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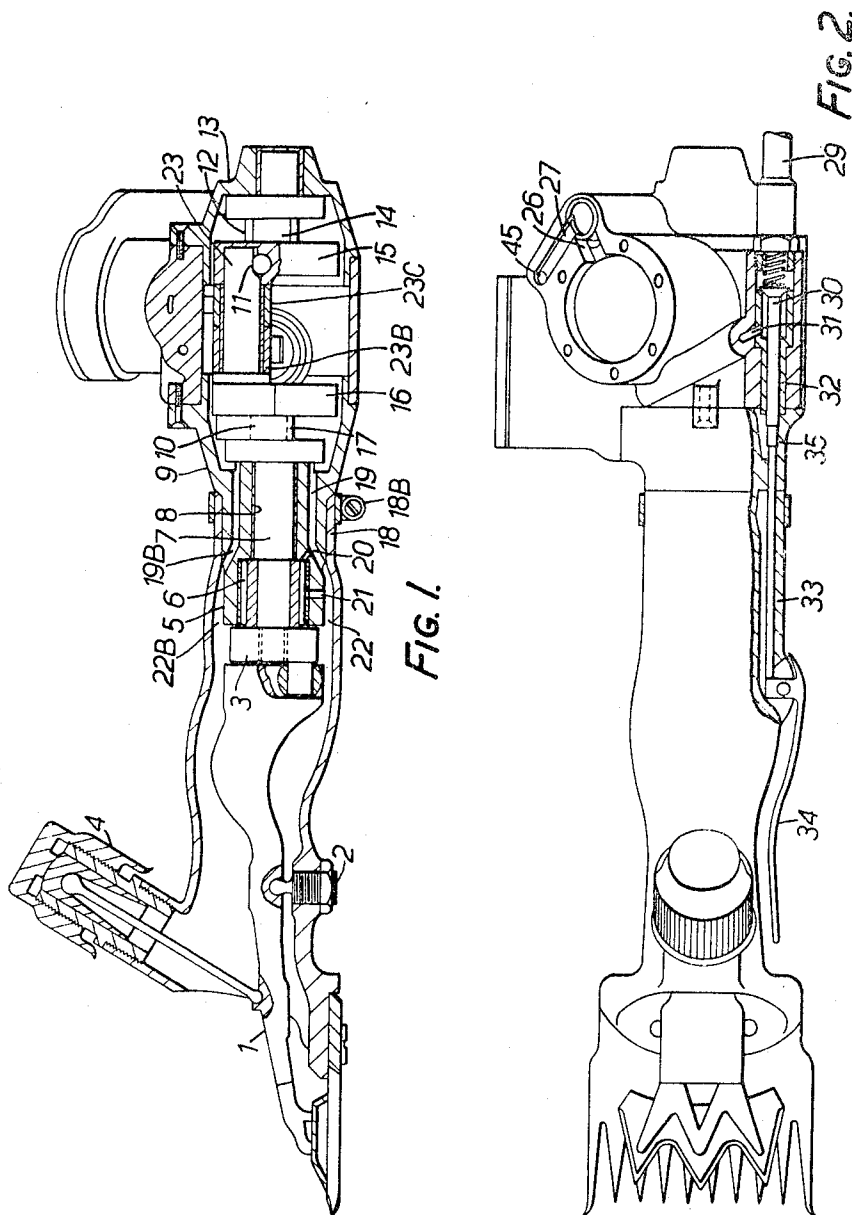
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3,467,204

SHEEP SHEARING HANDPIECE WITH RECIPROCATING PNEUMATIC MOTOR

Filed Sept. 21, 1967

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

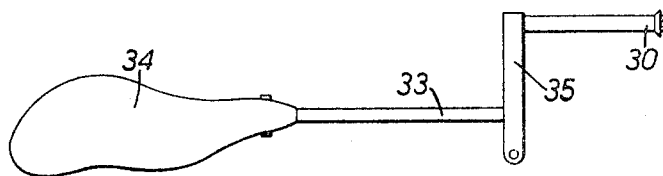


FIG. 3.

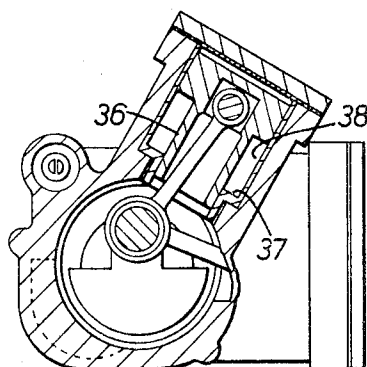


FIG. 4.

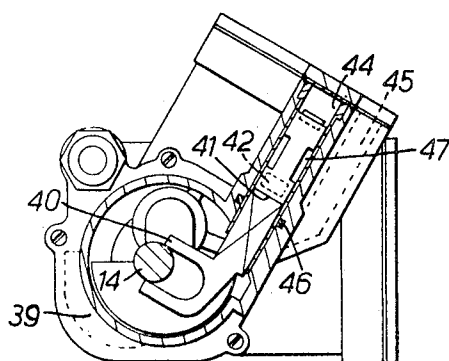


FIG. 5.

