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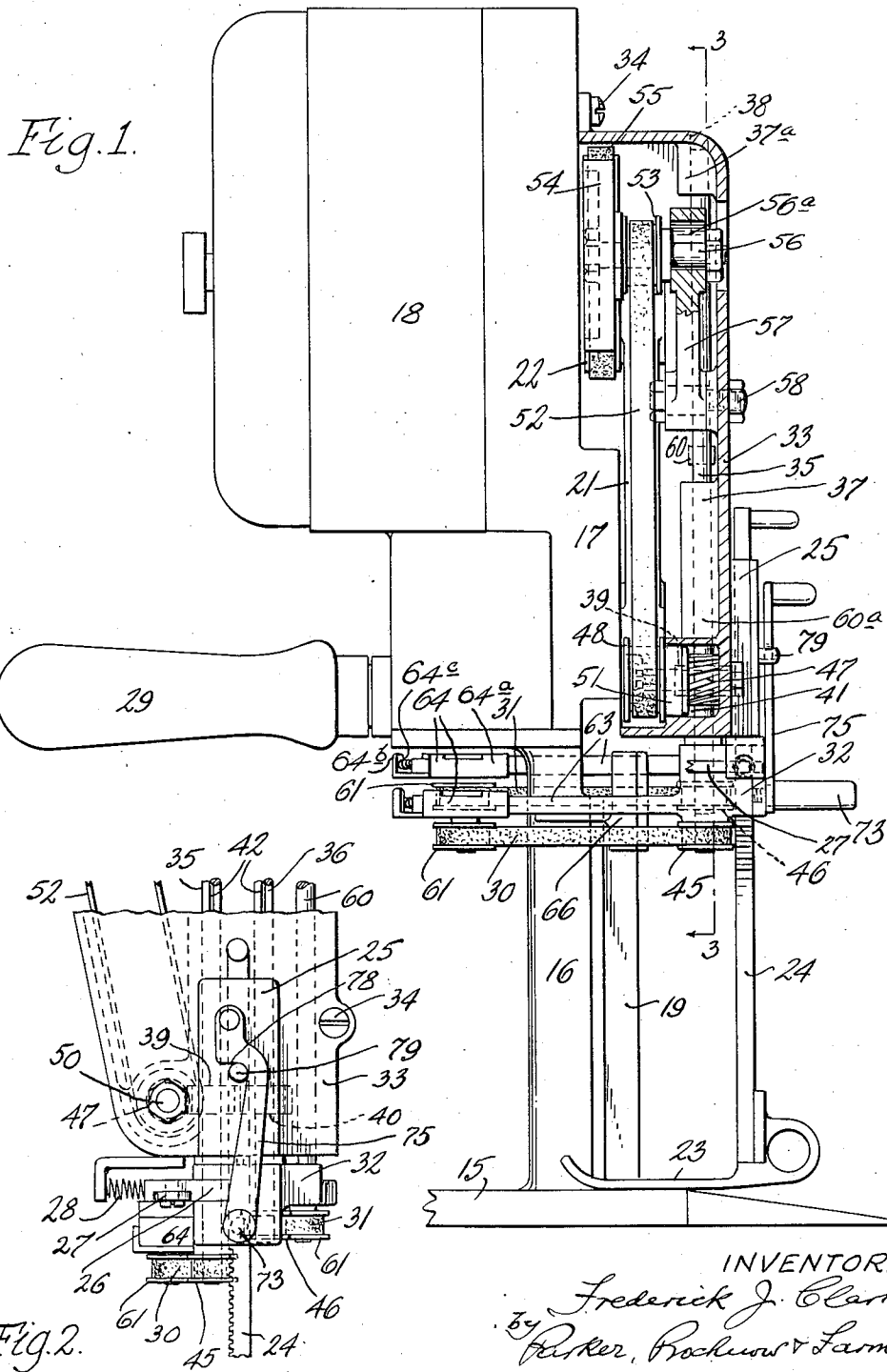
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KNIFE-SHARPENING MECHANISM FOR CUTTING MACHINES

