Dec. 19, 1939. F. J. CLARK ET AL 2,183,788

KNIFE-SHARPENING MECHANISM FOR CUTTING MACHINES

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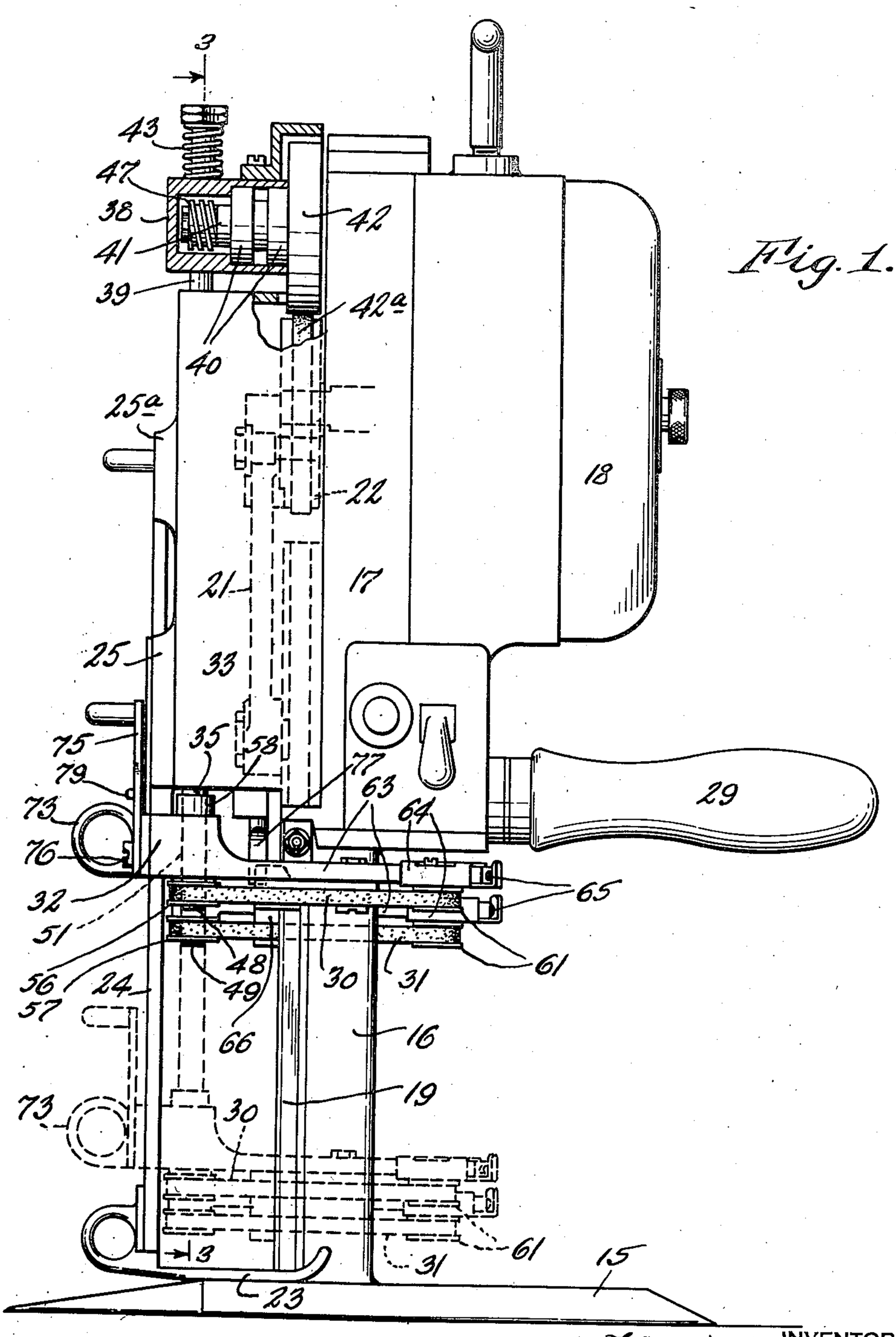

Fig. 1.

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Fig. 2.

