April 14, 1925. 1,533,263

W. S. PRITCHARD

TUBE SEVERING APPARATUS

Filed Aug. 28, 1922 3 Sheets-Sheet 1

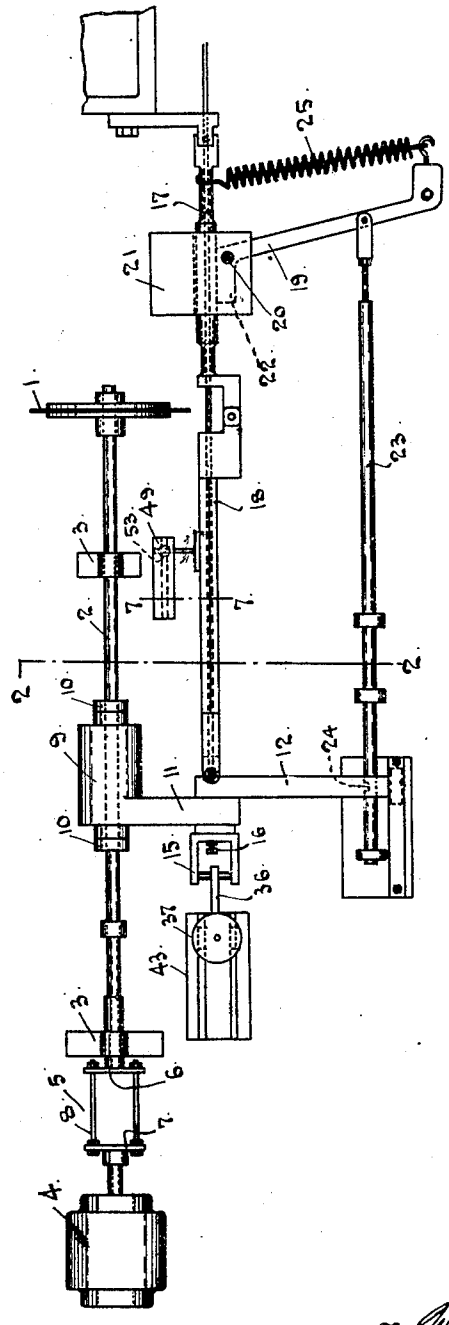


FIG. 1.

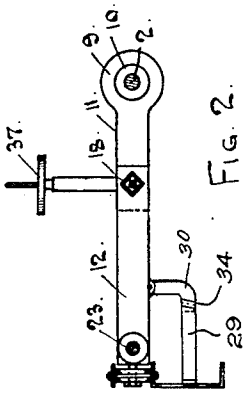


FIG. 2.

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TUBE SEVERING APPARATUS

Filed Aug. 28, 1922 3 Sheets-Sheet 2

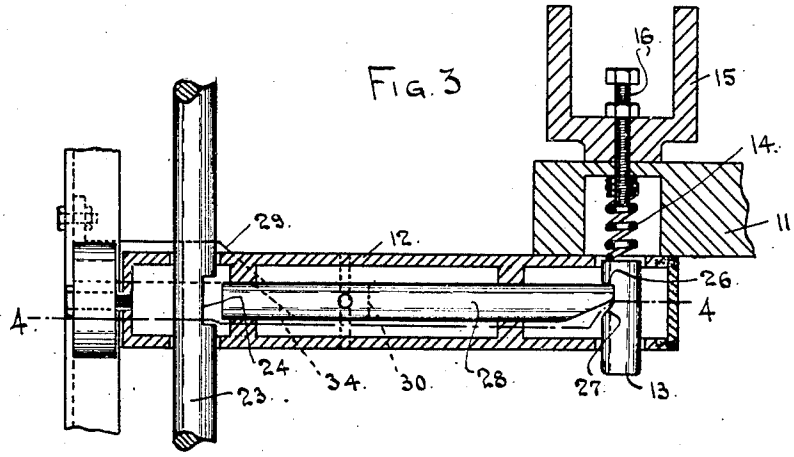


FIG. 3.

