June 22, 1943. V. A. WILCOX 2,322,610

MOTOR FOR SHEEP SHEARING DEVICES

Filed March 16, 1940 3 Sheets-Sheet 1

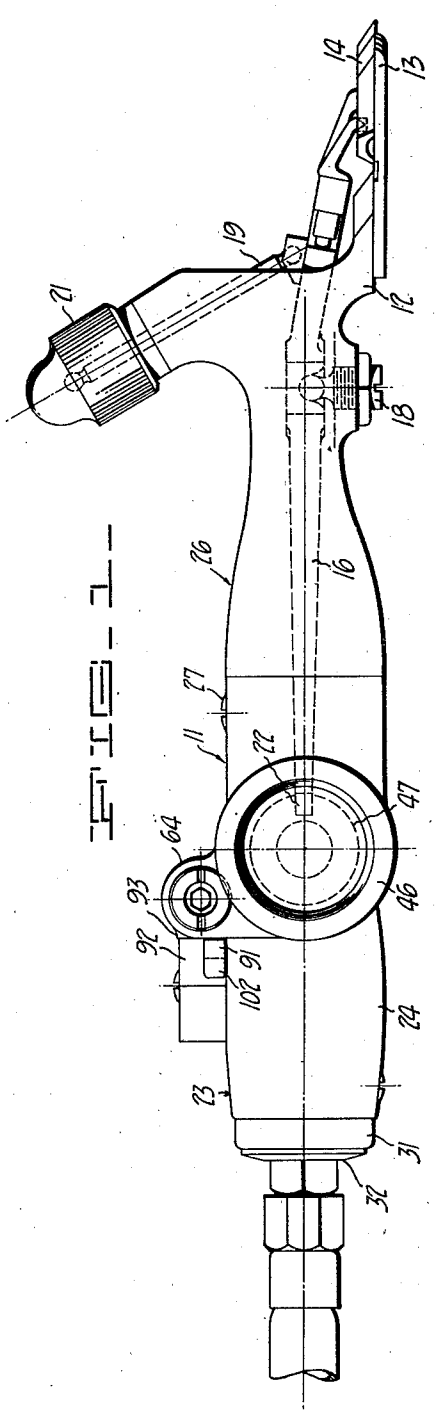


FIG. 1

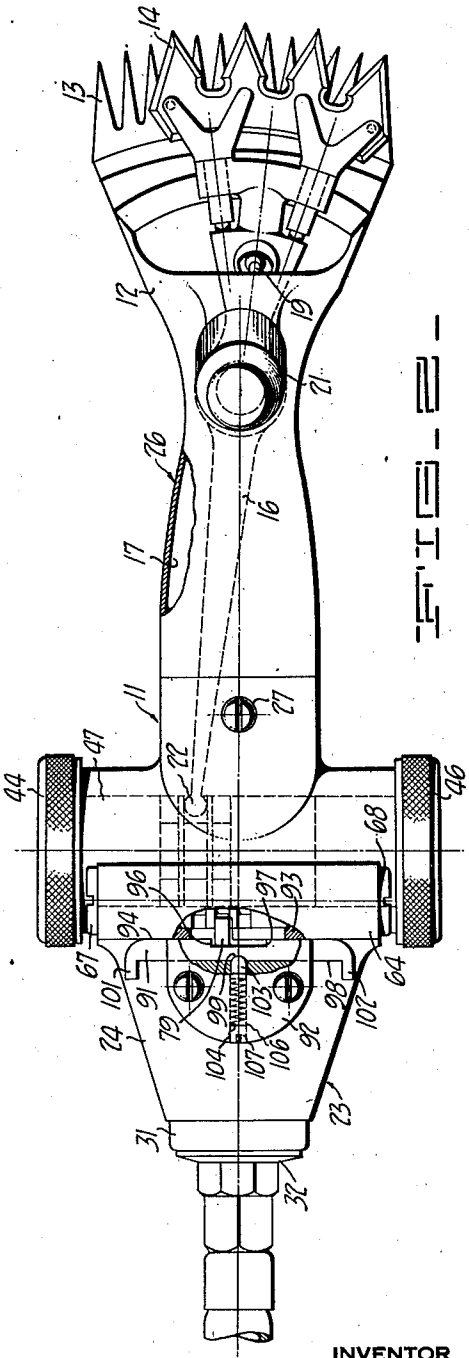


FIG. 2

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MOTOR FOR SHEEP SHEARING DEVICES