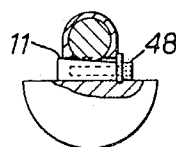


FIG. 6.

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SHEEP SHEARING HANDPIECE WITH RECIPROCATING PNEUMATIC MOTOR

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4 Claims

ABSTRACT OF THE DISCLOSURE

A shearing handpiece is disclosed which is for shearing wool, hair or fur from any animal. A composite unit is comprised by the handpiece itself and a reciprocating pneumatic motor having at least one double acting piston having two main diameters one providing a piston section acting in a main cylinder and the other providing a piston section extending through a close fitting bore into the crankcase.

This invention relates to a sheep-shearing handpiece with a reciprocating pneumatic motor. The term "shearing handpiece" is intended to be generic, in that this machine can be used for shearing wool, hair, or fur from any animal.

The object of the invention is to provide a shearing handpiece which is lighter, faster, cooler running, self-lubricating, and free from the restriction on mobility suffered by the use of a flexible drive when such an arrangement is used to transmit motion to a handpiece from some remote source.

According to the present invention the handpiece and its pneumatic motor form a composite unit, and according to a further feature of the invention the motor is automatically lubricated by oil mist carried by the working fluid or compressed air, said oil being supplied and dispensed in pre-determined quantity by a remotely situated air-line lubricator of standard type.

The motor, which can have any number of cylinders, and which cylinders can be disposed in V, flat, twin or four, or in line formation, is in this case a sixty degree twin, with double-acting cylinders, and the exhaust from both ends of both cylinders is discharged into the crankcase from whence it flows through drillways into the handpiece barrel and thence to atmosphere over the comb, lubricating en route all moving parts by virtue of the oil mist entrained and which has been supplied by the remote oil-line lubricator.

According to a further feature of the invention, stop-start control of the handpiece motor is by a poppet type valve located in the motor block and actuated by a thumb or finger lever mounted on the handpiece barrel. Under the influence of spring pressure the poppet valve, which is the main throttle valve, closes when thumb or finger pressure on the lever is released, consequently, the motor stops when the handpiece is unhandled, whether this action is inadvertent or not.

The motor revolutions can be varied in the range zero to 6,000 by adjusting the pressure of the air supply, and a normal pressure reducing valve is interposed in the air line at some convenient point, normally at the air stand-pipe outlet, for this purpose. The connection between the regulator which can conveniently be combined with the air-line lubricator, and the handpiece, is by a lightweight coiled nylon air-line.

According to another feature of the invention each motor piston has two main diameters the larger of which runs in its respective cylinder bore, while the smaller

passes through the close fitting bore of the inner cylinder head and into the crankcase.

The purpose of this configuration is to obviate the need for piston rods and cross-heads, simplicity and compactness being gained thereby.

According to a further feature of the invention the motor crankshaft is made in two parts to enable assembly of the unsplit connecting rod big-ends to the crank-pin.

To carry out this operation, the piston, connecting rod, inner cylinder head and cylinder liner are pre-assembled as a unit and then placed into position in the motor block. The connecting rod big-end eyes will then project into the crankcase tunnel and can be positioned so that the crankpin of the dis-assembled crankshaft can be passed through them. This done, the crankshaft is re-assembled whilst in its position inside the crankcase, and its two parts locked together and accurately aligned with a cotter pin which is in turn drawn into and locked into position by a draw-screw.

According to a further feature of the invention the piston valves which control the admission and exhaust of air to and from the working cylinders are positively operated and timed directly from the crankshaft without the usual interposition of an articulated link between the eccentric and the valve.

Each piston valve has a fork at its crankshaft with the axis of the said fork being disposed at a right-angle to the longitudinal axis of the piston valve. The fork engages an eccentric formed integrally with the crankshaft. The piston valves run in ported liners which are located in the motor block, and, to assemble the valves, these liners are left out of position. The crankshaft is moved to one side in its tunnel and rotated so that entry of its bob-weights into the cored recesses provided in the crankcase tunnel wall gives enough lateral displacement to allow the piston valve forks to pass over, and engage their respective eccentrics. Insertion of the valve liners and returning the crankshaft to its central position where it is located by the assembly of the crankcase end-plates completes the operation.

According to a further feature of the invention the motor crankshaft is extended and coupled directly to the handpiece "ball-and-crank" mechanism and dispenses with any form of reduction gearing.

According to a further feature of the invention the extended crankshaft takes the place of the conventional "back spindle" and, furthermore, improves upon the old plain bearing arrangement by substituting a needle-roller bearing which is situated directly behind the "ball-and-crank."

According to a further feature of the invention the handpiece barrel, motor block, and crankcase end-plates are magnesium alloy castings so as to obtain the most favourable strength-weight ratio. The tapped holes for the reception of the two comb screws and the centre-post are reinforced by being provided with steel inserts, which are cast into place.

According to a further feature of the invention the motor is mounted to the handpiece barrel by a single spigot and is retained in position by contracting the barrel on to the spigot by means of a clamping and screw. By reason of this arrangement the motor can be quickly removed and replaced.

