W. A. LORENZ.

TUBE CUTTING MECHANISM.

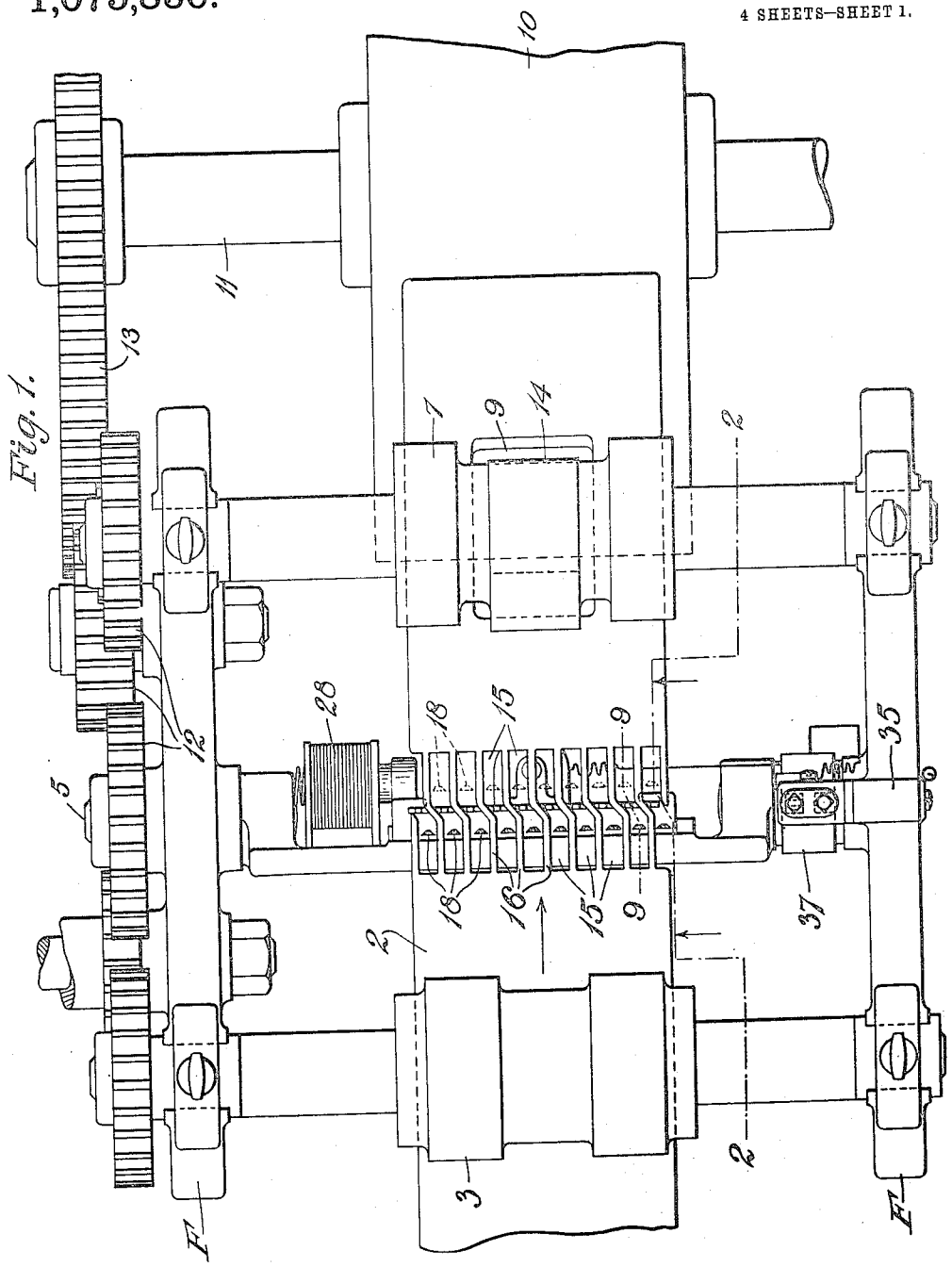
APPLICATION FILED JAN. 18, 1912.

1,075,836.

Patented Oct. 14, 1913.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses

C. H. Lorenz

L. L. Grotta.

Inventor

William A. Lorenz

By Wm. H. Honiss.

Att'y.

W. A. LORENZ.

TUBE CUTTING MECHANISM.

APPLICATION FILED JAN. 18, 1912.

1,075,836.

Patented Oct. 14, 1913.