Filed May 9, 1938

2 Sheets-Sheet 1



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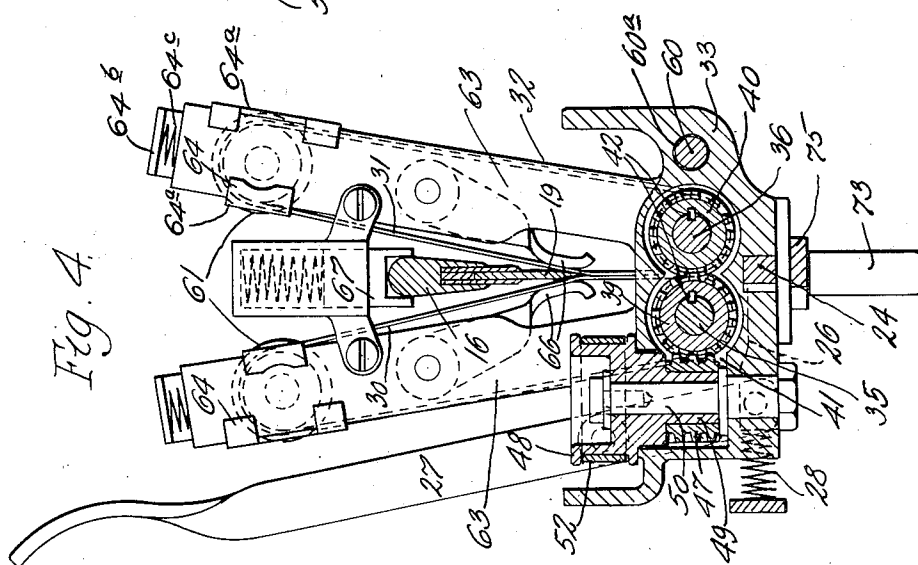
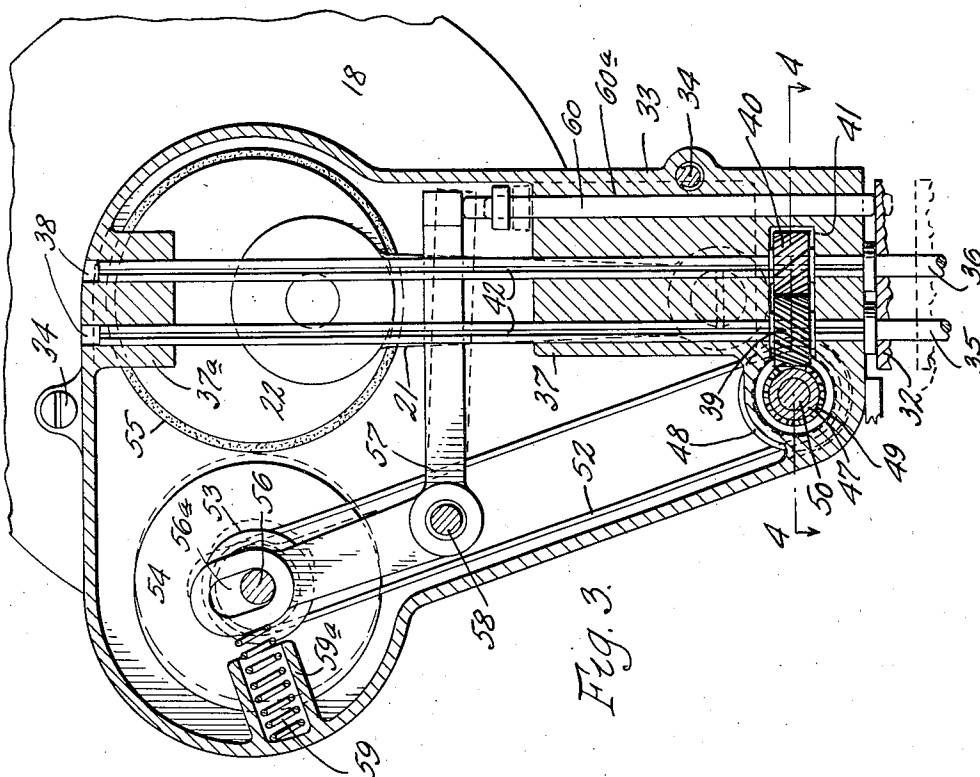
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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KNIFE-SHARPENING MECHANISM FOR CUTTING MACHINES

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11 Claims. (Cl. 51-246)

This invention relates more particularly to improvements in knife-sharpening mechanisms for cutting machines of the type, commonly used for cutting cloth and other sheet materials, comprising an upright, vertically reciprocating knife with a substantially vertical cutting edge which can be caused to follow a desired pattern or line of cut in a lay of cloth or other material by appropriately moving and guiding the machine about upon the supporting table for the material; and one purpose of my invention is to provide drive mechanism of improved construction for the knife-sharpening means of such machines.

