Sept. 27, 1938. C. L. OTT ET AL 2,131,233

INDEX SAFETY DEVICE

Filed June 11, 1937 2 Sheets-Sheet 1

Fig 1

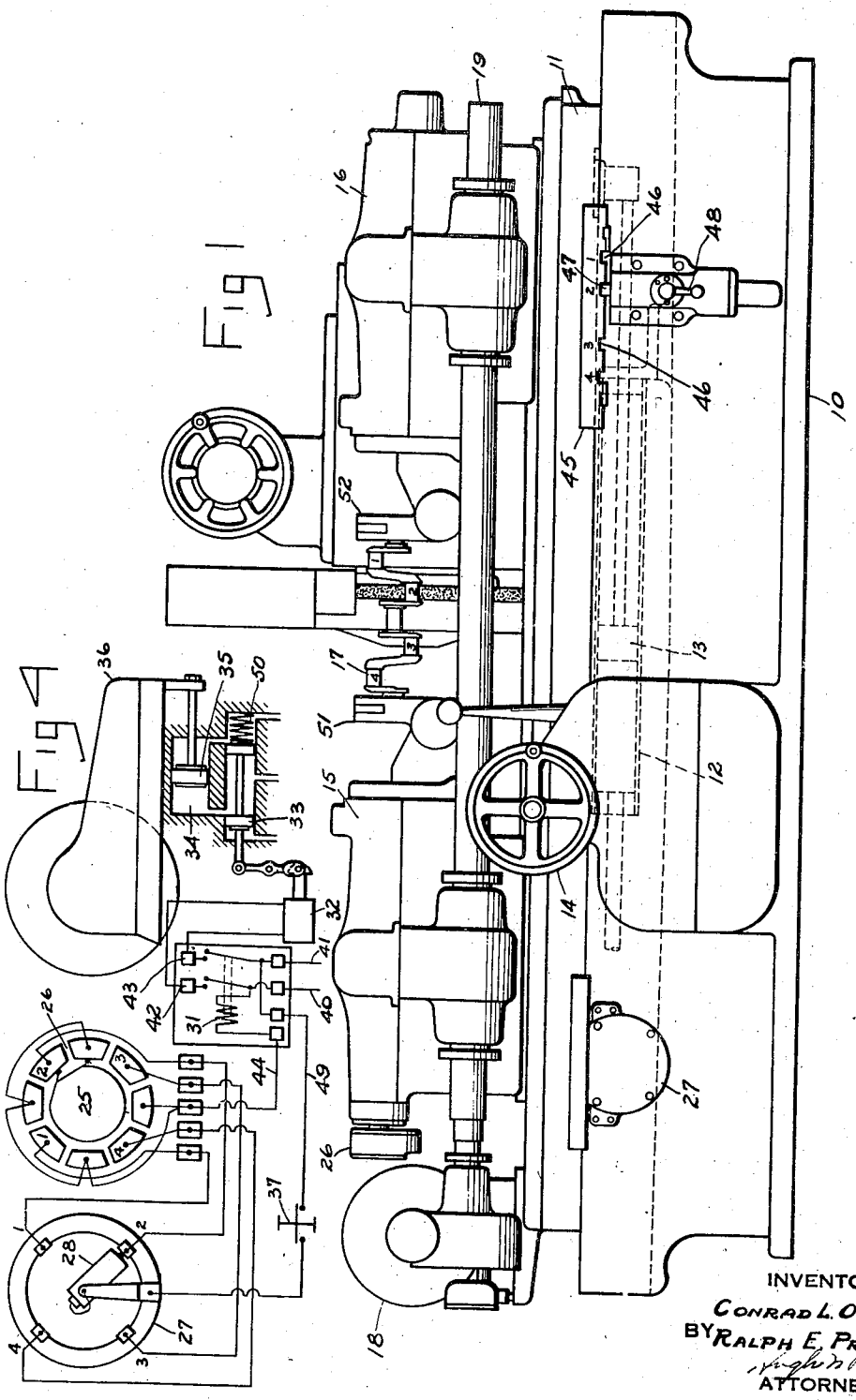


Fig 4

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Filed June 11, 1937 2 Sheets-Sheet 2