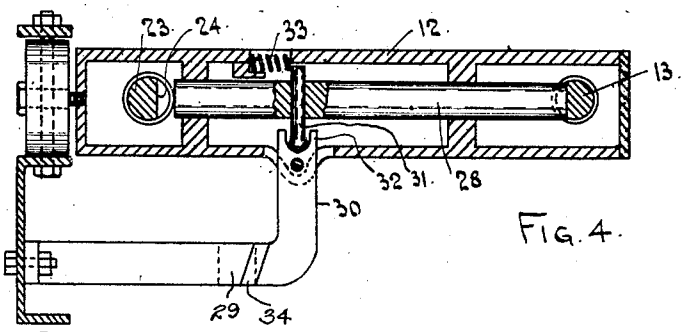


FIG. 4.

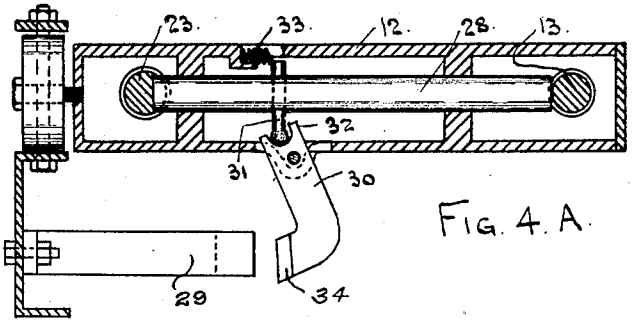


FIG. 4. A.

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Filed Aug. 28, 1922 3 Sheets-Sheet 3

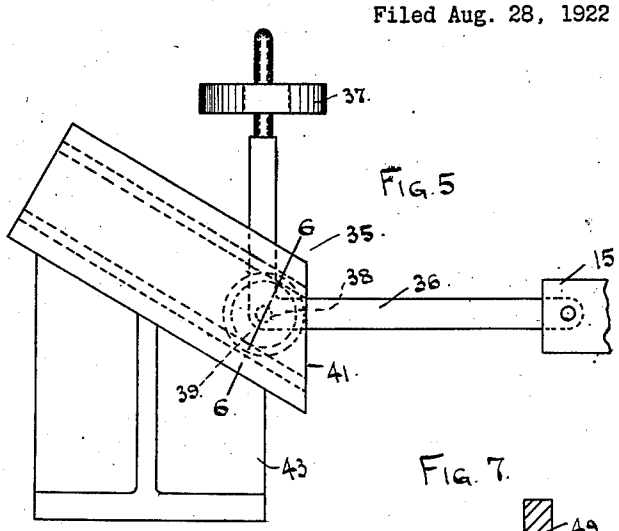


FIG. 5.

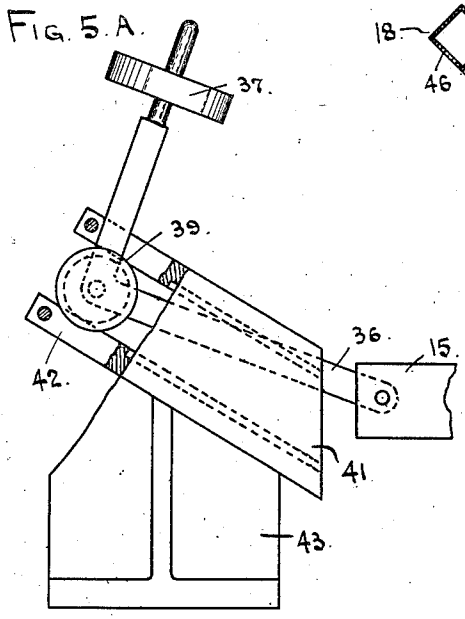


FIG. 5.A.

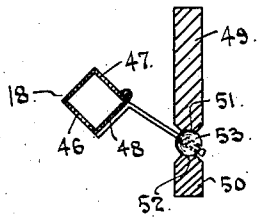


FIG. 7.

