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UNITED STATES PATENT OFFICE.

MARK D. KNOWLTON, OF CHICAGO, ILLINOIS.

MACHINE FOR MAKING PAPER TUBES.

SPECIFICATION forming part of Letters Patent No. 350,830, dated October 12, 1886.

Application filed November 27, 1885. Serial No. 184,110. (No model.)

To all whom it may concern:

Be it known that I, MARK D. KNOWLTON, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful
5 Improvements in Machines for Making Paper Tubes; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference
10 marked thereon, which form a part of this specification.

This invention relates to a cutting device of a tubing-machine, wherein the tube is formed upon a rotating mandrel and is severed by one
15 or more cutters bearing against the tube while the mandrel is in rotation, and has for its object to provide in such cutting mechanism a construction whereby the knife or cutting-disk is pressed against the tube by power derived
20 through the machine.

It also has for its object to prolong the cutting operation through two or more rotations of the mandrel, and to produce by mechanism a gradual entrance of the knife into the substance of the tube in the successive rotations
25 of the latter while being cut.

The invention consists in the several matters hereinafter set forth, and pointed out in the appended claims.

30 In the accompanying drawings, a tubing-machine of the general character illustrated in my application for patent, Serial No. 159,585, filed March 20, 1885, and allowed October 6, 1885, has been chosen as suited to the application of my present invention, though it is
35 to be understood that this said invention is adapted to be applied to tubing-machines differing from that so shown.

Figure 1 is a plan or top view of a tubing-machine. Fig. 2 is a front elevation. Fig. 3
40 is a vertical transverse section in the line $x x$ of Fig. 2. Fig. 4 is a vertical transverse section in the line $y y$, Fig. 2. Fig. 5 is a vertical section in the line $z z$, Fig. 2. Fig. 6 is a
45 vertical section in the line $v v$ of Fig. 5.

A A represent the rigidly-connected parts or frame of the machine.

B is a mandrel upon which the tubes are formed.

50 C is a driving-pulley, through which rotative motion is applied to the mandrel B in the

direction of the arrow shown in Figs. 1, 2, 3, and 4.

D is a rocking bar, which carries thereon sliding knife-holders E, the bar being mounted
55 to rock in the usual manner of this class of machines, wherein its movements have heretofore been produced by hand-power, and the knife-holders also being fitted to said rocking bar and longitudinally movable thereon, in
60 substantially the same way as heretofore constructed.

F is a shaft, which is provided for the especial purpose of operating the rock-bar D, and which in this instance is located below
65 the bed of the machine, as being most out of the way and more readily supported in that position, as by depending arms or brackets A' A², in which it rotates.

F' is a sprocket-wheel on the shaft F, which
70 is rotated by a chain, F², trained over a sprocket, B', on the mandrel-shaft. The wheel F', therefore, has motion whenever the mandrel B is rotated; but as it is desirable that the shaft F (as will further appear) shall have
75 motion only during a portion of the time in which the said tube-forming mandrel is operated, said shaft F is connected with the wheel F' by some suitable form of clutch mechanism which may be thrown in and out of gear at
80 the will of the operator, and preferably by such a form of clutch mechanism as will give to the shaft F a single rotation, and thereupon automatically stop the same. One form of clutch mechanism answering to these last con-
85 ditions is here shown, but not claimed, as the same is not my invention.

G is an arm on the bracket A², which arm extends below and to the rear of the bearing in which the shaft F is mounted in said bracket
90 A².

H is a bar pivoted at its lower end to the arm G, and connected by an adjacent rod, H', with the arm D', fixed to the rock-bar D, said rod H' having pivotal connection with both
95 the bar H and the arm D'.

F³ is a cam fixed on the shaft F adjacent to the arm H, and operating to throw said arm through the medium of a pin, h , upon which is desirably mounted the anti-friction roller
100 h' . The rod H' is made adjustable by means of a screw-threaded part thereof, h^2 , which ro-

tates in a tubular portion, h^3 , thereof, the said screw part h^2 being fitted to a threaded hole in the head H^2 , which has a shank that passes through the bar H , and is held in place by the nut h^4 on the opposite side of said bar. The object of this construction is to throw the arm H backward by the action of the cam F^3 on the pin h , and to thereby tilt the cutter-bar forward on its bearings d and to bring the cutter e into pressure upon the mandrel B .

For the purpose of producing a gradual depression of the cutter e into the substance of the tube during a plurality of rotations of the mandrel B , and by not more than a single rotation of the cam F^3 , the wheel F' is made materially larger than the sprocket B' , and the cam F^3 is given a slight eccentricity in that portion of its face which produces the throw of the cutter, the said cam F^3 being provided with a depression, f , which admits the pin h and its friction-roller, if present, far enough toward the axis of the shaft F to allow the cutter e to entirely clear the tube in its position at rest, as clearly shown in Fig. 4. The cam F^3 has motion in the direction of the arrow applied thereto in said Fig. 4, and preferably is constructed to throw the cutter e quickly into bearing upon the tube to be severed.

At f' f^2 dotted lines are drawn, indicating, respectively, the radii of the cam at the beginning and at the end of its surface engaging the pin h when the cutter is being forced through the tube. The radius f' is less than the radius f^2 , the former being sufficient to carry the cutter e into contact with the tube, and the radius f^2 being sufficient to force the cutter deep enough to sever the tube. A part of the surface of the cam between the radial line f^2 and a second radius, f^3 , drawn near the notch h is preferably made concentric with the shaft F , so as to hold the latter at the forward or inward limit of its throw during one or more rotations of the mandrel.

