

Feb. 18, 1941.

W. L. GROENE

2,232,228

CRANKPIN GRINDER

Filed May 10, 1940

2 Sheets-Sheet 1

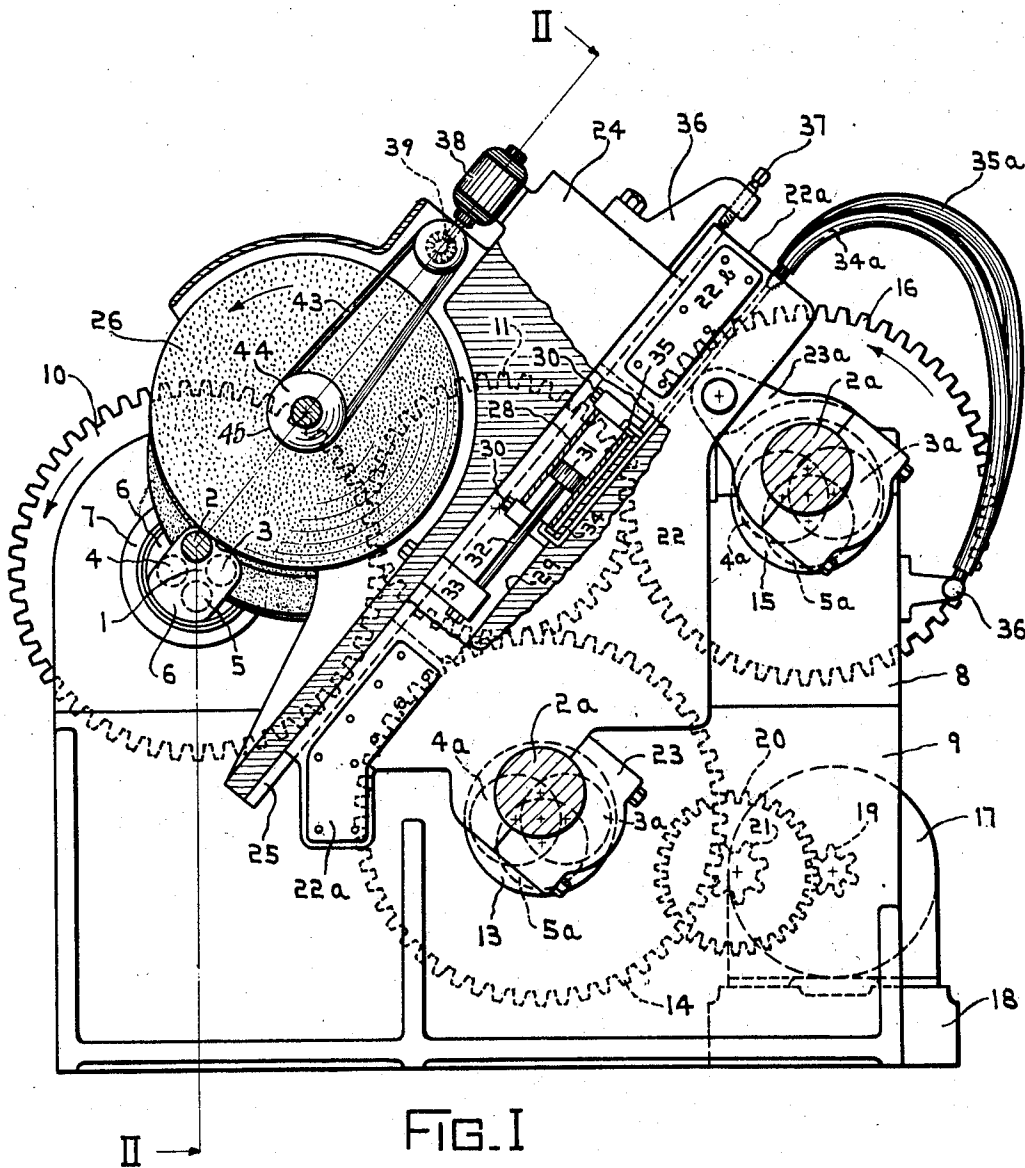


FIG. I

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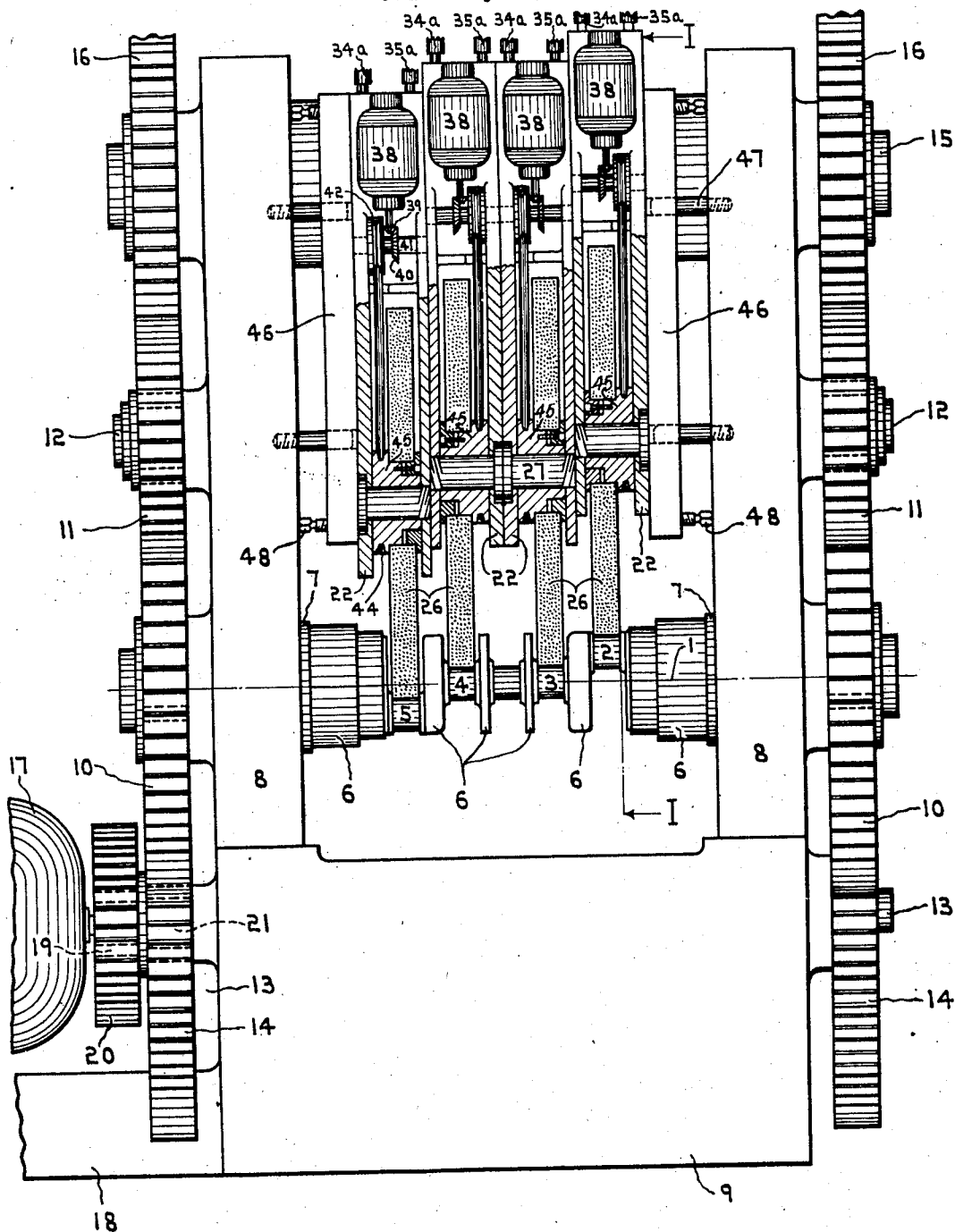


FIG. II

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UNITED STATES PATENT OFFICE

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CRANKPIN GRINDER

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Application May 10, 1940, Serial No. 334,407

6 Claims. (Cl. 51-105)

This invention pertains to grinding machines and is particularly related to the type of grinding machines used for grinding the crankpins of crankshafts for multi-throw internal combustion engines. More particularly this invention pertains to a grinding machine capable of simultaneously machining a plurality of crankpin bearings of a crankshaft in a single operation.

Another object of this invention is to provide a crankpin grinding machine which is capable of grinding all of the pin bearings of a multi-throw internal combustion engine crankshaft in one operation in which each of the grinding wheels for each of the crankpins may be fed independently to its respective crankpin so as to properly size these bearing portions of the crankshaft.

Another object of this invention is to provide an orbital grinding machine in which a series of grinding wheels is provided, for each of the crankpins of a multi-throw internal combustion engine crankshaft, which may be independently fed to each of the respective pin bearings to be ground during the simultaneous grinding of all of said bearing portions.

Another object of this invention is to provide in a crankpin grinding machine, means to cause a series of grinding wheels to be simultaneously applied to all of the crankpin bearings of a multi-throw crankshaft while said crankshaft is rotated on its line bearing axis during the grinding process.

