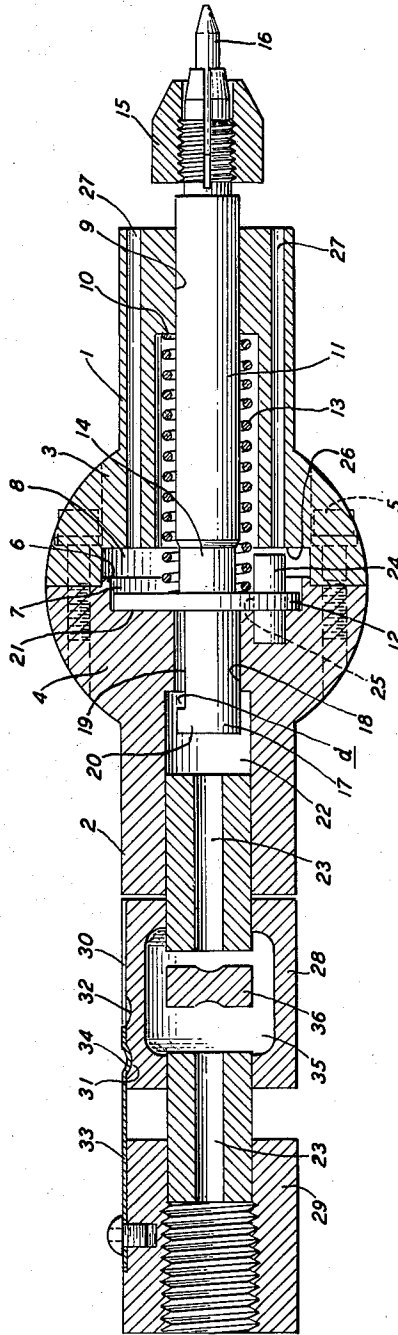


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H. R. KLENCK
PNEUMATICALLY DRIVEN TOOL FOR MARKING, CARVING
AND LIGHT HAMMERING
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INVENTOR
HERBERT RICHARD KLENCK
BY *[Signature]*
ATTORNEY

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PNEUMATICALLY DRIVEN TOOL FOR MARKING, CARVING, AND LIGHT HAMMERING

Herbert Richard Klenck, Richmond Hill, N.Y., assignor to Pneumatic Tool Sales & Repair Co. Inc., Long Island City, N.Y., a corporation of New York

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9 Claims. (Cl. 121-25)

The instant invention relates to a pneumatically driven tool, for example for marking hard surfaces, scaling paint, dental work, carving of all types, pin driving, or any work requiring light hammer blows, of which the vibrating point has an extremely short stroke at a high frequency.

An object of the invention is to provide a miniature pneumatic tool having a high stroke frequency and a short stroke of such proportions that it can readily be held and operated in one hand.

A further object is to provide a miniature pneumatic tool of which the casing is of such weight as substantially not to transmit vibrations to the user's hand in operation and is of such configuration as to be readily held.

A further object is to provide a pneumatic tool for one-hand operation of which the air valve may readily be opened and closed by a finger, usually the thumb or index finger, of the hand in which the tool is held while the tool is so held in working position.

The features, and objects, of the invention, will readily be understood from the following detailed description of an illustrative embodiment when read in conjunction with the annexed drawing in which the sole figure is a longitudinal section along the axis of the miniature pneumatic tool of my invention and of the air supply valve therefor.

The housing of the tool comprises two cylindrical sleeves 1 and 2 each integral with a hemispherical region 3 and 4, of which the flat bases are bolted airtight to each other by a plurality of bolts 5, an annular internal rim 6 extending from a cylindrical bore 7 with hemispherical region 4 into a cylindrical bore 8 of hemispherical portion 3 and concentric with bore 7 but of slightly larger diameter to provide a tight fit of rim 6 into bore 8. The housing is of a heavy metal, for example, steel, brass, ferrous or non-ferrous metals, and the apertures for bolts 5 are sufficiently deep that only the smooth spherical surface of housing portions 3 and 4 is encountered with the bolts properly tightened. In the sleeve portion 1 of the housing a longitudinal bore 9 is concentric with bore 8 and connects therewith beyond the annular shoulder 10. An elongated rod 11 slidable within bore 9 has integral therewith a disc 12 which is a snug sliding fit in bore 7. A compression spring 13 encircles the portion of the rod 11 between the shoulder 10 and disc 12 against which it is braced at its respective ends. To allow for the decrease in the internal diameter of the turns of spring 13 when the spring is compressed a portion 14 of the length of rod 11 adjacent to the face of disc 12 and about which the spring 13 is positioned is somewhat undercut. The free end of rod 11, which at all times extends from the end of sleeve 1 may be formed as the internal members of a chuck 15 by which a tool steel, or similar hard material, point 16 is held, as shown, or may be directly formed as such point, with which the scribing, etc., is had, as below explained.

