

Aug. 7, 1951

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2,563,464

FEED FINGER AND GRIPPING ELEMENT THEREFOR

Filed June 11, 1948

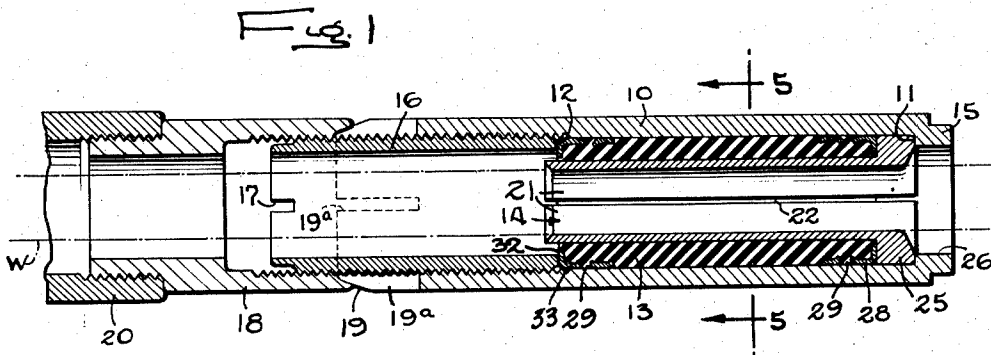
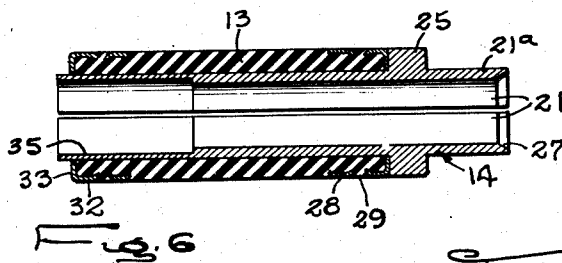
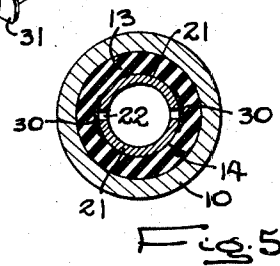
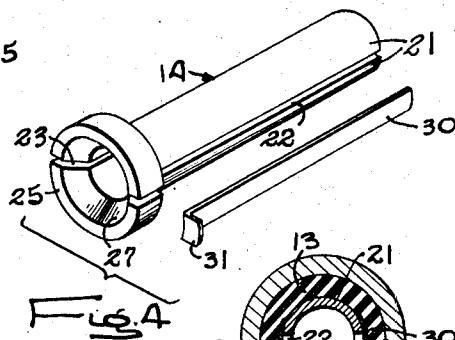
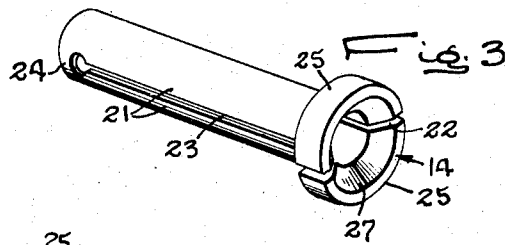
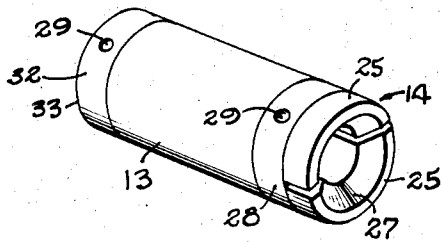


Fig. 2



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2,563,464

FEED FINGER AND GRIPPING ELEMENT
THEREFOR

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Application June 11, 1948, Serial No. 32,440

7 Claims. (Cl. 279-41)

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This invention relates to so-called feed fingers for automatic screw machines and has more particular reference to those of the type in which the gripping force is obtained by compressing a flowable resilient material.

One object is to increase the wear resistance of the work gripping surfaces in a feed finger of the above character.

Another object is to provide a work gripping element having rigid metal pads which are adjustable to accommodate a wider range of work sizes than prior gripping elements.

A further object is to provide a gripping element of the above character in which the work engaging surfaces are on separately formed hardened members which are collapsed radially by endwise compression of an associated body of resilient material surrounding the members.

Still another object is to join the work gripping elements in a novel manner while retaining ready collapsibility thereof.

The invention also resides in the novel manner of combining the unitary gripping element with the feed finger proper.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

Figure 1 is a longitudinal sectional view of a feed finger embodying the novel features of the present invention.

