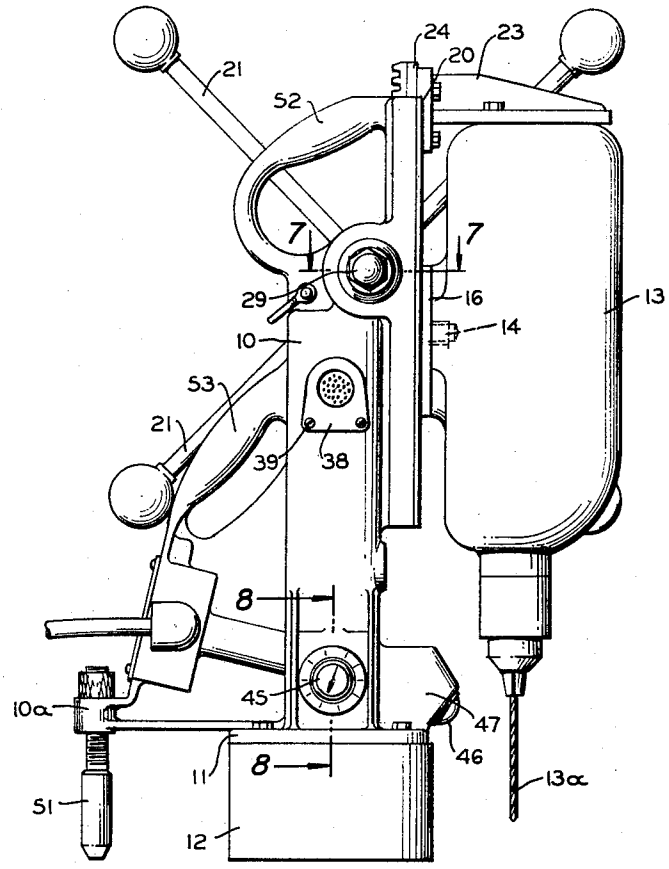
April 12, 1960 E. W. BUCK 2,932,194

MAGNETICALLY SUPPORTED PORTABLE TOOLS

Filed Oct. 29, 1956 4 Sheets-Sheet 1

FIG_1




INVENTOR.
EUGENE W. BUCK

BY
Allen and Chromy
ATTORNEYS

April 12, 1960 E. W. BUCK 2,932,194

MAGNETICALLY SUPPORTED PORTABLE TOOLS

Filed Oct. 29, 1956 4 Sheets-Sheet 2

FIG_2

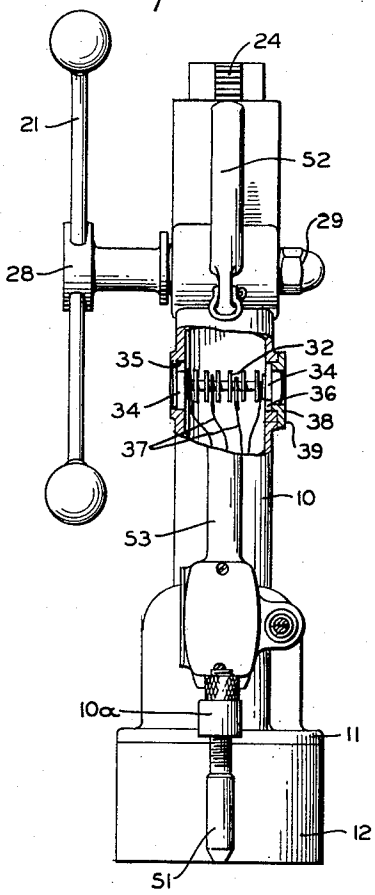



FIG_6

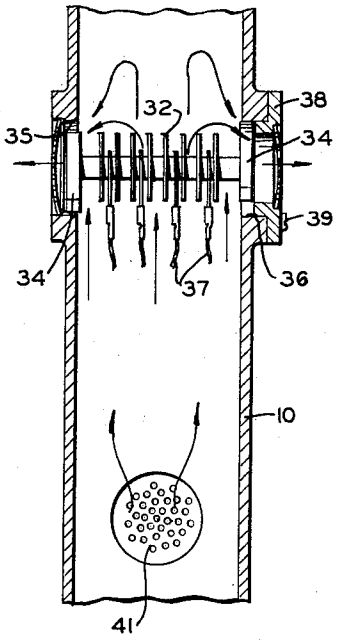



FIG_4