4 SHEETS—SHEET 2.

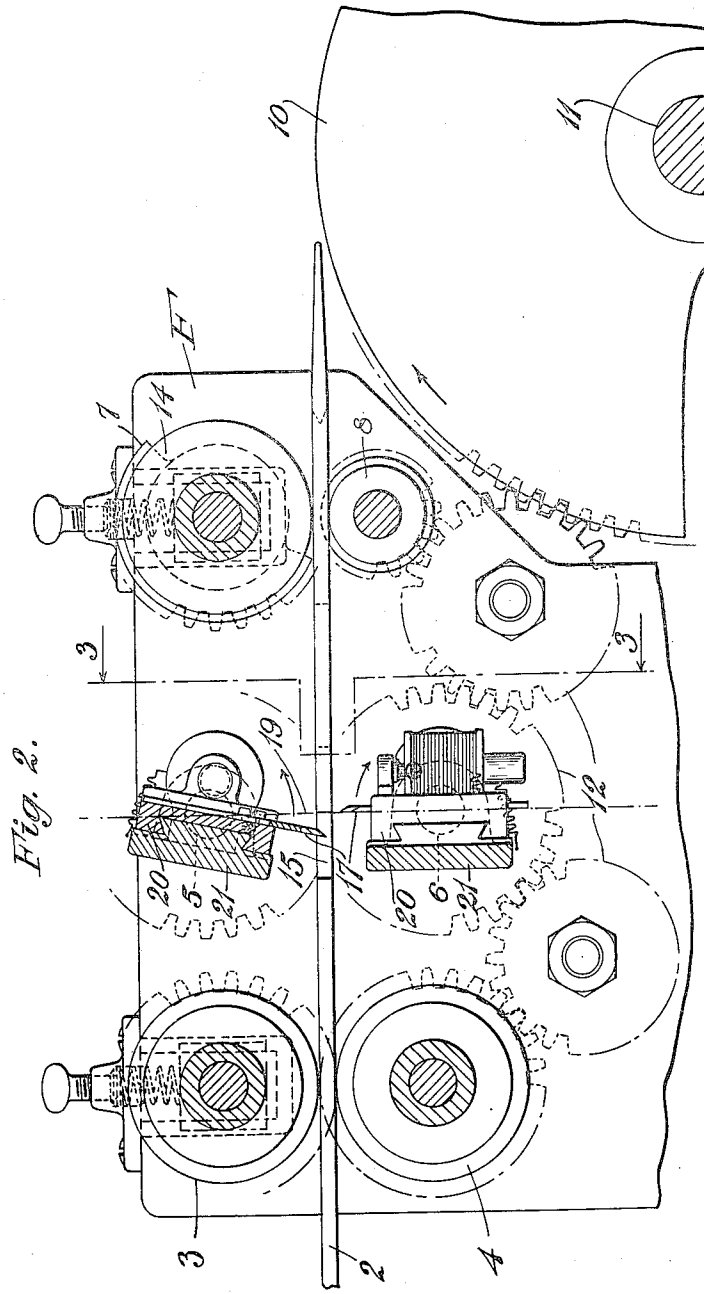


Fig. 2.

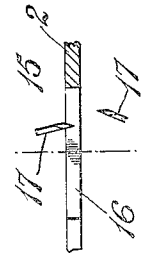


Fig. 10.

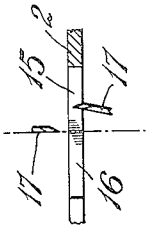


Fig. 9.

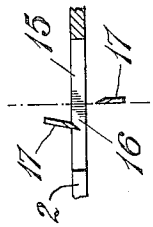


Fig. 8.

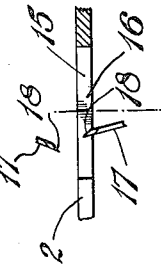


Fig. 7.

Witnesses

E. K. Lorenz

S. S. Grotta

Inventor

William A. Lorenz

By Wm. A. Homiss

Att'y

W. A. LORENZ.

TUBE CUTTING MECHANISM.

APPLICATION FILED JAN. 18, 1912.

1,075,836.

Patented Oct. 14, 1913.

4 SHEETS—SHEET 3.

Fig. 3.

