

Oct. 20, 1959

R. J. HAUG

2,909,068

PORTABLE TOOL WITH BACK CARRIED ENGINE

Filed March 1, 1955

2 Sheets-Sheet 1

Fig. 1

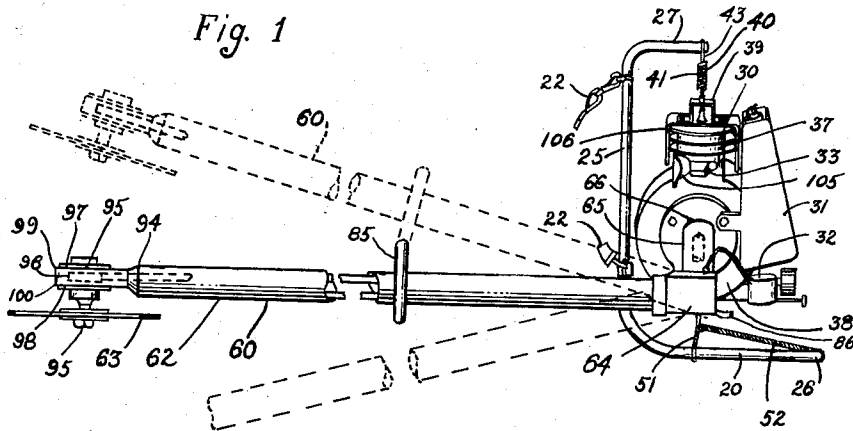


Fig. 2

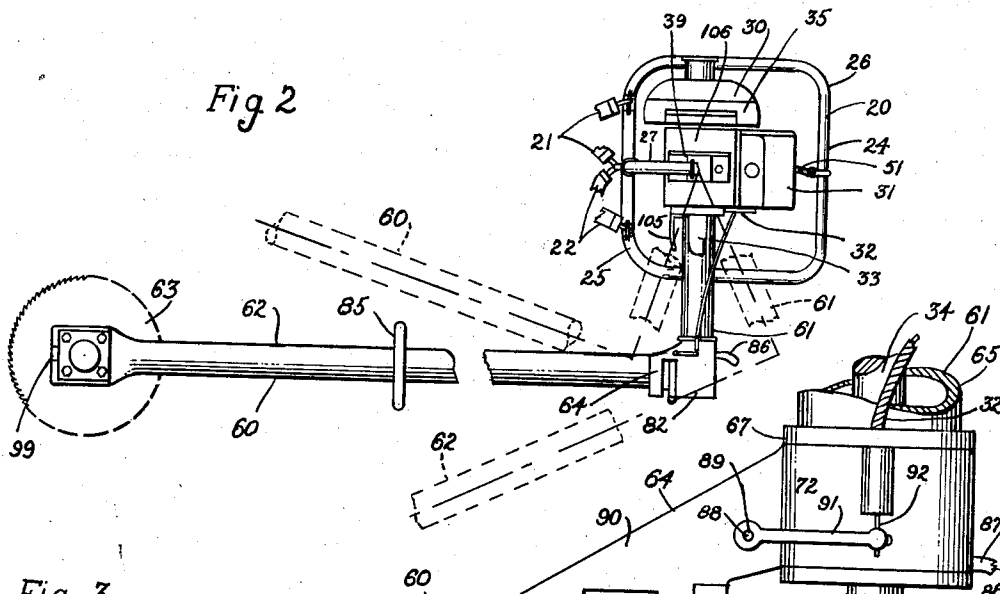


Fig. 3

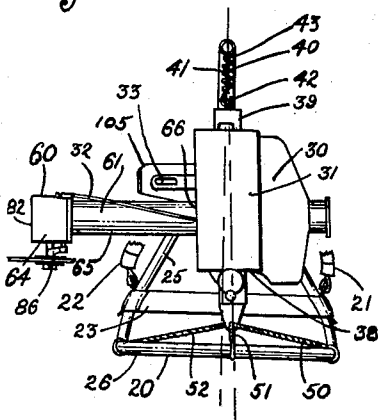
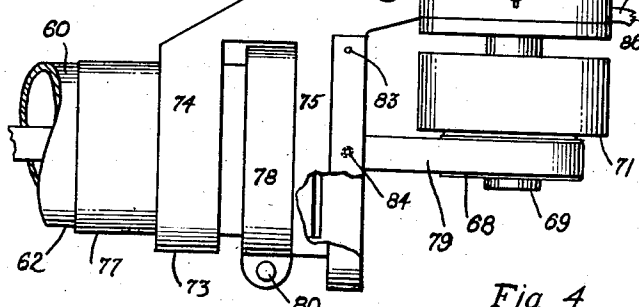


Fig. 4



INVENTOR.

Richard J. Haug

BY

Pearson & Pearson
Attorneys

Oct. 20, 1959

R. J. HAUG

2,909,068