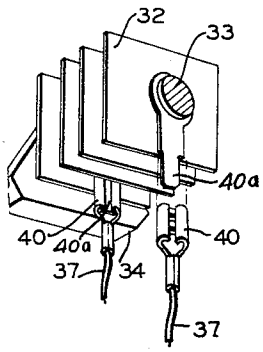



FIG_3

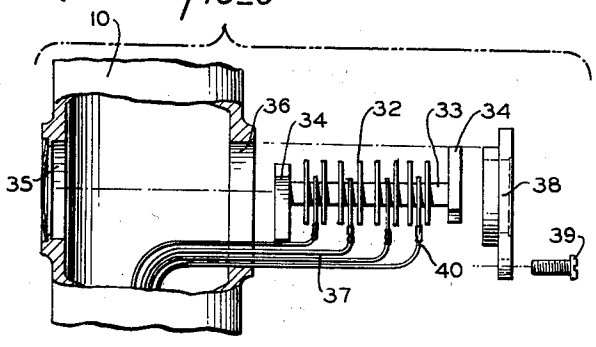
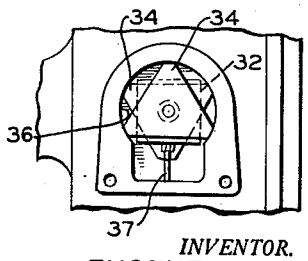



FIG_5




INVENTOR.
EUGENE W. BUCK

BY

Allen and Chromy

his ATTORNEYS

April 12, 1960 E. W. BUCK 2,932,194

MAGNETICALLY SUPPORTED PORTABLE TOOLS

Filed Oct. 29, 1956 4 Sheets-Sheet 3

FIG_7

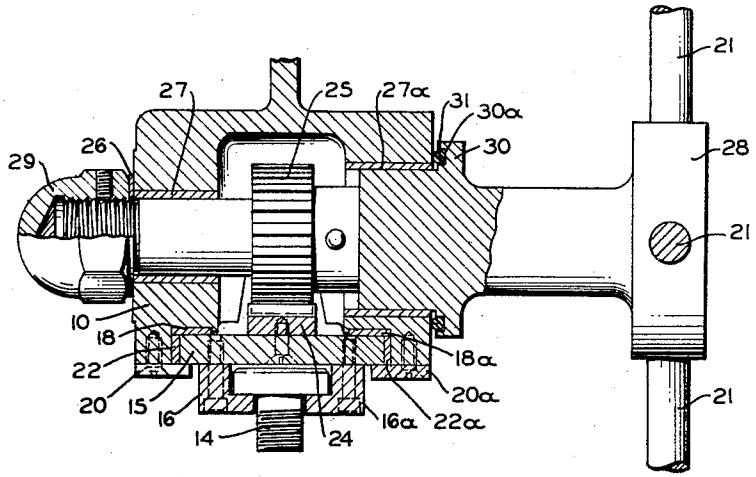



FIG_9

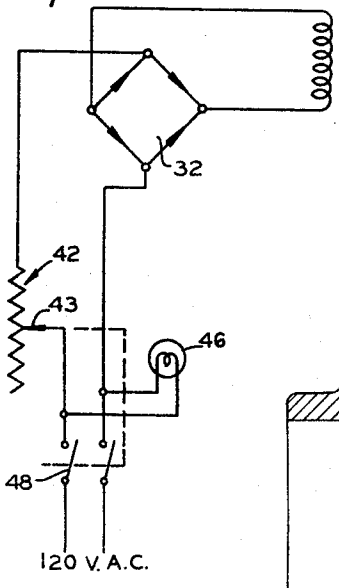
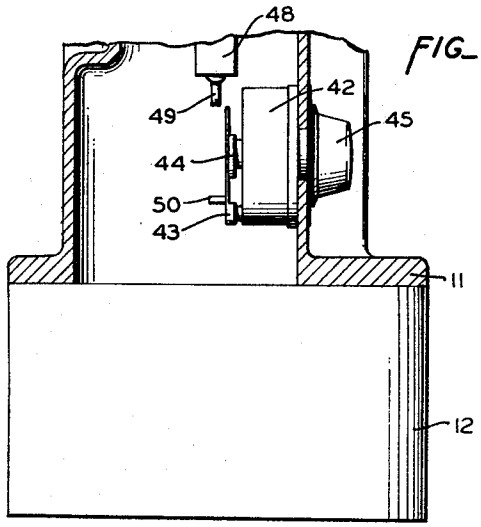