Other objects of the invention are to provide an efficient drive mechanism of novel construction for abrasive band or belt knife-sharpening means of the character disclosed in application for United States Letters Patent, Serial Number 198,298, filed March 26, 1938, by myself and Carl F. Hilgeman; also to provide novel drive mechanism of exceedingly simple, strong and durable construction for the knife-sharpening means of cutting machines of the type mentioned; and also to provide knife-sharpening mechanism for cutting machines having the other features of improvement and advantage hereinafter described and set forth in the claims.

In the accompanying drawings:

Fig. 1 is a side elevation, partly in vertical section, of an upright, reciprocating knife cutting machine, equipped with knife sharpening mechanism embodying my invention.

Fig. 2 is a fragmentary front elevation thereof and, like Fig. 1, shows the upper inoperative position of the grinding means.

Fig. 3 is a transverse, sectional elevation thereof on line 3-3, Fig. 1, and showing by dotted lines the operative position of the drive mechanism for the grinding means.

Fig. 4 is a sectional plan view of the sharpening means on line 4-4, Fig. 3.

Except with respect to the knife-sharpening mechanism and associated parts, this invention is not concerned with the construction of the cutting machine, and it may be of the construction illustrated in the drawings or of other suitable construction. As herein disclosed, the machine comprises the usual base 15 adapted to rest and be moved about upon the table or supporting surface for the material to be cut, an upright slender standard 16 which is rigid with and rises from the base and supports a stationary frame 17 housing an electric or other motor at 18, which reciprocates the vertical knife 19 in a guide slot in the front of the standard through drive connections comprising a slide to which the knife is secured at its upper end and which is connected by a pitman 21 to the crank pin of a crank wheel 22 on the front end of the horizontal rotary shaft of the motor. 23 indicates the usual

presser foot fixed to the lower end of a rod 24 which extends vertically in front of the knife 19, forming a guard therefor, and is adjustable vertically in a suitable guide 25 to support the presser foot at different elevations suited to different lays of material to be cut. The rear end of the presser foot shown is bifurcated and straddles the front edge portion of the standard to assist in preventing lateral deflection of the guard rod. The guard rod may be releasably held in different adjustments, as by a dog 26 on the front end of a release lever 27 and pressed into engagement with the toothed side of the guard rod by a spring 28. The lever 27 shown is pivoted at one side of the machine in a position to be readily actuated for moving the dog to release the guard rod by a finger of the operator's hand which grasps the handle 29 of the machine.

In the preferred embodiment of my invention illustrated in the drawings, flexible, abrasive band knife-grinding means are employed, preferably comprising flexible belts or strips 30 and 31, having grinding surfaces of carborundum or other suitable abrasive material disposed at opposite sides of the knife in such a way that they can be caused to travel in sharpening contact with opposite sides of the front edge portion of the knife. Said grinding means, like the similar means shown in the aforesaid application, may be power driven, for example, as shown, by the knife-operating motor of the machine, so that the band stretches or portions of the belts which contact with the knife, travel at high speed forwardly past the latter, and they are mounted on a grinder carriage or support 32 arranged for movement up and down along the knife to enable the sharpening of the knife throughout its full cutting length.

Said grinding means, together with the drive means therefor, and other operative parts of the sharpening mechanism are preferably mounted on a frame part or housing 33 which is stationary but removably secured at the front of the machine, as by screws 34 screwed into the front of the stationary frame 17 so that the sharpening mechanism may be applied to and removed as a unit from the machine. The housing 33 shown also serves as a cover for the crank wheel 22 and other parts of the knife-operating mechanism.

