

Feb. 10, 1948.

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2,435,928

FOOT ACTUATED PRESSURE GENERATOR

Filed Oct. 13, 1944

2 Sheets-Sheet 1

Fig. 1

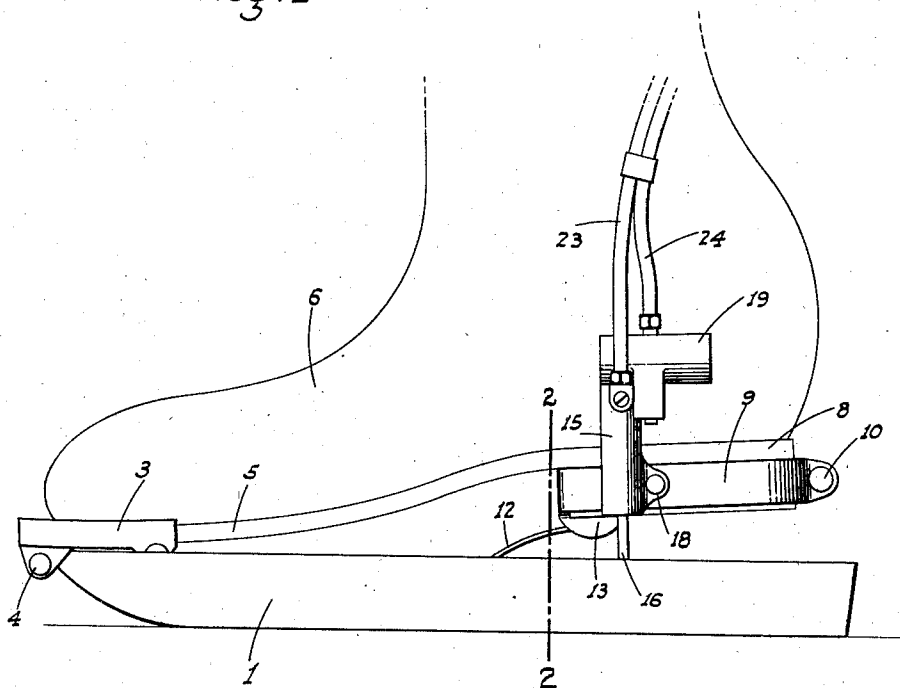
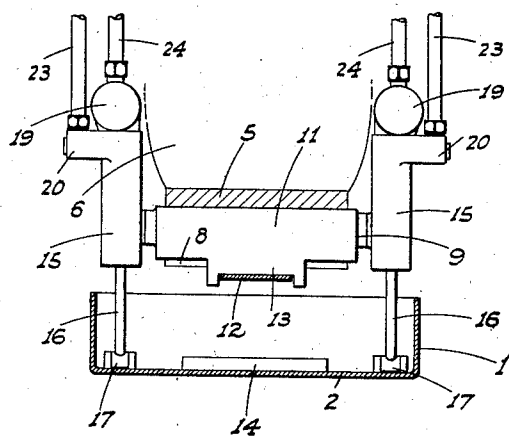