FIG_8




INVENTOR.
EUGENE W. BUCK

BY Allen and Chromy
his ATTORNEYS

April 12, 1960 E. W. BUCK 2,932,194

MAGNETICALLY SUPPORTED PORTABLE TOOLS

Filed Oct. 29, 1956 4 Sheets-Sheet 4

FIG_10

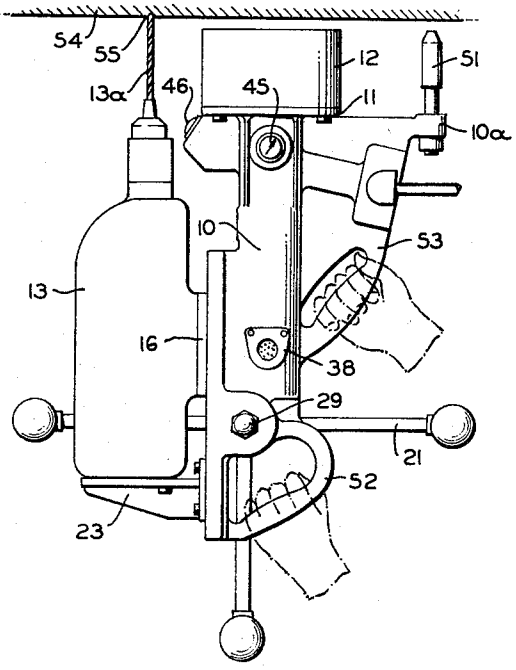
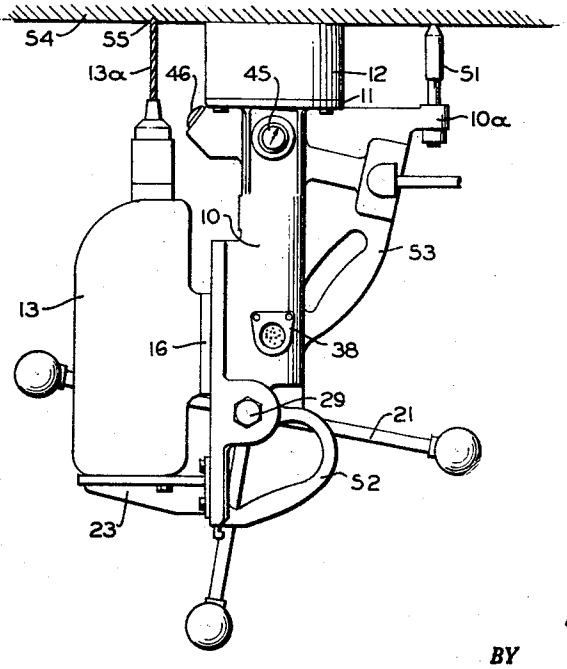



FIG_11




INVENTOR.
EUGENE W. BUCK

BY

Allen and Cromy

his ATTORNEYS

United States Patent Office 2,932,194
Patented Apr. 12, 1960



2,932,194

# MAGNETICALLY SUPPORTED PORTABLE TOOLS

Eugene W. Buck, Los Gatos, Calif., assignor to Buck Manufacturing Company, San Jose, Calif., a corporation of Delaware

Application October 29, 1956, Serial No. 618,935

13 Claims. (Cl. 77—59)

This invention relates to portable tools in general. More particularly this invention relates to portable tools adapted to be electromagnetically supported.

An object of this invention is to provide an improved portable tool with means for locating the working bit of the tool on the surface of the work prior to magnetically attaching the tool support adjacent to the work area.

Still another object of this invention is to provide an improved portable tool with an electromagnetic foot structure for magnetically supporting the tool which is slidably attached to and frictionally held in predetermined positions on the support.

