Feb. 6, 1934. M. C. KABIGTING 1,946,214

DRILL

Filed Dec. 17, 1931

Fig. 1.

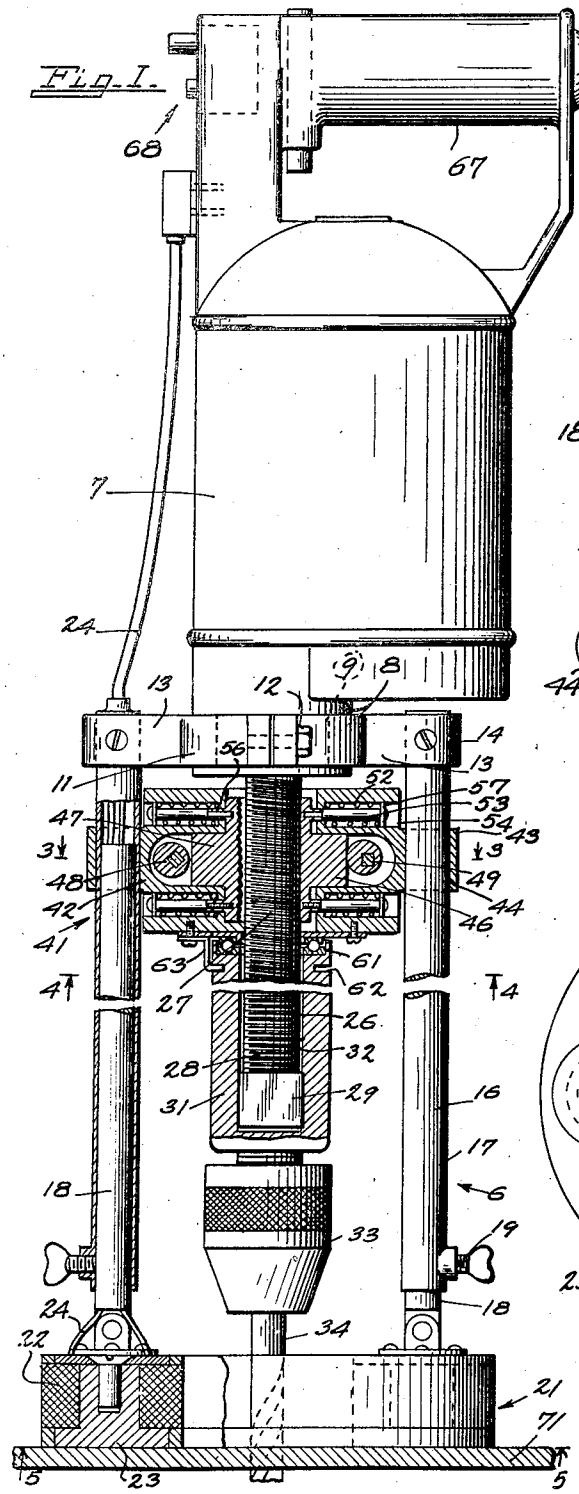
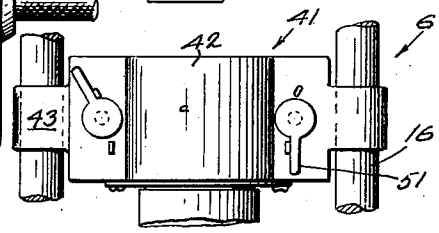


Fig. 2.



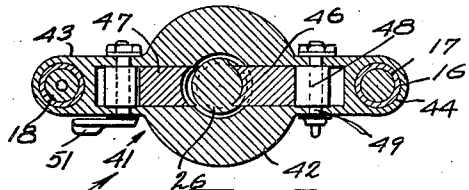


Fig. 3.

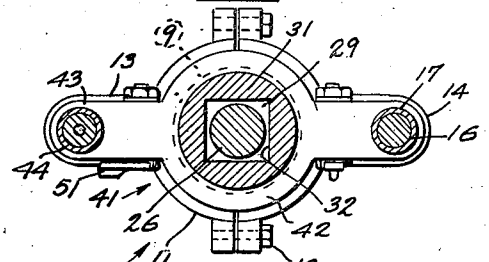


Fig. 4.

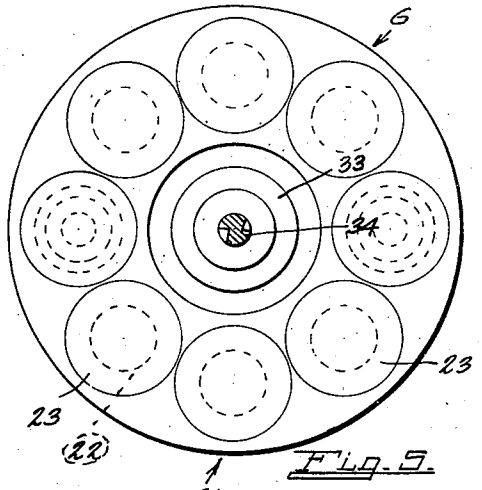


Fig. 5.