The operation of the parts above described is plainly as follows: When the shaft F is thrown into engagement with the wheel F' , the cutter e will enter the substance of the tube to a gradually-increasing depth, and the mandrel carrying the tube will make several rotations before the tube is entirely severed, so that the operation of cutting is gradual, while automatic, and the same as it would be if made by operating the cutter-bar by means of a hand-lever properly manipulated. The adjustment of the throw of the cutter is obviously effected by lengthening or shortening the extensible rod H' . It is entirely obvious, however, that other well-known devices may be employed for this adjustment instead of the extensible rod H' shown, or that said rod may be in many well-known ways made extensible otherwise than as indicated. It is entirely obvious, also, that in carrying out the main features of my invention other acting connections between the cam and cutter-bar than those above set forth may be

used—as, for instance, the said parts may be made as illustrated in dotted lines in Fig. 4, in which the dotted lines show a cam upon the shaft F , made larger than the cam F^3 , but of the same shape as the latter, and also show the arm D' as extended downwardly, so as to sustain a roller in position to act upon the cam, the roller being mounted in a bar passing through the lower end of the arm, and held in position by nuts at either side of the latter, whereby the roller may be adjusted relatively to the arm, for the purpose above stated.

The particular form of automatic clutch and stop illustrated consists of the following:

The device I is a hub fixed to the arms of the wheel F' , and having an inwardly-directed flange, I' , on the inner edge of which are provided a series of serrations, i .

J is a disk fixed to the shaft F , and having set in the radial recess therein a spring-catch, J' , adapted to engage the serrations i on the hub I . When the catch J' is engaged with the hub I , motion is of course imparted to the disk J and to the shaft F . The catch J' projects laterally beyond the hub I , as shown plainly in Figs. 5 and 6, and the advanced face of said catch in that portion thereof which stands out beyond the hub is rounded, as indicated clearly in Fig. 5.

K is a hand-lever pivoted between its ends at k to a stationary part of the machine, and preferably to a part of the bracket A' , as shown. The lever K has lateral motion on its pivot k , so that it may be vibrated into and out of the path of the protruding portion j of the catch J' , and is made to stand normally in the said path, and in position to strike the same, by means of a spring, k' , Fig. 2, or other suitable means. The lower end of the lever K is also, as shown, inclined or rounded out in that portion which engages the end of the catch J' , so that when the catch strikes said lower end of the lever K the former is forced inwardly and out of engagement with the serrations i on the hub I , thus disconnecting the moving hub from the disk J and allowing the latter to come to rest. Said disk J is stopped by the lower end of the lever K , for the reason that the latter is made long enough to continue to bear on the catch after it has given the latter its inward throw. To obtain the desired effect of a single rotation of the shaft F , therefore, when it is proposed to bring the cutter e into operation on the tube, the upper end of the lever K is thrown to the left, as the machine is viewed in Fig. 2, which carries the lower end of said lever out of engagement with the catch J' , and allows the latter to spring into engagement with the rack of hub I . The lever K is then immediately released by the hand, and is thrown back into its upright position by the spring k' , so that the lower end of said lever stands in the path of the catch, which strikes the lever at the end of one revolution of the shaft F , and is disengaged, as described, the said shaft being arrested and held from further rotation by the

continued engagement of the catch J' with said lever until the latter is again thrown by hand, as above described.

As before stated, other forms of clutch mechanism may be employed in place of that just described; but the latter is found to be entirely effective and to have the advantage over some others that might be used of operating as an automatic stop on the completion of one revolution of the shaft F.

I claim as my invention—

1. The combination, with the rotating mandrel of a tube-machine and knife-bar movable toward and from the mandrel, of a shaft having interruptible driving-connection with rotating parts which drive the mandrel, and connections, substantially as described, between the shaft and the knife-bar, whereby the latter is carried into working position during the rotation of the mandrel.

2. The combination, with the mandrel and knife-bar movable toward and from the said mandrel, of a counter-shaft provided with a cam, actuating-connections between the cam and knife-bar, a shaft driving the mandrel, and connections between said shaft and the counter-shaft embracing a clutch for giving interrupted motion to the counter-shaft, substantially as described.

3. The combination, with the mandrel and knife-bar movable toward and from the said mandrel, of a counter-shaft provided with a cam, adjustable acting connections between

the cam and knife-bar, a shaft driving the mandrel, and interruptible driving-connections between said shaft and the counter-shaft, substantially as described.

4. The combination, with a rotating tube-forming mandrel and knife-bar movable toward and from the said mandrel, of a rotating volute cam, interruptible driving mechanisms giving the cam a slower speed than the mandrel, and connections between the cam and knife-bar actuating the latter from the former, substantially as and for the purposes set forth.

5. The combination, with the mandrel and a knife-bar movable toward and from the said mandrel, and rotating mandrel-driving shaft, of a counter-shaft carrying a volute cam, a loose wheel on the counter-shaft driven from the mandrel-shaft and at slower speed than the mandrel, a clutch connecting the loose wheel with the counter-shaft, a stop constructed to disengage the clutch and stop the shaft at the termination of one revolution thereof, and connections between the cam and knife-bar actuating the latter from the former, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my invention I affix my signature in presence of two witnesses.

MARK D. KNOWLTON.

Witnesses:

C. CLARENCE POOLE,
W. N. JELLYMAN.