

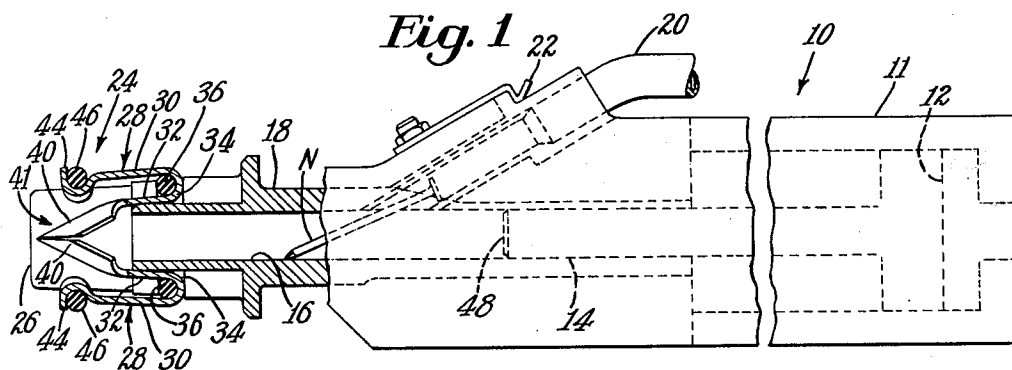
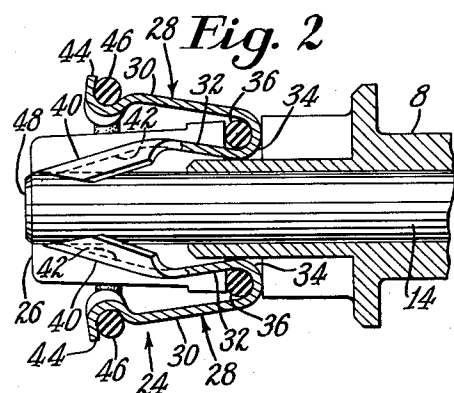
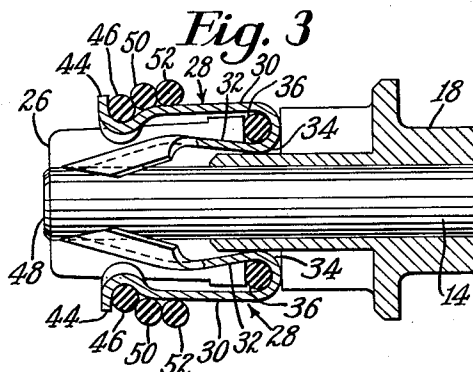
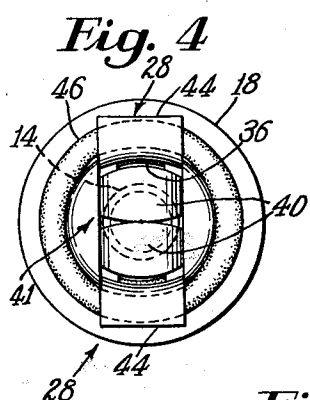
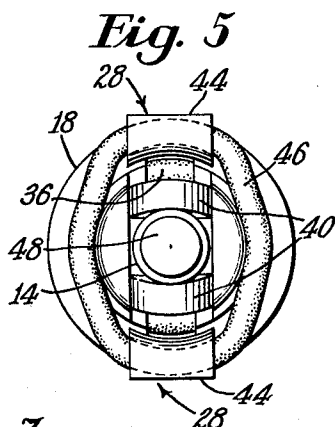
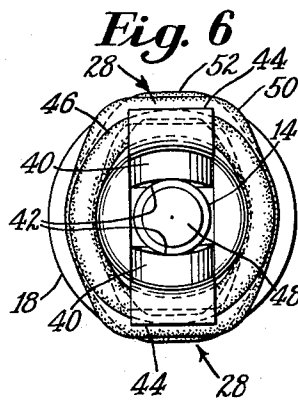
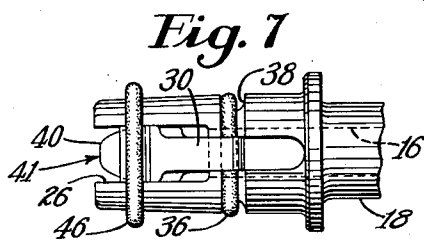
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FASTENER INSERTING TOOLS

Filed June 4, 1962



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3,134,981

FASTENER INSERTING TOOLS

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This invention relates to fastener inserting tools in general and more particularly to tools having movable drivers and jaws for releasably supporting fasteners in the paths of the drivers.

