

[54] **CUTTING APPARATUS**

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[56]

References Cited

UNITED STATES PATENTS

3,318,351	5/1967	Werder.....	83/596 X
360,715	4/1887	Miller	83/595 X
2,126,458	8/1938	Englen	83/355 X
3,572,412	3/1971	Reifenhaeuser	83/355
1,572,393	2/1926	Koerner	83/666 X

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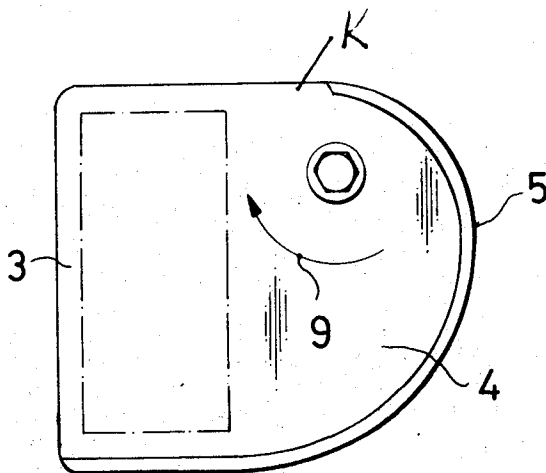
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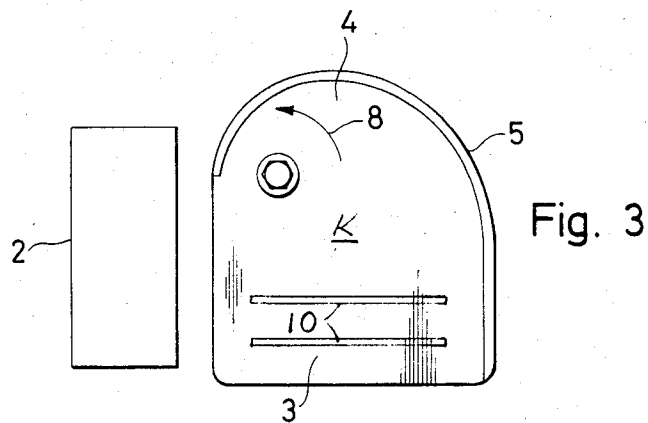
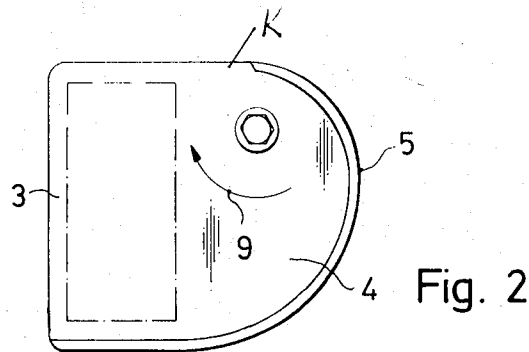
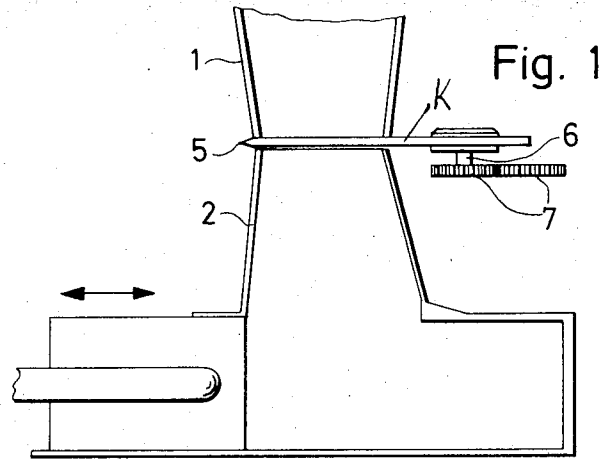
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ABSTRACT

The present cutting apparatus includes a rotatable knife having an arc-shaped cutting edge extending over an angle of approximately 270° for cutting transversely in a pulling manner through an intermittently fed stream of material, and a rear portion having a shape adapted for covering the portion of the material stream cut off by the cutting portion.

11 Claims, 3 Drawing Figures





CUTTING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to a cutting apparatus and knife for cutting through an intermittently fed stream of a material in a direction transverse to the stream while simultaneously covering up the cut off portion of the stream of material.

