This invention relates to a finder attachment for hand manipulated portable power driven screw driving tools.

The principal purpose and object of my invention is to provide a finder attachment which is not only simple in construction and operation, but which when attached to a screw driving tool will enable the tool to automatically pick up and hold a screw in position to be driven in the mere act of pressing the tool at its finder end over the head of the selected screw.

Another object of my invention is to provide a sleeve element to enclose and protect the yieldable fingers of the finder element and to limit the outward flexing thereof.

A further object of my invention is to provide means for adjusting the tension of the fingers whereby the grip of the fingers on the screw head may be regulated to the screw size being handled or adjusted to compensate for wear on their screw engaging ends.

A further object of my invention is to provide for this adjustment by the use of a tension ring fitting about the fingers and adjustable towards and from their free or outer ends.

Another object of my invention is to provide the finder about the fingers with annular grooves or channels to accommodate said ring and hold it in its adjusted positions.

It is also an object of my invention to provide the sleeve element with openings in the region of the ring and its channels so that the ring may be adjusted without removing the sleeve from the finder assembly.

The invention consists further in the features hereinafter described and claimed.

In the accompanying drawing—

Fig. 1 is a side view of a portable motor driven hand tool provided with a finder attachment of my invention;

Fig. 2 is an enlarged longitudinal sectional view of said tool taken on line 2—2 of Fig. 1;

Fig. 3 is a fragmentary longitudinal sectional view through the screw gripping end of the finder;

Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 2; and

Figs. 5, 6 and 7 show the individual main elements of the finder assembly to be hereinafter described.

The finder construction of my invention comprises three main parts or elements, a finder element 1, a sleeve element 2 and an adjustable ring-like element 3. These parts are made of metal, preferably tool steel, the first two elements being machined to the form desired.

The finder element 1 is in the form of a hollow cylindrical piece, the forward section 4 of which is slotted longitudinally to provide a number of screw gripping and holding fingers 5, 6. The slots 5, 6 extend through the front end of the finder and continue back to the screw threaded section 7 adjacent its rear end. The slots 6 make the fingers 5 yieldable to pick up and grip the head of a screw in the use of the device as will hereinafter appear. The inner ends of the slots may be enlarged, as shown, to enhance the yieldability of the fingers.

In the embodiment shown, three slots 6 are formed in the section 4 to provide three circumferentially disposed fingers 5. The slots are equally spaced about the finder and this conforms each finger to approximately one third of the circumference of the screw head 8 which the fingers engage. The advantage of this arrangement is that the fingers conform more accurately to the circumference of the screw head and will hold the screw firmly in position without tilting or canting which if allowed would hinder the ready spotting of the screw in respect to the hole into which the screw is to be driven. The three point contact which the fingers provide assure holding the screw in place and moreover, with three fingers two of them will effectively hold the screw should one of the fingers become ineffective because the two fingers which grip the screw head will engage more than half its circumference.

The fingers 5 are provided with arcuate grooves or recesses 9, 9 on their inner sides adjacent their outer or free ends to receive the head of the screw. These recesses, as detailed in Fig. 3, open into the bore of the finder and are co-planar being preceded by inclined camming surfaces 10, one at the outer end of each finger. The surfaces 10 guide the finder onto the screw and also enable the screw head to spread the fingers as the fingers are forced over the screw head. This places the fingers under tension to yieldably grip the screw head and hold it in the recesses 9 when the screw head comes to rest therein. The recesses have shoulders 11 at their inner ends to seat the screw head as shown in Fig. 3. The forward ends of the recesses 9 are provided with inclined surfaces 12 which enable the screw head to spread the fingers to release the screw as will presently appear.

The outer ends of the surfaces 10 have a di-
meter slightly larger than the screw head of the screw size for which the finder is provided. This enables the finder to be readily and readily engaged over the screw head to automatically pick up a screw on pressing the finder over the screw. It is to be understood that in practice the screws to be picked up will be supported or placed in positions with their heads uppermost to be engaged over the finder in the mere act of pressing the finder over the selected screw. This is done while the finder is a part of the tool employed to drive the screws. The screws are picked up one at a time by the tool at its finger end. The sleeve element 5 surrounds the fingers 6 and firmly grip and hold the screw with its shank or stem extending outwardly beyond the tool for insertion thereby into the hole into which the screw is to be driven. The kerf 13 of the screw head within the finder is in position to receive the screw driving bit or blade with which the tool is provided to drive the screw. This is clearly shown in Fig. 2, the portable power tool to which the finder is connected as an attachment being completely shown in Fig. 1 and there marked 14.

The screw shown is a self-tapping machine screw. These screws are made of hard metal and cut their own threads on being applied. These screws require a high torque to drive them and my improved finder facilitates the handling and driving of screws of this character. Moreover, the finder supports these screws in respect to the non-tapped holes into which these screws are to be driven. It is to be understood that my finder device is not limited to handling machine screws, on the contrary being adaptable for holding and driving screws of all types, machine as well as wood screws.

