Jan. 26, 1954

C. T. SKILLMAN

2,666,978

PNEUMATIC POWER FILE

Filed Dec. 27, 1949

3 Sheets-Sheet 1

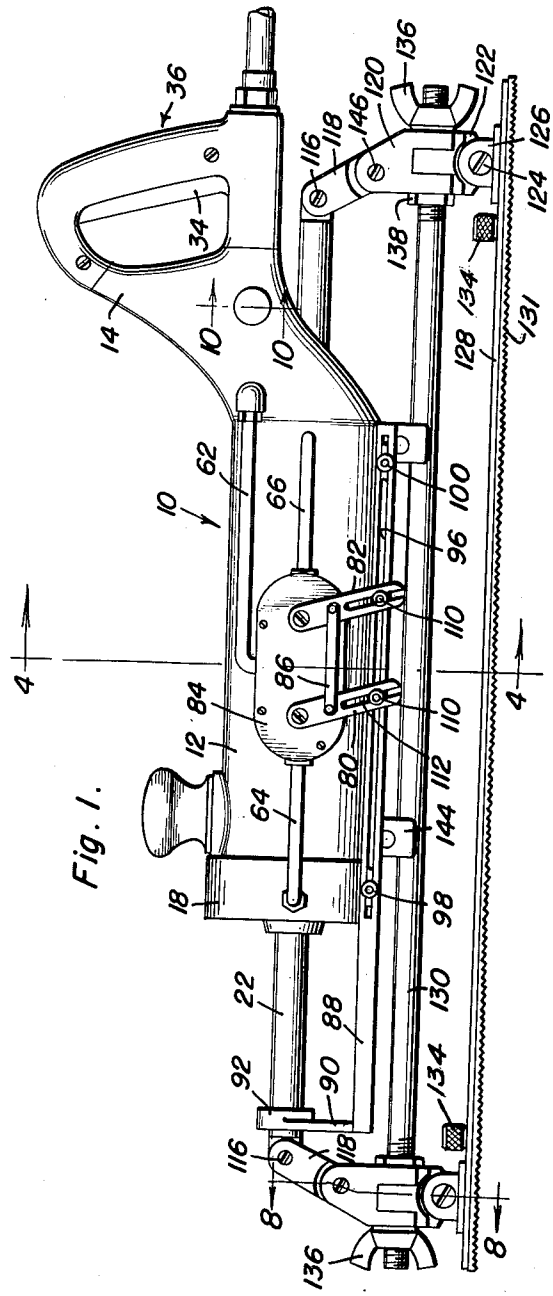


Fig. 1.

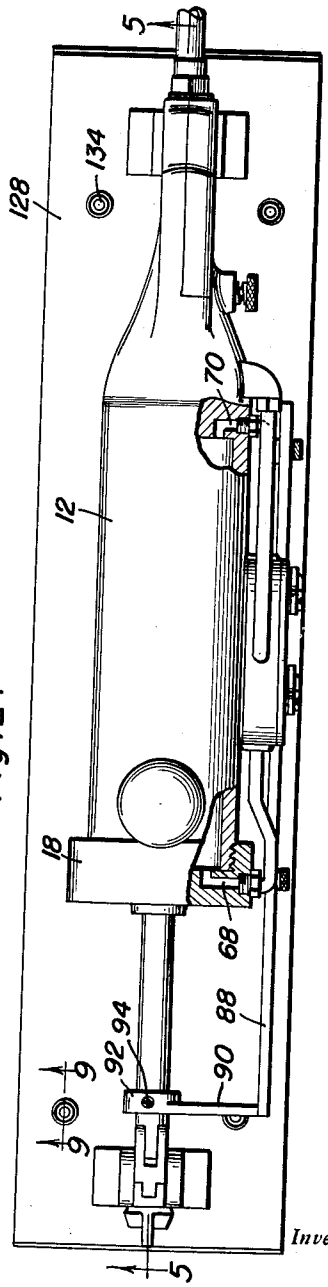


Fig. 2.

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Fig. 3.

