Nov. 1, 1927. 1,647,352

J. F. HALSTEAD

CIGARETTE MACHINE CUT-OFF

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Fig. 1.

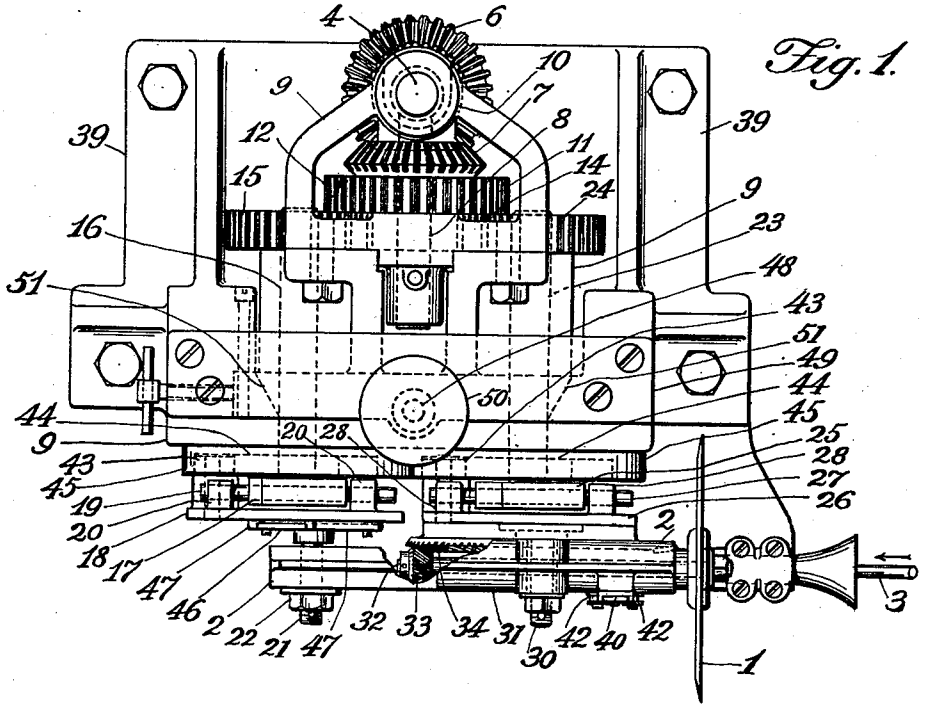
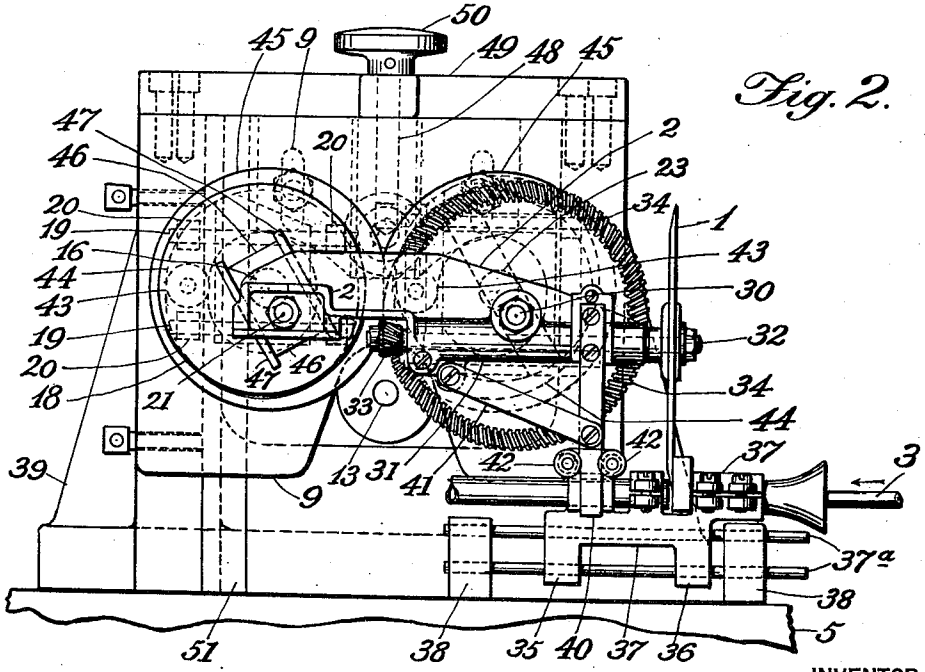



Fig. 2.