Fig. 2



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2 Sheets-Sheet 2

Fig. 3

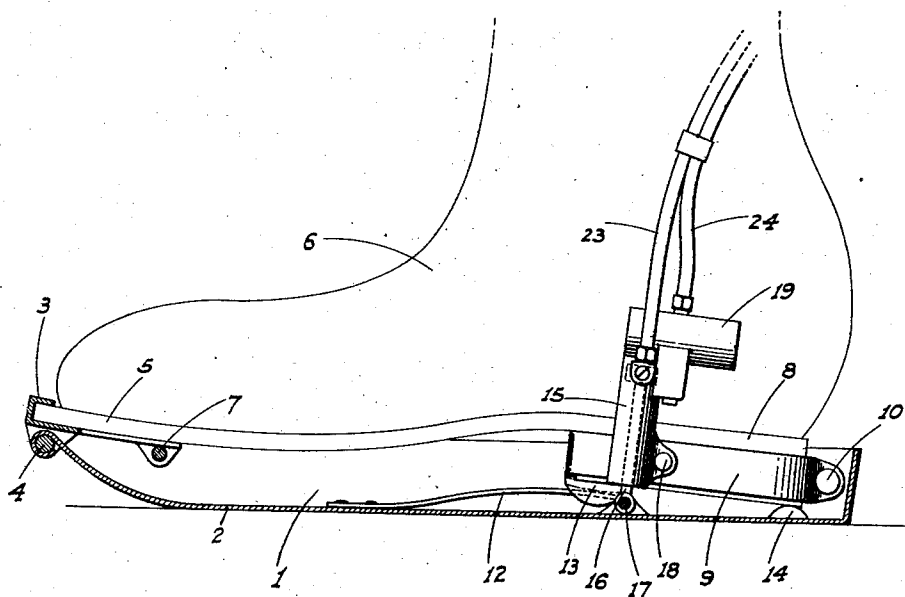
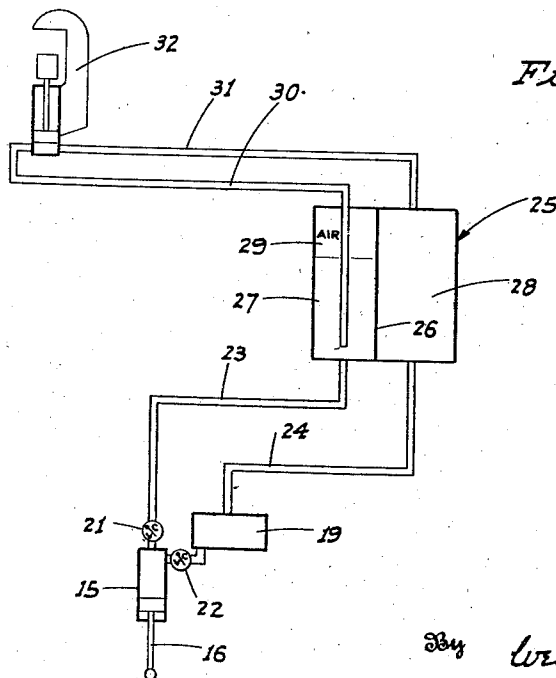


Fig. 4



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## UNITED STATES PATENT OFFICE

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## FOOT ACTUATED PRESSURE GENERATOR

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Application October 13, 1944, Serial No. 558,592

6 Claims. (Cl. 103—205)

1

This invention relates to, and it is an object to provide, a foot attached and actuated pressure generator arranged to create a working pressure as the user walks about; such pressure being retained in a storage tank preferably supported on the back, and intended for use to operate fluid pressure actuated tools, as for example the pruning tool shown in my copending application, Serial No. 558,591, filed October 13, 1944, now Patent No. 2,385,419.

A further object of the invention is to provide a pressure generator, as above, which comprises a ground engaging or sub-shoe adapted to be disposed under the user's regulation shoe, there being means to hingedly connect the regulation and sub-shoe together at the forward end for relative vertical swinging movement, and a pump assembly connected between the regulation and sub-shoe adjacent the rear ends thereof, said pump assembly being operated upon relative separating and approaching movement of said shoes; the created pressure being delivered by flexible tubes leading to the storage tank on the user's back.

An additional object of the present invention is to provide, in combination, a foot supported and actuated fluid pressure pump, a body supported storage tank for the fluid pressure, and a portable, hand supported, fluid pressure actuated pruning tool; there being flexible conduits connecting between the pump and tank, and between the tank and tool.

A further object of the invention is to produce a simple and inexpensive device, and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a side elevation of the device as in use, and at the top of its stroke.

Figure 2 is a cross section on line 2—2 of Fig. 1.

Figure 3 is a side elevation, partly in section, showing the device at the lower end of its stroke.