The portion 17 of rod 11 to the other side of disc 12

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is a snug sliding fit in a bore 18 concentric with bore 7, and of an appreciably smaller diameter, and has a flat exterior surface 19 between its cylindrical free end region 20 and the disc 12. The flat surface 19 is obtained by removing an arcuate portion of the cylindrical surface of rod portion 17, as by milling. The length of the flat surface 19 longitudinally of the rod 11 is such that with the disc 12 against the shoulder 21 formed in bore 7 by the reduced diameter of bore 18, rod end portion 20 is within bore 22, concentric with and of a larger diameter than bore 18, a distance of a length of about $\frac{1}{16}$ " of the flat surface 19. The air supply duct 23 opens into the bore 22, and thus with compressed air inflowing such air will flow from bore 22 through opening *d* between the wall of bore 22 and flat surface 19 and against disc 12. Rotation of disc 12 primarily for locking the piston while tightening the chuck, is prevented by the pin 24 integral with the hemispherical housing portion 4 extending through an aperture 25 through disc 12 in a close sliding fit, pin 24 being of a length adequate to extend therethrough for the entire stroke length of disc 12, and preferably, in the assembled tool, with its free end striking the annular shoulder 26 formed by smaller diameter bore 9 extending from bore 8. Preferably aperture 25 and projection 24 are opposite to the flattened surface 19 of rod portion 17, so that the air entering through the gap between bore 18 and the flattened rod portion 19 will exert its fullest force on the face of disc 12 driving it to the right (as shown in the figure), compressing spring 13 with the air between the disc 12 and in bore 8 exhausting to the atmosphere through a pair of exhaust passages 27. In an alternative embodiment, the pin 24 is press fitted through the disc 12, and is of a length to slide in two bores, not shown, aligned therewith in sleeve hemispherical regions 3 and 4 respectively, thus avoiding all leakage of air between the pin 24 and aperture 25. It will be noted such drive continues until the cylindrical end 20 of rod portion 17 enters bore 18 when no further air can flow through bore 18. With the air inflow to drive disc 12 stopped, spring 13 now takes over and tends to restore to its original state from its now compressed state, driving the disc 12 to the left, until such compression of the spring is released, the spring expands, and the rod end 20 again is in bore 22 to uncover the above stated length portion *d* of flattened rod surface 19, when the cycle begins anew.

The air inlet duct 23 includes valve member 28 slidable a predetermined distance on the exterior of duct 23 and between an end nipple 29 on the duct 23 and the end face of tool sleeve 2. The slidable valve member 28 has an axially extending groove 30 in its outer cylindrical surface provided with two spaced detents 31 and 32 in its bottom surface. A flat spring 33 is affixed at one end to the nipple 29 and has a detent 34 at such distance from its free end as to be engaged to detent 31 when the slidable valve member 28 strikes nipple 29 and closes the air duct 23, and with detent 32 when the slidable valve member 28 strikes sleeve 2 and opens the air duct. Within a hollow interior region 35 defined by the slidable valve member 28, a gate member 36 is supported spaced from the walls of the hollow interior so that with slidable member 28 in the position shown in the figure, the gate member 36 is spaced from the openings of duct 23 into interior region 35, thus permitting passage of air from a source connected to nipple 29 to flow into the tool, while with the slidable member 28 pushed to strike the nipple end face 29, detent 34 of spring 33 enters detent 32, to hold gate member 36 against the source opening of duct 23 into interior region 35, thus shutting off the air supply. It is to be noted

that with the entire assembly held in the user's hand with point 16 against the work surface to be scribed, or otherwise worked upon, and the spherical portion 3, 4 grasped by the fingers, the slidable air valve member 28 may readily be pushed to open and close the air duct 23 by a simple and slight axial movement of a finger.

By way of example of the magnitudes involved, the total weight of a practical embodiment of the miniature pneumatic tool of my invention is 8¾ ounces, the spherical diameter is 1¼ inches, the diameter of bores 9 and 18 is ¼ inch, of bore 8 is 1⅝ inch, of bore 7 is ¾ inch, the distance of shoulder 10 from shoulder 26 about 15/16 inch, the length of flat surface 19 about ¾ inch, of disc 12 ¾ inch, and the diameter of rod 11, including portion 17, ¼ inch. With an air pressure of 40 to 60 lbs., and a spring pressure of from about 8 to 10 lbs., I obtain frequencies of the order of, for example, 2500 strokes per minute at an air pressure of 25 lbs. per square inch. It is furthermore noted that the vibrations of the point 16 with rod 11 and disc 12, are not transmitted to the hand of the user in that the inertia of the housing is such as to absorb vibrations, thus avoiding any unpleasant and tiring sensation to the user.