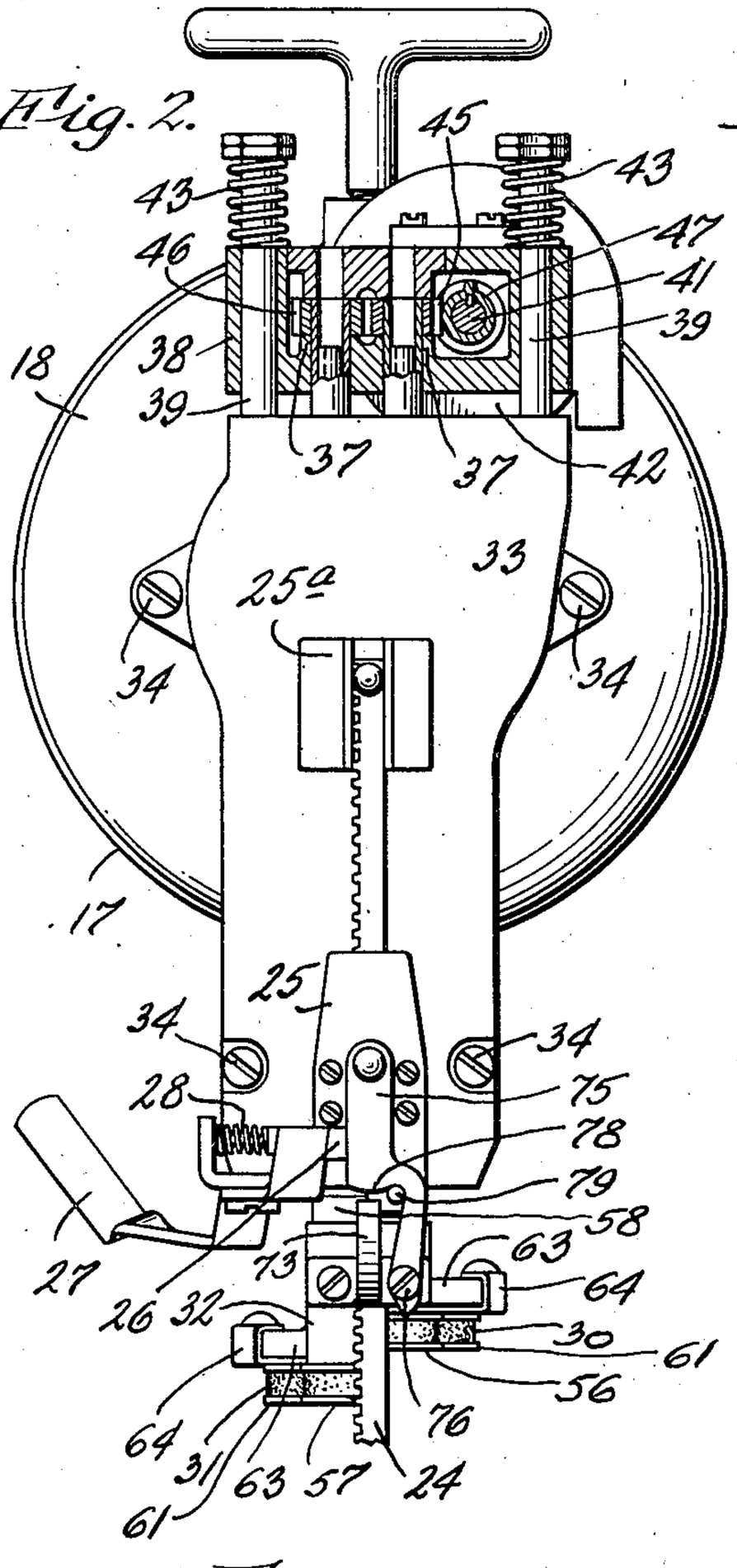


Fig. 3.

