

[54] **DRILLING DEVICE**

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 575,740, Aug. 29, 1966, Pat. No. 3,464,295.

[52] U.S. Cl. **408/112**

[51] Int. Cl. **B23b 45/14**

[58] Field of Search 77/55 G, 55, 7; 408/110, 408/111, 112, 241

[56] **References Cited**

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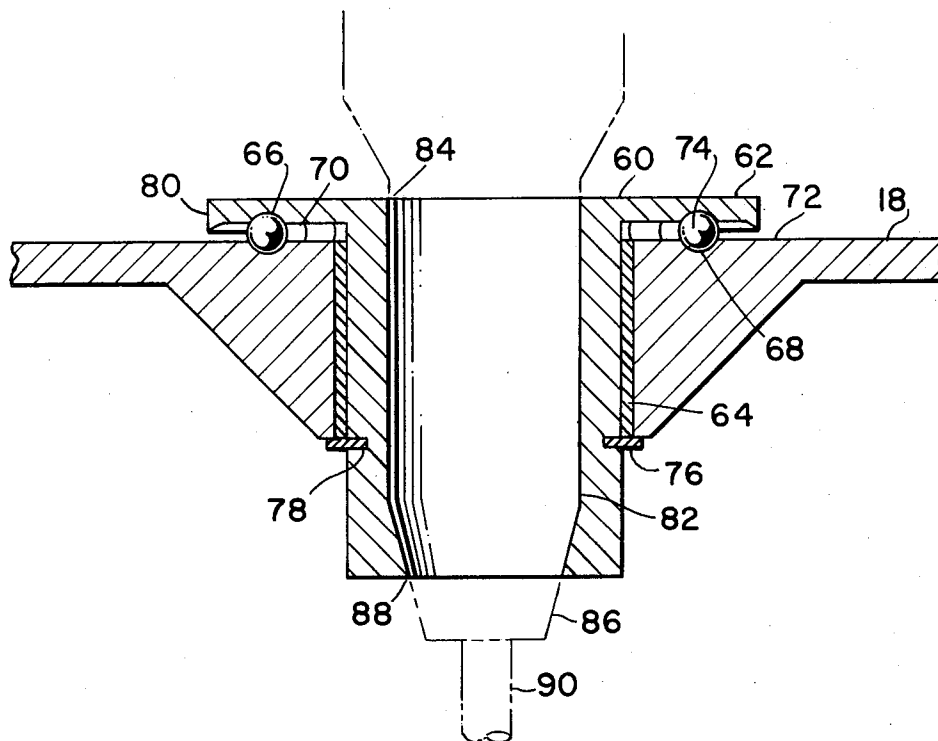
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[57] **ABSTRACT**

A drilling device for supporting a drill with the axis of the drill held in a desired relationship to a workpiece and permitting relative axial movement of the drill toward the workpiece.