Moreover, my finder construction, while shown herein for holding relatively small machine screws, may be made to handle screws of larger sizes. For flat headed, counter-sinking screws, the recesses 9 will be made to accommodate these screws and the bevel counter-sinking surfaces thereof will fit against the inclines 12 at the outer ends of the recesses. For flister head screws, the inclines 10 will extend directly to the side walls of the recesses 9. The straight side surfaces of these screw heads will give sufficient frictional support for holding such screws in the recesses without the supplemental inclines 12.

The screw threaded section 7 of the finder 1 is slightly larger in diameter than the finger provided section 4. This enables the sleeve element 2 to be connected with the finder element 1. The sleeve element 2 is provided with internal screw threads 15 at its inner end to engage the external screw threads on the finder section 7 when the sleeve and the finder elements are in assembled relation as shown in Figs. 1 and 2.

The rear end section 16 of the finder element 1 is larger in diameter than the section 7 which it joins and has a smooth cylindrical outer surface 17 to slidably mount the finder device within the outer end portion of the tool case 18. The end section 16 of the finder 1 is slotted longitudinally as at 19 to receive a set screw 20 carried by the tool case as shown in Figs. 1 and 2. The slot 20 is closed at its ends to limit the sliding movement of the finder with respect to the tool case and also to keep the finder in connected relation thereto. The slot and the set-screw also hold the finder from rotation.

The sleeve element 2 surrounds the fingers 5 to house and protect them and also to limit the extent of their outward flexing. Being so guarded, the fingers will not be sprung out of shape by the repeated picking up of screws in the use of the device or by contact with the work or other adjacent objects. The sleeve 2 terminates a trifle short of the outer or free ends of the fingers 6, as shown in Fig. 2, so that the fingers will be exposed to readily pick up a screw.

The section 22 of the sleeve 2 joins the section 1 slightly larger in diameter than the outer end portion of the fingers and is provided with a series of annular grooves or channels 21. The latter extend about the outer side of the fingers 6 and firmly grip and hold the screw head.

In the drawing, the finder attachment is shown applied to a portable pneumatically motor driven rotary tool, although it is to be understood that the attachment may be used with electrically motor driven portable tools. The particular type of tool is not essentially material, except that it must be adapted for screw driving operations.

In the tool shown, a collet spring 24 is located within the casing 18 at the rear end of the finder 1 to normally press it forwardly. This spring seats against a shoulder 25 within the tool case and said shoulder surrounds a spindle element 26. The latter is in line with the bore of the finder and has a screw threaded socket 27 to receive the threaded inner end of an adapter 28. The latter is in line with the bore of the finder and has a screw threaded socket at its outer end to receive the screw threaded inner end of a screw driving bit 29. The latter is housed within the finder 1 and is engageable with the kerf in the screw head when the tool is pressed against the work. Normally, the bit 29 occupies the position shown in Fig. 2 and does not engage the screw head when the finder picks up a screw.

The spindle element 26 mounts a pair of clutch members 30, 31, the former being revoluble on the spindle and the latter having a non-rotative, but slidable connection therewith. This connection comprises key-ways and cooperating ball keys as in tools of this character. Member 31 is normally held engaged with the clutch member 30 by a torque spring 32, the tension of which may be adjusted by a ring nut 33 mounted on a threaded portion of the spindle element 26 as shown. The clutch members 30, 31 have engageable clutch teeth on their opposed surfaces which teeth have inclined sides so as to slip at a given torque to release the power

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drive on the screw driver 29 when the screw tightens in the work. The power clut
ch member 30 on the spindle element 28 and a clutch member 34 on the tool spindl
25 These clutch members have engageable clutch teeth on their opposed surfaces and which clutch teeth are held normally disengaged by a collet spring 36 pressing outwardly against the spindle ele
ment 28 on an extension 37 thereof as in Fig. 1. The motor for driving the tool is located with
in the motor section 38 of the tool case, and in the tool structure shown is of the rotor type with radial piston blades. Compressed air for oper
ating the rotor is admitted to the tool casing through a supply conduit or hose 39 connected to the rear end of the tool as shown in Fig. 1. The tool has a throttle valve on the rear side of the motor case to control the supply of the pres
sure fluid to the motor. This valve is spring biased to a closed position, being opened by a lever 40 on the exterior of the tool casing and pivoted thereto as shown. The exhaust for the motor discharges at 41.

In the tool shown, the finder picks up the screws to be driven by merely forcing the finder end of the tool over the head of the selected screw. This connects the screw to the tool and the latter is employed to insert the screw into the hole into which the screw is to be driven. Pressing the screw into the hole by the tool connects the driving clutch 30, 34 and the screw is driven into its hole by the power of the tool. When the outer ends of the fingers 5 contact with the work, the continued forward movement of the screw under the driving action of the bit 29 spreads the fingers to release the screw. When the screw sets, that is, tightens in the work, the slip clutch 30, 31 releases and the tool is then withdrawn from the screw. The spring 36 now expands to open the power clutch and the tool is ready to be applied to the next screw to be picked up and driven.

The clutch spring 36 is strong enough to resist closing the power clutch as the finder end of the tool is forced over the head of the screw being picked up. The finder spring 24 is strong enough to normally keep the screw being picked up out of contact with the driver element 29.