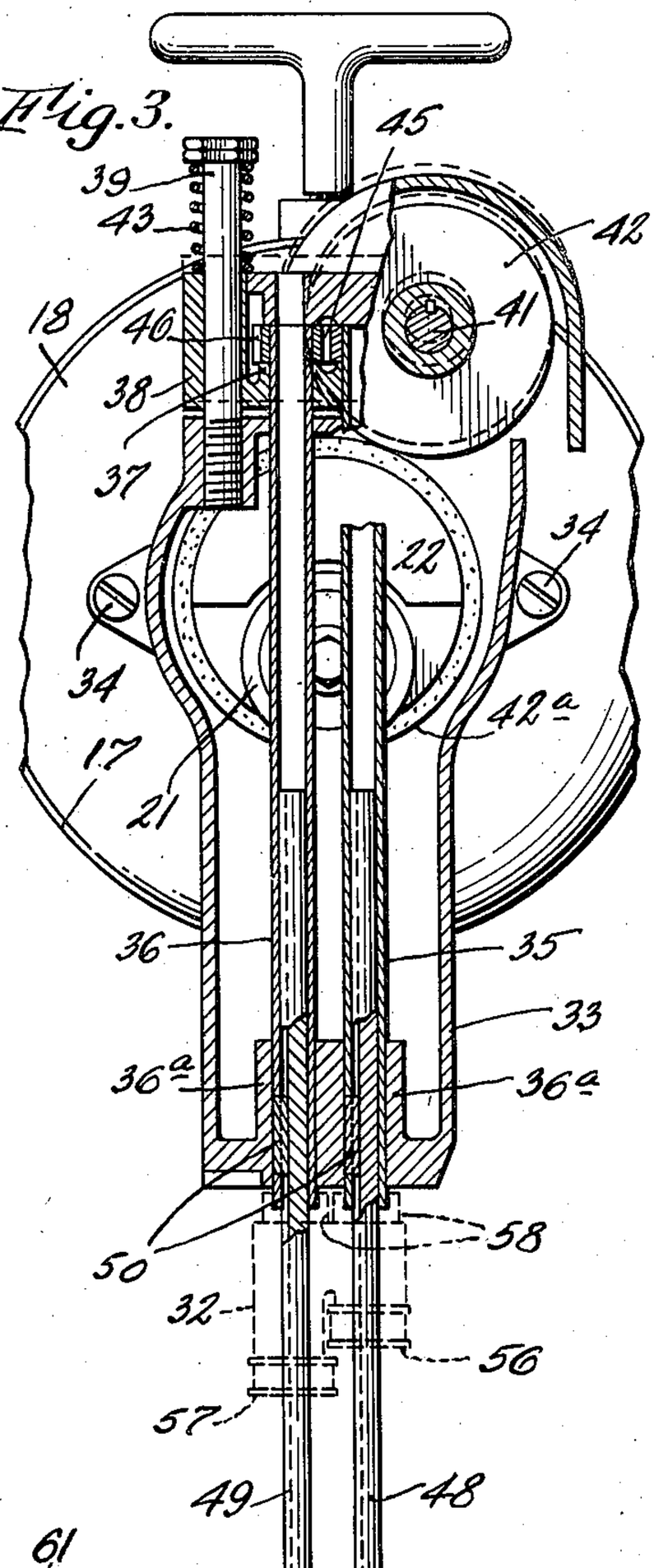
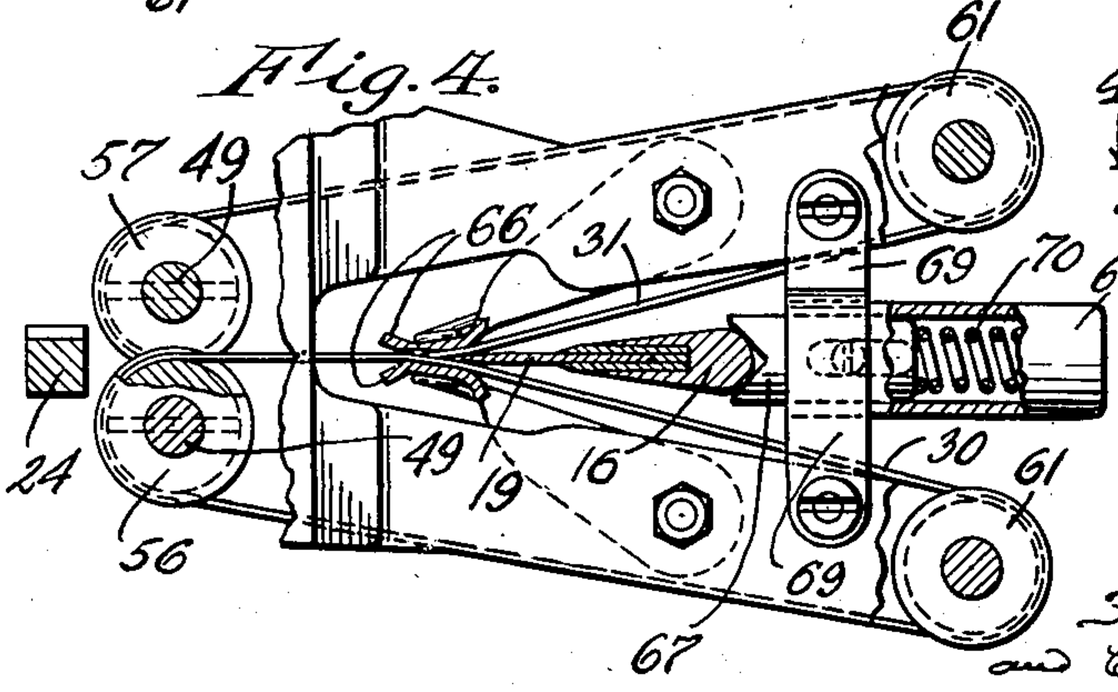