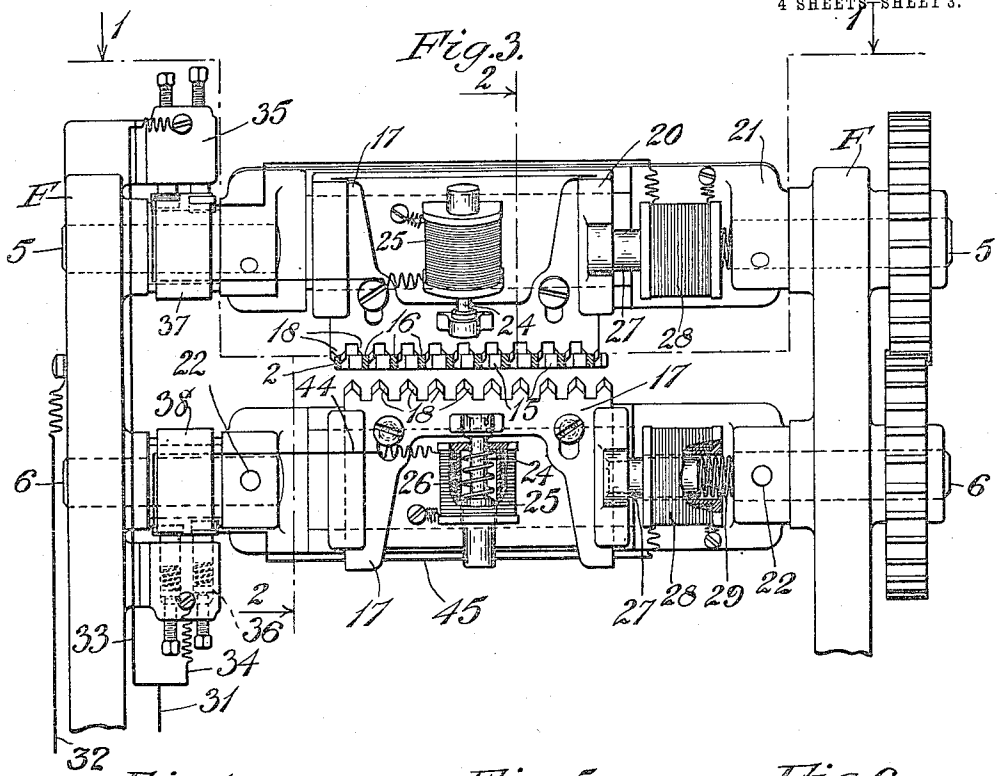


Fig. 4.

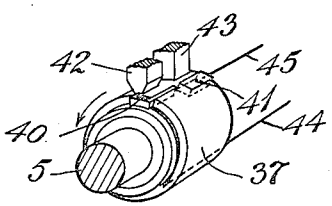


Fig. 5.

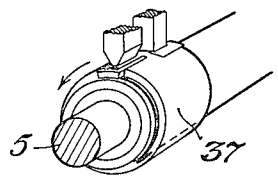


Fig. 6.

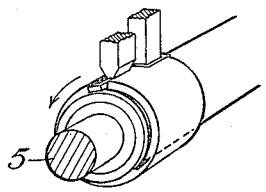


Fig. 11.

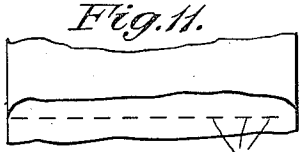


Fig. 12.

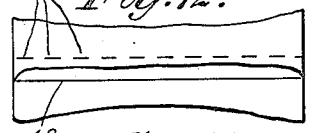


Fig. 13.

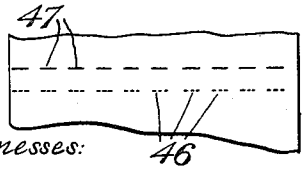
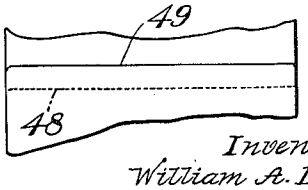


Fig. 14.



Witnesses:

E. H. Lorenz

S. S. Grotta

Inventor

William A. Lorenz

By Wm. A. Homiss.

Att'y.

W. A. LORENZ.

TUBE CUTTING MECHANISM.

APPLICATION FILED JAN. 18, 1912.

1,075,836.

Patented Oct. 14, 1913.

4 SHEETS—SHEET 4.

Fig. 15.

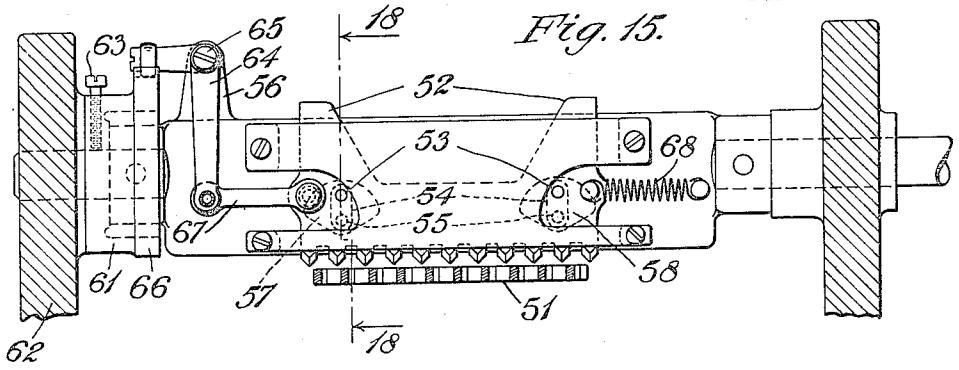


Fig. 16.

