

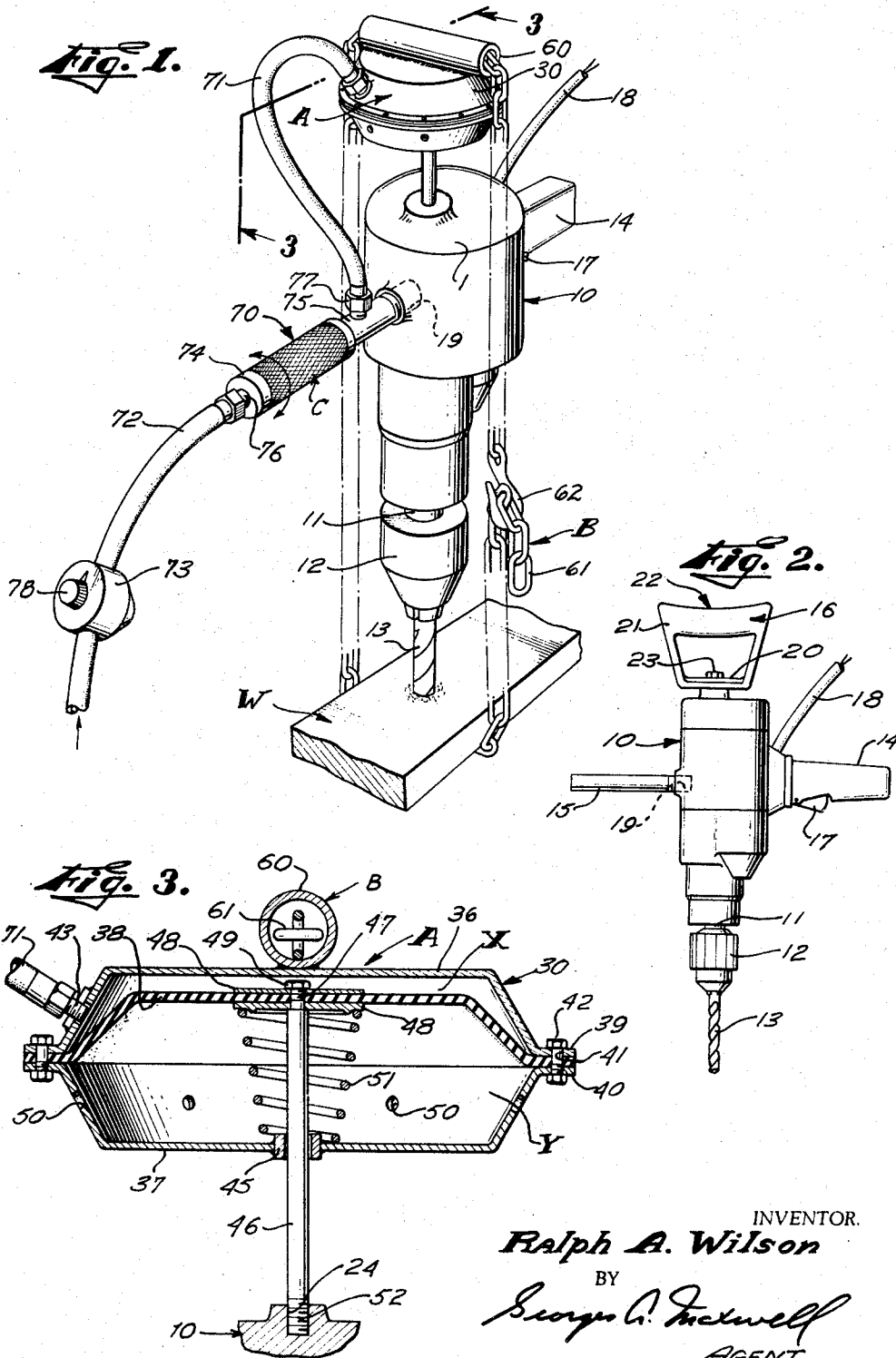
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PNEUMATIC FEED FOR ELECTRIC HAND DRILL

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## PNEUMATIC FEED FOR ELECTRIC HAND DRILL

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This invention relates to an apparatus applicable to an electric hand drill to support and feed the drill into engagement with a piece of work and is more particularly concerned with a pneumatic feed mechanism.