Fig. 2 is a perspective view of the improved gripping element.

Figs. 3 and 4 are perspective views of a part of the gripping element.

Fig. 5 is a section taken along line 5-5 of Fig. 1.

Fig. 6 is a longitudinal sectional view of a modified form of the gripping element.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiments. It is to be understood, however, that I do not intend to limit the invention by such disclosure but aim to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

As illustrated in the drawings, the invention comprises generally a rigid cylindrical shell 10 having internal abutments 11 and 12 movable toward each other to axially compress a body 13 of yieldable material within the shell and thereby derive radially directed forces for collapsing a hardened gripping element around a work bar

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W which is to be advanced step by step in an automatic screw machine.

Herein the abutment 11 is formed by an integral turned flange 15 which defines an opening 26 on the one end of the shell while the abutment 12 is formed by the end of a hollow plug 16 screw threaded into the other end of the shell.

By inserting a tool in a slot 17 in the projecting end of the plug 16, the latter may be turned to advance or retract the movable abutment 12. A hollow cap 18 is threaded onto the projecting end of the plug 16 and wedged against a conical surface 19 on the end of the shell which may be split longitudinally as indicated at 19^a. The other end of the cap is threaded externally to screw into and be supported by the reciprocating feed member 20 of an automatic screw machine.

The gripping element 14 comprises a plurality of elongated hardened pads or jaws 21 in the form of rigid metal bars of arcuate cross-section angularly spaced apart and having internal concave surfaces which fit around the work bar W and grip the latter frictionally when the pads or segments are collapsed. Preferably, the segments are connected integrally but are free to collapse radially. For this purpose, the gripping element may be formed by splitting a tube longitudinally as indicated at 22 throughout its length on one side and as indicated at 23 to a point short of one end whereby to leave a short connection 24 joining the segments together and retaining their angular spacing independently of the enclosing sleeve 13 without detracting materially from the collapsibility of the element as a whole.

To hold the gripping element 14 in the shell 10 against axial displacement, an abutment on the element end engages the forward abutment 11. Herein, the element abutment is formed by an external flange 25 at the split end of the tube 14 larger than the end opening 26 in the shell but sized to fit loosely within the shell proper. The flange is formed by lugs on each of the segments or jaws 21 and thus is collapsible with the latter. Preferably, the flange 25 is coned internally as indicated at 27 to form an axially facing surface for guiding the end of a work bar W into the gripping tube.

The internal surfaces of the jaws 21 are of course made smooth in order to avoid marring the exterior of the work bar along which the jaws slide in the return stroke of the feed member after each forward advance of the bar in the operation of an automatic screw machine. The jaw surfaces are hardened so as to resist wear.

The sleeve 13 by which the jaws 21 are col-

lapsed is composed of resilient flowable material, preferably a thermosetting plastic such, for example, as firm but reliable yieldable oil-resistant synthetic rubber molded around or formed separately from the gripping element 14. One end of the sleeve abuts against the flange 25 and may be covered by a ferrule or cup 28 enclosing the end of the sleeve and secured to the latter by bonding or by a mechanical interlock 29. The squared bottom of the cup forms the sleeve end and abuts directly against the flange 25.

The sleeve 13 is somewhat shorter than the tube 14 proper and is sized to fit loosely within the shell 10 when uncompressed and snugly around the tube 14 with which the sleeve forms a unitary assembly (Fig. 2) which may be inserted in or removed from the shell after removal of the plug 16. To prevent the plastic material when under compression from flowing into the slots 22 and 23, the latter are covered by thin strips or shims 30 of flexible material bent around the tube and held in place by the sleeve. To assist in maintaining their angular positions, the strips may be formed with end flanges 31 which project outwardly and become clamped between the end cup 28 and the tube flange 25.

At its other end, the sleeve 13 engages an abutment in the form of a collar 32 engageable with the movable shell abutment 12 slidable along the exterior of the tube 14 as the latter abutment is advanced over the end of the tube 14 or retracted relative to the shell. Herein, the collar constitutes the bottom of a cup 33 which encloses the end of the sleeve 13 the same as the cup 28. Preferably, the cups are joined to the sleeve during molding of the latter so that their external surfaces are flush with the exterior of the intervening part of the sleeve.