7 Claims, 9 Drawing Figures



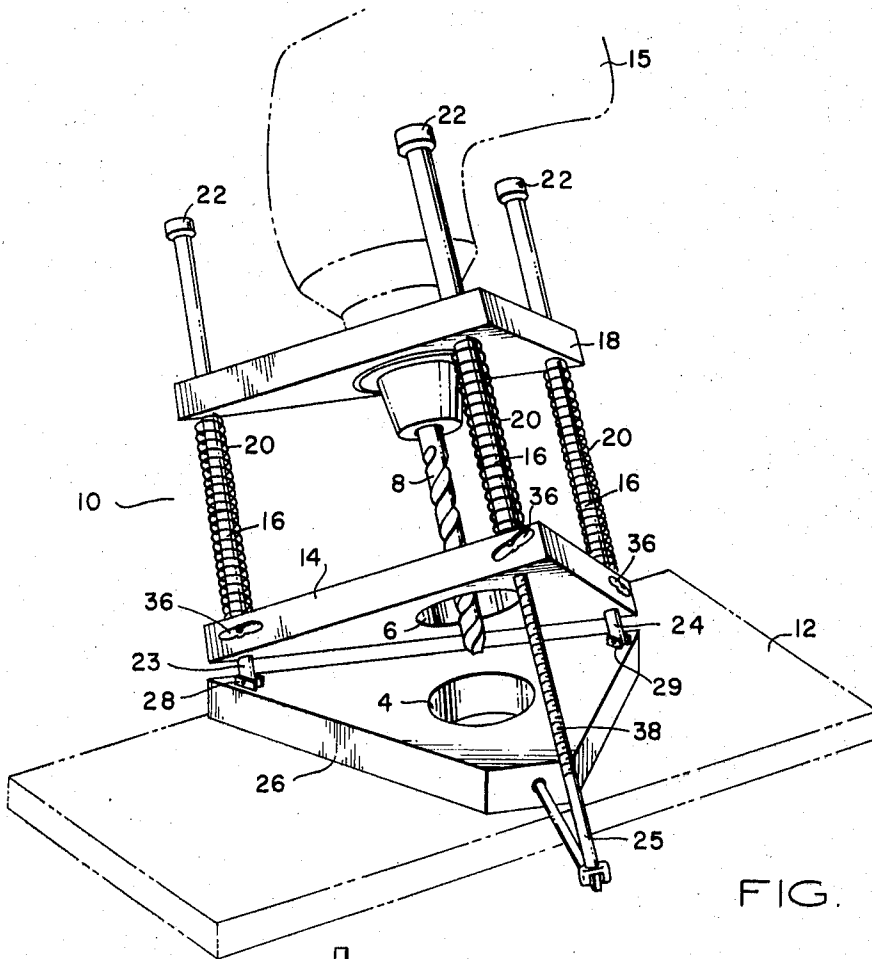


FIG. 1

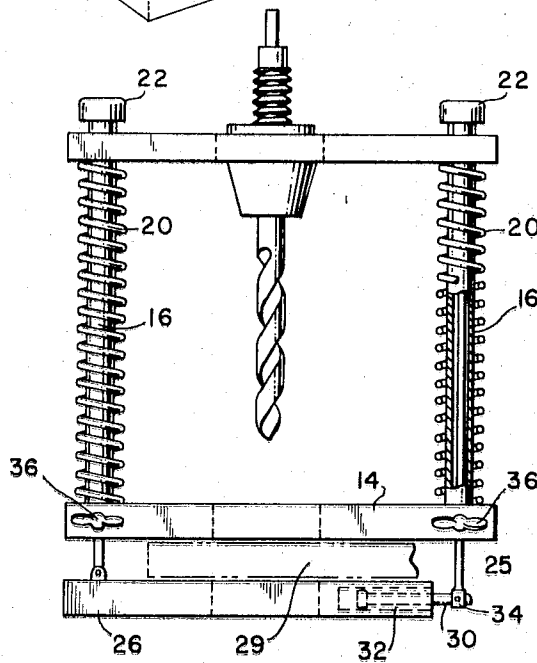


FIG. 2

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[Signature]

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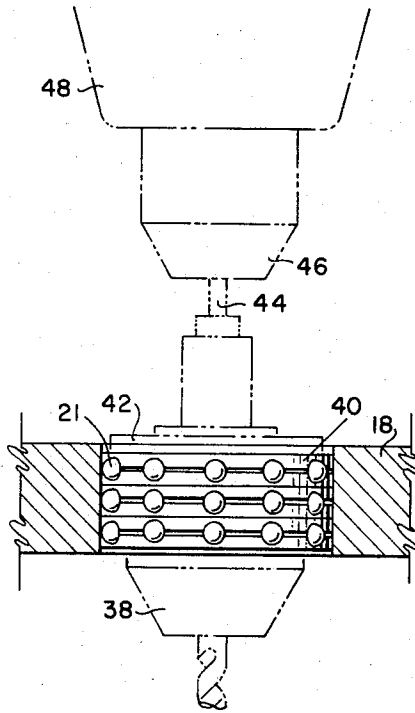