Electric hand drills are widely used in various manufacturing industries. In many circumstances where large diameter holes are to be established in heavy gauge steel, high powered, heavy duty hand drills must be employed. It frequently happens that the dispositioning of the work makes the drilling operation extremely difficult. For example, when it is desired to drill a hole in the frame of an automobile, the operator of the drill must slide under the automobile and then lift and support the drill into working position and then urge it into cutting engagement with the said frame. Due to the restricted space, the operator must necessarily acquire an awkward position which is very fatiguing and in which little of his strength and weight can be put to use.

An object of the present invention is to provide a supporting and feeding apparatus for an electric hand drill, which apparatus can be advantageously employed to hold an electric hand drill in working position with a piece of work and to feed the drill into the work.

It is another object of the present invention to provide a supporting and feed apparatus for an electric hand drill which is neat and compact and which can be advantageously employed in situations where little working space is available.

Another object of the present invention is to provide an apparatus for a hand drill of the character referred to in which the feed means is pneumatically operated and which includes mechanical means for engaging and supporting the drill on the work.

A further object of my invention is to provide suitable manually operable control and pressure regulator means for the feed means whereby advancing of the drill into engagement with the work can be advantageously controlled.

Still another object of the present invention is to provide an apparatus of the character referred to which is in the nature of an attachment and is such that it can be easily and quickly applied to or removed from an electric hand drill as circumstances require.

A further object of the present invention is to provide an apparatus of the character referred to which is easy and economical of manufacture and which is both highly effective and dependable in operation.

It is a feature of the present invention to provide an apparatus of the character referred to which includes a pneumatic drive means having a drive shaft engageable in the back or rear end of an electric hand drill and a supporting chain carried by the drive means and adapted to engage a piece of work.

It is another feature of the present invention to provide a manually operable control valve in the supply line, which valve is in the nature of a handle and is adapted to be applied as or substituted for a handle on the hand drill to which the apparatus is related.

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Another feature of my invention is to provide a pressure regulator valve in the air supply line to limit the pressure of the air delivered to the drive means and thereby control the pressure which can be exerted on the work through the drill.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a perspective view showing the apparatus provided by the present invention engaged with an electric hand drill and with a piece of work.

Fig. 2 is a side elevational view of the electric hand drill and showing it in its normal condition, without the apparatus of the present invention applied thereto.

Fig. 3 is an enlarged detailed sectional view of a portion of the apparatus that I provide and taken substantially as indicated by line 3—3 on Fig. 1.

The ordinary heavy duty electric hand drill such as is illustrated in Fig. 2 of the drawings, includes, a body 10 having upper and lower ends and in which a prime mover or motor is housed, a drive shaft 11 projects from the lower end of the body and carries a chuck 12 in which a suitable cutting tool or drill 13 is engaged. A pair of oppositely disposed, laterally outwardly projecting handles 14 and 15 are provided on the body, intermediate its ends, and a spade handle 16 is secured to and projects upwardly from the upper end of the body.

The handle 14 is formed as an integral part of the body 10 to project laterally therefrom and carries a suitable finger actuated switch 17 adapted to control the flow of current to the prime mover within the body. The current is supplied to the drill through a suitable power line 18 which, in the particular construction illustrated, enters the top side of the handle 14 at its inner end, that is, where it joins the body 10.

The handle 15 of the drill is a simple, straight bar or tubular member threadedly engaged in a socket 19 provided in the side of the body, diametrically opposite the handle 14. In practice, the handle 15 can be removed from the drill body if desired or if circumstances require.

The spade handle 16 is a substantially vertically disposed rectangular frame-like member having a lower horizontally disposed base 20, a pair of substantially vertically disposed legs 21 projecting upwardly from the ends of the base 20 and a substantially horizontally disposed hand engaging bar 22 fixed to and extending between the upper ends of the legs 21. The spade handle is releasably secured to the top end of the drill body 10 by means of a screw fastener 23 carried by the base 20 of the handle and engaged in a suitable threaded opening 24 provided in the top end of the body.

The apparatus provided by the present invention is adapted to be related to a drill construction of the character referred to above, to support the drill and feed the drill into engagement with a piece of work W. The apparatus is shown as involving generally, a pneumatic drive means A applicable to the top end of the drill body 10, a supporting means B carried by the drive means and engageable with the work W and manually operable control means C related to the drive means and adapted to control the operation of the drive means.