One well-known form of fastener inserting tool is shown in United States Patent No. 2,875,730, issued March 3, 1959 to K. H. Carpenter et al. The tool includes a fluid motor which powers a driver for inserting, in a single stroke, fasteners such as nails or the like. The nails are conveyed to the tool one at a time by a remotely located pneumatic separator. Each fastener, as it reaches the tool, is engaged and held by a pair of jaw members in the path of the driver at the forward end of the tool until the tool is fired. Thereupon, the driver moves forward, engages the fastener, and drives it into the work piece, camming open the jaw members in the process.

One of the problems encountered with all tools of this type is in properly positioning and supporting the fastener in the path of the driver. The Carpenter et al. patent discloses solid, precision machined, metal jaws having precisely formed fastener engaging surfaces for holding a fastener accurately in alignment with the driver axis. The jaws, while they do their intended job well, are relatively heavy, expensive to make and have a highly concentrated mass. Being solid and non-flexible, all of the fastener holding power is supplied to the jaws by external means, such as a garter spring in the form of an O ring which surrounds them. With this particular jaw construction, while the fasteners are properly held, constant usage sometimes results in premature jaw failure. Each time the tool is fired the driver engages the jaws with a high impact, camming them open with considerable force. The inherent high mass and inertia of the jaws offers considerable resistance to impact resulting in metal fatigue and fracture requiring them to be replaced.

Another type of jaw found in fastener inserting tools is of the type disclosed in United States Patent No. 2,879,509, issued March 31, 1959, in the name of Congdon et al. The Congdon tool operates by multiple blow and the jaws are the cantilever spring type which comprises a pair of flexible spring members each of which is attached to the tool at one end by a screw or the like. All of the holding power of the Congdon jaws results from the spring flexibility of the jaw members themselves, no auxiliary holding power being employed. One of the disadvantages of this type of jaw is that it must be interchanged depending upon the size and weight of fastener being driven. Since a relatively large nail is propelled to the tool with a greater amount of momentum than a smaller nail, if jaw members having sufficient strength to hold the large nail are employed, a substantially smaller nail does not have sufficient momentum to cam open the jaws and be received in driving position. Conversely, jaws intended for small nails will not offer enough holding power to prevent a large nail from being blown out of the tool. Thus, separate jaws must be used in accordance with the size and weight of fastener being driven. Another disadvantage of this type of jaw is that continuous usage loosens the holding means (i.e. screws or the like) which secure the jaws to the tool

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whereupon they must be tightened or lose their effectiveness.

Still a third type of jaw employed in fastener tools is the quill type, as for example that shown in United States Patent No. 2,820,966, issued January 28, 1958 to D. B. McIlvin. This type of jaw usually comprises three or four individual flexible jaw members joined at one end to form a quill which is inserted at the forward end of a driving tool. These jaw members, like the cantilever jaws of Congdon, rely entirely upon inherent spring resiliency for holding power. They have been found, for the most part, to be satisfactory for tacks and smaller fasteners, such as caseback nails, but do not offer sufficient holding power for large fasteners.

While attempts have been made to combine auxiliary holding means such as garter springs or O rings with the cantilever type jaws, this has not proved to be altogether satisfactory since the cantilever jaws do not lend themselves readily to the reception of a garter spring unless specially constructed. Furthermore, other attempts to remedy the above problems have resulted in jaws of the general cantilever type constructed with relatively heavy machined fastener engaging members at their free ends and surrounded by a garter spring. This type of jaw presents the same premature fracture problems as the Carpenter et al. type due to their high concentration of mass.

It is an object of this invention to provide inexpensive jaws for fastener inserting tools having all of the benefits but none of the disadvantages of the above-described types.

It is another object of this invention to provide flexible jaws for fastener inserting tools which have low total mass and which will not fracture as a result of continuous usage.

It is still another object of this invention to provide jaws for fastener inserting tools which provide fastener holding power through inherent resiliency as well as through supplemental means.

