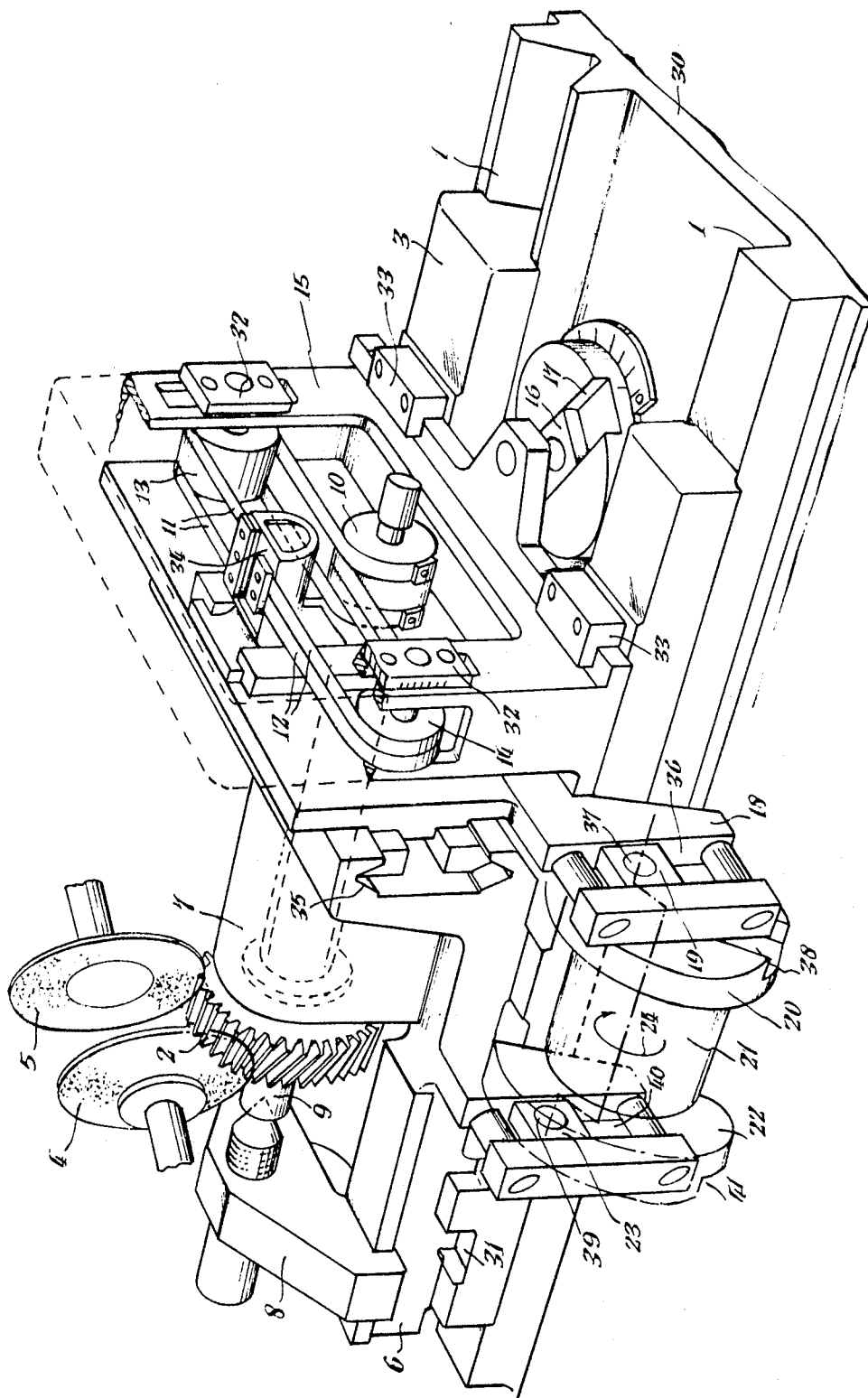


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W. GRAF
GENERATING MECHANISM FOR A GEAR GRINDING MACHINE
FOR HELICAL GEARS
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GENERATING MECHANISM FOR A GEAR GRINDING MACHINE FOR HELICAL GEARS

Willi Graf, Zurich, Switzerland, assignor to Maag Gear Wheel & Machine Company Limited, Zurich, Switzerland