It is expressly understood that neither as to the form of the above embodiment nor as to the dimensions of any of its elements, do I limit myself thereto, and that modifications thereof will occur to the skilled worker in the art which will still be embraced and included within the scope and spirit of my invention.

What I claim is:

1. A pneumatic tool comprising a casing defining an internal bore therethrough of an increased diameter at an intermediate region, a formed piston reciprocable in the bore having an enlarged portion in the intermediate bore region and an end thereof projecting externally the casing, spring means acting against the face of the enlarged piston portion the nearer to its projecting end, valve means integral with the piston for applying compressed air from a source to the opposite face of the enlarged piston portion to drive the piston and to cut off the compressed air at the end portion of the air driven movement of the piston to permit the spring means to return the piston to the position in which the valve means is open, and an air supply passage of a diameter larger than the internal bore of the casing in which the end of the piston having the valving means is positioned connects in axial alignment with such casing internal bore, the spring means biasing the piston to project such piston end into the air supply passage a predetermined distance to permit air flow from the air passage through the bore and against such opposite face of the enlarged piston portion.

2. The pneumatic tool according to claim 1 in which the valving means comprises a groove in a peripheral region of the piston end portion from such opposite face of its enlarged portion to adjacent the end of the piston facing the air supply passage.

3. The pneumatic tool according to claim 2 in which the formed piston is an elongated rod and its intermediate portion is a disc, and the valving means is a longitudinal groove in its exterior cylindrical surface extending from the disc a predetermined distance to a point spaced from the end region of the rod facing the air supply passage.

4. A pneumatic tool comprising a hollow casing defining a longitudinal stepped bore therein of which the end portions are of predetermined diameter and an inter-

mediate portion of an enlarged diameter, an annular shoulder to each side of and spaced from the enlarged diameter bore portion at which the bore diameter is intermediate the predetermined and the enlarged diameters, an elongated cylindrical rod having end regions slidably fitted into the bore portions of the predetermined diameter, a disk integral with an intermediate region of the elongated rod and slidably fitted in the enlarged diameter portion of the bore, one end of the bore being adapted for connection to a source of compressed air, a tool being attachable to the end at the other end of the bore and extending from the bore, a spiral spring encircling the rod braced between the disk and the annular shoulder to the tool-bearing side of the rod, and a planar surface formed in the cylindrical surface of the rod extending longitudinally from the face of the disk opposite that against which the spring bears to a region of the rod adjacent its end toward the source of compressed air so that the planar surface extends a predetermined distance into the bore portion of intermediate diameter to the air source side of the bore with the spring forcing the disk to that end of the enlarged diameter bore to permit compressed air to flow through that end bore of predetermined diameter and against the disk to propel the disk against the tension of the spring at least the predetermined distance to seal such end bore and permit the spring to restore the disk to its original position whereby reciprocating motion is imparted to the rod and disk.

5. The pneumatic tool according to claim 4 for one-hand operation in which end of the casing defining the end bore for connection to the source of compressed air is provided with a slide valve for one finger operation to one of two positions in one of which the source is connected to and in the other of which the source is disconnected from such end bore.

6. The pneumatic tool according to claim 4 in which a fixed axial guide means cooperating with the disk prevents rotation of the disk about its axis.

7. The pneumatic tool according to claim 6 in which the guide means comprises a rod extending from at least one annular shoulder the length of the intermediate portion of the bore and a close-fitting aperture defined by the disk.

8. The pneumatic tool according to claim 5 in which the casing is of two-part construction bolted to each other, the regions of each part at their bolted portions being hemispherical in shape and of sufficient weight to dampen transmission of the reciprocatory motion of the rod and disk to the hand of the user.

9. The pneumatic tool according to claim 5 in which the slide valve has an internal gate member which in the closing position of the slide valve blocks the air passage from the source and in the open position is removed from the air passage to permit air flow around it into the end bore of the casing, the body of the valve being provided with a pair of notches, and a spring latching member mounted on the exterior wall of the air passage and adapted to engage one of the pair of notches when the valve body is pushed away from the casing to lock the gate member in the closed position and to engage the other notch when the valve body is pushed against the casing to lock the gate member in the open position.

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