Still another object of this invention is to provide a crankpin grinding machine with a series of orbitally moving grinding wheel carriers which may be oscillated in synchronism with the rotation of the crankshaft to be ground so that each grinding wheel provided for each crankpin will travel in an orbital path properly following the orbital movement of the crankpin bearings of the work crankshaft as it is rotated during the grinding operation.

It is also an object to provide in a grinding machine, having orbitally moving grinding wheel carriers, means whereby the grinding wheels may be fed on said carriers to and from the crankpins to be ground independent of the orbital motion of said carrier.

A still further object of this invention is to provide, in a grinding machine for simultaneously grinding a plurality of crankpins on an internal combustion engine crankshaft, orbitally moving grinding wheel carriers upon which are mounted a series of grinding wheels, one for each crankpin to be ground on said crankshaft, and to provide motive means for rotating the grinding wheels on each of said grinding wheel carriers.

Further features and advantages of this invention will appear from the detailed description of the drawings in which:

Figure I is a diagrammatic transverse section through a crankpin grinding machine for simultaneously grinding all of the crankpins of a multi-throw internal combustion engine crankshaft in a single operation, shown on the line I—I of Figure II.

Figure II is a diagrammatic front elevation, partly in section, on the line II—II of Figure I.

For illustrative purposes, this invention has been shown applied to grinding the four crankpin bearings of a V-8 multi-throw crankshaft in which each of the crankpin bearings lie in a different indexed position about the line bearing axis of rotation of the crankshaft, that is each of the crankpin bearings are circumferentially spaced at 90° about this axis. The crankshaft C to be ground has the line bearing axis 1, and the various pin bearings 2, 3, 4, and 5, which are suitably interconnected by means of the webs 6, as is usual for such crankshafts. This crankshaft C is shown chucked on its line bearing axis 1 in suitable pot chucks 8 carried on appropriate work spindles 7 journaled in suitable bearings in the upright frames 9, mounted on top of the base 9 of the machine.

On each of these work spindles 7, is fixed a gear 10 which gears are in mesh with respective idler gears 11 journaled on suitable studs 12 fixed in the upright frames 9.

Journaled in the base 9 of the machine is the lower master crankshaft 13 upon the outer ends of which are fixed the driving gears 14 which are in mesh with the idler gears 11. Journaled in the upright frames 9 is the upper master crankshaft 15 which carries driving gears 16 on its outer ends also in mesh with the idler gears 11. The gears 10, 14, and 16 are all of the same diameter and number of teeth so that the work spindles 7 and the master crankshafts 13 and 15 rotate in exact synchronism when driven by the main drive motor 17, mounted on the projection 18 of the base 1. This motor 17 has a driving pinion 19 driving the gear 20 of the compound gear 20-21, the gear 21 of this compound gear in turn driving into the driving gear 14 on the lower master crankshaft 13.

Each of these master crankshafts have the respective crankpins 2a, 3a, 4a, and 5a, corresponding in indexed position and stroke with those of the respective bearings 2, 3, 4, and 5 of the crankshaft C to be machined. On these various pin bearings are mounted the grinding wheel carriers 22 mounted directly on the crankpins of the lower master crankshaft 13 by a suitable journal 23 and through a linkage connection 23a on the crankpins of the upper master crankshaft 15. Thus these carriers 22 are moved in synchronized motion in proper timed relation and position relative to the respective bearings 2, 3, 4, and 5, to be ground on the crankshaft C.

On these carriers 22 is mounted the grinding wheel housings 24 on suitable dove tailed guide ways 25 on the carrier 22 so that this carrier may be slid to and from the respective crankpins to be ground to effect a feeding motion of the grinding wheels 26 suitably journaled on studs 27 fixed in the respective housings 24.

The feeding or sliding motion of these housings 24 on the carrier 22 is effected by a fluid pressure cylinder 28, which is fixed on the surface 29 of the carrier 22 by suitable screws 30. In this cylinder operates the piston 31 having a piston rod 32, which is connected to the block 33, fixed on the underside of the grinding wheel housing 24. Fluid pressure may be applied to one or the other end of this cylinder 28, through suitable pipe lines 34 and 35 having pasageways opening outwardly and upwardly at the rear of the carriers 22 to which are connected the flexible pipe lines 34a and 35a to a manifold 36 which in turn is appropriately connected to hydraulic fluid pressure mechanism whereby fluid pressure may be distributed to the cylinders 28 for effecting independent reciprocary feeding movement in the various grinding wheel housings 24 for feeding the grinding wheels 26 to each of the crankpins to be ground. On each of the housings 24 is fixed a bracket 36 having an adjustable stop screw 37 adapted to abut against the rear surface 22a of the grinding wheel carriers 22 so as to provide an accurate and positive stop for the infeed position of the grinding wheel 26 for each crankpin to be ground, so that each of the crankpins may be ground to precise dimensions independent of the feeding motions being effected at the other crankpins. In this way accurate sizing of all of the crankpins is independently accomplished for each crankpin independent of the diameter provided by each of the grinding wheels, thereby effecting a very accurate finished result for each of the crankpins.

