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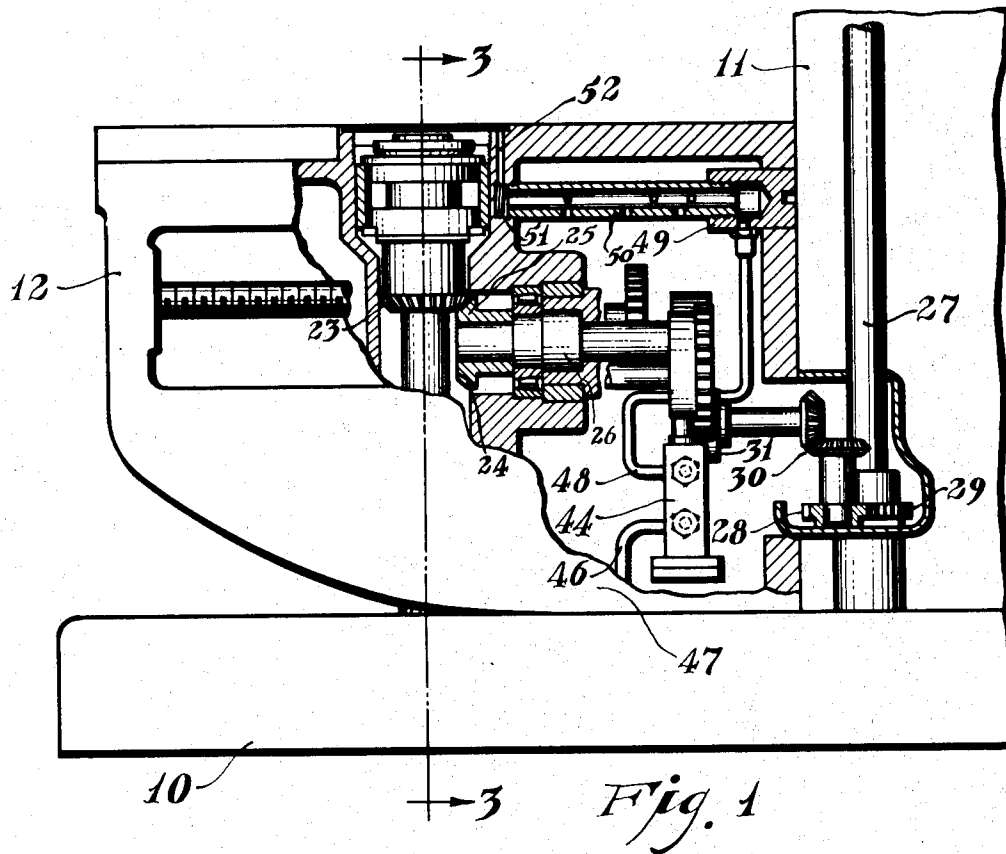
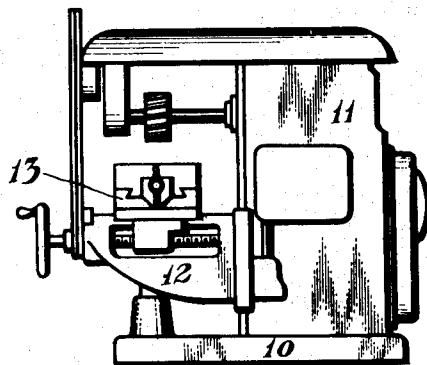