The drive means A is shown as including a pneumatic diaphragm motor 30, such as is employed in pneumatic braking systems for trucks and the like. The diaphragm 30 is shown as including, a hollow, sectional body having upper and lower concavo-convex portions 36 and 37 arranged in opposed relationship to each other, and a flexible disc-shaped membrane 38 engaged between the sections and establishing upper and lower chambers X and Y in the body. The sections 36 and 37 of the body

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are provided with radially outwardly projecting, peripheral flanges 39 and 40, which flanges establish flat engagement with the opposing surface of the membrane 38, about the outer peripheral portion thereof. The flanges 39 and 40 of the body sections 36 and 37 and the membrane 38 are provided with circumferentially spaced registering openings 41 adapted to receive suitable screw fasteners 42 which fasteners serve to hold the flanges in tight clamped engagement with the membrane 38.

The upper section 36 of the body is provided with a suitable hose fitting 43 adapted to connect with a suitable air hose and establish open communication between the hose and the chamber X of the body, which occurs above the membrane 38. The lower section 37 of the body is provided with a central vertically disposed cylindrical bearing 45 adapted to slidably receive an elongate vertically disposed operating or drive stem 46, which stem is fixed to and depends from the center of the membrane 38. In the particular case illustrated, the stem is shown as being provided with an externally threaded extension 47 of reduced diameter at its upper end, which extension projects through the membrane 38 and through a pair of washer-like members 48 arranged adjacent the top and bottom sides of the membrane. The washer-like members and the membrane are held in tight clamped engagement with each other and tight on the reduced extension and the top of the stem by a suitable nut 49 threadedly engaged on the upper terminal end of the stem extension.

In addition to the above, the lower body portion 37 of the diaphragm body is shown as being provided with a plurality of circumferentially spaced apertures or openings 50 adapted to allow for free passage of air into and out of the lower chamber Y of the body and occurring below the diaphragm. Still further, the diaphragm is shown as being provided with a suitable compression spring 51, engaged around the stem to occur between the lower washer-like part and the bottom section 37 of the case and normally yieldingly urging the membrane upwardly.

The lower end portion of the drive stem 46 is externally threaded as at 52 and is threadedly engaged in the opening 24 in the top of the drill body 10, which opening normally receives the screw fastener 23 for the spade handle 16.

With the above relationship of parts, it will be apparent that the pneumatic diaphragm motor 30 is operatively coupled with the drill body 10 and that upon the introduction of air into the upper chamber X of the body through the fitting 43, and resulting shifting of the membrane 38 downwardly in the body, the bodies of the diaphragm and the drill are shifted apart, axially of the operating stem.

It is to be understood that the particular diaphragm construction illustrated throughout the drawings is only illustrative of one pneumatic drive means that can be advantageously employed and that, in practice, any other suitable diaphragm construction or pneumatic cylinder piston construction can be employed, if desired, without effecting the novelty of the present invention.

The supporting and clamping means B that I provide is shown as including an elongate horizontally disposed sleeve 60 fixed to the top of the upper section 36 of the pneumatic diaphragm motor 30 and an elongate work-engaging chain 61 engaged through the sleeve. The chain is provided with a suitable chain hook 62 at one end to facilitate connecting the chain in looped engagement around the work W to which the drill and the apparatus is related and as clearly illustrated in Fig. 1 of the drawings.

With the above relationship of parts, it will be apparent that when the chain 61 is snugly engaged about the piece of work W and the chain hook 62 is made tight, in the manner illustrated in Fig. 1 of the drawings, the pneumatic diaphragm motor 30 is held in fixed position

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relative to the work. It will be further apparent that when the diaphragm is energized or actuated by the introduction of air into the upper chamber X thereof, the hand drill related to the diaphragm is urged into pressure engagement with the work.

The manually operable control means C that I provide is shown as including, a hand operated sleeve-type valve 70 which can, when circumstances permit, be substituted for or replace the removable handle 15 on the body 10 of the drill, an air conducting hose 71 connected to and extending between the valve 70 and the fitting 43 on the diaphragm body, an air supply hose 72 connected to and extending between a suitable air supply (not shown) and the valve and a pressure regulator valve 73 interposed or engaged in the air supply hose.