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1,946,214

DRILL

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Application December 17, 1931
Serial No. 581,681

2 Claims. (Cl. 77—32)

This invention relates to drilling machines, and more especially to that class of drilling machines which is known in the trade as "power drills" or "electrical breast drills."

An object of the present invention is to provide a "power drill" of the general class indicated, having means for avoiding the necessity for the operator to exert pressure thereagainst in order to effect feeding of the drill to the work.

Another object is to provide a self-feeding "power drill" as indicated, wherein the feeding means is adapted to advance the drill at any one of a plurality of selective speeds, so that different classes of work and drills of different diameter may be accommodated.

Another object is to provide means for rigidly securing the entire drilling machine with respect to the work to be drilled.

The invention possesses other objects and advantageous features, some of which, with those enumerated, will be set forth in the following description of the invention's particular embodiment which is illustrated in the drawing accompanying and forming a part of the specification.

Referring to the drawing:

Fig. 1 is a view in side elevation of a drilling machine embodying the principles of the present invention. Portions of the figure are broken away and shown in section to disclose the construction of different parts of the machine.

Fig. 2 is a view in side elevation of the feeding mechanism, portions of the figure being broken away to reduce its size.

Fig. 3 is a horizontal sectional view taken upon the line 3—3 of Fig. 1, with the direction of view as indicated.

Fig. 4 is a horizontal sectional view taken upon the line 4—4 of Fig. 1, with the direction of view as indicated.

Fig. 5 is a bottom plan view of the magnet whereby the drilling machine may be attached to the work. This view may be considered a horizontal sectional view taken upon the line 5—5 of Fig. 1, with the direction of view as indicated.

It is well known that one of the disadvantages of a "power drill" or "electrical breast drill" is that such a tool requires that the operator exert great physical force thereagainst in order to cause the rotating drill to penetrate metal. The present invention seeks to overcome this disadvantage by providing means for securing the drilling machine rigidly with respect to the work to be drilled, and means for mechanically advancing or feeding the drill at a proper rate proportional with the rate of rotation thereof as determined by the character of the work being drilled and the diameter of the drill being used.

Specifically described, the preferred embodiment of my drilling machine comprises a frame, indicated in its entirety at 6 and adapted to be mounted upon the housing 7 of a conventional "power drill" or "electrical breast drill." A tool of this general class is commonly provided with a projecting, circular boss 8, which serves as the support for the journal through which the spindle of the conventional drilling machine extends. I prepare the conventional electrical drill for use in connection with my improvement, by removing the spindle which is conventionally supplied therewith, and by turning an annular groove 9 in the outer circumferential wall of the boss 8. The frame 6 includes an upper clamp 11 in the form of a split annular collar adapted to enter the groove 9 and to be clamped therein rigidly by means of screws 12 or their equivalent interconnecting the two sections of the collar. Diametrically opposed extensions 13 are provided upon the collar 11, and a socket member 14 is formed upon the outer end of each of the extensions 13.

The frame 6 also includes telescopic legs 16, each comprising a tubular upper member 17, the upper end of which is rigidly but preferably removably received within one of the socket members 14 and a lower member 18 slidably received within the tubular upper member 17. Each leg 16 is provided with a set screw 19, preferably manually adjustable to secure the sections 17 and 18 rigidly in selected position, thereby making it possible to vary the effective length of the frame 6, as will readily be understood.

An electromagnet 21 is rigidly mounted upon the lower ends of the lower sections 18 of the frame 6. This electromagnet is annular in form, and includes a plurality of coils 22 spaced thereabout, each coil being provided with an individual core 23, the lower end of which preferably is exposed at the under surface of the electromagnet 21. All of the coils 22 of the electromagnet 21 are adapted to be energized by means of conductors 24 which extend through one of the legs 16 to a suitable location upon the housing 7.

The housing 7 conventionally contains a motor (not shown) and a spindle (not shown) extending through the boss 8 and carrying the chuck whereby a drill may be mounted in operative position. I remove this conventional spindle and chuck, and substitute therefor a spindle 26 of special design,

this spindle 26 being connected to the motor within the housing, preferably in the same manner as that which has been removed, so that when the motor is energized the spindle will be rotated. The spindle 26 is relatively long, and carries a plurality of threads 27 and 28 of different pitch at different sections of the spindle 26. The spindle 26 is also provided with a non-circular portion 29, preferably square, at the lower end thereof.

A socket 31 is provided with a non-circular bore 32, within which the non-circular portion 29 of the spindle 26 is slidably received. Hence, the socket 31 is splined to the spindle 26 to be rotated thereby, but is permitted to slide freely in an axial direction with respect thereto. Inasmuch as the spindle 26 extends in parallel with the legs 16 of the frame 6, this motion of the socket 31 will be in a direction parallel to the legs. The socket 31 carries a chuck 33, preferably of conventional design, whereby drills 34 of various diameters may be rigidly but removably mounted in axial alinement with the spindle 26 to be rotated thereby when the motor within the housing 7 is energized.

