May 19, 1964 J. HOCHREUTER 3,133,600

ELECTRIC HAMMER DRILLING DEVICE WITH INTERMITTENT CHANGE OVER GEAR FOR THE HAMMER TOOL

Filed April 15, 1960 5 Sheets-Sheet 1

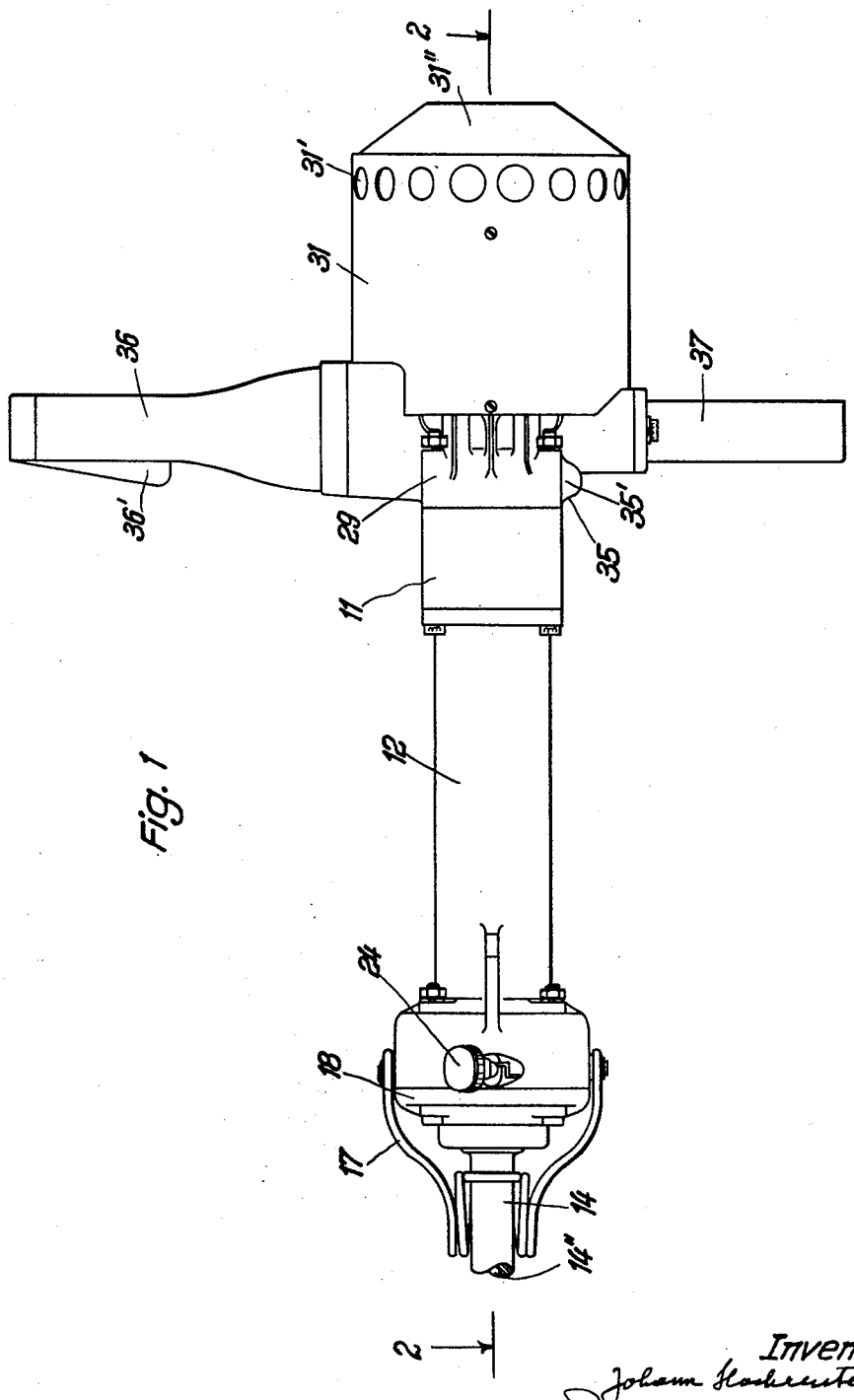


Fig. 1