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Fig. 3.

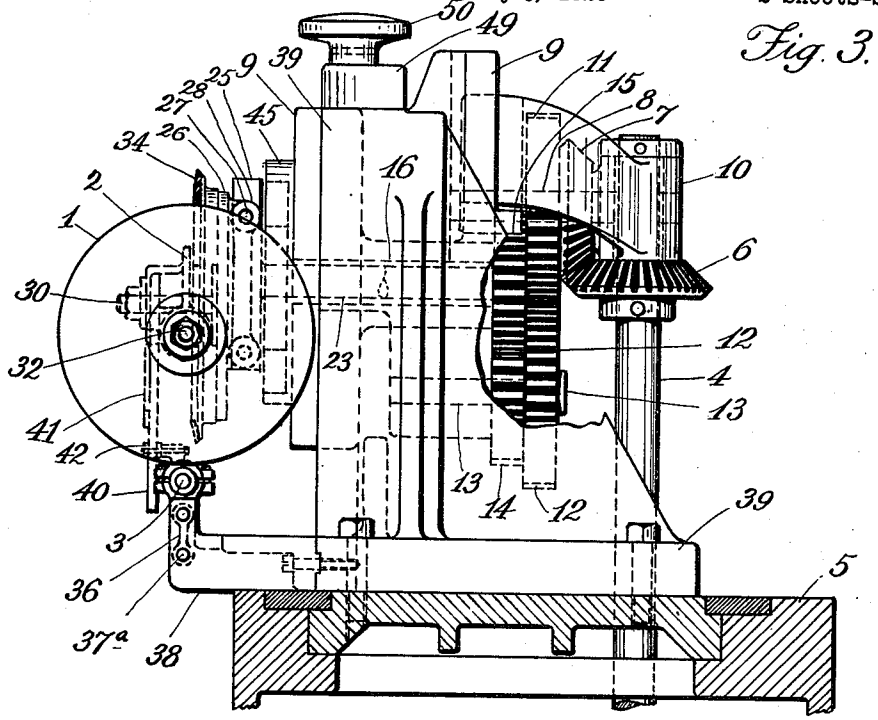
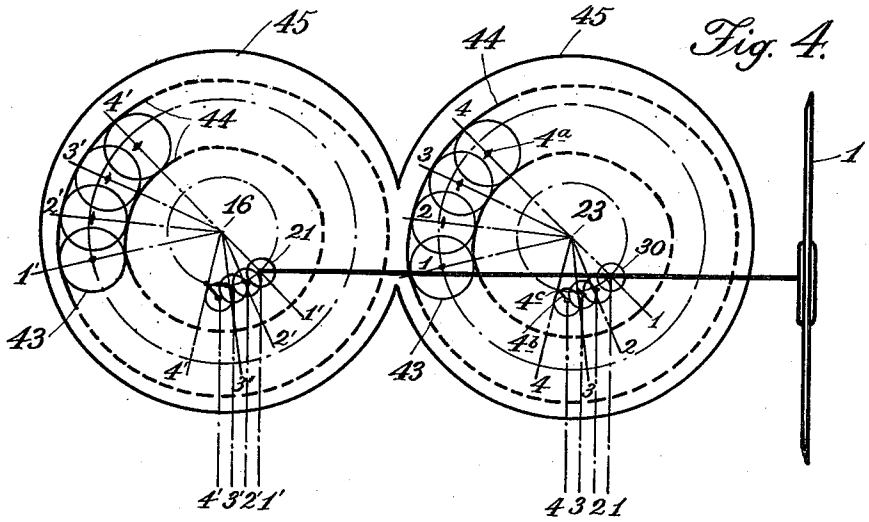



Fig. 4.




