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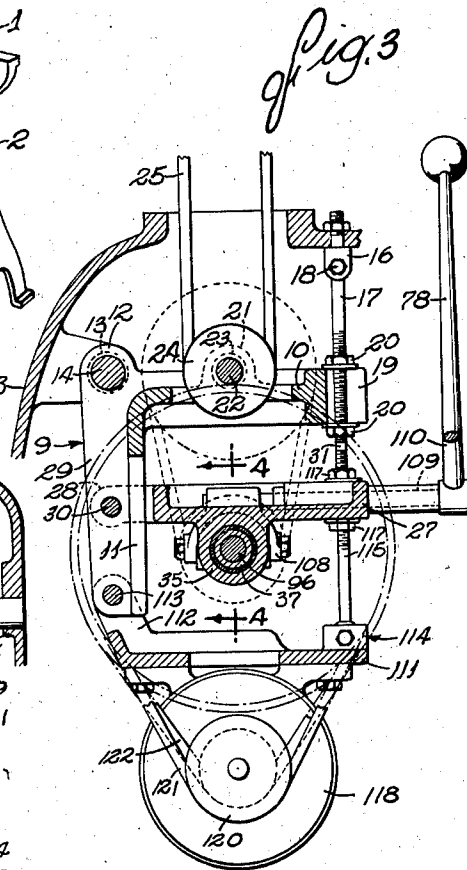
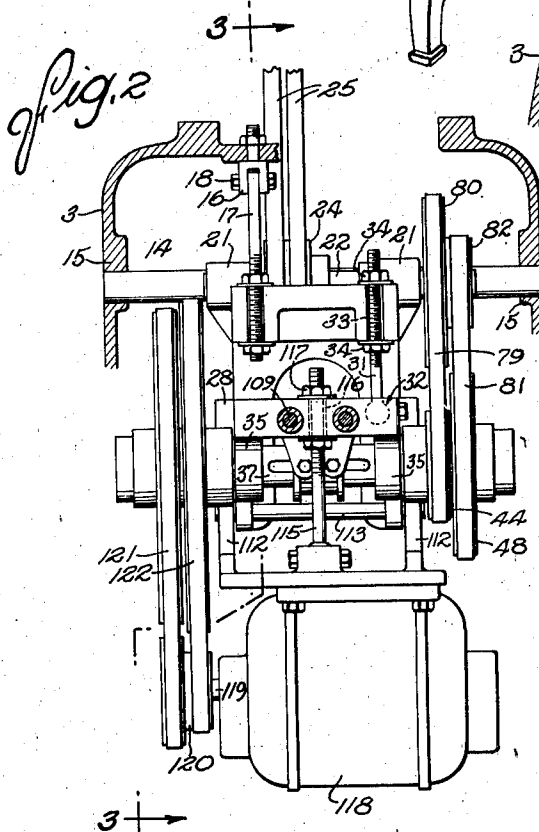
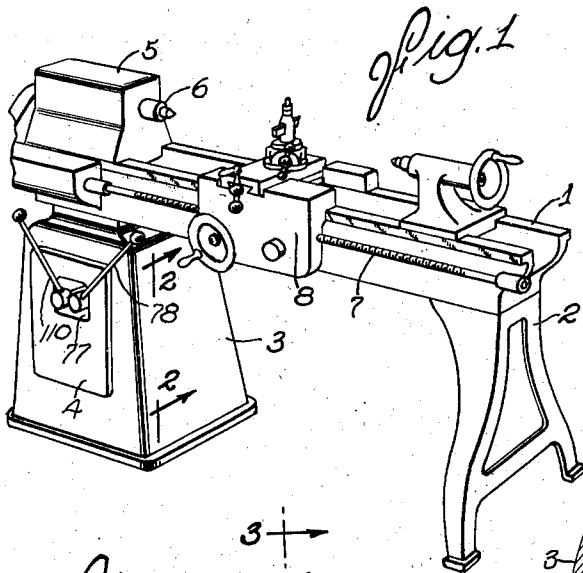
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VARIABLE SPEED DRIVE

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VARIABLE SPEED DRIVE

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7 Claims. (Cl. 74-217)

The present invention relates to variable speed drives, and has particular reference to a new and improved underdrive for lathes.