The improved drive mechanism for the knife-grinding means is preferably constructed as follows:

35 and 36 represent two vertical shafts arranged in front of the knife and parallel therewith, and preferably at opposite sides of the plane of the knife, to rotate and slide axially of themselves in suitable bearings 37 and 37a in the housing 33. These shafts extend downwardly out of the lower end of the housing with their lower portions journaled and held from

endwise movement in suitable bearings in the grinder carriage 32 so that the shafts move up and down with the carriage. Openings 38 in the upper end of the housing 33 make it possible for the upper ends of the shafts to extend there-
 5 through above the housing, thereby enabling shafts to be employed which are long enough to permit the necessary vertical travel of the grinder carriage for sharpening a knife of the maximum length without increasing the height
 10 of the housing. The shafts 35 and 36 are rotated in opposite directions by a gear train comprising intermeshing pinions 39 and 40 which are held from endwise movement in a chamber
 15 41 in the lower portion of the housing 33, and to which the shafts are connected to rotate with the pinions to slide axially therethrough, as by keys projecting from the pinions into longitudinal keyways 42 in the shafts. Belt pulleys 45
 20 and 46 keyed or otherwise fixed directly on the lower ends of shafts 35 and 36, constitute supporting and drive pulleys for the knife-sharpening band-means or belts 30 and 31.

Preferably, the pinions 39 and 40 are spiral
 25 toothed pinions, and one of them, as 39, meshes with and is driven by a spiral pinion 47 which is rotated by a motor-driven belt drive mechanism. As shown, the pinion 47 and a pulley 48 are formed or secured on a hub or sleeve 49 which is
 30 mounted to rotate on a horizontal stud axle 50 stationarily secured at its front end in the front wall of the housing 33 and projecting rearwardly in the housing. The pulley is connected by a belt
 35 52 with a driving pulley 53 connected to a wheel 56 which is movably mounted to adapt it to be shifted into and out of driving engagement with a motor-driven wheel. In the illustrated
 40 embodiment of the invention, the crank wheel 22 on the front end of the horizontal rotary shaft of the knife-operating motor is utilized as this drive wheel, and for this purpose the crank
 45 wheel is preferably provided with a tire or band 55 of suitable friction material adapted to drive the wheel 54 by frictional contact therewith. The driving pulley 53 and wheel 54, as shown,
 50 are formed on a connecting hub or sleeve which is journaled on a stud axle 56 secured to an upwardly projecting arm of a supporting lever 57 which is suitably fulcrumed on a pivot bolt 58
 55 secured to the front wall of the housing 33. The axle 56 is preferably adjustably secured in an elongated slot 59a in the lever 57 to enable the driving pulley 53 to be adjusted toward or from the belt pulley 48, as may be necessary, to properly tension the belt 52.

Driving engagement of the wheel 54 with the drive wheel 22 may be effected by suitable means, such as a coil spring 59 confined in a socket 59a
 60 formed in the housing 33 with the outer end of the spring pressing against the upwardly projecting arm of the lever 57 in a direction to hold the wheel 54 in contact with the drive wheel. Disengagement of the wheel 54 from the drive
 65 wheel 22 for stopping the grinding means is preferably effected through movement of the grinder carriage to an upper, inoperative position, for which purpose a vertical push rod 60 is shown, arranged to slide lengthwise in a suitable
 70 guide bearing 60a in the housing 33, with its lower end arranged to be engaged by the carriage 32 and its upper end engaging the outer end of a lateral arm of the lever 57. When sharpening the knife, the grinder carriage 32
 75 will be spaced downwardly away from the lower end of the housing 33 and the spring 59 will hold

the wheel 54 in engagement with the drive wheel 22, and hold the lower end of the push rod 60 projecting below the bottom of housing 33. The drive mechanism described will then rotate the belt pulleys 45, 46, and the abrasive belts 30, 31
 5 for sharpening the knife. When the sharpening of the knife is completed, the grinder carriage is pushed up to its highest, inoperative position, and the carriage will push up the rod 60 and swing the lever 57 so as to shift the wheel 54 out of
 10 driving engagement with the drive wheel 22 and stop the grinding means.

