Dec. 28, 1965 W. ENGI 3,225,802

SLICING MACHINE INCLUDING KNIFE SHARPENING MEANS

Filed Dec. 28, 1964 2 Sheets-Sheet 1

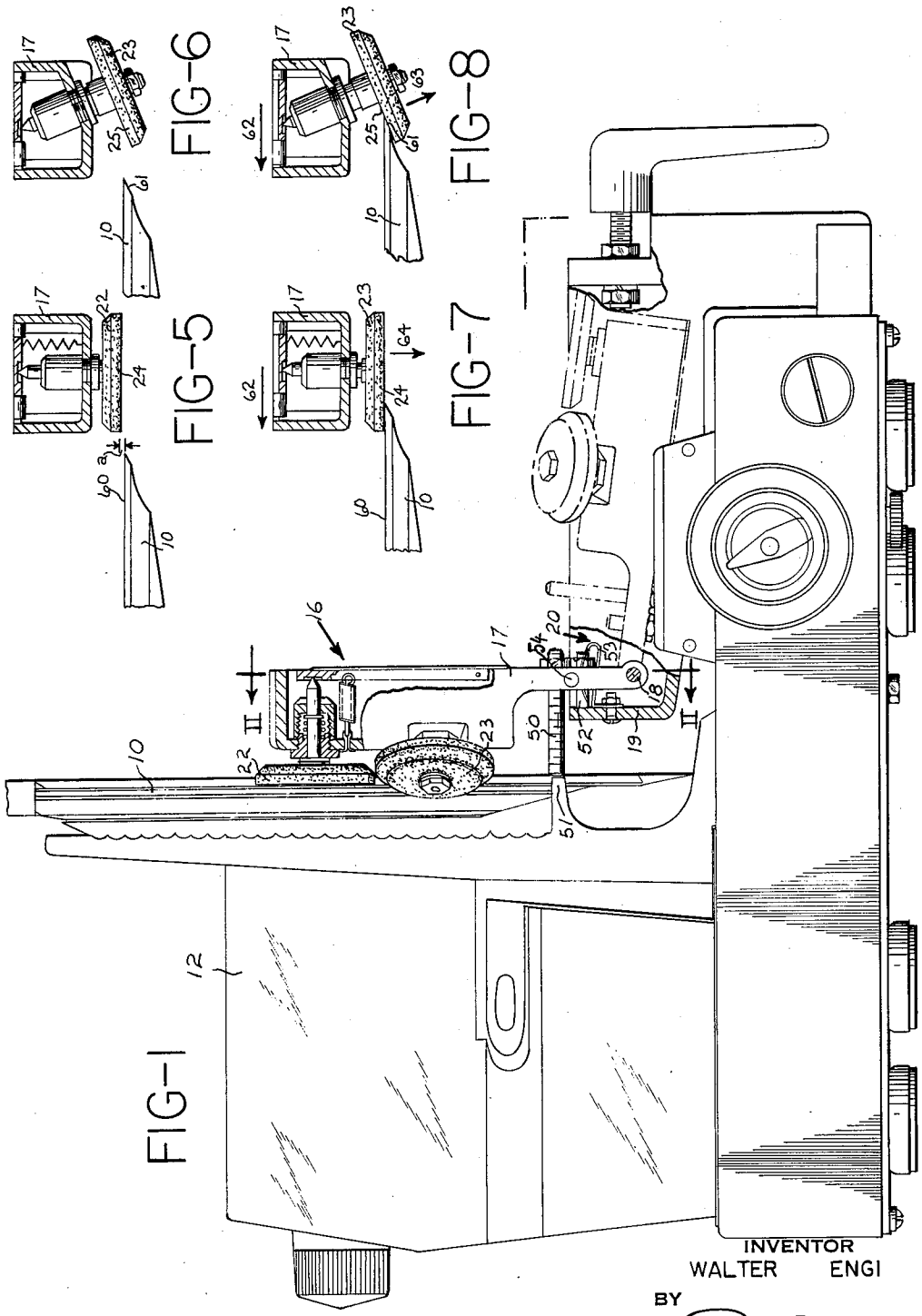

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FIG-3

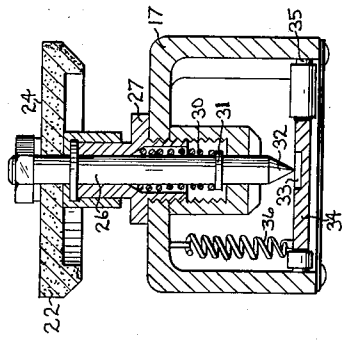
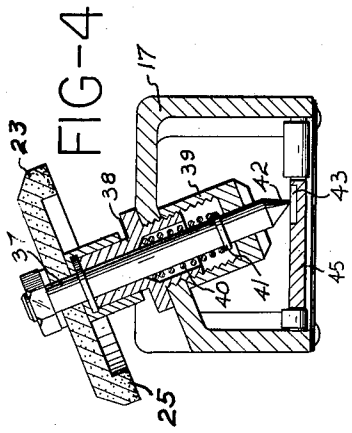


FIG-4



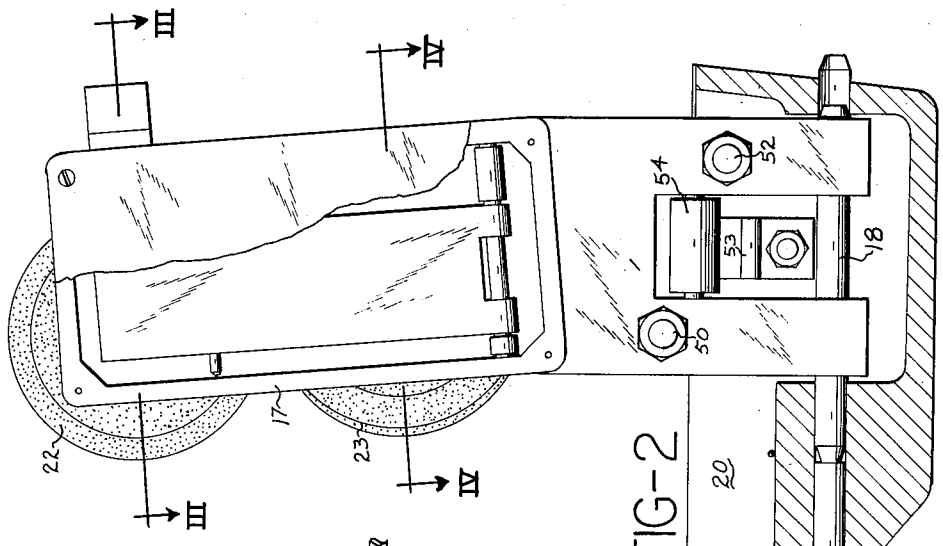


FIG-2

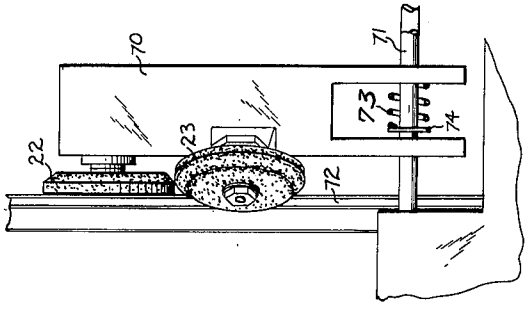


FIG-9

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SLICING MACHINE INCLUDING KNIFE SHARPENING MEANS

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Claims priority, application Switzerland, Mar. 13, 1961, 2,976/61
6 Claims. (Cl. 146—102)

This invention relates to a slicing machine having a rotary circular knife and more particularly to a sharpening device for the circular knife of a slicing machine and is a continuation-in-part of my application, Serial No. 178,-387, filed March 8, 1962, now Patent No. 3,182,700.

It is an object of the present invention to provide an arrangement for simplifying the sharpening operation of the circular knives of a slicing machine and to facilitate the operation to the point that it is substantially independent of the skill of the operator.

It is a further object of the invention to provide means for sharpening a circular knife of a slicing machine, which can be adjusted by the manufacturer to obtain accurately ascertained optimum sharpening results.

A further object of the invention is to provide a device which reduces the danger of accidents because, during a sharpening operation, the operator need not place his hands directly into the region of the knife.

It is a further object of the invention to provide a compact and simple sharpening device of the nature referred to, which may be operated and cleaned with great ease.