Each of the grinding wheels 26 is individually driven by its own electric motor 38 mounted on its respective grinding wheel housing 24, each of these motors having a bevel gear 39 adapted to drive a mating bevel gear 40 mounted on a pulley shaft 41, suitably journaled in the housing 24, and having a pulley fixed on it which carries the driving belt 43 passing over the driving pulley 44 of the grinding wheel hub 45, which appropriately carries the respective grinding wheels 26 and rotates on the studs 27 fixed in the housing 24. Obviously suitable flexible electrical connecting wires may be applied to each of these motors 38 to thereby provide an independent driving means for each of the grinding wheels 26 in the respective grinding wheel housings 24.

All of these carriers 22 are kept in proper axial alignment lengthwise of the crankshaft to be machined by means of suitable side thrust plates 22a and 22b, provided on the sides of these carriers and which are all maintained in proper operating contact by means of suitable thrust plates 46, carried on studs 47 fixed in the upright support 8, and adjusted in proper running contact with the various tool carriers 22 by suitable adjusting screws 48 in a manner substantially as set forth in Patent Reissue Number 18,662, of William F. Groene and Harold J. Siekmann, issued November 22, 1932.

Having thus fully set forth and described my invention what I claim as new and desire to secure by United States Letters Patent is:

1. In a crankpin grinding machine, a rotatable

work spindle, a pair of master crankshafts, means for rotating said work spindle and master crankshafts in synchronism, grinding wheel carriers mounted on the crankpins of said master crankshafts, a grinding wheel housing mounted on each of said carriers, a grinding wheel in each of said housings, means for rotating said grinding wheels, and means for moving said housings on said carriers to effect a feeding of said grinding wheels relative to said work spindle.

2. In a crankpin grinding machine, a rotatable work spindle, a pair of master crankshafts, means for rotating said work spindle and master crankshafts in synchronism, grinding wheel carriers mounted on the crankpins of said master crankshafts, a grinding wheel housing mounted on each of said carriers, a grinding wheel in each of said housings, means on each of said housings for driving said grinding wheels, and means for moving said housings on said carriers to effect a feeding of said grinding wheels relative to said work spindle.

3. In a crankpin grinding machine, a rotatable work spindle, a pair of master crankshafts, means for rotating said work spindle and master crankshafts in synchronism, grinding wheel carriers mounted on the crankpins of said master crankshafts, a grinding wheel housing mounted on each of said carriers, a grinding wheel in each of said housings, means on each of said housings for driving said grinding wheels, and means on said carrier for moving said housings to effect a feeding of said grinding wheels relative to said work spindle.

4. In a crankpin grinding machine, a rotatable work spindle, a pair of master crankshafts, means for rotating said work spindle and master crankshafts in synchronism, grinding wheel carriers mounted on the crankpins of said master crankshafts, a grinding wheel housing mounted on each of said carriers, a grinding wheel in each of said housings, means for rotating said grinding wheels, means for independently feeding each of said housings on its respective carrier, and means for limiting said feeding motion of said housings on each of said carriers.

5. In a crankpin grinding machine, a frame, a rotatable work spindle journaled in said frame, a pair of master crankshafts journaled in said frame, means for rotating said work spindle and master crankshafts in synchronism, grinding wheel carriers mounted on the crankpins of said master crankshafts, grinding wheel housings movably mounted on said carriers, a grinding wheel in each of said housings, means on said housings for rotating said grinding wheels, and means on said carriers for actuating said housings in feeding movements relative to said work spindle.

6. In a crankpin grinding machine, a frame, a rotatable work spindle journaled in said frame, a pair of master crankshafts journaled in said frame, means for rotating said work spindle and master crankshafts in synchronism, grinding wheel carriers mounted on the crankpins of said master crankshafts, grinding wheel housings slidably mounted on said carriers, a grinding wheel in each of said housings, an electric motor on said housings for rotating said grinding wheels, and fluid pressure operated means on said carriers for actuating said housings in feeding movements relative to said work spindle.

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