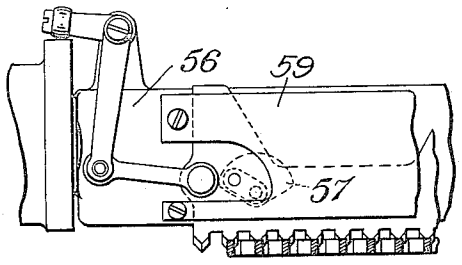


Fig. 17.

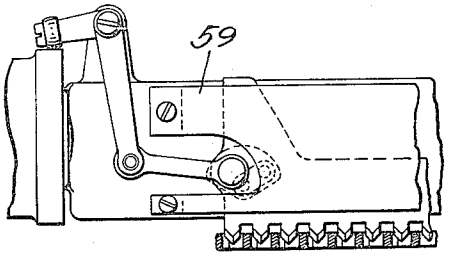
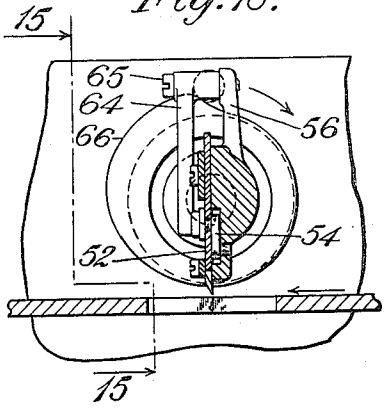


Fig. 18.



Witnesses

C. H. Lorenz

J. J. Grotta.

Inventor

William A. Lorenz.

By Wm. H. Honiss.

Att'y

UNITED STATES PATENT OFFICE.

WILLIAM A. LORENZ, OF HARTFORD, CONNECTICUT, ASSIGNOR TO UNION PAPER BAG MACHINE COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

TUBE-CUTTING MECHANISM.

1,075,836. Specification of Letters Patent. Patented Oct. 14, 1913.

Application filed January 18, 1912. Serial No. 671,868.

To all whom it may concern:

Be it known that I, WILLIAM A. LORENZ, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented new and useful Improvements in Tube-Cutting Mechanism, of which the following is a specification.

This invention is an improved machine for cutting the walls of tubing on one or more sides, while traveling through a machine, or while in transit from one section of a machine to another.

This invention is herein shown to be embodied in a machine adapted for the cutting off of paper bag tubing, while traveling through or from the tube forming devices to the diamond folding apparatus of a paper bag machine. In this, as in some other tubing, it is generally desirable to cut the opposite walls separately from each other, so as to avoid matting them together, and thus prevent their ready and certain separation during subsequent operations to which they may be subjected. Moreover, different portions of the wall of the tube must generally be cut at different positions longitudinally of the tube, so that some portion or portions of the edge of the tube will project beyond other portions. In the case of paper bags a projecting lip is thus formed at the top of the bag for the user's convenience in opening it. An inherent difficulty in thus cutting through different portions of the wall independently of other portions is that of properly sustaining the interior surface of the tube wall against the inward thrust of the cutting operation, so as to cut it cleanly, and prevent the tube from being buckled or wrinkled by the cutting operation. It is generally not feasible to employ a traveling support or a coöperating cutting member, such as a shear blade, within the tube. Moreover, especially in the case of a complex machine, like a paper bag machine, it is desirable to limit or confine the performance of each function to the smallest practicable space in the machine, for the general purpose of obtaining compactness of structure and simplicity and directness of driving connections. In this invention, the tube wall is cut through by quickly repeated movements of a toothed or serrated knife. The first cutting movement makes a row of separated or discontinuous cuts through the wall along the desired line of contour. The knife is then quickly withdrawn, and shifted laterally of the tube to bring the teeth over the uncut portions, through which they are then carried by a quickly repeated second cutting movement, so as to complete the severance during a relatively short longitudinal travel of the tube. The inner side of the tube wall is supported against the thrust of these cutting movements by means of narrow ribs of the tube guide or float disposed opposite the spaces between the cutting teeth of the knife, so that the latter cut into the spaces between the ribs, which thus sustain the paper against the cutting action at each of the succeeding cuts, without actual contact with the cutting teeth.