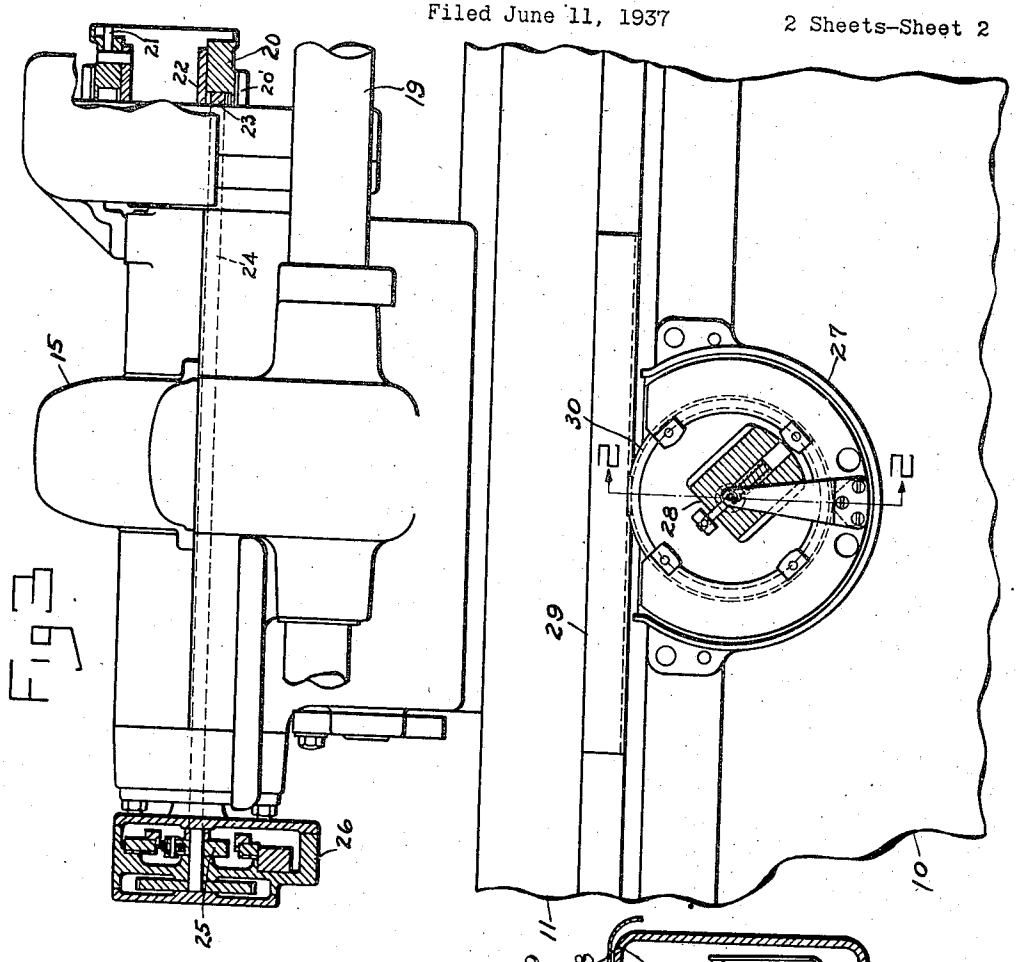


Fig 1

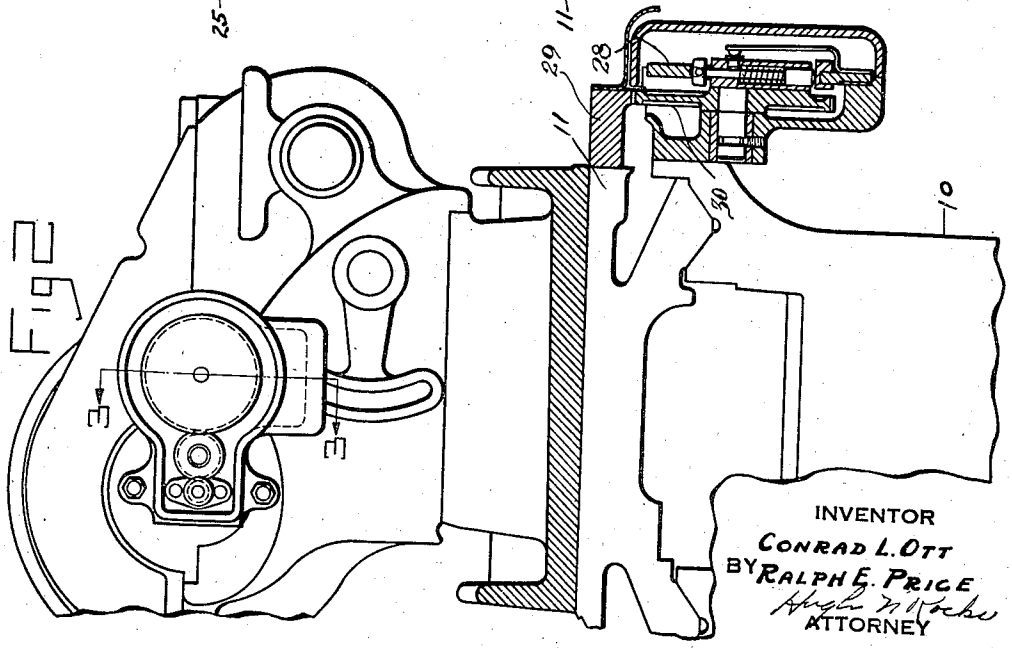


Fig 2

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UNITED STATES PATENT OFFICE

2,131,233

INDEX SAFETY DEVICE

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Application June 11, 1937, Serial No. 147,766

