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Steadman

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[54] **DRILL BIT SHARPENING MECHANISM
FOR USE IN CONJUNCTION WITH
HAND DRILLS**

[72] Inventor: **Rufus F. Steadman**, 2530 South
Congress, Austin, Tex. 78704

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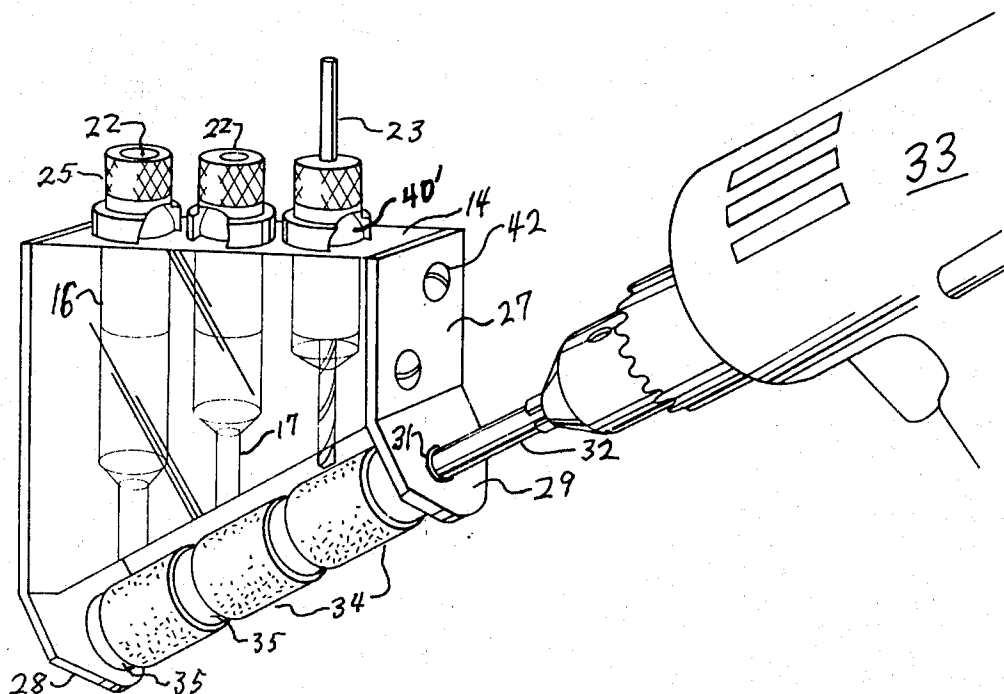
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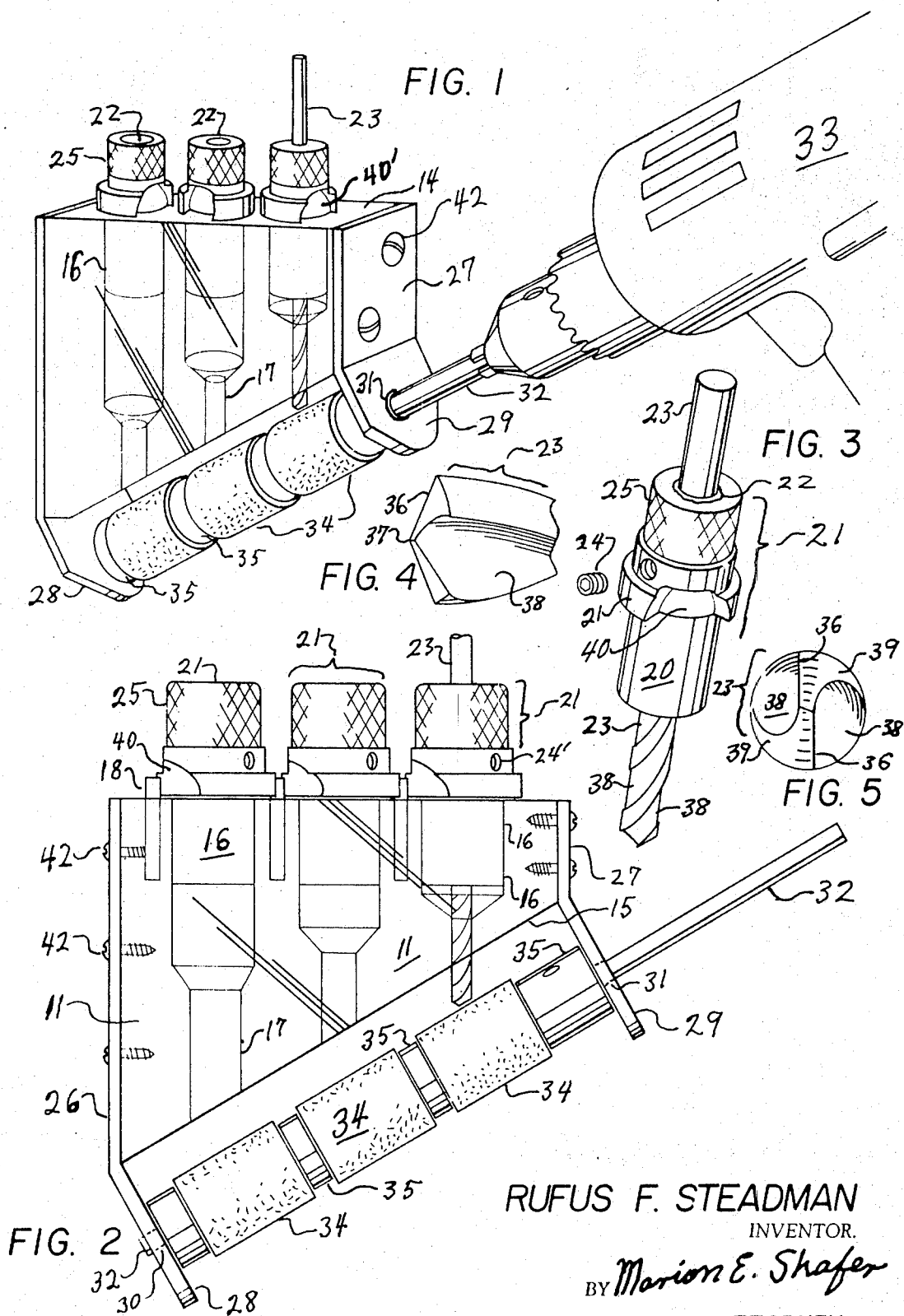
Primary Examiner—William R. Armstrong
Attorney—Marion E. Shafer