The manually operable control valve 70 is shown as including an elongate body 74 with inner and outer ends and having a threaded extension 75 at its inner end adapted to engage in the opening 19 in the side of the drill body 10, an air inlet fitting 76 at its outer end and connected with the air supply hose 72, a laterally projecting outlet fitting 77 at its inner end portion and connected with the air conducting hose 71, and a rotatable control sleeve surrounding the body and adapted to be rotated to control the flow of air through the valve. Since the particular porting and interior construction of the control valve can vary widely in construction, and since the particularly construction of the valve does not effect the novelty of the instant invention, I have not illustrated, and will dispense with further detailed description of the particular construction of the valve shown in the drawings.

It will be apparent that when my apparatus is engaged with a drill construction which is not provided with suitable means to receive and carry the control valve 70, in the manner set forth above, the valve can be loose or free without adversely effecting the operation of the construction, or can, if desired, be coupled or connected directly to the hose fitting 43 on the diaphragm.

The pressure regulator valve 73 is a conventional pressure regulator valve having a control knob 78 thereon and is engaged in the air supply line 72 to control the press of air delivered to the diaphragm through the control valve 70 and consequently controls the pressure which can be exerted upon the drill and the work by the diaphragm.

In practice, it is possible to eliminate the pressure regulator valve 73 from the apparatus without materially effecting its operation, however, in circumstances where the supply of air is under considerable pressure, the provision of the pressure regulator valve is desirable, since it eliminates the possibility of excessive pressures being exerted on or through the drill.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims:

Having described my invention, I claim:

1. An apparatus applicable to an elongated vertically disposed electric hand drill of the character described and having a central longitudinally disposed drive shaft with a bit engaging chuck including, pneumatically operated drive means operatively related to the hand drill to occur in axial alignment therewith, mechanical supporting means carried by the drive means and engageable with a piece of work and adapted to maintain said drive means in fixed position relative to said work with the hand drill therebetween, an air supply line connected with said drive means, and operating means including a manually operable control valve interposed in said line and controlling the flow of air to and from said drive means and a pressure regulator valve in said line ahead of said control valve, said drive means including a diaphragm motor having a hollow case, a flexible membrane in the

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case and defining upper and lower chambers, a drive stem fixed to said membrane to depend therefrom and through the case to engage the hand drill, and an air inlet fitting on the case communicating with the upper chamber and connected with the supply line, said drive means being adapted to urge and feed the hand drill towards the work upon the introduction of air into the upper chamber of the diaphragm motor.

2. An apparatus applicable to an elongate vertically disposed electric hand drill of the character described and having a central longitudinally disposed drive shaft with a bit engaging chuck including, pneumatically operated drive means operatively related to the hand drill to occur in axial alignment therewith, mechanical supporting means carried by the drive means and engageable with a piece of work and adapted to maintain said drive means in fixed position relative to said work with the hand drill therebetween, a supply line connected with said drive means and a manually operable control valve interposed in said line and controlling the flow of air to and from said drive means, said drive means including a diaphragm motor having a hollow case, a flexible membrane in the case and defining upper and lower chambers, a drive stem being fixed to said membrane to depend therefrom and through the case to engage the hand drill, and an air inlet fitting on the case communicating with the upper chamber and connected with the supply line, said drive means being adapted to urge and feed the hand drill towards the work upon the introduction of air into the upper chamber of the diaphragm motor, said supporting means including a sleeve fixed to the case and an elongate flexible member slidably engaged through the sleeve and engageable with the work.

3. An apparatus applicable to an electric hand drill having a body with a lower end from which a drive shaft

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projects and on which a chuck and drill are assembled, a side wall having an internally threaded handle receiving opening and a top end with an internally threaded fastener receiving opening, said fastener receiving opening being in axial alignment with the drive shaft said apparatus including a pneumatically operated diaphragm motor with a downwardly projecting drive stem threadedly engaged in the fastener receiving opening in the top of the drill body, mechanical supporting means carried by the drive means and engageable with a piece of work to maintain the diaphragm motor in fixed position relative to the work with the hand drill engaged therebetween, an air supply line connected with said diaphragm motor, and a manually operable control valve interposed in said line and controlling the flow of air to and from the drive means, said control valve having a part threadedly engaged in said handle receiving opening in the drill body to project laterally therefrom, said supporting means including an elongate horizontally disposed sleeve fixed to the diaphragm motor, an elongate chain slidably engaged through the sleeve and adapted to extend about the piece of work and a chain hook at one end of the chain to engage the other end portion of the chain.

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