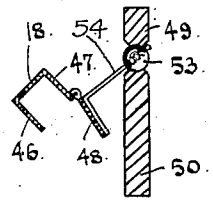


FIG. 7.A.

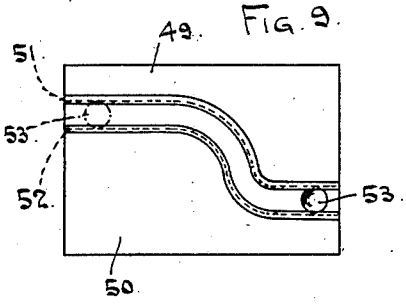


FIG. 9.

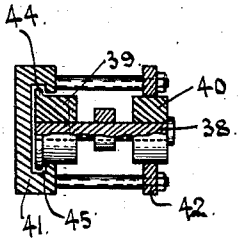


FIG. 6.

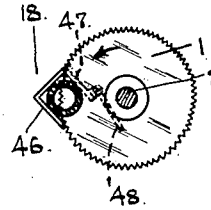


FIG. 8.

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Patented Apr. 14, 1925. 1,533,263

UNITED STATES PATENT OFFICE.

WILLIAM S. PRITCHARD, OF DETROIT, MICHIGAN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO MOTOR PRODUCTS CORPORATION (1923), OF DETROIT, MICHIGAN, A CORPORATION OF NEW YORK.

TUBE-SEVERING APPARATUS.

Application filed August 28, 1922. Serial No. 584,682.

To all whom it may concern:

Be it known that I, WILLIAM S. PRITCHARD, a citizen of the United States of America, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Tube-Severing Apparatus, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to an apparatus for severing continuously moving tubing, and refers particularly to an apparatus including a rotary severing device advanced by the tubing and operating to successively sever the tubing into sections of a predetermined length. One of the objects of the invention is the provision of means for returning the severing device to its starting position, this means opposing progressively decreasing resistance to the movement of the severing device from its starting position. Another object is to provide means for positively locking the severing device from movement from its starting position until the tubing has moved a predetermined distance. A further object is the provision of a guide for the section of the tubing to be severed, this guide having a side against which the section of the tubing is forced by the severing device during the severing operation and also having a section which is movable to inoperative position before the completion of the severing operation to permit the severed section to become disengaged from the guide. Other objects of the invention reside in the novel features of construction and combinations and arrangements of parts as more fully hereinafter set forth.

In the drawings:

Figure 1 is a plan view of a tube severing apparatus embodying my invention;

Figure 2 is a cross section on the line 2—2 of Figure 1;

Figure 3 is a horizontal section through the gage and adjacent parts;

Figure 4 is a cross section on the line 4—4 of Figure 3;

Figure 4A is a similar view showing the parts in adjusted position;

Figure 5 is a side elevation of the device for returning the severing device to its starting position;

Figure 5A is a similar view showing the parts in adjusted position;

Figure 6 is a cross section on the line 6—6 of Figure 5;

Figure 7 is a cross section on the line 7—7 of Figure 1;

Figure 7A is a similar view showing the parts in different position;

Figure 8 is a view illustrating a rotary severing device in engagement with the tubing;

Figure 9 is a side elevation of the cam for operating the movable section of the guide for the section of the tubing to be severed.

The tubing is delivered from a tube forming machine (not shown) and since this tubing is continuously advancing it is necessary that the severing operation should be effected without interference with such advancement. Also, it is necessary to sever the tubing into sections of an exact predetermined length. This is accomplished by a mechanically operated machine in which the advancing end of the tubing relatively moves the tubing and severing device toward each other to bring the same into engagement and also moves the severing device in the same direction and at the same speed as the tubing during the interval in which the severing device is performing its operation.

1 is the saw for severing the continuously advancing tubing, this saw being mounted upon an arbor 2 which is longitudinally slidable in bearings 3. 4 is a suitable device for rotating the arbor 2, such as an electric motor, which is coupled to the arbor by a telescopic connection 5 which permits of longitudinal movement of the arbor relative to the motor. This telescopic connection comprises a head 6 secured upon the arbor, the head 7 secured upon the motor shaft and the parallel pins 8 secured to the head 7 and longitudinally slidably engaging the head 6.