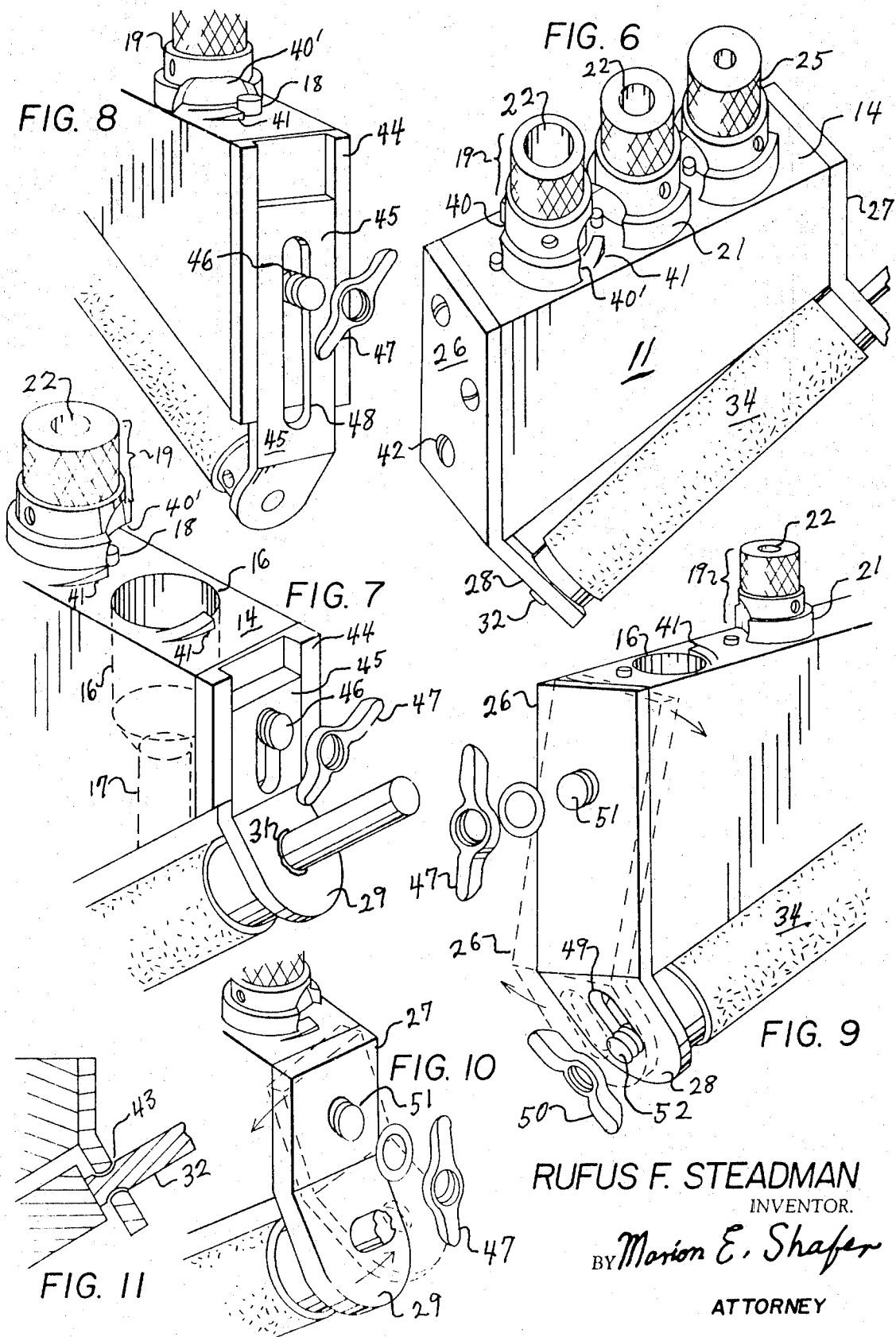
[57] **ABSTRACT**

A compact and highly portable mechanism for sharpening standard drill bits with the grindstone, all tools and associated hardware built in to the device and motive power supplied by attachment of a conventional hand drill with provision for adjustment of the angle of interaction between the rotatable grind stone and the face of the drill bit to preserve the original cutting angle of each of the drill bit biting surfaces. The device is provided with chuck holders for drill bits of varying sizes and guide structures hold the drill bit in proper alignment with respect to the grindstone during the sharpening operation.