For dividing materials such as food stuffs, for instance meat, into portions it is known to feed a stream of such material through an upper inlet opening into a magazine having a size corresponding to the size of the portion. The magazine is equipped with a cover in the form of a cutting bar which is reciprocable and/or tiltable in the plane of the inlet opening. The cutting bar during its movement from a rest position outside the inlet opening to its position in which it covers the inlet opening, cuts off the portion of the stream of material fed into the magazine from that above the inlet opening. The material stream above or outside the magazine is held back until the magazine has been emptied. Moreover, the cutting bar has the function of preventing any of the material filled into the magazine from escaping again through the inlet opening if the material in the magazine is being compressed.

Depending on the consistency of the material the cutting bar is incapable of performing either of the two functions satisfactorily. For example, in order to cut through a stream of raw meat, a large force has to be exerted by the cutting edge of the cutting bar since the cutting edge becomes simultaneously effective over the entire width or length of the magazine. With decreasing sharpness of the cutting edge this force has become larger and larger and eventually leads to squeezing the meat at least over a portion of the intended cut and to fraying of the meat.

In order to at least reduce this serious drawback, it has already been suggested to arrange the cutting bar so that its cutting edge extends at an angle with respect to the magazine. Since the angle of inclination can only be rather small because of the additional function of the cutting bar as a cover member for the magazine, the force for the cutting operation can be reduced only insignificantly and thus also the danger of the meat being squeezed and frayed. With an increasing angle of inclination it is also necessary to increase the width of the cutting bar in order to assure that upon completion of the cutting operation the magazine will be covered completely. However, the demands upon a relatively long cutting knife to properly cover the magazine are too high especially if it has to counteract the forces resulting from the compression of the material in the magazine.

OBJECTS OF THE INVENTION

In view of the above, it is the aim of the invention to achieve the following objects singly or in combination:

to overcome the above mentioned drawbacks of prior art cutting devices;

to provide a knife for cutting through an intermittent stream of material, which can easily do so with a minimum of force and without distorting, fraying or squeezing excessively the material to be cut;

to provide a knife which, in addition to being able to cut the stream of material easily, can cover up the cut-off portion of the stream of material satisfactorily, even

where the cut off portion is subjected to substantially compressing forces; and

to provide a cutting apparatus adapted for cooperation with the present cutting knife.

SUMMARY OF THE INVENTION

According to the invention there is provided a rotatable or tiltable cutting knife comprising a curved cutting edge which is adapted to be drawn through an intermittently advancing stream of material so that a covering portion in back of said curved cutting edge may cover the portion of cut off material. The curved cutting edge has preferably the shape of a spiral or evolvent over a range of about 270°.

The present apparatus has a material receiving chamber and an inlet funnel separated by a gap through which the knife is drawn. The shape of the sectional area of the gap corresponds substantially to the covering portion of the knife which is shaped and driven in such a manner that during its motion toward the covering position in which the covering portion of the knife closes off the receiving chamber from the funnel, the edge of the knife is drawn gradually through the stream of material in the gap.

The drawing cutting motion has the advantage that the instantaneous cutting length is maintained within a short range whereby the required cutting forces are reduced. The pulling or drawing cut according to the invention has the further advantage that as compared to a straight cutting edge which is shifted or journaled, the present knife need not be as sharp and nevertheless, the material will not be squashed.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be clearly understood, it will now be described, by way of example, with reference to the accompanying drawings, wherein:

FIG. 1 is a side view of a portioning device with a knife according to the invention shown in its closing position;

FIG. 2 is a top view of the knife in the closing position of FIG. 1; and

FIG. 3 is a top view of the knife in its withdrawn position.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS:

The portioning device shown in FIG. 1 divides a stream of material, such as meat into portions, for instance, for compressing. The device comprises a funnel 1 which is arranged above the inlet of a magazine 2. Between the funnel 1 and the magazine 2 there is a gap of sufficient width to permit the passage of a knife K which is arranged for movement in the plane of the gap.

The knife K comprises a covering portion 3 for covering the magazine inlet opening and a cutting portion 4 with an arc-shaped cutting edge 5. Preferably, the shape of the cutting edge 5 is that of an evolvent or spiral. In the area of the cutting portion 4, the knife comprises means for eccentrically journaling the knife on a stationarily supported shaft 6. The knife may also be fixed to the shaft and the shaft journaled in a housing not shown. In any event the knife is rotatable through an angle of about 270° about the axis of the shaft by means of a pair of gears 7 between the positions shown in FIG. 2 and FIG. 3. When the knife is rotated from the FIG. 3 to the FIG. 2 position in the direction of the

arrow 8, the knife cuts through the stream of material with a so called "pulling" cut as explained further below. When it reaches the position shown in FIG. 2 it covers the inlet opening of the magazine 2, whereby the material in the magazine cannot escape therefrom even if it is subjected to pressure.

