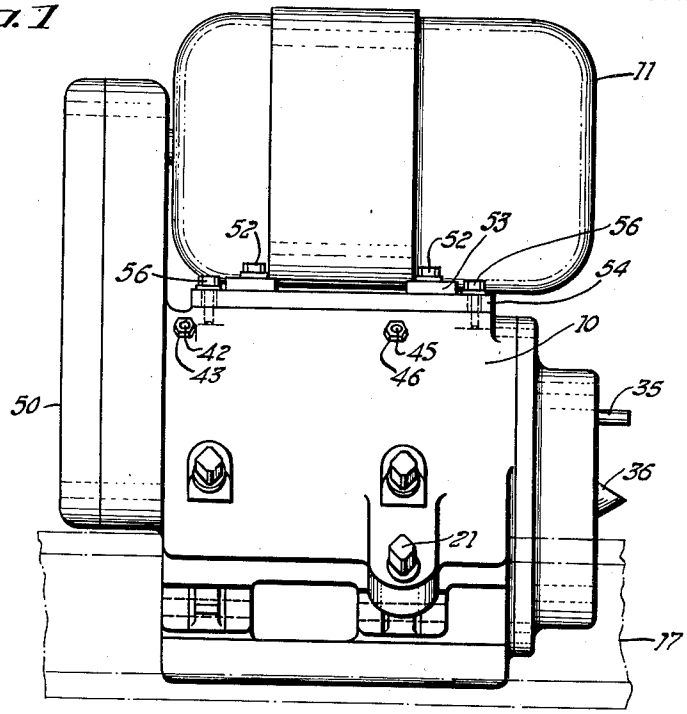
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HEADSTOCK FOR MACHINE TOOLS

