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AUTOMATIC KNIFE SHARPENER

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3 Sheets-Sheet 1

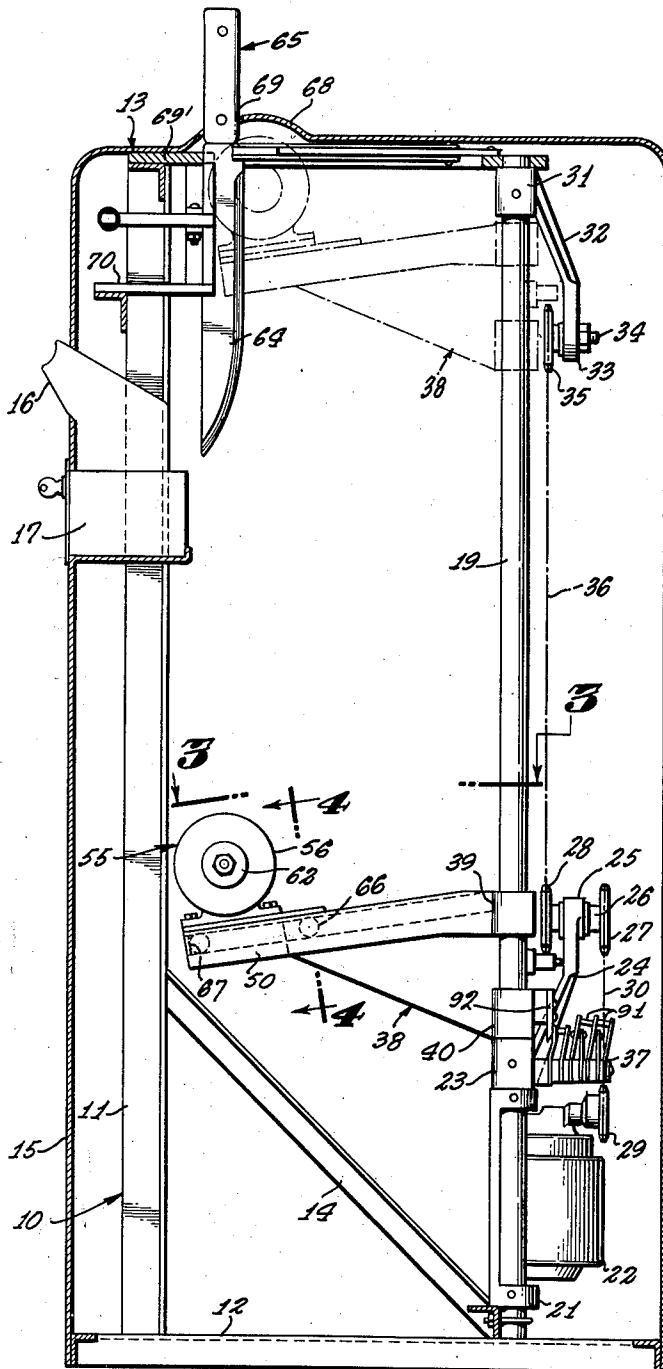


Fig. 1.