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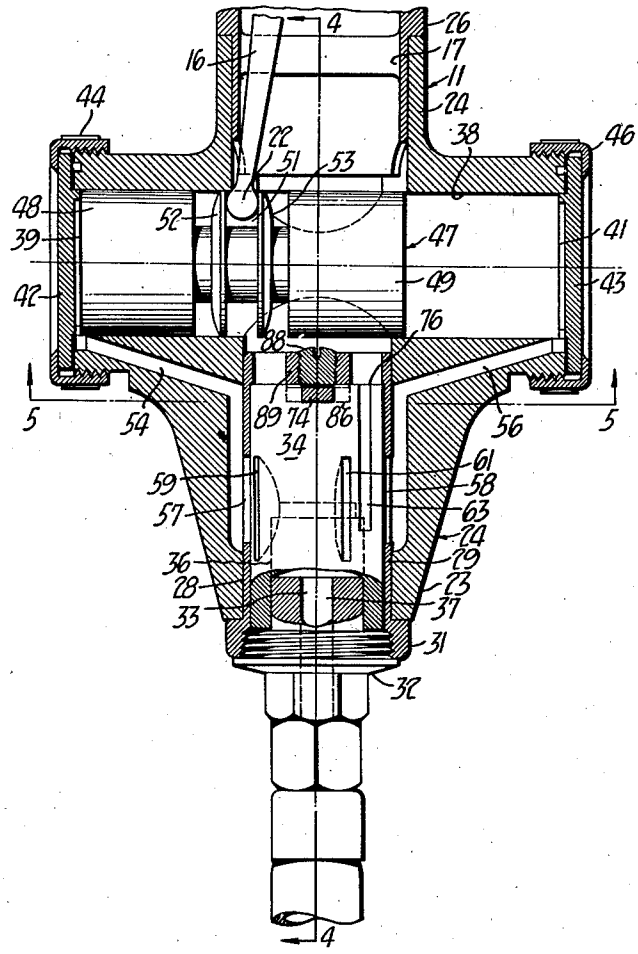


FIG. 3

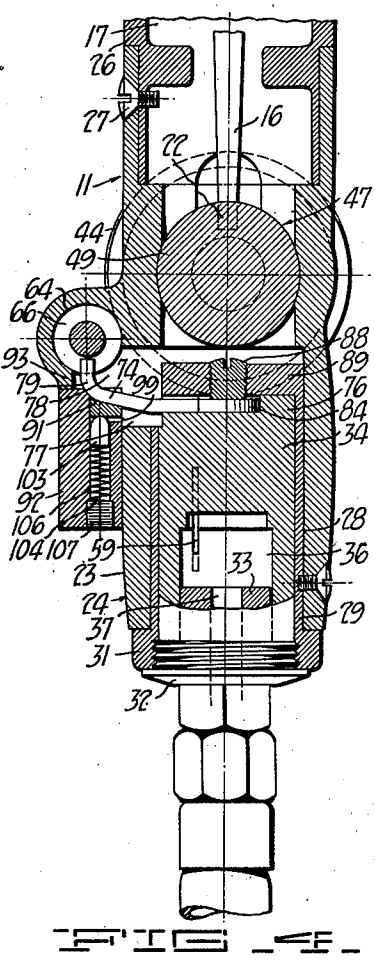


FIG. 4

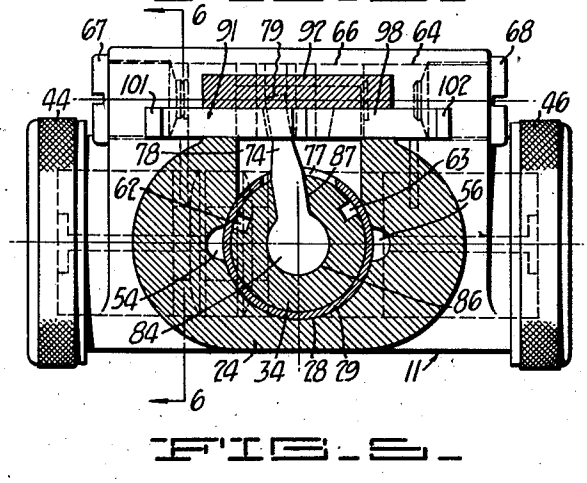


FIG. 5

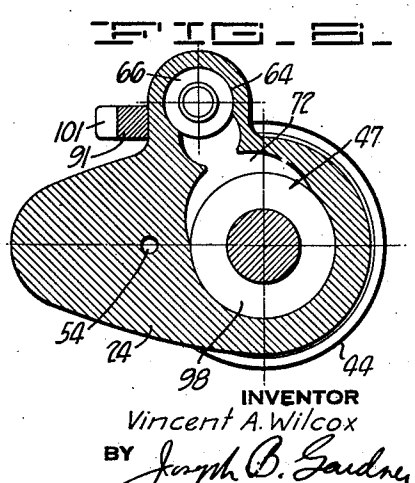


FIG. 6

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MOTOR FOR SHEEP SHEARING DEVICES