FIG. 5

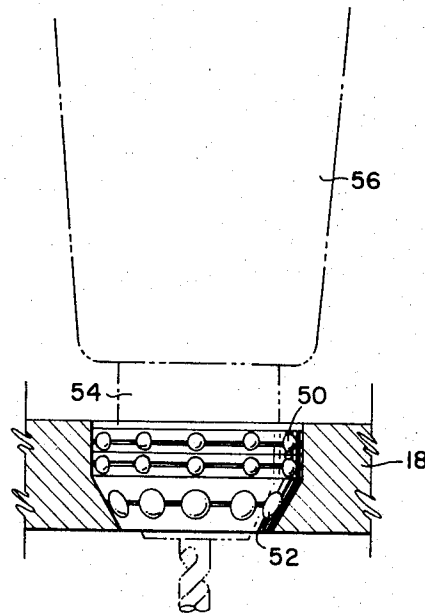


FIG. 6

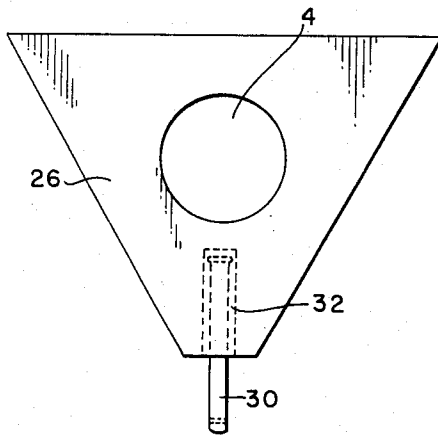


FIG. 3

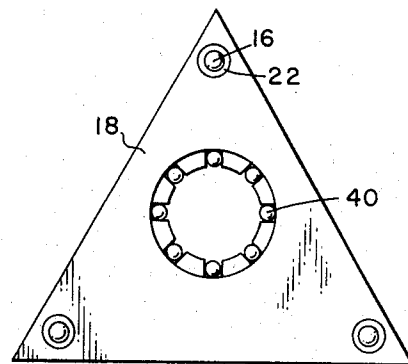


FIG. 4

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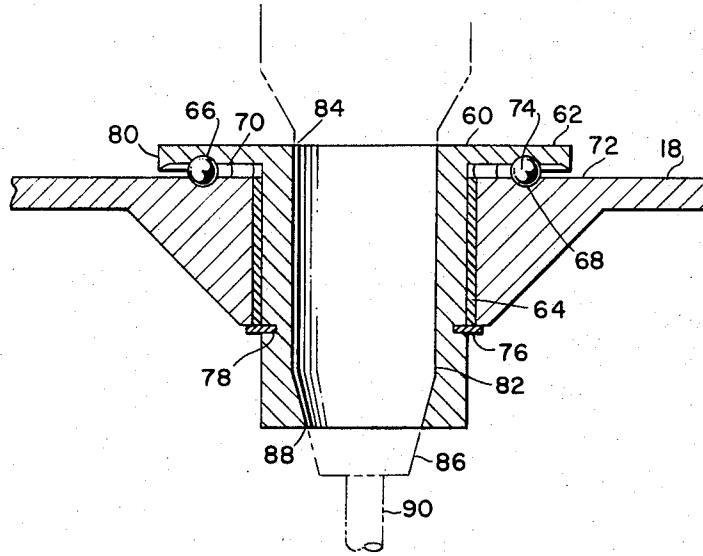