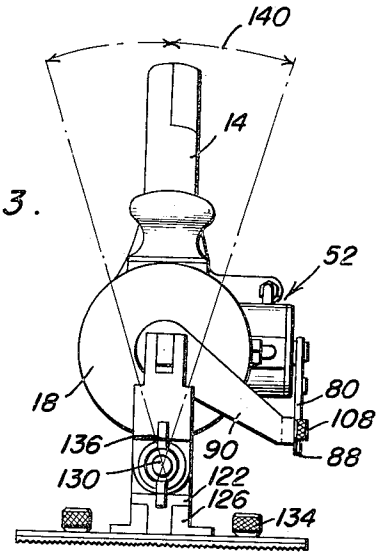


Fig. 4.

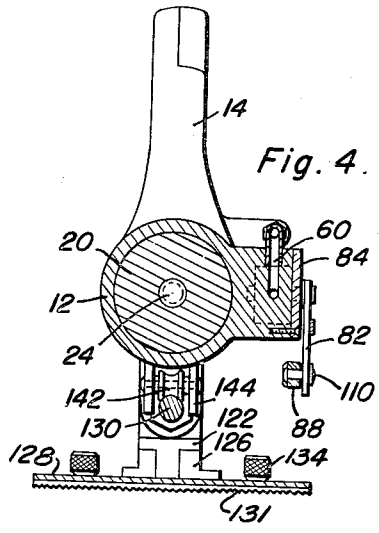


Fig. 7.

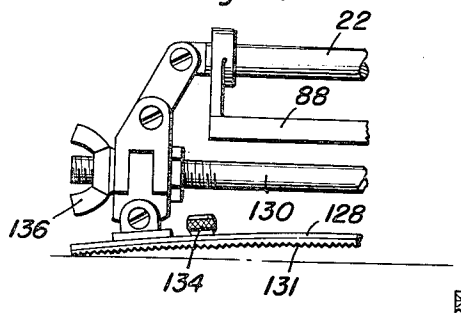


Fig. 8.

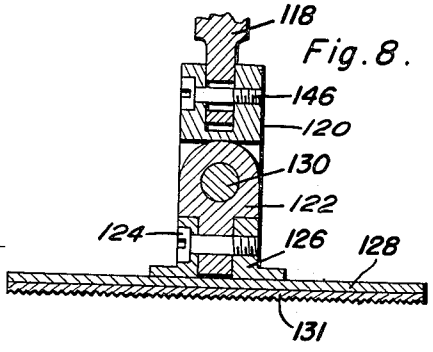


Fig. 9.

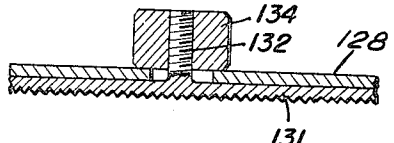


Fig. 10.

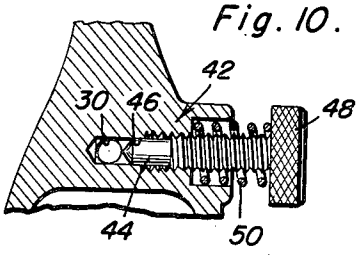
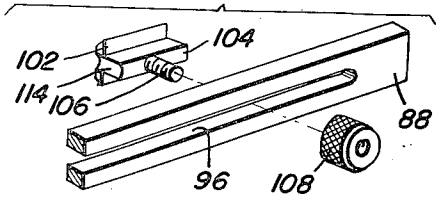


Fig. 11.