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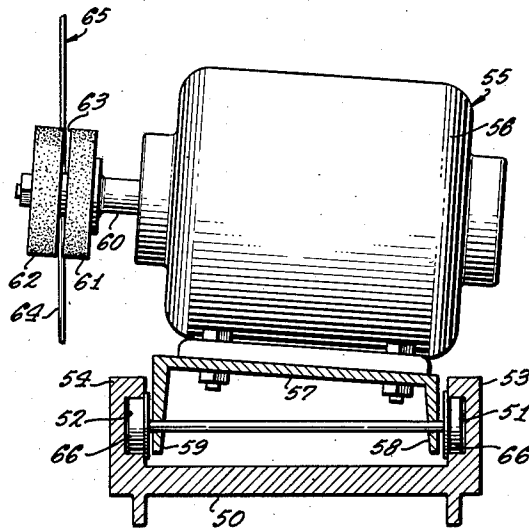
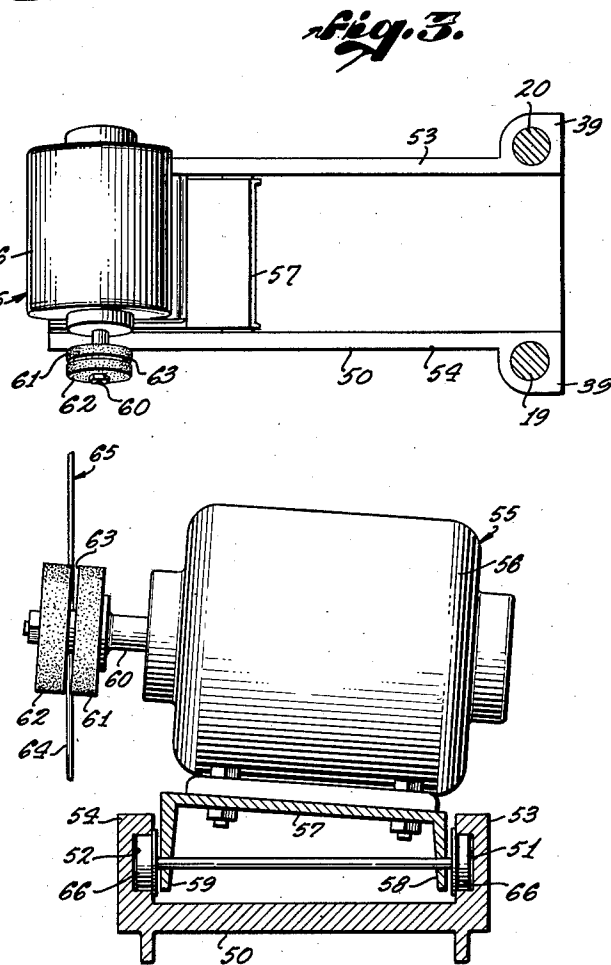
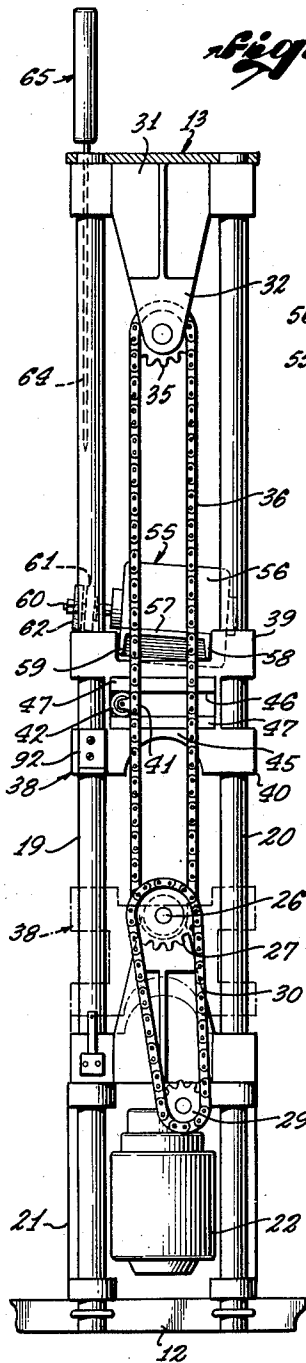
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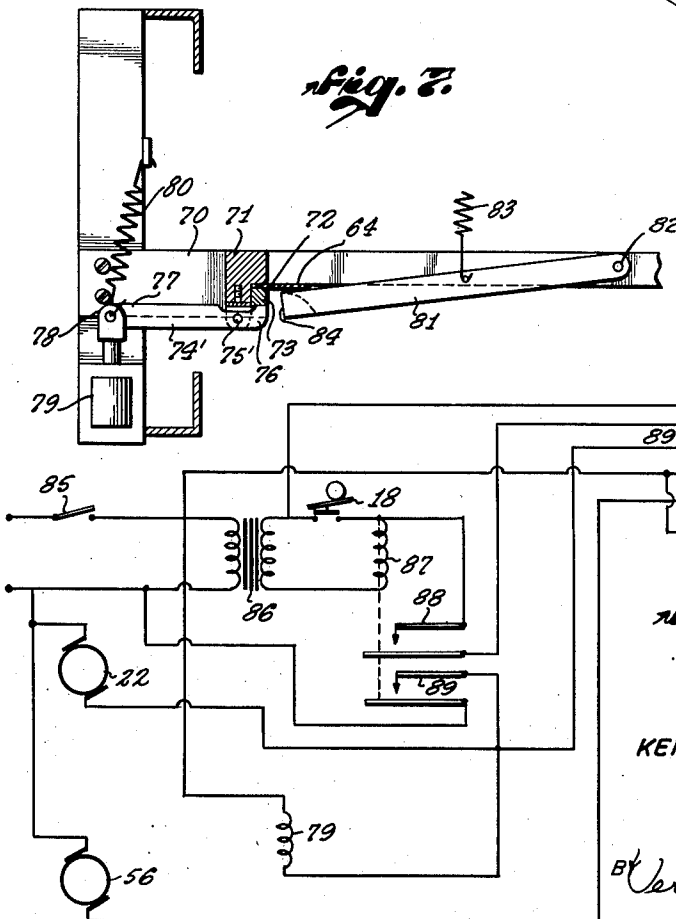
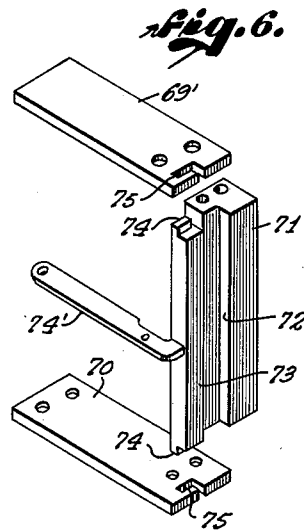
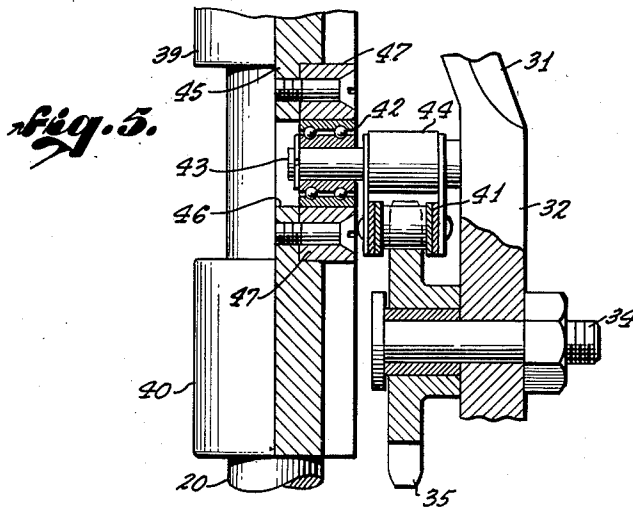
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3 Sheets-Sheet 3