12 Claims, 11 Drawing Figures







DRILL BIT SHARPENING MECHANISM FOR USE IN CONJUNCTION WITH HAND DRILLS

SUBJECT MATTER OF THE INVENTION

This invention relates generally to hand tool grinding and sharpening devices and more particularly to portable drill bit holding and grinding devices to sharpen twist drill bits.

OBJECTS OF THE INVENTION

It is primary object of this Invention to devise a twist drill bit sharpening device of such compactness and such portability that it can be held in the workman's hand during usage and of sufficient compactness to permit the device to be stored and transported in a small corner of the workman's tool kit.

Another object of the Invention is to provide a compact and portable drill bit sharpening device in which a drill bit chuck holder structure together with a guide block provided with a plurality of pilot guideways that will automatically hold twist drill bit mounted in such position as to be in proper angular alignment with respect to the self contained rotary grind stone as to permit accurate sharpening of the two angularly disposed drill bit cutting surfaces during the sharpening process.

A further object of the Invention is to devise a compact portable drill bit sharpening device provided with its own builtin rotary grind stone in which the builtin rotary grind stone is held in proper angular grinding position with respect to the drill holding pilot guides provided in a guide block.

A further object of the Invention is to provide such a compact and portable drill bit sharpening device in which the motive power for the rotary grind stone can be provided by attachment of any suitable hand drill including conventional electrical hand drills and the recently popularized battery electric hand drills which will make it convenient and practical to sharpen twist drill bits on the job and at locations remote from regular power facilities with all of the equipment including the motive power requirements being completely portable.

A still further object of the Invention is to provide reliable but otherwise field adjustable means for adjusting the angle of interaction between the rotatable grind stone and the positioned drill bit to be sharpened when said drill bit is held in a chuck holder and positioned within the pilot guide device.

A still further object of the invention is to provide reliable guide and stop means which will permit the operator to accurately sharpen one drill bit bite surface at a time with accuracy and then to rotate the drill bit by one hundred and eighty degrees to accurately sharpen the second drill biting surface.

These and other objects and advantages of this Invention will become apparent through the consideration of the following description and appended claims in conjunction with the attached drawings.

DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is a perspective view of the drill sharpening device contemplated by this Invention attached to a hand drill to provide motive power.

FIG. 2 is a front plan view of said drill sharpening device showing the manner in which drill bit holder chucks and pilot guide block are employed to hold the drill bit to be sharpened in proper alignment with an angularly positioned grind stone.

FIG. 3 is a perspective view of the chuck drill bit holding device showing a drill bit in place.

FIG. 4 is a detailed perspective view of a drill bit.

FIG. 5 is an end plan view of the cutting surfaces of the drill bit shown in FIG. 4.

FIG. 6 is a perspective view of the drill sharpening device contemplated by this invention showing the positioning and arrangement of the drill bit chuck holder devices in relationship to the pilot guide block.

FIG. 7 is a perspective view of one end of the guide block for said drill bit sharpening device showing one alternate means by which the sharpening grind stone can be adjusted to change the angle of interaction between the grindstone and the drill bit to be sharpened.

FIG. 8 is a perspective view of the opposite end of the pilot guide block shown in FIG. 7 showing an alternate means by which the opposite end of said grind stone from that shown in FIG. 6 may be adjusted to vary the angle of interaction between the rotary grind stone and the drill bit to be sharpened.

FIG. 9 is a perspective end view of the guide block for said drill bit sharpening device showing another alternate means by which the angle of interaction between the drill bit and the rotary grind stone may be altered.

FIG. 10 is a perspective view of the opposite end of the guide block illustrated in FIG. 9 showing another aspect of the alternate pivot technique of adjusting the angle of interaction between the rotary grind stone and the biting faces of the drill bit to be sharpened.

In describing one selected form of preferred embodiment of this Invention as shown in the drawings and in this specification, specific terms and components are used for clarity. However, it is not intended to limit the claimed Invention to the specific form, components, or construction shown and it is to be understood that the specific terms used in this illustration of the Invention are intended to include all technical equivalents which operate in a similar manner to accomplish a similar purpose.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT OF INVENTION

Referring to the specific embodiment of the invention selected for illustration in the accompanying drawings, the improved drill bit sharpening device contemplated by this Invention is illustrated generally in the perspective drawing shown in FIG. 1 and the number 11 is used to designate the body portion of said device which shall be referred to in this specification as a guide block. Said specially shaped guide block 11 has a face configuration that is of a generally trapezoidal shape, with what shall be arbitrarily designated as a vertically disposed left side panel 12 and a vertically disposed right side panel 13 intercept upper or top panel 14 at right angles, together with bottom panel 15 being angularly disposed with upward slope from left to right at an acute angle with respect to left side panel 12 and said guide block 11 having thickness of approxi-

mately one and a quarter to perhaps one and three quarter inches as circumstances may require. It should be noted that this recommended configuration for guide block 11 will result in said guide block having greater depth from top to bottom on the left side than said guide block has on the right side. The left end of said guide block will therefore be employed to provide drill bit guideways for long drills while drill bit guideways for small short drills will be located toward the right hand end of said guide block 11 and this provision of an angularly disposed bottom panel 15 for said guide block 11 facilitates convenient and appropriate mounting space such that a cylindrical grind stone may be mounted directly under bottom panel 15 of guide block 11 in such manner as to intercept and interact with drill bits mounted in the guide block guideways at a proper angle for accurately sharpening said drill bits.

