Jan. 19, 1932. R. B. LONG 1,841,967

CAM OPERATED KNIFE CONSTRUCTION

Filed Nov. 28, 1927

Fig. 1.

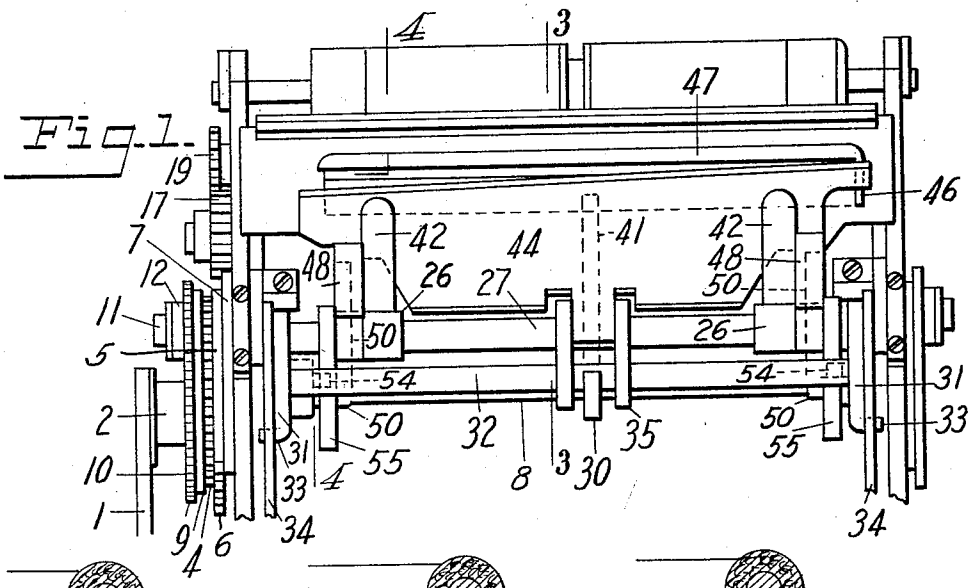


Fig. 4.

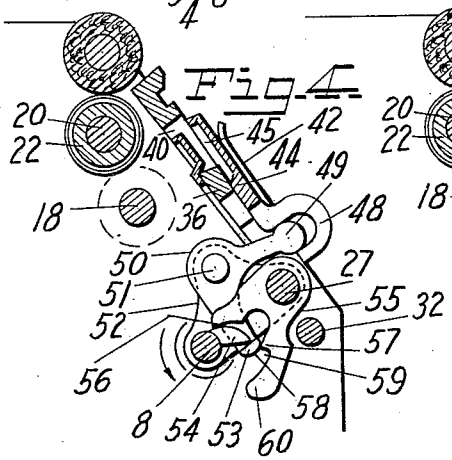


Fig. 5.

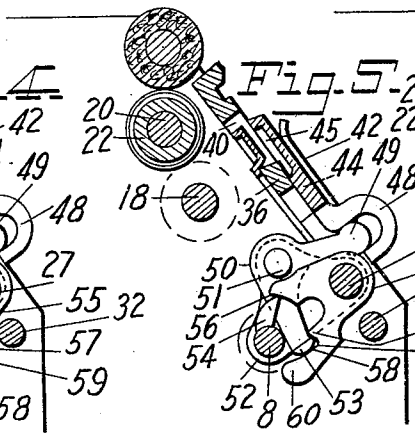


Fig. 6.

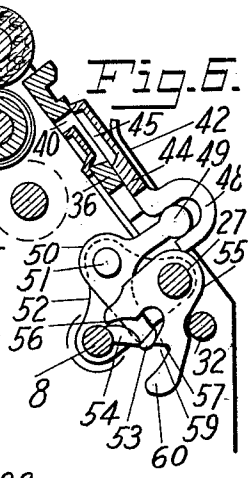


Fig. 2.