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AUTOMATIC KNIFE SHARPENER

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2 Claims. (Cl. 51—54)

The invention relates to knife sharpeners and has particular reference to an automatic machine which is capable of holding the knife during the sharpening operation and moving grinders through a sharpening operation to place a sharp edge on the knife and thereafter withdrawing the grinder and bringing it to rest.

While sharpening devices for knives, razors, and the like, exist in considerable variety, a certain amount of dexterity is required to employ them successfully. Even partially automatic devices require considerable skill on the part of the operator holding the knife in exactly the right position with relation to the abrasive surface in order to pitch the sharp edge at the right angle on both sides of the blade and to bring the blade to a suitable sharp angle along a perfectly straight edge without any raggedness in the sharpened edge.

It is among the objects of the invention to provide a new and improved automatic sharpening device for knives and blades of other kinds which is all automatic with respect to holding the edge to be sharpened in a fixed position relative to the abrasive and at the same time automatically advancing the abrasive to the blade, moving it through a sharpening cycle, and thereafter withdrawing it to a position of rest.

Another object of the invention is to provide a new and improved sharpening device for blades which automatically accommodates itself to blades of various contours without the necessity of making any adjustment in the machine.

Still another object of the invention is to provide a new and improved automatic blade sharpener which can be started electrically by placing the knife in position in the machine and which will thereafter completely sharpen the knife, at the end of which time the entire mechanism comes to rest and the knife or other blade can then be withdrawn.