Figure 1 of the drawings is a plan view of my improved mechanism, partly in section on the line 1—1 of Fig. 3. Fig. 2 is a side view in section taken on the line 2—2 of Figs. 1 and 3. Fig. 3 is and end view partly in section taken on the line 3—3 of Fig. 2. Figs. 4, 5 and 6 are perspective views showing details of the timing or commutator devices for closing and breaking the electric circuits by which the cutting-off devices of this embodiment are driven. Figs. 7, 8, 9 and 10 are side views in section taken on the line 9—9 of Fig. 1, showing the sequence of position and operation of the cutting blades. Figs. 11 to 14 inclusive are plan views of a paper tube showing the effect of the progressive cutting operations illustrated in Figs. 7 to 10, respectively. Figs. 15 to 18 inclusive illustrate a modified form of the invention which is operated mechanically instead of electrically, Fig. 15 being an end view in section taken on the line 15—15 of Fig. 18, showing the float or former, and one of the knives in connection therewith in its retracted position. Fig. 16 is a fragmentary view of the left hand portion of what is shown in Fig. 15, showing the cutting teeth at the bottom of their first cutting stroke. Fig. 17 is a similar view showing the cutting teeth at the bottom of their second cutting stroke. Fig. 18 is an end view in section taken on the line 18—11 of Fig. 15.

In the embodiment illustrated in Figs. 1 to 14 inclusive the cutting instrumentalities are operated by electrical agencies. The paper tube 1 is guided into and through this cutting-off mechanism by means of a float or

tube guide 2, which may project from and be supported by any well-known tube former around which a continuous web of paper drawn from a roll is formed into a continuous tube which is drawn over the former, passing thence into the apparatus of the present invention around the float or tube guide 2. The paper passes between the steadying rolls 3 and 4, thence past the cutting instrumentalities carried by one or both of the rotating cutter shafts 5 and 6, thence through transfer or accelerating rolls 7 and 8, which advance the severed tube, at accelerated speed, if desired, to a folding bed or cylinder 10 mounted on the rotating shaft 11, or transfers them to any other desired mechanism. These rolls and shafts are journaled in suitable frames F F, and are connected and driven at suitable relative speed by means of a train of gearing 12, which may receive driving movement from the tube making machine, or from the gear 13, or in any other convenient way. At that portion of its length which lies nearest to the cutting instrumentalities, and for the purpose of coöperating therewith, the float is provided with a transversely disposed series of inclined or offset slots 15, forming recesses into which the teeth of the cutting instrumentalities may project without dulling them, leaving between them the sinuous ribs 16 for supporting the wall of the paper between the cutting teeth, and holding it against the thrust of their cutting action. The form and disposal of these ribs is best shown in Fig. 1. At about the middle of their length, on a line between the centers of the cutter shafts 5 and 6, they are sharply inclined or offset, one end of the ribs being thus brought approximately in line with the slots between the opposite ends of the ribs, so as to clear the teeth 18 of the cutting blades 17 at their two cutting positions indicated in Fig. 1. The first cutting position of the teeth is indicated in full lines, while the second cutting position is indicated by dotted lines, the knives being shifted in a direction laterally of the tube between these two cutting positions, by the mechanism which will now be described. This mechanism may be employed for severing either the upper or lower wall of the tube, or both, as may be desired. In the present illustration, it is assumed that both walls are to be severed at different longitudinal positions, so as to leave the end of one wall projecting beyond the other wall to form a lip, as is customary in the manufacture of paper bags. Therefore, two sets of cutting mechanism are shown in action; but as they are similar in construction and mode of operation, the detailed description of one will apply to both, each being adjusted and timed suitably for the position of the cut it is to make in the tube, these being at different longitudinal positions, as illustrated in Figs. 7 to 10 inclusive. The cutting teeth 18 are herein shown to be made integrally with blades 17, which in addition to their revolving movement with the shafts 5 and 6 are mounted for sliding movement in a direction generally radial to the axes of their rotating shafts 5 and 6, and are also mounted for movement longitudinally of those axes. By this compound movement of the blades they are moved in a radial direction to carry their teeth through the wall of the tube at one position, then withdrawn, and by axial movement of the blade equal to half the spacing of the teeth are moved to another position transversely of the tube; and by a repetition of their radial movement, the revolving teeth meanwhile traveling with the tube, the second cutting movement is made in line with and between the first series of cuts, thus completing the severance. While the first cut is being made at the full line position of the teeth 18 in Fig. 1, the paper is supported between the teeth by the leading or left hand portion of the sinuous ribs 16; and while the second cut is being made at the dotted line position of the teeth 18 in Fig. 1, the paper is also supported between the teeth, the change in position of the cutting teeth being made by the transverse shifting movement already referred to; and the change in the supporting position of the ribs being due to their sinuous or offset disposal. Each of the blades 17 is mounted for radial sliding movement in a blade carrier 20, which in turn is mounted for sliding movement in an axial direction upon a yoke or head 21, driven by the rotating shaft or shafts 5 and 6. In this instance, these rotary shafts each consist of two short lengths which are secured by pins 22, or otherwise, in the ends of the cutter head 21. For conciseness and definiteness of description, the radial movements of the blade relative to its axis of revolution, toward and from the paper, will be termed its cutting movement, while its other movement, transversely of the tube, and longitudinally of its axis of revolution, will be termed its shifting movement. In this construction, the cutting movement of each blade is imparted by means of a magnet or solenoid, or similar electrical agency, one of the members of which, in this case the core 25, is attached to the blade, while the other or coil member 26 is attached to the blade carrier. The shifting movement of the blade is in this instance shown to be imparted by a similar solenoid, the core member 27 of which is appurtenant to the blade carrier, while the coil member 28 is attached to the cutter head 21. When the solenoid coil 26 is energized, it imparts a cutting movement to the cutter; and when the solenoid coil 28 is energized, it imparts a single shifting movement to its