Still another object of this invention is to provide jaws for fastener inserting tools which are yieldable relatively to the tool and which are virtually immune to damage caused by continuous impact engagement by a fastener driver.

Still another object of this invention is to provide jaws for fastener inserting tools whose holding power may be varied in accordance with the size and weight of the fastener to be driven without having to be replaced.

In accordance with these objects and as a feature of this invention, there is provided in a fastener inserting tool having a movable driver, improved jaws for removably supporting a fastener in the path of the driver. The jaws comprise a pair of flexible jaw members pivotally assembled on the tool with a fastener engaging portion of each of the members in the path of the driver. Yieldable pressure means urge the flexible jaw members together whereby either or both of the jaw members and the pressure means will yield outwardly of the driver path as the driver moves through the jaws.

Each jaw member comprises a flexible, elongated spring of low total mass bent on itself intermediate its ends to form two extending legs. The jaw members are assembled on the tool on opposite sides of the driver path with the legs of each member opening in the direction in which the fastener is driven. The end of one leg of each jaw member has formed on it a fastener engaging surface which, when combined with the corresponding end of the leg of the other member, forms a fastener retaining member resembling a "duck bill." The opposite or outer legs of each jaw member is formed to receive pressure means, such as a garter spring or O ring, for urging the jaws together. The jaws may be pivoted by a single retaining member, such as a steel ring, or preferably by

a garter spring whereby, in using the latter, the jaw members are yieldable outwardly as the fastener driver moves through them in addition to pivoting and flexing.

The above and other features of the invention including various novel details of construction and combinations of parts will now be more particularly described with reference to the accompanying drawings and pointed out in the claims. It will be understood that the particular tool and jaws embodying the invention are shown by way of illustration only and not as limitations of the invention. The principles and features of this invention may be employed in varied and numerous embodiments without departing from the scope of the invention.

In the drawings,

FIG. 1 is a side elevation, partially in section, of a fastener inserting tool having jaws embodying the invention;

FIG. 2 is a sectional view, on an enlarged scale, of the fastener retaining portion of the tool including the jaws shown in FIG. 1;

FIG. 3 is a sectional view similar to FIG. 2 with supplemental pressure means holding the jaws together;

FIGS. 4, 5 and 6 are end views of the tool as shown in FIGS. 1, 2 and 3, respectively; and,

FIG. 7 is a plan view of the tool shown in FIG. 1 on a scale corresponding thereto.

Referring to FIG. 1, the invention will be seen embodied in a fastener inserting tool of the type shown in the above-identified Carpenter et al. patent to which reference may be had for a more detailed description. Briefly, the tool comprises a fluid motor 10, herein shown only schematically, having a piston 12 located for reciprocation within a casing 11. A fastener driver 14 extends from the piston 12 and passes through a bore 16 in a nail receiver or nose-piece 18 on the forward or left-hand end of the tool. A fastener delivering conduit 20 is releasably secured by a latch 22 to the tool. Fasteners such as a nail N, are pneumatically delivered one at a time to the tool from a remotely located fastener separating mechanism (not shown) upon receipt of a signal from the tool in known manner as evidenced by the Carpenter et al. patent.

As the nail N reaches the tool, it is engaged and held in the path of the driver 14 by jaws generally indicated 24. The nail is retained by the jaws 24 until the driver 14, which moves from right to left through the bore 16, drives it into the work piece. In the process the jaws are cammed open by the driver passing through them as seen in FIGS. 2 and 3.

As seen in FIGS. 1 and 7, the nail receiver 18 comprises a generally cylindrical member having a bifurcated forward end 26 in which is held a pair of symmetrical jaw members 28. Each jaw member 28 is formed from a strip of flexible spring steel bent on itself intermediate its ends to form two extending legs 30 and 32. The thin narrow strip of steel from which the jaw members are made is relatively light in weight having a comparatively low total mass as compared with the rigid, precision machined type jaws. The intermediate bent portion 34 of each jaw member is pivotally secured by a ring 36 fitting within a groove 38 in the nail receiver or nosepiece 18. The unsupported end of the inner leg 32 of each jaw member is wider than the remaining portion of the leg and is formed into a general spade like configuration 40 having an interior concave fastener engaging surface 42 formed on a radius approximating that of the driver 14. In their assembled position, as seen in the drawing, the spade portions 40 of the jaw members 28 extend into the path of the driver and have the general appearance of a "duck bill" 41.