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Fig. 1



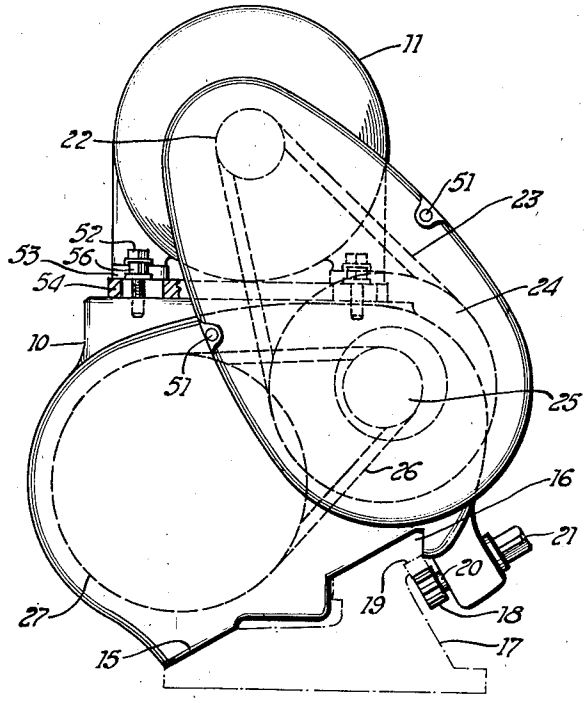


Fig. 2

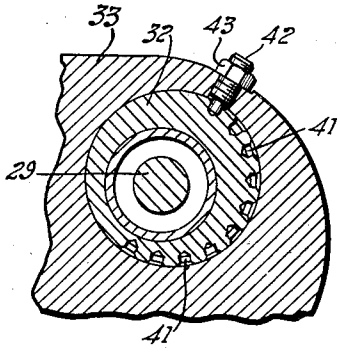


Fig. 4

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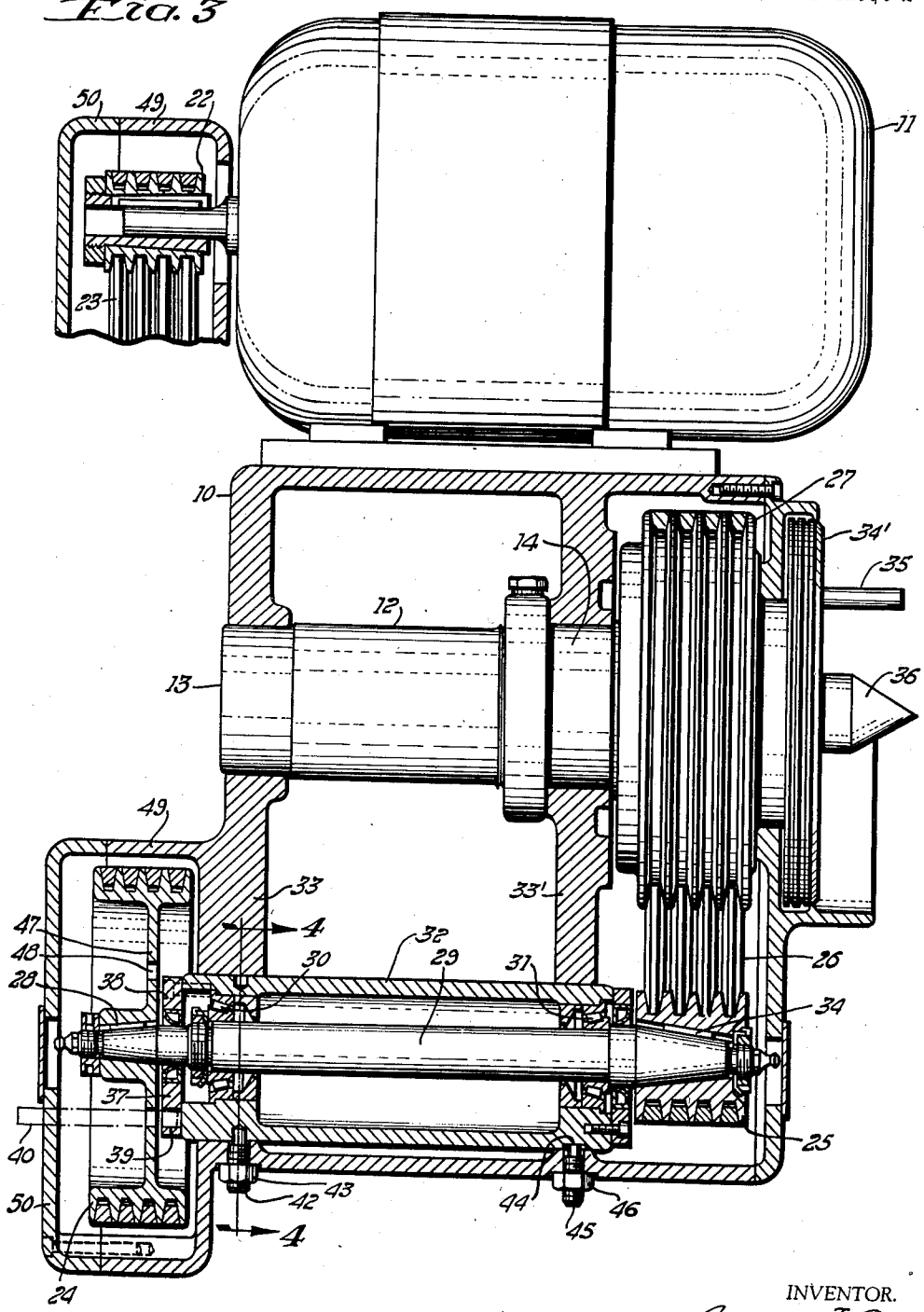
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Fig. 3



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HEADSTOCK FOR MACHINE TOOLS

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Application December 24, 1940, Serial No. 371,504

3 Claims. (Cl. 51—237)

This invention relates to grinding machines and more particularly to an improved headstock therefor.

One of the objects of this invention is to provide an improved power driven self-contained headstock for precision machine tools.

Another object of this invention is to provide an improved headstock which will transmit power to the headstock spindle without appreciable vibration and which contains adjustments to insure a constant torque on the spindle.

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 forming a part thereof and it is to be understood that any modifications may be made in the exact structural details there shown and described, 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 or similar parts:

Figure 1 is an elevational view of the headstock embodying the principles of this invention.

Figure 2 is an end view of the headstock shown in Figure 1, and as viewed from the left side of that figure.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a detail sectional view on the line 4—4 of Figure 3.

Referring to Figure 1 of the drawings there is shown a headstock embodying the principles of this invention in which the reference numeral 10 indicates a housing upon the top of which is mounted a prime mover in the form of a motor which may be either hydraulic or electric, there being shown for illustrative purposes an electric motor 11. The headstock spindle 12, as shown in Figure 3, is suitably journaled at 13 and 14 in the walls of the housing 10.

In precision machine tools and especially in grinding machines it is desirable that power be transmitted to the headstock spindle in a manner which will not create vibration because it tends to mar the finish produced on a ground work piece. In addition, it is necessary to provide for speed reduction between the prime mover and the spindle because the conventional commercial types of motors normally run at a much higher rate of speed than is desired in the headstock spindle.

These requirements are met by providing two speed reduction steps between the prime mover and the spindle and in using multiple flexible belts as the motion transmitting medium.

