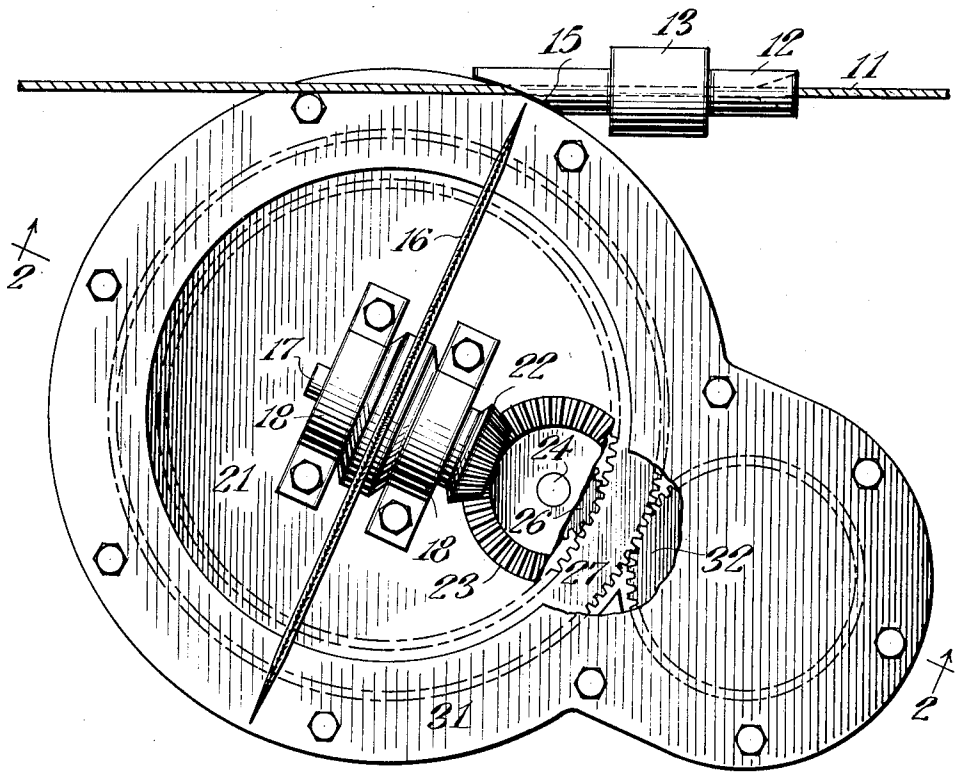
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CUTTING MACHINE

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Fig. 1.