5 Claims. (Cl. 51—72)

Our invention relates to crank grinding machines particularly to an interlocking index mechanism therefor in combination with a grinding wheel feed mechanism. It is an object of our invention to provide indexing mechanisms for indexing a work piece both angularly and axially and for preventing the grinding wheel from approaching the work unless each of said indexing movements is completed.

In grinding a crank shaft it is necessary to first grind a given pin then withdraw the grinding wheel far enough to permit the work to be shifted axially to bring another pin into position in front of the gearing wheel. If the unground pin is not already on center the shaft must be rotated in the chuck so that when the headstock begins to rotate, the crank will be rotated about the center of the pin which is before the grinding wheel. We have provided means whereby if the work is indexed angularly but not longitudinally, or vice versa, the mechanism for moving the grinding wheel toward the work will remain inoperative. This is accomplished by mounting on the headstock a multi-pole switch operable with the indexing plate having a pole for each crank pin on the shaft. Another multiple pole switch is mounted on the bed and arranged to be actuated by movement of the work carriage. This switch also has a pole for each crank pin. Corresponding poles on each switch are connected in series. When a circuit is completed through the two switches a solenoid in the circuit may be energized to actuate a valve and direct fluid to the wheel feed motor and move the grinding wheel toward the work. If one switch is shifted and not the other the solenoid cannot be energized and the wheel cannot move toward the work.

In the drawings—

Figure 1 is a front elevation of a crank grinding machine to which my device is particularly adapted.

Figure 2 is a fragmentary end elevation of the machine partly in section.

Figure 3 is a partial front elevation partly in section.

Figure 4 is a diagram showing the connections between the multi-pole switches and the feed mechanism.

Numeral 10 indicates the bed of a crank grinding machine, 11 a work carriage mounted thereon, 12 a cylinder and 13 a piston therein, connected to said carriage for traversing same. A hand wheel 14 operable through mechanism, not shown, provides a manual traverse. Work heads 15 and 16 support a crankshaft 17 in the usual manner in fixtures 51 and 52. Said heads are driven in synchronism by a motor 18 through shaft 19. An index plate 20 is eccentrically mounted on fixture 51 and carries a pin 21 for engaging a hole in the flanged end of shaft 17 to locate said shaft on the fixture. Notches 20' on the periphery of said plate may be engaged by an index plunger, not shown, to locate said shaft in its various angular positions. A sleeve 22 is partially inserted in and secured to said index plate. The protruding portion is at the inner end of said plate and has gear teeth which mesh with those of a pinion 23 on shaft 24. Said shaft extends through the head and drives through suitable gearing a rotor 25 of multi-pole switch 26. Said switch has a pole for each pin on the crankshaft 17. Said poles are spaced alternately with another series of poles which are connected to a single return line The rotor 25 carries a pair of contact fingers connected together so as to bridge adjacent poles and complete the circuit at that point. A second multi-pole switch 27 is mounted on the bed and has a rotor 28 which is driven through a rack 29 and a gear 30 by movement of carriage. The various positions of the carriage are determined by a spacing bar 45 having notches 46 into which a plunger 47 may enter to locate said carriage. Lever 48 operates said plunger. Corresponding poles of the two switches are connected in series in a circuit which includes a relay 31 and solenoid 32 operably connected to a reversing valve 33. A spring 50 shifts said valve in the opposite direction. Said valve serves to direct fluid under pressure to one side or the other of feed cylinder 34 in which is mounted a piston 35. Said piston is connected to wheel base 36 and serves to move said wheel base toward and from working position. Further control of said solenoid is effected through push button switch 37 which is in series with relay 31. Current is supplied through lines 40 and 41 direct to relay contacts 42 and 43 which are normally open. Line 41 is tapped to provide a connection through push button switch 37 to traverse switch 27. Line 40 is tapped to provide a connection through the coil of relay 31 to headstock switch 26. The poles of each switch are numbered 1, 2, 3 and 4 to correspond to the numbers of the pins on the crankshaft 17.