The knife-sharpening belts 30 and 31 are shown, as in the aforesaid application, passing around the drive pulleys 45, 46, and two idler
 15 pulleys 61 journaled on spring-pressed slides 64 which are movable toward and from the drive pulleys on fixed legs 63 projecting rearwardly from the grinder carriage 32 and straddling the knife standard. These movable idler pulleys
 20 maintain the belts under suitable tension and allow ready removal and renewal of the belts. Each idler pulley slide preferably consists, as best shown in Figs. 1 and 4, of a plate which
 25 extends across one face of its supporting leg 63 and has side walls 64a with inwardly projecting flanges which embrace the opposite side edges of the leg to slidably retain the slide on the leg,
 30 and a transverse wall 64b against which the spring 64c acts to press the slide and its idler pulley rearwardly for holding the sharpening belt under proper tension. This slide, which can be made from a single plate bent into the form
 35 shown, provides a desirable adjustable idler pulley mounting of exceedingly simple and inexpensive construction. Also, as shown in said application, the two sharpening belts, which are disposed at different levels, are yieldingly pressed
 40 into sharpening contact with the edge portion of the knife by the spring-pressed fingers 66, which are pivoted on the carriage legs, and are so shaped that they will hold those portions of the belts which contact the knife, at the requisite
 45 converging inclinations to insure the grinding of wide, thin, bevelled edges on the longitudinal and bottom edges on the knife, which edges will be very sharp or keen and will remain so for the maximum time.

The parallel sliding shafts 35 and 36, which are guided vertically in their bearings in the housing,
 50 act to guide the grinder carriage 32 to cause it to move up and down parallel with the knife edge, and prevent horizontal deflection or twisting of the carriage, thus providing desirable guide means therefor. Fig. 4 shows a spring-pressed
 55 guide block 67 on the carriage with a slotted end yieldingly and slidably engaging the rear edge of the standard and supplementing the carriage-guiding action of the parallel sliding shafts 35 and 36.

The described drive mechanism drives the grinding means or belts rapidly and positively
 60 and, the belts while running, may be moved up and down along the edge of the knife for sharpening its longitudinal edge throughout its effective length and also its bottom end or point, by any suitable means adapted to move the grinder
 65 carriage up and down. Preferably, the carriage is provided for this purpose with a forwardly projecting handle 73 in the form of a stud fixed to the front end of the carriage 32 and adapted to be grasped by the hand.

In the normal operation of the machine for cutting material, the grinder carriage with its grinding means or belts is held in its uppermost
 75

position, shown in Fig. 1, where it is out of the way and does not interfere with the cutting operation of the knife nor obstruct the view of the operator in manipulating and guiding the machine so as to cause the cutting edge of the knife to properly follow the pattern or required line of cut. The grinder carriage is releasably held in this upper, inoperative position and the wheel 54 held out of engagement with the drive wheel 22 to prevent driving the grinding means, preferably by a cam latch 75, such as shown in the aforesaid application, and which is in the form of a lever pivoted on the carriage handle stud 73. This latch has a laterally extending cam edge 78 which, when the grinder carriage has been raised nearly to its uppermost position, is adapted to be swung into engagement with a forwardly projecting, fixed stud 79 on the housing 33, and by pressure of the latch, acts on the stud to cam the grinder carriage up to and releasably hold it in its uppermost, inoperative position.

The final upward movement of the grinder carriage by the cam latch operates through the push rod 60, as before explained, to disengage the wheel 54 from the crank wheel 22 and throw the drive mechanism for the grinding means out of action. When the sharpening mechanism is in use, the grinder carriage is below said uppermost inoperative position, and the lower end of the push rod 60 projects below the bottom of the housing 33. In camming the grinder carriage up to its inoperative position by the latch 75, the carriage engages the projecting lower end of the push rod 60 and lifts the rod, thus swinging lever 57 and shifting the wheel 54 out of driving engagement with the crank wheel, thus stopping the grinding means.

When the knife requires sharpening, it is only necessary to release and lower presser foot to its lowest position, then release the latch 75 and move the grinder carriage down and up along the reciprocating knife by means of the handle stud 73. Only one or two down and up movements of the grinding means is usually necessary, and at the end of the last up movement, the grinder carriage is latched in its inoperative position, as explained, and the machine is ready to continue its cutting.

The described drive mechanism for the grinding means is composed of the minimum number of parts of simple construction, and readily fabricated. It provides an efficient and desirable drive of sturdy and durable construction, not likely to get out of order or cause trouble and annoyance.