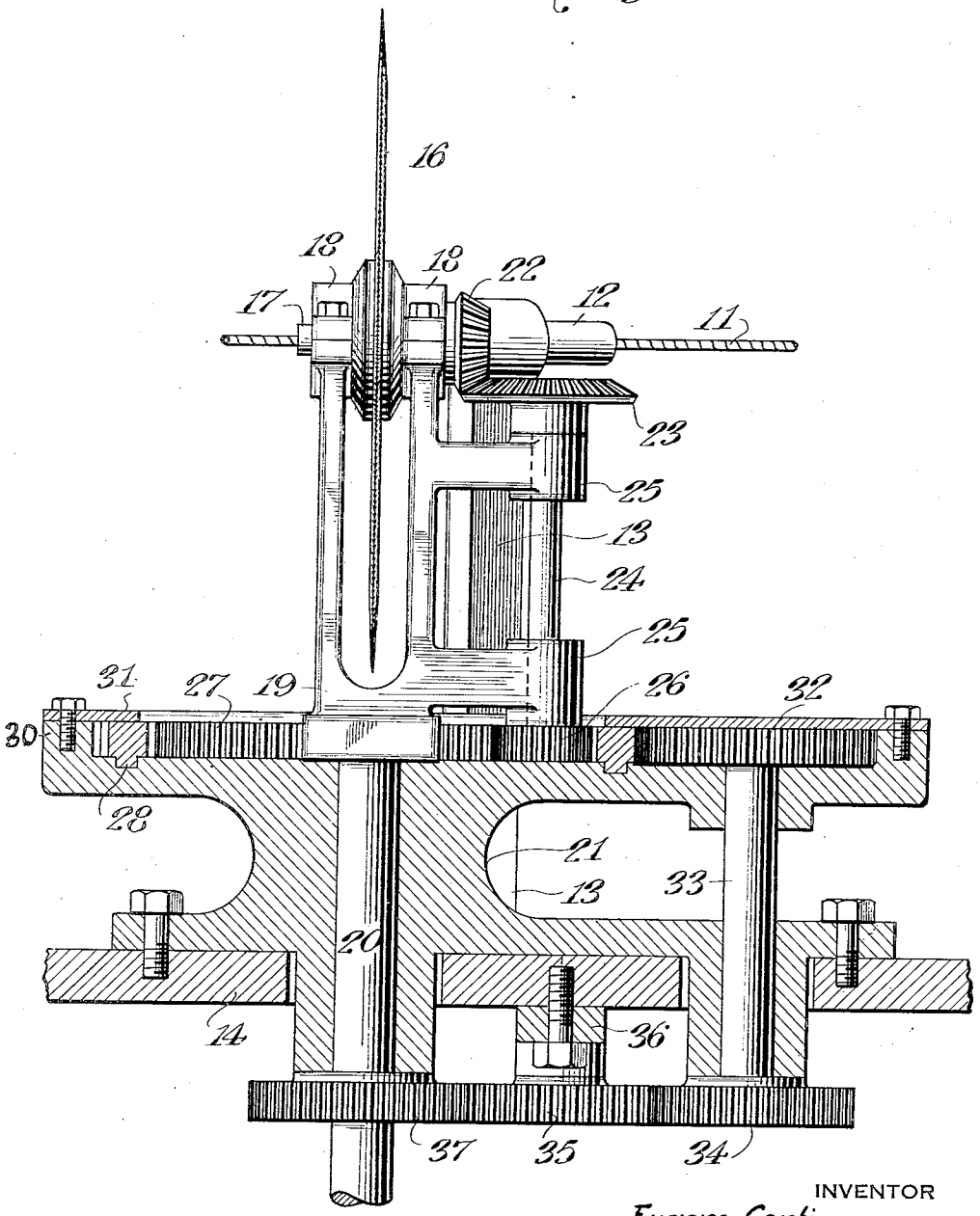
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Fig. 2.



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UNITED STATES PATENT OFFICE

EUGENE CONTI, OF MOUNT VERNON, NEW YORK, ASSIGNOR TO ALEXANDER HERZ, OF NEW ROCHELLE, NEW YORK

CUTTING MACHINE

Application filed August 23, 1930. Serial No. 477,219.

This invention relates to cutting machines, and more particularly to mechanism for cutting off predetermined lengths of a continuously moving member such as a tube or rod. It is an object of this invention to provide an improved machine of this character which may be effectively operated at high speed without unduly mutilating the continuously moving member at the point of severing and without too great strain upon the cut-off mechanism or other parts of the machine. Other objects and advantages of the invention will appear hereinafter.

Inasmuch as the invention is of particular utility in the manufacture of paper tubes, the embodiment selected merely for the convenience of illustration and for the sake of showing the invention in a concrete form discloses a machine designed for cutting such tubes. In the drawings accompanying this specification and forming a part thereof:

Fig. 1 is a top plan view of the illustrative embodiment of the invention, a part of the apparatus being broken away to disclose the construction more clearly; and

Fig. 2 is a view partly in elevation and partly in section taken substantially on the line 2—2 of Fig. 1.

