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TOOL FOR HOLDING AND DRIVING SCREWS

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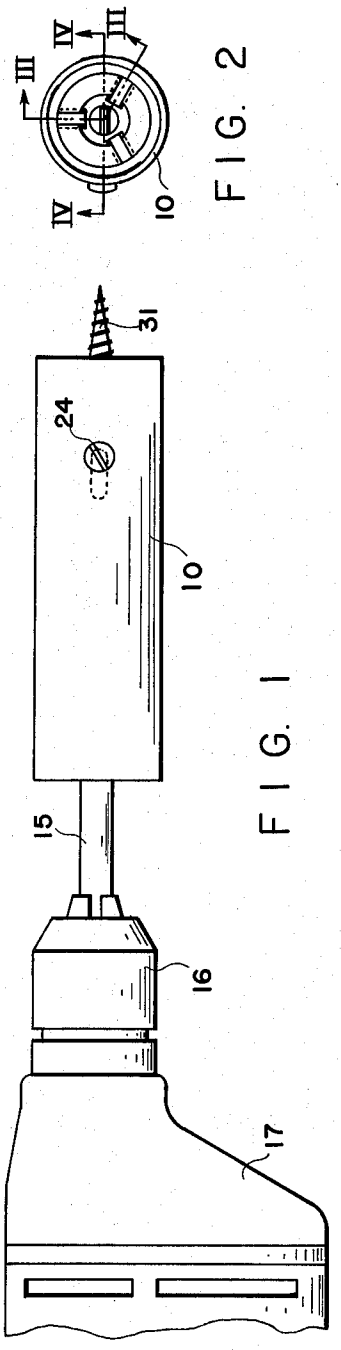



FIG. 1




FIG. 2




FIG. 3

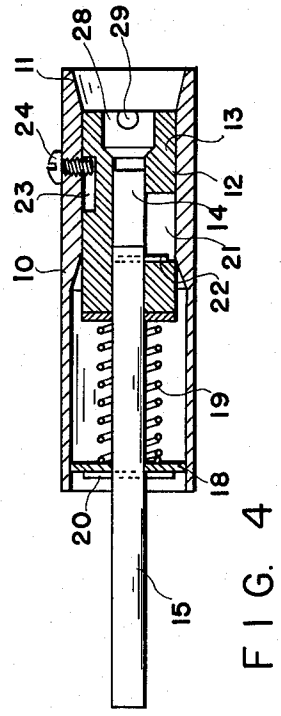



FIG. 4

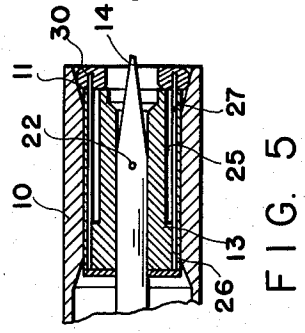



FIG. 5

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# TOOL FOR HOLDING AND DRIVING SCREWS

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This invention relates to a rotary tool for holding and driving screws, and more particularly to a tool of the nature in which the head end of a screw is detachably retained in an assembly adapted to be rotated so that the tapered end of the screw may be started into its seat and thereafter be power driven fully into its seat by continued rotation of the tool and inward pressure applied therethrough. The prior art shows a number of tools for accomplishing the same general result but the arrangements heretofore proposed have been both exceedingly complicated and expensive to build as well as being difficult to keep in repair so that these prior devices have not found favor with craftsmen and tradesmen who would ordinarily make extensive use of such equipment. The primary object of the present invention is to so improve a rotary screw holder and driver that the same is exceedingly simple in design, economical to manufacture with high speed automatic equipment, and which is exceedingly easy to use and trouble-free in operation.

While rotary combined screw holders and drivers of the general nature herein involved are capable of a wide variety of uses, they are most advantageous for use in connection with the driving chuck of a portable electric drill and for the purpose of locating and driving home self-tapping sheet-metal screws in the installation of air ducts and outlets, for example. Accordingly, the invention herein will be illustrated and described in such environment although it should be understood that the meritorious use of the invention is not so limited.

The above and other objects and advantages of the invention will become apparent upon consideration of the following specification and the accompanying drawing wherein there is disclosed a preferred embodiment of the invention.