One of the objects of the present invention is to provide a novel underneath motor drive for lathes which is fully enclosed within a cabinet leg and which may be adjusted for different speeds by means of hand actuators operable from the exterior of the leg, thereby permitting speed changes with ease, speed and safety.

Another object is to provide a new and improved underneath motor drive which is simple, compact and efficient in construction and in which drive pulleys are not subjected to an objectionable degree of friction.

Further objects and advantages will become apparent as the description proceeds.

In the accompanying drawings,

Figure 1 is a view of a lathe provided with an underdrive embodying the features of my invention.

Fig. 2 is a transverse vertical sectional view through the base of the lathe taken along line 2-2 of Fig. 1 and showing the underdrive in side elevation.

Fig. 3 is a fragmentary longitudinal vertical sectional view through the base taken along line 3-3 of Fig. 2 and showing the underdrive in front elevation.

Fig. 4 is a fragmentary sectional view on an enlarged scale of the main clutch shaft taken substantially along line 4-4 of Fig. 3.

Fig. 5 is a transverse sectional view taken along line 5-5 of Fig. 4.

Fig. 6 is a fragmentary sectional view taken along line 6-6 of Fig. 4.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

The variable speed drive constituting the exemplary embodiment of the invention is incorporated for purposes of illustration as an underdrive for a screw lathe such as illustrated in Fig. 1. The lathe comprises a horizontal bed 1 supported at one end by a leg 2 and at the other end by a hollow closed pedestal leg 3 having a cover or door 4 in the front. Mounted on the bed 1 substantially over the pedestal leg 3

is a headstock 5 in which a spindle 6 is suitably journaled. The spindle 6 may be connected through any conventional means to drive a lead screw 7 extending along and journaled at opposite ends on the front of the base 1. A tool slide 8 is suitably mounted on the bed 1 and adapted to be traversed therealong by power rotation of the lead screw 7.

The underdrive is enclosed within the pedestal leg 3 and connected to drive the spindle 6. Referring to Figs. 2 and 3, the underdrive comprises a mounting bracket 9 having a top plate 10 and a depending vertical leg 11 at the rear. Projecting upwardly from the rear edge of the top plate 10 are two spaced aligned ears 12 which are rotatably suspended from suitably sealed bearings 13 on a pivot shaft 14 supported in bosses 15 on the rear wall of the pedestal leg 3. These bearings 13 are constructed to permit grease gun lubrication. The front edge of the top plate 10 is suitably supported from the top of the pedestal leg 3 for pivotal adjustment about the shaft 14. In the present instance, a clevis 16 is bolted to the top wall of the pedestal leg 3. A vertical eye bolt 17 is secured at its upper end to the clevis 16 by means of a pivot bolt 18 for free swinging movement transversely of the shaft 14. The lower threaded end of the bolt 17 extends through an open slot 19 in the front edge of the top plate 10. Two nuts 20 are adjustably threaded onto the bolt 17 and are adapted to be turned into engagement with opposite faces of the top plate 10 to clamp the latter in position of adjustment.

Formed on the top of the plate 10 are two spaced bosses 21. A drive shaft 22 is journaled at opposite ends in bearings 23 supported in the bosses 21 adapted for grease gun lubrication. The shaft 22 extends parallel to the shaft 14 and has secured thereto a double V pulley 24. Two V belts 25 serve to connect the pulley 24 to a similar pulley (not shown) secured to the spindle 6 within the headstock 5. By loosening one of the nuts 20 and tightening the other nut 20, the top plate 10 may be adjusted upwardly or downwardly as required to place the belts 25 under proper tension.

Mounted on the vertical leg 11 of the bracket 9 is an intermediate bracket or plate 27. In the present instance, the plate 27 has spaced rearwardly extending ears 28 interfitted with marginal vertical flanges 29 on the depending leg 11. The ears 28 are pinned to a pivot shaft or rod 30 extending through the flanges 29 so as to

provide a pivotal support for the intermediate bracket or plate 27.

Means is provided for angularly adjusting the plate 27, and in the present instance this means comprises an upwardly extending bolt 31. The lower end of the bolt 31 has a ball and socket connection 32 with the plate 27, and the upper end of the bolt extends through a slot 33 in the top plate 10. Nuts 34, threaded onto the bolt 31 at opposite faces of the top plate 10, afford means whereby the plate 27 may be adjusted and supported in different relative angular positions.