Referring to Figure 2, the headstock housing 10 is provided on the underside with a flat guide surface 15 and a V-guide surface 16 by which it may be supported on complementary surfaces of a grinding machine table 17. The headstock may be adjusted relative to the table by means of a pinion 18 which is adapted to interengage with a rack 19 provided on said tables. The shaft 20 which is integral with the pinion 18 is journaled in the headstock and may be provided with a square head 21 to which a suitable crank may be applied for rotating the gear.

The motor pulley 22 is connected by belting 23 to a much larger pulley 24 whereby a first reduction in speed is accomplished. A third pulley 25 much smaller in diameter than the pulley 24 but integrally connected for rotation with the pulley 24 is connected by belting 26 to a much larger pulley 27 whereby a second reduction in speed is obtained. Referring to Figure 3, it will be noted that the pulleys 22 and 24 have multiple belt grooves and that the belting 23 consists of a series of V-belts. This facilitates the transmission of power, especially when the arc of contact on the pulley 22 is somewhat reduced on account of its closeness to the pulley 24 and the large difference in diameter between the two pulleys.

The pulley 24 is keyed at 28 to the end of a jack shaft 29 which is anti-frictionally journaled at 30 and 31 in a sleeve 32 which is supported at opposite ends in the walls 33 and 33' of the housing 10. The pulley 25 is keyed at 34 to the other end of shaft 29 whereby the pulleys 24 and 25 rotate as a unit. It will be noted that the pulleys 25 and 27 are also multiple groove pulleys and that the belting 26 consists of a series of V-belts. This facilitates the transmission of power in spite of the large difference in diameter between the pulleys 25 and 27. It will thus be seen that in two steps the high speed of the driving motor is reduced to a usable speed for the headstock spindle. The headstock spindle is provided with a face plate 34' which carries a driving pin 35 for rotating the work. The end of the spindle 12 is suitably bored for receiving the work supporting center 36.

When two sets of belting are utilized in a manner such as shown herein there is always the possibility that one set of belting will stretch more than the other during use, and furthermore it is necessary to provide for initial tightening of the belts when first assembled in the unit. The problem of tightening and maintaining the

proper tension in both sets of belting is solved herein by mounting the shaft 29 in eccentric relation to its supporting sleeve 32 whereby upon rotation of the sleeve the belting 26 may be properly tensioned. After this is accomplished, the motor 11, which is supported for lateral adjustment, is shifted laterally or to the left as viewed in Figure 2 to obtain the proper tension in the belting 23.

The manner of adjusting the sleeve 32 will now be explained. Referring to Figure 3, the sleeve has a cap 37 attached to one end as by screws 38 and in this cap is formed a hole 39 for receiving an adjusting pin 40. As shown in Figure 4, the sleeve 32 is provided with a series of radial holes 41 adapted to receive the end of a locking screw 42 which is threaded in the wall 33. The screw is provided with a lock nut 43. The sleeve is provided at the other end with an annular groove 44 into which fits a set screw 45 having a lock nut 46. When adjustment is to be made the lock nuts 43 and 46 are loosened and the set screw 45 is backed off just sufficient to loosen its grip on the sleeve while still maintaining the end of the screw in the groove. The set screw 42 is backed off sufficiently to disengage the radial hole 41 and then the sleeve is rotated by the pin 40 which is inserted in the hole 39. When the necessary tension is placed on the belting 26 the set screw 42 is engaged with the nearest radial hole 41 to hold the sleeve in proper position and then the remaining parts are tightened. The adjusting pin 40 is then removed.

It will be noted that the pulley 24 is mounted adjacent to the collar 37, and to make possible the insertion of pin 40 in the hole 39, the web 47 of the pulley is provided with a series of holes 48. The pulley is rotated until one of these holes is aligned with the hole 39.

It is desirable that the belting 23 be enclosed during operation, and therefore the belt guard 49 is provided having a removable cover plate 50 which is secured in position by screws 51. It is necessary to remove this cover plate in order to insert the pin 40 for adjustment of the sleeve.

After the eccentric sleeve has been adjusted the motor 11 is laterally adjusted. The bolts 52 pass through the feet 53 of the motor for clamping the motor to the supporting plate 54. The plate 54 has elongated holes through which the bolts 56 pass and these holes are elongated in a lateral direction as respects the axis of the motor so as to permit lateral adjustment of the motor for belt tightening purposes. The bolts 56 are threaded in the housing 10 and are tightened after the motor and plate have been adjusted to obtain the proper belt tension.

There has thus been provided an improved headstock construction which is especially suitable for precision grinding machines because it is adapted to transmit power to the headstock spindle in a substantially vibrationless manner. It also contains means for adjusting and maintaining suitable belt tensions whereby the torque on the headstock spindle may be maintained substantially constant.