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FIG. 1

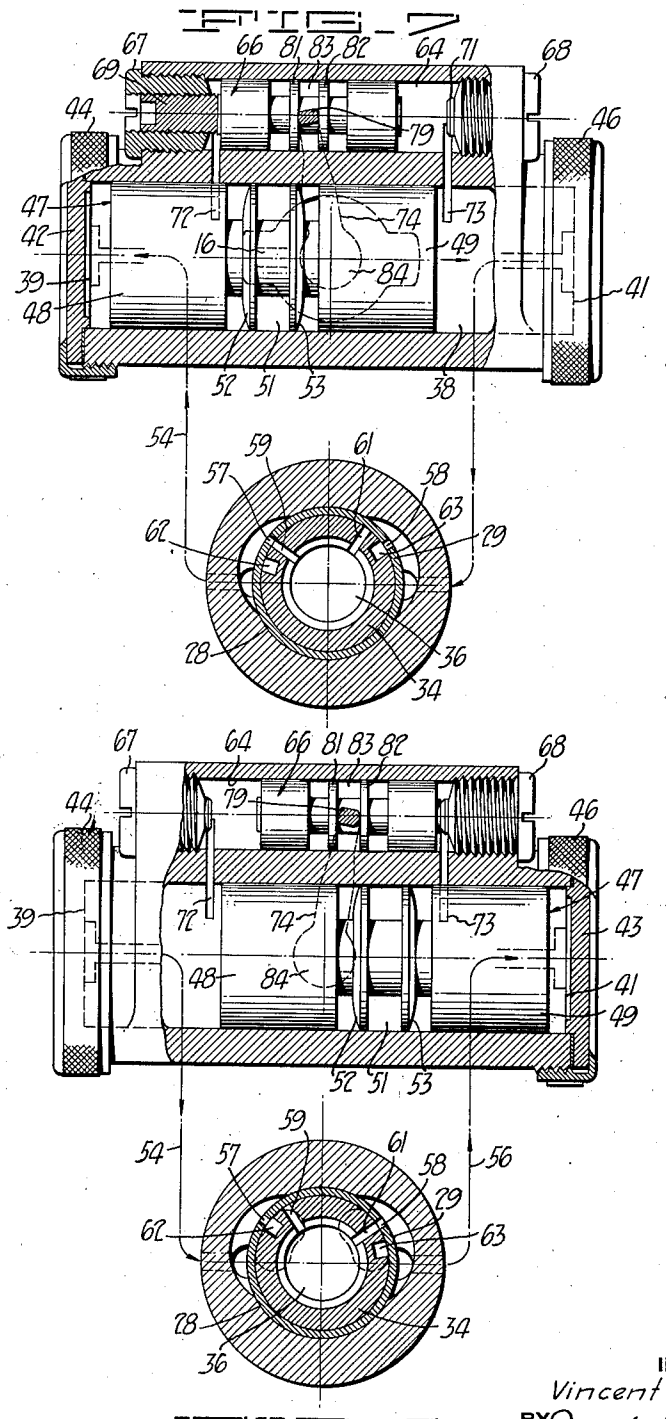


FIG. 2

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UNITED STATES PATENT OFFICE

2,322,610

MOTOR FOR SHEEP SHEARING DEVICES

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Application March 16, 1940, Serial No. 324,352

6 Claims. (Cl. 121—3)

The invention relates to devices for shearing of sheep or other animals and more particularly to a pneumatic motor mechanism for driving the movable cutter member of the shears.

An object of the invention is to provide a pneumatic sheep shear motor of the character described having a main reciprocating engine piston operated by air pressure in conjunction with an air valve and operating mechanism therefor for periodically reversing the air pressure differential in the main engine cylinder and wherein the valve mechanism is arranged to operate in an almost instantaneous fashion whereby the air passages leading to the opposite end of the main engine cylinder remain fully open and deliver full power throughout substantially the entire stroke of the piston in both of its reciprocal directions.