Guide block 11 is provided with a plurality of vertically disposed, spaced apart and parallel positioned chuck receiving pilot guideways drilled or recessed from the so-called top panel 14 downward into the body of guide block 11 with said chuck receiving pilot guideways 16—16 being tubular shaped to receive the vertically shaped shank of a drill bit holding chuck. In axial alignment with each of said chuck receiving pilot guideways 16—16 there is provided a further but smaller tubular shaped drill bit channel 17 extending from the bottom of each of said pilot guideways through to bottom panel 15 of said guide block 11. Also in the upper face or top panel 14 of guide block 11 there is provided a plurality of vertical positioned and mounted stop pins 18—18 which are mounted at generally spaced apart positions near the periphery of guideway openings 16—16 so that said stop pins 18—18 project vertically above top panel 14 for a small fraction of an inch with there being approximately one stop pin for each guideway opening 16.

The drawings of the improved drill bit sharpening device contemplated by this invention are based upon a prototype model constructed by the inventor with the body portion of guide block 11 fabricated from transparent lucite plastic material such that the interior guideway passageways 16 - 16 and other apparatus mounted in said lucite block are visible through the exterior surface and for purposes of clarity, the drawings herein have illustrated the invention as fabricated from such transparent lucite material but actual experience may show that a guide block body of lucite or related moldable plastic may not stand up to prolonged usage and it may be desirable for the manufacturer of such a device to employ a metal guide block or a more durable material for the fabrication of guide block 11. The invention merely contemplates that guide block 11 should be made from a suitable material and does not necessarily recommend use of a specific material. Again the matter of fabricating chuck receiving pilot guideways 16—16 through guide block 11 by molding or casting said openings into the initial block or drilling or otherwise drilling or recessing said chuck receiving guideways 16—16 is a matter of fabrication choice that may well depend upon the nature of the material from which guide block 11 is fabricated and the method of creating such chuck receiving guideway openings is left to the discretion of the manufacturer of the device.

The best overall view of drill holding chuck 19 is provided in FIG. 3 of the drawings herein in which it should be noted that said drill holding chuck 19 is of a generally cylindrical shape, is provided with a cylindrically shaped shank 20 which is adapted to rotatably fit into guideway opening 16. Said drill holding chuck 19 inserts into guideway opening 16 until a bearing shoulder flange structure 21 on the exterior surface of chuck 19 comes into contact with the surface of top panel 14 of guide block 11. Through the center of chuck 19 there is provided a tubular recess 22 means of receiving and holding a drill bit 23 of proper size in axial longitudinal alignment within said chuck structure together with means 24 for securely locking said drill bit in position within said drill holding chuck.

In the case of the prototype illustrated in the drawings and described in this specification, the inventor has provided a plurality of drill bit holding chucks 19—19 with stepped or sized drill receiving recesses 22—22 with each chuck being provided with a different size tubular recess 22 to receive and hold drill bits 23 of varying sizes. The drill bit securing means 24 illustrated herein is a simple set screw 24 but the inventor contemplates that a production model for market should be provided with an adjustable drill bit receiving opening 22 and that a more sophisticated and more convenient bit securing means 24 will be provided on the manufactured chucks.

At the upper end of drill bit holding chuck 19 there is provided a knurled surface 25 which provides a thumb and finger grip knob surface by which drill holding chuck 19 may be rotated within chuck holding guideway 16 in the process of sharpening all sides of drill bit 23. The simple drill holding chuck structure described to this point would work successfully if only the smaller bite surface or cutting edge of the drill bits were to be sharpened for only a few times. If drill bit 23 is sharpened very often the lead point 37 and angled drill bit biting surfaces 36—36 will be ground away so that the heel of drill bit 23 will drag on the surface of the material being drilled and will create considerable friction and heat with eventual destruction of the drill. If a particular drill bit 23 is to be sharpened more than a few times than an additional means must be provided for grinding away the heel portion of said drill bit. The modifications in drill holding chuck 19 and the provision of cam bearing structures on the upper surface of guide block 11 together with control stops for regulating said grinding process will be reserved to a later place in this specification.

On each end of guide block 11 there is provided a left end plate 26 and a right end plate 27 with said left and right end plates being secured to guide block 11 by appropriate screws 42—42 or similar or appropriate fastening means. Left end plate 26 paralleling the longer side of guide block 11 will obviously be longer than right end plate 27. Each of said end plates are provided with downwardly depending flange extensions 28 and 29 with each of said flange extensions being bent or disposed at an angle from the main body of the end plate as illustrated in FIG. 1 and in FIG. 2 of the drawings herein with each of said end plates being provided with axial receiving bearing openings 30 and 31 to provide means for mounting and supporting an angularly positioned drill bit grinding stone. Axle shaft 32

extends through and between each of said axle receiving bearing openings 30 and 31 in said flange portions of the left and right end plates and said axle shaft 32 is extended beyond the right axle bearing 31 to form a coupling drive shaft by which a hand drill 33 may be connected to said axle coupling drive shaft to deliver rotary drive motion or power to said axle 32 and grinding stones 34—34 as illustrated in FIG. 1 and FIG. 2 of the drawings herein.