PORTABLE TOOL WITH BACK CARRIED ENGINE

Filed March 1, 1955

2 Sheets-Sheet 2

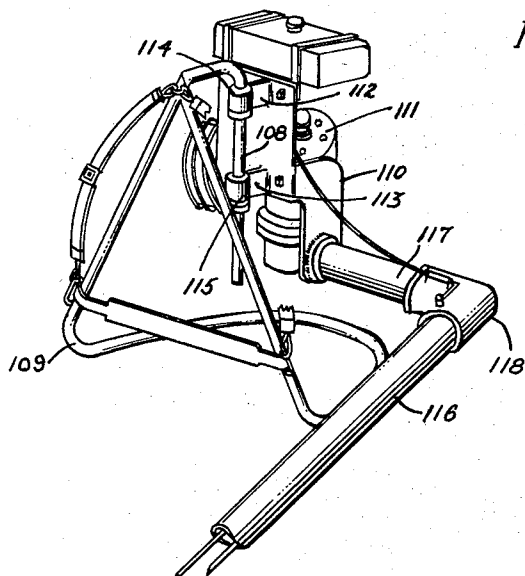


Fig 6

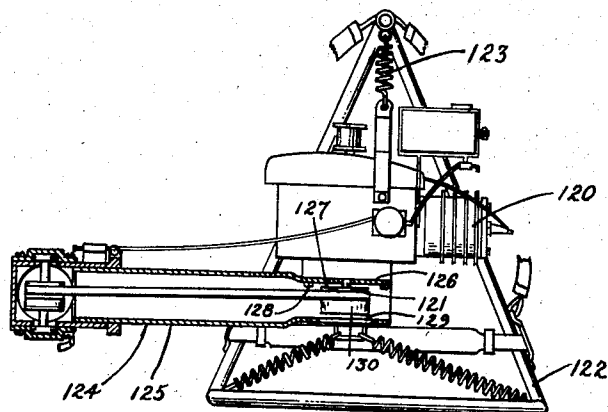


Fig. 7

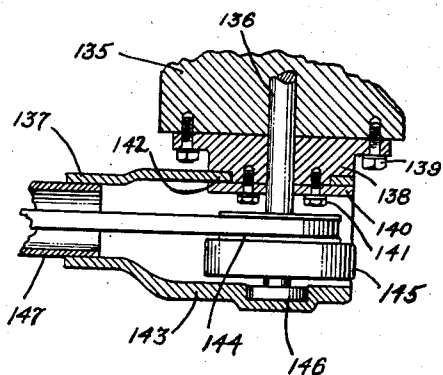
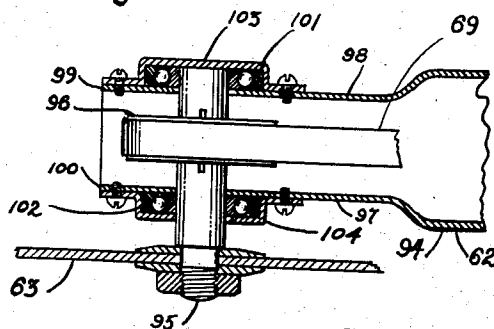


Fig 8



INVENTOR.
Richard J. Haug
BY

Pearson & Pearson
Attorneys

1

2,909,068

PORTABLE TOOL WITH BACK CARRIED ENGINE

Richard J. Haug, Nashua, N.H.