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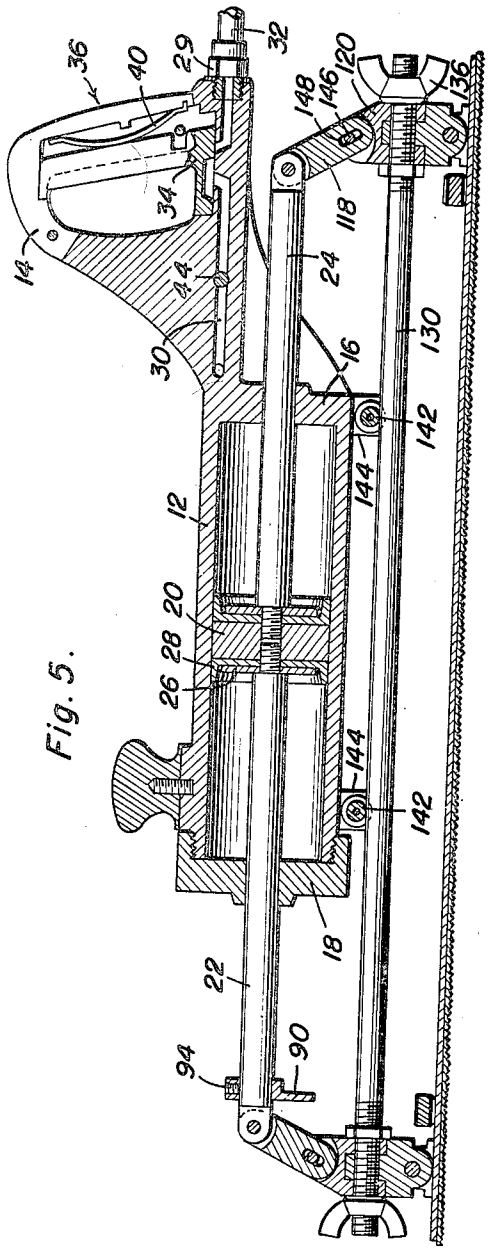


Fig. 5.

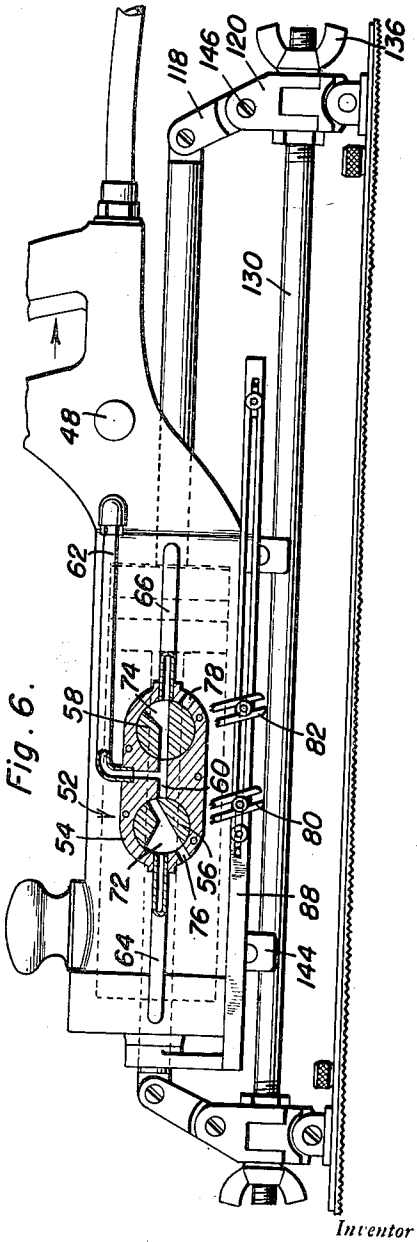


Fig. 6.

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UNITED STATES PATENT OFFICE

2,666,978

PNEUMATIC POWER FILE

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Application December 27, 1949, Serial No. 135,195

7 Claims. (Cl. 29—76)

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The present invention relates to new and useful improvements in power files, and more particularly pertains to a fluid pressure actuated file having improved means for controlling the reciprocation of the piston rod and for adjustably holding the file.

The primary object of this invention is to provide a power file which will efficiently perform the filing operation while requiring a minimum amount of time and effort on the part of the operator.

Another important object of this invention is to provide a power file in accordance with the foregoing object which may be adjusted to file arcuate surfaces and surfaces inclined to the horizontal.

Another important object of this invention in conformity with the foregoing objects is to provide a power file in which the length of the stroke of the file and its speed of oscillation is adjustable.

Another important object of this invention is to provide a power file of this character, which utilizes a fluid pressure cylinder, and in which the fluid pressure cylinder is guidingly supported relative to the file so as to avoid undue vibration and stresses in the same.

Still another object is to provide a device of this character of simple and practical construction, which is efficient and reliable in operation, relatively inexpensive to manufacture, and otherwise well adapted for the purposes for which the same is intended.

A meritorious feature of this invention resides in the means provided for engaging the file, which will permit the same to be angularly adjusted relative to the power cylinder as well as flexed for filing arcuate surfaces.