Mounted an axial shaft 32 by appropriate means there is provided at least one cylindrically shaped grind stone sleeve 34 as illustrated in FIG. 6 of the drawings or a plurality of small, cylindrically shaped grind stone sleeves 34—34 as illustrated in FIG. 1 and FIG. 2 of the drawings herein. The craftsman using such a device will frequently find that he uses and sharpens particular sizes of drills more frequently than he needs to sharpen other sizes of drills and this may well lead to wearing grooves in the frequently used portions of grind stone sleeve 34 without using or wearing out all of said sleeve. It may therefore be prudent to fabricate said drill bit sharpening device with a plurality of small inexpensive and replaceable individual grind stone sleeves 34—34 as illustrated in FIG. 1 and in FIG. 2 of the drawings since appropriate sized grind stone sleeves are already commercially available at modest prices. If a plurality of cylindrically shaped grind stone sleeves 34—34 are provided as illustrated in FIG. 2 of the drawings, then said grind stone sleeves 34—34 should be spaced apart on axle 32 by means of bushings 35—35 so that one of said grind stone sleeves is centered and mounted directly beneath each of the drill channel openings 17—17. Axle 32 and associated grind stone sleeves 34—34 are arranged in such angular position as illustrated in FIG. 2 of the drawings that said grind stone 34 intercepts drill bit 23, when drill bit 23 is held in chuck 19 mounted in guideway 16 and guide block 11, at a proper angle to grind a new sharpened cutting surface on said drill bit at a proper angle of taper for said drill bit.

Once a structure for a drill bit sharpening device has been proposed as contemplated by this invention and illustrated and described herein it will be readily apparent to any craftsman familiar with the art that a variety of plausible and useful variations and alternate arrangements may be devised within the scope of the invention contemplated. In particular the inventor has explored several alternate arrangements by which the angle of disposition between grind stone 34 and guide block 11 may be varied to alter the angle of taper to be ground on drill bit 23 as illustrated in Figures eight through eleven of the drawings herein. However, the central concept of this Invention resides in the provision of an integrated combination drill bit sharpening device in which a nearly fool proof drill chuck is mounted in prepositioned drill holding chuck guideways to intercept a prepositioned and integrated rotary grind stone that is a built in part of the assembled apparatus such that the operator of the device has minimum difficulty in positioning and successfully grinding and sharpening drill bits with the aid of this device, and other combinations or rearrangement of alternate or equivalent parts for a similar purpose combined into an integrated guide block with guideways therein, with drill bit holding chucks designed to fit in

said guideways, and on said sharpening device being provided with its own self contained mounted and prepositioned grind stone is within the scope and purpose of this Invention as described herein and in the appended claims.

Returning to a detailed analysis of some of the special problems of forming and sharpening the cutting surfaces of a twist drill bit and of special supplemental structures proposed by the Inventor of the device described herein for remedying these subsidiary problems we should start with the structure proposed for a means of lifting twist drill 23 and associated drill holder chuck 19 in such manner as to properly grind off the heel of drill bit 23. Examination of FIG. 4 and FIG. 5 of the drawings will indicate that a twist drill bit may be regarded as a pair of chisel like biting surfaces 36—36 extended from a common center pivot point 37 so that each of said chisel like cutting surfaces 36—36 bite into and chisel off material into which the drill bit is being rotated. Said material being scraped or cut away by said forward biting edges is carried upward and out of the way by means of a pair of helically shaped flutes 38—38 that channel the waste debris out of the way so as not to interfere with further cutting by the forward biting edges of the drill bit. Said chisel shaped forward biting surfaces of the drill bit are supported in part by, and the drill is partially maintained in alignment by a buttressing surface immediately behind the forward cutting edge called the heel 39—39 of the drill but said heel portion of the drill should taper backward and upward at an angle slightly greater than the angle provided for chisel like forward biting surfaces 36—36 or the drag of heel surfaces 39—39 on the work being drilled will cause friction and develop useless and excessive heat that will eventually ruin the temper of the drill bit. If the height of centerpoint 37 and drill bit forward biting surfaces 36—36 are ground back in the process of sharpening said drill cutting surfaces 36—36 then some additional means must be provided for proportionately grinding back and removing at a proper angle of taper part of heel surface areas 39—39 to which problem the following structures are proposed in supplementation to the principal features of the invention.

In the bearing shoulder flange structure 21 and perhaps extending slightly into the upper body of drill bit holding chuck 19 there is provided a horizontally disposed stop recessway 40 adapted to engage with one of the stop pins 18 set in upper surface 14 of guide block 11 with said horizontal stop recessway 40 extending through an arc at the outer circumference of chuck 19 proportionate to the arc described from one cutting edge of drill bit 23 to the following heel on said drill bit. Thus if chuck 19 is inserted in guideway 16 of guide block 11 with chuck 19 rotated clockwise until stop recessway 40 rests against stop pin 18 and drill bit 23 is inserted in and through chuck 11 until drill bit 23 comes to rest firmly against rotary grindstone 34 with said drill bit positioned and secured in chuck 19 in such position that the surface from drill center point 37 to the trailing end of heel 39 is in contact with angularly positioned rotary grind stone 34, then we are ready to grind off the heel of drill bit 23 at the preset angle of interception between rotary grind stone 34 and drill bit 23.