Application March 1, 1955, Serial No. 491,407

15 Claims. (Cl. 74-16)

This invention relates to portable power operated tools of the type easily borne by an operator. It especially relates to such tools powered by a lightweight internal combustion motor carried on the back of an operator and having a power take-off handle member with a rotating tool at the terminal end thereof.

In my copending patent application, Serial No. 237,462 filed July 18, 1951, now U.S. Patent No. 2,725,753 of December 6, 1955, a portable power operated tool is described having a back carried motor and a tubular power transmitting handle with a knee joint intermediate thereof. In my copending patent application, Serial No. 401,808 filed Jan. 4, 1954, now U.S. Patent No. 2,765,666 of October 9, 1956, a special type of knee joint is described for use in such a tool. Although there are many advantages in the use of a hollow, tubular rigid power transmitting handle with a knee joint therein, the elimination of such a knee joint while retaining the advantages of the same is also advantageous.

It is the principal object of this invention to provide a portable tool with a back carried motor and power take-off mechanism of rigid material in which the tool may be freely moved with relation to the operator, both vertically and horizontally, the operator cannot fall on the tool while the motor is back carried and the cost of manufacture is comparatively small.

Another object of the invention is to provide a power unit for portable tools in which a gasoline engine is suspended from a back frame to freely turn or pivot on a vertical axis whereby the engine mounting itself provides some of the turning movement of the tool.

A further object of the invention is to provide a back carried power unit for portable tools in which the motor is suspended by a single coil spring from a back frame, thereby providing a vibrationless mounting as well as a freely turnable pivoted mounting.

Still another object of the invention is to provide power take-off mechanism of rigid material connected to a back carried internal combustion engine, wherein a part of the power take-off mechanism is swingable in a vertical plane and the power take-off mechanism and the engine are swingable in a horizontal plane as a unit.

A still further object of the invention is to provide a portable tool having the advantages of a back carried, rigid handled device, but which eliminates the need for much costly precision casting, turning, boring and milling operations and mainly requires only inexpensive manufacturing operations such as drilling and the like.

In the drawings:

Fig. 1 is a side elevation of the invention showing the pivoting on a horizontal axis of the tool arm.

Fig. 2 is a plan view of the device shown in Fig. 1 showing the pivoting on a vertical axis of the tool arm, joint, motor arm and motor as a unit.

Fig. 3 is a rear elevation of the device shown in Figs. 1 and 2.

Fig. 4 is an enlarged fragmentary plan view of the rigid hollow right angular pivot joint of the power take-off mechanism and

Fig. 5 is a perspective view from the front of a modified form of the device.

Fig. 6 is a rear elevation similar to Fig. 3, but with the motor arm sectionalized, showing another modification of the device.

2

Fig. 7 is an enlarged sectional view of a turnable connection between a handle and a vertical shaft engine such as shown in the device of Fig. 6, and

Fig. 8 is an enlarged sectional view of the preferred tool mounting at the end of the tool arm of the invention.

As shown, in Figs. 1, 2, 3 and 4, 20 is a motor support frame adapted to be carried on the back of an operator with a fixed relation thereto by means of shoulder straps 21 and 22 and a waist band 23. The frame 20 is formed of rigid material and preferably is bent from a single hollow tube 24 of aluminum, or other light weight metal, to outline a closed figure. The frame 20 includes a vertical portion 25 adapted to rest against the back of an operator, a rearwardly extending horizontal lower portion 26 at the bottom of the portion 25 and a rearwardly extending horizontal upper portion 27 at the top of the portion 25. The tube 24 is of pear, or raindrop, shape when in a single plane but the base or lower portion 26 is bent at right angles to the intermediate portion 25 and the apex, or upper portion 27 is bent to extend at least part way over the portion 26 to proximate the centre thereof.