Figure 4 is a diagrammatic illustration of the pressure generator or pump as arranged in combination with a storage tank and a hand-supported, fluid pressure actuated pruning tool; there being fluid conduits connected between the pump and tank and between the tank and tool.

2

Referring now more particularly to the characters of reference on the drawings, the device comprises a ground engaging or sub-shoe, indicated generally at 1, which shoe includes a bottom plate 2. At its forward end the sub-shoe 1 is fitted with a sole clip 3 hinged at the front, as at 4, to said sub-shoe 1 for relative vertical swinging movement. The clip 3 includes a flange adapted to overhang the edge of the forward portion of the sole 5 of the user's regulation shoe 6 which is disposed directly above the sub-shoe 1. An adjustable cross bolt 7 clamps the clip 3 to the sole 5.

To the heel 8 of the user's conventional shoe I affix an attachment yoke 9 which surrounds said heel from the back, said yoke being split at the rear and held in place by a tension bolt 10 which extends through facing ears. At the front the yoke 9 includes a cross strap 11 which engages beneath the instep of the shoe 6.

A heavy-duty leaf spring 12 is secured to the bottom plate 2 of the sub-shoe 1 centrally within the latter and extends upwardly and rearwardly to slidable engagement in a cradle 13 formed on the cross strap 11. The spring 12 yieldably resists downward movement of the heel-supported yoke 9; there being a bumper 14 which limits the downward movement of the heel 8 toward the bottom plate 2.

On opposite sides of the heel 8 the yoke supports substantially vertically extending, reciprocating type pumps 15, each of which includes a downwardly projecting piston rod 16 pivotally connected, as at 17, to the bottom plate 2 of the sub-shoe 1; the pumps 15 being pivotally attached to the legs of the yoke, as at 18, for swinging movement about a transverse horizontal axis. Each of the pumps 15 includes an auxiliary fluid reservoir 19 and a boss 20 which encloses a check valve 21 closing toward the pump. Another check valve 22 is included in each pump between the corresponding auxiliary reservoir 19 and the pump cylinder; each check valve 22 opening toward the pump. A pair of flexible conduits 23 and 24 respectively, lead from each pump; the conduit 23 being the pressure feed line, while the conduit 24 is the return line.

From each pump the conduits 23 and 24 lead upwardly to a tank unit 25 adapted to be supported in any convenient manner on the back of the user. The tank unit 25 is separated by a partition 26 into separate chambers 27 and 28. The fluid pressure system here shown is hydraulic, the chamber 27 being partially filled with hydraulic fluid and the remainder filled with air,

3

as at 29, to form an air dome. The chamber 28 is the main supply reservoir which feeds through the conduit 24 and auxiliary reservoirs 19 to the pumps 15.

Other flexible conduits 30 and 31 lead from chambers 27 and 28 respectively, to the fluid pressure actuated hand-supported tool, here shown as a pruning tool 32, as shown in detail in my co-pending application hereinbefore identified.

The conduit 30 which takes delivery from adjacent the bottom of the chamber 27 is the pressure line, whereas the conduit 31 is the return line to chamber 28.

In use of the above described device the pumping units, as shown in detail in Figs. 1-3 inclusive, are attached to the shoes 6 of the user and the tank unit 25 is supported from his back by shoulder straps (not shown) or the like. The user of course carries the tool 32 in his hand. As the user walks about there is a recurring relative up-and-down movement between the sub-shoe 1 and shoes 6, which causes a reciprocation of the pumps 15 and consequently the creation of a substantial pressure in the chamber 27 of tank unit 25. This pressure is, as previously described, utilized at the tool 32 to operate the latter.