On the opposite side of guide way opening 16 and chuck 19 from stop pin 18 there is provided a second stop recessway 40' cut into shoulder 21 of chuck 19 making a pair of identical stop recessways 40 and 40' cut into the opposite sides of chuck 19. Within this second stop recessway 40' when chuck 19 is positioned as described there is provided a cam bearing ramp structure 41 which is attached or formed on the upper surface 14 of guide block 11 at a point adjacent to guideway opening 16.

By carefully examining the forward structure of drill bit 23 as illustrated in FIG. 3, FIG. 4 and FIG. 5 and the shape of stop recessways 40 and 40' in chuck 19 and examining and analyzing the action of drill bit 23 with respect to rotary grind stone 34 as chuck 19 is rotated counterclockwise so that bearing shoulder 21 rides up the incline of cam shaped bearing ramp 41, as may be seen by examination of FIG. 8 and FIG. 7 of the Drawings herein, the angle of interaction between the drill bit and the grind stone, as measured from the center line of the drill bit, will become sharper or less acute so that the chisel shaped forward cutting edges 36—36 are ground off at a slightly broader angle than was the heel of the bit. Note also that this gradual lift provided as chuck 19 rides up said cam bearing ramp surface 41 means that heel 39 of drill bit 23 is ground back more than is the forward cutting surface 36 so that heel 39 will not drag as cutting surfaces 36—36 dig into the work to be drilled. Or alternatively, the Inventor prefers to describe the process in terms of rotating chuck 19 in a clockwise direction so that forward cutting surfaces 36—36 are sharpened first and then the following heel surfaces 39—39 are ground back even more as bearing shoulder 21 of chuck 19 rides down cam shaped ramp surface 41. The grinding process can be started at either end of said stop recess opening 40 and rotated to the opposite end of stop recess opening 40. The increase in the acuteness of the angle traced from center point 37 to heel 39 of drill bit 23 with respect to the center line of drill bit 23 as compared to the angle traced from center point 37 to the outer circumference across the front of drill bit cutting surface 36 is very minute and results from a varying interaction between the curved surface of grind stone 34 and the angled surface of the drill bit plus the effect of the lift action of chuck 19 by riding up or down on cam bearing ramp surface 41. The small differences in angle are difficult to perceive by the unaided eye but the upward and backward slope can be felt and seen as you examine the trailing taper from the forward cutting edge 36 of drill bit 23 back to the trailing heel 39.

The process described in the immediately preceding paragraphs will sharpen and grind only one of the two cutting surfaces on drill bit 23. When grinding or sharpening of this first cutting surface is completed, the operator lifts chuck 19 and rotates the chuck 180° to bring stop recessway 41' into engagement with stop pin 18 and the described process is repeated to grind or sharpen the second cutting face 36 of drill bit 23.

In addition to the compound taper-angle problem discussed above in connection with the application and use of cam bearing ramp structure 41 there is also an additional problem of grinding the face of cutting surface 36—36 precipitated by the fact that manufacturers vary the angle or slope of the drill bit in ac-

cordance with the hardness of the materials for which the bits are manufactured or recommended. Thus wood cutting drill bits often have a very shallow angle of bite slope (measured from the work) and the face of the cutting edges 36—36 almost form a straight line. On the other hand drill bits for drilling in steel and very hard materials are provided with a much sharper cutting angle and come to a sharper point at center point 37 of said drill bit 23. Whereas high speed drills for working in aluminum and soft metals may be provided with an intermediate taper less acute than that provided for steel drills but still sharper than the taper provided on drills used for wood only.

The ordinary home craftsman will usually purchase a single set of drills with a medium taper and use the same drills for all work from wood through steel even if he must discard the drill after drilling in steel for a half dozen or so times. For such home craftsmen who prefer not to become embroiled in the fine niceties concerning adjustment for drill taper, the drill bit sharpening apparatus illustrated in FIG. 1 and FIG. 2 of the Drawings with a fixed angle grind stone 34 preset for a medium taper at the factory will probably constitute the happiest and most practical working compromise. However, for the use of machinists and serious craftsmen employing a variety of kinds of drills for work in a plurality of materials it may be advisable to provide adjustable means of varying the position of one end of axle shaft 32 in such manner as to slightly alter the angle of slope at which grind stone 34 cuts the face of drill bit 23.

This adjustment of the angle of slope for axle shaft 32 and associated rotary grind stone 34 may be accomplished by hinging (not shown) of flange extension 29 with respect to end plate 27 or alternatively providing a swivel axle bearing means 43 as illustrated in FIG. 11 of the drawings, and then at the opposite end of said axle 32 and associated grind stone 34 providing a means for raising or lowering the effective position or effective height of grind stone 34. There is no need to raise and lower both ends of the grind stone. In order to alter or adjust the angle of slope, one end of the grind stone should be hinged or made swingable and the other end should be made adjustable up or down. One means for raising or lowering the effective height of one end of grind stone 34 is illustrated in FIG. 8 of the drawings in which channeled end plate 44 is provided with an adjustable slotted sliding tongue 45 which can be raised or lowered by distances of approximately a quarter of an inch in either direction with respect to securing stud 46 and clamped in place after adjustment by screwing down wing nut clamping means 47. Tongue adjustment slot opening 48 as illustrated in FIG. 8 of the drawings is grossly exaggerated in length. Said tongue slot opening 48 probably will not need to be more than $\frac{3}{8}$ to $\frac{1}{2}$ inch in length.