What is claimed is:

1. A headstock unit for a grinding machine comprising a housing having guide portions formed on the underside thereof for cooperation with the ways of a grinding machine and having a seat portion formed on the upper surface thereof, said housing having aligned bearing portions formed in the forward portion thereof, a headstock spindle rotatably mounted in said bearings, a multiple groove sheave mounted on the spindle, the housing having additional apertures formed therein rearwardly of the spindle bearings, a sleeve rotatably mounted in the apertures and extending in axial parallelism with the headstock spindle, bearings eccentrically disposed within the sleeve, a drive shaft rotatably supported in said bearings, a multiple groove pulley carried by the drive shaft, flexible driving means connecting the pulley and sheave for imparting rotation to the headstock from the shaft, the sleeve having a peripheral groove formed therein near one end thereof and a circumferentially extending series of apertures near the opposite end thereof, a first guide and clamp member carried by the housing having a portion engaged in the groove for determining the axial positioning of the sleeve, and a second clamp member also carried by the housing having a portion selectively engageable in the several apertures of the sleeve for locking the same in rotatable adjusted position whereby the tension of the flexible driving means may be varied by rotative adjustment of the sleeve and consequent displacement of the eccentric bearings and the shaft journaled therein.

2. A headstock unit for a grinding machine comprising a housing having guide portions formed on the underside thereof for cooperation with the ways of a grinding machine and having a seat portion formed on the upper surface thereof, said housing having aligned bearing portions formed in the forward portion thereof, a headstock spindle rotatably mounted in said bearings, a multiple groove sheave mounted on the spindle, the housing having additional apertures formed therein rearwardly of the spindle bearings, a sleeve rotatably mounted in the apertures and extending in axial parallelism with the headstock spindle, bearings eccentrically disposed within the sleeve, a drive shaft rotatably supported in said bearings, a multiple groove pulley carried by the drive shaft, flexible driving means connecting the pulley and sheave for imparting rotation to the headstock from the shaft, the sleeve having a peripheral groove formed therein near one end thereof and a circumferentially extending series of apertures near the opposite end thereof, a first guide and clamp member carried by the housing having a portion engaged in the groove for determining the axial positioning of the sleeve, and a second clamp member also carried by the housing having a portion selectively engageable in the several apertures of the sleeve for locking the same in rotatable adjusted position, a motor element adjustably mounted on the upper face of the housing having its mass disposed intermediate the shaft and spindle, a driving pulley on the motor, a driving sheave on the shaft, flexible driving means connecting the pulley and sheave for imparting rotation to the shaft, and means for securing the motor in transversely adjusted position with respect to the vertical plane of the shaft whereby the tension of the driving connections from the motor to the shaft may be selectively varied by rotative adjustment of the supporting sleeve for the shaft or by transverse adjustment of the motor, substantially as and for the purpose described.

3. A headstock unit for a grinding machine comprising a housing having guide portions formed on the underside thereof for cooperation with the ways of a grinding machine and having a seat portion formed on the upper surface there-

of, said housing having aligned bearing portions formed in the forward portion thereof, a headstock spindle rotatably mounted in said bearings, a multiple groove sheave mounted on the spindle, the housing having additional apertures formed therein rearwardly of the spindle bearings, a sleeve rotatably mounted in the apertures and extending in axial parallelism with the headstock spindle, bearings eccentrically disposed within the sleeve, a drive shaft rotatably supported in said bearings, a multiple groove pulley carried by the drive shaft, flexible driving means connecting the pulley and sheave for imparting rotation to the headstock from the shaft, the sleeve having a peripheral groove formed therein near one end thereof and a circumferentially extending series of apertures near the opposite end thereof, a first guide and clamp member carried by the housing having a portion engaged in the groove for determining the axial positioning of the sleeve, and a second clamp member also carried by the housing having a portion selectively engageable in the several apertures of the sleeve for locking the same in rotatable adjusted position, a motor element adjustably mounted on the upper face of the housing having its mass disposed intermediate the shaft and spindle, a driving pulley on the motor, a driving sheave on the shaft, flexible driving means connecting the pulley and sheave for imparting rotation to the shaft, means for securing the motor in transversely adjusted position with respect to the vertical plane of the shaft whereby the tension of the driving connections from the motor to the shaft may be selectively varied by rotative adjustment of the supporting sleeve for the shaft or by transverse adjustment of the motor, an actuating member carried by the sleeve for effecting rotative adjustment thereof, the pulley on the shaft having access apertures formed through the web thereof for engagement of the actuating member by way of the web whereby adjustment of the sleeve for tightening of the flexible connections may be effected without removal of the pulley or shaft.

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