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CAM GRINDER

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Fig 1

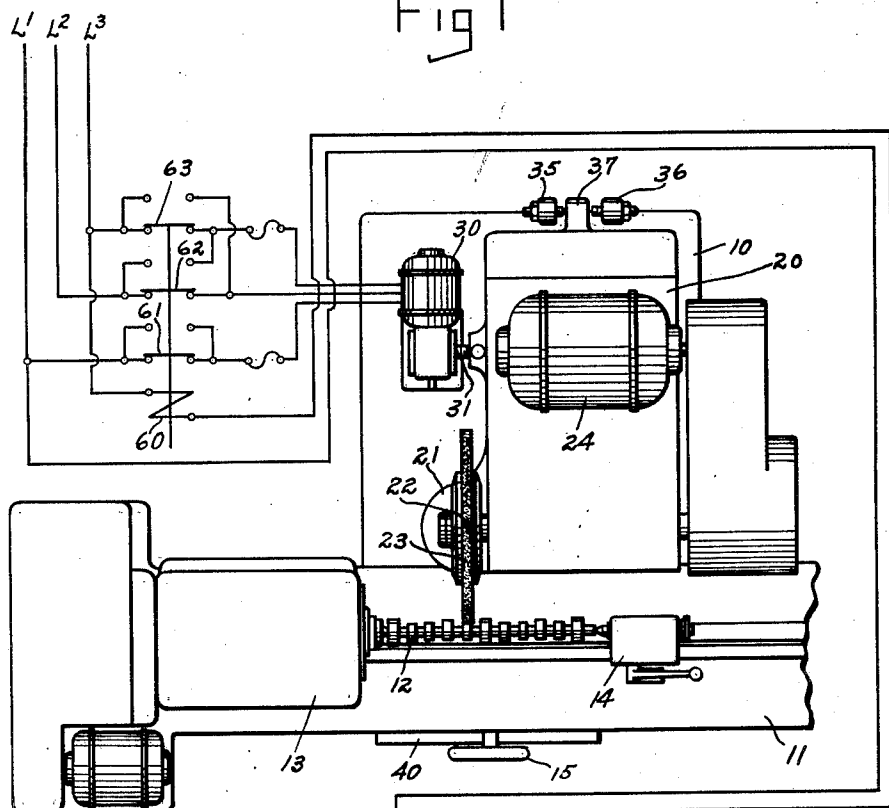
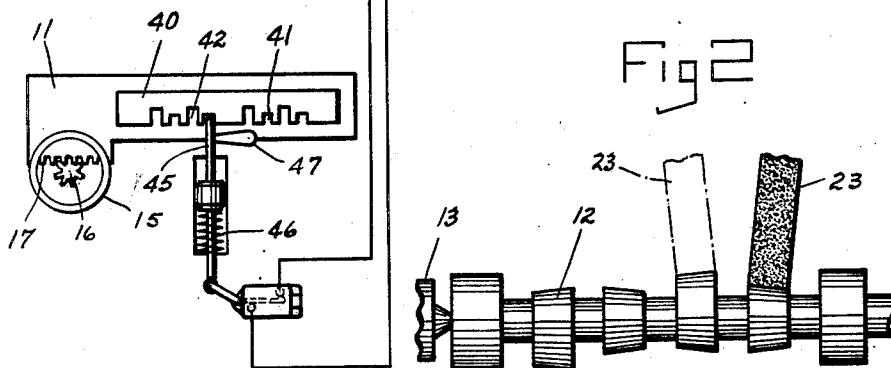


Fig 2



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CAM GRINDER

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8 Claims. (Cl. 51-101)

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This invention relates to cam grinding apparatus, particularly for grinding automotive camshafts having adjacent cams tapered in opposite directions.

The grinding of such camshafts may be accomplished in several ways:

First, all of the cams tapered in one direction may be ground on one machine with the grinding wheel set at an angle corresponding to the angle of taper of the cams. The remaining cams would then be ground on a second machine with the grinding wheel positioned at an angle opposite to the position of the wheel on the first machine for grinding the cams tapered in the opposite direction.

Second, such a shaft may be ground completely on one machine by positioning the grinding wheel at an angle for cams tapered in one direction, successively grinding those cams while the carriage moves intermittently in one direction, then shifting the wheelbase to position the grinding wheel for grinding the cams tapered in the opposite direction and successively grinding said cams while the work carriage moves intermittently in the opposite direction.

A third method which is used here for the purpose of illustration, utilizes a machine having a wheelbase which may be shifted automatically to either of two angular positions. In this case, the grinding wheel is held in one position for grinding one cam and automatically shifted to another position for grinding the next cam. The angular position of the grinding wheel thus changes from cam to cam.

It is, therefore, an object of this invention to provide means for grinding cams on an automotive camshaft on which adjacent cams are tapered in opposite directions.

A further object is to provide means for positioning the grinding wheel angularly to grind the cams tapered in one direction and to shift said grinding wheel at a predetermined point in the operation of the machine to position the grinding wheel for grinding cams tapered in the opposite direction.