These and other objects of the invention will become apparent from the following description, taken in connection with the accompanying drawings, in which:

FIGURE 1 is a view of a slicing machine, partly broken away, looking in toward the edge of the blade and having a sharpening device thereon according to the present invention;

FIGURE 2 is a view indicated substantially on line II—II of FIGURE 1, drawn at a somewhat larger scale, and showing the sharpening device from the back;

FIGURE 3 is a plan sectional view indicated by line III—III on FIGURE 2 and showing one of the sharpening wheels of the sharpening device and the support therefor;

FIGURE 4 is another plan sectional view indicated by line IV—IV on FIGURE 2 and showing the other sharpening wheel of the sharpening device;

FIGURES 5 and 6 are somewhat diagrammatic sectional views showing the wheels of the sharpening device and their position relative to the blade to be sharpened before being moved into engagement with the blade;

FIGURES 7 and 8 are views similar to FIGURES 5 and 6 but showing the wheels after they have operatively engaged the blade to be sharpened; and

FIGURE 9 is a somewhat diagrammatic view showing a different supporting arrangement for the sharpening device in which the sharpening device moves bodily as the wheels operatively engage the blade to be sharpened.

Referring to the drawings somewhat more in detail, the slicing machine illustrated therein comprises a blade **10** which accomplishes the slicing, such as meat and the like, and which blade is to be sharpened by the device, according to the present invention. The knife is driven by a motor **12** and is mounted on a horizontal axis and thus rotates in a vertical plane.

A moveable platform, generally indicated at **14**, supports the material to be sliced and is moveable in a direction parallel to the plane of the knife to carry the material to be cut past the knife. The structure is, furthermore, provided with means for effecting step-wise advancement of the material to be cut toward the knife for slicing predetermined thicknesses therefrom.

The device for supporting the material to be cut and for moving it past the slicing knife and for causing stepwise advance of the material toward the knife are well known in the art and are not disclosed in great detail in the present application.

The present invention relates specifically to the arrangement of a knife sharpening unit, generally indicated at **16**, and which serves for effecting efficient, rapid and safe sharpening of the rotary circular cutting blade, or knife. Sharpening unit **16** comprises a frame **17** which is pivotally supported by pivot pin **18** on base member **19**, which may be a part of the platform on which the materials to be sliced are carried. Base portion **19** comprises a recess **20** in which the lower end of frame **17** of the sharpening device is disposed and wherein pivot pin **18** is disposed. This recess is of such a size that the sharpening device can be folded down into the recess as indicated in dot-dash outline in FIGURE 1.

FIGURE 2 will show pivot pin **18** has a knob **21** on one end so that the sharpening device can be detached or separated for cleaning purposes by drawing the pin **18** out of the bore.

The sharpening device, in addition to housing **17**, comprises an upper sharpening wheel **22** which rotates on an axis extending substantially perpendicular to the plane in which the rotary cutting knife runs and the face of wheel **22** which is to engage the cutting knife is normally spaced from the cutting knife toward the side of the cutting knife on which wheel **22** is disposed.

Frame **17** of the sharpening device carries a second cutting wheel **23** which may be disposed beneath cutting wheel **22** and which is mounted for rotation on an axis extending substantially horizontal but inclined relative to wheel **22** so that the plane of the operative cutting face of wheel **23** is inclined at an angle to a plane in which the cutting knife rotates and normally intersects the said plane in a region spaced radially from the cutting knife.

Referring to FIGURES 3 and 4, the operative cutting face of wheel **22** is indicated by reference numeral **24** and the operative cutting face of wheel **23** is indicated by reference numeral **25**. Both of the said wheels are preferably of abrasive material, such as carborundum, and are freely rotatable on or together with their respective axes.

FIGURE 3 will show that wheel **22** is fixed to a shaft **26** which is reciprocably and rotatably carried in bushing means consisting of a first threaded bushing part **27** which may be threaded through a wall of housing **17**, and a second bushing part **28** threaded to bushing **27** inside housing **17**. A spring **30** surrounding shaft **26** bears between the end of bushing **27** and a snap ring **31** on shaft **26** and urges the shaft continuously in a direction away from wheel **22**. The extreme end of shaft **26**, which is to say the end thereof opposite wheel **22**, is conical as at **32** and may advantageously be hardened and engages a recess **33** formed in a plate **34** pivoted on pivot pin **35** in housing **17**. The bottom of recess **33** should be preferably hardened, or hardened wear plate be placed therein, so that engagement of the plate with the wheel shaft will not materially interfere with free rotation of the wheel and shaft and also so that rapid wear between the shaft and plate is inhibited.