A further object of this invention is to provide an improved portable electric tool having an electromagnet for holding said tool on magnetic surfaces and having a dry type rectifier that is housed in the frame of the tool and is readily accessible for replacement and servicing whenever necessary.

Still another object of this invention is to provide an improved support for mounting a portable tool on the electromagnetic foot structure thereof, said tool being frictionally held in definite positions on a supporting slide so that the working bit of the tool may be held in a definite position over the work and thereafter the electromagnet of the support may be energized and drawn firmly to the magnetic supporting surface against the friction of the tool support.

Another object of this invention is to provide an improved mounting means for the dry type rectifier employed for rectifying the alternating current to direct current which is supplied to the electromagnet of magnetically supported portable tools whereby the rectifier is easily accessible and detachable for replacement or servicing.

Other and further objects of this invention will be apparent to those skilled in the art to which it relates from the following specification, claims and drawing.

In accordance with this invention there is provided a portable tool having electromagnetic foot structure for supporting the portable tool upon a magnetic surface while the tool is employed to perform certain work such as drilling and tapping holes and the like. In this improved apparatus the tool is slidably supported on a member attached to the foot structure in such a way that the tool may be adjusted to pre-determined positions and held in any one of these positions by means of a frictional clutch even through the tool is used in an overhead or any other position. With this arrangement the point of the drill bit or tap may be located exactly over the centering mark or hole formed in the work piece before the electromagnet of the foot structure is brought against the magnetic supporting surface to support the tool in this position. This advantageous operation is accomplished by means of the aforesaid frictional clutching arrangement whereby the point of the working tool may be brought to and held at a position slightly below the lower surface of the electromagnetic



foot structure so as to permit locating this point exactly over the mark provided on the work surface before allowing the electromagnetic field of the electromagnet to firmly attract and magnetically grip the magnetic supporting surface. When the tool point is properly located, the electromagnet of the foot structure is brought firmly against the magnetic supporting surface while the tool point is held at the marked position. When the electromagnetic foot structure is brought against the magnetic support by the magnetic forces set up therein, the frictional clutch controlling the slidable support of the tool yields slightly to permit the lower surface of the foot to be drawn firmly against the magnetic supporting surface while at the same time the tool point is held at the marked position on the work surface.

In addition to the above features, this apparatus also employs a novel and improved support for the dry type rectifier that is provided for rectifying the alternating current and supplying direct current to the electromagnet. The rectifier is supported and connected to the electric circuit in such a way that it may be readily removed and disconnected for servicing or replacement. For this purpose, the axial member of the rectifier is supported on small plates which are arranged to fit into recesses formed in a hollow frame member of the portable tool. These recesses are arranged so that air may circulate therethrough and provide ventilation for the rectifier unit as well as providing supporting surfaces therefor. In addition, the connections provided to the rectifier unit may be quickly detachable clamp on type of connections so that the rectifier unit may be quickly disconnected without the necessity of employing a soldering iron when it is necessary to test the unit or replace it.

Further details of this invention are set forth in the following specification, claims and drawing, in which briefly:

Fig. 1 is a side elevational view of an embodiment of this invention;

Fig. 2 is a rear view partially in section of an embodiment of this invention;

Fig. 3 is an expanded view showing the dry rectifier unit being removed from the hollow frame member of this apparatus;

Fig. 4 is a detail view showing the readily detachable connections employed on the rectifier terminals;

Fig. 5 is a detail view showing how the rectifier is supported in the holes provided in the apparatus frame to permit easy removal of the rectifier unit therefrom;

Fig. 6 is a sectional view of the hollow frame member showing the recesses provided therein for the purpose of circulating cooling air around the rectifier unit;

Fig. 7 is a sectional view taken along the line 7—7 of Fig. 1 and illustrating the frictional clutch and the rack and pinion arrangement employed for slidably supporting the tool mechanism on the frame member of this apparatus;

Fig. 8 is a sectional view along the line of 8—8 of Fig. 1;

Fig. 9 is a schematic wiring diagram of this apparatus;

Fig. 10 is a view showing the positioning of this apparatus over a point in an overhead work piece; and

Fig. 11 is a view similar to Fig. 10 showing the manner in which the electromagnetic foot structure is brought against the magnetic surface of the work piece after the point of the tool bit is located at the marked point of the work surface.