A further object is to provide a longitudinal indexing device having means for positioning the grinding wheel in opposite angular positions for grinding alternate cams on a camshaft.

In the drawings,

Figure 1 is a plan view including an electrical circuit for controlling the angular position of the wheel support.

Figure 2 is a close-up of part of a camshaft showing the relation of the grinding wheel to

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alternate cams thereon tapered in opposite directions.

Numeral 10 indicates the bed of a cam grinding machine of the type disclosed in Patent 2,243,410, granted May 27, 1941. A work carriage 11 is slidably mounted on said bed for longitudinal movement thereon. A work piece 12 is rotatably mounted on said carriage in a headstock 13 and a footstock 14. Ordinarily, such a carriage is traversed on the bed by means of the apparatus disclosed in the above-mentioned patent. For the purpose of describing this invention, a manual traverse mechanism is sufficient. Such a mechanism consists of a handwheel 15, a handwheel shaft 16 having gear teeth cut thereon for engaging the teeth of a rack 17 attached to the underside of said carriage 11.

The wheelbase 20 is slidably mounted on bed 10 for feeding movement transversely of work carriage 11. Said wheelbase is mounted for angular adjustment in a horizontal plane on said bed by means of an intermediate slide 21 pivoted at a point 22 substantially directly beneath the center of grinding wheel 23. With this arrangement, the grinding wheel is fed at right angles to the tapered cam surface. Said grinding wheel is rotatably mounted in wheelbase 20 and is driven by means of a motor 24 through a V-belt drive (not shown). Angular adjustment of said wheelbase is effected by means of a reversible torque motor 30 connected to said wheelbase through a driving screw 31. The extent of angular movement of said wheelbase is determined by a pair of adjustable stops 35 and 36 mounted on the bed 10 and adapted to be engaged by a lug 37 on wheelbase 20.

The means for determining the direction of angular movement of wheelbase 20 consists of a spacing bar 40 on the front of carriage 11. Said spacing bar has a series of notches corresponding in number and position to the cams on the shaft to be ground. This spacing bar differs from the one shown in the above-mentioned patent in that adjacent notches are of different depths. The spacing bar thus consists of a series of shallow notches 41 and a series of deep notches 42. Carriage 11 is located in the position for grinding successive cams by means of a plunger 45 held in engagement with spacing bar 40 by means of a spring 46. A handle 47 on said plunger provides means for withdrawing said plunger from the notches in the spacing bar.

The lower end of said plunger engages a single pole limit switch 48. In the closed position of

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this switch, i. e., when plunger 46 is in a deep notch 42, relay coil 60 is energized to hold relay contacts 61, 62 and 63 in the position shown in the drawings to drive torque motor 30 in a direction to shift wheelbase 20 in a clockwise direction. After a cam has been ground with the wheel in this position, plunger 45 is withdrawn by means of handle 47 and the carriage moved to the next position by means of hand-wheel 15. Withdrawal of plunger 46 opens switch 48. In this position of switch 48, relay coil 60 is de-energized and relay contacts 61, 62 and 63 move to a position to cause motor 30 to rotate in the opposite direction and thus move wheelbase 20 in a counterclockwise direction to position the grinding wheel for grinding a cam having a taper opposite to that of the preceding cam. Plunger 45 is then dropped into the next notch which is shallow and does not permit sufficient movement of said plunger to close switch 48.

Where two or more successive cams are tapered in the same direction followed by two or more tapered in the opposite direction, or where cams of opposite taper are irregularly spaced, the swivelling of the wheel base may be controlled by using a spacing bar in which the deep and shallow notches are arranged to conform to the direction of taper of the various cams. For example, in the arrangement mentioned above, the spacing bar would have two or more successive deep notches followed by two or more shallow notches. Briefly the arrangement of notches on a spacing bar depends upon the arrangement and direction of taper on the cams to be ground.

I claim:

1. In a machine of the kind described, a bed, a grinding wheel support, a grinding wheel rotatably mounted thereon, a work support, said supports being mounted on said bed, means for effecting relative longitudinal movement between said supports, means to effect said movement intermittently to successively position said grinding wheel and spaced portions of a work piece in operative relation, means for swiveling said grinding wheel about a point in substantial vertical alignment with the center thereof, and means for actuating said swiveling means alternately in opposite directions in timed relation with the intermittent movement of said carriage, including a spacing bar on said carriage having alternately deep and shallow notches spaced in accordance with the portions of the work piece to be ground, a reversible motor for actuating said swiveling means, a plunger for successively engaging the notches in said spacing bar, and control means actuated by said plunger for actuating said motor alternately in opposite directions.