Another object of the invention is to provide a pneumatic sheep shear motor of the character above wherein the valve mechanism is so arranged and operated as to positively prevent sticking or jamming of the cutter members in the fleece of the animal being sheared.

A further object of the invention is to provide a pneumatic sheep shear motor of the character described which will be constructed of a minimum number of sturdily formed parts which will last and give positive and foolproof operation for a substantially unlimited length of time and which will provide for a motor having improved operating efficiency.

Still another object of the invention is to provide a pneumatic sheep shear device of the character above which will remain cool under all operating loads and duration of such loads and which will keep the cutter members of the shears cool, clean, and lubricated.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

Referring to said drawings:

Figure 1 is a side elevation of a sheep shearing device constructed in accordance with the present invention.

Fig. 2 is a plan view of the device illustrated in Figure 1.

Figure 3 is a longitudinal plan sectional view showing the pneumatic motor and valve mechanism of the device.

Figure 4 is a longitudinal sectional view of the mechanism illustrated in Figure 3 and is taken at right angles to the plane of Figure 3 as indicated by the plane of line 4—4 of Figure 3.

Figure 5 is a transverse sectional view of a part of the mechanism illustrated in Figure 3 and is taken substantially on the plane of line 5—5 of Figure 3.

Figure 6 is a vertical sectional view taken through the main engine cylinder and the valve engine cylinder at a portion of the mechanism indicated by the plane of line 6—6 of Figure 5.

Figure 7 is a diagrammatic cross-sectional view of the main engine cylinder and the corresponding position of the valve.

Figure 8 is a diagrammatic cross-sectional view similar to Figure 7 but showing a different position of the parts.

A sheep shearing device of the type to which the present invention relates consists essentially of a shearing head consisting of stationary and movable cutter members which engage in and shear off the fleece, and a pneumatic motor mechanism which is operatively connected to a source of air or other fluid under pressure and which is operatively connected to the movable cutter member for displacing and oscillating the latter across the fixed cutter member. More specifically the present invention relates to the pneumatic motor mechanism of the shearing device.

As depicted in the accompanying drawings, the sheep shearing device consists of an elongated body 11 which may be formed of one or a plurality of joined members and which serves as a housing and support for the several operating parts of the shearing device. The cutter head is arranged in a conventional manner adjacent one end 12 of the body and includes a stationary toothed member 13 and a movable toothed cutter bar 14 which overlies and slides across the face of the member 13 to provide a shearing of fleece engaged in the teeth. The movable cutter member is mounted at the forward end of a lever 16 which extends longitudinally into a longitudinal hollow or bore 17 in the body and the lever is pivoted on a fulcrum screw 18 adjacent its forward end and held in place by a universally pivoted rod 19 located forwardly of its fulcrum and adjustably carried by a screw cap 21 on the body. The rear end 22 of the lever extends through the interior 17 of the body and is operatively connected to the main reciprocating engine piston of the pneumatic motor. As

aforementioned, the above-described cutter structure is more or less conventional in the art.

The pneumatic motor mechanism of the present invention is positioned adjacent the opposite end 23 of the body 11 and preferably a portion of the body which houses the motor mechanism is formed as a separate section 24 from a forwardly extending section 26 of the body carrying the cutter head, and the two sections telescopically joined, as illustrated at the top portions of Figures 3 and 4. The sections so joined may be held against endwise displacement by means of a set-screw 27. The section 24 adjacent its free end 23 is provided with an internal longitudinal bore 28, see Figures 3 and 4, which extends centrally and longitudinally of the body and opens to the lower end 23 of the body. Fitted within this bore is a valve sleeve 29 which at its outer end 31 is formed with an enlarged head portion which seats against the end face of the body and is internally threaded for the receipt of an air fitting plug 32, the latter in the present instance having a cylindrical portion 33 projecting axially into the space defined by the sleeve 29. A cylindrical valve member 34 is slidably fitted for rotation within the sleeve 29 and is formed with an end bore 36 defining a hollow interior for the member and which surrounds the cylindrical projecting part 33 of the plug 32, whereby air from a pressure source is delivered through the interior passage 37 of the plug into the hollow interior 36 of the rotary valve member.