Referring to the drawing in detail, there is shown in Fig. 1 a side view of an embodiment of this apparatus in which the hollow frame member **10** is provided with a flange **11** at one end thereof for the purpose of attaching this hollow frame member to the casing **12** in which the winding of the electromagnet is housed.

The tool 13, which in this case is an electric drill, is shown in dotted outline in Fig. 1 and the mid portion of the motor of this tool is attached to the slidable member 15 by means of a suitable bolt 14. For this purpose there are provided two angular members 16 and 16*a* which are attached to the slidable plate 15 by means of suitable machine screws and these angular members 16 and 16*a* clamp the head of the bolt 14 therebetween. The plate 15 is slidably held against the back strips 18 and 18*a* by means of the strips 20 and 20*a*, respectively, which are held on the frame member 10 by suitable machine screws as shown in Fig. 7.

The strips 18 and 18*a* are provided for the purpose of taking up wear that occurs when the plate 15 is moved up and down during normal use of this apparatus and after a certain amount of wear, new strips 18 and 18*a* may be inserted to compensate therefor. Similar side strips 22 and 22*a* are provided along the sides of the plate 15 for the same purpose and these strips 22 and 22*a* are pressed against the strips 18 and 18*a*, respectively, by the plates 20 and 20*a*, respectively. The strips 18 and 18*a* are lodged in slot-shaped recesses formed in the frame 10 and these strips together with the strips 22 and 22*a* engage edge portions of the back strips 18 and 18*a*, respectively, so that these strips are interlocked as shown in Figure 7. These strips 18, 18*a*, 22 and 22*a* may, of course, be made of softer material in order that wear resulting from use of this apparatus will take place therein rather than on the plate 15 and the strips 20 and 20*a* which may be surface hardened steel.

The top of the electric drill motor is also attached to the slidable plate 15. As shown in Fig. 1, a bracket 23 is attached by suitable bolts to the top portion of the plate 15 and also to the top of the drill motor 13.

The rack 24 is attached to the back side of the plate 15 as shown in Fig. 7, and cooperates with the pinion 25 which is fixedly mounted on the shaft 26 that is journaled in the frame member 10. Suitable bearing sleeves 27 and 27*a* are provided around bearing surfaces of this shaft. One end of the shaft 26 is threaded to receive the cap nut 29 and the other end is provided with a flange 28 in which there are formed a plurality of threaded holes for receiving the radially extending hand grips 21 which are adapted to be engaged by the operator for the purpose of rotating the shaft 26 and pinion 25 when it is desired to move the rack 24 and slidable plate 15 up and down.

The shaft 26 is provided with a flange 30 in which there is formed an annular recess 30*a* that is adapted to receive the ring 31 which is made of resilient material, such as, rubber, neoprene, silicone rubber and the like. This ring 31 projects out of the recess 30*a* a distance such that it may be brought into frictional engagement with the flat surface of the frame 10 opposite to the flange 30. The frictional contact of the ring 31 with the surface of the frame 10 may be regulated by adjusting the cap nut 29 so that this ring acts as a frictional clutch and holds the shaft 26 against undesired rotation. In this way the plate 15 carrying the electric drill or similar tool may be held in a predetermined position by this frictional clutch, irrespective of the position of the unit, for example, this friction clutch is adapted to hold the electric drill 13 in a predetermined position on the support even though the unit is inverted for overhead drilling or if it is upright for use on a work bench or if it is horizontal for drilling in a sidewall.

The electromagnet winding that is positioned in the casing 12 is provided with a plurality of turns of insulated copper wire through which electric current is passed for the purpose of setting up a magnetic field through a central core member that is positioned inside of the casing 12 and through the walls of this casing. It is preferred that the current supplied to the electro-magnet winding be a direct current and in order that this apparatus may be operated from conventional 120 volt lighting circuits which are supplied with alternating current, a rectifier 32 is provided.

