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Marowsky

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[54] **CRANKSHAFT GRINDING MACHINE**

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[51] **Int. Cl.** **B24b 5/42**

[58] **Field of Search** ..... 51/50 R, 98 SP, 105 R, 51/105 SP, 105 EC

[56] **References Cited**

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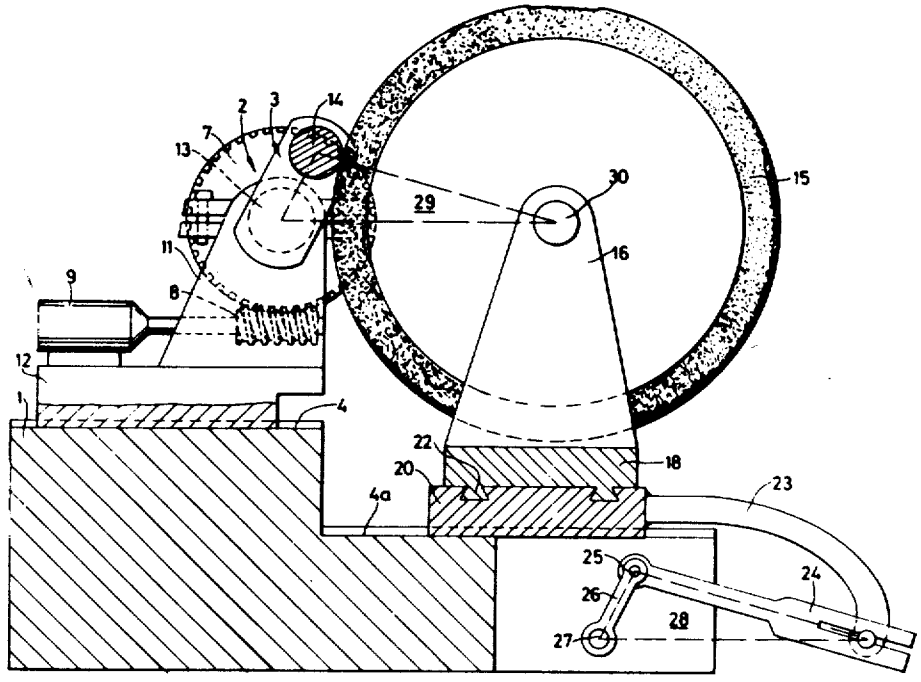
Attorney, Agent, or Firm—Kurt Kelman

[57] **ABSTRACT**

A crankshaft grinding machine comprises a chuck for mounting the crankshaft for rotation about the axis of the main bearing pin and a grinding wheel mounted for reciprocation in relation to the crankshaft on a slide for movement perpendicular to the axes of rotation of the crankshaft and the grinding wheel. A crank drive reciprocates the slide, the lengths of the cranks of the crankshaft and of the crank drive being identical and the crank drive including a push rod connected to the slide. The length of the push rod is identical to the distance between the axis of the crankshaft crank pin and the axis of rotation of the grinding wheel.