Arranged in the body section 24 forwardly of the cylinder 28 and at substantially right angles thereto is the main engine cylinder 38 of the pneumatic motor. As here shown, the cylinder 38 extends completely through the transverse dimension of the body section which is expanded transversely at the cylinder to obtain sufficient cylinder length and is closed at its opposite ends 39 and 41 by means of sealing gaskets 42 and 43, here held in place by threaded rings 44 and 46 secured to the body. Mounted within the interior of the cylinder 38 is a reciprocating piston 47 which is preferably formed with a pair of piston heads 48 and 49 adjacent the opposite ends of the piston and with a circumferential groove 51, defined between annular shoulders 52 and 53, at the center of the piston, arranged to receive the rear end 22 of the operating lever 16 for the movable cutter bar In this manner reciprocal movement of the piston 47 is translated into an oscillatory movement of the operating lever 16 for the movable cutter.

The valve member 34 is so designed and arranged that upon oscillation, the same will communicate the opposite ends 39 and 41 of the cylinder 38 alternately to the pressure source so as to produce a reciprocation of the piston 47. This is here effected by providing in the body section 24 a pair of air passages 54 and 56 which extend from the opposite ends 39 and 41 of the cylinder 38 to spaced parts of the periphery of the sleeve 29 and which there register with peripherally spaced slots 57 and 58 in the sleeve. The valve member is formed with a pair of peripherally spaced slots 59 and 61, see Figures 7 and 8, which extend from the hollow interior 36 of the valve to the outer periphery thereof for registration with the slots 57 and 58 in the sleeve upon appropriate rotational positioning of the member. Provided also in the periphery of the valve member are longitudinal exhaust slots 62 and 63 which are spaced peripherally from the slots 59 and 61, as illustrated in Figures 7 and 8, and which are adapted to alternately register with one of the sleeve slots 57 and 58 upon oscillation of the valve for conducting the exhaust air longitudinally through the slots 62 and 63 and into and through the open center portion of the piston and thence out through the hollow interior 17 of the body. The valve member is oscillated between two rotated positions illustrated in Figures 7 and 8. In Figure 7 the hollow interior of the valve is communicated by way of the valve slot 59 and the sleeve slot 57 with the passage 54 leading to the end 39 of the engine cylinder, whereas the opposite end 41 of the cylinder is communicated by way of passage 56 to the sleeve slot 58 which is in registration with the exhaust groove 63, whereby the air pressure differential in the cylinder 38 as viewed in Figure 7 is from left to right, producing a corresponding movement of the piston 47. From this position, the valve is rotated in a clockwise direction to a position illustrated in Figure 8 wherein the cylinder passages 54 and 56 are reversely connected to the air pressure source and the exhaust passage. In the position illustrated in Figure 8 the air flow is from the interior 36 of the valve through the valve slot 61, the sleeve slot 58 and the cylinder passage 56 to the head end 41 of the engine cylinder 38, and air is returned from the opposite end 39 of the cylinder by way of passage 54, sleeve slot 57 and exhaust groove 62, thereby causing a reversal in movement of the engine piston 47.

In accordance with the present invention, this oscillation of the valve member between the two positions enumerated is adapted to take place rapidly so that there is a substantially immediate and full registration of the several passages and a full delivery of power to the engine piston for substantially its entire stroke. The movement of the valve member is here controlled by a separate pneumatic cylinder 64 and reciprocating piston 66 which receives its operating air from the engine cylinder 38 in timed relation to the movement of the piston 47 and which is operatively connected to the valve member. As here shown most clearly in Figures 7 and 8, the cylinder 64 is formed in the body section 24 adjacent and substantially parallel to the cylinder 38 and is also preferably extended completely through the transverse dimension of the section and is closed at its opposite ends by threaded plugs 67 and 68. These plugs may in turn carry set-screws 69 and 71, see Figure 7, for defining the ends of reciprocal movement of the piston 66. The communication between the cylinder 64 and the cylinder 38 is effected by means of slots 72 and 73 which open into the cylinder 64 adjacent the opposite ends of movement of the piston 66 and into the cylinder 38 adjacent the inwardly displaced positions of the piston heads 48 and 49. In this manner the piston heads 48 and 49 cover and uncover the passages 72 and 73 during the reciprocal movement of the piston 47 and thus shut off or communicate the opposite ends of cylinder 64 with the pressure source and the atmosphere in an alternate manner to produce a reciprocation of the piston 66. In accordance with the present arrangement, the movement of the piston 66 while dependent upon and synchronous with the movement of piston 47, is out of phase with the movement of the latter piston. Thus with reference to Figures 7 and 8, the movement of the piston 47 to the left does not bring about a corresponding leftward movement of the piston 66