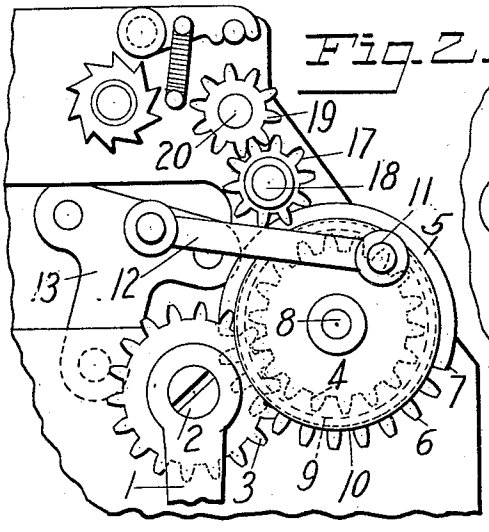
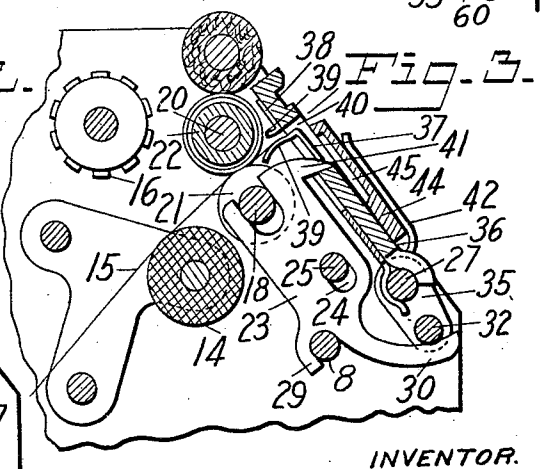


Fig. 3.



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Patented Jan. 19, 1932 1,841,967

UNITED STATES PATENT OFFICE

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CAM OPERATED KNIFE CONSTRUCTION

Application filed November 28, 1927. Serial No. 236,202.

This invention is a modification of the structure shown in the application of John F. Ohmer and Robert B. Long, Serial No. 220,765, filed September 20, 1927, and constitutes an improvement thereon in that a single cam is employed to raise and lower the movable knife plate. The single cam may, in fact, be in duplicate but each of the cams would perform exactly the same function. Reference is made to the said copending application for a more detailed discussion of the advantages and merits of a knife of the construction shown herein.

The attached drawings show the preferred embodiment of my improved construction in which—

Fig. 1 is a front elevational view of a portion of a machine having incorporated therein my knife construction.

Fig. 2 is an elevational view of the left hand side of the machine shown in Fig. 1.

Fig. 3 is a cross-sectional view on the line 3—3 of Fig. 1.

Figs. 4, 5 and 6 are detail cross-sectional views on the line 4—4 of Fig. 1.

Fig. 4 shows the parts in normal position.

Fig. 5 shows the same parts after the cam has made a portion of a revolution and has completely lowered the movable knife, and

Fig. 6 shows the same parts after the cam has practically completed its revolution, and has severed the paper.

The operating handle 1 is secured to a shaft 2 which carries a gear 3 which meshes with a gear 4 attached to a disk 5 provided with teeth 6 for a portion of its circumference forming a segmental gear. The disk 5 is attached to a disk 7 which has a radius equal to the pitch radius of the teeth 6. The gear 4, disk 5 and disk 7 are rotatably mounted on the shaft 8 but are operatively connected with a disk 9 and ratchet 10 which form a full-stroke mechanism. If the full-stroke mechanism is not desired, the gear 4 may be directly secured to the shaft 8.

The ratchet 10 is provided with a stud pin 11 which operates a pitman 12 which actuates an oscillating printing carrier 13 which carries platens 14, one of which is shown in Fig. 3, which press a strip of paper 15 against type wheels 16. The disk 5, segmental gear 6 and disk 7 cooperate with a Geneva pinion 17 attached to a shaft 18, which pinion drives a pinion 19 on a shaft 20. The shafts 18 and 20 are provided with feed rollers 21 and 22 respectively between which the paper strip 15 is fed after being printed, from whence it passes through the knife mechanism, hereinafter to be described, where the printed ticket or receipt is sheared from the paper strip 15 and delivered to the customer or passenger.

A locking plate 23 is bifurcated at its upper end and receives the shaft 18 in the bifurcation. It is provided with a slot 24 which receives a cross-bar 25 mounted on standards 26 secured to a cross-bar 27. The standards 26 are furthermore provided with cutaway portions (not shown) which receive the rotatable shaft 8 thereby holding the standards against turning. The lower end of the locking plate 23 is provided with a rearwardly and downwardly extending arm 29 which engages the shaft 8 and serves as a stop for the locking plate 23. The locking plate 23 is also provided with a downwardly and forwardly extending arm 30. Arms 31 are rotatably mounted on the cross-bar 27, which arms carry a rod 32. The arms 31 are provided with outwardly extending lugs 33 which may be engaged by levers 34 mounted on the cross-bar 27. Arms 35 also connect the cross-bar 27 and the rod 32. The stationary knife 36 has secured thereto plates 37 and 38 having rearwardly extending guides 39 for the paper. It is also provided with an aperture 40 through which the paper is fed. The upper end of the locking plate 23 is provided with a forwardly and downwardly extending lug 41 which moves the stationary knife 36 immediately below the aperture 40, locking the knife mechanism into position.