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# UNITED STATES PATENT OFFICE.

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## CIGARETTE-MACHINE CUT-OFF.

Application filed May 5, 1925. Serial No. 28,157.

This invention relates to cutting off mechanism for cigarette machines of the continuous rod type to enable cigarette lengths to be readily cut off from the continuous cigarette rod.

The object of the invention is to provide an improved cutting off mechanism which may be run at high speed with less vibration than with previous forms of mechanism and in which the cutting knife is moved uniformly with the cigarette rod during the cutting operation.

The invention consists in a cutting off mechanism for cigarette machines, comprising means for producing continuous movement of the cutting knife and its carrier in an orbital path about an axis at right angles to and offset from the path of movement of the cigarette rod, said means being such as to cause uniform forward movement of the knife and cigarette rod throughout the time the knife is in engagement with and is effecting the cutting of the cigarette rod.

Other subsidiary features of the invention will be set forth hereinafter and will be clearly pointed out in the appended claims.

The improved cutoff mechanism is illustrated in one form thereof in the accompanying drawings in which:

Fig. 1 is a plan view of the cutoff mechanism.

Fig. 2 is a front elevation of the mechanism.

Fig. 3 is a side elevation of the mechanism, and

Fig. 4 is a diagram illustrating the action of the cams controlling the movement of the cutting knife as hereinafter referred to.

The improved cutoff mechanism in the particular form thereof shown in the drawings comprises a circular rotatable cutoff knife 1 and a carrier 2 therefor which are arranged to be moved continuously in an orbital path about an axis at right angles to and offset from the path of movement of the cigarette rod 3 to cause the knife during a part of its orbital movement to engage and cut the cigarette rod as the latter moves forwardly or in the direction of the arrows in Figs. 1 and 2, and means are provided for insuring that the cutoff knife will move forwardly with the cigarette rod at a uniform speed during the cutting operation.

The mechanism for effecting the orbital movement of the knife 1 and carrier 2 includes a vertical shaft 4 which may be driven in any suitable manner from one of the shafts of the cigarette machine with which the cutoff mechanism is associated, a part of the framework of such machine being shown at 5. The shaft 4 has secured thereto a bevel gear 6 which meshes with another bevel gear 7 mounted on a shaft 8 carried by a frame 9 which also carries a bearing 10 for the upper end of the shaft 4. Secured to the bevel gear 7, or to the shaft 8 to rotate with said bevel gear, is a spur gear 11 meshing with a change gear 12 on a shaft 13 carried by the frame 9. Connected to rotate with the gear 12 is another gear 14 which in turn meshes with a gear 15 secured to one end of a shaft 16 rotatably supported in bearings in the aforesaid frame 9.

To the other end of the shaft 16 is secured a driving head 17 for driving a disc 18, the driving connection between the head 17 and the disc 18 being such as to permit a relative movement between the head and disc for a purpose to be later described. The particular form of driving connection shown comprises a pair of rods 19 carried by the head 17 and lugs or projections 20 on the rear face of the disc 18 which lugs or projections are apertured to fit over and to slide upon the rods 19.

Carried by the disc 18 in an eccentric position is a crankpin 21 upon which the carrier 2 of the cutoff knife 1 is mounted being held in place by a nut 22. It will be understood that when the shaft 16 is rotated, it will rotate the disc 18 through the head 17 and driving connection 19, 20, and the crankpin 21 and the knife carrier mounted thereon will receive an orbital movement about the axis of said shaft 16.

In order to insure that the knife carrier 2 and the knife carried thereby are maintained in proper upright position throughout the orbital movement thereof, a second shaft 23 is rotatably mounted in the frame 9 in spaced relation to the shaft 16 as shown, this shaft 23 having secured to its rear end a gear 24 meshing with the before mentioned gear 14 and having secured to its front end a driving head 25 which is connected to rotate a disc 26 through a driving connection including rods 27 on the head and lugs 28 on the disc 26 similar to the driving connection between the head 17 and disc 18 al-

ready described. The disc 26 carries a crankpin 30 eccentrically positioned thereon in a similar manner to the positioning of the crankpin 21 on the disc 18. The carrier 2 for the cutoff knife connects together and is mounted upon both crank pins 21, 30 so that during the orbital movement of the carrier it is always maintained in positions parallel to that shown in Fig. 2 of the drawings.