The arbor 2 is moved longitudinally by the pressure of the advancing tubing and this is accomplished by the following construction. 9 is a sleeve upon the arbor and between the collars 10 also upon the arbor and secured thereto by suitable means such as set screws. The sleeve 9 has the lateral arm 11 carrying the gage housing 12 in the

inner end of which is the plunger 13 mounted to slide in a direction parallel to that of the tubing. The front end of this plunger is in the path of the tubing and is adapted to be engaged thereby and it is normally held beyond the front face of the housing by means of the coil spring 14 in a recess in the outer end of the lateral arm 11, the rear end of this coil spring abutting the bottom of the recess. 15 is a yoke secured to the rear face of the lateral arm 11 by the threaded member 16 which threadedly engages the bottom of the recess in the lateral arm and is adjustable to vary the rearward movement of the plunger 13, the rear end of which comes into contact with the front end of the threaded member when the advancing end of the tube contacts with and moves the plunger rearwardly. This threaded member also acts as a guide for the coil spring 14. With this arrangement, as soon as the advancing end of the tubing engages the plunger 13 and forces the latter rearwardly into contact with the stop 16, the sleeve 9 through the arm 11 advances the arbor 2 and the saw 1 carried by the arbor in the same direction and at the same speed as the continuously advancing tubing, whereby the tubing may be severed without interfering with its advancement.

To sever the tubing, it is moved laterally across the path of the saw by the advancing tubing. In detail, 17 is a guide pivotally connected to the tube forming mechanism and into which the tubing enters as it leaves this mechanism. 18 is a second guide pivotally connected at its forward end to the first-mentioned guide and at its rear end to the gage housing 12. 19 is a rock arm pivotally mounted at 20 upon the stationary member 21 of the machine and having the bearing 22 which is adapted upon rocking of the rock arm to engage the guide 17 and laterally force the same toward the saw 1 a sufficient distance to permit the saw to sever the tubing passing through the guide 17. The adjacent ends of the guides 17 and 18 are spaced sufficiently apart to permit of the entrance of the saw therebetween. 23 is a tie rod pivotally connected to the rock arm 19 and extending substantially parallel to the guides 17 and 18, the rear end of this tie rod extending through the outer end of the gage housing 12 and having a notch 24 in its inner side. The rock arm 19 is normally held in inoperative position, so that its bearing 22 does not engage the guide 17, by suitable means such as the coil spring 25 extending between the outer end of the rock arm and the guide 17.

In order to grip the tie rod 23 to pull the same and thereby rock the rock arm 19, the plunger 13 which is adapted to be engaged by the advancing end of the tubing, is provided with a notch in its outer side having a transverse shoulder 26 at its rear end and an inclined bevelled shoulder 27 at its front end, the bevelled shoulder being adapted to slidably engage the inner end of the rod 28 within the gage housing 12 and extending transversely of the plunger to force the rod outwardly and to bring its outer end into engagement with the notch 24 in the tie rod 23. The shoulder 26 of the plunger normally engages the rod 28 and as a consequence, the forward movement of the plunger under the action of its coil spring, is predetermined. With this description, it is readily seen that the advancing tubing laterally moves its guides toward the saw to bring the saw into engagement with the tubing at a definite time during the advancement of the tubing.

