

[54] PNEUMATIC BOOM SUPPORT FOR HAND TOOLS 3,259,351 7/1966 Olsen ..... 248/325  
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 Canada, Calif. 91011 3,747,886 7/1973 Carlson ..... 248/325

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 [51] Int. Cl.<sup>2</sup> ..... B66D 1/00; A47F 5/00  
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 248/13

[57] ABSTRACT

A boom is connected to a support member through a hinge connection which permits both vertical and horizontal movement of the end of the boom. A pneumatic linear actuator, including a cylinder and a piston, is connected between the boom and the support member at the hinge such that the length of the actuator changes with vertical movement of the boom about the hinge support. A bleed-type adjustable pneumatic pressure regulator controls the air pressure applied to the actuator so as to exactly counterbalance the weight of the boom and tools supported on the end of the boom.

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5 Claims, 2 Drawing Figures

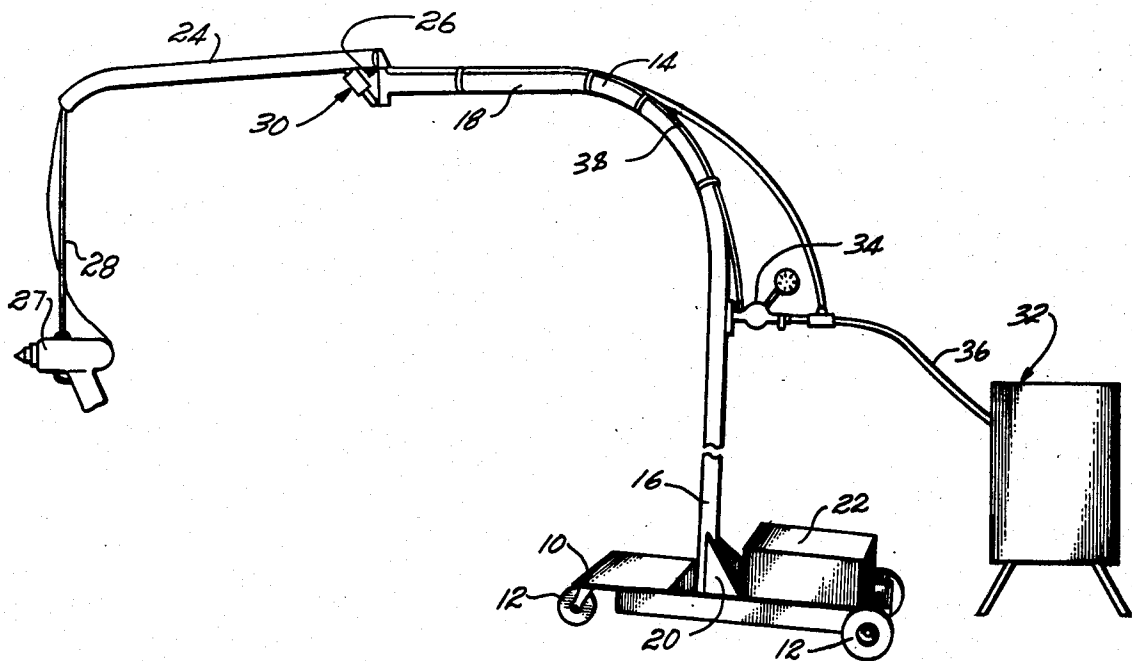


Fig. 1

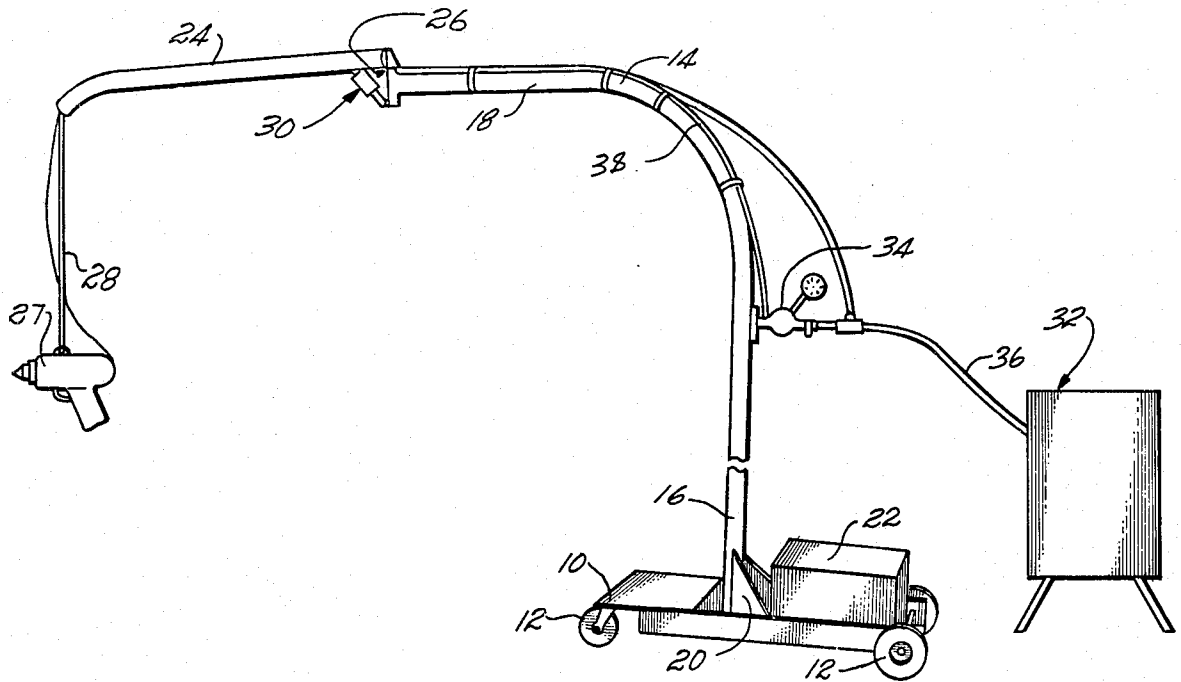
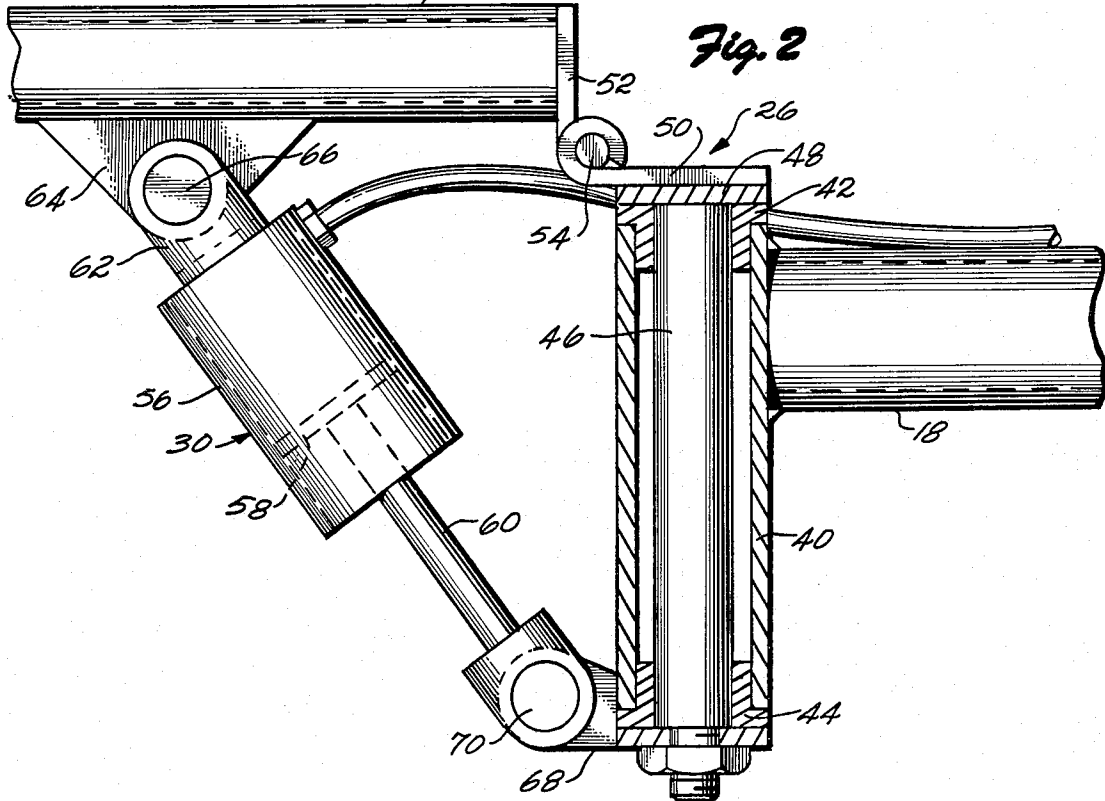


Fig. 2



# PNEUMATIC BOOM SUPPORT FOR HAND TOOLS

## FIELD OF THE INVENTION

This invention relates to a tool support, and more particularly, is related to a pneumatically-operated support for manually manipulated tools.

