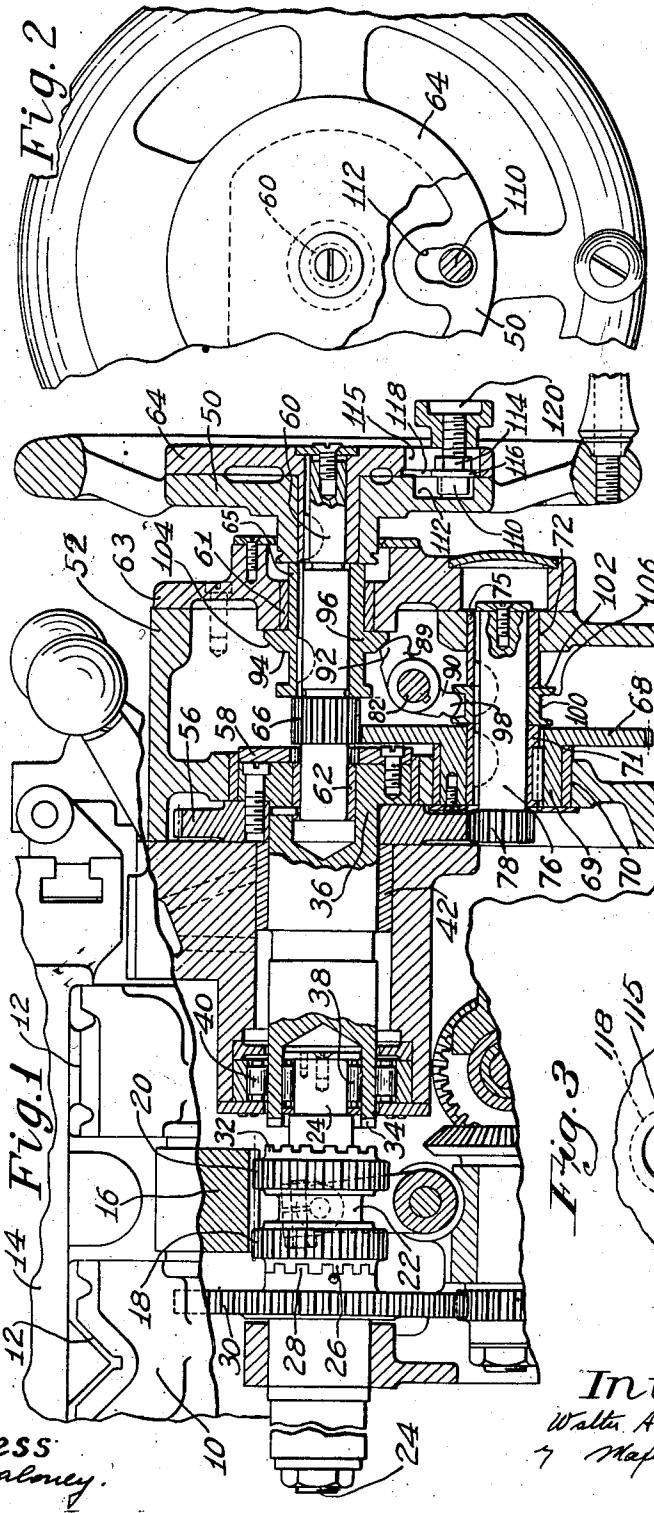
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CONTROL DEVICE

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CONTROL DEVICE

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7 Claims. (Cl. 74—27)

The present invention relates to improvements in control devices for movable machine tool supports, and is herein disclosed as embodied in a two-speed manual drive device for a reciprocable grinding machine work support. This device is of the general type which comprises a hand wheel and gear driving connections therefrom including high speed and slow speed driving gears alternatively shiftable into clutch position to drive the work support.

It is a principal object of the invention to provide a novel and improved manual drive for a machine tool support including a manual actuating element and gear driving connections therefrom in which provision is made in the driving connections to permit the use of the manual driving element or hand wheel as a hammer available particularly with the slow speed drive of the device to inch the work support along by very slight amounts. In accordance with this object, applicant provides connection between the hand wheel and the gear driving connections whereby a knocking action may be set up between the hand wheel and these connections for inching the support ahead by very small amounts. This feature permits of a more accurate manual adjustment in the position of the table than has heretofore been considered possible because of the take-up or yield normally present in the gear driving connections which operates when overcome by rotation of the hand wheel to jump the table.

Features of applicant's improved construction relating particularly to the two-speed transmission and the control means therefor form the subject-matter of a separate application for Letters Patent in the United States Patent Office, Serial No. 420,989 for Control devices, filed November 29, 1941, of which the present application is a division.