The finder device shown and described is simple in construction and operation. It is adapted to automatically pick up screws and insert and drive them into the work without manual support by the operator of the tool. This enables screws to be rapidly applied and driven as required along production lines, and moreover, with the screw supported by the tool screw driving operations are made possible in restricted and confined quarters as encountered for example in the mounting of automotive ra
diator grills. A fixture for holding a supply of screws in position to be picked up by the tool is shown in the co-pending application of Frank K. Ames, Serial No. 306,256 filed No

ember 27, 1939, and owned by the assignee of the instant application.

The details of construction and arrangement of parts shown and described may be variously changed within the spirit and scope of my invention, except as pointed out in the annexed claims.

I claim as my invention:

1. A finder attachment of the character de
scribed comprising, a cylindric finder element having a bore extending therethrough and slotted axially for a portion of its length through one end to provide a plurality of circumferentially disposed yieldable fingers for picking up and holding a screw at their outer ends, the finder element secured to the finder element about the fingers and extending to substantially the outer thereof to house and protect the fingers for substantially their entire length, and a tension ring fitting about and movable along the fingers within the sleeve element for adjusting the ten
sion of the fingers, said sleeve element having an opening through its surrounding wall to expose the ring for access through the sleeve element.

2. A finder attachment of the character described comprising, a cylindric finder element having a bore extending therethrough and slotted axially for a portion of its length through one end to provide a plurality of circumferentially disposed yieldable fingers for picking up and holding a screw at their outer or free ends, and a sleeve element enclosing the finder element about the fingers and having releasable connection with the finder beyond the inner ends of the fingers, said sleeve element extending to substan
tially the outer ends of the fingers to house and protect the same for substantially their entire length, said sleeve element having an inside diameter slightly greater than the outside diameter of the finder at the fingers to limit the extent to which the fingers may yield outwardly on the passing of a screw head theretwixten and to permit sliding of the sleeve element on and off the finder over the outer ends of the fingers.

3. A finder attachment of the character de
scribed comprising, a cylindric finder element having a bore extending therethrough and slotted axially for a portion of its length through one end to provide a plurality of circumferentially disposed yieldable fingers for picking up and holding a screw at their outer or free ends, a sleeve element enclosing the finder element about the fingers and having releasable connection with the finder beyond the inner ends of the fingers, said sleeve element extending to substantially the outer ends of the fingers and permitting sliding of the sleeve element on and off the finder over the outer ends of the fingers.

4. A finder attachment of the character de
scribed comprising, a cylindric finder element having a bore extending therethrough and slotted axially for a portion of its length through one end to provide a plurality of circumferentially disposed yieldable fingers to pick up and hold a screw at their outer or free ends, a sleeve element enclosing the finder element about the fingers and having releasable connection with the finder beyond the inner ends of the fingers, said sleeve element extending to substantially the outer ends of the fingers to house and protect the same for substantially their entire length, said sleeve element having an inside diameter slightly greater than the outside diameter of the fingers to limit the extent to which the fingers may yield outwardly on the passing of a screw head theretwixten and to permit sliding of the sleeve element on and off the finder over the outer ends of the fingers, and a tension ring fitting about and movable along the fingers within the sleeve element.
in the space between the sleeve element and the fingers for adjusting the tension of said fingers.

5. A finder attachment of the character described comprising, a cylindric finder element having a bore extending therethrough and slotted axially for a portion of its length through one end to provide a plurality of circumferentially disposed yieldable fingers for picking up and holding a screw at their outer or free ends, a sleeve element enclosing the finder element about the fingers and having releasable connection with the finder beyond the inner ends of the fingers, said sleeve element extending to substantially outer ends of the fingers to house and protect the same for substantially their entire length, said sleeve element having an inside diameter slightly larger than the outside diameter of the finder at the fingers to limit the extent to which the fingers may yield outwardly on the passing of a screw head therebetween and to permit sliding of the sleeve element on and off the finder over the outer ends of the fingers, and a tension ring fitting about and movable along the fingers in the space between the same and the sleeve element for adjusting the tension of the fingers, said finder having a series of stops spaced along the fingers within the sleeve element to locate the ring in its various positions of adjustment.

6. A finder attachment of the character described comprising, a cylindric finder element formed to provide a series of longitudinally arranged annular sections reduced in diameter from the inner to the outer end of the finder element, said finder element having a bore extending through all of said sections and slotted axially in the section at the outer end of the finder element through the end thereof to provide a plurality of circumferentially disposed yieldable fingers for picking up and holding a screw at the outer or free ends of said fingers, the section at the inner end of the finder element being formed to mount the same in a tool device and the intermediate section being provided with external screw threads, and a sleeve element enclosing the finder about the fingers and having screw threaded connection with the screw threaded section of the finder to releasably connect the sleeve element to the finder, said sleeve element extending from the threaded section of the finder to substantially the outer ends of the fingers to house and protect the same for substantially their entire length, the section of the finder containing the fingers being smaller in diameter than the sleeve element to provide for the outward flexing of the fingers on the passing of a screw head therebetween and to permit sliding of the sleeve element on and off the finder over the outer ends of the fingers.

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