The other or outer leg 30 of each jaw member 28 lies outwardly of the driver path and at its free end is formed into an open hook 44 to receive one or more resilient pressure applying O rings 46. It will be seen that the outer legs 30 and inner legs 32 of the jaw members 28 open in the direction in which the fastener is driven, i.e., right to

left. The jaw members are flexible along their length between the hooks 44 and the spade portions 40.

The assembled jaws 24 may be considered to have a first or inner portion comprising the "duck bill" 41, i.e. the spade 40 to each jaw member, yieldingly located in the driver path and a second or outer portion comprising the hook 44 located outside the driver path. It will be noted that the first and second portions of the assembled jaws are spaced from each other in substantial alignment transversely of the driver path and are yieldable relatively to each other whereby the individual flexible jaw members 28 or the O ring 46 or both will yield as the driver moves through the jaws.

FIG. 2 illustrates the condition where a relatively light weight fastener is being driven. In this condition a single garter spring or O ring 46 urges the jaws together. When the driver 18 passes through the jaws in the process of driving the fastener, its forward end 48 will engage the concave surfaces 42 of the "duck bill" 41 and cam the jaw members 28 outwardly. Under this condition where there is a relatively light pressure, i.e. that of the single spring or O ring 46 urging the jaws together, substantially all of the yielding will take place in the O ring with the jaw members pivoting outwardly about their intermediate portions 34, i.e., those portions engaged by the retaining ring 36. This will be seen by comparing FIGS. 4 and 5 which show, respectively, the tool before and after the driver 14 has passed through the jaws 24, FIG. 5 showing the stretched O ring 46 and the extended hooks 44.

Under the condition where a heavier or larger nail is to be driven, the holding power of the jaws may be increased by adding additional O rings 50 and 52, as shown in FIGS. 3 and 6. Under this condition, when the driver 14 passes through the "duck bill" 41 formed by the spades 40 of the jaw members 28, substantially all of the yielding will take place in the jaw members themselves with little stretching taking place in the O rings. This will be seen by comparing the O ring 46 as seen in FIGS. 3 and 6 with the condition shown in FIGS. 2 and 5.

Under conditions between those illustrated in FIGS. 2 and 3, where perhaps two O rings are employed, the amount of yield between the O ring and the jaw members 28 will be somewhat more equally distributed, part of the expansion being taken up by the jaw members 28 and part by the O rings. In any event, however, the assembled jaws 24 being flexible, pivotally attached to the tool, and of low total mass, will be virtually immune to metal fatigue and fracture.

The retaining ring 36 which pivotally assembles the jaw members 28 on the nail receiver 18 may, if desired, also be a garter spring or O ring, and in the drawings is so illustrated. By the use of a flexible assembling member 36, the jaw members 28 are not only pivotal with respect to the tool but may, under extreme pressure conditions, yield laterally outwardly in addition to flexing.

Thus, it will be seen that by this construction any or all of the flexible jaw members 28, the yieldable pressure members 46, 50 and 52, as well as the resilient assembling member 36, will yield in a direction outwardly of the driver path as the driver moves through the jaws thereby producing an inexpensive construction having all of the benefits but none of the disadvantages of the above-described jaw types.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. A fastener inserting tool having a movable driver and a pair of jaw members removably supporting a fastener in the path of the driver, each jaw member comprising a flexible elongated spring of low total mass bent on itself intermediate its ends to form two legs, means pivotally assembling the jaw members on the tool on opposite sides of the driver path with the legs of each member opening in the direction in which the fastener is driven, one leg of each jaw member converging inwardly of the

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driver path toward the corresponding leg of the member, the other leg of each jaw member lying outside said path and resilient means engaging the outer legs of the assembled jaw members urging said members together whereby the inner legs will engage and yieldingly hold a fastener in the driver path.

2. A fastener inserting tool having a movable driver and a pair of jaw members for removably supporting a fastener in the path of the driver, each jaw member comprising a flexible elongated spring of low total mass bent on itself intermediate its ends to form two extending legs, resilient means engageable with the intermediate bent portions of the jaw members pivotally assembling said members on the tool on diametrically opposite sides of the driver path with the legs of each member opening in the direction in which the fastener is driven, one leg of each jaw member converging inwardly of the driver path toward the corresponding leg of the other member, the other leg of each jaw member lying outside said path, and resilient means engaging the outer legs of the assembled jaw members urging said members together to position the inner legs to engage a fastener in the driver path whereby said jaw members will yield outwardly of the driver path as the driver moves through the jaws.