Fig. 4.



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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 portable type, commonly used for cutting cloth and other sheet materials, and having an upright, vertically reciprocating knife 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 knife-sharpening means with drive mechanism of improved construction for such machines.

Other objects of the invention are to improve the drive mechanism for the sharpening means or elements of the sharpening mechanism of generally similar organization disclosed in application for United States Letters Patent, Serial No. 194,895 filed March 9, 1938, in the name of Frederick J. Clark; also to provide efficient drive mechanism of exceedingly simple, strong and durable construction for the knife-sharpening means or elements of sharpening mechanisms for 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 of an upright reciprocating knife cutting machine, equipped with knife-sharpening mechanism embodying our invention, a portion of such mechanism being shown in vertical section.

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

Fig. 3 is a transverse, sectional elevation thereof on line 3—3, Fig. 1, and showing the grinding means lowered.

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 a base 15 adapted to rest and be moved about upon the table or supporting surface of the material to be cut, and an upright, slender standard 16, which is rigid with and rises from the base and supports a stationary frame 17 which houses an electric or other motor at 18 for driving the vertical knife 19. The knife is reciprocated in a vertical guide slot in the front of the standard by the motor through drive connections comprising a slide to which the knife is secured at its upper end and which is reciprocated in a suitable guide on the frame by a pitman 21 connecting it to the crank pin of a crank wheel 22 secured to 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, thus forming a guard for the knife, and is adjustable vertically, as in guides 25 and 25a on the front of the housing 33 to support the presser foot at different elevations suited to different lays of material to be cut. The rear end of the presser foot is shown as bifurcated and straddling 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 carried by the up-turned front end of a release lever 27 and pressed into holding engagement with the toothed side of the guard rod by a spring 28. The lever 27 may be 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 machine illustrated, the knife-grinding or sharpening means comprises flexible abrasive band means preferably comprising flexible belts or strips 30 and 31 having grinding surfaces of carborundum or other suitable abrasive material and disposed at opposite sides of the knife in such a way that their abrasive surfaces can be caused to travel in sharpening contact with opposite sides of the front edge portion of the knife. These belts are power driven, for example, by the knife-operating motor of the machine, so that the runs or portions of the belts which contact with the knife, travel forwardly past the latter, and they are mounted on a grinder carriage or support 32 arranged for movement up and down along or parallel with the knife edge to adapt the belts to sharpen the knife throughout its effective cutting length.

Said knife-grinding means or elements, 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 stationarily 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 an unit from the

machine. The housing **33** shown also serves as a cover for the crank wheel **22**, pitman and other parts of the knife-operating mechanism.

The improved drive mechanism for the grinding means or elements is preferably constructed as follows:

Arranged vertically side by side in the housing **33** in front of the crank wheel are two parallel tubular shafts **35** and **36** which are journalled at their lower portions in suitable bearings **36***a* at the lower end of the housing **33**. These shafts extend up through the upper end of the housing and through bearings **37** therefor in a gear casing **38** arranged above the housing **33** to move vertically toward and from the same on suitable guides, such as fixed posts **39**, projecting up from the housing **33** through guide holes in the gear casing **38**. Journalled in the gear casing **38**, preferably in suitable ball bearings **40**, is a horizontal shaft **41** on the inner end of which is fixed a wheel **42** adapted to be driven by engagement with the crank wheel **22**, which may be provided with a peripheral band or tire **42***a* of rubber or other suitable friction material to ensure effective driving of the wheel **42** by frictional contact therewith. The wheel **42** is adapted to be pressed into driving engagement with the crank wheel, as by coil springs **43** which surround the posts **39** between nuts at their upper ends and the top of the gear casing **38**, and tend to move the gear casing downwardly to engage the wheel **42** with the crank wheel **22**.