Still another object of the invention is to provide a new and improved automatic blade sharpening device wherein the abrasive in the form of grinding wheels is carried by means of a carriage into engagement with the knife causing a sharpening throughout the length of the blade in one direction, then reversing the direction, and finally withdrawing the abrasive device to a position of rest preparatory to a second sharpening cycle.

A further object of the invention is to provide a new and improved grinder featuring a pair of abrasive wheels positioned tilted relative to the blade in such a manner that the abrasive wheels are maintained automatically at the correct position for sharpening the blade without it being necessary to readjust the position of the abrasive wheels until they are finally worn out.

Still further among the objects of the invention is to provide an all-automatic knife or other blade sharpening mechanism which can be entirely housed within a casing so that all operations are carried out with perfect safety.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects con-

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templated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

5 Figure 1 is a vertical sectional view of the device showing a knife in place preparatory to the start of a sharpening operation.

Figure 2 is a rear elevational view of the device with the casing removed to show the interior mechanism.

10 Figure 3 is a cross-sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a vertical sectional view taken on the line 4—4 of Figure 1.

15 Figure 5 is a fragmentary sectional view showing the connection between the carriage for the grinder and the chain drive therefor.

Figure 6 is an exploded perspective view of portions of the knife-holding means.

20 Figure 7 is a detailed view partially in section on a horizontal plane showing the knife-holding means in engagement with the knife blade.

Figure 8 is a wiring diagram of the electrical circuit for the motors, switches, and hold circuit of the invention.

25 The automatic knife sharpener of my invention, as illustrated in Figure 1 in some particular, comprises a vertically disposed frame 10 consisting of columns 11 at the front, angle irons forming a base 12, and an upper structure 13, there being provided stiffening braces 14 to make the structure sufficiently rigid. A housing 15 is adapted to completely encompass the frame and the entire automatic means. At the front of the frame is a coin slot 16 leading into a coin drawer 17 which is a part of some conventional coin actuated switch, not shown in detail, but illustrated schematically at 18 in the wiring diagram of Figure 8.

30 At the rear of the frame there are provided two cylindrical columns 19 and 20 which provide a vertically disposed slideway. The columns are anchored at the bottom in the base 12 and anchored at the top in the upper structure 13.

40 Adjacent the base of the columns 19 and 20 there is provided a mounting 21 for a carriage driving motor 22 stationarily positioned with respect to the frame.

45 Immediately above the mounting is a bracket 23 likewise stationarily positioned, which bracket is provided with a rearwardly extending arm 24 at the upper end of which is a bushing 25 adapted to receive a shaft 26 on the outer end of which is keyed a sprocket 27 and on the inner end of which is keyed another sprocket 28. A sprocket 29 is mounted upon the motor 22 and driven thereby through a suitable conventional type of gearing. The sprocket 29 is connected to the sprocket 27 by means of a chain drive 30.

50 At the upper ends of the columns 19 and 20 is an upper bracket 31 having a rearwardly and downwardly extending arm 32 at the lower end of which is a bushing 33 receiving a shaft 34 on which is an idler sprocket 35. The idler sprocket is connected to the sprocket 28 by an endless chain 36.

55 Also mounted upon the bracket 23 is a switch face 37 adapted to carry the sundry switches for operating motors with which the device is equipped.

60 Immediately above the bracket 23 is a carriage indicated generally by the reference character 38. More particularly the carriage has upper and lower sleeve-like elements 39 and 40, one on each side, adapted to slidably engage the respective vertical cylindrical columns 19 and 20. These sleeve-like elements provide a smooth-sliding mounting for the carriage on the columns which comprise the vertical slideways. These are preferably lubricated to assure a free sliding fit.

70 The carriage 38 is adapted to slide from the solid line

position illustrated in Figure 1 to the upper dotted line position as there shown.

For lifting the carriage and to provide its gradual return to the initial position shown in solid line in Figure 1, there is provided a connection between the carriage and one link 41 in the chain 36. More particularly the connection comprises a pair of ball-bearing rings 42 which rotatably mount a stub shaft 43, the stub shaft extending rearwardly to a point where it rotatably engages the link 41 of the chain 36 within a bearing 44.

As seen to better advantage in Figure 2, the carriage includes a web 45 in which is a transversely disposed bearing slot 46 adapted to slidably receive the ball-bearing rings 42 so that they with the stub shaft 43 can reciprocate from side to side throughout the length of the slot. Suitable tracks 47 may be provided for direct contact with the ball-bearing rings.