Means are provided for advancing the socket member 31 as the spindle 26 rotates, so as to feed the drill 34 to the work. This feeding means is indicated in its entirety at 41, and comprises a housing 42, preferably of substantially annular form and encircling the spindle 26. The housing 42 is provided with diametrically opposed lugs or ears 43 having apertures 44 through which the legs 16 extend slidably, thereby permitting the housing 42 to move in an axial direction upon the frame 6, but holding the housing against rotation with respect thereto. Adjustable nut sections 46 and 47 are mounted within the housing 42, there being at least one such nut section for each of the threaded sections 27, 28 of the spindle 26. These nut sections are provided with segmental threads complementary to the associated threads on the spindle, and are adapted to be engaged selectively therewith. For this purpose a cam 48 is mounted upon a transversely extending pin 49 in back of each nut section 46, 47, and each pin 49 is provided with a handle portion 51 (see Fig. 2) whereby that pin may be turned. Each nut section 46, 47 is urged outwards away from the spindle 26 and into contact with the associated cam 48 by means of springs 52, each of which encircles a pin 53 rigid with the associated nut section. Each spring 52 is disposed within a socket 54 and is under compression between a shoulder 56 at the inner end of that socket and a flange or washer 57 rigid with the associated pin 53.

The socket 31 is adapted to be advanced by the feeding means 41; and whereas the socket 31 rotates with the spindle but the housing 42 of the feeding means 41 does not rotate, I prefer to interpose a thrust bearing 61 between the upper end of the socket 31 and the lower side of the housing 42. I also prefer to provide means for connecting the socket 31 to the housing 42, so that the socket 31 and chuck 33 will not be permitted to drop away from the housing 42 when the feeding means is in elevated position. Whereas any suitable type of interconnection may be employed, I have illustrated the socket 31 as being provided with an annular groove 62 in its outer surface and adjacent its upper end, within which is engaged a bracket 63 rigid with the under surface of the housing 42.

Current is supplied to both the motor within the housing 7 and the electromagnet 21 by conductors 66 which lead to the housing 7, preferably through the handle 67 thereof. A control switch 68 is provided in convenient location, whereby energization of the motor may be controlled and energization of the electromagnet 21 also may be controlled by this same switch 68, if desired, under which circumstances the motor 7 and the electromagnet 21 will preferably be connected in parallel with each other and in series with the switch 68.

Operation

Inasmuch as in the present modification an electro-magnet 21 is utilized as the means for securing the drilling machine rigidly with respect to the work, it will readily be understood that this modification is intended for drilling magnetic material such as steel plate 71. After a drill 34 of proper size has been selected and suitably mounted in the chuck 33, the frame 6 should be adjusted so that it is of proper length, permitting the point of the drill 34 to make contact with the proper portion of the plate 71 when the feeding means 41 is in proper position with respect to the spindle 26. After the rate at which it is desired to feed the drill 34 to the work has been determined, the proper nut section 46 or 47, as the case might be, is forced inwards into engagement with the spindle 26, it being understood, however, that the housing 42 has first been slid axially so that the selected nut section is in registry with that section 27 or 28, as the case might be, of the spindle 26 which carries threads complementary to those of the selected nut section. Moreover, before starting to drill, the selected nut section should engage the spindle 26 adjacent the upper end of the associated threaded section 27, 28 of the spindle, so that maximum advance of the drill may be attained before requiring that a new adjustment of the feeding means and frame 6 be made.

Energization of the electromagnet 21 will cause it to adhere firmly to the plate 71, thereby making it possible for the feeding means 41 to advance along the spindle 26 and press the drill 34 into the work.

It is to be understood that the details of the invention as herein disclosed, are subject to alteration within the spirit or scope of the appended claims.

I claim:

1. A drilling machine comprising a frame, means for securing said frame rigidly with respect to the work to be drilled, a motor mounted on said frame, a revoluble spindle connected to said motor to be rotated thereby, said spindle having threads of different pitch thereon at different longitudinal positions, feeding means comprising a housing slidably engaging said frame, a plurality of nut sections carried by said housing, each of said nut sections being threaded complementarily to one of the threaded portions of said spindle, and means for selectively advancing each of said nut sections into threaded engagement with its associated spindle section, a socket having a non-circular bore, said spindle having a non-circular portion slidably fitted to said bore, a chuck carried by said socket, and means connecting said socket to said feeding means.

2. In a drilling machine, a plurality of guide members, a feeding means slidably mounted thereon and retained from rotation by the guide means, said feeding means having a plurality of adjustable nut sections with a spring means to

retract such sections, a spindle extending through the feeding means and having threads of different pitches at different positions lengthwise thereof, a socket member surrounding part of the spindle and having a drive connection therewith to rotate the socket member, an attaching means securing the socket member to the feeding means to permit rotation of the socket member and to feed same by the feeding means, and a cam to engage each nut section to bring such section into engagement with one of the pitch threads on the spindle.

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