This rectifier is made up of a plurality of discs that have a surface coated with specially prepared selenium or the like and these are arranged to provide a full wave rectifier. The rectifier is mounted on a rod 33, the ends of which are fitted into supports 34 which may be made of substantially triangular shape as shown in Fig. 5. The supports 34 may be made of insulating material and the corners thereof are cut away so as to provide surfaces for engaging side walls of the holes 35 and 36 that are provided in opposite sides of the hollow frame member 10 as shown in Figs. 2, 3 and 5. Thus the supports 34 have dimensions such that one of these supports fits into the circular hole 35 and the other of these supports fits into the circular portion of the hole 36. This latter hole 36 is made somewhat larger so that the connecting wires 37 that are connected to terminals of the rectifier 32 may be conveniently extended out of the frame member when the rectifier is extracted from the inside of the frame through the hole 36 as shown in Fig. 3. In order for the rectifier to be so removed, the cover plate 38 which is adapted to go over the hole 36 is first removed by taking out the screws 39 that are provided for the purpose of holding this cover plate. The rectifier may then be extracted from the frame by gripping one of the supports 34 and pulling the unit outward. When the unit is out of the frame it may be disconnected by removing the detachable connections 40 that frictionally engage the flat, elongated end portions of the terminals 40*a* of the rectifier unit as shown in Fig. 4. Thus the rectifier unit is readily removable for testing or replacement.

The rectifier unit 32 is mounted with the supports 34 thereof lodged in holes formed in the frame member as described above; in such position the discs of the rectifier unit are adapted to be swept by air passing through the hollow frame member 10. The air enters the hollow frame member 10 through the holes 41 and passes around the rectifier discs and out through the holes 35 and 36 through suitable passageways around the insulation supports 34 as shown in Fig. 6. Of course, where this apparatus is used in an inverted position as shown in Figs. 10 and 11, air entering through the holes 35 and 36 may be circulated around the rectifier 32, and in this case the circulating air will leave the frame through the holes 41. In either the upright or vertical position of this mechanism, sufficient circulating air passes around the rectifier 32 to provide appropriate cooling therefor so that efficient operation of this rectifier is not impaired by excessive heat.

The current to the winding electromagnet positioned in the casing 12 is controlled by the rheostat 42 which comprises a resistance winding that is engaged by a wiper contact 43. This rotatable contact is supported by the shaft 44 which is controlled by the knob 45 of insulating material. The resistance of the rheostat 42 is connected as shown in Fig. 9 so that variable amounts of this resistance may be connected in series with the input of the rectifier 32. In this way the output voltage of this rectifier may be controlled by the rheostat 42 and consequently the current through the winding of the electromagnet may be either increased or decreased between certain limits. Thus the magnetic field produced by this winding may also be increased or decreased, and as a result the holding power of the electromagnet may be varied with the result that if it is desired to move the apparatus by sliding it along the magnetic work surface, the holding power of the electromagnet may be slightly reduced and the apparatus shifted more readily.

A small light 46 is provided in the casing 47 which is attached to the side of the frame 10 as shown in Fig. 1. This light is arranged so that the work surface below the point of the drill bit 13*a* is illuminated thereby. Electric current is provided to the light 46 when this

light is connected to the source of current supply through the switch 48. This switch is a conventional toggle type that is provided with notched actuating lever 49 adapted to be engaged by the pin 50 which is carried by the wiper contact 43 of the rheostat 42. The switch 48 is supported by the frame 10 in a position such that it is closed when the wiper contact 43 is turned from the high resistance position of the rheostat in the direction to reduce the effective resistance thereof. Consequently, the switch 48 is opened when the wiper contact 43 is rotated in the direction necessary to increase the effective resistance until the high resistance end of the rheostat is reached, at which time the notched lever 49 is engaged by the pin 50 and the switch is open.

The frame member 10 is also provided with an extension 10*a* that extends to the back thereof substantially in line with the drill bit 13*a* which is positioned to the front of the frame member. The purpose of the extension 10*a* is to receive the threaded stud 51 which is threaded through a suitable hole formed in this extension. The bottom end of the stud 51 is adapted to be brought into engagement with the work surface for the purpose of bracing the apparatus to prevent slight shifting of the drill bit 13*a* with respect to the work surface when drilling pressure is applied to this drill bit, that is, when the operator is manipulating the levers 21 and applying pressure to said drill bit. This arrangement so stabilizes the apparatus that even minute torsional shifting thereof caused by this pressure is prevented.