To positively lock the saw in its starting position until a predetermined length of tubing has advanced, I have provided the stationary stop 29 upon the machine and below the gage housing 12 which is engageable with the rear face of the latch 30 when the saw is in its starting position. This latch is preferably of bell crank shape pivoted in the lower part of the gage housing. 31 is a pin extending transversely of the rod 28 and having a portion depending therebelow for engagement between the bifurcations 32 at the upper end of the latch 30. 33 is a coil spring within the gage housing and abutting the portion of the transverse pin 31 above the rod 28 for tending to laterally force the rod inwardly into engagement with the plunger 13. The arrangement is such that with the parts in starting position as shown in Figure 4, the rod is in engagement with the notch in the plunger 13 and the latch 30 has its nose 34 in engagement with the front face of the stop 29. However, upon longitudinal rearward movement of the plunger, the depending portion of the transverse pin 31 through the bifurcations of the latch swing the latter so that its nose becomes disengaged from the stop as shown in Figure 4A, after which the saw may be advanced with the tubing. The nose 34 of the latch is bevelled to slide over the stop 29 during the return of the parts to initial position.

For returning all the parts of the machine which move with the tubing to their initial or starting positions, I have provided the gravity actuated device 35 which is connected to the yoke 15. In detail, 36 is a bell crank having the forward end of its horizontally extending arm pivotally connected between the bifurcations of the yoke and having at the upper end of its upright arm, the weight 37. A shaft 38 having rollers 39 and 40 journalled at its opposite ends, passes through the bend of the bell crank. These rollers engage parallel tracks 41 and 42 respectively which are inclined upwardly

and rearwardly and are supported upon the column 43. The roller 39 preferably has an annular flange 44 at its outer edge which engages in a groove 45 in the track 41, whereby lateral disengagement of the rollers from their respective tracks is prevented. With this arrangement, the resistance opposed to the forward movement of the parts of the machine moving with the tubing gradually decreases owing to the fact that the yoke 15 moves through a horizontal path while the gravity actuated device as a whole moves through an upwardly inclined path, and also owing to the fact that the center of the gravity actuated device moves rearwardly relative to the yoke because the weight 37 is secured to the upright arm of the bell crank which swings relative to the path of travel of the gravity actuated device. In this connection, attention is directed particularly to Figures 5 and 5A of the drawings which respectively show the relative arrangement of parts of the gravity actuated device when the saw is in starting position and when the saw is at the limit of its forward travel with the tubing.

Another important feature of my invention resides in arranging the guide 18 for the section of the tubing to be severed so that this guide will have one side 46 of its stationary section 47 inclined downwardly and inwardly relative to the saw, so that as the saw is operating upon the tubing, it forces the tubing against this downwardly and inwardly inclined side by its rotation, this being shown particularly in Figure 8. This guide 18 has the pivoted section 48 which is inclined in the opposite direction to the side 46 and is adapted to abut the lower edge of this side and forms with the stationary section an inclosure through which the tubing is freely slidable. However, the dimension of this inclosure is such that the tubing is guided on all sides while it is initially engaging the plunger 13 and advancing the movable parts of the machine, whereby distortion of the tubing is prevented. However, the pivoted section 48 is swung to open position prior to the complete severing of the tubing, this being accomplished by upper and lower stationary cooperating cam members 49 and 50 respectively, provided in their adjacent edges with grooves 51 and 52 respectively which are engaged in by a ball 53 mounted upon the arm 54 secured to the pivoted section 48. The grooves 51 and 52 together form a track for the ball 53 having front and rear portions at different elevations connected by an intermediate inclined portion. In the initial or retracted position of the guide 18, the ball 53 engages in the grooves forming the front portion of the track as shown particularly in Figure 7 and 9 of the drawings and the pivoted section 48 is closed so that the tubing is inclosed. As the tubing advances, it engages the plunger 13 and through this plunger advances the moving parts of the severing mechanism including the guide 18 which advances the arm 54 and the ball 53, bringing the latter into engagement with the intermediate inclined portion of the track and then with the upper rear portion of the track which causes the pivoted section 48 to swing into open position. The arrangement of the parts is such that the pivoted section is swung into open position just before completing the severing operation so that as the section of the tubing is severed, it is free to drop out of the stationary section of the guide, after which the parts of the machine are returned to their initial positions and the pivoted section of the guide swings to closed position and the guide is then in condition to receive another length of tubing.