In the accompanying drawings, which are drawn two thirds full size, the comb end of the handpiece is to be regarded as the "front" for descriptive purposes.

FIGURE 1 is a longitudinal elevation, partly sectioned, of the handpiece with motor, according to the invention;

FIGURE 2 is a plan view of the handpiece, with motor, according to the invention. The rear cylinder is shown with its head removed;

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FIGURE 3 is a view of the control trigger, push-rod, motion-transferring lever and poppet type main throttle valve detail;

FIGURE 4 is a part transverse section of the motor about the longitudinal axis of the rear cylinder, viewed from the rear;

FIGURE 5 is a part transverse section of the rear cylinder's valve chest about its longitudinal axis, viewed from the rear;

FIGURE 6 is a detail of the cotter arrangement used for locking the two crankshaft sections together.

Referring now to FIGURES 1 to 6 of the accompanying drawings, item 1 is a normal handpiece fork pivoted upon the centre-post 2. It is oscillated by the conventional ball-and-crank mechanism and the tension device 4 is also the standard arrangement.

The crank just mentioned is screwed to what is normally termed the back spindle, the difference in this invention being that an extension of the crankshaft main journal performs the same function with the improvement of the substitution of a needle-roller bearing for the usual plain one. The outer race of the needle-roller bearing 6 is a press fit in the magnesium alloy spigot 5, which is made integrally with the motor end-plate 9. Drillways 19 and 19B through the spigot carry exhaust air away from the crankcase and into the barrel via cored passages 22 and 22B. Drillway 20 conveys oil mist to the needle race and weep-hole 21 allows the escape of condensed water. The sintered bronze bushing 8 provides further support for the crankshaft main journal 7. The crankshaft is supported at its rear end in a similar bushing.

The barrel 18 is clamped to the spigot 5 by the clamping ring and screw 18B.

The crankshaft has a single throw and the crankpin 23 has a de-mountable crankcheek or web 15 to enable assembly of the unsplit connecting rod big ends, 23B and 23C. A hardened cotter 11 aligns the parts and is drawn into place and locked by cap-screw 48.

The eccentrics 10 and 14 located next to the bobweights 16 and 15 respectively, engage the forked ends 17 and 12 of the piston valves and impart reciprocating motion thereto.

Admission and exhaust of air to and from each end of the rear cylinder is by the ports 42 and 43, air being supplied to the annulus 47.

The valve arrangement of the front cylinder is a counterpart of that of the rear.

Air is exhausted from the cylinders past the outer ends of the piston valves 40 and in the case of the crankshaft end the edge 41 formed by milling a flat on the piston valve shank controls the port, air being exhausted passing into the crankcase. For the cylinder outer ends the exhaust is led into drillway 45 and so into the crankcase. Port 27 milled in the cylinder block communicates between drillway and valve chest and port 26 is common to both exhaust and incoming air.

The main throttle valve 30 carried in the guide 32 receives air via flexible air-line 29 and when opened allows air to proceed via drillway 31 to cross drillways (not shown) in the motor block and so to the piston valve annuli.

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A lever 35 is pivoted on a pin located in the motor end-plate 9 and transfers motion from the push-rod 33 when the thumb or finger lever 34 is depressed. The geometry of the lever 35 is such that there is a multiplication of movement, enabling the travel of the thumb lever 34 to be kept small.

The aluminium piston 36 has two diameters as shown. The larger is a good fit in the cast-iron liner 38, and the smaller a good fit in the bore of the inner cylinder head 37. The liner is located axially by being nipped between the inner cylinder head and the outer cylinder head where a gasket provides a certain amount of resiliency. The inner cylinder head abuts a shoulder machined at the bottom of the motor block cylinder bore. The configuration of both cylinders is the same.

An O ring 46 backed by a D shaped washer seals the D shaped opening in the crankcase and plates which are necessary for assembly. The recesses 39 are those referred to in the introduction to the specification, i.e. they allow entry of the bobweights to give enough lateral displacement to allow the piston valve forks to pass over and engage their respective eccentrics.

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

1. A shearing hand-tool consisting of a composite unit comprising a hand piece, a reciprocable cutting head mounted on said hand piece, a pneumatic motor having at least two cylinders each of which has a double acting piston therein, a rotary crankshaft operatively connected to and driven by said pistons, and means interconnecting said crankshaft and said cutting head for reciprocating said cutter head upon rotation of said crankshaft.

2. A shearing hand-tool according to claim 1 wherein an eccentric is provided integrally with said crankshaft and wherein said motor has piston valves to control the admission and exhaust of air to and from said cylinders, said pistons each having a fork portion at one end at a right angle to its longitudinal axis in engagement with said eccentric so as to be reciprocated thereby.

3. A shearing hand-tool according to claim 2 wherein said crankshaft is made in two sections and which crankshaft has a demountable crank-cheek or web capable of being assembled with a crank pin, aligned and locked into place by means of a transverse cotter and draw-screw.

4. A shearing hand-tool according to claim 3 further characterized by a main throttle valve controlled by a finger lever mounted upon said handpiece.

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