cutting head and blade. The springs 26 and 29 of the respective solenoids serve to retract the blades after their respective cutting and shifting movements. The electrical circuits for energizing these solenoids may be derived from any convenient source, by means of the circuit wires 31 and 32, the latter of which is grounded through the frame of the machine. The circuits are made and broken at the required times by a timing device best shown in Figs. 3, 4, 5 and 6. Branches 33 and 34 of the circuit wire 31 extend to brush holders 35 and 36 for the two cutting mechanisms herein shown, each having a brush for each of its solenoids. Commutators 37 and 38 carried by the cutting shafts 5 and 6, respectively, are each provided with two contacts 40 and 41 for the brushes 42 and 43, respectively, the contact 40 being connected by means of the wire 44 with the solenoid coil 25, and the contact 41 being connected with the solenoid coil 28 by a wire 45. The contact 41 for the shifting movement of the cutter blade makes but a single contact with its brush 43 at each revolution, since only one shifting movement is required. But the contact 40 for the cutting movement is a double contact formed for convenience in horseshoe form, the branches of which contact with the brush 42 in suitable succession to impart two quickly successive cutting movements to the blade.

Figs. 7 to 10 inclusive illustrate four positions of the cutting blades on opposite sides of the tube, while Figs. 11 to 14 inclusive represent the corresponding cuts made in the tube at the respective positions shown in Figs. 7 to 10. The lower blade, as shown in Fig. 7, first makes the separated cuts in the lower wall of the tube shown in Fig. 11. The upper blade, in the position shown in Fig. 8, then makes the separated cuts 47 in the upper wall of the tube shown in Fig. 12. Fig. 13 shows the completed cut 48 made by the lower blade when in the position of Fig. 9, completing the severance of the lower wall of the tube, while Fig. 14 shows at 49 the completed severance of the upper wall by the cutting action of the upper blade shown in Fig. 10.

The mode of operation of the apparatus as a whole will be understood from the foregoing detailed description.

The modified embodiment shown in Figs. 15 to 18 inclusive is adapted to be operated by mechanical means. Only one set of cutting mechanism is shown, on the upper side of the float 51, although obviously a similar mechanism may be used below the float, either separately or in conjunction with the upper mechanism. The cutting blade 52 is in this embodiment mounted for swinging movement which imparts both its radial or cutting movement and its axial or shifting movement, as these terms have previously been defined herein. The cutting blade is pivoted at 53 upon the links 54, the opposite ends of which are pivoted at 55 upon the cutter head 56, the latter being recessed at 57 and 58 to receive the links, and allow of their swinging movement. A cap or plate 59 attached to the cutter head confines the cutter blade in a sidewise direction, leaving it free to swing endwise to the positions shown in Figs. 15, 16 and 17. The swinging movement is imparted by means of a cam 61, which is attached to a side frame 62, or any other convenient portion of the machine, being adjustably secured by a screw 63. A cam lever 64, which in this case is of a bell-cranked form, is pivoted at 65 to the cutter head 56, and engages with the peripheral surface 66 of the cam 61, the contour of which is arranged to produce the desired motions of the blade, which is connected to the end of the cam lever by the link 67. In case an open cam is used, as herein shown, a spring 68 may be employed for holding the cam lever in contact with the cam and drawing back the blade. Or a closed cam may be employed, in which case the spring may be dispensed with. The mode of operation of this device is similar to that of the electrically operated embodiment previously described, the principal difference being that the blade has a single swinging movement on the cutter head instead of a compound sliding movement. But the resultant cutting and shifting effect is substantially the same in both cases.

