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CROSS-FEED FOR GRINDING MACHINES

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Fig. 1.

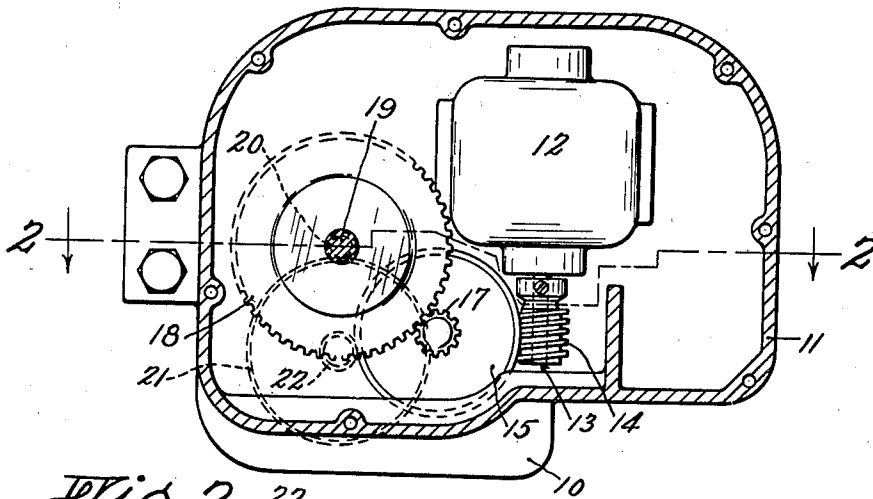


Fig. 2.

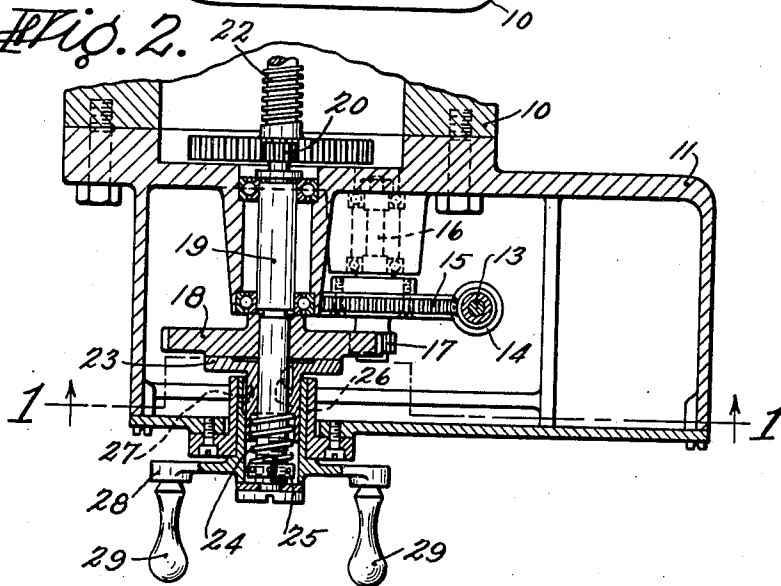
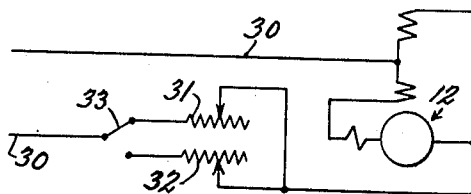


Fig. 3.



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CROSS-FEED FOR GRINDING MACHINES

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5 Claims. (Cl. 51—165)

This invention relates to cross-feeding mechanism particularly adaptable for cylindrical, bore, and oscillating grinding machines. It has been the practice to employ cross-feed mechanism in which feeding impulses were applied at one or both ends of each traverse, generally by a pawl and ratchet device. In accordance with the present invention the rotating grinding wheel and the work piece are repeatedly traversed axially of each other, generally by moving one only of the members, and are caused to approach each other continuously instead of intermittently. Since the wheel and work are approaching laterally during each traverse it might be supposed that a conical surface would be produced. The rate of cross-feed relative to the traverse is so slow, however, that the tendency to produce a conical surface is not measurable on any but the longer work pieces; a condition aided by the fact that reversal requires a time period forming a substantial part of the traverse on the shorter work pieces. Since the cross-feed is continuing during reversal as well as during the actual traverse the amount of cross-feed during any one traverse period is very small.

A further object of the invention is to produce a cross-feed which may be adjusted manually in either direction and at any time without disturbing the cross-feed mechanism itself. Additional objects will appear from the following description and claims.

Referring to the drawing,

Fig. 1 is a front elevation of a cross-feed mechanism constructed in accordance with this invention, with the manual operating shaft broken away and the front cover plate removed; the view being taken substantially on line 1—1 of Fig. 2;

Fig. 2 is a section on line 2—2 of Fig. 1; and

Fig. 3 is a conventionalized wiring diagram.