Many of the tube forming machines in use at the present time produce a tube which is continuously fed from the machine in one continuous tube of indefinitely great length, and which must thereafter be severed into the desired short sections. The machine herein illustrated is provided for this purpose, and in operation may be secured to and made a part of the tube forming machine. No tube forming machine has been shown, however, the drawings merely showing the tube 11 as it is being fed forward from the forming mechanism.

The moving tube 11 passes through a guide 12 which conveniently may be mounted on the upper end of a standard 13 secured to the bed 14 of the tube forming machine. As may be seen in Fig. 1, the exit end of the tube guide 12 preferably is cut to the arcuate form 15 substantially coinciding with the surface of an imaginary cylinder whose longitudinal axis is displaced to one side of the path of the tube and slightly forward of the exit end of the guide.

In the embodiment shown, the tube severing mechanism comprises a disk cutter 16, conveniently a saw, which is secured on a shaft 17 mounted in bearings 18 on the upper ends of a fork 19. The fork 19 is secured on the end of a shaft 20 which is rotatably mounted in a sleeve bracket 21 secured upon and extending through the bed 14. The axes of the fork 19 and the shaft 20 are aligned and coincide with the axis of the imaginary cylinder previously referred to, which common axis will, for convenience, be referred to as the fixed axis. The axis of the shaft 17 preferably is perpendicular to the said fixed axis, and upon rotation of the shaft 20 and the fork 19 generates a plane substantially passing through the longitudinal axis of the tube 11.

The disk cutter 16 has a diameter slightly less than that of the imaginary cylinder previously referred to, so as to permit the edge of the disk to clear the face 15 of the guide 12 upon the rotation of the shaft 20 and the fork 19. Suitable driving means, (not shown) will be secured to the lower end of the shaft 20 for turning the shaft to the left, as viewed in Fig. 1, thereby causing the edge of the disk cutter 16 to move periodically into and out of the path of the tube 11 in the direction of movement of the tube. Preferably the driving means turns the shaft 20 at a speed such that the edge of the disk cutter is moving at substantially the same speed as the tube during the time of passage in the path of the moving tube, whereby the tube may be severed without buckling or undue mutilation. To insure the cutting off of sections of tube of constant length the shaft 20 conveniently may be driven by the same means as the tube forming machine.

In addition to the means already described for turning the disk cutter about the fixed axis, means are provided for turning the disk cutter 16 about its central axis. Conveniently this last mentioned means may be associated with the disk cutter in such a manner that the disk cutter will be turned about its

central axis automatically upon the rotation of the shaft 20.

In the illustrative embodiment, secured rigidly upon one end of the shaft 17 is a bevel gear 22. The gear 22 meshes with a bevel gear 23 secured rigidly on the upper end of a shaft 24, which shaft is rotatably mounted in brackets 25 extending outwardly from one branch of the fork 19. The shaft 24 preferably is mounted parallel to the aforementioned fixed axis, and secured rigidly on its lower end is a pinion 26 meshing with an annular gear 27 co-axially encircling the shaft 20 and supported on the upper surface of the bracket 21. It will be apparent that if the annular gear 27 is secured rigidly on the bracket 21, rotation of the shaft 20 will cause the pinion 26 to turn the shaft 24, which rotation of the shaft 24, will through the bevel gears 23 and 22, cause the shaft 17 and the disk cutter 16 to rotate. The speed of rotation of the shaft 17 and the disk cutter 16 will depend on the speed of rotation of the shaft 20, and on the ratios of the meshing gears included in the driving connection.

It may be desirable to be able to change the speed of rotation of the disk cutter 16 about its central axis relative to the speed of rotation of the disk cutter about the fixed axis. Conveniently this may be accomplished by rotatably mounting the annular gear 27 on the bracket 21, and by providing means for turning the annular gear during the rotation of the shaft 20.