Constructed in this manner it will be noted that as the left side of the endless chain 36, as viewed in Figure 2, travels upwardly it moves the carriage 38 upwardly until the chain begins to travel over the top of the idler sprocket 35. At that portion of the cycle the ball-bearing rings and stub shaft travel from the left end of the slot 46 to the right end of the slot 46 while the carriage remains substantially stationary in the dotted position shown in Figure 1. After the stub shaft travels to the opposite or right-hand end of the slot 46, as viewed in Figure 2, the link to which it is fastened begins a downward movement at which time the carriage is lowered steadily at the rate of operation of the chain until it again arrives at the solid line initial position illustrated in Figure 1.

The carriage 38 is further provided with a platform 50 which slopes forwardly and downwardly. The construction of the platform is illustrated to good advantage in Figures 3 and 4. As there shown the platform includes grinder slideways 51 and 52 formed at the inside surfaces of channels 53 and 54, respectively.

A grinder 55 consists of a motor 56 mounted upon a grinder base 57, the base being provided with a lateral web 58 on one side shorter than a lateral web 59 on the other side. The unequal height of the web gives the axis of a motor shaft 60 a slight tilt with respect to horizontal, as illustrated in Figures 2 and 4.

At the end of the shaft 60 are two grinder wheels 61 and 62 keyed to the shaft in spaced relationship to each other so that a space 63 is formed therebetween. By positioning the grinder wheels in this fashion, a blade 64 of a knife 65 when positioned in a vertical direction between the inside surfaces of the grinder wheels will be sharpened on both sides simultaneously by the respective grinder wheels 61 and 62, the position of which will automatically determine the sharpness of the edge of the blade, which adjustment will be maintained at all times.

It should be further noted that the normal position of the grinder 55 is at the outer end or lower end of the platform 50 but that the grinder, being mounted on wheels 66, is free to roll up the slope of the platform against the force of gravity during a certain phase of the operation and when released will again roll to the lower end where it will be stopped by a suitable block 67.

At the top of the housing 15 there is provided a protuberance 68 in which is a hole 69 of sufficient size to receive both the blade and the handle of the knife which is to be sharpened.

The upper structure of the frame is provided with upper and lower plates 69' and 70 which are adapted to retain between them an angular shape 71 in which is a cut-out portion 72. A member 73 is fastened partly within the cut-out portion 72 by means of suitable tabs 74 and slots 75 so that the inside surface of the member 73 forms a rather narrow slot adapted to snugly accommodate the blade 64 of the knife. The member 73 by reason of its mounting is adapted to shift its position laterally to accommodate blades of different thickness.

The member 73 is normally urged to a position adapted

to close upon the knife by means of a lever 74' pivotally mounted by the structure 75'. One end 76 of the lever normally bears laterally against the member 73 and the other end 77 is pivotally secured to a plunger 78 of a solenoid 79. A spring 80 normally tends to bias the lever to a position releasing the member 73 so that the recess for the knife blade can be opened. When the solenoid is energized it tends to bias the lever in a direction tending to grip the knife blade.

A second lever 81 is pivoted at a point 82 to the upper structure and normally biased by a spring 83 in a direction such that an outer end 84 tends to press laterally against the edge portion of the knife blade to steady it in proper position during the sharpening cycle.

As illustrated in the wiring diagram of Figure 8 the electric circuit for operating the device includes a start switch 85 adapted to close a power circuit through a suitable transformer 86. In circuit with the transformer is a relay 87 connected to a pair of switches 88 and 89 which are normally open. The circuit, including the motor 56, contains a switch 88' normally open and the circuit which contains the motor 22 includes a switch 89' also normally open. A switch 90, normally closed, is in circuit with the normally open switch 88. Switches 88', 89' and 90 are actuated in a gang simultaneously through an interconnection 91.

In operation the carriage 38 is at the lowermost position, illustrated in Figure 1. In that position a trip 92 holds the switches 88', 89' and 90 in the positions shown in the wiring diagram against a bias in a contrary direction.

