply roll, means for folding the paper longitudinally along a plurality of parallel lines, converging endless belts for feeding the paper in advance of said cooperating rolls, overlapping endless belts for feeding the paper, cutting means

located between the latter belts and the converging belts for separating the paper into lengths, a folding blade for engaging each length of paper and forcing same in a direction perpendicular to its former direction of travel, endless belts cooperating with said overlapping endless belts to receive the paper from said folding blade, and a second blade for again folding the paper.

10. A crape paper handling machine of the character described comprising a pair of cooperating friction rolls, for drawing a strip of paper from a supply roll under tension, two inclined plates between said cooperating rolls and the supply roll for longitudinally folding the paper along parallel lines, endless belts mounted on and extending in advance of the said cooperating rolls for conveying the paper under transverse tension, feed means for receiving the paper from said belts, a rotary knife between the feed means and said belts for cutting the strip of paper into lengths, means cooperating with said feed means to form conveying means for the lengths of paper, a plurality of folding blades for successively folding the lengths of paper and forcing same into engagement with said conveying means, and means for forcing the folded paper parts from engagement with said conveying means.

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