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5 Sheets-Sheet 2

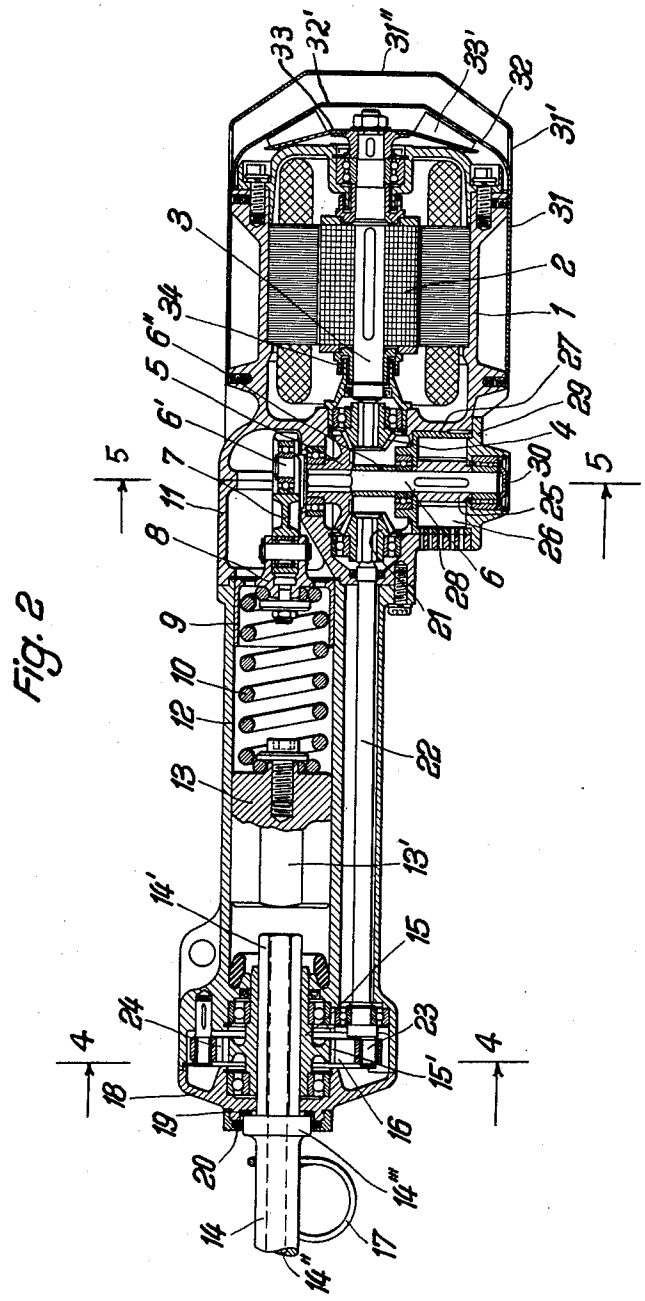


Fig. 2

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Filed April 15, 1960 5 Sheets-Sheet 3