An internal combustion motor 30 is provided having a fuel tank 31, throttle control element 32, exhaust port 33 and drive shaft 34 as well as other well known parts. It will be apparent that such motors are made in many forms and that the type shown herein is for illustration purposes only. Preferably the motor 30 is of the type having a fly wheel 35 and drive shaft 34 rotatable on an horizontal axis and a cylinder 37 upstanding above a crank case 38. In the preferred form of the invention shown in Figs. 1, 2, 3 and 4 a bracket 39, or its equivalent, is fixed to the top of the motor at a point with relation to the centre of gravity of the motor where the motor will hang substantially vertically when suspended by the bracket.

Mounting means 40 turnably connects the motor 30 to the frame 20 to enable the motor to freely turn on a substantially vertical axis with relation to the frame. The mounting means 40 is preferably a coil spring 41 having its lower end 42 attached to the bracket 39 and its upper end 43 attached to the upper horizontal portion 27 of frame 20. The longitudinal axis of spring 41 is thus the vertical axis of turning of the motor 30 and the spring 41 not only forms a pivot but also absorbs vibration of the motor and cushions the weight of the motor. No rigid connection is provided between the motor 30 and the lower horizontal portion or the intermediate vertical portion of frame 20 as in prior devices and the entire motor is free to turn or oscillate while depending from the single centrally disposed spring 41. A chain or the like, not shown, may be passed through the centre of coil spring 41 to prevent the motor from dropping in the event of spring breakage. A coil spring has been found preferable to leaf springs, torque rod springs and similar equivalents, especially in regard to ease and cost of manufacture.

One or more resilient elements such as 50, 51 and 52 may be provided to connect the lower portion of motor 30 proximate crank case 38, to the adjacent parts of the lower horizontal portion 26 of frame 20. Preferably the resilient elements are coil springs as illustrated and the spring such as 50 may be somewhat stronger than the other elements to counteract the weight of a power take-off mechanism to be described hereinafter. In any case, the location of the bracket 39 and the location and strength of the elements 50, 51 and 52 are arranged to keep the motor 30 in balance and normally in central vertical position relative to the frame while allowing limited lateral oscillation and a considerable angle of rotation around the axis of the mounting means.

The frame 20, motor 30 and mounting means 40 forms

3

a compact power unit of light weight which may be carried on an operator's back with ease. When the mounting means 40 is a single coil spring the motor 30 is not only turnable on a vertical axis, but is also cushioned against vibration and able to oscillate or swing in arcs centred on the spring such as 41. The resilient elements 50, 51 or 52 are especially useful when the power take-off mechanism is not rigid for example, a flexible shaft leading to a tool. When the power take-off mechanism is of rigid material, as preferred, it acts as a counter balance and rigid control lever to prevent excessive undesired movement of the motor and some or all of the resilient elements 50, 51 and 52 may be eliminated.

The power take-off mechanism 60, of the invention, includes a motor arm 61 of rigid material such as aluminum, extending horizontally from the motor 30 and a tool arm 62 also of rigid material extending at an angle from the motor arm 61 to a rotatable tool 63. The angle preferred is a right angle for ease of transmitting power therearound although other angles may be used, if desired, whereby the tool 63 may be manipulated in front of the operator while driven from the power unit on his back. The meeting points of the motor arm 61 and the tool arm 62 is thus preferably a right angular joint 64 which is also of rigid material and it will thus be apparent that the tool arm 62, motor arm 61 and motor 30 are oscillatable or turnable as a unit on the vertical axis formed by the mounting means 40 such as coil spring 41.

Because of the free turnability and swingability of the motor 30 in frame 20, the tool arm 62 may be directed downwardly and forwardly from motor arm 61 and controlled motion of the tool 63 secured within a wide range horizontally and a narrow range vertically. However, it is preferred that the joint 64 be a pivot joint as shown, thereby permitting the tool arm 62 to pivot in a vertical plane through a wide range, but relying on the turnability of the motor itself for pivot action in a horizontal plane. Thus the tool 63 may be moved freely in any direction vertically or sidewise in front of the operator and the operator is still protected in case of a falling branch or a fall of the operator from coming into contact with the tool. This is because the tool arm 62 is preferably longer than the motor arm and sufficiently elongated to always maintain the tool well away from the operator by rigid connections to the motor and frame on his back.