## BACKGROUND OF THE INVENTION

In using manually-manipulated tools, such as power tools, spray guns, and the like, it is desirable to counterbalance in some manner the weight of the tool without restricting the manual manipulation of the tool by the user. For example, it has heretofore been proposed to suspend the tool on a spring such that a portion of the weight of the tool was absorbed by the deflection of the spring. However, because the force produced by the spring varies as a function of deflection of the spring, movements of the tool by the operator require a varying force supplied by the operator to change the deflection of the spring in moving the tool about from position to position. Particularly in the use of a spray gun which must be scanned over a large area, the conventional spring counterbalancing arrangement has not proved satisfactory.

## SUMMARY OF THE INVENTION

The present invention is directed to a load counterbalancing support mechanism for a spray gun or other hand-manipulated tool which permits a wide range of movement in both a vertical and horizontal direction with the load of the tool being completely counterbalanced in any position. In brief, this is accomplished by providing a boom which is connected to a support member by hinge means which permits both horizontal and vertical movement of the boom. The tool or other load is suspended from the end of the boom. A pneumatic linear actuator, including a cylinder and piston, is connected between the boom and the support member adjacent to the hinge such that the length of the actuator changes with vertical movement of the boom about the hinge connection. The linear actuator is energized from a source of compressed air through a bleeder type regulator which maintains the pressure in the actuator substantially constant regardless of changes in the volume of the actuator as the length of the actuator changes with vertical movements of the boom.

## BRIEF DESCRIPTION OF THE DRAWINGS

For a more complete understanding of the invention, reference should be made to the accompanying drawing, wherein:

FIG. 1 is an elevational view of the counterbalanced load supporting structure of the present invention; and

FIG. 2 is a detailed view, partly in section, showing the hinge and pneumatic actuator assembly.

## DETAILED DESCRIPTION

Referring to the drawing in detail, the numeral 10 indicates generally a portable base preferably provided with wheels 12 for moving the base about. However, it will be understood that the base may be permanently attached to the floor or other structure in the vicinity of the work area.

Attached to the top of the base 10 is a support member 14 preferably in the form of a hollow pipe having a 90° bend so that the lower end 16 extends vertically

up from the base 10 while the outer end 18 extends horizontally away from the base 10. The lower end 16 is welded or otherwise secured to the base 10 and is further anchored by reinforcing flanges 20. A ballast weight 22 may be provided on the base 10 to provide added stability.

Attached to the outer end 18 of the support member 14 is a boom 24. The boom 24 is attached to the support member 14 through a double hinge assembly indicated generally at 26 and described in more detail below in connection with FIG. 2. A portable power tool, spray gun, or other device, indicated generally at 27, is suspended from the end of the boom 24 by a flexible line or cable 28.

To counterbalance the weight of the boom 24 and the tool 27, a pneumatic linear actuator 30 is provided which interconnects the boom 24 and support member 14 in the manner shown in more detail in FIG. 2. The pneumatic linear actuator is pressurized from a source of compressed air, such as indicated generally at 32, through a pressure regulator 34 mounted on the support member 14. Air under relatively high pressure is applied to the input of the pressure regulator 34 through an air line 36. The output of the pressure regulator 34 in turn is connected to the linear actuator through an air line 38.

The air regulator 34 is of a type referred to as a "bleeder" or "relieving" type regulator, that is, an adjustable regulator in which the output pressure is maintained substantially constant at any selected level below the pressure at the input to the regulator. Any drop in the pressure at the output due to the demands of the load results in an increase of air supplied from the input to bring the pressure back up to the regulated level, whereas any increase in pressure at the output above the regulated level causes a bleeding of air from the output side of the regulator to bring the pressure back down to the regulated level. Such regulators are well known in the pneumatic regulator art and readily available from a number of manufacturers. Further description of the regulator is therefore not believed necessary to an understanding or practice of the present invention.

Referring to FIG. 2, the hinge structure 26 includes a tubular member 40 which is welded or otherwise rigidly secured to the outer end 18 of the support member 14 with the axis of the tubular member 40 extending vertically. Bearing bushings 42 and 44 are inserted in the two ends of the tubular member 40. A hinge shaft 46 is journaled in the bushings 42 and 44. The upper end of the shaft 46 has a flange 48 which engages the top surface of the bushing 42.