A similar adjustment of the low end of axle shaft 32 may be accomplished by providing a slot shaped axle bearing 49 in flange extension 28 of end plate 26 at the point where axle 32 passes through said axle bearing—as illustrated in the lower part of FIG. 9 of the drawings. Axle 32 is raised or lowered as needed to secure the desired angle of taper and is then secured in its adjusted position by tightening wing nut 50 on a threaded axle bearing sleeve 52.

Since grind stone 34 may need to be moved as little as an eighth of an inch to effect a considerable change in the angle of slope or taper applied to the drill bit being sharpened, it may also be possible to accomplish the small amount of angular change required for adjustment for drills of varying taper by swinging left and right end plates 26 and 27 forward or backward with respect to pivot studs 51—51 as illustrated in FIG. 9 and FIG. 10 of the drawings herein. In the case of such pivoted alternate arrangement, end plates 26 and 27 would be secured in place after adjustment by tightening securing means 47 such as the wing nut securing means 47 as illustrated in the drawings.

OPERATION

In operation the craftsman removes said drill bit sharpening apparatus from his tool kit or from the accustomed storage place and selects a suitable drill bit holding chuck 19 for the size of drill bit 23 to be sharpened. Said drill bit 23 is inserted into tubular drill bit receiving opening 22 in chuck 19 and chuck 19 is inserted into one of the plurality of chuck receiving guideways 16—16. Said chuck 19 is lowered into position until one of the cam shaped bearing ramp ways 41 rests inside horizontal recessway 40 in the shoulder of drill holding chuck 19. Drill bit 23 is then rotated inside opening 22 until the cutting end of drill bit 23 comes into contact with angularly positioned rotary grind stone 34 in the manner described in the body of the specification above. With drill bit 23 properly aligned and adjusted into place as described, electric hand drill 33 is attached to coupling extension shaft from axle 32 as illustrated in FIG. 1 of the drawings and power is applied to secure rotary drive motion from said hand drill 33 to rotate grind stone 34 which in turn grinds one of the two faces of drill bit 23. When said face of drill bit 23 has been properly sharpened and the trailing taper of associated heel 39 has been ground by rotating drill holding chuck 19 as explained above, then drill chuck holder 19 is lifted and rotated by 180 degrees until stop recessway 40 sits over cam bearing ramp 41 when the previously described procedure is repeated to grind and sharpen the second face of drill bit 23. When both faces of drill bit 23 have been properly ground and sharpened the sharpening process is complete and the apparatus is available for sharpening of other drill bits — or for returning to storage.

ADVANTAGES OF THE INVENTION

In the foregoing description of the structure and operation of the invention set forth herein, a number of advantages have been claimed for the apparatus and others will be readily apparent to persons skilled in the art.

A primary advantage of this invention is that it devises a twist drill bit sharpening device of such compactness and such portability that it can be held in the workman's hand during usage and of sufficient compactness to permit the device to be stored and transported in a small corner of the workman's tool kit.

Another advantage of the invention is that it provides a compact and portable drill bit sharpening device in which a drill bit chuck holder structure together with a guide block provided with a plurality of chuck receiving pilot guideways that automatically hold a twist drill

bit mounted therein in such position as to be in proper angular alignment with respect to a self-contained rotary grind stone as to permit accurate sharpening of the two angularly disposed drill bit cutting surfaces.

A further advantage of the Invention is that it devises a compact portable drill bit sharpening device provided with its own builtin rotary grind stone in which the builtin rotary grind stone is held in proper angular grinding position with respect to the drill.

A further advantage of the invention is that it provides a compact and portable drill bit sharpening device in which the motive power for the rotary grind stone can be provided by attachment of any suitable hand drill including conventional electrical hand drills and the recently popularized battery electric hand drills which will make it convenient and practical to sharpen twist drill bits on the job and at locations remote from regular power facilities with all of the equipment including the motive power requirements being completely portable.

A still further advantage of the invention is that it provides a reliable and field adjustable means for adjusting the angle of interaction between the rotatable grind stone and the positioned drill bit to be sharpened.

A still further advantage of the invention is that it provides reliable guide and stop means which will permit the operator to accurately sharpen one drill bit surface at a time with accuracy and then to rotate the drill bit by 180° to accurately sharpen the second drill biting surface.

Another advantage of the Invention is that it provides a simple and reliable means by which the heel area of the drill bit can be proportionately ground back during the same operation in which the cutting faces of the drill bit are sharpened.

Although this specification describes but a single embodiment of the Invention with certain applications thereof, it should be understood that structural or material rearrangements of adequate or equivalent parts, substitutions of equivalent functional elements and other modifications in structure can be made and other applications devised without departing from the spirit and scope of my invention. I therefore desire that the description and drawings herein be regarded as limited only as set forth in the following claims, or as required by the prior art.