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2 Claims

ABSTRACT OF THE DISCLOSURE

In generating mechanism for a gear grinding machine for helical gears, on which a workpiece having helical teeth which are to be ground is mounted on a generating slide, a rolling pitch block is fitted to a work spindle which is to carry the workpiece, the rolling pitch block is encircled by rolling pitch tapes, the ends of which pitch tapes are fixed to the pitch block and to a secondary slide, and both the secondary slide and the generating slide are moveable parallel to each other and at right angles to the workpiece axis. The rolling pitch tapes are passed round return idler guide pulleys, the said guide pulleys are mounted in a tape stand which is moveable parallel to the generating slide and to the secondary slide, and the said tape stand is moveable from side to side by a sliding block which is slidable in a guideway which is angularly adjustable according to the helix angle of the teeth of the workpiece.

This invention relates to a generating mechanism for a gear grinding machine for helical gears, on which a workpiece having helical teeth which are to be ground is mounted on a generating slide, a rolling pitch block is fitted to a work spindle which is to carry the workpiece, the rolling pitch block is encircled by rolling pitch tapes, the ends of which pitch tapes are fixed to the pitch block and to a secondary slide, and both the secondary slide and the generating slide are moveable parallel to each other and at right angles to the workpiece axis.

Such a generating mechanism is known for a gear grinding machine on which the grinding wheel is fed across the gear tooth width, and in the case of helical gears is also moved from side to side according to the helix angle. The generating actions of the two slides, that is, of the generating slide and of the secondary slide, are derived from a lever, a fixed fulcrum of which is in the horizontal plane of generation of the workpiece, one connection pivot pin of the said lever joins with the generating slide in the horizontal plane through the workpiece axis, and another connection pivot pin of the said lever joins with the secondary slide in the horizontal plane in which the rolling pitch tapes run off the rolling pitch block.

On a gear grinding machine on which the grinding wheels are not fed across the gear tooth width, but on which the generating slide performs this action indirectly, in order to improve the stability of the machine and to permit arrangement of two separate grinding wheels, one each for the two opposite flanks of a tooth, without incurring disadvantage, it has not yet been possible to grind helical gears with the generating mechanism described. The object of the present invention is to make this possible.

According to the invention, the rolling pitch tapes are passed round return idler guide pulleys, the said guide pulleys are mounted on a tape stand which is moveable

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parallel to the generating slide and to the secondary slide, the said tape stand is moveable from side to side by a sliding block which is slidable in a guideway which is angularly adjustable according to the helix angle of the teeth of the workpiece.

By this arrangement it is possible to also grind helical gears with two grinding wheels, which latter remain in a fixed position, and nevertheless command a wide range of gear base circle diameters with a single rolling pitch block.

A recommendable practice is to drive the generating slide and secondary slide with one disc crank each, both with adjustable stroke, and both of which disc cranks are fitted to the same crank shaft.

By adjusting the two strokes in relation to each other, and in relation to the base circle diameter and the rolling pitch block diameter, the correct generating action for the workpiece is obtained.

One embodiment of the invention is shown, in perspective diagrammatic form, in the accompanying drawing.

On a bed 30 of a gear grinding machine for helical gears there are guideways 1 parallel to the axis of a work spindle 9 and of a helical gear 2 mounted on the spindle 9 and which is to be ground. On these guideways a carriage 3 slides, moving the workpiece 2 axially thereof to feed it in the tooth longitudinal direction past two dished grinding wheels 4 and 5. On the carriage 3, a generating slide 6 is located slidable on guideways 31 on the carriage which are at right angles to the said axis of the workpiece 2 and parallel to the common plane through the axes of the dished grinding wheels 4 and 5. Mounted on the generating slide 6 is a generating head 7 and a tailstock 8, in which the workpiece 2 is set up in a manner allowing its rotation.

The workpiece 2 is secured to a work spindle 9, to which latter a rolling pitch block 10 is also secured. One end of two pairs 11 and 12 of rolling pitch tapes the latter. The pair of rolling pitch tapes 11 then pass are fastened to the rolling pitch block 10 and encircle round a return idler guide pulley 13, and the pair of rolling pitch tapes 12 pass round a return idler guide pulley 14, both of which pulleys are mounted rotatably in bearings 32 in a tape stand 15, the bearings 32 being adjustable vertically in the tape stand. The tape stand 15 is likewise located in guideways 33 on the carriage 3 and is movable parallel to and with the generating slide 6.