The two shafts **35** and **36** are driven so as to rotate in opposite directions, preferably by intermeshing spiral pinions **45** and **46** fixed on the upper ends of the shafts **35** and **36** respectively, and one of which pinions, as **45**, meshes with and is driven by a spiral pinion **47** on the horizontal shaft **41**. The pinions **45** and **46** are confined vertically in a chamber therefor in the gear casing **38**, and since they are fixed to the tubular shafts **35** and **36**, the latter are adapted to move vertically or endwise in their bearings with the gear casing **38** when the casing is moved for placing the wheel **42** into and out of driving engagement with the crank wheel **22**.

Slidable lengthwise in the tubular shafts **35** and **36**, are two shafts **48** and **49** which are splined to the tubular shafts, as by keys **50** fixed in the tubular shafts and entering longitudinal keyways in the shafts **48** and **49**, so that, while the latter shafts rotate with the tubular shafts, they are adapted to slide up and down therein. The shafts **48** and **49** extend downwardly out of or below the housing **33** with their lower ends extending through and journalled in bearing openings **51** in the grinder carriage **32**. Drive pulleys **56** and **57** for the sharpening belts **30** and **31** respectively are fixed on the lower ends of the shafts **48** and **49** below the carriage **32**, and relative vertical movement between said shafts and the carriage **32** is prevented by confining the carriage between the pulleys **56** and **57**, and collars **58** fixed on the shafts and engaging the top of the carriage. The grinder carriage is thus adapted to move with the shafts **48** and **49** vertically or up and down along and parallel with the edge of the knife.

As shown, each belt **30**, **31** passes around its drive pulley and an idler pulley **61**, and the two idler pulleys are journalled on slides **64** movable toward and from the drive pulleys on fixed legs **63** projecting rearwardly from the grinder carriage **32** and straddling the knife standard. The slides are yieldingly pressed rearwardly by springs **65** for maintaining the belts under suitable tension, and removal and renewal of the belts are readily effected by moving the idler pulley slides to slacken the belts.

The two sharpening belts in the construction shown are disposed at different levels, one above the other, and yieldingly pressed into sharpening contact with opposite sides of the edge portion of the knife by suitable means, such as the spring-pressed fingers **66**, more fully shown and described in said copending application. These presser fingers are so shaped that their free end portions, which engage the belts, will hold those portions of the belts which contact the knife, at the requisite converging inclinations to insure grinding and maintaining longitudinal and bottom edges on the knife of wide, thin, bevelled form which are very sharp or keen and will remain sharp for the maximum time.

The parallel sliding shafts **48** and **49**, which are guided vertically in the tubular shafts **35** and **36**, 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. In the illustrated embodiment of the invention, a guide block **67** on the carriage, see Fig. 4, slidably engages the rear edge of the standard **16**. This block is movably retained in a tubular holder **68** having arms **69** secured to the carriage legs, and the notched front end of the block is held in yielding engagement with the rounded rear edge of the standard by a spring **70** in the holder back of the block. The parallel sliding shafts **48** and **49** supplemented by the block **67** yieldingly and slidingly engaging the standard, form a very efficient carriage guide.

The described drive mechanism drives the grinding means or belts rapidly and positively 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 sharpening its bottom end or point by any suitable means adapted to move the grinder carriage up and down. Preferably, the carriage is provided for this purpose, with a forwardly projecting, rigid finger piece **73** in the form of a ring adapted to be conveniently grasped between the thumb and finger for moving the carriage.