Another important feature of the present invention resides in the triple function of the guide rod, that is, forming a pivot for the angular adjustment of the file, adjusting the amount of flexing of the file, and guiding and supporting the power cylinder.

A final important feature to be specifically enumerated herein resides in the means provided for reciprocating the piston rod which includes a pair of rotary valves, which are adjustable to vary the length of the stroke of the file, and further valve means provided for controlling the rate of reciprocation of the piston rod.

These, together with various ancillary features and objects of the invention which will later become apparent as the following description

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proceeds, are attained by the present invention, the principles of which have been illustrated by way of example only in the accompanying drawings, wherein:

Figure 1 is a side elevational view of the present invention;

Figure 2 is a top plan view of the present invention, portions of the cylinder being broken away to show the internal construction of the same;

Figure 3 is a front elevational view of the present invention, the angle through which the body portion may be angularly adjusted being indicated in dash lines;

Figure 4 is a vertical transverse sectional view of the present invention, being taken upon the plane of the section line 4—4 of Figure 1;

Figure 5 is a vertical longitudinal sectional view of the present invention, being taken upon the plane of the section line 5—5 of Figure 2;

Figure 6 is a side elevational view similar to that shown in Figure 1, with the concealed portion of the piston rod and the piston being indicated in dotted outline and the rotary valve assembly being shown in vertical section to illustrate the internal construction of the same;

Figure 7 is a side elevational detail view illustrating the manner by which the file is flexed;

Figure 8 is a vertical transverse sectional view of the present invention, being taken substantially upon the plane of the broken section line 8—8 in Figure 1;

Figure 9 is a vertical longitudinal detail sectional view that is enlarged and taken upon the plane of the section line 9—9 of Figure 2;

Figure 10 is an enlarged vertical transverse sectional view taken upon the plane of the line 10—10 of Figure 1; and

Figure 11 is an exploded perspective detail view of the means provided for adjusting the length of the piston rod stroke.

Reference is now made more specifically to the accompanying drawings, wherein like numerals designate similar parts throughout the various views, and in which the pneumatic power file is indicated generally by the numeral 10.

The pneumatic power file 10 comprises an integral body formed with a cylinder 12 at one end and a handle 14 at the other, the cylinder 12 being closed at one end with an integral head wall 16 and at the other end by a cylinder head 18 threadingly engaging the outer end of the cylinder 12. A piston 20 is slidably disposed in the cylinder 12 and threadingly receives piston rods 22 and 24.

As will be clearly seen in Figure 5, the inner ends of the piston rods 22 and 24 are shouldered to hold the retaining rings 26 and packing members 28 against opposite faces of the piston 20, while the piston rods extend through the cylinder heads 18 and 16, respectively.

Means is provided to reciprocate the piston 20 in the cylinder 12. These means include a passage 30 in the handle 14, which, through a suitable coupling 29, at the rear of the handle 14, communicates with an air hose 32. The handle 14 includes a sliding valve 34 as a part of the hand grip 36, which is adapted to open and close the passage 30. As clearly shown in Figure 5, the hand grip 36 includes a spring 40 which yieldingly urges the sliding valve 34 to a position closing the passage 30, but which is depressed upon squeezing the hand grip 36 to slide the valve 34 to a position opening the passage 30 as will be readily understood. As best shown in Figures 5 and 10, the maximum amount of air permitted to flow in the passage 30 is adjustably controlled by the needle valve assembly indicated generally at 42. The needle valve 44 threadingly extends into a transverse bore 46 communicating with the passage 30, and which is provided at its outer extremity with a knurled knob 48 to facilitate turning of the same, and which is retained frictionally in adjusted relation by means of a compression spring 50.

The means to reciprocate the piston 20 further includes a rotary valve assembly 52 disposed to one side of the cylinder 12. The assembly 52 comprises a valve housing 54 preferably formed integrally with the cylinder 12, and in which is seated for rotation valve plugs 56 and 58. The rotary valve plugs 56 and 58 each communicates through a T-shaped passage 60 in the valve housing 54 and conduit 62 with the passage 30. The space in which the rotary valve plugs 56 and 58 are disposed further communicates through conduits 64 and 66, respectively, with opposite ends of the cylinder 12, L-shaped passages 68 and 70 being provided in the heads 18 and 16, respectively, for this purpose.