I claim as my invention:

1. In a cutting machine, the combination with a knife which has a substantially upright cutting edge and is reciprocated substantially in the lengthwise direction of said edge, of knife-grinding flexible abrasive band-means arranged to contact opposite sides of the edge portion of the knife, a carriage supporting said grinding means, means for moving said carriage and grinding means lengthwise along the knife edge, two laterally spaced apart shafts extending from said carriage upwardly parallel with the knife edge and movable up and down with said carriage, supporting and driving pulleys for said band-means fixed directly on said shafts, a gear train comprising pinions to each of which one of said shafts is slidably connected to rotate with and move axially of said pinion, a motor, and a belt drive mechanism operatively connecting said motor with said gear train for rotating said shafts.

2. In a cutting machine, the combination with

a knife which has a substantially upright cutting edge and is reciprocated substantially in the lengthwise direction of said edge, of knife-grinding flexible abrasive band-means arranged to contact opposite sides of the edge portion of the knife, a carriage supporting said grinding means, means for moving said carriage and grinding means lengthwise along the knife edge, two laterally spaced apart shafts extending from said carriage upwardly parallel with the knife edge and movable up and down with said carriage, supporting and driving pulleys for said band-means fixed directly on said shafts, a gear train comprising pinions to each of which one of said shafts is slidably connected to rotate with and move axially of said pinion, a motor, and belt drive mechanism for said gear train including a driving wheel movably supported and shiftable into and out of driving connection with said motor.

3. In a cutting machine, the combination with a knife which has a substantially upright cutting edge and is reciprocated substantially in the lengthwise direction of said edge, of knife-grinding flexible abrasive band-means arranged to contact opposite sides of the edge portion of the knife, a carriage supporting said grinding means, means for moving said carriage and grinding means lengthwise along the knife edge, two laterally spaced apart shafts extending from said carriage upwardly parallel with the knife edge and movable up and down with said carriage, supporting and driving pulleys for said band-means fixed directly on said shafts, a gear train comprising pinions to each of which one of said shafts is slidably connected to rotate with and move axially of said pinion, a motor, and belt drive mechanism for said gear train, comprising a pulley connected with a gear of said train, a driving pulley, a belt connecting said pulleys, a wheel connected to said driving pulley, and means for supporting and shifting said wheel into and out of driving connection with said motor.

4. In a cutting machine, the combination with a knife which has a substantially upright cutting edge and is reciprocated substantially in the lengthwise direction of said edge, of knife-grinding flexible abrasive band-means arranged to contact opposite sides of the edge portion of the knife, a carriage supporting said grinding means, means for moving said carriage and grinding means lengthwise along the knife edge, two laterally spaced apart shafts extending from said carriage upwardly parallel with the knife edge and movable up and down with said carriage, supporting and driving pulleys for said band-means fixed directly on said shafts, a gear train comprising pinions to which said shafts are connected to rotate with and move axially of said pinions, a motor, and belt drive mechanism for said gear train comprising a pulley connected with a gear of said train, a second pulley arranged above said first pulley, a belt connecting said pulleys, and a wheel secured to said second pulley, a pivoted lever supporting said second pulley and wheel, and means for moving said lever to shift said wheel into and out of driving connection with said motor.

5. In a cutting machine, the combination with a knife which has a substantially upright cutting edge and is reciprocated substantially in the lengthwise direction of said edge, of knife-grinding flexible abrasive band-means arranged to contact opposite sides of the edge portion of the