Having thus described my invention, I claim:

1. A compact, portable, hand-held drill bit sharpening device comprising:

A. a specially shaped trapezoidal guide block having

1. a plurality of spaced apart chuck receiving pilot guideway channels drilled through one plane of said guide block, and

2. a plurality of stop pins mounted in the upper surface of said guide block;

B. a plurality of cylindrical, sized drill bit holding chucks adapted to rotatably fit into said guideway channels in the guide block,

1. provided with a central drill bit receiving tubular passageway running through the length of said drill holding chuck, and

2. provided with stop recesses in each drill holding chuck adapted to engage with the stop pins provided in said guide block;

- C. cylindrical rotary sharpening stone pivotally mounted in an angular position with respect to said guide block such that said stone will make contact with and sharpen a drill bit held in one of said drill holding chucks mounted in one of said pilot guideway channels; and
- D. an axle supporting said angularly disposed rotary grind stone and provided with a shank connection to a hand drill to provide rotary motive power.
2. The compact, portable drill bit sharpening apparatus described in claim 1 provided with a plurality of at least three small individual spaced apart grinding stones on a common axle and spacially arranged to be in alignment with the drill holding chuck guideways in the main guide block.
3. The compact, portable drill bit sharpening apparatus described in claim 1 in which the drill holding chucks are provided with adjustable means for receiving and securely holding drill bits of various sizes.
4. The compact, portable drill bit sharpening apparatus described in claim 1 provided with adjustable means of varying the angle of interaction between the grind stone and the drill bit to be sharpened.
5. The compact, portable drill bit sharpening apparatus described in claim 1 in which
- A. a cam bearing ramp structure is provided through a fractional arc on the upper surface of said guide block adjacent to each of the openings into the pilot guideways in said guide block; and
- B. a bearing shoulder flange structure is provided on the exterior of each of said drill holding chucks and adapted to engage with said cam bearing ramp structure through a controlled arc of rotation by said drill holding chuck to provide means of grinding away a proportionate part of the heel of the drill bit as the drill bit biting surfaces are being sharpened.
6. A compact, portable drill bit sharpening device comprising:
- A. a trapezoidally shaped guide block having
1. a plurality of spaced apart and parallel positioned chuck receiving pilot guideways recessed into one plane of said guide block,
 2. drill bit channels extending from the bottom of each pilot guideway through to the opposite face of said guide block, and
 3. a plurality of stop pins mounted in the upper surface of said guide block at spaced apart positions near the periphery of the guideway openings;
- B. a plurality of sized and cylindrically shaped drill holding chucks being
1. provided with tubular recess means of receiving and holding a drill bit of proper size in axial longitudinal alignment within said chuck structure,
 2. means for securely locking said drill bit in position within said chuck,
 3. provided with cylindrically shaped shanks adapted to rotatably fit into one of the pilot guideways provided in said guideblock,
 4. provided with a pair of spaced apart stop-recesses cut into opposite sides of said chucks in such manner as to engage at least one of said stop pins and limit the arc through which said drill holding chuck can rotate;

- C. left and right end plates of unequal length attached to the left and right ends of said guide block with said end plates having
1. downwardly depending flange extensions,
 2. with each of said flanges being disposed at an angle from the main body of the end plate, and
 3. each of said end plates being provided with an axle receiving bearing opening;
- D. an axle shaft extending through each of the axle receiving bearing openings in the flanges of said left and right end plates with one end of said shaft being extended to form a coupling drive shaft by which a hand drill may be connected to said axle-coupling drive shaft to deliver rotary drive motion to said axle; and
- E. a cylindrically shaped grindstone sleeve mounted on said axle in such manner and in such angular position that said grindstone intercepts drill bits held in chucks mounted in the guide block at a proper angle to grind new sharpened cutting surfaces on said drill bits at a proper taper.
7. The compact, portable drill bit sharpening apparatus described in claim 6 provided with a plurality of at least three small individual spaced apart grinding stones on a common axle and spacially arranged to be in alignment with the drill holding chuck guideways in the main guide block.
8. The compact, portable drill bit sharpening apparatus described in claim 6 provided with adjustable means of varying the angle of interaction between the grind stone and the drill bit to be sharpened.
9. The compact, portable drill bit sharpening apparatus described in claim 8 in which the means of varying the angle of interaction between the grindstone and the drill bit to be sharpened is by means of a swivel axle bearing in one of the end plates and by provision of means for adjusting the vertical position of the opposite end plate in such manner as to change the angle of tilt of said grindstone.
10. The compact, portable drill bit sharpening apparatus described in claim 8 in which the means of varying the angle of interaction between the grind stone and the drill bit to be sharpened is accomplished at one end by means of a swivel axle bearing in one of the end plates and the angle of tilt of said grind stone is made adjustable by providing a slot shaped bearing opening in the opposite end plate with releasable means of repositioning the grind stone axle within said slot shaped bearing opening.
11. The compact, portable drill bit sharpening apparatus described in claim 8 in which the angle of interaction between the grind stone and the drill bit to be sharpened is accomplished by providing means of pivotally mounting said left and right end plates on pivot studs provided in the opposite ends of the guide block.
12. The compact, portable drill bit sharpening apparatus described in claim 6 in which
- A. a cam bearing ramp structure is provided through a fractional arc on the upper surface of said guide block adjacent to each of the openings into the pilot guideways in said guide block; and
- B. a bearing shoulder flange structure is provided on the exterior of each of said drill holding chucks and adapted to engage with said cam bearing ramp

structure through a controlled arc of rotation by said drill holding chuck to provide means of grinding away a proportionate part of the heel of the drill bit at a proper angle of taper as the drill bit biting surfaces are being sharpened.

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