The carrier 2 includes a suitable bearing portion 31 for the knife shaft 32 upon one end of which the circular knife 1 is secured. To the other end of the knife shaft 32 is secured a spiral bevel pinion 33 which meshes with a spiral bevel gear 34 which is secured upon the crankpin 30. With this arrangement it will be seen that as the crankpin 30 which is secured to the disc 18 is revolved about the axis of the shaft 16 it will be turned about its own axis with respect to the knife carrier 2, and as the bevel gear 34 is secured to the crankpin it will also be turned about the axis of the pin with respect to the knife carrier and during such turning movement will revolve the pinion 33, knife shaft 32 and cutoff knife 1 secured thereto. The knife will thus be driven continuously during its orbital movement.

To support the cigarette rod 3 which is to be cut by the knife 1, guides 35, 36 are provided carried by a support 37 which is adapted to be reciprocated in a straight line upon suitable guide rods $37^a$ carried by brackets 38 which may be suitably secured to or carried by the main framework 39 of the cutoff mechanism. In order to secure proper reciprocation of the support 37 it derives its motion from the orbital movement of the knife carrier 2, and to this end a bar 40 is secured to and extends downwardly from the knife carrier, being braced by a brace 41, the lower end of the bar 40 being slidably associated with the support 37, for example extending between two roller guides 42 carried by said support. Thus during the orbital movement of the carrier the bar 40 will be permitted to slide vertically relatively to the support 37 but will effect movement of the latter horizontally along the guides $37^a$.

With the arrangement as described, the rotating cutting knife 1 receives an orbital movement and is brought into engagement with the cigarette rod to cut the same as it passes downwardly and horizontally along the lower part of this orbital path. The horizontal movement of the knife along this lower part of the path unless corrected will not be a uniform movement, and the cigarette rod would be liable to be damaged or improperly cut by the action of the cutting knife. To correct this, means are provided for insuring that the cutting knife receives a uniform horizontal movement during the time it is in engagement with and is effecting the cutting of the cigarette rod. Such means comprises cam rolls 43 carried by and extending rearwardly from the discs 18 and 26 and engaging in cam grooves 44 formed in stationary cams 45 carried by the framework. The action of these cam grooves will be readily understood from Fig. 4. In considering this diagram it will be understood that the knife starts to cut the cigarette rod when it, the carrier 2, the crankpins 21, 30 and the cam rolls 43 are in the positions marked 1 and 11 in the figure. It will also be understood that unless corrected the knife would move at a gradually increasing horizontal speed in moving from the position 1 through the positions 2, 3 and 4 indicated in the diagram. To correct this the cam grooves 44 are so shaped that during the movement of the cam rolls along the grooves from the position 1 through the positions 2, 3 and 4 the cam rolls are moved inwardly toward the axes of the shafts 16 and 23 and naturally the discs 18, 26 are moved along the rods 19, 27 respectively so as to move the crankpins 21, 30 outwardly away from the axes of the shafts 16, 23. This has the effect of retarding the normal movement of the crankpins to such an extent that the movement of the knife horizontally during the cutting operation is a uniform one as indicated by the vertical dot and dash lines 1, 2, 3 and 4 in Fig. 4 which indicate the successive positions of the crankpins and necessarily of the carrier 2 and knife 1. This will be clear when it is considered that the normal movement of the crankpin 21 during the cutting operation would be from the radial line 1 to the radial line 4 but during such angular movement the cam roll 43 has been moved inwardly by the cam groove 44 to the position $4^a$ and necessarily the crankpin 21 has been moved outwardly or backwardly along the line indicated by $4^b$ from the position which it would normally have assumed at $4^c$ to the position indicated by the vertical dot and dash line 4. A similar action will have occurred at the positions 2 and 3 the shape of the cam groove 44 being such that in moving from the position 1 through the positions 2, 3 and 4 the crankpins 21, 30 and necessarily the knife carrier and knife will have moved through uniform horizontal distances in uniform time intervals. This insures that the cutting knife during the cutting operation will move at a uniform speed with the cigarette rod so that the latter will be properly cut and will not be torn or damaged.