To insert the knife mechanism the levers 34 are raised so as to disengage the lugs 33 on the arms 31. The rod 32 is then swung outwardly and the locking plate 23 is manually raised. The lower end of the stationary knife 36 and the lower end of the plate 37 are curved oppositely, forming an opening which

receives the cross-bar 27. The plate 37 is made of resilient metal so as to resiliently clamp the cross-bar 27 between the lower end of the stationary knife and the plate 37. The knife construction is then pressed rearwardly so that the lug 41 of the locking plate 23 engages the stationary knife 36, slightly below the aperture 40. The rod 32 is moved rearwardly so as to engage the forward arm 30 of the locking plate 23, clamping the lug 41 to the stationary knife. The levers 34 then move downwardly, locking the arms 31 and 35 against movement. The knife mechanism may be readily removed by reversing the above mentioned operation.

Substantially U-shaped springs 42 are secured to the stationary knife 36 by any convenient means, which springs extend forwardly of the knife and press the movable knife 44 toward the stationary knife 36. There are two such springs 42 near the opposite ends of the movable knife. The movable knife 44 is provided with a channel 45 which extends throughout the length thereof and from a point shortly beneath the top or cutting edge thereof to near the bottom. The stationary knife 36 is provided with an upwardly extending guide 46 and a horizontal guide 47, which guides 46 and 47 form the guiding plate of the movable knife, but there is no similar guide on the left hand side of the knife. From Fig. 1 it will be noticed that the upper or cutting edge of the movable knife is not parallel to the lower edge of the guide 47 which forms the cutting edge of the stationary knife. Furthermore, since the springs 42 press the movable knife toward the stationary knife and since the guide 46 supports one end of the movable knife but there is nothing to support the other end thereof, the plane of the movable knife does not coincide with the plane of the stationary knife when the shearing action is commenced, but as the shearing action progresses the movable knife is raised, traveling along the guide 46 and each successive point of the cutting edge of the movable knife engages the cutting edge of the guide 47 of the stationary knife, so that when the action of shearing is completed the two knife edges lie in the same plane. When the knife is in its lower position as shown in Figs. 4 and 5, the knife edges are not in the same plane. As a matter of fact, they form something of a V with the point of the V on the guide 46. This is caused by the guide 46 holding out the right-hand edge (Fig. 1) of the movable knife while the left-hand spring 42 presses the left-hand end thereof inwardly. However, as the knife is raised into the position shown in Fig. 6 the right-hand end of the movable knife remains supported either by the guides 46 or 47 while the left-hand end thereof is gradually raised by the guide 47 against the tension of the left-hand spring 42 so that at the end of the cutting stroke the left-hand edge of the movable knife has been moved outwardly just as far as the right-hand edge thereof. In this position both the right-hand end and the left-hand end of the movable knife rest on the guide 47 and the two edges which are pressed together lie in the same plane. This action brings each and every point of the movable knife edge into contact with the corresponding point of the stationary knife edge so that almost the entire force of the springs 42 is successively exerted on the succeeding portions of the paper so that the knife edges will sever the same even though the knife edges might not be perfectly straight or might be warped slightly. Furthermore, as the knife travels upwardly, as soon as the cutting edge of the movable knife has moved over the horizontal guide 47 of the stationary knife the channel 45 receives that portion of the horizontal guide 47 to the right of the cutting edge as viewed in Fig. 1 so that it will prevent any tendency of that part of the movable knife which has completed the severing operation from holding that part which has not completed the same away from the stationary knife. This construction also insures that each of the knife edges will sharpen the other knife edge.

The lower portion of the movable knife 44 is provided with a V-shaped hook 48 which receives a knob 49 of a bell crank lever 50 pivoted on a pin 51 secured to a plate 52 mounted on the shaft 8 and cross-bar 27. The other end of the bell crank lever 50 is provided with an offset lug 53 which projects into the path of movement of the cam 54 rigidly secured to the shaft 8. A bell crank lever 55 is pivoted on the cross-bar 27. One arm of the bell crank lever 55 is provided with a cam surface 56 which is engaged by the said cam 54. The other arm of the bell crank lever 55 is provided with a cam 57 which engages the lower beveled edge 58 of the lug 53. Beyond the cam 57 is a recess 59 to receive the lug 53 and the second arm of the bell crank lever 55 terminates in a cam portion 60.

