A combustion engine driven hammer machine is disclosed, which incorporates a clutch unit which automatically disengages the drill-rotation when the throttle is moved to a certain part of its adjustment range.
COMBUSTION ENGINE DRIVEN HAMMER MACHINES

The present invention concerns a device relating to combustion engine driven hammer machines comprising a machine housing, a crankshaft which is arranged in the machine housing and connected to a compressor piston and driven by a combustion engine which is controlled by a throttle, and a device for transferring rotation from the crankshaft to a drill-sleeve for rotating a tool which is inserted into the drill-sleeve.

The object of the invention is to achieve an automatic disconnection of the drill-rotation when the number of revolutions of the combustion engine impairs a certain predetermined value. Through this the advantage that the drill-tool can be safely applied against the point on the ground where drilling is to take place is gained. At the application of the drill-tool against the ground the combustion engine works at idling speed. The operator is hereby burdened with the entire weight of the machine and has, therefore, difficulties in guiding the machine laterally. This involves, if the drill-tool rotates at the application, a great risk that the drill-tool starts "walking" across the ground. By means of the automatic disconnection of the drill-rotation at low numbers of revolutions an essential part of this problem is avoided, because the drill-rotation starts only when the weight of the machine rests on the drill-tool and the throttle is pressed down, whereby the operator can concentrate on guiding the machine laterally.

An embodiment of the invention is described below with reference to the accompanying drawing on which FIG. 1 shows a schematized rock-drilling machine partly in section. FIG. 2 shows, on a larger scale, a clutch unit incorporated in the machine partly in section. FIG. 3 shows the clutch unit in section according to the line A—A in FIG. 2.

The machine shown in FIG. 1 is provided with a machine housing 1 which, for the sake of simplicity, is shown as made in one piece. The machine comprises a combustion engine 5 with a spark-plug 24 and an engine piston 25. The engine piston 25 drives via a connecting rod 26 a crankshaft 2. The crankshaft 2 drives via a connecting rod 27 a compressor piston 3. Through the inlet conduit 29 the compression chamber 30 is supplied with air, which is compressed by the compressor piston 3 for driving the hammer piston 28 towards a tool 8, which is inserted into the drill-sleeve 7. The machine is provided with two handles 20, which are elastically connected to the machine housing 1 as shown by the lines of dashes 23 for attenuating vibrations caused by gas-pressure forces in the machine. A device 6 for transferring rotation from the crank shaft 2 to the drill-sleeve 7 comprises a clutch unit 10 which is closer described below, and a therefrom outgoing axle 58 and a toothed wheel 17 which cooperates with teeth 18 on the drill-sleeve 7.

The drill-sleeve 7 is provided with projections 19 for cooperation with a dog 35 which is loaded by a spring 34. A cylindrical part 32 is rotatably journaled in the machine housing 1 and connected to a function selector 31. The cylindrical part 32 is provided with an eccentric terminal 33 for lifting the dog 35 out of engagement with the projections 19 at drilling. From the compression chamber 30 air is conducted through channels 40, 41 to a chamber 42 for flushing air through a central, not shown, channel in the tool 8. From the compression chamber 30 air is also conducted via a check-valve 38 and channels 37, 39 to a conduit 11 for actuating a servo-motor 9 for engaging the drill-rotation.

The slide-valve 36 is turned so, when the machine is switched over for breaking by means of the function selector 31, that the air supply to the conduit 11 and the chamber 42 is broken. The eccentric terminal 33 is furthermore removed so that the spring 34 pulls the dog 35 into engagement with the projections 19 on the drill-sleeve 7 in order to bar the tool-rotation.

The combustion engine 5 works at idling speed when the throttle 4 is in the position shown in FIG. 1. The airflow through the conduit 11 is conducted via a venting conduit 22 and a valve 12 to the atmosphere. This means that the drill-rotation is disengaged as shown below. Through pushing the throttle 4 downwards the number of revolutions of the combustion engine 5 is increased in a well-known manner. Hereby the spring 21 presses the valve member 12 downwards so that the airflow through the venting conduit 22 is blocked. The airflow is through this conducted to the servo-motor 9 for engaging the drill-rotation.

In FIG. 2 the clutch unit 10 and the servo-motor 9 are shown on a larger scale and whereby a part of the device has been broken away according to the line B—B in order to show the crankshaft 2 and the worm 65. The clutch unit 10 and the servo-motor 9 are mounted in a housing which consists of a mantle 68, a lower part 67, and a lid 60. This housing is a part of the machine housing 1. The worm 65 of the crankshaft 2 cooperates with the worm wheel 64. The worm wheel 64, a driving part 51, and a distance sleeve 69 are by means of a sleeve 62 and a nut 66 clamped to a ball bearing 63, which is axially fixed in the mantle 68. The driving part 51 is provided with three recesses 52 each of which accommodates a roller 53. The rollers 53 are pressed by a spring means 54 against a cam 55 on a driven part 56, which constitutes a first coupling part. The driven part 56 is provided with clutch jaws 70 for cooperation with clutch jaws 71 on a second coupling part 57. The second coupling part 57 is provided with splines 72 for cooperation with recesses 73 in the outgoing axle 58. The second coupling part 57 is displaceable by means of an actuator 13 against the action of a spring 16. The actuator 13 is fluidtightly connected to a diaphragm 14 which is fluidtightly clamped between the mantle 68 and the lid 60. For manoeuvring the clutch unit 10 compressed air is conducted from the conduit 11 via the channel 61 to the channel 15 through which the actuator 13 displaces the second coupling part 57 so that the clutch jaws 70, 71 are brought into cooperation. Through this the rotation of the crankshaft 2 is transferred to the outgoing axle 58.

The above described machine works in the following manner. In the condition shown in FIGS. 1 and 2 the combustion engine 5 works at idling speed and the drill-rotation is disengaged. When the tool 8 has been applied against the ground feed force is applied via the handles 20 through which the throttle 4 is pressed downwards. The number of revolutions of the combustion engine 5 increases and the tool 8 is exposed to more powerful impacts. When the throttle 4 is pressed downwards the airflow from the compression chamber 30 via the conduit 11 and the venting conduit 22 is blocked by the valve 12. Through this the pressure in the chamber 15 in the servomotor 9 increases and the actuator 13 displaces the second coupling part 57 to a moment-transferring cooperation with the always ro-
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3. A device according to claim 2, in which the servomotor comprises an actuator which is fluid-tightly connected to a diaphragm, which is fluid-tightly connected to the machine housing in order to form a chamber together therewith, to which the fluid-pressure, created by the compressor piston, is conducted for displacing the actuator against the action of a spring for engagement of the rotation.

4. A device according to claim 1, in which the clutch unit comprises a driving part provided with a number of recesses each accommodating a roller, one or more radially acting spring means for pressing the rollers against a cam on a driven part which is made as one coupling part of the clutch unit, the other coupling part of which is coaxial with and essentially surrounded by the driven part and axially displaceably arranged partly in relation to this and partly on an outgoing axle for moment-transferring cooperation with the latter.

5. A device according to claim 1, in which a function selector comprising an essentially cylindrical part, which is guided in the machine housing and provided with, an eccentric first terminal for actuating a spring-loaded dog for barring the drill-sleeve against rotation when the function selector is in a certain adjustment position, and a second-terminal which is made as a slide-valve for blocking the transferring of fluid-pressure, created by the compressor piston, to the servomotor when the function selector is in said adjustment position, through which the rotation remains disengaged independent of the adjustment of the throttle.

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