Fig. 2

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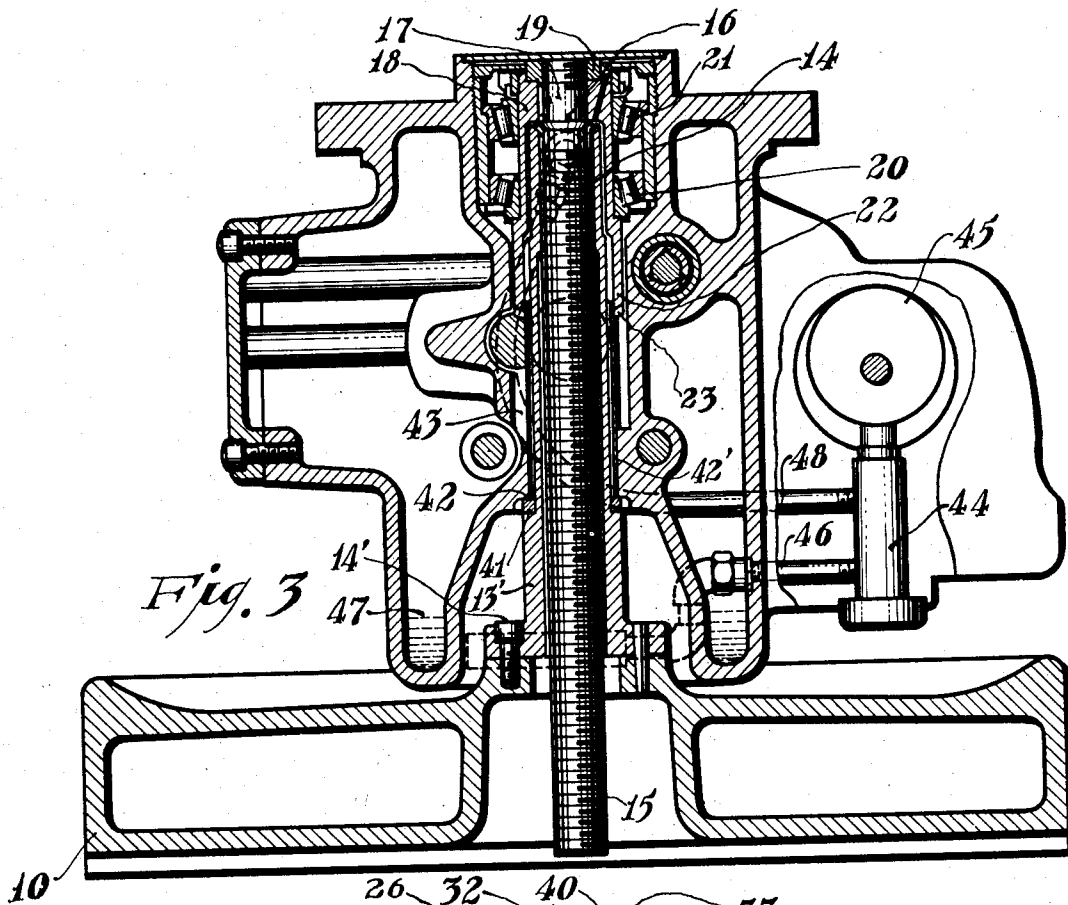
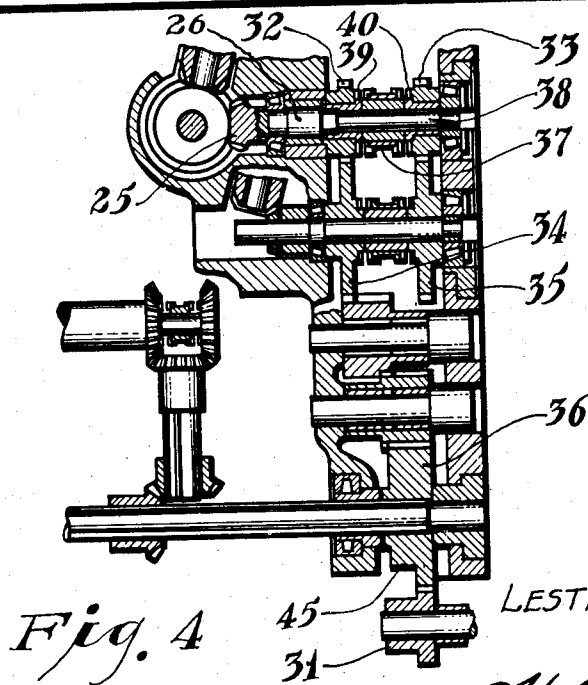
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1,919,150

MILLING MACHINE

Filed July 14, 1930

2 Sheets-Sheet 2



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MILLING MACHINE

Application filed July 14, 1930. Serial No. 467,695.

This invention relates to milling machines and more particularly to improvements in the knee and column type machine.

One of the objects of this invention is to provide an improved elevating mechanism for the knee support of a milling machine whereby the knee will have a maximum length of adjustment.

Another object of this invention is the provision of a suitable housing for the knee elevating screw of a milling machine, whereby the screw will be protected from dirt or chips in all positions of adjustment of the knee.

A further object of this invention is the provision of a complete automatic independent lubricating system enclosed in the knee of the milling machine for lubricating the transmission and actuating members carried therein.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification considered in conjunction with the accompanying drawings illustrative of one embodiment thereof but it will be understood that any modifications may be made in the specific structural details hereinafter disclosed within the scope of the appended claims without departing from or exceeding the spirit of the invention.

Referring to the drawings in which like reference numerals indicate like parts:

Figure 1 is a side elevation partly in section of the knee of a milling machine illustrating one embodiment of this invention.

Figure 2 is a side elevation of a milling machine.