FIG. 8

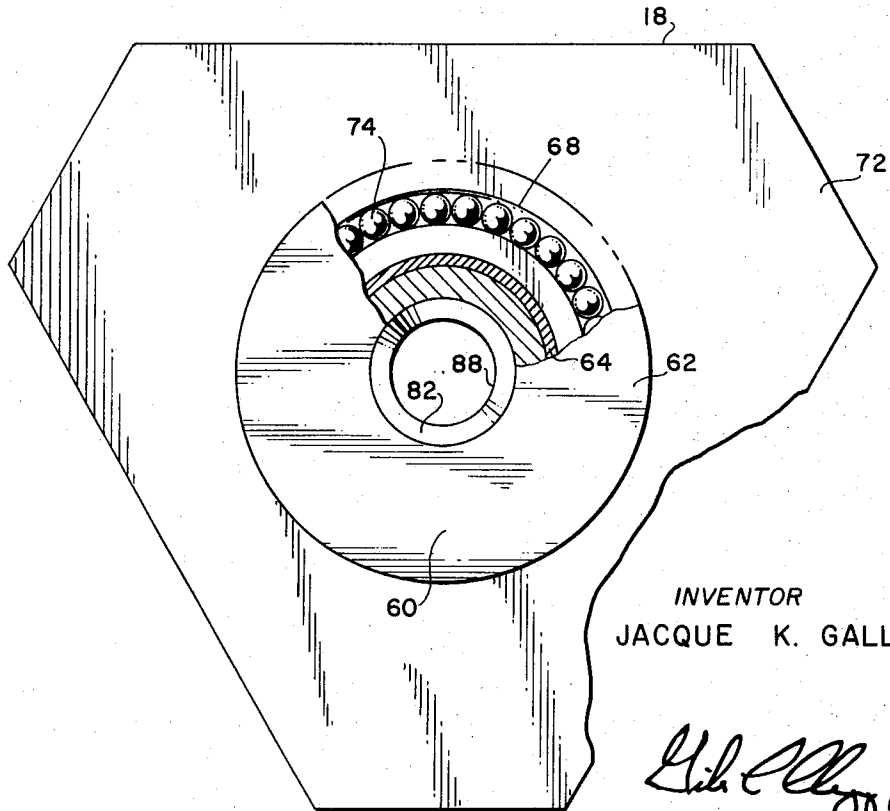


FIG. 7

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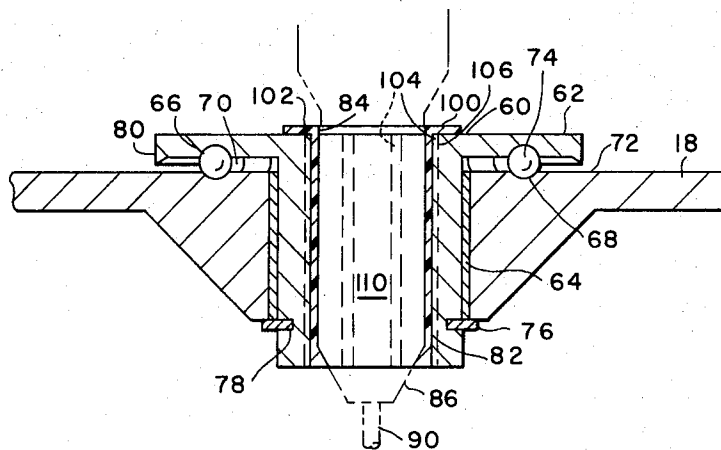


FIG. 9

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DRILLING DEVICE

CROSS REFERENCE

The application is a continuation-in-part of my co-pending application Ser. No. 575,740 filed Aug. 29, 1966 and now U.S. Pat. No. 3,464,295.

This invention relates to a drilling device and more particularly to a compact assembly to be used in conjunction with a power hand drill to aid in maintaining the path of the drill through the workpiece.

There are many instances when it is desirable to drill a straight hole perpendicular or at an angle to a workpiece, in which it is impractical, inconvenient, or impossible to use a drill press due to the inaccessibility or demeanor of the workpiece. For example, it is impractical, if not impossible, to use a drill press to drill an angular hole in a wall or ceiling or within a small enclosure.

It is the principal object of this invention to provide a simple, inexpensive device which may be readily used in conjunction with a hand drill to drill straight holes in a workpiece and which may be easily used for drilling at various positions and angles of drilling.

An additional object of this invention is the provision of a device having the features as just described wherein a small workpiece may be held securely to prevent its rotation during the drilling operation.