With the above stated and other objects in view, as may hereinafter appear, the several features of the invention consist in the devices, combinations and arrangement of parts hereinafter described and claimed which, together with the advantages to be obtained thereby, will be readily understood by one skilled in the art from the following description taken in connection with the accompanying drawing, in which

Fig. 1 is a fragmentary view of a grinding machine looking from the left and partly in section, illustrating particularly applicant's improved two-speed hand wheel device for driving the work support and including the lost motion connection between the hand wheel and gear driving connections;

Fig. 2 is a detail view in front elevation showing a portion of the hand wheel illustrated in Fig. 1; and

Fig. 3 is an enlarged detail view in front elevation of the stud and cooperating slots forming the inching device, but with the knurled headed clamping nut removed and the stud shown in section.

The invention is disclosed in the drawing as embodied in a grinding machine which may be of ordinary description comprising generally a grinding wheel unit which may be of conventional type and is not shown, including a grinding wheel spindle and a supporting carriage movable transversely toward and away from the work, and a work supporting table which is longitudinally movable with relation to the grinding wheel. The base portion of the machine is indicated generally at 10 and has formed therein ways 12 on which is mounted a work table 14. Movement of the table is effected by means of connections which include a rack 16 secured to the under side of the table which is engaged by two gears 18 and 20 formed on a power-manual clutch sleeve member 22. The clutch sleeve member 22 is shiftable axially on a supporting shaft 24 between alternate power and manual feed positions. In the power position of the power-manual clutch, a clutch face 26 on the clutch sleeve member 22 is arranged for engagement with a power clutch element 28 formed on one face of a power driving gear 30 on the shaft 24. The sleeve member 22 is shown in the power position. Inasmuch as the present invention is not concerned with the power drive for the work table, no further description of the power driving mechanism is believed necessary. For the manual position of the power-manual clutch, a clutch face 32 on the clutch sleeve 22 is arranged for engagement with a clutch element 34 on the sleeved end of a connecting shaft 36 supported co-axially with shaft 24. As shown in Fig. 1, the shaft 24 extends within the sleeved portion of the shaft 36, being supported therein by means of a roller bearing 38. The shaft 36 is externally supported at this point by means of a roller bearing 40 mounted on the machine frame. The shaft 36 projects forwardly through the forward wall of the base 10 of the machine, being supported adjacent its forward end by means of a bushing 42.

For manual operation of the table, a two-speed hand wheel device is provided comprising a casing 52 which is mounted on the base 10 to extend over the forward end of the shaft 36, and provides support for a hand wheel 50 and gear driving

connections including a two-speed gear shifting device through which the hand wheel is connected to drive the shaft 36 at either of two predetermined driving ratios. The driven elements through which the two-speed hand wheel device is connected to drive the shaft 36 comprise a driven external slow speed gear 56 secured to the shaft 36, and an internal high speed driven clutch gear 58 secured to the flanged outer end of shaft 36. The hand wheel 50 is carried on a drive shaft 60 which is supported adjacent its forward end by means of a bearing 61 which is formed in a cover 63 for the casing 52 and engages the sleeve hub 65 of a spool 96 on the shaft 60. At its rear end, the drive shaft 60 is supported in a bushing 62 carried in an axial bore in the forward end of the shaft 36. The hand wheel 50 is loosely supported to turn on the sleeve hub of a flanged member 64 keyed to the shaft 60, and is operatively connected therewith by means of an adjustable connection hereinafter more fully to be described. A driving gear 66 is secured to the drive shaft 60, and is arranged to be moved axially therewith into clutching engagement with the clutch gear 58 to provide a direct driving connection for the hand wheel 50 and the drive shaft 60 with the driven shaft 36. For driving the shaft 36 at a relatively slow rate from the hand wheel 50, reduction gear connections are provided including a gear 68 having a sleeve hub portion 69 which is supported in a bearing 70 in the casing 52, and is continuously meshed with the gear 66. A sleeve member 71 is fitted within and is slidably secured to the sleeve hub of the gear 68, and is in turn supported upon and rigidly secured to a countershaft 76. A gear 74 formed on the rear end of the countershaft 76 is arranged to be meshed with the slow speed driven gear 56. The countershaft 76 is supported at its forward end by means of a bearing 72 formed in the casing 52 which receives a sleeve member 75 fitted to and secured to move with the countershaft 76. The entire assembly including countershaft 76, sleeve elements 71 and 75 and gear 78 are arranged to be moved axially as a unit to move the gear 78 into and out of meshing position with relation to the gear 56.