Formed on the underside of the intermediate plate 27 adjacent the side edges are two depending bearing brackets 35 (see Fig. 4) adapted to support a main tubular clutch shaft 37 extending parallel to the shafts 14 and 22. The shaft 37 is supported by suitable roller bearings 38 which are sealed against leakage and which are adapted to be lubricated through grease gun fittings 39. A shifter rod 36 extends slidably in one end of the shaft 37.

Rotatable on the right end of the shaft 37 and disposed in bearing engagement through an antifriction washer 40 against the outer end of the contiguous bearing bracket 35 is a sleeve 41 fitting tightly within and secured as by means of keys 42 to the hub 43 of a V pulley 44. Similarly disposed on the shaft 37 outwardly of the sleeve 41, is a coaxial sleeve 45 which is tightly fitted within and secured as by means of a key 46 to the hub 47 of a larger V pulley 48. A nut 49 is threaded onto the outer end of the shaft 37 and coacts with the bearing lug 35 to confine the sleeves 41 and 45 together with the pulleys 44 and 48 in assembled relation. A suitable antifriction washer 50 may be interposed between and in bearing engagement with the pulleys 44 and 48.

Suitable clutch means is provided for connecting the pulleys 44 and 48 selectively to the shaft 37. In its preferred form, this clutch means comprises a clutch pin 51 extending through and projecting from opposite ends of a transverse bore 52 in the rod 36. Preferably, the pin 51 is suitably secured in centered position within the rod 36, and to this end two set screws 53 are threaded into opposite ends of a parallel transverse bore 54 in the rod and have tapered inner ends in wedging engagement with a ball 55 tightly seated in a V-shaped notch 56 in one side of the pin 51. The projecting ends of the pin 51 extend slidably through diametrically opposed longitudinal slots 57 formed in the outer end of the shaft 37 and are adapted upon axial movement of the rod 36 in opposite directions to engage selectively in diametrically opposed notches 58 and 59 formed in the adjacent ends of the sleeves 41 and 45. It will be seen that when the rod 36 is in one extreme position of adjustment, the pin 51 will engage in the notches or recesses 58 to connect the small pulley 44 for rotation with the shaft 37. When the rod 36 is adjusted into the other extreme position, the pin 51 will engage in the notches or recesses 59 to connect the relatively large pulley 48 for rotation with the shaft 37. In the neutral or intermediate position of the rod 36, the pin 51 will be disposed between and clear of the sleeves 41 and 45 so that neither pulley will be connected.

Suitable detent means is provided for securing the rod 36 yieldably in its three selective positions of adjustment. This means comprises a transverse bore 60 formed in the rod 36 adjacent its outer end and intersecting an axial bore 61. Two ball detents 62 are disposed respectively in

opposite ends of the bore 60 and are pressed outwardly by an interposed coiled compression spring 63. The balls are thus urged outwardly of the ends of the bore 60 for engagement selectively with three different sets of recesses 64, 65 and 66 formed in longitudinally spaced relation inside the shaft 37. A screw plug 67 is threaded into the outer end of the nut 49 to close the outer end of the shaft 37 so that the clutch space, is fully enclosed. The pulley 44 is provided with a fitting 68 for force gun lubrication.

To provide means for shifting the rod 36, a pin 69 extends through and is secured in a transverse bore 70 formed in the rod 36 at a point between the bearing brackets 35. The projecting ends of the pin 69 extend slidably through two diametrically opposed longitudinal slots 71 formed in the shaft 37 and are suitably secured as by means of a set screw 72 to a clutch collar 73 having a peripheral groove 74. A clutch yoke 75 engages in the groove 74 of the collar 73 and is keyed to the rear end of a shaft 76 journaled in the intermediate plate 27. The shaft 76 projects forwardly from the plate 27 through an opening 77 in the front cover or door 4 of the pedestal leg 3, and is provided externally of the leg with a suitable hand lever 78.

The pulley 44 is connected through a V belt 79 to a relatively large pulley 80 keyed to the shaft 22. Similarly, the pulley 48 is connected through a V belt 81 to a relatively small pulley 82 also keyed to the shaft 22. Consequently, by appropriate manipulation of the hand lever 78, the shaft 37 may be connected at either of two speeds to the shaft 22, or may be disconnected to interrupt the drive to the spindle.