In the event that the normal walking about of the user does not create sufficient pressure, the user, while standing at a given point, may rock his feet up and down so as to produce whatever additional pressure is necessary to maintain continued and effective operation of the tool 32.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention, what I claim as new and useful and desire to secure by Letters Patent is:

1. A foot-actuated fluid pressure generator comprising a sub-shoe adapted to be disposed under the user's regulation shoe, means adapted to connect the sub-shoe and regulation shoe for relative separating and approaching movement, a reciprocating pump unit, means connecting the pump unit at one end to the sub-shoe, other means adapted to connect the pump unit at the other end to said regulation shoe, and fluid conduit means leading upwardly from the pump unit; said first named means comprising a clip pivoted on the sub-shoe at the front for vertical hinging movement, said clip being adapted to removably attach to the regulation shoe at the front end, the pump unit being adapted to connect between the sub-shoe and regulation shoe adjacent the rear of the latter.

2. A foot-actuated fluid pressure generator comprising a sub-shoe adapted to be disposed under the user's regulation shoe, means adapted to connect the sub-shoe and regulation shoe for relative separating and approaching movement, a reciprocating pump unit, means connecting the pump unit at one end to the sub-shoe, other means adapted to connect the pump unit at the other end to said regulation shoe, and fluid conduit means leading upwardly from the pump unit; the means to connect the pump unit at said other end to the regulation shoe com-

4

prising a yoke adapted to straddle the heel of said regulation shoe, and a device adapted to removably clamp the yoke directly to said heel, the pump unit being upstanding and pivotally connected at its lower and upper ends to the sub-shoe and said yoke, respectively.

3. A foot-actuated fluid pressure generator comprising a sub-shoe adapted to be disposed under the user's regulation shoe, means adapted to connect the sub-shoe and regulation shoe for relative separating and approaching movement, a reciprocating pump unit, means connecting the pump unit at one end to the sub-shoe, other means adapted to connect the pump unit at the other end to said regulation shoe, and fluid conduit means leading upwardly from the pump unit; there being a spring arranged between the regulation shoe and sub-shoe urging the latter in a separating direction, said spring being of leaf-type secured at one end to the sub-shoe and slidably engaged adjacent the other end in a cradle formed in connection with said other pump connecting means.

4. A foot actuated fluid pressure generator comprising a sub-shoe adapted to be disposed under the user's regulation shoe, means adapted to hingedly connect said shoe and sub-shoe at the front for relative vertical swinging movement, a yoke adapted to be removably secured in straddling relation about the heel of the regulation shoe, said yoke including transversely spaced legs, a pair of upstanding pump units pivotally connected between the sub-shoe and corresponding ones of said yoke legs, and fluid conduits leading upwardly from the pump units.

5. A foot actuated fluid pressure generator comprising a sub-shoe adapted to be disposed under the user's regulation shoe, means adapted to hingedly connect said shoe and sub-shoe at the front for relative vertical swinging movement, a yoke adapted to be removably secured in straddling relation about the heel of the regulation shoe, said yoke including transversely spaced legs, a pair of upstanding pump units pivotally connected between the sub-shoe and corresponding ones of said yoke legs, and fluid conduits leading upwardly from the pump units; said yoke including a cross member extending beneath the regulation shoe directly ahead of the heel thereof, and an upwardly bowed leaf spring fixed on the sub-shoe longitudinally thereof and engaging said cross member with and normally urging the same upward.

6. A foot actuated fluid pressure generator comprising a sub-shoe adapted to be disposed under the user's regulation shoe, means adapted to connect the sub-shoe and regulation shoe for relative separating and approaching movement, a reciprocating pump unit, means connecting the pump unit at one end to the sub-shoe, other means adapted to connect the pump unit at the other end to said regulation shoe, and a pair of conduits leading upwardly from the pump unit; the pump unit being of the cylinder and reciprocating piston type and including a relatively small auxiliary fluid supply reservoir, a check valve between the reservoir and cylinder opening toward the latter, one of said conduits connecting to the reservoir and the other conduit connecting to the cylinder, and a check valve interposed in said other conduit and opening away from the cylinder.

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