In accordance with the invention, means are provided for introducing a lost motion between the hand wheel and the gear driving connections which permits the use of the hand wheel by the operator as a hammer to enable the work table to be moved when so desired by very small amounts. It has been found that a certain amount of lost motion normally exists in the gear driving connections between the hand wheel and the work table. Rotation of the hand wheel acts first to tighten up the driving connections, and then has a tendency to jump the table as the friction of rest of the table on its ways is finally overcome. It has been found that a series of light blows or taps delivered upon the hand wheel gear driving connections will act to overcome this lost motion and also the starting friction of the table to advance the table by the desired small amounts. With the present construction, a lost motion connection is provided between the hand wheel 50 and the flanged sleeve member 64 secured to the drive shaft 60, in the form of a stud 110 which is supported on the flanged sleeve member 64 for engagement in a slot 112 in the flanged hub portion of the hand wheel 50. The slot 112 is elongated in a radial direction, the portion towards the axis of rotation of the hand wheel 50 being narrowed to provide a locking fit between the stud 110 and slot 112, and the portion of the slot 112 toward the rim of the hand wheel being widened so that the stud 110, when located in this portion of the slot 112, fits loosely therein, thus permitting a limited amount of lost motion between the hand wheel 50 and the flanged sleeve member 64. In order to permit adjustment of the stud to either of the locking or loose positions and the securing of the stud 110 in its adjusted position, the stud is provided with a flanged portion 114 having opposite sides thereof slabbed off to engage in a radially extending slot 115 in the flanged sleeve member 64, and is further provided with a flange or disk 116 of somewhat larger diameter which rides in a widened groove portion 118 formed at the inner edge of the slot 115 in the flanged sleeve member 64. The stud 110 at its outer end is screw-threaded to receive a knurled headed clamping nut 120. In the position of adjustment shown in Figs. 1 and 2, in which the stud 110 is engaged in the wide portion of its slot 112, the hand wheel 50 is free to move through a small angle with relation to the flanged sleeve member 64, so that the operator is enabled to employ the hand wheel 50 as a hammer to advance the table by very small amounts. For this position of adjustment of the stud 110, it may be assumed that the two-speed gear mechanism will be in the slow speed position illustrated in Fig. 1, in order to increase the efficiency of the two-speed hand wheel in moving the table by very slight amounts.

It will be understood that the invention is not limited to the specific embodiment shown, and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What is claimed is:

1. A manual driving device for a machine tool support, which comprises with the support, a driving member and gear connections therefrom for driving the support, a hand wheel supported coaxially with said member, and an operating connection between the hand wheel and driving member comprising cooperating pin and slot elements located in said member and in the hand wheel, the slot having a narrowed portion providing a tight fit with the pin, and a radially disposed widened portion providing a loose fit with respect to the pin, and means for adjusting the pin radially for engagement alternatively with said widened and with said narrowed portions of the slot.

2. In a machine tool, the combination of a frame provided with ways, a support movable on said ways, a drive shaft and gear connections therefrom for driving the support, a hand wheel loosely supported to turn on the drive shaft, a member secured to the drive shaft adjacent said hand wheel, and an operating connection between the hand wheel and member comprising cooperating pin and slot elements located in said member and in the hand wheel and arranged to provide a loose connection between the hand wheel and member whereby a knocking action may be set up between the hand wheel and member for inching the support by small amounts.

3. In a machine tool, the combination of a frame provided with ways, a support movable on said ways, a drive shaft, and gear connections therefrom for driving the support, a hand wheel loosely supported to turn on the drive shaft, a flanged member secured to the drive shaft adjacent said hand wheel, and a loose connection

between the hand wheel and flange comprising abutting surfaces associated with the hand wheel and with the flanged member arranged to permit a limited relative movement between the hand wheel and flanged member whereby a knocking action may be set up between the hand wheel and flanged member for inching the support by small amounts.

4. A manual drive device for a machine tool support, which comprises with the support, a drive shaft, and gear connections therefrom for driving the support, a hand wheel loosely supported to turn on the drive shaft, a flanged member secured to the drive shaft adjacent said hand wheel, and a loose connection between the hand wheel and flange comprising abutting surfaces associated with the hand wheel and with the flanged member arranged to permit a limited relative movement between the hand wheel and flanged member whereby a knocking action may be set up between the hand wheel and flanged member for inching the support by small amounts, and means for locking the hand wheel rigidly to the flanged member.

5. A manual driving device for a machine tool support which comprises with the support, a driving member and a two-speed transmission therefrom for driving the support, a hand wheel supported co-axially with said member, and a loose connection between the hand wheel and the driving member comprising abutting surfaces associated with the hand wheel and with the driving member arranged to permit a limited relative movement between the hand wheel and driving member whereby a knocking action may be set up between the hand wheel and driving member for inching the support by small amounts, and means for locking the hand wheel rigidly to the driving member.

6. A manual driving device for a machine tool support which comprises with the support, a driving member and mechanical transmission means therefrom for driving the support, a hand wheel and a loose connection comprising abutting surfaces relatively movable to permit a knocking action to be set up therebetween for transmitting small increments of movement from the handwheel to the driving member for inching the support by small amounts, and means comprising closely fitting abutting surfaces for locking the loose connection to move as a unit.

7. In a machine tool, the combination of a frame provided with ways, a support movable on said ways, a driving member and a train of mechanical transmission elements therefrom for driving the support, a handwheel, and a loose connection comprising abutting surfaces relatively movable to permit a knocking action to be set up therebetween for transmitting small increments of movement from the handwheel to the driving member to inch the support by small amounts.

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