3. A fastener inserting tool having a movable driver and a pair of jaw members for removably supporting a fastener in the path of the driver, each jaw member comprising a strip of spring material flexible along its length and bent on itself intermediate its ends to form two extending legs, the end of one leg having a concave fastener engaging surface formed on a radius approximating that of the driver, means pivotally assembling the jaw members on the tool on opposite sides of the driver path with the legs of each member opening in the direction in which the fastener is driven, the legs of the jaw members having the concave surfaces converging inwardly of the driver path toward each other, the other leg of each jaw member lying outside said path, and resilient means engaging the outer legs of the assembled jaw members for urging said members together whereby the concave surfaces will cooperate to engage and yieldingly hold a fastener until released by the movement of the driver through said jaw members.

4. A fastener inserting tool having a movable driver and a pair of jaw members for removably supporting a fastener in the path of the driver, each jaw member comprising a strip of narrow spring material bent on itself intermediate its ends to form two extending legs, the end of one leg having a concave fastener engaging surface wider than the remaining portion of said leg and formed on a radius approximating that of the driver, the end of the other leg of each member being formed into an open hook, said members being flexible along their length between the concave surface and the hook, means engageable with the intermediate portions of the jaw members pivotally assembling said members on the tool with the legs of each member opening in the direction in which the fastener is driven, the legs having the concave fastener engaging surfaces converging inwardly of the driver path toward each other, the legs having the hooks lying outside said path, and at least one garter spring engageable with the hooks of the extending legs for urging the jaw members together whereby said concave surfaces cooperate to engage and yieldingly hold a fastener until released by the passage of the driver through said jaw members.

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5. A fastener inserting tool having a movable driver and jaws for removably supporting a fastener in the path of the driver, said jaws comprising a pair of flexible symmetrical jaw members each pivotally assembled on the tool at opposite sides of the driver path, the assembled jaws having an inner portion comprising an inner part of each jaw member yieldingly located in the driver path and engageable with a fastener and an outer portion comprising an outer part of each jaw member located outside of the driver path, resilient pressure means engageable with said outer portion of the assembled jaws urging the jaw members together, said inner and outer parts of each jaw member being spaced respectively from the other part in substantial alignment laterally of the driver path and yieldingly movable relatively to each other whereby either or both of said flexible jaw members and said resilient pressure means will yield as the driver moves through the jaws.

6. A fastener inserting tool having a movable driver and jaws for removably supporting a fastener in the path of the driver, said jaws comprising a pair of flexible symmetrical jaw members, resilient means pivotally assembling said members on the tool at opposite sides of the driver path, said assembled jaws having an inner portion comprising an inner part of each jaw member yieldingly located in the driver path and engageable with a fastener and an outer portion comprising an outer part of each jaw member located outside the driver path, annular resilient pressure means engageable with said outer portion of the assembled jaws urging them together, said inner and outer portions of the assembled jaws being spaced from each other in substantial alignment with said annular pressure means and yieldingly movable relatively to each other whereby all or any of said flexible jaw members, said resilient pressure means and said resilient assembling means will yield outwardly of the driver path as the driver moves through the jaws.

7. A fastener inserting tool having a movable driver and jaws for removably supporting a fastener in the path of the driver, said jaws comprising a pair of flexible symmetrical jaw members, means pivotally assembling the jaw members on the tool at opposite sides of the driver path, said assembled jaws having an inner portion comprising an inner part of each jaw member yieldingly located in the driver path and engageable with a fastener and an outer portion comprising an outer part of each jaw member located outside the driver path, resilient pressure means engageable with said outer portion of the assembled jaws urging the jaw members together, said inner and outer portions of the assembled jaws being spaced from said pivotal assembling means in the direction in which the fastener is driven and spaced from each other in substantial alignment transversely of the driver path, said inner and outer portions being yieldingly movable relatively to each other whereby either or both of said flexible jaw members and said resilient pressure means will yield as the driver moves through the jaws.

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