In the drawing:

FIGURE 1 is a side elevation of the tool of the invention as installed in the drive chuck of a conventional portable drill, the view also showing the threaded tip of a self-tapping sheet-metal screw held in the tool;

FIGURE 2 is a front end view of the tool of FIGURE 1;

FIGURE 3 is a longitudinal section of the tool of FIGURES 1 and 2 taken along the planes III—III of FIGURE 2, and showing the retained screw in longitudinal section;

FIGURE 4 is a longitudinal section taken along the line IV—IV of FIGURE 2; and

FIGURE 5 is a fragmentary section showing the relative position of certain of the component parts when the tool is about to be disengaged from a driven screw.

In the drawing, reference numeral **10** designates a tubular shell having an inwardly tapering internal surface **11** at its forward end. The taper **11** terminates at a longitudinal internal surface section **12** in which is slideably received a tubular block **13** (see FIGS. 3–5).

Slideably received in the bore through block **13** is the pointed end **14** of a screwdriver having an integral shank **15** adapted to be rigidly clamped in a conventional chuck **16** of a portable electric drill **17**. Near the back end of the shell **10** and slideably received therein is a washer **18** whose aperture receives the shank **15**. Interposed between the washer **18** and the block **13** is a coil spring **19** and a pin **20** restricts rearward sliding movement of the washer **18** on the shank **15**. It should be obvious that the spring **19** is thus arranged to keep the shank **15** normally retracted whereby the pointed end **14** of the screwdriver is retained within the block **13**.



The side wall of the block **13** is formed with a longitudinally elongated thru-slot **21** in which is received the projecting end of a pin **22** which is attached to the shank **15** adjacent the pointed end thereof. This limits the rearward movement of the shank **15** relative to the block **13** but nevertheless permits the shank or screwdriver to move forwardly in the block **13** against the action of the spring **19** and to a relative position shown in FIGURE 5. Block **13** has a longitudinal slot **23** in its outer surface which receives the inner end portion of a retaining screw **24** threaded through the side wall of the shell **10**. This slot **23** keeps the longitudinal movement of the block **13** with respect to the shell **10** within a predetermined range while yet permitting the screwhead retaining chuck to be hereinafter described to open up sufficiently to detach the tool from the driven screw.

In the illustrated embodiment of the invention, the side wall of the block **13** is formed with three circumferentially spaced bores **25** which are drilled inwardly from the front end of the block. Communicating with each of these bores **25** is a bore **26** of much smaller diameter which is drilled into the block **13** from the rear end thereof. Received within each of the bores **26** and extending longitudinally through the connected bore **25** is a length of spring or piano wire **27**. It should be noted that those portions of the wires **27** which are received within the bores **26** are effectively restrained against any radial bending whereas the free ends of the wires which are in the larger bores **25** may flex radially inward or outward a substantial extent. It should also be noted from FIGURES 3 and 5 that the small bores **26** are aligned with the wall sections of the larger bores **25** which are closest to the outer cylindrical surface of the block **13**. The free ends of the wires **27** are thus inherently biased to radial outward positions with respect to the longitudinal center axis of the tool.

As shown in FIGS. 3–5, the bore through the block **13** is enlarged at its forward end as shown at **28** to a diameter slightly larger than the diameter of the head of the screws which are intended to be used in the tool. Extending radially through the side wall of the block **13** are three bores **29**, as shown in FIGURE 4, slightly less than a complete circle in cross section but substantially greater than a semicircle. The location of these bores **29** coincide with the location of the bores **25**, and obviously therefore the bores **29** intersect the bores **25**. Slideably received in each of the bores **29** is a bit **30** having a blind bore therein to receive the free end of the wire **27** which lies in the adjacent bore **25**.

Interposed between the rear end of the block **13** and the compression spring **19** is a washer **31'** which rides on the shank **15** and the peripheral portion of which overlies the open ends of the small bores **26**. It should now be apparent that the action of the spring **19** prevents the wires **27** from sliding in a rearward direction with respect to the block **13** without any additional fastening. Forward sliding movement of the wires is restrained by the bits **30**, these bits in turn being restrained against longitudinal movement with respect to the block **13** by their almost complete circular cross section which snugly fits within the bores **29**.