In accordance with this invention, a device is provided which is readily adaptable to a hand drill. The device has a base for resting on a workpiece, means for holding a drill in a fixed position and means for biasing the drill away from the workpiece whereby pressure must be applied to the rear or handle of the drill to cause it to move to and engage the workpiece. The base includes a hole or opening for allowing a drill bit to pass through to a workpiece. There can also be provided a plate member which also includes an opening and which is hingedly attached at one side to one side of the base in such a manner that the angle of the device relative to a workpiece may be varied. The base has three upright tubular members perpendicularly attached to the top of it and spaced about the periphery of the hold. A drill holding member is slideably attached to the tubular members and springs are provided to bias the drill holding member away from the base and against stops which are provided on the upward end of the tubular members. Thus, a hand drill positioned in the drill holding member will be biased to a first position away from the workpiece. To drill a hole in a workpiece upon which the device is situated, pressure must be applied to the back of the drill in order to overcome the biasing effect of the springs and allow the drill bit to pass through the holes in the base and plate member and engage the workpiece.

The means for hingedly attaching the plate member to the base are rods which are extendably included in the upright tubular members and extend through the base. To enable the angle between the plate member and the base to be varied, it is necessary that at least one of the rods is extendably connected to the plate member. The means for extendably connecting the rod to the plate member consist of a short rod included within the plate member and hingedly connected to that rod. Thumbscrews, or the like, are provided which go through the base and tubular member to bear upon the rods included therein, thus firmly supporting them

at the desired extension. As a result of this configuration, the rod extendably connected to the plate member may be extended to position the device in such a manner as to enable the device to drill angular holes. A second advantage of this configuration is that all of the rods may be extended uniformly and a small workpiece inserted and held between the base and plate member.

In one embodiment of the device, a drill chuck having a shank is releasably included in the drill holding member. Bearings are provided between the chuck of the drill and the drill holding member to allow it to rotate about an axis perpendicular to the base and passing through the opening included therein. In a second embodiment of the device the drill holding member includes a combination of bearings or the like, which are adapted to conform to the outline of the chuck of a standard power drill. The bearings act to position the drill for rotation about an axis perpendicular to the base and passing through the hole included therein. In a third embodiment of the invention, an insert having a cavity for receiving a drill chuck is releasably supported by the drill holding member. Bearings are provided for supporting the insert for rotation about the axis of the drill.

The novel features believed characteristic of this invention are set forth in the appended claims. The invention itself, however, as well as further objects and advantages thereof will best be understood by reference to the following detailed description read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a pictorial view of the device of the present invention showing it resting on a workpiece and set for drilling an angular hole;

FIG. 2 is a side elevation partially in cross section showing the device having a workpiece between the base and plate member;

FIG. 3 is a plan view of the base;

FIG. 4 is a plan view of the drill holding member and bearings included therein;

FIG. 5 is a fragmentary enlarged vertical section showing the bearings adaptable for a releasably mounted drill chuck;

FIG. 6 is a fragmentary enlarged vertical section showing the bearings adaptable to the chuck of a standard size power drill;

FIG. 7 is a plan view of another embodiment of the invention;

FIG. 8 is a vertical section of the embodiment shown in FIG. 7 similar to FIGS. 5 and 6; and

FIG. 9 is a vertical section similar to FIG. 8 showing still another embodiment of the invention.

Referring now more specifically to the drawings, the numeral 10 denotes the present device generally. The device 10 is shown in FIG. 1 resting on a workpiece 12 in a tilted position for drilling slanted holes. A power hand drill 15 is positioned in the device 10 in the manner in which it would normally be used. The device 10 includes a base 14 having a hole 6 in it for the purpose of allowing a drill bit 8 mounted in the drill 15 to pass through the base to engage the workpiece 12. The base 14 has three upright tubular members 16 attached perpendicularly to it to support the drill holding plate member 18 which is slideably attached to them. It should be noted at this point that the number of tubular members could be varied and that the choice of three for this embodiment is only for the purpose of illustrating

tion. Each tubular member 16 has an enlarged end or stop 22 provided at its upper end. Springs 20 encircle the tubular members 16 and serve to bias the drill holding member 18 at a position against the stops 22 whereby a drill 15 positioned in the member 18 will be at a first position above the workpiece 12.