Hand grips 52 and 53 are also provided to the frame of this apparatus so that the operator may employ both hands in positioning the mechanism for performing the desired operation as shown in Fig. 10 wherein the device is being located on the work surface 54 in preparation for drilling a hole at the marked point 55.

In the operation of this apparatus, the point of the drill bit 13*a* is placed into the small hole 55 before the foot structure magnetically grips the magnetic work surface firmly. In this way the drill bit may be properly located with the least effort. After the drill bit is located at the point where it is desired to drill the hole, the electromagnet which is full energized, brings the foot structure and the stud 51 firmly against the surface of the magnetic work piece 54, as shown in Fig. 11, with the point of the drill bit 13*a* in the desired marked position on the work piece. In order to accomplish this it is necessary to press the foot structure and stud 51 toward the work surface against the holding action of the friction clutch, thereby causing this clutch to slip sufficiently to bring the drill bit 13*a* even with the base surface of the foot structure. During this operation, the point of the drill bit 13*a* is lodged in the marked point of the work. If desired, the current through the winding of the electromagnet may be purposely reduced by means of the rheostat 42 until the drill bit is properly located at the point where the hole is to be drilled to permit easier shifting of the apparatus and thereafter the electromagnet may be given the full current so that the magnetic grip thereof is of sufficient strength to hold the apparatus firmly on the work.

While I have shown a preferred embodiment of the invention it will be understood that the invention is capable of variation and modification from the form shown so that its scope should be limited only by the scope of the claims appended hereto.

I claim:

1. An electromagnetic drill press comprising an electromagnetic foot structure and a mount structure including a post upstanding from the foot structure, an electric drill, means for slideably attaching said electric drill to said post, said means having a frictional element, and means for pressing said frictional element against surfaces of said post with sufficient force to hold said electric drill in a predetermined work engaging position so that the tip of the drill bit of said electric drill may be located at a marked point of the work to be drilled prior to energization of the electromagnet in said foot structure and while the plane of the work surface is below the bottom of the electromagnetic foot structure, and an electric switch for closing the circuit of the electromagnet in said foot structure to energize the latter for magnetically holding said foot structure on the work surface.



2. An electromagnetic drill press comprising an electromagnetic foot structure and a mount structure including a post upstanding from the foot structure, an electric drill, means for slidably attaching said electric drill to said post, said means having a frictional element, and means for pressing said frictional element against surfaces of said post with sufficient force to hold the drill bit of said electric drill in a predetermined work engaging position so that the tip of the drill bit of said electric drill may be located at a marked point of the work to be drilled prior to energization of the electromagnet in said foot structure and while the plane of the work surface is below the bottom of the electromagnetic foot structure, and an electric switch for closing the circuit of the electromagnet in said foot structure and energizing the latter for magnetically holding said foot structure on the work surface, said frictional element being of resilient material and being adapted to yield sufficiently to permit said foot structure to be placed against said work surface after said drill bit is on said marked point.

3. An electromagnetic drill press comprising an electromagnetic foot structure and a mount structure including a post upstanding from the foot structure, an electric drill, means for slidably attaching said electric drill to said post comprising a plate slidably mounted on said post, a rack attached to said plate, a pinion, a shaft for rotatably supporting said pinion on said post, a flange on said shaft, a substantially circular resilient rubber member positioned in a recess formed in said flange, said rubber member being held in frictional contact with surfaces of said post for holding said electric drill in a predetermined work engaging position so that the tip of the drill bit of said electric drill may be located at a marked point of the work to be drilled prior to energization of the electromagnet and while the plane of the work surface is below the bottom of the electromagnetic foot structure, and an electric switch for closing the circuit of the electromagnet in said foot structure to energize the latter for magnetically holding said foot structure on the work surface.