A spring 36 connected between plate 34 and housing 17 continuously biases plate 34 toward the left in FIGURE 1 and which is in a direction to cause wheel 22 to move toward the rotary slicing or cutting knife which it is to sharpen.

As will be seen in FIGURE 4, wheel 23 similarly fixed to a shaft 37, which is rotatably supported in bushing means comprising a first bushing part 38 which may be threaded through a wall of housing 17, a second bushing part 39 threaded to the end of bushing part 38. Spring 40 bearing between bushing part 38 and a collar 41 on shaft 37 continuously biases shaft 37 and wheel 23 in a direction to move wheel 23 toward housing 17. The end of shaft 37, opposite wheel 23, is conical as at 42 and bears on another recess 43 formed in plate 45. Recess 43 and at least the conical end part of shaft 37 are preferably hardened for reasons explained in connection with shaft 26 and recess 33.

The housing 17 of the sharpening device is provided with an upper stop screw 50 adapted for abuttingly engaging a rib 51 formed on a part of the carriage of the machine so as to locate the housing of the sharpening device when it is moved upwardly into operative position. A second stop screw 52 is also provided, which is also carried by the frame 17 of the device and which abuts against the end wall of recess 20.

The sharpening device is positioned in its operative position by a spring 53 connected to the end wall which is abutted by stop screw 52 and which spring is engaged by a roller 54 carried by the housing of the sharpening device. When the sharpening device is elevated into operative position, engagement of the spring by the roller will support the sharpening device in the proper upright position during a sharpening operation.

In operation, when the housing of the sharpening device is raised to its operative position, the wheels 22 and 23 of the sharpening device will be disposed relative to the cutting knife as shown in FIGURES 5 and 6. In this position, the operative cutting face of wheel 22 is spaced laterally from the side 60 of the knife it is to engage by distance indicated at "*a*."

The operative cutting face of wheel 23 on the other hand, is disposed intersecting relation to the side 61 of knife 10 which is to be engaged thereby. It will be noted that both wheels are spaced radially from the cutting or slicing knife 10 in FIGURES 5 and 6 while the wheels are spaced from each other in the direction of the circumference of knife 10.

A sharpening operation is effected by moving housing 17 of the sharpening device, which is to say, the entire sharpening device in the direction of the arrows 62 in FIGURES 7 and 8.

When the sharpening device moves in this direction face 25 of wheel 23 will engage side 61 of knife 10 and this will cause wheel 23 to move outwardly on its axis of rotation in the direction of arrow 63. When wheel 23 moves in the direction of arrow 63 the conical end 42 of its shaft 37 is withdrawn from plate 35 and this will permit biasing spring 36 connected to the plate to cause the plate to move inwardly of housing 17 and thereby cause wheel 22 to move on its axis in the direction of arrow 64 and thus to bring its operative cutting face 24 into engagement with side 60 of the cutting knife. In effect, wheel 23 sharpens the knife and wheel 22 removes any burr formed thereon from the knife.

Retraction of the sharpening device away from the cutting or slicing knife 10 will, of course, permit the cutting wheels 22 and 23 to return to the original position thereof.

It will be apparent that the combined forces of springs 30 and 40 on plate 34 will overcome the biasing of spring 36, while the bias of the spring 36 is in excess of the force of spring 30.

It will be evident that wheels 22 and 23 move substantially in unison during the sharpening operation and for this reason, it becomes possible to support the entire sharpening unit for movement in a direction axially of the slicing knife, whereby the cutting wheels need not be provided with independent axial movement.

An arrangement of this nature is disclosed diagrammatically in FIGURE 9, wherein it will be seen that the housing 70 of the sharpening device is mounted on a rod 71 along which it can move in the direction of the axis of the slicing knife 72 against the biasing of spring 73 bearing between a collar 74 on rod 71 and the housing or frame of the sharpening device. Preferably, there are two of the rods 71 so that the sharpening device will be supported against tilting. If this sharpening device is not used, it can be detached from the rods 71.