Referring to Fig. 2 of the drawings, the annular gear 27 has on its lower edge a ring 28 engaging a circular track on the upper surface of the bracket 21. Preferably the outer edge of the bracket has an upwardly extending flange 30 surrounding the annular gear, to which flange is removably secured an annular plate 31 overlying the annular gear and preventing any substantial upward movement of the gear. It will be seen that rotation of the annular gear 27 relative to the shaft 20 will be effective to change the relative speeds of rotation of the shafts 17 and 20.

Conveniently the annular gear 27 is an external as well as an internal gear, and may be rotated by means of a spur gear 32 engaging the outer gear surface. In the illustrative embodiment the flange 30 and plate 31 are extended laterally to enclose the spur gear 32, which gear is rigidly secured on the upper end of a shaft 33 extending downwardly through the bracket 21 and the bed 14. Secured on the lower end of the shaft 33 is a spur gear 34 meshing with an idler gear 35 adjustably mounted at 36 on the under side of the bed 14. The idler gear 35 also meshes with the spur gear 37 rigidly secured on the shaft 20, whereby the relative speed of the shaft 20 and the annular gear 27 will be constant. It will be apparent that this relative speed may be changed readily by changing the ratio of the gears 34 and 37.

Summarizing the operation of the machine, as the continuous tube 11 is fed from the tube forming machine forward through the guide 12, the shaft 20 is rotated by means of a suitable driving connection with the tube forming machine to cause the edge of the disk cutter 16 periodically to move into and out of the path of the tube with a movement in the direction and at substantially the speed of the tube. As the disk cutter rotates about the fixed axis it also is caused to rotate about its central axis, whereby the tube is severed without mutilation as the edge of the disk cutter moves across the path of the tube. Since the speed of operation of the cutting mechanism is determined by the speed of operation of the tube forming machine, the sections of tube cut off will be of equal length.

The description of the illustrative embodiment is not intended as defining the limits of the invention, and it will be understood that the invention may be variously modified and embodied within the scope of the appended claims.

I claim:

1. In a machine for cutting a continuously formed length of moving material into predetermined lengths, the combination of a rotatable shaft, a fork secured to one end of said shaft, a second shaft rotatably mounted on said fork substantially at right angles to said first mentioned shaft, a disk cutter carried by said second mentioned shaft and rotatable therewith, a third rotatable shaft carried by said fork substantially parallel to said first mentioned shaft, bevel gears connecting said second and third mentioned shafts, and an annular gear co-axially encircling said first mentioned shaft, said first mentioned shaft being rotatable relative to said annular gear, and a pinion on said third mentioned shaft engaging said annular gear, whereby rotation of the first mentioned shaft causes the second mentioned shaft and the disk cutter to rotate.

2. In a machine for cutting a continuously formed length of moving material into predetermined lengths, the combination of a rotatable shaft, a fork secured on one end of said shaft, a second shaft rotatably mounted on said fork substantially at right angles to said first mentioned shaft, a disk cutter carried by said second mentioned shaft and rotatable therewith, a third rotatable shaft carried by said fork substantially parallel to said first mentioned shaft, bevel gears connecting said second and third mentioned shafts, an annular gear co-axially encircling said first mentioned shaft, said first mentioned shaft being rotatable relative to said annular gear, a pinion on said third mentioned shaft engaging said annular gear, whereby rotation of the first mentioned shaft causes the second men-

tioned shaft and the disk cutter to rotate, and means for causing said annular gear to turn to change the relative speeds of rotation of said first and second mentioned shafts.

3. In a machine for cutting a continuously formed length of moving material into predetermined lengths, the combination of a rotatable shaft, a fork secured on one end of said shaft, a second shaft rotatably mounted on said fork substantially at right angles to said first mentioned shaft, a disk cutter carried by said second mentioned shaft and rotatable therewith, means for rotating said first mentioned shaft to move the edge of the disk cutter periodically through cutting position in the same direction as and at substantially the speed of the moving material and means for simultaneously rotating said second mentioned shaft and said disk cutter to sever the material during the said movement through the cutting position.