The rolls 3 and 4 and the rolls 7 and 8 are shown in Fig. 2 as being separated to an extent substantially equaling the thickness of the float or tube guide 2, in which case they may be utilized to support and steady the float as well as to advance the paper or other material along the float. Any desired portions of these rolls may, however, be made larger in diameter or be set closer together so as to meet and grip the paper or other material between them, the float being cut away for this purpose, as is frequently done in paper bag machinery. In the present instance, the float is thus shown to be cut out at 9, the circular outlines of the corresponding middle portions 7 and 8 meeting through this opening about midway of the thickness of the float, as best shown in Fig. 2. In this case, these central portions of the roll are made larger in diameter than the driving diameters of the end portions of the rolls 3, 4, 7 and 8, so as to advance the blanks more rapidly after they are severed, thus drawing them away from each other to sever any remaining uncut portions and to leave a separation between them which is frequently desirable in their subsequent manipulation. In such cases, however, the central accelerating portion of one of the rolls is cut away as illustrated at 14, in

connection with the roll 7, so as to avoid gripping and accelerating the blank before it is severed from the tube.

When employing this invention in the cutting of the bellows sided tubing frequently employed for the manufacture of paper bags, the intucked bellows sides may pass either above or below the float, according as it may be desirable to cut these intucked sides coincidently with the upper or the lower wall.

The rapid radial thrusts of the blades enable the cutting operation to be performed during that portion of the revolution of the teeth which is most nearly in coincidence with the plane of travel of the tube across the line 19 in Figs. 2 and 7 to 10 inclusive, thereby making a quicker and cleaner cut than would result if the knives merely revolved without radial movement, as is the common practice, in which the revolving teeth engage with the paper for a much longer period, during some portions of which their rate of travel cannot be coincident with that of the paper.

In the blanks illustrated in Figs. 11 to 14, the ends of the cuts through the upper and lower walls are shown to be out of coincidence at the edges of the tube, thus leaving a short uncut line between them. These connecting unsevered portions may be severed by the drawing apart of the blanks, by means of the transferring rolls, or if desired these or any other desired portions of the tube may remain unsevered, forming connecting strips or tabs which preserve connection between the succeeding blanks, until after subsequent operations have been performed. At any time these remaining portions may be severed either by means of suitable knives, or by accelerating the leading blank as above described.

The slots 15, and the ribs 16 of the float, are not necessarily made continuous from end to end as shown herein, it being only necessary to cut away the float sufficiently to clear the knives during their respective cutting movements. But for convenience of construction and certainty of clearance, these slots are preferably made continuous, as herein shown. In various other ways which will occur to those familiar with this art, the various features of this invention may be varied in structure and arrangement, while still embodying the substance of the invention.

I claim:—

1. The combination, with tube advancing and guiding devices, of means for making separated cuts along the wall of the tube, and means for shifting the said cutting means aside and repeating the cutting operation to cut the paper remaining between the first cuts.

2. The combination, with means for advancing and guiding a tube, of cutting instrumentalities for making separated perforations across the tube, and means for shifting the cutting instrumentalities laterally of the tube, and repeating the cutting operation to sever the material remaining between the said cuts.

3. The combination, with means for advancing and guiding a tube, of cutting instrumentalities for making separated cuts across the wall of the tube, means for moving the said cutting instrumentalities a plurality of times into the tube wall, and means for shifting the said cutting instrumentalities aside between the strokes to pierce the tube wall at different lateral portions thereof by the successive strokes.

4. The combination, with means for advancing and guiding a paper tube, of cutting instrumentalities for making a series of separated cuts across the wall of the tube, means for repeating the cutting stroke of the said instrumentalities, and means for shifting the said instrumentalities to bring its successive cuts at two different portions of the width of the tube.

5. The combination, with means for advancing and guiding a paper tube, of cutting instrumentalities including a row of cutting teeth for making separated cuts through the paper, means for imparting successive cutting movements to the said teeth, and means for shifting said teeth to effect their cutting movements upon different portions of the width of the tube.