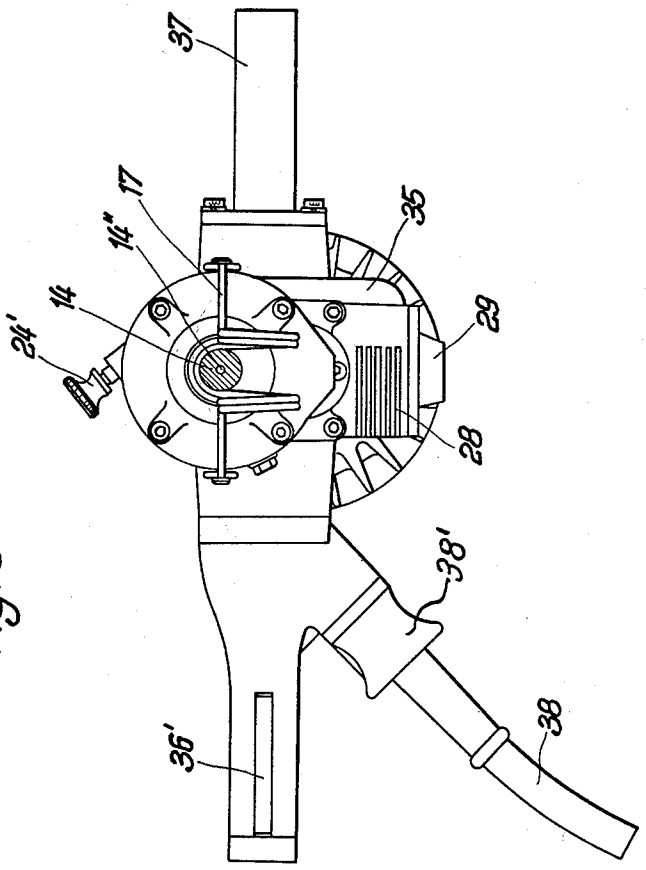


Fig. 3

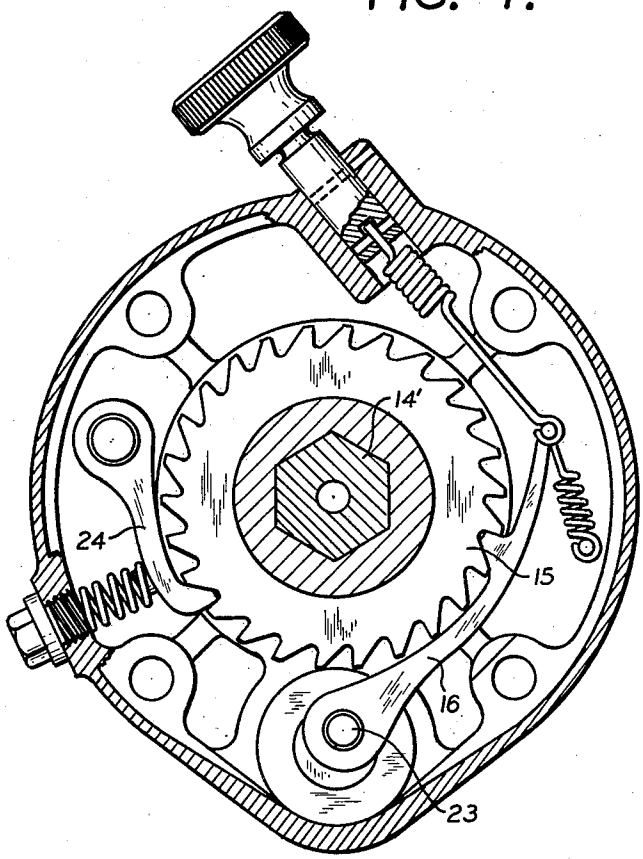
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Filed April 15, 1960 5 Sheets-Sheet 4

FIG. 4.