As may be seen in FIGS. 1 and 2, there can also be provided a plate member 26 hingedly attached to the base 14 so that the angle of the apparatus 10 and consequently the drill 15 and drill bit 8, relative to the workpiece 12 may be varied. Rods 23, 24, and 25 are included within the tubular member 16 and extend below the base 14 to a pivotally connect to the plate member 26. Rods 23 and 24 pivotally connect to one side of the plate member 26 by hinges 28 and 29 and rod 25 pivotally connects to a fourth rod 30 at hinge 34. The rod 30 is included in a hole 32 in the plate member 26, the hole 32 being on the side of the plate member 26 opposite that where rods 23 and 24 pivotally connect to it. The hole 32 extends into the plate member 26 perpendicular to the opposite side. The rod 30 is extendable within the hole 32 so that the angle of the plane of the base 14 and plate member 26 may be varied as shown in FIG. 1. Thumbscrews 36 are provided to bear upon the rods 23, 24, and 25 and hold them at varying lengths of extension through the base 14 such that the angle of drilling may be adjusted as shown in FIG. 1 by tilting the device and extending rod 25 further through the base which consequently causes rod 30 to extend within the hole 32. Rod 25 preferably includes calibrations 38 to aid in determination of the drilling angle. A further advantage of this device is that all of the rods 23, 24, and 25 may be extended uniformly as shown in FIG. 2 such that a workpiece 29 can be held securely between the base 14 and plate member 26.

As may be seen in FIGS. 4 and 5, a drill chuck 38 may be releasably mounted in the drill holding member 18 by means of a flange 42. The drill chuck 38 is held in position for rotation about the drilling axis which is perpendicular to the plane of the base 14 and passes through the openings 4 and 6 by means of flange 42 which turns in bearings 40. It will be noted that the desired alignment is provided by having the flange 42 supported in a desired plane by bearings 40. The drill chuck 38 has a shank 44, which is sized to fit a chuck 46 of hand drill 48, extending upward along its line of rotation. To use this particular embodiment of the device, it is necessary to first position a drill bit in the releasable drill chuck 38 and then attach the chuck 46 of hand drill 48 to the shank 44.

In a second embodiment of the device, shown in FIG. 6, the drill holding member 18 includes a combination of roller bearings 50 and tapered bearings 52 adapted to conform to the outline of the chuck 54 of a standard size hand drill which is denoted here by the numeral 56. It should be noted at this point that this embodiment would be easily adaptable to fit almost any type of hand drill, either powered or nonpowered, by changing the size of the opening in the drill holding member 18 and the size and configuration of the bearing included therein. To operate the device of the second embodiment it is simply necessary to position the hand drill such that the chuck is centered in the bearings 50 and 52 and by applying pressure to the rear of the handle of the drill 56 causing the drill holding member 18 to slide downward which in turn causes the drill bit in-

cluded in the drill to pass through the openings 4 and 6 and engage the workpiece 12.

A third embodiment of the invention shown in FIGS. 7 and 8 of the drawings, is similar to the embodiment of the invention shown in FIGS. 4 and 5. However, rather than use the drill holding member 18 in combination with a drill chuck 38 having a flange 42, there is provided a drill sleeve 60 having a flange 62. A different bearing structure is shown in the third embodiment of the invention, although a bearing as shown in FIG. 5 can be used. Thus, in accordance with third specific example of the invention, a sleeve bearing 64 is provided in the drill holding member 18 for permitting substantially friction-free rotation of the drill sleeve 60 therein. Opposed grooves 66 and 68 are formed in the faces 70 and 72 of the flange 62 and the drill holding member 18. The grooves 66 and 68 define a race in which a plurality of ball bearings 74 move. The flange 62 is thereby supported in a desired plane by bearings 74 in a manner similar to that in which the flange 42 was supported by bearings 40. A retaining ring 76 can be provided for engaging a groove 78 to hold the drill sleeve 60 in a position as shown. With the drill sleeve in position and held as shown, the bearings 74 will be retained in the race defined by the grooves 66 and 68. The rim of the flange 62 is preferably enlarged at 80 to insure that the bearings 74 do not escape from their position between the member 18 and the flange 62 and also to minimize the amount of dust and other foreign particles which might otherwise find their way into the bearing structure.