In the normal operation of the machine for cutting material, the grinder carriage with its grinding means or belts is held in its uppermost 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 using the machine, at which time it is necessary for him to be able to see the cutting edge of the knife so as to properly guide it to follow the pattern or required line of cut. The grinder carriage is releasably held in this upper, inoperative position and the drive wheel **42** held out of driving engagement with the crank wheel **22** to prevent driving the grinding means, preferably by a latch **75** in the form of a lever pivoted at **76** on the front of the grinder carriage. 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 lower portion of 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 to disengage the wheel 42 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 its uppermost inoperative position, and the lower ends of the tubular shafts 35 and 36 project downwardly out of the bottom of the housing 33, in which position they are held by the downward pressure of the springs 43 on the gear casing 38. In camming the grinder carriage up to its inoperative position by the latch 75, the carriage engages the projecting lower ends of the shafts 35 and 36 and lifts the shafts slightly, and through them lifts the gear casing 33 and moves the wheel 42 out of driving engagement with the crank wheel, thus stopping the grinding means.

When using the machine for cutting, the grinder carriage is retained in its raised, inoperative position by the latch 75, where it is out of the way. In this position of the sharpener, the belts may be held out of contact with the knife to prevent cutting the belts or wearing the knife, by a wedge pin 77 arranged to engage and spread apart the presser fingers 66. When the knife requires sharpening, it is only necessary to release and lower the presser foot to its lowest position, then release the latch and move the grinder carriage down and up along the reciprocating knife by means of the carriage finger piece 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.

In the described drive mechanism, the drive pulleys for the belts are secured directly on the lower ends of the two vertically movable shafts 48 and 49, and only a single train of three pinions is required between the releasable drive shaft 41 and the belts for driving them. The vertically movable shafts are sturdily supported and guided for rotary and lengthwise movement and they, in turn, are directly journalled in the grinder carriage and afford simple and efficient means for guiding the carriage in its up and down movements along the knife and preventing horizontal shifting or twisting movements of the carriage.

We claim as our invention:

1. 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 its edge, of knife-grinding means comprising flexible abrasive band means arranged to contact opposite sides of the edge portion of the knife, a supporting carriage for said grinding means, drive mechanism for said grinding means comprising two shafts extending side by side above said carriage parallel with the knife edge, a power-operated driving motor geared to said shafts, a pair of shafts extending downwardly from and slidable lengthwise of and driven by said first two shafts, a pulley fixed directly on each of said slidable shafts and engaging said flexible band means for driving the same, and means for moving said carriage with said grinding means and last mentioned shafts lengthwise along the knife edge.

2. 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 its edge, of knife-grinding belts disposed at opposite sides of the edge portion of the knife, a supporting carriage for said belts, means for moving said carriage and grinding belts lengthwise along the knife edge, and drive mechanism for said belts comprising a pair of upright shafts arranged parallel with and at opposite sides of the plane of the knife, a driving motor geared to the upper portions of said shafts, a second pair of shafts rotated by and movable with said carriage lengthwise of said first pair of shafts, and extending downwardly from said first shafts, and a belt driving pulley fixed directly on the lower end portion of each of said second pair of shafts and engaging one of said belts.

3. 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 its edge, of knife-grinding belts disposed at opposite sides of the edge portion of the knife, a supporting carriage for said belts, and drive mechanism for said belts comprising a pair of upright tubular shafts arranged at opposite sides of the plane of the knife, a driving motor geared to the upper ends of said shafts, shafts slidable lengthwise in and rotated by said tubular shafts with their lower ends journalled in said carriage, a belt-driving pulley fixed on the lower end of each of said last mentioned shafts and engaging one of said belts, and means for moving said carriage and belts lengthwise along the knife edge.

4. 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 its edge, of knife-grinding elements disposed at opposite sides of the edge portion of the knife, a supporting carriage for said elements, and drive mechanism for said elements comprising two shafts extending side by side above said carriage parallel with the knife edge, a driving motor, releasable drive means from said motor to said shafts, a pair of shafts coaxial with and rotated by said first mentioned shafts and arranged to move with said carriage lengthwise of the knife edge, drive connections between said last mentioned shafts and said grinding elements, and means for moving said carriage lengthwise along the knife edge, said first mentioned shafts being shifted by movement of said carriage for actuating said releasable drive means for stopping the grinding elements.