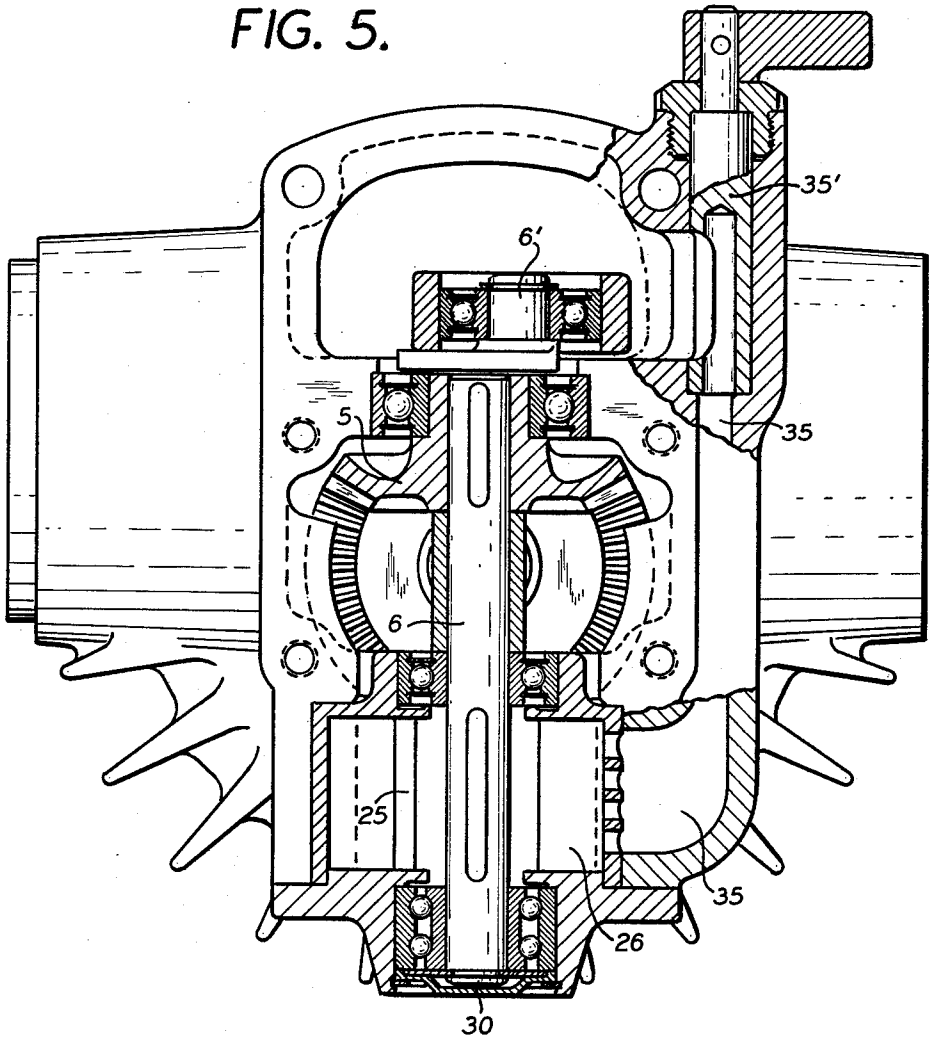
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ELECTRIC HAMMER DRILLING DEVICE WITH INTERMITTENT CHANGE OVER GEAR FOR THE HAMMER TOOL

Filed April 15, 1960 5 Sheets-Sheet 5

FIG. 5.



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ELECTRIC HAMMER DRILLING DEVICE WITH INTERMITTENT CHANGE OVER GEAR FOR THE HAMMER TOOL

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1 Claim. (Cl. 173—75)

The present invention relates to an electric hammer drilling device with intermittent change over gear for the hammer tool.

Electric hammer drilling devices having a gear transmission are known, which are particularly designed for mining purposes, wherein the arrangement of the electro-motor of the gear transmission and of the hammer tool is arranged as to its location in such a manner, that a very great and spatially very far reaching or longitudinally extending device is formed.

It is one object of the present invention to provide an electric hammer drilling device which is light and easy to handle, has spatially very small dimensions and simultaneously complies with all safety requirements, as particularly prescribed in the mining field.

It is another object of the present invention to provide an electric hammer drilling device, wherein the driving motor and the shaft of the intermittent change over gear are disposed coaxially one behind the other and wherein the axis of the hammer tool is parallel to the axis of said shaft.

It is yet another object of the present invention to provide an electric hammer drilling device, wherein the driving motor operates a drive set off for 90° to the axis of the motor by means of a beveled gear, which beveled gear drive operates the hammer piston guided in the housing by means of the crank shaft with a crank pin for the hammer piston over a connecting rod and a cross-head, as well as by arrangement of an intermediate helical spring.

Simultaneously, the bevelled gear works in turn over a beveled pinion on the shaft of the drilling-intermittent change over gear, which shaft causes a stepwise rotation by acting on the periphery of the tool by means of a pawl.

It is still a further object of the present invention to provide an electric hammer drilling device, which includes a damping member for the return shock consisting of an elastic disc of non-metallic material disposed between a collar of the tool and the front housing cover of the device.