5 Claims, 2 Drawing Figures



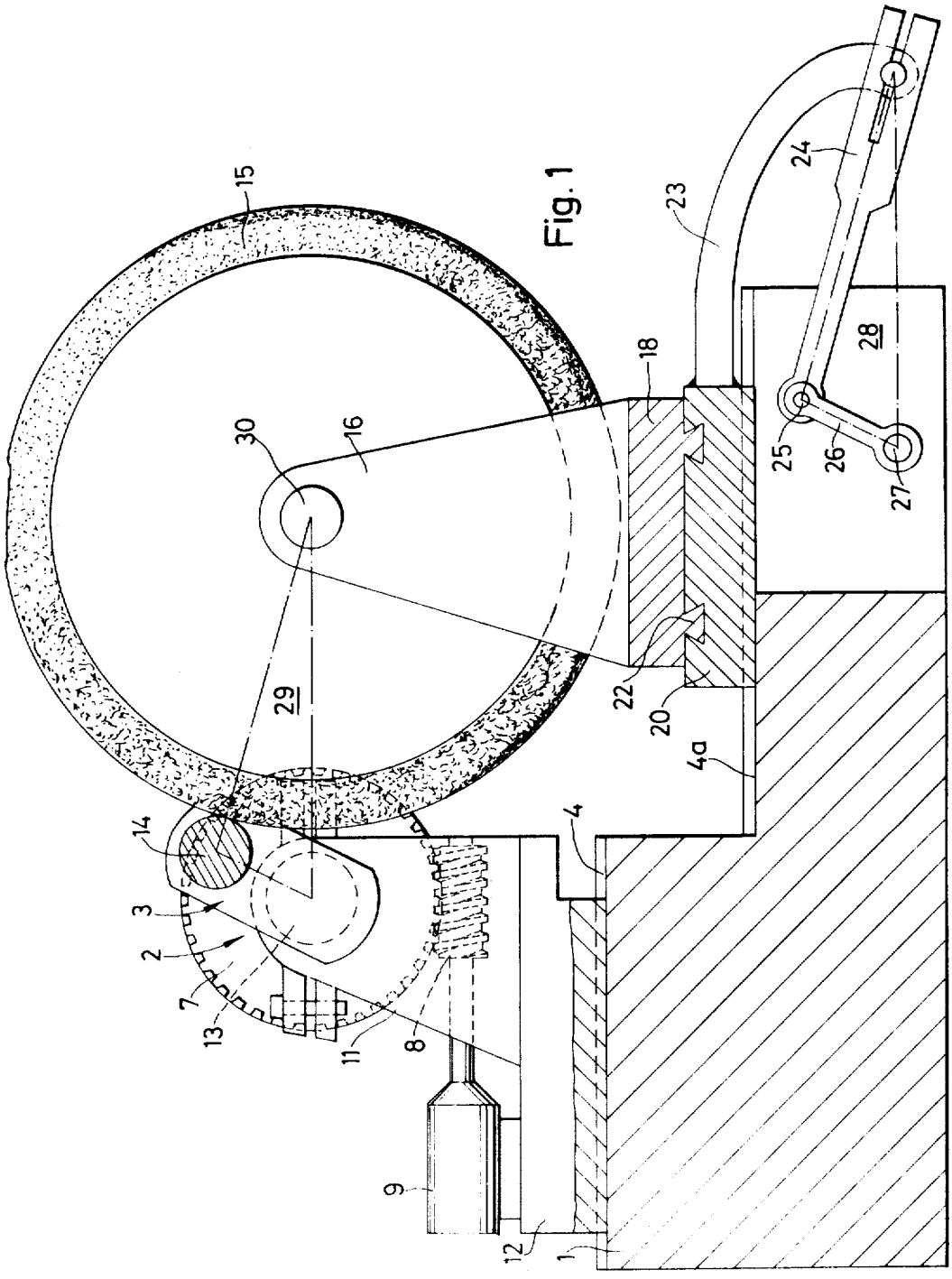


Fig. 1

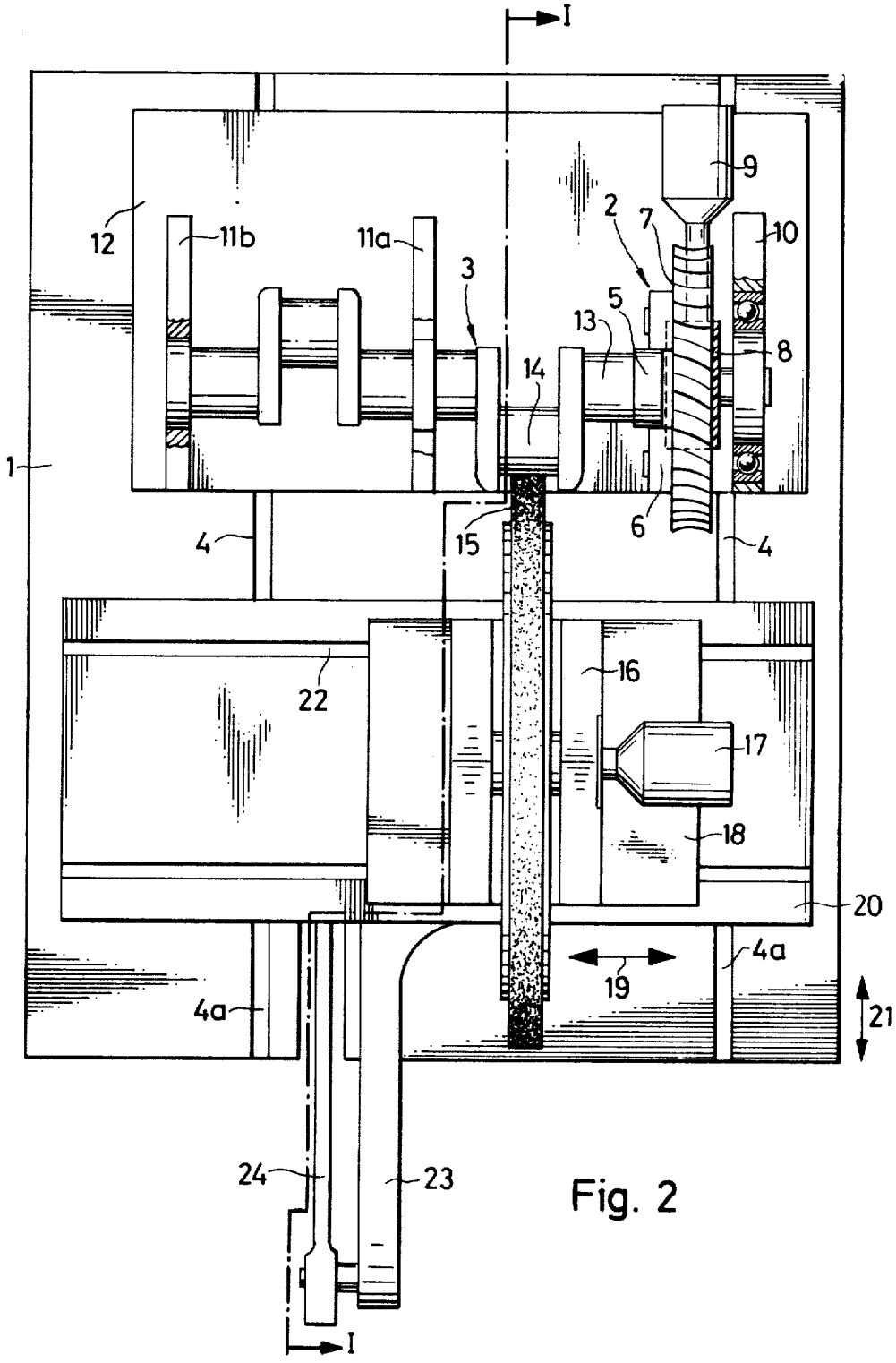

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Fig. 2

CRANKSHAFT GRINDING MACHINE

The present invention relates to improvements in a grinding machine for grinding a crankshaft having a main bearing pin and a crank pin arranged to revolve around the main bearing pin during rotation of the crankshaft.

In known grinding machines of this type, a chuck means mounts the crankshaft for rotation about the axis of the main bearing pin and a grinding wheel is mounted for movement in relation to the crankshaft for grinding the revolving crank pin. In conventional crankshaft grinding machines, the crankshaft is centered for rotation about the axis of the main bearing pin when the latter is to be ground and is then centered for rotation about the axis of the crank pin when grinding of the latter is desired. These two grinding operations are effected either on two separate machines or, of a single machine is used, the crankshaft blank must be remounted on the chuck for the two operations, which requires considerable time and effort. Furthermore, counterweights must be mounted for the grinding of the crank pin, which further increases the dead time.

It has been proposed to provide grinding machines wherein it is not necessary to remount the crankshaft for grinding the main bearing and crank pins. In these machines, the grinding wheel is either swingingly mounted in respect to the crank pin or the movement of the grinding wheel in relation to the crank pin is cam-controlled during the grinding operation. These structures are complex when relatively large crankshafts are to be ground so that they have been limited in commercial practice to work on small and light crankshafts.