The parts are normally in the position shown in Fig. 4, at which time the crank handle 1 is directly below the shaft 2. As the crank handle 1 starts its operation the shaft 8 is rotated with it. The cam 54 is in engagement with the cam surface 56. As the cam 54 rotates in a counter-clockwise direction as viewed in Fig. 4 it rotates the bell crank lever 55 in a clockwise direction so that the cam 57 engages the lower beveled surface 58 of the lug 53, rotating the bell crank lever 50 clockwise and lowering the movable knife 44 from the position shown in Fig. 4 to that shown in Fig. 5. The movable knife 44 is now held in this position by the lug 53 engaging the forward side of the recess 59 as is clearly shown in Fig. 5. As the cam 54 continues

this rotation it engages the cam portion 60 of the bell crank lever 55, rotating the lever 55 in a counter-clockwise direction and thereby lowering the forward edge of the recess 59 below the lug 53 or into the position shown in Fig. 6. The cam 54 now engages the lug 53 of the bell crank lever 50 rotating the bell crank lever 50 in a counter-clockwise direction and raising the knife into the position shown in Fig. 6 and severing the paper. When the cam 54 has passed the lug 53 it engages for a second time the cam surface 56, rotating the bell crank lever 55 in a clockwise direction so that the cam 57 again engages the beveled surface 58 of the lug 53 thereby slightly rotating the bell crank lever 50 in a clockwise direction and lowering the knife 44 from the position shown in Fig. 6 to that shown in Fig. 4 and thereby completing the operation. It is necessary to lower the knife as last described so that in case the paper 15 has been completely consumed a new roll could be inserted in the machine and one end thereof passed through the opening 40. If the knife closed this opening it would be impossible to insert the end of a new roll of paper.

It is, therefore, obvious that the cam 54 performs the function of first lowering the knife, then raising it and slightly lowering it. In the said application of John F. Ohmer and Robert B. Long, Serial No. 220,765, a cam raised the knife and springs were employed to lower the same, whereas in this application a cam performs the function of both raising and lowering the knife. The cam, therefore, serves as a means to positively raise and lower the knife blade whereas in the said application there were no positive means to lower the knife. I used the word "positively" in contradistinction to a spring means to accomplish this function.

Having now described my invention, I claim:

1. In combination, a knife, a cam, means whereby said cam is rotated, a plurality of interconnected levers operated thereby and both lying in the path of movement of said cam and means whereby said knife is operated by said levers so that it is initially actuated in one direction and is then positively actuated in the opposite direction.

2. In a knife construction, a knife, a cam, a lever connected to said knife, a second lever actuated by said cam and operating said first lever to move said knife, said cam subsequently engaging said first lever and actuating said knife in the opposite direction.

3. In a knife construction, a knife, a cam, a lever, a lug carried by said lever, a second lever actuated by said cam and thereby moving said lug to operate said first lever to move said knife, said cam subsequently engaging said lug and actuating said knife in the opposite direction.

4. In a knife construction, a knife, a cam, means whereby said cam is rotated, a lever interposed between said cam and knife, a lug on said lever, a second lever rotatable by said cam on its initial rotation to rock said second lever into contact with said lug and thereby rock said first lever to actuate said knife, and means to positively actuate said knife in the opposite direction to that of its first movement.

5. In a knife construction, a cam, a lever rocked in one direction by said cam, a second lever rocked by said cam and actuating said first mentioned lever in the opposite direction to that induced by the cam on said first lever, a knife, a hook secured to said knife and operatively connected to said first mentioned lever.

6. In combination, a rotatable cam, a reciprocable knife, a lever directly engagable with said cam during a portion of its rotation to actuate said knife on its cutting stroke, a second lever provided with a surface with which said cam will contact to rock said second lever, and means interconnecting said levers to rock said first mentioned lever on the first part of the rotation of said cam to retract said movable knife.

7. In combination, a cam, means whereby said cam is rotated a plurality of interconnected levers lying in the path of movement of said cam, a reciprocable knife operatively connected to one of said levers, said cam acting on said levers to first lower said knife, then raise it and then lower it to initial position.

In testimony whereof I affix my signature.

ROBERT B. LONG.