It is yet also another object of the present invention to provide an electric hammer drilling device, which includes a compressor providing an air flow during the drilling and hammering activities and disposed inside of the housing of the device. It is known to use such compressors outside of the housing of the device, and particular compressor conduits were required to feed the pressurized air from the compressor to the device, which made a servicing of the device rather difficult.

The cooling air, compressed by the compressor, is fed over a channel with adjustable control members inside of the housing and is fed into the bore of the tool through recesses provided in the hammer piston. In accordance with the present invention, the compressor can be mounted directly on the shaft of the bevelled gear, the housing of the compressor being non-rotatably mounted in the housing of the motor.

It is yet a still further object of the present invention to provide an electric hammer drilling device, wherein the cooling air required for the motor is sucked through openings provided on the cylindrical peripheral portion of a protecting cap and is pressed over a wing gear mounted on the motor axle to pass the cooling ribs of the motor housing.

By this arrangement, a device is achieved as to its spacial arrangement, which receives inside of the housing all necessary elements and which is completely closed up to the outside and has such a handy configuration, that it is applicable for the most different types of work.

With these and other objects in view, which will become apparent in the following detailed description, the present invention will be clearly understood in connection with the accompanying drawings, in which:

FIGURE 1 is a top plan view of the electric hammer drilling device;

FIG. 2 is a vertical axial section along the lines 2—2 of FIG. 1;

FIG. 3 is a front elevation of the electric hammer drilling device;

FIG. 4 is a section along the lines 4—4 of FIG. 2; and

FIG. 5 is a section along the lines 5—5 of FIG. 2, the crank pin being shown in a position set off 90° relative to the showing in FIG. 2.

Referring now to the drawings, the electric hammer drilling device comprises an electro-motor 1 having an anchor 2 and is mounted on the motor shaft 3. The motor shaft 3 carries a bevelled gear 4. The latter meshes with another bevelled gear 5, the axis of which is perpendicular to the shaft 3 of the electric-motor 1. The bevelled gear 5 is mounted on the crank shaft 6 having the crank pin 6'. The latter drives by means of the connecting rod 7, the cross-head 8, which extends into the bushing 9 and has secured thereto one end of a helical spring 10. The crank housing 11 is disposed between the motor housing and the housing 12 receiving the reciprocating hammer piston 13, which is secured to the other end of the helical spring 10. The hammer tool 14 has a rear shaft 14' which receives the blows from the hammer piston 13. The latter has recesses 13' at its periphery. Thus, the hammer piston 13 is guided on the inner wall of the housing 12 only for a portion of its periphery. The recesses 13' of the hammer piston 13 are adapted to permit air exchange and the feeding of cooling air to the tool 14, which is equipped with an axial bore 14'' for feeding air therethrough.

The rear shaft 14' is disposed non-rotatably in a ratchet wheel 15 having teeth 15'. A pawl 16 engages the teeth 15' to operate the ratchet wheel 15.

A spring 17 retains the exchangeable tool 14 in its mounted position. The spring 17 is linked to the front cover 18. An elastic disc 19 is arranged in the front cover 18 and functions as a damping member for the return shock of the tool 14, the latter being equipped for this purpose with a collar 14'''. The elastic disc 19 is made of non-metallic material. A sealing member 20 is disposed around the collar 14'''.

The bevelled gear 5 meshes finally with a beveled gear 21, which is disposed opposite the beveled gear 4 and is mounted on a shaft 22 which operates the pawl 16 by means of a crank pin 23, so that the tool 14 is subjected to continuous step-wise rotation by means of the pawl 16 and the ratchet wheel 15. The steps for the movement of the tool in circumferential direction may be arranged in such a manner that the rotation of the tool 14 does not coincide timely with the hammer blow. A locking pawl 24 prevents the return rotation of the tool 14 after each operating circumferential stroke.

A compressor 25 with its wings 26 is mounted on the shaft 6 of the bevelled gear 5. A housing 27 surrounds the compressor, which housing 27 is rigidly secured to the housing of the electric motor 1. Suction openings 28 for entering air are provided in the closure cover 29 of the compressor 25 which is closed up by a cover disc 30.