A cavity 82 is defined within the drill sleeve 60. The cavity 82 is shaped to conform to a drill chuck of a drill to be used with the device. The end 84 of the cavity is sufficiently large that a drill chuck 86 can be inserted into the cavity. The opening 88 in the opposite end is restricted, it only being necessary that opening 88 be sufficiently large to permit a drill 90 held in the chuck to pass through, although the opening 88 can permit a portion of the drill chuck to extend there through as shown. The drill sleeve 60 supports the drill chuck with the axis of the drill chuck normal to the plane of the flange 62 or having a known relationship thereto.

In accordance with the embodiment of the invention shown in FIGS. 7 and 8, it is contemplated that the drill sleeve 60 will be releasably connected to the drill holding member 18 by the retaining ring 76. A plurality of the drill sleeves such as drill sleeve 60 can be provided with each of the drill sleeves fitting a particular drill chuck. By furnishing drill sleeve 60 having cavities of the appropriate size and configuration, the device of the present invention, as exemplified by FIGS. 7 and 8, can be used with drills of many different models and different manufacturer's type without the necessity for provision of a separate chuck 38, as described as reference 4 and 5 of the drawing. It is contemplated that the drill chuck 86 will fit quite snugly within the cavity 82 and accordingly, the bushing 60 will rotate with the chuck 86. As the chuck 86 and the bushing 60 rotate as a unitary number, there will not be substantial wear of the wall of the cavity 82 and accordingly, excellent alignment of the drill chuck, and according with drill 90, will be maintained through many uses of the device.

The embodiment of the invention shown in FIG. 9 of the drawings is similar to that shown in FIG. 8. Rather than provide the drill sleeve 60 with a cavity to con-

form to the drill chuck, the cavity receives a chuck sleeve 100 which suitably includes a radial flange for supporting the chuck sleeve in the cavity 82 of the drill sleeve. If flange 102 is provided, the reduced diameter portion of cavity 82 is not required for positioning the sleeve. Mating lands 104 and 106 can be provided for preventing relative rotation between the chuck sleeve 100 and the drill sleeve 60 and facilitating easy insertion and removal of the chuck sleeve 100, although such is not necessary. The chuck sleeve 100 is provided with a cavity 110 for receiving the drill chuck 86 in a manner similar to that described with reference to the cavity 82 of FIG. 8. The chuck sleeve 100 and drill sleeve 82 cooperate to maintain the desired alignment of the drill chuck while permitting free rotation thereof. Provision of the chuck sleeve 100 is desirable in that chuck sleeves having cavities of different sizes to accommodate drill chucks of different sizes can more readily be used as it is only necessary to withdraw one chuck sleeve and insert another of cavity size when a different size drill is used. The bearing structure is not disturbed when a drill having a chuck of different size is used. Further, the chuck sleeve 100 can be of less expensive construction than the drill sleeves 60.

To operate the device of the first embodiment of the present invention, a hand drill is attached to the shank of the drill chuck included in the device and a bit is secured in the chuck. If an angular hole is desired, the angle of the plate member relative to the base is adjusted by reference to the calibrated scale on the third rod. The thumbscrew holding that rod is loosened and the rod extended until the desired angle is shown on the calibrated scale. The thumbscrew is then tightened and the device is placed on the workpiece or the area where the hole is to be drilled. Pressure is applied to the rear of the drill to overcome the biasing effect of the springs. The bit will then pass through the holes in the base and plate member and engage the area to be drilled. Operation of the second, third and fourth embodiments is similar to that of the first, except there is no drill chuck included in the device and therefore the chuck of the drill to be used is positioned in the holding member for rotation about an axis perpendicular to the base.