According to this invention, the grinding wheel is supported for reciprocation in relation to the crankshaft in a direction perpendicular to the axis of rotation of the grinding wheel and a crank drive is operatively connected to the slide means for reciprocating the slide means. The geometry of the crank drive conforms to the crank of the crankshaft to be ground, i.e., the lengths of the cranks of the crankshaft and of the crank drive are identical and the crank drive includes a push rod connected to the slide means, the length of the push rod being identical to the distance between the axis of the crank pin and the axis of rotation of the grinding wheel.

According to a preferred embodiment, the axis of symmetry of the crank drive is parallel to the line of connection between the axis of the main bearing pin of the crankshaft and the axis of rotation of the grinding wheel. The crankshaft and crank drive are driven synchronously so that both cranks work with the same cranking angle.

This simple structure, whose positioning means operates most accurately, makes it possible to grind the main bearing pins and crank pins of crankshafts of large dimensions to a high degree of tolerance without the necessity of remounting the crankshaft during the entire grinding operation.

If the push rod of the crank drive is longitudinally adjustable, a change in the effective length of the push rod makes is possible readily to adjust the position of the grinding wheel and also to compensate for grinding errors. Thus, by shortening or lengthening of the push rod, any deviations from the circular in the circumference of the pin may be compensated by introducing a corresponding error in the movement of the grinding wheel so as to counteract the error in the pin periphery.

The above and other objects, advantages and features of the present invention will become more apparent from the following detailed description of a now preferred embodiment thereof, taken in conjunction with the accompanying drawing wherein

FIG. 1 is a cross sectional end view along line I—I of FIG. 2 of a crankshaft grinding machine according to this invention and

FIG. 2 is a side elevational view of the machine.