A similar clutch arrangement is provided on the other end of the shaft 37 for selectively connecting either of two pulleys 83 and 84. These pulleys have hubs 85 and 86, respectively, separated by an antifriction washer 87 and are confined on the shaft 37 against the bearing bracket 35 by a nut 88. Suitable antifriction washers 89 and 90 are interposed respectively between the bearing bracket 35 and the hub 86, and the hub 85 and the nut 88. Two clutch sleeves 91 and 92 are secured as by means of keys 93 in the hubs 85 and 86, respectively, and are formed in their adjacent ends with diametrically opposed notches or recesses 94 and 95, respectively. A shifter rod 96 extends slidably in the tubular shaft 37 and carries a transverse pin 97 secured in position by a ball 98 in a manner similar to the pin 51. The projecting ends of the pin 97 extend through slots 99 in the shaft 37 and are adapted for selective engagement in the recesses 94 and 95 upon movement of the rod 96 respectively into its opposite end positions. Detent balls 100, similar to the balls 62, are adapted for engagement in recesses 101 and 102 to secure the shifter rod 96 in its selected positions of adjustment. A plug 103 serves to close the outer end of the shaft 37 and the interior of the bearing space may be lubricated through a fitting 104. The inner end of the shifter rod 96 carries a pin 105 which projects through slots 106 in the shaft 37 between the bearing brackets 35. The pin 105 is secured to a clutch collar 107 engaged by a yoke 108 fixed on a shaft 109. This shaft is journaled in the intermediate plate 27 and the front end thereof extends forwardly through the opening 77 in the door 4 and is provided with a hand lever 110.

Pivotaly mounted on the lower end of the depending leg 11 of the bracket 9 is a base plate

111. In the present instance, the plate has two spaced ears 112 which are pinned to a pivot shaft 113 rotatably supported in the flanges 29. Connected by a ball and socket coupling 114 to the forward end of the base plate 111 is a vertical adjusting screw 115. The threaded upper end of the screw extends through a slot 116 in the intermediate plate 27. Suitable nuts 117 are threaded on the screw 115 at opposite faces of the plate 27 and afford means for adjusting the angular position of the plate 111 relative to the plate 27.

Rigidly mounted on the underside of the base plate 111 is an electric drive motor 118 having a shaft 119. A double V step pulley 120 is secured to the shaft 119 and is connected through V belts 121 and 122, respectively, to the pulleys 83 and 84. It will be seen that by appropriate manipulation of the hand lever 110, the clutch shaft 37 may be driven selectively from the electric motor 118 at either one of two different speeds. It will be understood that the belts 79 and 81 may be suitably tensioned by adjusting the intermediate plate 27 relative to the plate 10 and that the tension of the belts 121 and 122 may be similarly tensioned by adjusting the position of the base plate 111 relative to the intermediate plate 27.

It will be seen that I have provided a new and advantageous variable speed drive adapted particularly for use as an underdrive for a screw lathe. This drive is fully housed within the pedestal leg 3 of the lathe and may be conveniently lubricated by use of a grease gun. Although the underdrive itself is enclosed, it may be easily and quickly adjusted from the exterior by the readily accessible hand levers 78 and 110.

I claim as my invention:

1. A drive for a lathe having a spindle, said drive comprising, in combination, a cabinet constituting a leg for said lathe, a bracket structure mounted in said cabinet and having a generally horizontal top plate, a shaft journaled on said top plate, a pulley fixed to said shaft and adapted to be connected through belt means to said spindle, an intermediate plate mounted on said bracket, a clutch shaft journaled on said intermediate plate, two pulleys mounted on one end of said clutch shaft, two pulleys fixed on said first mentioned shaft and connected through belts to said pulleys on said clutch shaft, the two sets of pulleys affording two different selective speed drives between said shafts, clutch means for connecting said clutch shaft selectively to said two pulleys thereon, said clutch means having an actuator projecting to the exterior of said cabinet, a base plate mounted on said bracket, an electric drive motor mounted on said base plate and having a motor shaft, a cone pulley mounted on said motor shaft, two pulleys of unequal size mounted on said clutch shaft in alignment with said cone pulley and connected to said cone pulley by belts, and clutch means for selectively connecting said clutch shaft to said last mentioned pulleys, said clutch means having an actuator extending to the exterior of said cabinet.