The boom 24 is connected to the shaft 46 through a conventional hinge including a pair of hinge plates 50 and 52 pivotally joined by a hinge pin 54. The hinge plate 50 is rigidly attached to the top of the flange 48 while the hinge plate 52 is rigidly attached to the end of the boom 24, thus permitting the boom 24 to move vertically about the axis of the hinge pin 54 relative to the support member 18. At the same time, the boom 24 can rotate horizontally about the axis of the shaft 46 by rotation of the shaft within the bushings 42 and 44.

The linear actuator 30 is a conventional pneumatic actuator including a cylinder 56, piston 58, and piston rod 60. The upper end of the cylinder 56 is hingedly connected to the boom 24 through a clevis member 62 which extends on either side of a pipe 64 connected to

and projecting down from the underside of the boom 24. A pin 66 connects the clevis member 62 to the pipe 64.

The lower end of the piston rod 60 in turn is hingedly secured to the lower end of the shaft 46 by a bracket 68 which is bolted or otherwise secured to the lower end of the shaft 46. The lower end of the piston rod 60 is connected to the bracket 68 through a suitable pin 70.

From the above description it will be seen that vertical movement of the end of the boom 24 varies the length of the linear actuator 30. A downward movement of the boom 24 decreases the volume within the linear actuator, causing an increase in the back pressure on the regulator 34. By bleeding off the air, the regulator maintains the pressure substantially constant with shortening of the linear actuator by the downward movement of the boom. Similarly, an upward movement of the boom increases the length of the actuator, producing an increase in volume and decrease in pressure within the actuator cylinder. The decrease in pressure is compensated by the regulator 34 to maintain the pressure substantially constant. Thus the counterbalancing force produced by the linear actuator is substantially constant regardless of the vertical position of the boom. The user of the tool 27 can move the tool vertically to any position within the normal limits of the supporting structure and the weight of the tool is completely counterbalanced by the action of the linear actuator 30 and pressure regulator 34. At the same time, the tool 27 is freely movable horizontally by virtue of the rotation of the shaft 46 within the bushings 42 and 44.

What is claimed is:

1. A movable support for a hand-manipulated tool, such as a spray gun, permitting a wide range of movement in both vertical and horizontal direction, comprising:

a support member including a substantially horizontally extending first boom, a second boom forming an extension of said first boom, hinge means connecting one end of the second boom to the free end of said first boom, the hinge means providing movement of the second boom relatively to the first boom about a vertical as well as horizontal axis, means connecting the load to the other end of the second boom, a pneumatic linear actuator in-

cluding a cylinder and piston, means, including at least a part of the hinge means, connecting one end of the actuator to the second boom and the other end of the actuator to the first boom such that the length of the actuator changes with vertical movement of the second boom about the horizontal axis of the hinge means, and means including a pneumatic pressure regulator connecting the cylinder to a pressurized pneumatic source, the regulator pressurizing the actuator sufficiently to counterbalance the weight of the second boom and load.

2. Apparatus of claim 1 wherein the pressure regulator is adjustable.

3. Apparatus of claim 1 wherein the regulator maintains substantially constant pressure in the cylinder with changes in volume as the actuator changes length.

4. Apparatus of claim 3 wherein the regulator is a bleeding type regulator.

5. A movable support for a hand-manipulated tool, such as a spray gun, permitting a wide range of movement in both a vertical and horizontal direction, comprising: a support member in the form of a first boom, a second boom forming an extension of said first boom, hinge means connecting the second boom to the support member, the hinge means providing vertical as well as horizontal movement of the second boom about the hinge means and including a first hinge unit secured to the support member and a second hinge unit secured to the second boom, the two hinge units being connected to each other and having mutually perpendicular hinge axes, means connecting the load to one end of the second boom, a pneumatic linear actuator including a cylinder and piston and pivotally secured at one end to the second boom adjacent the end secured to the second hinge unit, the other end of the linear actuator being pivotally connected to the common connection between the first and second hinge units, means connecting one end of the actuator to the second boom and the other end to the support member such that the length of the actuator changes with vertical movement of the second boom about the hinge means, and means including a pneumatic pressure regulator connecting the cylinder to a pressurized pneumatic source, the regulator pressurizing the actuator sufficiently to counterbalance the weight of the second boom and load.

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