If desired, the crankpins 21, 30 may be mounted on the discs 18, 26 so as to be adjustable as to their distance from the axes of the shafts 16 and 23. This enables the extent of the orbital path through which the knife moves to be varied for the purpose of adjusting the cutoff mechanism to cut different

lengths of cigarette. This may be effected as shown more clearly in conjunction with the crankpin 21 in Fig. 2 by mounting this pin upon a plate 46 slidable between guides 47 on the disc 26 (or 18) and adapted to be secured in different adjusted positions by any suitable means.

The action of the cam grooves 44 as above described, not only produces a uniform horizontal speed of the knife but it also extends the dip of the knife downward as will be clear from Fig. 4 to make it possible to cut through cigarettes of extra large diameter.

Means may also be provided for raising and lowering the knife while the machine is in operation. For this purpose the frame 9 carrying the shafts 16 and 23 is adapted to be vertically adjusted with respect to the main framework 39 by means of a screw 48 between said frame 9 and the top plate 49 of the main frame, the screw being provided with an adjusting head 50. The frame 9 is vertically slidable on the dovetailed guides 51 on the main frame.

What is claimed is:

1. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line, of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut.

2. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line, of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut, said mechanism including means for effecting retardation of the normal orbital movement of said knife while effecting said cut.

3. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line, of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut, said mechanism including cam-actuated means for effecting retardation of the normal orbital movement of said knife while effecting said cut.

4. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line, of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut, said mechanism including a crankpin for moving said knife along its orbital path, and means for moving said crankpin radially with respect to said axis while the knife is effecting said cut.

5. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line, of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut, said mechanism including a crankpin for moving said knife along its orbital path, a disc carrying said crankpin, and means for moving said disc and said crankpin radially with respect to said axis while the knife is effecting said cut.

6. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line, of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut, said mechanism including a crankpin for moving said knife along its orbital path, a disc carrying said crankpin, a shaft driving said disc, and means for moving said disc and said crank-

pin radially with respect to said shaft while the knife is effecting said cut.

7. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line, of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut, said mechanism including a crankpin for moving said knife along its orbital path, a disc carrying said crankpin, a shaft driving said disc and having a driving head provided with guide rods upon which said disc is radially slidable, and means for moving said disc on said rods.

8. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line, of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut, said mechanism including a crankpin for moving said knife along its orbital path, a disc carrying said crankpin, a shaft driving said disc and having a driving head provided with guide rods upon which said disc is radially slidable, a stationary cam, and a cam bowl carried by said disc and actuated by said cam to move said disc on said rods.

9. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line, of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut, said mechanism including a crankpin for moving said knife along its orbital path, and gearing one member of which is carried by said crankpin to operate said knife.

10. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line, of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut, and means for raising and lowering said knife during machine operation.

11. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut, and screw-actuated means for raising and lowering said knife during machine operation.

12. In a cigarette machine cutoff, the combination with means for guiding a cigarette rod in a right line, of a knife coacting with said guiding means to cut said rod, and mechanism including two shafts and operative connections for maintaining said knife in a vertical position and for producing a movement of said knife in an orbital path about an axis at right angles to and offset from the path of said rod and embracing a forward movement which is equal to the forward movement of said rod throughout the time the knife is in engagement with said rod and effecting said cut, and means for varying the extent of the orbital path of said knife to enable cigarettes of different length to be cut from the cigarette rod.

In testimony whereof, I have signed my name to this specification.

JOHN FREDERIK HALSTEAD.