The electric motor 1 is covered by a particular motor housing 31 and since the electric motor 1 develops heat during its operation, means for air cooling must be provided. For this reason air entrance openings 31' are arranged on the entire periphery of the upper portion of the motor housing 31, as clearly disclosed in FIGS. 1 and 2 of the drawings. Furthermore, a flush wheel 33, carrying in conventional manner a plurality of blades 33', and operating like a suction ventilator fan, is mounted on the upper end of the motor shaft 3. The flush wheel 33 rotates upon operation of the electric motor 1. Due to the rotation of the flush wheel 33 cooling air is sucked into the motor housing 31 through the air entrance openings 31'. The motor housing 31 forms at its front end an outer closure wall 31'' and is equipped with an inner closure wall 32, the outer side of which functions as a guide face. The inner closure wall 32 has at its center a wide opening 32' through which the air stream is fed towards the flush wheel 33, said air stream entering through the air entrance openings 31' of the motor housing 31.

The compressor 25 communicates with the crank housing 11 and, thereby, also with the hammer piston receiving housing 12 through a conduit 35 (FIG. 3) disposed laterally from the compressor 25 and leading into the crank housing 11. The conduit 35 is equipped with any conventional control member 35', as a control valve, so that the flow of compressed air towards the tool 14 can be adjusted. The compressed air is fed through the hammer piston receiving housing 12 passing along the hammer piston 13 through the recesses 13' towards the tool 14.

The electric hammer drilling device is equipped with two laterally extending handles 36 and 37 disposed opposite each other. The handle 36 is equipped with a switch 36' and forms a socket extension 38' which receives an electric cable 38.

The hammer drilling device operates in the following manner:

Since the bevelled gear 5 is mounted on shaft 6, the latter is driven. The bevelled gear 5 is, however, also in mesh with the bevelled gear 21 mounted on the shaft 22 which drives the ratchet wheel 15. If now the electric motor 1 is in operation, the crank shaft 6 is driven by means of the bevelled gears 4 and 5 and, thereby, also the crank pin 6'. The crank pin 6' brings about the operation of the hammer device. In addition, the shaft 22 is driven sumultaneously by means of the bevelled gears 4, 5 and 21, whereby by means of the pawl 16 a step-wise rotation of the ratchet wheel 15 is achieved.

The compressor 25 is keyed to the shaft 6 and upon rotation of the shaft 6 the compressor is operated simultaneously.

As stated previously, the shaft 22 carries a crank pin 23 on which the driving pawl 16 is mounted, bringing about the step-wise movement of the ratchet wheel 15 upon rotation of the shaft 22. The locking pawl 24 is disposed diametrically opposite the driving pawl 16.

While I have disclosed one embodiment of the present invention, it is to be understood that this embodiment is given by example only and not in a limiting sense, the scope of the present invention being determined by the objects and the claim.

I claim:

An electric hammer drilling device comprising

a motor housing,

a motor disposed in said motor housing,

a motor shaft driven by said motor,

a tubular housing disposed adjacent said motor housing,

the longitudinal axis of said motor housing being parallel to the longitudinal axis of said tubular housing,

a hammer piston axially movable in said tubular housing,

gear means operatively connecting said motor shaft with said hammer piston,

said gear means including means for reciprocating said hammer piston in said tubular housing,

a hammer tool disposed coaxially with said hammer piston and adapted to receive hammer blows from said hammer piston,

a second shaft having an axis parallel to that of said motor shaft,

means operatively connecting said second shaft with said motor shaft,

means, operated by said second shaft, for rotation of said hammer tool,

a compressor operated by said gear means and disposed adjacent said motor and providing communication between

a conduit, said compressor and said tubular housing,

said hammer piston having at least one axially disposed channel disposed within said tubular housing for feeding compressed air through and from said tubular housing to said hammer tool,

the latter having an axial air bore for feeding said compressed air through said hammer tool to its front end, and

said channel means comprising a plurality of axial peripheral recesses on said hammer piston to provide communication in said tubular housing between both ends of said hammer piston.

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