4. In a machine for cutting moving material, the combination of a rotatable shaft, a second shaft rotatably carried by said first mentioned shaft substantially at right angles thereto, a disk cutter mounted on said second mentioned shaft and rotatable therewith about the axis of the shaft, means for rotating both of said shafts, and a guide for directing the moving material substantially in the plane generated by the second mentioned shaft upon the rotation of the first mentioned shaft, and through the edge of the circular area swept by the disk cutter in the direction of the edge of the disk cutter.

5. In a machine for cutting moving material, the combination of a rotatable shaft, a fork secured on one end of said shaft, a second shaft rotatably mounted in said fork substantially at right angles to said first mentioned shaft, a disk cutter carried by said second mentioned shaft and rotatable therewith, a guide for the material to be cut, means for rotating said first mentioned shaft to cause the edge of the disk cutter to move periodically into and out of the path of the material to be cut with a movement substantially in the direction and at the speed of the moving material, and means for rotating said second mentioned shaft to cause the disk cutter to sever the material when the edge of the cutter is moved into the path of the material.

6. In a machine for cutting a continuously formed length of moving material into predetermined lengths, the combination of a disk cutter mounted for rotation about its central axis and also for rotation about a fixed axis passing through the central axis in the plane of the disk, means for rotating the disk about said fixed axis, means operative upon such rotation to rotate the disk about its central axis, and a guide for feeding the moving material through the edge of the circle described by the disk in a plane perpendicular to said fixed axis.

7. In a machine for cutting a continuously formed length of moving material into predetermined lengths, the combination of a disk cutter mounted for rotation about its central axis and also for rotation about a fixed axis passing through the central axis in the plane of the disk, means for rotating the disk about said fixed axis, means operative upon such rotation to rotate the disk about its central axis, a guide for feeding the moving material through the edge of the circle described by the disk in a plane perpendicular to said fixed axis, and means for varying the relative speeds of rotation about said central axis and said fixed axis.

8. In a machine for cutting a continuously formed length of moving material into predetermined lengths, the combination of a disk cutter mounted for rotation about its central axis and also for revolution about a fixed axis substantially perpendicular to said central axis, means for revolving the disk about said fixed axis, and a gear train connecting said last mentioned means and said disk cutter whereby revolution of the disk about said fixed axis causes the disk to rotate about its central axis.

9. In a machine for cutting a continuously formed length of moving material into predetermined lengths, the combination of a disk cutter mounted for rotation about its central axis and also for revolution about a fixed axis substantially perpendicular to said central axis, means for revolving the disk about said fixed axis, a gear train connecting said last mentioned means and said disk cutter whereby revolution of the disk about said fixed axis causes the disk to rotate about its central axis, and means in said gear train for changing the relative speeds of revolution and rotation of said disk cutter.

10. In a machine for cutting a continuously formed length of moving material into predetermined lengths, the combination of a disk cutter mounted for rotation about its central axis and also for rotation about a fixed axis passing through the central axis in the plane of the disk, means for rotating the disk about said fixed axis, means operative upon such rotation to rotate the disk about its central axis, and means for guiding the moving material into the cutting zone of the rotating disk.

11. In a machine for cutting a continuously formed length of moving material into predetermined lengths, the combination of a disk cutter mounted for rotation about a fixed axis lying in the plane of the disk and passing through the center of the disk, means for rotating the disk about said fixed axis, means for rotating the disk simultaneously about its central axis, and means for guiding the mov-

ing material into the cutting zone of the rotating disk.

12. In a machine for cutting a continuously formed length of moving material into predetermined lengths, the combination of a disk cutter mounted for rotation about a fixed axis lying in the plane of and passing through the disk, means for rotating the disk about said fixed axis, means for rotating the disk simultaneously about its central axis, and means for guiding the moving material into the cutting zone of the rotating disk.

In testimony whereof, I have signed my name to this specification this nineteenth day of August 1930.

EUGENE CONTI.