Referring now to the drawing, the machine is shown to comprise support 1 for chuck 2 holding blank 3 of the crankshaft to be ground, the chuck being slidably arranged on guides 4 of the support. End portion 5 of the crankshaft 3 is held in clamping jaws 6 of chuck 2 and the clamping jaws are connected to rotatably mounted worm gear 7. The worm gear meshes with gear 8 driven by motor 9 so that rotation of gear 8 by motor 9 causes rotation of the worm gear during operation of the grinding machine. Bearing support 10 rotatably supports worm gear 7 and crankshaft 3 is additional supported by bearings 11*a* and 11*b* along its length. The bearings 10, 11*a*, 11*b*, chuck 2 and drive motor 9 are mounted on support 12 which is slidably arranged on guides 4 of support 1 for accurate adjustment.

Crankshaft blank 3 is supported on its bearings in the same manner as it would be arranged within a motor during operation thereof, i.e., main bearing shaft 13 of the crankshaft is centered while crank pin 14 revolves about the main bearing shaft.

Grinding wheel 15 is rotatably mounted in bearings 16 and is rotated by driving motor 17. Bearings 16 are supported on a slide comprising upper slide part 18 reciprocal in a first direction indicated by double-headed arrow 19 while lower slide part 20 is reciprocal on support 1 in a second direction perpendicular to the first direction, as indicated by double-headed arrow 21. Dovetailed guides 22 support upper slide part 18 for reciprocation on lower slide part 20 while guides 4*a* support the lower slide part for reciprocation on support 1. Lower slide part 20 carries rearwardly directed arm 23 extending in the general direction of arrow 21 and one end of push rod 24 of a crank drive is longitudinally adjustably connected to the outer end of arm 23. The other end 25 of the push rod is connected to crank 26 whose rotary axle 27 is mounted on support 1.

The above-described grinding machine operates as follows:

Assuming it is desired first to grind main bearing pin 13 of crankshaft 3, grinding wheel 15 is positioned by movement of slide parts 18, 20 until it has reached the desired point of grinding. When crank pin 14 is to be ground subsequently, the grinding wheel is accordingly repositioned until it has reached the new point of grinding and crank drive 24–27 is operated so that slide 18, 20 follows the revolving motion of crank pin 14 about main bearing pin 13, thus grinding the crank pin without requiring re-mounting of the crankshaft blank.

As clearly shown in FIG. 1, the illustrated embodiment of the crankshaft grinding machine is so arranged that, in all grinding positions of crank pin 14, two congruent triangles 28, 29 are formed, the triangles being congruent because two of their sides and the angle opposite the larger side are identical. Thus, the length of crank 26 is the same as the distance from the axis of

main bearing pin **13** to that of crank pin **14**, and the length of push rod **24** is the same as the distance from the axis of crank pin **14** to axis **30** of rotation of grinding wheel **15**. The angles formed by the crank of triangle **29** and by crank **26** of triangle **28** are necessarily identical because of the synchronous drive of crankshaft **3** and crank drive **26, 27.**

The grinding machine of the invention is useful for grinding all types of used in used piston machines and presses, for instance.

What is claimed is:

1. A grinding machine for grinding a crankshaft having a main bearing pin and a crank pin arranged to revolve around the main bearing pin during rotation of the crankshaft, the machine comprising

1. means for mounting the crankshaft for rotation about the axis of the main bearing pin,

2. a grinding wheel mounted for movement in relation to the crankshaft and for rotation about an axis substantially parallel to the axis of rotation of the main bearing pin of the crankshaft,

3. a slide means supporting the grinding wheel for reciprocation in relation to the crankshaft in a direction perpendicular to the axes of rotation, and

4. a crank drive operatively connected to the slide means for reciprocating the slide means,

a. the lengths of the cranks of the crankshaft and of the crank drive being identical and

b. the crank drive including a push rod connected to the slide means, the length of the push rod being identical to the distance between the axis of the crank pin and the axis of rotation of the grinding wheel.

2. The crankshaft grinding machine of claim **1**, wherein the axis of symmetry of the crank drive extending from the axis of rotation of the crank of the drive to the point of connection of the push rod to the slide means is parallel to the line of connection between the axis of the main bearing pin of the crankshaft and the axis of rotation of the grinding wheel.

3. The crankshaft grinding machine of claim **1**, comprising means for synchronously driving the crank drive and the crankshaft.

4. The crankshaft grinding machine of claim **1**, comprising means for longitudinally adjustably connecting the push rod of the crank drive to the slide means.

5. The crankshaft grinding machine of claim **1**, wherein in all grinding positions, two congruent triangles are formed, on the one hand, by the crank of the crankshaft, the distance between the axis of the crank pin and the axis of rotation of the grinding wheel, and the distance between the axis of the main bearing pin and the axis of rotation of the grinding wheel, and on the other hand, by the crank of the crank drive, the length of the push rod, and the distance between the axis of rotation of the crank drive and the point of connection between the push rod and the slide means.

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