until after the piston 47 reaches almost the end of its stroke when the piston head 49 uncovers the slot 73 to release air under pressure into the right-hand end of cylinder 64. As soon as slot 73 is uncovered piston 66 is abruptly thrown to the left and this movement of the piston 66 is utilized to throw the valve member to its opposite position, as illustrated in Figure 8, to thereby reverse the flow of air into the main engine cylinder, admitting compressed air into the left end of cylinder 38 and venting the air from the right ends of cylinders 38 and 64. The piston 66 then remains in its left position, as illustrated in Figure 7, until after piston 47 has substantially completed its movement to the right when piston-head 48 uncovers slot 72 which causes an abrupt and rapid movement of piston 66 to the right, which in turn restores the valve member to the position illustrated in Figure 7.

The operative connection between the valve member 34 and the piston 66 here includes an arm 74, see Figures 3 and 4, and 5, 7 and 8, which is secured to the inner end 76 of the valve member 34 for rotation with the member and extends radially from such end through a slot 77 formed in the sleeve 29 and through an opening 78 in the body section leading to the central portion of the cylinder 64. The outer end 79 of the arm is preferably curved laterally, as illustrated in Figure 4, and extended into engagement between a pair of annular shoulders 81 and 82 on the piston 66 defining a central circumferential groove 83, see Figures 7 and 8. Thus upon reciprocation of the piston 66 the arm and attached valve member will be rocked or oscillated between the positions of the valve aforementioned. The connection of the arm 74 to the end of the valve member is here effected by seating a circular hub portion 84 of the arm into a circular recess 86 in the end face of the valve member and engaging the radial part of the arm in a radial recess 87 in the valve and face, the arm being held in place against longitudinal movement by means of a pin 88 extending axially through the inner sleeve end 89, see Figures 3 and 4. The pin 88 is preferably threaded through the sleeve end to permit longitudinal adjustment of its position to take up for any wear and also the pin serves as a thrust bearing for the valve, thus minimizing the latter's frictional resistance to rotation. Preferably the end wall 89 of the sleeve is perforated, as shown in Figure 3, so as to permit the flow of air therethrough from the exhaust slots 62 and 63 of the valve member.

Preferably no special exhaust provision is provided the opposite ends of the cylinder 64 other than the slots 72 and 73 so that a temporary compression of air is effected in the ends of the cylinder during the reciprocal movement of the piston 66 and which compression provides an air cushion for the opposite ends of the piston safeguarding the piston against direct contact with the pins 69 and 71. Likewise during the operation of the motor, the reversel of the valve is effected with a sufficient rate of speed so as to interject air under pressure into the opposite ends of the engine cylinder prior to the complete movement of the piston whereby an air cushion is provided at the opposite ends of piston 47 safe-guarding the ends of this piston against direct endwise collision with the end walls of the cylinder.

Preferably, manually controlled means is provided for controlling the movement of the valve member and its operating piston for placing the device into and out of operation. This means consists of a slide member 91, here in the form of an elongated bar slidably attached to the body section by a plate 92 in parallelism with cylinder 64, and which is adapted to engage, and on movement displace, the arm 74. As here best shown in Figures 2 and 4, the wall 93 of the cylinder 64 is formed with a longitudinal slot of a length somewhat greater than the length of movement of the arm 74 thereat and the member 91 is slidably fitted into this slot and held in position by the plate 92. The length of the member 91 is sufficient to constantly cover and seal the slot during movement of the member by a distance corresponding to the travel of the arm 74. Formed in the inner face 94 of the member is a slotted recess engaging over the arm 74 and providing a pair of longitudinally spaced shoulders 96 and 97 which upon movement of the member abut and displace the arm. The longitudinal spacing of the shoulders is as great as the length of travel of the arm 74 so that in a central position of the member the arm is free to oscillate in accordance with the operation of the device as above explained. The member 91 may, however, be displaced to position the arm in the center of its course of movement in which case the valve will be moved to a neutral position cutting off air flow to either end of the engine cylinder. If by chance in the handling of the device during its inoperative period, the valve and piston should move to this neutral position, the operator may, after applying the air pressure, start the motor by moving the slide member to displace the valve to one of its operative positions and then restoring the slide member to a central position to permit oscillation of the valve, arm and connected piston.