Attached to the tape stand is a sliding block 16, which engages and slides in a guide 17. The guide 17 is mounted on the bed 1 and is rotatable about its axis so as to be set at an appropriate angle on the bed according to the helix angle of the teeth of the workpiece 2, and the guide is then clamped to the bed 1.

The other ends of the rolling pitch tapes 11 and 12 are fixed to a bracket 34 on a secondary slide 18 and which is adjustable vertically in said secondary slide of the two pairs thereof. The secondary slide 18 is moveable in guideways 35 on the generating slide 6 and parallel to the sliding movement of the generating slide 6 and of the tape stand 15. This secondary slide 18 is driven to and fro by a block 19 which slides in a guide 36 on the secondary slide 18, the block 19 being rotatable on a crank pin 37 on a disc crank 20. The stroke of the block 19 is adjustable by the position of the crank pin 37 along a diametral slot 38 in the disc crank 20. The disc crank 20 is rigidly secured to a rotatable crank shaft 21 to which another disc crank 22 also is rigidly secured. A crank pin 39 on the disc crank 22 carries a rotatable block 23 which is slidable in a guideway 40 on the generating slide 6, whereby to drive the generating slide to and fro on the carriage 3, the stroke of the block 23 being ad-

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justable by adjusting the position of the crank pin 39 along a diametral slot 41 in the disc crank 22.

As the crank shaft 21 rotates in the direction indicated by the arrow 24, the generating slide 6 is moved to and fro over a stroke H_w for which adjustment has been made, and the secondary slide 18 is moved to and fro over a stroke H_x for which adjustment is made. To achieve a correct generating action of the helical gear 2 which is to be ground, relative to the two dished grinding wheels 4 and 5, the following condition is to be fulfilled: 10

$$d_r = d_b \left(1 + \frac{H_x}{H_w} \right)$$

where

d_r = diameter of the rolling pitch block 10, and
 d_b = base circle diameter of the teeth on the workpiece 2.

From this relationship it is seen that for a given available rolling pitch block diameter d_r , an appropriate fixing of the strokes H_w and H_x of the generating slide 6 and of the secondary slide 18 makes it possible to obtain the base circle diameter d_b relevant to the workpiece 2, and hence that only a few rolling pitch blocks of different diameters need to be kept in stock. 20

On displacing the helical gear 2, which is to be ground, axially past the two dished grinding wheels 4 and 5, the one of which grinds the left tooth flanks and the other the right tooth flanks, the additional rotation of workpiece 2 necessary on account of the helix is obtained, in that, due to the appropriately set angle of the guide 17, the sliding block 16 moves the tape stand 15 parallel to the generating slide 6 and to the secondary slide 18. Thereby the return idler guide rollers 13 and 14 are likewise displaced relatively to the pitch block 10 and 25

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impart to the rolling pitch block 10 an additional rotation which is then transmitted to the workpiece 2.

What I claim and desire to secure by Letters Patent is:

1. Generating mechanism for a gear grinding machine for helical gears, on which a workpiece having helical teeth which are to be ground is mounted on a generating slide, a rolling pitch block fitted to a work spindle for carrying said workpiece, said rolling pitch block being encircled by rolling pitch tapes, the ends of said pitch tapes being fixed to the pitch block and to a secondary slide, and both said secondary slide and said generating slide are moveable parallel to each other and at right angles to the workpiece axis, characterised in that said rolling pitch tapes being passed round return idler guide pulleys, said guide pulleys being mounted in a tape stand moveable parallel to said generating slide and to said secondary slide, said tape stand being moveable from side to side by a sliding block which is slidable in a guideway, said guideway being angularly adjustable according to the helix angle of the teeth of the workpiece. 15

2. Generating mechanism according to claim 1, characterised in the said generating slide and said secondary slide are each driven by a separate disc crank with adjustable stroke, and that the two disc cranks are fitted to a common crank shaft. 25

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HAROLD D. WHITEHEAD, Primary Examiner

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