As may be readily understood upon reference to Figure 6, the rotary valve cores 56 and 58 are provided with openings 72 and 74 and the valve housing 54 provided with exhaust ports 76 and 78, the openings in the rotary valve plugs being of such a shape that the plugs may be rotated from one position affording communication between the conduit 62 and the interior of the cylinder 12 and another position providing communication between the interior of the cylinder 12 and the exhaust ports. Thus, it will be seen that air may be forced into one end of the cylinder 12 and exhausted from the other end alternatively by the use of the valve assembly 52 so as to cause the piston 20 and the piston rods 22 and 24 to reciprocate.

The rotary valve plugs 56 and 58 are rotated to reciprocate the piston 20 by means which include crank arms 80 and 82 which are connected to the valve plugs and disposed outside of the valve cover plate 84. The crank arms 80 and 82 are connected by a cross link 86 for simultaneous and synchronous actuation of the valve plugs upon rotation of either of the crank arms 80 or 82. A valve actuating member 88 is disposed laterally of the cylinder 12 which includes a transverse arm 90 at one end thereof which terminates in a collar 92 slidably embracing the piston rod 22, the collar 92 being adjustably retained on the piston rod 22 by means of a set screw 94 in the collar. The member 88 is provided with a longitudinal slot 96 in which are adjustably positioned stops 98 and 100. Each of the stops 98 and 100 comprises a slide 102 having a medial rib 104 disposed to slide in the slot 96, and a threaded projection 106 extending from the rib 104 engaged by a knurled nut 108. It will be understood that tightening of the nut 108 clamps the rib 104 in adjusted relation in the slot 96. Floating pins 110 extend through the slot 96 and slots 112 in the crank arms 80 and 82, which are adapted to engage the concaved end 114 of the stops 98 and 100.

The operation of the piston reciprocating means will be readily understood. Since the member 88 is connected to the piston rod 22, it will move therewith, the length of the stroke of the piston being determined by the spacing of the stops 98 and 100 which strike the floating pins 110 to actuate the valve plugs 56 and 58 for reversing the direction of travel. Accordingly, the length of the piston stroke may be shortened by moving the stops toward each other or extended by moving them apart, and when the piston stroke is short, the motion of the piston 20 may be confined to any predetermined portion of the cylinder 12 by either moving the stops 98 and 100 inwardly or outwardly on the member 88, or adjusting the collar 92 longitudinally on the piston rod 22 as will be understood. The importance of the degree of control held over the motion of the piston 20, that is, as to controlling the amplitude of its motion, restricting its motion to a selected portion of the cylinder 12, and controlling its velocity by means of the needle valve 44, will be more fully appreciated hereinafter.

The opposite outer ends of the piston rods 22 and 24 are flattened and pivoted by fasteners 116 to the bifurcated end of links 118, the other ends of the links 118 are pivotally received between bifurcated ends of eye members 120, the eye members 120 being rotatably interdigitated with a member 122, which is in turn pivoted by a fastener 124 between upstanding ears 126 on a flexible tool holder plate 128. A guide rod 130 extends through the interdigitated portions of the members 120 and 122 and constitutes a pivotal connection therebetween. A file 131 is secured to the member 128 by having upstanding threaded studs 132 thereon extending through the plate 128 and engaged by nuts 134, as best shown in Figure 9.

The opposite ends of the rod 130 are threaded and provided with wing nuts 136 which cooperate with stop nuts 138 to retain the members 120 and 122, which may be conveniently termed tool holders, in adjusted angular relationship, whereby the handle 14 and cylinder 12 may be adjusted angularly with respect to the plate 128 and file as indicated by the arrows 140 in Figure 3.

Means is provided to stabilize the power file 10, guide the movement of the rod 130, and lend support to the cylinder 12 and handle 14, which includes a pair of rollers 142 carried by the cylinder 12 and engaging the guide rod 130. The outer peripheries of the rollers 142 are concaved for engagement with the guide rod 130 and the rollers are journaled between pairs of lugs 144 depending from the cylinder 12.