Preferably, means is provided for holding the slide member 91 in its neutral center position and in endwise displaced positions corresponding to a neutral center position of the arm 74. As here shown, the rear face 98 is provided with an indentation 99, located midway of the length of the bar, which is engaged by a spring detent member 103 to locate and hold the bar in central position. The detent member is here slidably carried by the plate 92 to engage the rear face 98 of the slide member. As here shown, the detent member 103 is slidably carried in a bore 106 opening to the rear face of the slide member and is pressed against the slide member by means of a spring 104 carried in the bore 106 and compressed between the detent 103 and a closure screw 107. The end positions of the slide member are determined by the engagement of laterally bent ends 101 and 102 of the bar with the opposite sides of the plate.

One of the important features in the present construction is the exhausting of the spent air through the interior of the clipper body and out over the cutter head. This air discharge keeps the cutter body and the cutter head cool during all operating conditions, whereas without the cooling effect of the air, the cutter members may become heated to a sufficient temperature to cause loss of temper. The air flowing over the cutter teeth also keeps the cutter members clean and free from cut wool. In addition I prefer to run the air line through a bath of lubricating oil so that sufficient oil will be contained

in the air to lubricate all of the working parts of the clipper device.

One of the important features of the present design is the provision of a hollow rotary valve member and positioning of this member in alignment with the air inlet passage. By reason of this arrangement the valve is relieved of all radial thrust against its sleeve due to the air pressure present, and thus a minimum frictional resistance to movement of the valve is encountered.

As will be further understood, the pneumatic motor of the present device is extremely simple and sturdy in construction, entailing only four working parts, viz. the rotary valve, the engine piston, the valve piston and the connecting arms for the valve piston and valve. This simplified construction renders the clipper mechanism highly efficient and capable of long and continuous use.

I claim:

1. A pneumatic sheep shear motor comprising, an elongated body having an air inlet passage centrally at one end thereof adapted for connection to a source of air under pressure, an axially extending valve cylinder at said end connected to said passage, a hollow cylindrical valve member rotatably mounted in said cylinder and having the interior thereof communicated with said passage, a main engine cylinder transverse to the length of said body, a piston reciprocally mounted therein and adapted for connection to the movable cutter bar of the shear, a third cylinder, a piston reciprocally mounted therein, means connecting said second piston with said valve member to provide an oscillation of the valve member upon reciprocation of said second piston, and air passage means including ports in said valve member and said cylinders and connecting said cylinders to provide upon oscillation of said valve member for the communication of said source to the opposite ends of said main engine cylinder in an alternate manner and to provide for the movement of said second piston by air received from said main engine cylinder in out of phase relation to the movement of said first piston.

2. A pneumatic sheep shear motor comprising, an elongated body having an air inlet passage centrally at one end thereof adapted for connection to a source of air under pressure and formed with a cylinder coaxial with said passage, a hollow rotary valve member mounted for rotation in said cylinder with the interior thereof in connection with said passage, said body being formed with a second cylinder transverse to the length thereof, a piston reciprocally mounted in said second cylinder and formed for connection to the movable cutter bar of the shear, said body being formed with a third cylinder, a second piston reciprocally mounted in said third cylinder, said body having passages communicating said first and second cylinders and said valve member having circumferentially spaced passages adapted upon oscillation of said valve member to register with said first passages to alternately connect said source to the opposite ends of said second cylinder to reciprocate said first piston, said body having passages connecting said second and third cylinders which are covered and uncovered by said first piston and connected to the opposite ends of said third cylinder for producing a reciprocation of said second piston in timed relation to said first piston, and means connecting said second piston with said valve member to oscillate the latter upon reciprocation of the former.

3. A pneumatic sheep shear motor comprising, an elongated body having an air inlet passage axially at one end thereof adapted for connection to a source of air under pressure, an axially extending cylinder formed in said body coaxial with said passage and communicated at one end to said passage, a hollow cylindrical valve member rotatably mounted in said cylinder and being open at one end thereof adjacent said passage to communicate the latter with the interior of said member, a second cylinder formed in said body transversely to the length thereof with its axis at substantially right angles to the axis of said first cylinder, air passages in said body leading from the periphery of said first cylinder to said second cylinder adjacent the opposite longitudinal ends thereof, a piston reciprocally mounted in said second cylinder and adapted for connection to the movable cutter bar of the shear, said valve member having openings in the periphery thereof adapted upon oscillation of said member to alternately register with said passages for causing a reciprocation of said piston, a third cylinder arranged in substantially parallel relation to said second cylinder and adjacent one end of said first cylinder, a piston reciprocally mounted in said third cylinder, passage means connecting the opposite ends of said third cylinder with longitudinally spaced portions of said second cylinder which are covered and uncovered in said second cylinder by the piston therein whereby air under pressure is passed from said second cylinder to said first cylinder to cause a reciprocation of said second piston in timed out of phase relation to the movement of said first piston, and an arm connected to one end of said valve member and to said second piston for providing an oscillation of the valve member upon reciprocation of said second piston.