- knife, a carriage supporting said grinding means, means for moving said carriage and grinding means lengthwise along the knife edge, two laterally spaced apart shafts extending from said carriage upwardly parallel with the knife edge and movable up and down with said carriage, supporting and driving pulleys for said band-means fixed directly on said shafts, a gear train comprising pinions to each of which one of said shafts is slidably connected to rotate with and move axially of said pinion, a motor, belt drive mechanism operatively connecting said motor with said gear train and including a driving wheel shiftable into and out of driving connection with said motor, and means actuated by movement of said grinder carriage to an inoperative position for shifting said wheel out of driving connection with said motor.
6. In a cutting machine, the combination with a knife which has a substantially upright cutting edge and is reciprocated substantially in the lengthwise direction of said edge, of knife-grinding flexible abrasive band-means arranged to contact opposite sides of the edge portion of the knife, a carriage supporting said grinding means, means for moving said carriage and grinding means lengthwise along the knife edge, two laterally spaced apart shafts extending from said carriage upwardly parallel with the knife edge and movable up and down with said carriage, supporting and driving pulleys for said band-means fixed directly on said shafts, a gear train comprising pinions to one of which each of said shafts is slidably connected to rotate with and move axially of said pinion, a motor, belt drive mechanism operatively connecting said motor with said gear train including a driving wheel, a spring for shifting said driving wheel into driving connection with the motor, and means actuated by movement of said grinder carriage to an inoperative position for shifting said driving wheel out of driving connection with said motor.
7. In a cutting machine, the combination with a knife having a substantially upright cutting edge and which is reciprocated substantially in the lengthwise direction of said edge, of knife-grinding elements disposed to contact opposite sides of the edge portion of the knife, a supporting carriage for said elements movable to carry said elements lengthwise along the knife edge, and drive mechanism for said elements comprising two laterally spaced apart shafts extending upwardly from said carriage parallel with said knife edge and movable up and down with said carriage, a drive connection from each shaft to one of said grinding elements, a motor, a gear train located below said motor and above said carriage and comprising pinions to each of which one of said shafts is slidably connected to rotate with and move axially of said pinion, and belt drive mechanism operatively connecting said motor with said gear train for rotating said shafts.
8. In a cutting machine, the combination with a knife having a substantially upright cutting edge and which is reciprocated substantially in the lengthwise direction of said edge, of knife-grinding elements disposed to contact opposite sides of the edge portion of the knife, a supporting carriage for said elements movable to carry said elements lengthwise along the knife edge, and drive mechanism for said elements comprising two laterally spaced apart shafts extending upwardly from said carriage parallel with said

knife edge and movable up and down with said carriage, a drive connection from each shaft to one of said grinding elements, a gear train comprising pinions to each of which one of said shafts is connected to rotate with and move axially of said pinion, a motor, belt drive mechanism comprising a pulley connected with a gear of said train, a second pulley arranged above said first pulley, a belt connecting said pulleys, and a wheel secured to said second pulley, and a support for said second pulley and wheel movable to shift said wheel into and out of driving engagement with said motor.

9. In a cutting machine, the combination with a knife having a substantially upright cutting edge and which is reciprocated substantially in the lengthwise direction of said edge, of knife-grinding elements disposed to contact opposite sides of the edge portion of the knife, a supporting carriage for said elements movable to carry said elements lengthwise along the knife edge, and drive mechanism for said elements comprising two laterally spaced apart shafts extending upwardly from said carriage parallel with said knife edge and movable up and down with said carriage, a drive connection from each shaft to one of said grinding elements, a gear train comprising pinions to each of which one of said shafts is connected to rotate with and move axially of said pinion, a motor having a fore and aft extending horizontal rotary shaft, a drive wheel on the front end of said motor shaft, a wheel shiftable parallel with its plane of rotation into and out of driving engagement with said drive wheel, a pulley secured to said shiftable wheel, a pulley connected with a gear of said train, and a belt connecting said pulleys.

10. In a cutting machine, the combination with a knife having a substantially upright cutting edge and which is reciprocated substantially in the lengthwise direction of said edge, of knife-grinding elements disposed to contact opposite sides of the edge portion of the knife, a supporting carriage for said elements movable to carry said elements lengthwise along the knife edge, and drive mechanism for said elements comprising two laterally spaced apart shafts extending upwardly from said carriage parallel with said knife edge and movable up and down with said carriage, a drive connection from each shaft to one of said grinding elements, a motor, a gear train located below said motor and above said carriage and comprising pinions to each of which one of said shafts is connected to rotate with and move axially of said pinion, belt drive mechanism for said gear train including a driving wheel shiftable into and out of driving engagement with said motor, and means actuated by movement of said grinder carriage to and from an inoperative position for shifting said driving wheel out of and into driving engagement with said motor.

11. In a cutting machine, the combination of a flexible sharpening belt for the machine knife, a supporting leg for said belt, a tightening pulley for said belt, and a slide carrying said pulley and comprising a plate extending across one face of said leg and having side walls with inwardly projecting flanges which slidably embrace the opposite edges of said leg, and a transverse wall, and a spring between and engaging said transverse wall and said leg and acting on the slide to hold said sharpening belt under tension.