In order to release the stream of material again, the knife is rotated in the direction of the arrow 9 from the FIG. 2 position to the FIG. 3 position. The material can flow until the magazine 2 is filled again whereupon the knife motions are repeated.

The above mentioned "pulling" cut means that the knife edge 5 is drawn gradually through the material rather than pushed through the material as is the case with a cutting bar. The active or effective length of the cutting edge is thus held within rather narrow limits thus requiring only a relatively small force for the cutting of the material.

Due to the reduced cutting force the sharpness of the knife is not of critical importance in contrast to the prior art reciprocating or tilting cutting bar. In addition the material is not squeezed or squashed in the area being cut. The covering portion 3 of the knife K does not have to perform a cutting function and can therefore be made sturdy without interfering with the cutting function of the cutting portion 4 of the knife. More specifically, the covering portion 3 can be made rigid by reinforcing ribs 10 or the like so that it can withstand without deformation the forces resulting from the compression of the cut off material in the magazine.

The particular shape of the cutting knife according to this invention is also more advantageous than a circular knife which could perform the covering function only when having a relatively large diameter. Besides a circular knife cannot be reinforced by ribs or the like.

The eccentricity of the drive shaft for the knife K is such that in its rest position neither the cutting nor the covering portion impedes the stream of material, whereas during the cutting operation the knife cuts through the stationary material with a "pulling" cut until the covering portion is fully located in the cross-sectional plane of the gap. In this respect the knife according to the invention also favorably distinguishes itself from a centrally driven, circular knife which in addition to a rotational drive for the cutting also requires a reciprocating drive with corresponding guiding means for displacing the knife axis parallel to itself.

The eccentric arrangement of the shaft driving the knife permits rotating the knife through about 270° from a rest position not interfering with the stream of material transversely through the stream into the covering position whereby the covering portion of the knife does not have to extend substantially outside the cross-section of the stream. Incidentally, the present shape of the cutting edge assures a continuous movement of the instantaneous cutting point along the cutting line and not perpendicularly thereto.

Although the operation of the present cutting knife has been described with reference to a back and forth tilting movement, it is also possible to rotate the knife according to the invention, whereby each revolution starting from a zero position will include a sequence of cutting, covering, and returning to said zero position. The cutting and covering will take up about 270° of one complete revolution and the return will take up about

90° of said one revolution. Thus, it is to be understood that the invention is not limited to the specific examples shown and described, but that it is intended to cover all modifications and equivalents within the scope of the appended claims.

What is claimed is:

1. In an apparatus for cutting an advancing stream of material, wherein the material is cut transversely of the direction of material advance, and wherein the severed portion of the material may be covered by the cutting means; the improvement comprising a funnel, a magazine positioned to receive material from the funnel, a gap between the funnel and magazine, and a rotatable knife positioned to extend into said gap, said knife having a first portion with a shape substantially corresponding to the cross sectional shape of the material stream in said gap and a second portion having a curved cutting edge merging into said first portion.

2. The apparatus of claim 1, wherein said cutting edge extends through an angle of between 180° and 270° with respect to the axis of rotation of the knife.

3. The apparatus of claim 1, wherein said rotatable knife comprises eccentric means for driving said knife in sequence through a drawing, cutting operation with said cutting edge extending into said gap, and a covering position wherein said first portion covers said cross sectional shape in the gap.

4. The apparatus of claim 1, wherein said cutting edge is spiral shaped.

5. The apparatus of claim 1, wherein said cutting edge defines an evolvent.

6. The apparatus of claim 1, further comprising reinforcing means on said first portion of said rotatable knife.

7. The apparatus of claim 1, comprising means journaling said knife for rotation.

8. The apparatus of claim 7, wherein said means journaling said knife for rotation comprises means journaling said knife for back and forth rotation about its axis.

9. The apparatus of claim 7, wherein said means for journaling comprises means positioned eccentrically with respect to said knife and spaced from said gap, whereby said knife has a first position in which all knife portions are withdrawn from the gap and a second position in which said first portion blocks the passage from the funnel into said magazine, whereby said cutting edge severs material in said gap in positions between said first and second position.

10. The apparatus of claim 1, further comprising means for positively driving said knife.

11. A cutting apparatus comprising funnel means for receiving material to be cut, a magazine aligned to receive material from said funnel, whereby a gap is formed between said funnel and said magazine, a rotatable knife positioned to extend into the gap, and means journaling said knife for movement in said gap transversely of the direction of material movement there-through, said knife having a first portion with a shape substantially corresponding to the shape of said gap, and a second curved portion having a cutting edge and merging with said first portion, whereby in one position of said knife, said gap is blocked by said first portion and in another position of said knife, said gap is unblocked.

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