The motor arm 61 may be formed by an integral extension of the motor drive shaft 34, extending from the crank case 38 sidewise or laterally beyond one side of the tubular frame 20. Preferably a hollow sleeve 65 is provided around the shaft 34, to protect the operator, and to form a non rotating support for the right angular pivot joint 64. Sleeve 65 is fixed at one end 66 to the crankcase 38 by suitable bolts and encircles shaft 34 up to a collar 67 proximate a drive belt pulley 68 carried on the terminal end 69 of the shaft 34. Preferably a centrifugal clutch 71, of well known type, is mounted between the collar 67 and the drive pulley 68 whereby the pulley rotates with the shaft 34 only at a predetermined angular speed.

The right angular pivot joint 64 includes a section 72 encircling collar 67 and pivotable around the longitudinal axis of the shaft 34 in a vertical plane and another section 73 at right angles to section 72 and bifurcated as at 74 and 75. The sections 72 and 73 are hollow whereby section 72 may accommodate the hollow sleeve 65 and section 73 may accommodate the hollow tool arm 62. The tool arm 62 preferably includes a sleeve 77 and split collar 78 which encircles an end thereof with the collar 78 contained within the space between bifurcations 74 and 75 of joint 64. Arm 62 may thus be moved axially to tension a belt 79 therewithin and then be locked in place by bolts 80 of collar 78. At the same time tool arm 62 is preferably rotatable on its longitudinal axis within the pivot joint 64 to permit the tool 63 to be twisted at various angles.

4

Preferably a sheet metal cover 82 is provided over the exposed portions of joint 64 the cover being attached by suitable machine screws 83 threaded in holes such as 84. The operator's right hand is normally on the handle 85 and his left hand is applied to the joint 64 or the cover 82 to also guide the tool arm. A hand operable throttle lever 86 is thus provided on the joint 64, the lever 86 including a finger arm 87, a pivot 88 extending through a hole 89 in the web 90 of joint 64 and another arm 91 connected by a Bowden wire 92 to the throttle control 32 of motor 30 in a well known manner.

The opposite end 94 of tool arm 62 carries the rotatable tool 63 as well as a tool arbor 95 and a tool pulley 96 for driving the tool. Preferably the tool-carrying end 94 of arm 62 is flattened to form two parallel, spaced apart flat faces 97 and 98, and each face is slotted as at 99 and 100 to receive the arbor 95 which is revoluble in a pair of bearing housings of a well known type, such as 101 and 102. The arbor 95 is rotatable in the bearings 101 and 102 and a pair of covering shells such as 103 and 104 are each bolted to the exterior of one of the flat faces 97 or 98 to hold the bearings in place, but to permit easy access thereto when desired.

The belt 69 is trained around drive pulley 68 and driven tool pulley 96 and is quarter twisted within the hollow, rigid tool arm 62. Preferably an imperforate metal plate 105 is fixed to motor 30 between the exhaust port 33 and the vertical portion 25 of frame 20 to protect the back of the operator and the exhaust port is preferably turned to the rear away from the back of the operator. If desired, a metal shield 106 may also be mounted on motor 30 around the cylinder 37, the waist band 23 may be of heat insulating material and of sufficient area to shield the motor from the operator's back or a light metal sheet may be used for the same purpose on vertical portion 25 of frame 20.

As shown in Fig. 5, the mounting means 40 may take the form of a rigid upright rod 108 depending downwardly from a frame 109 similar to frame 20. A suitable bracket 110 is provided on a motor 111, the bracket having at least one, and preferably a pair of supporting arms 112 and 113 swiveled at 114 and 115 on the rod 108. The motor 111 is thus enabled to freely turn on the rod 108 as a vertical axis, but cannot also oscillate as in the preferred construction. The power take-off means 116 of this embodiment is identical with power take-off means 60, being formed of rigid, hollow tubular material and capable of turning in a horizontal plane on rod 108 as an axis and in a vertical plane on the motor arm 117 as an axis because of pivot joint 118.