When the knife is inserted through a suitable mechanism, not shown, the switch 85 is closed and this serves to energize the transformer 86. The apparatus may be started by dropping a coin in the coin slot 16 which momentarily closes the switch 18. Closing the switch 18 closes the circuit through the relay 87 serving to energize the relay and closing the switches 88 and 89. At the same time the circuit is closed through the motor 22 which immediately begins to elevate the carriage 38. As the carriage elevates, the trip 92 is withdrawn and this permits the positions of the switches 88', 89' and 90 to be reversed. Closing of the switch 89' maintains operation of the motor 22. Closing of the switch 88' initiates operation of the grinder motor 56, and opening the switch 90 maintains the circuit through the relay 87.

The carriage then continues its upward travel and when the grinder wheels 61 and 62 engage the blade 64 of the knife near its lower tip, they begin the sharpening operation. Because of the curve at the tip of the knife, force is exerted against the grinder wheels which tends to shift the grinder uphill and to force the grinder wheels to follow the contour of the knife blade. The carriage then continues to the top of its stroke, at which point the grinder wheels will reach the upper end of the sharpened end of the knife blade and then begin the downward travel again along the edge of the knife blade. When the wheels again reach the curve at the pointed end of the knife, the weight of the grinder will cause it to move down the slope of the platform 50, again following the contour of the blade, until the point is reached, after which the carriage will travel to its lowermost position.

When it reaches the lowermost position the trip 92 will engage the gang of switches 88', 89' and 90, causing them to reverse position and again assume the positions illustrated in the wiring diagram, Figure 8. In that position opening the switch 88' will deenergize the motor 22 and cause the carriage to stop. Opening the switch 89' will deenergize the motor 56 and operation of the grinder wheels will stop. Closing the switch 90 reestablishes a portion of the hold circuit preparatory to a succeeding operation of the mechanism.

There has therefore been disclosed and described an all-automatic knife sharpening mechanism which can be completely operated by the insertion of a knife into the

machine and the deposit of a coin or the tripping of a suitable button, not shown, to close the electric circuit. From this point on everything operates automatically and with complete safety since no portions of the mechanism are accessible from the exterior. The sharpening will proceed automatically through a double sharpening cycle, at the end of which time all portions of the mechanism reassume initial position ready for a succeeding operation.

Regardless of the contour or width of the knife blade the grinding wheels and grinder in the mounting described will automatically follow the contour of the blade, sharpening the blade throughout its entire edge without any special adjustment being necessary. The machine will operate with equal success on straight or curved blades.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An automatic knife sharpener comprising a frame, a releasable knife blade retainer on the frame, a vertical slideway on the frame, a carriage reciprocably slidable on said slideway, power means on the frame adapted to move said carriage through a forward and return cycle, a power actuated grinder having a transversely reciprocable mounting on the carriage and normally biased in a general direction toward said retainer, said grinder including a power actuated abrasive member having portions thereof on opposite sides of the knife and adapted to engage simultaneously both sides of the cutting edge of a knife, said releasable knife blade retainer being adjacent the forward end of the carriage movement and adapted to retain the blade with the cutting edge vertically disposed in the line of travel of the abrasive mem-

ber, said grinder being adapted to drive the abrasive member throughout a forward and reverse sharpening cycle along the cutting edge of the knife.

2. An automatic knife sharpener comprising a frame, a releasable knife blade holder in the frame, a vertical slideway on the frame, a carriage reciprocably slidable on said slideway, a motor and a drive operably connected between the frame and the carriage and adapted to move said carriage through forward and return travel, a grinder and a motor therefor having a transversely reciprocable mounting on the carriage and normally biased in a general direction toward the knife blade holder, said grinder including a pair of abrasive wheels on a common shaft having a space therebetween adapted to receive the cutting edge of a knife in said holder, said releasable knife blade holder being adjacent the forward end of the carriage movement and adapted to retain the knife with the cutting edge vertically disposed in the line of travel of the abrasive wheels, said grinder being adapted to drive the wheels throughout a forward and reverse sharpening cycle following the cutting edge of the knife, and an electric system interconnecting said motors and including a hold circuit subject to breaking by said carriage, a coin actuated starting switch in said hold circuit, and a set of shut-off switches in said electric system operably connected between the frame and the carriage.

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