Figure 3 is a section on the line 3—3 of Figure 1.

Figure 4 is an expanded view of the transmission to the elevating screw.

The reference numeral 10 indicates the base or pedestal of a knee and column type milling machine having a vertical column 11 upon which is vertically, slidably mounted the knee 12 which carries the work support organization indicated generally by the reference numeral 13.

Means have been provided for mechanically raising or lowering the knee which may be

operated by hand or power, and comprises an elevating screw 15 mounted in an upstanding housing 13', which is firmly attached to the pedestal 10 as by bolts 14'. The upper terminal of the housing is interiorly threaded forming a nut 14 for the reception of the elevating screw 15.

The screw is provided at one end with a shoulder 16 and a reduced portion 17 upon which is keyed the beveled gear 18 for effecting rotation of the screw. A locking nut 19 is threaded on the portion 17 to hold the gear in engagement with said shoulder. The gear 18 is provided intermediate its length with anti-friction bearings 20 and 21 which in turn support the knee on the screw. The gear is further provided with a tubular depending portion or skirt 22 which has formed on its lower extremity beveled gear teeth 23 which engage with the teeth 24 of the beveled gear 25 mounted on the end of the horizontal shaft 26. This shaft is adapted to be rotated through suitable power means, which in the present instance includes the vertical shaft 27, which may be driven from the prime mover in the column 11 of the machine through a suitable known transmission. A pinion 28 journaled on a stud shaft in the knee receives power from the gear 29 splined on shaft 27 and through a pair of beveled gears 30 actuates the pinion 31. A forward and reverse driver 32 and 33 are driven from the pinion 31 through intermediate gears 34 and 35 respectively, which in turn are constantly rotated by the gear 36 in mesh with the pinion 31, one in a forward direction and the other in a reverse direction through a reverser. A clutch 37 is slidably mounted on the splined portion 38 of the shaft 26 upon which the gears 32 and 33 are mounted for free rotation and has clutch teeth upon its opposite faces for engagement with either the clutch teeth 39 of the gear 32 or the clutch teeth 40 of the gear 33. This transmission serves to actuate the beveled gear 25, previously mentioned, in either a forward or a reverse direction depending upon the position of the clutch 37 to cause upward or downward movement of the knee.

In order to limit the downward movement

of the knee the member 13' is provided with a shoulder 41 against which the circular boss 42 formed in the knee casting abuts. This stop prevents jamming of the feed screw which might effect the precision of the machine. A bore 42' is formed in the knee adjacent the boss 42 and has fixed therein a tube 43 which extends vertically upward and telescopes inside the skirt 22 of the gear 18, the tube moving up and down with the knee and forming a shroud around the elevating screw housing thereby preventing oil or other lubricant, which flows down over the gear 23, from being lost by conducting it back to the sump or reservoir. This tube also acts to prevent exposure of the elevating screw to dirt or chips when the knee is in a raised position.

Attention is invited to the fact that the gear member 18 is attached to the upper end of the elevating screw in close proximity to the saddle guideway and that its intermediate portion, upon which the anti-friction bearings are mounted, extends downward and circumscribes the threaded end of the housing 13 thereby permitting the threaded end of nut 14 to be placed or positioned at the highest possible point resulting in a maximum effective length of the elevating screw being available for raising or lowering the knee without undue heightening of the knee structure.

An independent automatic system for lubricating the elevating screw, as well as the power transmission therefor, has been provided in the knee. The lubricant is circulated by a pump 44 which may be of the plunger type and driven by an eccentric 45, formed on the gear 36. Thus whenever the transmission to the elevating screw is actuated the pump will be simultaneously actuated therewith. The pump 44 is provided with an inlet 46, for drawing oil from the sump 47 in the bottom of the knee, and with an outlet 48 which leads to a header 49 secured in the side wall of the knee. A spray pipe 50 projects horizontally from the header and has a plurality of holes formed therein for spraying the oil over the gears of the transmission. The outer extremity of this pipe is threaded into a bore 51 formed in a depending flange which surrounds the elevating screw. A vertical bore 52 communicating with bore 51 is formed in the flange through which oil rises when the pressure is sufficient and flows over the top and down inside of the flange to lubricate the elevating screw and bevel gear 18. The falling lubricant is then collected in the sump in the base of the knee from which it may be drawn up again by the pump for recirculation. Thus a self-contained lubricating system has been provided in the knee casting itself for lubricating the parts therein which is automatically operated when the parts are power actuated.