What I claim as my invention is:

1. In a mechanism for cutting moving tubing, the combination with a device for severing the tubing, of means for relatively moving the tubing and severing device toward each other to bring the severing device into engagement with the tubing and also for moving said severing device in the same direction and at the same speed as the tubing is advancing, and means for returning said severing device to its original position, said means opposing a resistance to the forward movement of said severing device which progressively decreases as said severing device is advanced.

2. In a mechanism for cutting moving tubing, the combination with a device for severing the tubing, of means actuated by the tubing itself for advancing said severing device in the same direction and at the same speed as the tubing is advancing, and for relatively moving the tubing and severing device toward each other to bring said severing device into engagement with the tubing, and gravity actuated means for returning said severing device to its normal starting position, said gravity actuated device opposing a variable resistance to the advancement of said severing device.

3. In a mechanism for cutting moving tubing, the combination with a severing device, of means for advancing said severing device in the same direction and at the same speed as the tubing is advancing and for relatively moving the tubing and severing device toward each other to bring said severing device into engagement with the tubing, and gravity actuated means for returning said severing device to its original position, said gravity actuated device being movable through an upwardly and rearwardly inclined path.

4. In a mechanism for cutting moving tubing, the combination with a rotary sever-

ing device, of means actuated by the tubing itself for advancing said severing device with the tubing and for relatively moving the tubing and severing device toward each other to bring said severing device into engagement with the tubing, an upwardly and rearwardly inclined track, and a bell crank movable upon said track and connected to said severing device to return the same to its original position, said bell crank having a weighted upwardly extending arm.

5. In a mechanism for cutting moving tubing, the combination with a severing device, of means for advancing said severing device with the tubing and for relatively moving the tubing and severing device toward each other to bring said severing device into engagement with the tubing, and means for positively locking said severing device in its initial position controlled by the tubing.

6. In a mechanism for cutting moving tubing, the combination with a rotary severing device, of means for advancing said severing device with the tubing, means for relatively moving the tubing and severing device toward each other to bring said severing device into engagement with the tubing, and means for locking said severing device in its initial position controlled by said means for relatively moving the tubing and severing device toward each other.

7. In a mechanism for cutting moving tubing, the combination with a rotary severing device, of means actuated by the tubing itself for advancing said severing device with the tubing, means actuated by the tubing itself for laterally moving the tubing into engagement with said severing device, and means cooperating with said lateral moving means to lock said severing device in its initial position, said locking means releasing said severing device upon actuation of said lateral moving means.

8. In a mechanism for cutting moving tubing, the combination with a severing device, of means for advancing said severing device with the tubing, a stationary stop, a latch adapted to cooperate with said stop and to move with the tubing, and means actuated by the tubing for moving said latch out of engagement with said stop and for laterally moving the tubing into engagement with said severing device.

9. In a mechanism for cutting moving tubing, the combination with a rotary severing device, of a plunger engageable with the advancing end of the tubing, means engageable with said plunger for advancing said severing device with the tubing, a rod extending transversely of said plunger and adapted to be actuated thereby, means controlled by said rod for laterally moving the tubing into engagement with said severing device, a stationary stop, and a latch cooperating with said stop to lock said severing device in its initial position and adapted to be disengaged from said stop upon actuation of said bar.

10. In a mechanism for cutting moving material, means for severing the material, means for relatively moving the material and severing means toward each other and also for progressively moving the material and severing means in the same direction during the severing action, means for returning the severing means to its original position, and means opposing a resistance of the forward movement of said severing means which is less in its intensity at the end of the movement than at the start.

11. In a mechanism for cutting moving tubing, the combination with a rotary severing device, of a guide through which the tubing advances, said guide having a section with a side inclined downwardly and inwardly against which the tubing is forced by said severing device during its engagement therewith, said guide also having a section movable to open position to allow the severed section of the tubing to drop out of said guide, and means for relatively moving said guide and severing device toward each other and for moving said severing device in the same direction and at the same speed as the tubing is advancing.

In testimony whereof I affix my signature.

WILLIAM S. PRITCHARD.

Witness:
W. V. HELMEL.