2. A drive for a lathe having a spindle, said drive comprising, in combination, a cabinet constituting a leg for said lathe, a bracket structure pivotally mounted in said cabinet and having a generally horizontal top plate, a first shaft journaled on said top plate, means for adjustably supporting said bracket in different pivotal positions, a lower intermediate plate pivotally mounted on said bracket, a clutch shaft journaled on

said intermediate plate, means for adjustably interconnecting said top plate and said intermediate plate in different relative angular positions, a base plate pivotally connected to said bracket, an electric drive motor mounted on said base plate and having a motor shaft, means for adjustably interconnecting said intermediate plate and said base plate in different relative angular positions, a selective-speed belt drive between said first shaft and said clutch shaft, and a selective-speed belt drive between said clutch shaft and said motor shaft.

3. A power transmission drive comprising, in combination, a bracket having a mounting plate, a shaft journaled on said plate, an intermediate plate pivotally mounted on said bracket in generally parallel relation to said first mentioned plate, a clutch shaft journaled on said intermediate plate, a base plate pivotally mounted on said bracket in generally parallel relation to said first mentioned plate, a motor mounted on said base plate and having a motor shaft, a selective speed belt drive connecting said first two mentioned shafts, a selective speed belt drive connecting said clutch shaft and said motor shaft, each of said drives including a clutch, said clutches being associated with said clutch shaft, adjustable means interconnecting said plates to secure them in different selective relative angular positions, and means adapted to transmit power from said first mentioned shaft.

4. A power transmission drive comprising, in combination, a bracket structure having a generally horizontal top plate, a shaft journaled on said top plate, a pulley fixed to said shaft and adapted to be connected through belt means to a driven element, an intermediate plate mounted on said bracket, a clutch shaft journaled on said intermediate plate, two pulleys mounted on one end of said clutch shaft, two pulleys fixed on said first mentioned shaft and connected through belts to said pulleys on said clutch shaft, the two sets of pulleys affording two different selective speed drives between said shafts, clutch means for connecting said clutch shaft selectively to said two pulleys thereon, an actuator for said clutch means, a base plate mounted on said bracket, an electric drive motor mounted on said base plate and having a motor shaft, a cone pulley mounted on said motor shaft, two pulleys of unequal size mounted on said clutch shaft in alignment with said cone pulley and connected to said cone pulley by belts, clutch means for selectively connecting said clutch shaft to said last mentioned pulleys, and an actuator for said last mentioned clutch means.

5. A power transmission drive comprising, in combination, a bracket having a mounting plate, a shaft journaled on said plate, means adapted to transmit power from said shaft, an intermediate plate mounted on said bracket, a clutch shaft journaled on said intermediate plate, a base plate mounted on said bracket, a motor mounted on said base plate and having a motor shaft, a selective speed belt drive connecting said first two mentioned shafts, a selective speed belt connecting said clutch shaft and said motor shaft, each of said drives including a clutch associated with said clutch shaft, and an actuator for each of said clutches.

6. A power transmission drive for a driven element comprising, in combination, a support for said driven element, a bracket structure pivotally mounted in said support and having a generally horizontal top plate, a first shaft journaled on

said top plate, means for adjustably supporting said bracket structure in different pivotal positions, a lower intermediate plate pivotally mounted on said bracket structure, a clutch shaft journaled on said intermediate plate, means for adjustably interconnecting said top plate and said intermediate plate in different relative angular positions, a base plate pivotally connected to said bracket structure, an electric drive motor mounted on said base plate and having a motor shaft, means for adjustably interconnecting said intermediate plate and said base plate in different angular positions, a selective speed belt drive between said first shaft and said clutch shaft, and a selective speed belt drive between said clutch shaft and said motor shaft.

7. A power transmission drive for a rotary driven element comprising, in combination, a support for said driven element, a bracket pivot-

ally mounted in said support and having a mounting plate, a first shaft journaled on said plate, an intermediate plate pivotally mounted on said bracket in generally parallel relation to said first mentioned plate, a clutch shaft journaled on said intermediate plate, a base plate pivotally mounted on said bracket in generally parallel relation to said first mentioned plate, a motor mounted on said base plate and having a motor shaft, a selective speed belt drive connecting said first shaft and said clutch shaft, a selective speed belt drive connecting said clutch shaft and said motor shaft, adjustable means interconnecting said plates to secure them in different selective relative angular positions, a belt drive adapted to connect said first shaft with said driven element, and means for adjustably supporting said bracket in different pivotal positions.

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