As shown in Fig. 6 it is possible to use an internal combustion engine 120 having a vertical drive shaft 121 in place of the motor 20 with its horizontal drive shaft 34. The power supply support means 122 is identical with frame 20 and the mounting means 123 is identical with mounting means 40. In this embodiment the power take-off means 124 is identical with power take-off means 60 except that the hollow, tubular motor arm 125 is flattened as at 126 at the motor end thereof to accommodate a horizontal drive pulley 127 mounted on vertical drive shaft 121. Suitable engine bolts 128 rigidly attach the flattened end 126 of arm 125 to the engine and a hole 129 is provided in the opposite flattened wall for insertion of an automatic clutch 130 similar to clutch 71.

As shown in Fig. 7 it is possible with a power unit such as 135, having a vertical drive shaft 136, similar to engine 120 and shaft 121, to secure turnability on a vertical axis at the connection between the motor arm such as 137 and the engine 135. As shown, a block 138 is attached by bolts 139 to power unit 135 and a cover plate 140 is attached to block 138 by bolts 141. An annular groove 142 is thus formed to turnably support a motor arm head 143. The drive pulley 144 and clutch 145 are housed within head 143 together with a suitable bearing 146 and a tube 147 is sleeved in the portion 148 of head

143. The power take-off means is otherwise similar to previous embodiments in that the tool may be moved in a vertical plane on a pivot joint and twisted around the longitudinal axis of a tool arm. It will be apparent that the power unit 135 may be turnably supported on a coil spring such as 41, or on a rod 108 if desired, but may also be non-turnably mounted on the engine support means because of the turnable connection of the motor arm to the motor. The use of a horizontal drive shaft engine supported in pendant position from a back frame by a single coil spring is much preferred because of less cost in manufacture, increased absorption of vibration and better balancing of the tool. Experience has shown that such a portable tool unit is inexpensive, light weight, rugged and can be used all day in the field without adversely affecting the efficiency of the operator.

I claim:

1. A portable power operated tool comprising a motor support frame of rigid material adapted to be carried on the back of an operator in substantially fixed relation thereto, said frame having a rearwardly overhanging portion; an internal combustion motor having a drive shaft; mounting means turnably connecting said motor below the overhanging portion of said frame for substantially free turning of said motor, on a substantially vertical axis proximate its centre of gravity, with relation to said frame; a rotatable tool; and power take-off mechanism including a motor arm of rigid material extending horizontally from said motor to a tool arm and a tool arm of rigid material extending at an angle from said motor arm to said tool, said tool arm, motor arm and motor being oscillatable as a unit on the vertical axis formed by said mounting means.

2. A combination as specified in claim 1 wherein said power take-off mechanism includes a right angular pivot joint between said motor arm and said tool arm for permitting said tool arm to pivot in a vertical plane relative to said motor arm.

3. A combination as specified in claim 1 wherein the drive shaft of said motor is horizontal and said power take-off mechanism includes a hollow, tubular motor arm enclosing a lateral extension of said horizontal drive shaft; a right angular joint pivotable around the terminal end of said drive shaft extension and motor arm in a vertical plane, a hollow tubular tool arm having one end mounted in said joint to turn around the longitudinal axis of said tool arm and having said tool mounted to rotate on an axis perpendicular to said longitudinal axis at its other end and a belt and pulley drive connection operable through said hollow tool arm to connect said tool with said drive shaft.

4. A combination as specified in claim 1 wherein said mounting means includes a centrally disposed vertical rod fixed below the overhanging portion of said frame and a pair of swivel arms extending horizontally from said motor, said arms being swivelled on said rod for turnably supporting said motor.