Considering now the operation of the tool above described and assuming first that the tool is empty of the screw to be driven, it will be apparent that if the sleeve **10** is moved rearwardly with respect to the block **13** (as permitted by the slot **23**) the bits **30** will ride out onto the taper **11** of the sleeve and thereby move radially outward by the forces exerted by the wire springs **27**. This permits the head of the screw (herein designated by refer-

ence numeral 31) to be inserted longitudinally past inner radial ends of the bits 30 into the cavity 28. Now forward movement of the sleeve with respect to the block 13 will draw the bits inwardly into overlying relation with the head of the screw to be driven, as shown in FIGURE 3, whereby the screw is loaded into and retained in the tool. At this stage the penetrating tip of the screw to be driven may be spotted in relation to the work by manual manipulation of the supporting drill 17. Upon the screw contacting the work, the drill 17 may be urged forwardly to compress the spring 19 and allow the pointed end 14 of the screwdriver shank 15 to slide in the block 13 and into engagement with the slotted or other preformed face of the drive head of the screw. Now upon the application of rotative power to the shank 15, the screw will be driven home. As this takes place and as the forward end of the sleeve 10 engages the work, the bits 30 and consequently the block 13 will, of course, be drawn forwardly with respect to the sleeve and as the bits 30 travel outwardly along the taper 11 they will expand radially to allow the head of the screw to escape past them. The elongation of the slot 21 permits the driving end 14 of the shank 15 to project outwardly beyond the bits 30 and the forward end of the sleeve 10 to permit the screw 31 to be fully tightened in its intended location even though its head may then be slightly recessed with respect to any surfaces encountered by the bits 30 and the forward end of the sleeve 10. As suggested in FIGS. 3 and 5, the bits 30 are slightly radiused to facilitate the above described escape of the screwhead past them.

It should now be apparent that I have provided an improved tool for holding and driving headed screws which is easy to use, simple in design, and economical to produce. The component parts are few in number and capable of being made at high speed on automatic equipment. The assembling of the parts is also exceedingly simple, requiring the use of but a single tool to tighten the screw 24.

Since the retaining bits 30 as well as the driver 14, 15 and the sleeve 10 rotate with the screw to be driven there is no need for bearings and wear of the parts is reduced to a minimum. Also, since the tool of the invention is small in size and light in weight, it may readily be employed in the drive chuck of a conventional small electric hand drill.

Having thus described my invention, what I claim is:

1. A tool for holding and driving screws having heads of predetermined maximum diameter and wherein the outer face of each head has at least one driving indentation comprising, an elongated bit having one end formed to fit the said indentation while the other end portion thereof is adapted to be fitted into a driving means, a tubular block slideably but non-rotatably fitted on said bit adjacent said formed end and surrounding said formed end, said block having an enlarged bore section extending inwardly from one end thereof to receive the heads of the screws, the side wall of said bore section having circumferentially spaced apertures therein adjacent the said one end of said block, grip bits slideable radially in said apertures and operative when in radially inward positions to engage the peripheral portions of the inner faces of the heads of the screws, means carried by said block to yieldingly bias said grip bits to radially outward positions, a sleeve having limited longitudinal sliding fit on said block and having a tapered internal bore section which flares outwardly to the end of the sleeve which is adjacent said grip bits, and spring means housed within said sleeve biasing said elongated bit and block in opposite relative longitudinal directions.

2. A tool according to claim 1 further characterized in that said spring means comprises a spiraled expansion spring slideably received on the first mentioned bit and having one end bearing against an end of said block, a washer on said first mentioned bit and slideably received within said sleeve and against which the other end of said spring is abutted, and pin means limiting sliding movement of said washer on said first mentioned bit in a direction outwardly of said spiraled spring.

3. A tool according to claim 1 wherein said means to yieldingly bias said grip bits comprises a longitudinal thru-bore for each of said grip bits and longitudinally aligned therewith, each of said thru-bores being of larger diameter in its end portion adjacent a grip bit than in its other end portion, a length of spring wire received in each of said thru-bores and tightly held in the small diametered portion thereof while being free to flex laterally in the portion of larger diameter, and said wires being connected to said grip bits.

4. A tool according to claim 3 wherein said circumferentially spaced apertures are of such cross section as to retain said grip bits longitudinally with respect to said block, said wires having end portions received in blind bores formed in said grip bits, and means to restrain sliding movement of said wires in said thru-bores in a longitudinal direction away from said grip bits.

5. A tool according to claim 4 further characterized in that said means to restrain longitudinal sliding movement of said wires in said thru-bores comprises a washer slideable on the first mentioned bit and overlying the adjacent ends of said wires, and an expansion coil spring surrounding said first mentioned bit within said sleeve and having one of its ends fixed with respect to said first mentioned bit while its other end abuts against said washer.

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