An important function of the present invention resides in the fact that the wing nuts 136 may be moved toward each other on the guide rod 130, whereby the plate 128 and the file 131

may be forced to flex upwardly or downwardly as desired, the pivotal connections between the plate 128 and the piston rods permitting the file 131 to flex smoothly throughout its entire length as indicated in Figure 7. To retain the guide rod 130 in proper engagement with the rollers 142 when the file is in flexed condition, the lower ends of the links 118 which receive the pivot fastener 146 are slotted, as at 148, to compensate for the vertical displacement of the guide rod 130 during flexing of the file 131, it being noted that the pivot fastener 146 may be of a type that, upon tightening, retains the link 148 and the member 129 in adjusted relationship.

The advantages of the pneumatic power file disclosed herein will be readily appreciated. The paramount advantages flowing from the disclosed construction reside in the extreme flexibility of the machine, in that the file may be arcuately flexed or angularly adjusted relative to the handle 14, each of these adjustments being possible independently or simultaneously. The utility of the device is further enhanced by the extreme flexibility of control furnished over the motion of the file 131 which has been emphasized hereinbefore, it being noted that short strokes of the file are frequently desired when working on a plane surface but highly desirable when working on arcuate surfaces.

From the foregoing, the construction and operation of the invention will be readily understood and further explanation is believed to be unnecessary. However, since numerous modifications and changes will readily occur to those skilled in the art after consideration of the foregoing specification and accompanying drawings, it is not desired to limit the invention to the exact construction shown and described, but all suitable modifications and equivalents may be resorted to, falling within the scope of the appended claims.

Having described the invention, what is claimed as new is:

1. A fluid pressure actuated tool, comprising a cylinder, a piston rod slidably extending through and projecting from the opposite ends of said cylinder, means for imparting reciprocatory motion to said piston rod, a cutting element disposed laterally from said cylinder, means which include a pivotal connection carried at each end of the piston rod for engaging the cutting element, a guide rod disposed in parallel relation to said cylinder and connecting said last means and constituting the pivot for said pivotal connections, means carried by said cylinder and engaging said guide rod for guiding and supporting said cylinder relative to said cutting element.

2. The combination of claim 1, wherein said means for imparting reciprocatory motion includes a pair of rotary valves responsive to motion of the piston rod for actuation, and means operatively associated with the valves for adjusting the stroke of the piston rod.

3. A fluid pressure actuated tool, comprising a cylinder, a piston rod slidably extending through said cylinder, means for imparting reciprocatory motion to said piston rod, a flexible cutting element disposed laterally from said cylinder, a pair of tool holders each having one end pivotally connected to the cutting element, a pair

of links each having one end pivoted to opposite ends of said piston rod and the other end pivoted to one of said tool holders, a guide rod adjustably connecting said tool holders for flexing the cutting element, and means carried by said cylinder and engaging said guide rod for guiding and supporting said cylinder relative to said cutting element.

4. A power tool comprising a double-ended cylinder, a piston rod extending through said cylinder, valve means controlling the flow of actuating fluid into said cylinder, articulated links pivotally mounted at each end of said piston rod, tool holders transversely interdigited with said links, a guide rod extending through and connecting said tool holders to said links.

5. A power tool comprising a double-ended cylinder, a piston rod extending through said cylinder, valve means controlling the flow of actuating fluid into said cylinder, articulated links pivotally mounted at each end of said piston rod, tool holders transversely interdigited with said links, a guide rod extending through and connecting said tool holders to said links, adjusting means cooperating with said guide rod to determine the spacing of said tool holders.

6. A power tool comprising a double-ended cylinder, a piston rod extending through said cylinder, valve means controlling the flow of actuating fluid into said cylinder, articulated links pivotally mounted at each end of said piston rod, tool holders transversely interdigited with said links, a guide rod extending through and connecting said tool holders to said links, bearing guides on said cylinder, said guide rod being seated in said bearing guides.

7. A power tool comprising a double-ended cylinder, a piston rod extending through said cylinder, valve means controlling the flow of actuating fluid into said cylinder, articulated links pivotally mounted at each end of said piston rod, tool holders transversely interdigited with said links, a guide rod extending through and connecting said tool holders to said links bearing guides on said cylinder, said guide rod being seated in said bearing guides, said articulated links including a pin and slot joint.

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