5. A combination as specified in claim 1 wherein said mounting means comprises a single, centrally disposed coil spring depending from the overhanging portion of said frame and entirely supporting said motor at its lower end, in pendant relationship.

6. A combination as specified in claim 5 plus an additional coil spring connecting the lower portion of said motor to an adjacent portion of said frame for permitting limited yielding of the lower portion of said motor while controlling the same against excessive lateral movement.

7. A portable power operated tool comprising a rigid motor support frame of light weight metal including a vertical portion adapted to rest against the back of an operator, a rearwardly extending, horizontal lower portion at the bottom of said vertical portion and a rearwardly extending horizontal upper portion at the top of said vertical portion, said frame having shoulder straps thereon for supporting the same on the back of an oper-

ator; a coil spring depending from the upper horizontal portion of said frame for entirely supporting an internal combustion motor therebelow; an internal combustion motor, suspended on said frame by said spring, said motor having an elongated drive shaft extending laterally beyond one side of said frame and having a drive pulley at the terminal end thereof; a tubular rigid sleeve fixed to said motor and encircling said drive shaft up to proximate said drive pulley; a right angular hollow pivot joint having one section rotatably mounted on said sleeve and having an end of a hollow tubular tool arm rotatably mounted in the other section thereof; a hollow tubular rigid tool arm rotatably mounted to turn on its longitudinal axis on said pivot joint and carrying a tool pulley at its terminal end for rotating a tool and a flexible belt connecting said tool pulley with said drive shaft pulley through said hollow tubular tool arm.

8. A combination as specified in claim 7 plus a plurality of resilient members spaced around the lower portion of said motor and connecting the same to the lower horizontal portion of said frame for permitting limited oscillation of said motor on said coil spring as a centre.

9. A combination as specified in claim 7 plus an imperforate metal plate fixed to said motor between the exhaust port thereof and the vertical portion of said frame for protecting the back of an operator from said exhaust.

10. A combination as specified in claim 7 wherein said frame is formed from a single piece of light weight metal tubing bent into a closed figure outlining said vertical and lower horizontal portions and having at least one terminal end forming said upper horizontal portion.

11. A combination as specified in claim 7 plus a centrifugal clutch mounted between said drive shaft and said drive shaft pulley within the confines of said right angular hollow pivot joint.

12. A combination as specified in claim 7 plus a hand operable throttle lever pivoted on the exterior of said right angular hollow pivot joint and operably connected to the throttle of said motor for controlling the same.

13. A combination as specified in claim 7 wherein the section of said right angular pivot joint in which said rigid tool arm is rotatably mounted is bifurcated and an adjustable collar is slideably mounted on said tool arm within the bifurcation whereby said tool arm may be longitudinally moved to predetermined positions relative to said knee joint section for controlling belt tension.

14. A combination as specified in claim 7 wherein the end of the tubular arm carrying said tool pulley is flattened to form two parallel, spaced apart, flat faces, each flat face is slotted to receive one of a pair of opposite bearing housings and each bearing housing is held in place by one of a pair of opposite shells bolted to the adjacent flat face of said tube.

15. A hollow, tubular tool arm for use in carrying a rotatable tool at a distance from a portable engine, said tool arm being of circular cross section throughout its length except at one terminal end of said terminal end being flattened to form two parallel, spaced apart, flat faces, each flat face being slotted to receive one of a pair of opposite bearing housings and each bearing housing being held in place by one of a pair of opposite shells attached to the adjacent flat face of said tube.

References Cited in the file of this patent

UNITED STATES PATENTS

D. 154,703	Phillips	Aug. 2, 1949
1,329,816	Winslow	Feb. 3, 1920
1,390,484	Ball	Sept. 13, 1921
2,097,729	Mall	Nov. 2, 1937
2,172,841	Gerhardt	Sept. 12, 1939
2,368,731	Snyder et al.	Feb. 6, 1945
2,521,920	Koch	Sept. 12, 1950
2,563,195	Soule et al.	Aug. 7, 1951
2,725,753	Haug	Dec. 6, 1955