While the drilling device of this invention has been described with reference to particular embodiments, it is, of course, understood that this description is not to be construed in a limiting sense. Other embodiments of the invention, as well as modifications of the disclosed embodiments will be apparent to persons skilled in the art upon reference to this specification.

What I claim is:

1. A drilling device readily adaptable to a simple hand drill to aid in drilling straight holes comprising:
 - a base means having a large opening, said base means being suitable for resting on a work piece;
 - a drill sleeve for supporting a drill for rotation about a predetermined axis, said drill sleeve having a radially extending flange normal to the axis of rotation;
 - said drill sleeve having a cavity defined therein for receiving at least a portion of the chuck of a hand drill with a drill held by the chuck extending through the element, the wall of said cavity substantially conforming to the shape of the portion of the chuck received therein whereby the sleeve is engageable by the chuck and rotatable with the

- chuck, the axis of the drill and the predetermined axis being substantially co-axial when the sleeve is rotatable with the chuck;
- a drill holding plate having an opening for rotatably receiving the drill sleeve, said opening being substantially aligned with the opening in the base;
- means releaseably holding said sleeve in said opening in said drill holding plate;
- bearing means supporting said flange to align the axis of the drill with the predetermined axis with said drill sleeve positioned in said opening in said drill holding plate;
- said bearing means including a plurality of ball bearings and opposed circular grooves formed in the lower surface of said flange and the upper surface of said drill holding plate, said opposed grooves providing a race in which said ball bearings move;
- means supporting said drill holding plate on said base for movement perpendicular to the base with the position of the drill holding plate being variable between a first position in which a bit carried by said drill is positioned above the workpiece and a second position in which said drill engages the workpiece; and
- means extending between said plate and said base for biasing said drill holding plate to the first position.

2. A drilling device as defined in claim 1 wherein additional bearing means extends along the wall of the opening of the plate for reducing the frictional resistance between the drill sleeve and the plate as said drill sleeve rotates in said opening.

3. A drill holding device readily adaptable to a simple hand drill to aid in drilling straight holes comprising:

- a base means having a large opening, said base being suitable for resting on a work piece;
- a drill holding means for supporting a drill for rotation about a predetermined axis, said drill holding means including a drill sleeve and a removable chuck sleeve, said drill sleeve having a cavity therein for receiving said chuck sleeve, said chuck sleeve defining a cavity for receiving at least a portion of the chuck of a hand drill with the drill held by the chuck extending through the element, the wall of the cavity of the chuck sleeve substantially conforming to the shape of the portion of the chuck received therein and engaging the chuck to cause the chuck sleeve and drill sleeve to rotate with the chuck and supporting the chuck so that the axis of the drill held by the chuck is co-axial with the axis of the chuck sleeve and drill sleeve;

- a drill holding plate having an opening for receiving the drill sleeve, said opening being substantially aligned with the opening in the base;
- bearing means rotatably supporting said drill sleeve in the opening of said drill holding plate to align the axis of the drill with the axes of the chuck sleeve and drill sleeve,
- means supporting said drill holding plate for movement perpendicular to the base means with the position of the drill holding plate being variable between a first position in which a bit carried by said drill is positioned above the workpiece and a second position in which said drill engages the workpiece; and

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means biasing said drill holding plate to the first position.

4. A drilling device as defined in claim 3 wherein the cavity of the drill sleeve includes a tapered portion supporting the chuck sleeve in said cavity.

5. A drilling device as defined in claim 3 wherein the chuck sleeve includes a radial flange means for supporting said sleeve in the cavity of the drill sleeve.

6. A drilling device as defined in claim 3 wherein lands are formed in the surface of the cavity of said drill sleeve for engaging corresponding lands on the abut-

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ting surface of the chuck sleeve and preventing relative rotation therebetween.

7. A drilling device as defined in claim 3 wherein said drill holding sleeve further includes a radially extending flange normal to the axis of rotation and wherein the bearing means includes a plurality of ball bearings and opposed circular grooves formed in the lower surface of the flange and the upper surface of the drill holding plate, said opposed grooves providing a race in which said ball bearings move.

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