2. In a machine of the kind described, a bed, a grinding wheel support, a grinding wheel rotatably mounted thereon, means for effecting relative longitudinal movement between said supports, means to effect said movement intermittently to successively position said grinding wheel and spaced portions of a work piece in operative relation, means for swiveling said grinding wheel about a point in substantial vertical alignment with the center thereof, and means for actuating said swiveling means alternately in opposite directions in timed relation with the intermittent movement of said carriage, including a spacing bar on said carriage having alternately deep and shallow notches spaced in accordance with the portions of the work piece to be ground, a reversi-

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ble electric motor for actuating said swiveling means, a plunger for successively engaging the notches in said spacing bar, and a switch actuated by said plunger for actuating said motor alternately in opposite directions.

3. In a machine of the kind described, a grinding wheel support, a grinding wheel rotatably mounted thereon, means for effecting relative longitudinal movement between said supports, means to effect said movement intermittently to successively position said grinding wheel and spaced portions of a work piece in operative relation, means for swiveling said grinding wheel about a point in substantial vertical alignment with the center thereof, and means for actuating said swiveling means alternately in opposite directions in timed relation with the intermittent movement of said carriage, including a spacing bar on said carriage having alternately deep and shallow notches spaced in accordance with the portions of the work piece to be ground, a reversible electric motor for actuating said swiveling means, a plunger for successively engaging the notches in said spacing bar and control means, including a reversing relay operable when energized, to actuate said motor in one direction, and when deenergized, to actuate said motor in the opposite direction, and a switch actuated by said plunger for alternately energizing and deenergizing said relay.

4. In a machine of the kind described for grinding axially spaced portions on a work piece, a bed, a work support, a grinding wheel support, a grinding wheel rotatably mounted thereon, means for effecting a longitudinal movement of one of said supports relative to the other, means to effect a swivelling movement of one of said supports relative to the other, means to effect said longitudinal movement intermittently including a spacing bar having notches spaced in accordance with the spacing of said portions to be ground, a plunger for engaging the notches in said spacing bar to position said grinding wheel and said spaced portions in operative relation, means including a motor, and control means therefor actuated by said plunger for moving said swivelling support to different angular positions to grind tapered surfaces on some of said spaced portions.

5. In a machine of the kind described, a bed, a work support, a grinding wheel support, a grinding wheel rotatably mounted thereon, means for effecting relative longitudinal movement between said supports, means for effecting said movement intermittently to position said grinding wheel and spaced portions of a work piece in operative relation including a spacing bar having notches spaced in accordance with the spacing of the said positions to be ground and a plunger for engaging the notches in said spacing bar, a swivel mounting for one of said supports, means for effecting a swivel movement of said support including a motor, and control means actuated by said plunger for causing said motor to move said support to different angular positions for grinding tapers on said portions in different directions.

6. In a machine of the kind described, a bed, a grinding wheel support slidably mounted on said bed, a grinding wheel rotatably mounted thereon, a work support slidably mounted on said bed, means for rotatably supporting a work piece thereon, means for effecting relative longitudinal movement between said supports, means to effect said movement intermittently to position said grinding wheel and spaced portions of a work

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piece in operative relation, including a spacing bar on said carriage having deep and shallow notches spaced in accordance with the spacing of the portions to be ground, a plunger for engaging the notches in said spacing bar, means for swivelling said grinding wheel support including a motor, and control means actuated by said plunger when it moves into a deep notch for causing said motor to move in one direction and upon withdrawal from said deep notch causes said motor to move in the opposite direction.

7. In a machine of the kind described, a bed, a grinding wheel support slidably mounted on said bed, a grinding wheel rotatably mounted thereon, a work support slidably mounted on said bed, means for rotatably supporting a work piece thereon, means for effecting relative longitudinal movement between said supports, means to effect said movement intermittently to position said grinding wheel and spaced portions of a work piece in operative relation, including a spacing bar on said carriage having deep and shallow notches spaced in accordance with the spacing of the portions to be ground, a plunger for engaging the notches in said spacing bar and means for swivelling said grinding wheel support including a motor, and control means actuated by said plunger when it moves into a deep notch for causing said motor to move in one direction and upon withdrawal from said deep notch causes said motor to move in the opposite direction, said shallow notches being dimensioned to prevent sufficient movement of said plunger to actuate said swivel control means.

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8. In a machine of the kind described, a base, a wheel support movable transversely on said base, a grinding wheel rotatably mounted on said wheel support, a pivotal mounting for said wheel support for swivelling movement about a vertical axis, a work carriage slidably mounted on said bed for longitudinal movement relative to said grinding wheel, means for rotatably supporting a cam shaft on said carriage, means for effecting said longitudinal movement of said carriage, a locating mechanism for controlling said longitudinal moving means to position spaced cams on the cam shaft in grinding relation to the grinding wheel, means to swivel said wheel support in either direction, and means including a control device actuated by said locating means for initiating operation of said swivelling means to position said grinding wheel angularly for grinding tapers on said cam.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,683,859	Brown -----	Sept. 11, 1928
2,041,244	Green -----	May 19, 1936
2,185,837	Crompton -----	Jan. 2, 1940
2,272,088	Hultgren -----	Feb. 3, 1942
2,303,639	Herfurth et al. -----	Dec. 1, 1942
2,581,759	Green -----	Jan. 8, 1952