4. An electromagnetic drill press comprising an electromagnetic foot structure and a mount structure including a post upstanding from the foot structure, said post being provided with a cavity, a dry A.C.-D.C. rectifier having a mounting member passing therethrough, said cavity having holes formed therein to permit air circulation through said cavity, means engaging said mounting member for supporting said rectifier in said cavity in the path of the air circulating through said cavity, an electric drill, means for slidably attaching said electric drill to said post, said means having frictional means for holding said electric drill in a predetermined work engaging position so that the top of the drill bit of said electric drill may be located at a marked point of the work to be drilled prior to energization of the electromagnet and while the plane of the work surface is below the bottom of the electromagnetic foot structure, and connections for connecting the input of said rectifier to a source of alternating current and for connecting the direct current output to the electromagnet of said electromagnetic foot structure to energize said electromagnet for magnetically holding said foot structure on the work surface.

5. An electromagnetically supported tool comprising an electromagnetic foot structure having an electromagnet and a mount structure including a post having a cavity, means for attaching said post to said foot structure, slidable means for supporting a tool on said post, a dry rectifier, said cavity having holes formed in the sides thereof one above the other to permit air circulation through said cavity, a rod for supporting said recti-

fier in said cavity between a pair of said holes and substantially in alignment therewith, said rectifier being positioned in the path of the air circulating through said cavity, and means for connecting the input of said rectifier to a source of alternating current and for connecting the direct current output to said electromagnet.

6. An electromagnetically supported tool as set forth in claim 5, further characterized in that said means for connecting the input of the rectifier to a source of alternating current comprises means for varying the input current so that the rectified current to said electromagnet may be gradually reduced to facilitate moving the tool on the magnetic work surface.

7. An electromagnetically supported tool as set forth in claim 6, further characterized in that said means for varying the rectifier input current comprises a rheostat having a rotatable contactor, a pin carried by said rotatable contactor, a toggle switch for controlling the current to said rectifier, said switch having means engageable by said pin for actuating said switch to open said switch when the effective resistance of said rheostat is maximum.

8. An electromagnetically supported tool as set forth in claim 7, further characterized in that said frame is provided with a housing bulging from the lower part thereof toward the drill bit, said housing having a tilted front having a hole therein, a lamp positioned in said hole tilted to direct the light therefrom upon the work surface.

9. An electromagnetically supported tool as set forth in claim 5, further characterized in that said rod extending through said rectifier is provided with a pair of recessed members, one of said recessed members being at one end of said rod and the other being at the other end of said rod, one of said recessed members being positioned in one of said pair of holes and the other of said recessed members being positioned in the other of said pair of holes, said recessed members being shaped so that parts thereof engage surfaces of the corresponding holes to support said rectifier while permitting air passage through said holes by way of the recessed parts of the recessed members.

10. An electromagnetically supported tool as set forth in claim 9, further characterized in that one of the holes



in which said rectifier is supported is shaped with an enlarged portion so that said rectifier may be readily removed through the latter hole from said cavity.

11. An electromagnetically supported tool as set forth in claim 10, further characterized in that said rectifier is provided with terminals for making electrical connections thereto, said connections having frictional means for holding said connections firmly on said terminals so that said rectifier may be readily disconnected when it is removed from said cavity.

12. An electromagnetically supported tool comprising a mount structure having an electromagnet, said mount structure having a cavity, slidable means for supporting a tool on said mount structure, a dry rectifier, said cavity having holes formed in the sides thereof, a rod for supporting said rectifier in said cavity between said holes and substantially in alignment therewith, means for connecting the input of said rectifier to a source of alternating current and for connecting the direct current output to said electromagnet, said rod being adapted to extend through said rectifier, a pair of recessed members, one of said recessed members being at one end of said rod and the other being at the other end of said rod, one of said recessed members being positioned in one of said pair of holes and the other of said recessed members being positioned in the other of said pair of holes, said recessed members being shaped so that parts thereof engage surfaces of the corresponding holes to support said rectifier, one of the holes being shaped with an enlarged portion so that said rectifier may be readily removed therethrough.

13. An electromagnetically supported tool as set forth in claim 12, further characterized in that said rectifier is provided with terminals for making electrical connections thereto, said connections having frictional means for holding said connections firmly on said terminals so that said rectifier may be readily disconnected when it is removed from said cavity.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,487,690 | Marti | Mar. 18, 1924 |
| 2,672,770 | Buck | Mar. 23, 1954 |