4. A pneumatic sheep shear motor comprising, a body providing a plurality of cylinders, a piston reciprocally mounted in one of said cylinders and formed for connection to the movable cutter bar of the shear, a cylindrical valve member mounted for rotation in another of said cylinders and formed with passages adapted for connection to a source of air under pressure and to the opposite ends of said first cylinder and arranged on oscillation of said member to alternately connect said source to said cylinder ends, a second piston mounted for reciprocation in another of said cylinders, said last named cylinder being connected to said first cylinder for receipt of air therefrom in a manner providing a related movement of said pistons, a member secured to said valve member for rotation therewith and connected to said second piston to produce an oscillation of said valve member upon reciprocation of said second piston, and manually displaceable means carried by said body and engageable with said last named member for manually displacing said second piston and connected valve member to the opposite ends of their movement.

5. A pneumatic sheep shear motor comprising, an elongated body having an air inlet passage adjacent one end thereof adapted for connection to a source of air under pressure, a cylinder formed in said body coaxial with said passage and communicated at one end to said passage, a hollow cylindrical valve member rotatably mounted in said cylinder and being open

at one end thereof adjacent said passage to communicate the latter with the interior of said member, a second cylinder formed in said body and having its axis at substantially right angles to the axis of said first cylinder, air passages in said body leading from the periphery of said first cylinder to said second cylinder adjacent the opposite longitudinal ends thereof, a piston reciprocally mounted in said second cylinder and adapted for connection to the movable cutter bar of the shear, said valve member having openings in the periphery thereof adapted upon oscillation of said member to alternately register with said passages for causing a reciprocation of said piston, a third cylinder arranged in substantially parallel relation to said second cylinder and adjacent to one end of said first cylinder, a piston reciprocally mounted in said third cylinder, passage means connecting the opposite ends of said third cylinder with longitudinally spaced portions of said second cylinder which are covered and uncovered in said second cylinder by the piston therein whereby air under pressure is passed from said second cylinder to said first cylinder to cause a reciprocation of said second piston in time out of phase relation to the movement of said first piston, an arm connected to one end of said valve member and to said second piston for providing an oscillation of the valve member upon reciprocation of said second piston, and manually displaceable means carried by said body and engageable with said arm for displacing said second piston to the opposite ends of its stroke.

6. A pneumatic sheep shear motor comprising, an elongated hollow body having an air inlet passage axially at one end thereof and adapted for connection to the movable and stationary cutter members of the shear adjacent the opposite end thereof, said body being formed with a longitudinally extending cylinder adjacent said first end in coaxial alignment with said passage and communicating at one end to said passage, a hollow cylindrical valve member rotatably mounted in said cylinder and having the hollow interior thereof communicated with said air inlet passage, a second cylinder arranged transversely of said body at substantially right angles to said first cylinder and intersecting the hollow interior of said body, a piston reciprocally mounted in said second cylinder and adapted for connection through the hollow in said body to the movable cutter member of the shears, air passage means connecting the opposite ends of said second cylinder with the periphery of said first cylinder and coacting with circumferentially spaced ports in the valve member for providing a passage of air under pressure from the interior of said valve member to the opposite ends of said second cylinder in an alternate manner upon oscillation of said valve member to reciprocate said piston, a third cylinder arranged transversely across said body adjacent the interior end of said first cylinder, a piston reciprocally mounted in said third cylinder, air passage means connecting the opposite ends of said third cylinder with longitudinally spaced portions of said second cylinder for causing a reciprocal movement of air and said third piston in said third cylinder upon reciprocation of said first piston, means connecting said second piston with said valve member to oscillate the latter upon reciprocation of the former, and air exhaust means connecting said third cylinder with the hollow interior of said body for discharging air from said third cylinder longitudinally through said body and over said cutter members.

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