In this arrangement (FIG. 9), a common pivotally plate 34 is not necessary because engagement of the slicing knife with the inclined wheel 23 causes movement of the whole housing 17 against the action of spring 73. Spring 40 which is working together with wheel 23 must be made somewhat stronger than spring 73, so that by a movement of the sharpening device in a direction radially against the slicing knife, and engaging this knife the housing 70 together with the wheel 22 will be moved in a direction axially of the slicing knife and thus bringing the cutting face 24 into engagement with the knife for removing the burr.

Other arrangements for supporting the sharpening device for movement bodily during a sharpening operation will occur to those skilled in the art. In every case, the sharpening device includes one wheel disposed in a plane extending angularly to the plane of the slicing knife and so situated that the plane of the sharpening knife intersects the wheel while another wheel is provided disposed in a plane parallel to the plane of the slicing knife and at least slightly spaced therefrom axially.

In every case, also, engagement of the slicing knife with the inclined wheel causes movement of the inclined wheel and the other wheel substantially in unison in the direction of the respective axes of the sharpening wheels, and in such a direction that the said other wheel which runs in a plane parallel to that of the slicing knife, will move into operative engagement with the pertaining side of the slicing knife.

Inasmuch as the base or platform 14 is moveable in a direction parallel to the plane of the knife, it forms an ideal support for the sharpening device which can be moved while supported on the platform in a direction radially of the knife so as to convey the sharpening device into and out of operative engagement with the knife.

Suitable means could be provided, as disclosed in my prior application referred to above, to locate the platform relative to the knife prior to a sharpening operation so as to properly position the discs relative to the cutting edge of the knife; and furthermore, stop means could be provided with the platform so positioned to interrupt the movement of the platform with the said abrasive or grinding discs in proper sharpening engagement with the cutting edge of the knife.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions; and accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

What is claimed is:

1. A slicing machine, comprising a circular rotary knife with a cutting edge, said knife having an axis of rotation, a reciprocable movable carriage for carrying the articles to be sliced, a support on said carriage rotatably supporting a first and a second grinding disc for sharpening the knife, said support being movably mounted on said carriage for movement of said support into a working position wherein said discs are substantially in the plane of said knife or into a retracted position wherein the discs are disposed out of the plane of said knife, the

axis of said first disc being substantially parallel to the axis of said knife, the axis of said second disc being inclined relative to the axis of said first disc and offset therefrom in the peripheral direction of said knife, those parts only of said first and second grinding discs nearest said knife being disposed on respectively opposite sides of the plane of the cutting edge of said knife, spindles in said support on which said discs are respectively mounted, biasing means biasing said discs in a direction laterally of the knife so that the said portion of said second disc nearest said knife is urged toward the knife, said first disc being axially spaced from the respective side of the knife, whereby upon movement of said support toward the knife, the said knife will be first engaged by said second disc, and means operable upon yielding of said biasing means when said second disc engages the respective side of the knife for moving said first disc into engagement with the respective side of the knife, whereby said second disc sharpens the edge of the knife and said first disc clears from the knife any burr formed thereon by said second disc.

2. A slicing machine, comprising a circular rotary knife with a cutting edge, said knife having an axis of rotation, a reciprocable movable carriage for carrying the articles to be sliced, a support on said carriage rotatably supporting a first and a second grinding disc for sharpening the knife, said support being movably mounted on said carriage for movement of said support into a working position wherein said discs are substantially in the plane of said knife or into a retracted position wherein the discs are disposed out of the plane of said knife, the axis of said first disc being substantially parallel to the axis of said knife, the axis of said second disc being inclined relative to the axis of said first disc and offset therefrom in the peripheral direction of said knife, those parts only of said first and second grinding discs nearest said knife being disposed on respectively opposite sides of the plane of the cutting edge of said knife, spindles in said support on which said discs are respectively mounted, said spindles being individually axially moveable in said support, a spring pertaining to each of said spindles, biasing the said respective spindle in a direction such that said part of the second disc nearest the said knife is biased toward the respective side of the knife, a plate in the support engaging both of the spindles, and spring means acting on the plate urging it against said spindles and biasing said spindles in the direction opposite to the direction in which the springs pertaining thereto bias the spindles, said spring means exerting a force on said plate less than the force exerted by the two spindle springs taken together, but greater than the force exerted by either one of the spindle springs.