Operation

With the carriage in the extreme left-hand position rotor 28 of traverse switch 27 is in con-

tact with pole 1 of said switch and plunger 47 has entered the first notch in spacing bar 45. When a crankshaft is placed in the clamping fixtures, it is located with reference to index plate 20 by a pin 21 which is inserted in a hole in the flange of said crankshaft. The crankshaft and index plate are then rotated until number 1 pin on the shaft is in alignment with the headstock spindle in which position the plate is latched by a plunger (not shown) entering one of the notches 20'. Rotation of said shaft and said index plate is effective through mechanism described above to rotate rotor 25 of switch 26 to complete a circuit between pole 1 and an adjacent pole which is connected to line 40 through line 44 and relay 31. A circuit is now closed through both switches. However, it is not desirable to have the wheel base move forward immediately upon completion of the index movements and to prevent this a push button switch 37 in line 49 must be closed before solenoid 32 can be energized. Upon being energized said solenoid shifts valve 33 to the right to direct fluid under pressure to the right hand end of cylinder 34. Piston 35 is then moved to the left carrying with it the wheel base 36 for movement into grinding position. When the work has been ground to size switch 37 is opened, solenoid 32 de-energized and valve 33 shifted to the left by means of spring 50 to direct fluid under pressure to the left end of cylinder 34 and shift piston 35 to the right thereby withdrawing the grinding wheel from operative position.

The work clamps are then opened and the crank rotated about the main bearing until number 2 pin is in alignment with the center of rotation of the heads. The carriage is also shifted to place number 2 pin in front of the grinding wheel. If the operator accidentally failed to place number 2 pin on center or traversed the carriage so that number 3 pin was in front of the wheel and number 2 pin on center there would be no circuit through switches 26 and 27 and solenoid 32 could not shift valve 33 to supply the fluid necessary to move the wheel support 36 to grinding position.

We claim:—

1. In a machine of the kind described, a work support, means for rotatably supporting a crankshaft thereon including a pair of crankheads, means for rotating said crankheads, a grinding wheel support, mechanisms for effecting relative transverse and longitudinal movements of said supports, means for effecting said longitudinal movement intermittently to place successive portions of a work piece in grinding position, means for effecting a rotary indexing movement of a work piece to place successive portions of a work piece in alignment with the center of rotation of said crankheads and interlocking means movable with said longitudinal movement and said rotary indexing movement for controlling said transverse movement.

2. In a device of the kind described, a bed, a grinding wheel support slidably mounted thereon, means for moving same toward and from operative position, a work carriage slidably mounted thereon, a headstock on said carriage, a work clamping fixture rotatably mounted in said headstock, an index plate rotatably mounted on said clamping fixture for movement to predetermined positions, an index plate for locating said carriage in predetermined positions, multiple position control mechanisms movable with each of said index mechanisms and means actuated by said control mechanisms only when said index mechanisms have moved to corresponding positions for rendering operable the moving means for said grinding wheel support.

3. In a grinding machine a work support, means for rotatably mounting a work piece therein, a grinding wheel support, mechanism for effecting a relative transverse movement of said supports including a motor and means for controlling same, mechanism for indexing said work axially to place successive portions thereof in operative relation with a grinding wheel, mechanism whereby said work may be indexed angularly to place said portion in alignment with the center of rotation thereof, a multi-pole switch movable with each of said index means, the corresponding pole on each switch being connected in series with said motor control means whereby said control means will be actuated only after a predetermined movement of each of said index mechanisms.

4. In a grinding machine a work support, means for rotatably mounting a work piece therein, a grinding wheel support, mechanism for effecting a relative transverse movement of said supports including a motor and means for controlling same, mechanism for indexing said work axially to place successive portions thereof in operative relation with a grinding wheel, mechanism whereby said work may be indexed angularly to place said portion in alignment with the center of rotation thereof, a multiple position control mechanism movable with one of said index mechanisms for controlling said motor controlling means and means movable with said other index mechanism for rendering said first mentioned control means operative only after a predetermined movement of each of said index mechanisms.

5. In a crank grinding machine, a work support, means for rotatably supporting a crankshaft thereon including a pair of crankheads, means whereby a crankshaft may be indexed angularly in said crankheads, a grinding wheel support, mechanisms for effecting relative transverse and longitudinal movements of said supports, means for effecting said longitudinal movement intermittently to place successive portions of a work piece in grinding position, means actuated in response to said longitudinal movement in combination with means actuated in response to said angular index movement for rendering said transverse moving means operative.

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