5. 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 its edge, of knife-granding elements disposed at opposite sides of the edge portion of the knife, a supporting carriage for said elements, and drive mechanism for said elements comprising two shafts extending side by side above said carriage parallel with the knife edge, a driving motor, releasable drive means from said motor to said shafts, a pair of shafts coaxial with and rotated by said first mentioned shafts and arranged to move with said carriage lengthwise of the knife edge, drive connections between the said last mentioned shafts and said grinding elements, means for moving said carriage lengthwise along the knife edge, and a latch for releasably retaining said carriage in an upper inoperative position, the movement of the carriage to the latched position actuating said releasable drive means through the medium

of said first mentioned shafts for stopping the grinding elements.

6. 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 its edge, of knife-grinding elements disposed at opposite sides of the edge portion of the knife, a supporting carriage for said elements, and drive mechanism for said elements comprising two shafts extending side by side above said carriage parallel with the knife edge, a driving motor, releasable drive means from said motor to said shafts, a spring tending to maintain driving relation between said releasable drive means and the motor, a pair of shafts coaxial with and rotated by said first mentioned shafts and arranged to move with said carriage lengthwise of the knife edge, drive connections between the said last mentioned shafts and said grinding elements, means for moving said carriage lengthwise along the knife edge, a latch for releasably retaining the carriage in an upper inoperative position, the movement of the carriage to the latched position actuating said releasable drive means through the medium of said first mentioned shafts for stopping the grinding elements, and the unlatching of the carriage permitting movement of said releasable drive means by said spring for setting said drive mechanism in motion.

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 its edge, of knife-grinding elements disposed at opposite sides of the edge portion of the knife, a supporting carriage for said elements, and drive mechanism for said elements comprising two shafts extending side by side above said carriage parallel with the knife edge, a driving motor, releasable drive means from said motor to said shafts, a pair of shafts coaxial with and rotated by said first mentioned shafts and arranged to move with said carriage lengthwise of the knife edge, drive connections between the said last mentioned shafts and said grinding elements, said carriage being manually movable lengthwise along the knife edge, and a latch operable to releasably retain the carriage in an inoperative position and release said releasable drive means from the motor, said latch being arranged adjacent said carriage in position to be actuated by a finger of the hand which moves said carriage.

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 its edge, of knife-grinding elements disposed at opposite sides of the edge portion of the knife, a supporting carriage for said elements, drive mechanism for said elements comprising two shafts extending side by side above said carriage parallel with the knife edge, a driving motor geared to said shafts, shafts movable lengthwise of and rotated by said first shafts and operatively connected to said grinding elements, means for moving said carriage and grinding elements lengthwise along the knife edge, a stationary upright guide, and a guide block movably mounted on said carriage in rear of said upright guide and having a notched end held in yielding sliding engagement with the rear edge of said stationary guide and cooperating with said lengthwise movable shafts to guide said carriage in its movements along the knife edge.

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 its edge, of knife-grinding elements arranged to contact opposite sides of the edge portion of the knife, a carriage supporting said elements, means for moving said carriage and grinding elements lengthwise along the knife edge, and drive mechanism for said elements comprising two shafts extending side by side above said carriage parallel with the knife edge, a driving motor, releasable drive means from said motor to said shafts, a pair of shafts rotated by said first two shafts and movable axially thereof with said carriage lengthwise of the knife edge, drive connections from each of said last-mentioned shafts to one of said grinding elements, latch means for moving said carriage to and releasably securing it in an upper inoperative position, and means actuated by the operation of said latch means for actuating said releasable drive means to stop and start said grinding elements.

10. 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 supporting carriage for said band means, means for moving said carriage and band means lengthwise along the knife edge, a pair of shafts extending up from the carriage parallel with and at opposite sides of the knife edge and movable up and down with said carriage, supporting and driving pulleys for said band means one fixed directly on each of said shafts, a second pair of shafts each having a sliding drive engagement with one of said first pair of shafts, and a power-operated motor and drive mechanism for rotating said second pair of shafts.

11. 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 flexible abrasive sharpening belts arranged to contact opposite sides of the edge portion of the knife, a supporting carriage for said belts, means for moving said carriage and belts lengthwise along the knife edge, a pair of shafts extending up from the carriage parallel with and at opposite sides of the knife edge and movable up and down with said carriage, supporting and driving pulleys for said belts each fixed directly on one of said shafts, a second pair of shafts each having a sliding drive engagement with one of said first pair of shafts, a power-operated motor, and a single gear train from said motor to said second pair of shafts for driving said sharpening belts.

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