Since the improvement relates to the cross-feed mechanism only, the grinding machine to which it is applied has not been shown. It will be understood that this may be an oscillating grinder such as shown for example in the Van Norman, Stowell and Pyne Patent 2,149,409, March 7, 1939, or any desired type of bore, cylindrical, or surface grinder which employs both a longitudinal traverse and a cross-feed. The cross-feed mechanism is mounted on the frame 10 of the machine in a casing 11 containing a variable speed motor 12 preferably of the compound wound direct-current type. The shaft 13 of the motor carries a worm 14 engaging a worm wheel 15 on a stub shaft 16 suitably journaled in the casing and bearing a pinion 17. This pinion engages a

gear 18 loosely mounted upon a cross-feed drive shaft 19 here shown as bearing a pinion 20 meshing with a gear 21 on the cross-feed screw 22. The gear 18 has a friction surface engaged by a friction drive member 23 forced against the gear by a spring 24 compressed between the member and a collar 25 on shaft 19. The drive member 23 is keyed to shaft 19 at 26, and keyed to the drive member at 27 is a sleeve portion formed on a manual operating wheel 28 preferably fitted with handles 29. The spring 24 is adjusted in force so that the motor-driven gear 18 will drive shaft 19, and thus the feed screw 22, positively under the very slight resistance offered by the cross-feed. At the same time the shaft 19 may be turned by hand wheel 28 in either direction without affecting the continuing operation of the motor drive. This differs from the usual ratchet feed, which may be fed forwardly by hand, but which cannot be fed rearwardly without disconnecting the ratchet drive.

The variable speed motor 12 has been conventionally indicated in Fig. 3 as a compound wound direct current motor. One side of this motor is connected to the line 30, while the other is connected to a plurality of variable resistances 31, 32 made selectively available by a switch 33 in the second side of the line. One of the rheostats 31 may be adjusted to give a motor speed suitable for coarse feed and the second rheostat 32 may be adjusted for fine feed. The switch 33 may be controlled manually or by any suitable gauge mechanism, preferably through suitable relays as described in the Van Norman et al. patent, to change from coarse to fine feed and then to open the circuit to terminate the cross-feeding operation.

It should be noted that there is thus available an infinite number of speeds, both coarse and fine; and that speed changes can be made instantly at any time during the operation of the mechanism. Furthermore, the friction mechanism provides for instant availability of the hand feed without necessity for operating any clutch mechanism. The grinding wheel may thus be brought into contact with the work by the hand-wheel with assurance that automatic feed will be resumed without interruption merely by discontinuing the application of force to the hand-wheel; and at the termination of the feed may be backed off without disconnecting the drive to motor 12.

What I claim is:

1. A cross-feed for a grinding machine comprising a mechanical cross-feed train, a manual

drive positively coupled to said train, a friction drive coupled to said train and of a resistance sufficiently low to permit operation of the manual drive during continued engagement of the friction drive, a variable speed direct current motor coupled to said friction drive, a plurality of adjustable rheostats selectively connected in series with the motor, and switch means for selecting between the rheostats.

2. A cross feed for a grinding machine comprising a mechanical cross-feed train, a manual drive positively coupled to said train, a friction drive coupled to said train and of a resistance sufficiently low to permit operation of the manual drive during continued engagement of the friction drive, a variable speed motor coupled to the friction drive, an irreversible driving element in the last-named coupling, and means for varying the speed of the motor.

3. A cross-feed for a grinding machine comprising a mechanical cross-feed train, a manual drive positively coupled to said train, a friction drive coupled to said train and of a resistance sufficiently low to permit operation of the manual drive during continued engagement of the friction drive, a variable speed direct current motor coupled to said friction drive, an irreversible driving element in the last-named coupling, a plurality of adjustable rheostats selectively connected in series with the motor, and switch means for selecting between the rheostats.

4. A cross-feed for grinding machines comprising a feed screw, a driving shaft coupled thereto, a handwheel having a sleeve portion surrounding the shaft and fixed for rotation therewith, a friction element fixed for rotation with the shaft but slidable thereon, a second friction element journaled for free rotation about the shaft but fixed against sliding thereon, a spring surrounding the shaft and pressing against the slidable friction element, a collar on the shaft adjustable to press the spring against the slidable friction element to force it against the second friction element, drive gearing for the second friction element including a worm and worm wheel, a variable speed direct current motor connected to the worm, a plurality of adjustable rheostats selectively connectible to the motor, and switch means for selecting between the rheostats.

5. A cross-feed for a grinding machine of the type in which the work and wheel are repeatedly traversed axially of each other, comprising a mechanical cross-feed train, a manual drive positively coupled to said train, a friction drive coupled to said train and of a resistance sufficiently low to permit operation of the manual drive during continued engagement of the friction drive, a variable speed motor continuously operating during said traverse and coupled to said friction drive for continuous operation thereof, and means for varying the speed of the motor.

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