6. The combination, with means for advancing and guiding a paper tube, of a blade provided with teeth for making separated cuts through the wall of the tube, means for imparting to the blade a succession of cutting movements toward and from the tube, and means for shifting the blade lengthwise to bring its cutting teeth successively to different portions of the width of the tube.

7. The combination, with means for guiding a paper tube, of a revolving blade provided with teeth for making separated cuts through the wall of a tube, of means for imparting to the blade a succession of cutting movements toward and from the tube and radial to the revolving movement of the blade.

8. The combination, with means for guiding a paper tube, of a revolving blade extending across the tube, and provided with teeth for making separated cuts, means for imparting successive cutting movements to the blade toward and away from the tube and radially to the axis of revolution of the blade, and means for shifting the blade lengthwise between its successive radial cutting movements to bring the successive cutting actions of its teeth to different portions of the width of the tube.

9. The combination, with means for ad-

vancing and guiding a paper tube, of cutting instrumentalities mounted for revolution at the side of the tube including teeth for making separated cuts across the wall of the tube, means for imparting reciprocating movements to the teeth to project them twice through the paper at each revolution, and means for moving the said teeth laterally of the tube between the said cutting movements to sever the paper remaining between the cuts made by the first cutting movement.

10. The combination, with means for advancing and guiding a paper tube, of means for cutting the wall of the tube entirely across by a succession of cuts, including a revolving blade provided with teeth for making separated cuts through the paper, means for projecting the said teeth into the paper twice at each revolution of the blade, and means for shifting the blade laterally of the tube to bring its cutting teeth to different cutting positions at its successive cutting movements.

11. The combination in a bag machine of a revolving and sidewise moving cutting device, and a support for the tube having a series of clearance recesses for the cutting devices disposed side by side in a sinuous contour extending lengthwise and sidewise of the said support.

12. The combination, in a paper bag machine, of tube cutting devices, and a float provided with a series of clearance recesses disposed side by side across the float, the end portions of the openings being substantially parallel with the float, and the intermediate portions being inclined.

13. The combination, in a paper bag machine, of a float for guiding a paper tube, provided with a series of openings disposed side by side across the float in inclined relation thereto, and a cutting device comprising a revolving blade having a series of cutting teeth registering with the openings in the float, and means for moving the blade while revolving, to maintain its teeth in registering relation to the inclined openings.

14. The combination, in cutting devices for paper bag machines, of a traveling cutting blade, a solenoid for moving the cutting blade transversely relative to its traveling movement and electrical connections for energizing the solenoid in a timed relation to its traveling movement.

15. The combination, in cutting devices for paper bag machines, of a traveling cutting blade, solenoids for moving the blade in different directions transverse to its traveling movement, electrical connections for energizing the solenoids in a timed relation to each other and to the traveling movement of the blade.

16. The combination, in cutting devices for paper bag machines, of a revolving cutting blade, a solenoid for moving the blade radially, relative to its revolving movement and electrical connections for energizing the solenoid in predetermined time relation to its revolving movement.

17. The combination, in cutting devices for paper bag machines, of a revolving cutting blade, a solenoid for moving the blade in an axial direction relative to its revolving movement, and electrical connections for energizing the solenoids in predetermined time relation to the revolving movements of the blade.

18. The combination, in cutting devices for paper bag machines, of a revolving knife, solenoid devices for moving the knife radially and axially relative to its revolving movement, and electrical connections for energizing the solenoid devices in predetermined time relation to the revolving movements of the blade.

19. The combination, in a paper bag machine, of tube cutting mechanism, comprising a revolving cutter head, a cutting blade mounted in the said head for radial movement relative to its axis of revolution, a solenoid device connected with the blade, and the head, and electrical connections for energizing the solenoid device to move the cutting blade radially at a predetermined time in the revolution of the head.

20. The combination, in paper bag machines, of tube cutting devices comprising a revolving cutter head, a cutting blade mounted on the head for radial and axial movement relative to the axis of revolution of the head, solenoid devices carried on the head for effecting the said radial and axial movement of the blade, and electrical connections for energizing the solenoid devices in predetermined time and sequence in the revolution of the head.

21. The combination, in a paper bag machine, of a tube cutting device, comprising a revolving head, a cutting blade mounted in the said head for radial and axial movement relative to the axis of revolution of the head, solenoids carried with the revolving head, and engaging with the cutting blade to impart its radial and axial movements and electrical connections for the solenoid devices, including contacts carried by the head, and brushes mounted adjacent to the head, engaging with the said contacts during their revolution with the head.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM A. LORENZ.

Witnesses:
EDWARD H. LORENZ,
KARL E. PEILER.