3. A slicing machine, comprising a circular rotary knife with a cutting edge, said knife having an axis of rotation, a carriage on the machine reciprocable in a direction substantially at right angles to the axis of rotation of said knife for carrying the articles to be sliced, a support on said carriage rotatably supporting a first and a second grinding disc for sharpening the knife, said support being movably mounted on said carriage for movement of said support into a working position wherein said discs are substantially in the path of said knife or into a retracted position wherein the discs are disposed out of the path of said knife, the axis of said first disc being substantially parallel to the axis of said knife, the axis of said second disc being inclined relative to the axis of said first disc and offset therefrom in the peripheral direction of said knife, those parts only of said first and second grinding discs nearest said knife being disposed on respectively opposite sides of the plane of the cutting edge of said knife when said support is in working position, spindles in said support on which said discs are respectively mounted, means moveably supporting said support on said carriage for movement thereon in a direction laterally of the plane of the knife, and spring means

biasing said support on the carriage in a direction so as to urge the said part of said second disc nearest said knife toward the respective edge of said knife while said first disc is spaced laterally from the respective edge of said knife, said spring means yielding upon development of lateral force on said second disc by said knife when the second disc engages the knife whereby the said support will move on the carriage to bring said first disc into engagement with the knife so that said second disc sharpens the edge of the knife and said first disc clears from the knife any burr formed thereon by said second disc.

4. In a slicing machine; a circular rotary knife, and sharpening means for the knife comprising first and second rotatably supported abrasive discs about equidistantly spaced in the radial direction from the axis of rotation of the knife, supporting means operatively interconnecting said discs and supporting said discs for movement thereof in unison relative to the knife in a direction radially of the knife and in a plane parallel to the plane of the knife, said supporting means also supporting said discs for movement in a direction laterally of the plane of the knife, the axis of said first disc being substantially parallel to the axis of said knife, and the axis of said second disc being substantially parallel to the axis of the knife and the axis of said first disc but inclined to the axis of the first disc and the axis of said knife and offset from the axis of said first disc in the direction of the circumference of said knife, those portions only of said first and second abrasive discs nearest the knife being disposed on respectively opposite sides of the plane of the edge of the said knife for engagement with respective sides of said edge whereby movement of said supporting means and knife relatively in a direction radially of the knife will bring said second disc into engagement with the respective side of the edge of the knife while said first disc is laterally spaced a small distance from the opposite side of the edge of the knife, said supporting means including resilient means biasing at least said second disc in a direction toward said knife, whereby said second disc will move laterally relative to the knife because of yielding of said resilient means when the said relative radial movement of said supporting means and knife is effected and said second disc is conveyed into operative engagement with the respective side of the edge of the knife, and said supporting means including means responsive to said lateral movement of said second disc for bringing about movement of said first disc laterally toward the knife and into operative engagement with the edge thereof on the side opposite said second disc to thereby cause said first disc to clear from the knife the burr formed thereon by the said second disc during a sharpening operation.

5. A slicing machine comprising; a circular knife rotatable on a predetermined axis, sharpening means comprising a housing, a first abrasive disc and a second abrasive disc rotatably carried by said housing and operable for sharpening and deburring the cutting edge of the knife, respective shafts in said housing rotatably supporting said discs, the axis of rotation of said first disc being substantially parallel to the axis of said knife, and the axis of rotation of said second disc being inclined to the axis of said first disc and off-set therefrom in the direction of the circumference of said knife, supporting means slidably supporting said housing for movement in a direction laterally of the plane of the knife, said housing being normally positioned on said support means with said discs substantially in the plane of said knife and those parts only of said first and second discs nearest said knife being disposed on respectively opposite sides of the plane of the cutting edge of said knife, spring means biasing said housing on said support means in a direction to urge that part of said second disc nearest said knife toward said knife, while said first disc is spaced laterally from the knife, and means for advancing said housing together with

the said support means therefor and said knife toward each other in a direction parallel to the plane of the knife, whereby said second disc will engage said knife and transmit a force to the housing to move the housing against the bias of said spring means and thereby move said first disc into engagement with the knife so that said second disc sharpens the edge of the knife and said first disc clears from the knife any burr formed thereon by said second disc.

6. A slicing machine according to claim 5 which includes a carriage reciprocable in a direction substantially at right angles to the axis of rotation of said knife,

and said means slidably supporting said support means being mounted on said carriage.

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