That which is claimed is:

1. In a milling machine having a column and a knee slidably mounted thereon, elevating means for the knee including a screw and nut, one of which is fixed to the machine, a tubular member telescoping said screw and having one end attached to the end of the screw, a power shaft journaled in the knee at an angle to said screw with its axis intersecting the axis of the screw beyond the free end of said member, means intermediate the ends of said member for supporting the knee, and means on said shaft operatively engaging the free end of said member for imparting rotation to the screw to thereby effect rectilinear movement of the knee.

2. In a milling machine having a column and a knee reciprocably mounted thereon, means for effecting reciprocation of the knee including an elevating screw, a fixed tubular housing having a nut formed in the end thereof for receiving the screw, an actuating member having one end attached to the end of said screw for imparting rotation thereto, said member also having a skirt attached to the knee for effecting movement thereof, said skirt depending from the member to thereby telescope said nut and permit movement of the knee to an extreme lower position.

3. In a machine tool comprising a supporting frame and a pedestal projecting therefrom, a guideway formed on the frame and an adjustable knee mounted on the guideway, means for supporting and adjusting the knee including a tubular housing vertically projecting from said pedestal and having a threaded bore in the end thereof, an elevating screw rotatably mounted in said bore and having one end extending substantially to the upper face of the knee, means for attaching the knee to said screw for movement therewith including a connecting member secured to the upper end of the screw and having a depending skirt, said skirt being adapted to telescope said nut upon movement of the knee to an extreme lower position.

4. An elevating mechanism for the knee of a milling machine comprising a tubular housing fixed to the machine, an elevating screw depending from said knee and threaded in the end of said housing, said housing adapted to project through an opening in the bottom wall of said knee to a position adjacent the opposite wall when the knee is in its lowermost position, an actuating member attached to said screw and having a skirt depending therefrom, a tubular sleeve attached to the bottom wall of the knee adjacent the opening therein and telescoping interiorly of the depending skirt whereby upon movement of the knee to an elevated position the screw will be protected from chips or dirt.

5. A milling machine having a column and a knee reciprocably mounted thereon, elevat-

ing means therefor, a power transmission train mounted in the knee for actuating said elevating means, a lubricating system self-contained in the knee for lubricating said transmission train, a lubricant circulator for said system located in the knee, and means coupling the circulator to the train for automatically effecting self-lubrication of the train during actuation thereof.

6. In a milling machine having a column, a knee reciprocally mounted thereon, and an elevating screw for effecting adjustment of said knee, the combination of a transmission train self-contained in the knee for actuating said screw in a clockwise or counter clockwise direction, a lubricating pump mounted in the knee for actuation by said transmission train, and means to conduct lubricant from the pump to the screw and transmission train whereby upon actuation of the transmission said screw and train will be automatically lubricated.

7. A milling machine having a knee, a transmission train therein for effecting movement thereof, a lubricant sump formed in the bottom thereof, a circulating pump operatively connected to said transmission, having an inlet and an outlet, said inlet being connected to the sump, distributing pipes connected to the outlet whereby upon actuation of said transmission a lubricant will be circulated in a closed system in the knee to effect lubrication of the moving parts thereof.

8. A milling machine comprising a pedestal, the bottom face of which is adapted to rest on a floor, a column uprising from the pedestal having vertical guideways thereon, a work support mounted on said guideways, an elevating screw housing vertically projecting from the pedestal and having a nut formed in the upper end thereof, an elevat-

ing screw having a reduced shank on one end forming a shoulder threaded in the nut, said screw being of sufficient length to reach the floor when the shoulder is flush with the upper end of the nut, a driver for the screw fixed on said shank, means on the driver in circumscribing relation to the nut for supporting the work support on the lead screw and with the top face of the work support lying substantially in the plane of the upper end of said driver, and means for actuating the driver whereby the work support may be elevated a distance substantially equal to the height of its top surface above the floor when the work support is in its lowermost position.

9. In a milling machine having a pedestal, a vertical column mounted on the pedestal, a tubular housing projecting from the pedestal parallel to the column, a knee mounted on the column having an opening in the bottom thereof for receiving said housing, a knee elevating screw threaded in the housing and projecting beyond the top thereof into engagement with the knee, an actuator attached to said screw, operating means coupled to the actuator for effecting rotation of the screw, a lubricant sump formed in the bottom of the knee, means self-contained in the knee and operable by the operating means for the screw to elevate lubricant from the sump to said actuator and its operating means, a skirt depending from the actuator and a tube mounted in the opening in the knee and extending upward in circumscribing relation to the housing and in telescoping relation with the skirt whereby lubricant flowing over the moving parts will be retained within the knee and returned to said sump.

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