To permit the sleeve 13 to be compressed axially and thus flow as a fluid so as to collapse the jaws 21 radially, the inner surface of the rubber is disconnected from the exterior of the tube 14. This may be accomplished by forming the sleeve separately or, if the sleeve is molded directly into the tube, by preventing bonding of the rubber to the metal.

In order to shorten the length of the work bar which is wasted as the bar is fed out of the feed finger, the jaws 21 may be projected forwardly beyond the flange 25 as indicated at 21^a in Fig. 6 so as to extend through and beyond the opening 26 in the forward end of the shell 10. Owing to the rigid character of the jaws, the collapsing force exerted on the latter by endwise compression of the rubber sleeve 13 will be distributed over the entire internal surface of the jaws so that the work bar is gripped all of the way to the ends of the jaw extensions 21^a. If it is desired to concentrate the gripping force over the forward end portion of the jaws, the trailing end portions of the latter may be undercut as indicated at 35 (Fig. 6). In this way, the required amount of rubber may be provided within the radial space available within the shell and, at the same time, the gripping force may be supplied to the work at any desired position along the latter.

In use, the improved gripping unit is inserted in the shell 10, preferably with the work bar to be used projecting into the flanged end of the tube 14. The plug 16 is then inserted and screwed into the shell to advance the abutment 12 past the rear end of the tube 14. As the abutment is advanced, the volume of the tubular space defined by the exterior of the tube 14 and the interior of the shell 10 between the flange 25 and

the abutment 12 is reduced and the rubber material is thus compressed. Because of the flowability of the material, the axially directed force is converted into a radial force exerted on the jaws 21 to collapse the latter around the work bar. The tightening of the screw is continued until the work bar is gripped with the desired force. The latter is applied uniformly to the work surface because of the freedom of the jaws 21 to flex relative to each other and because of the flowability of the sleeve material. As a result, the danger of marring the work surface and uneven wearing of the jaws 21 is minimized. For the same reason, the gripping force may be adjusted very accurately to a value best suited to given operating conditions.

I claim as my invention:

1. A feed finger comprising, a rigid walled shell adapted to be mounted on the feed element of an automatic screw machine, axially spaced abutments within said shell movable axially toward and away from each other, rigid wear pads angularly spaced apart within said shell and radially collapsible around a bar of stock extending through the shell, each pad engaging one of said abutments and projecting axially past the other abutment, and a sleeve of resiliently yieldable material between said shell and pads and operable when compressed axially by movement of the abutments toward each other to press said pads radially inwardly and grip said stock bar.

2. A stock gripping element comprising elongated metal pads of arcuate cross-section angularly spaced apart and adapted to fit around a bar of stock, strips each overlapping the external margins of the adjacent pads, an external abutment rigid with each of said pads, a layer of yieldable material covering the external surface of said pad and said strips, and a rigid abutment slidable endwise along the exterior of said pad and said strips to effect endwise compression of said layer.

3. A stock gripping element comprising a plurality of elongated metal pads of arcuate cross-section providing concave wear-resisting internal surfaces adapted to fit around a bar of stock, means rigid with said pads and providing an external substantially right angular axially facing abutment, a layer of resiliently yieldable material covering the outer surfaces of said pads, means connecting said pads and acting independently of said layer to hold the pads in angularly spaced relation while permitting radial contraction and expansion thereof, and a member abutting against the opposite end of said layer and slidable endwise along said outer pad surfaces to effect endwise compression of said material and radial collapse of said pads.

4. A gripping element for the feed finger of an automatic screw machine comprising a metal tube having an external flange rigid with one end thereof and providing an abutment facing axially toward the other tube end, said tube being split longitudinally into a plurality of radially collapsible segments, a sleeve of resiliently yieldable material enclosing said tube and abutting at one end against said flange, and a collar slidable along said other tube end and engageable with the other end of said sleeve to compress the latter axially along the tube and against said flange.

5. A stock gripping element comprising a plurality of elongated metal pads of arcuate cross-section providing angularly spaced concave

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wear-resisting internal surfaces angularly spaced apart at their adjacent edges by narrow gaps, a layer of resiliently yieldable material enclosing said pads, an arcuate abutment at one end of said layer slidable endwise along the exterior of said pads, and a second abutment rigid with the exterior of said pads and spaced from said first abutment whereby the intervening material layer may be compressed between said abutments by movement of the latter toward each other along said pads, said gaps being of sufficiently narrow width to prevent substantial extrusion of the yieldable material into the gaps when the material is under compression.

6. A stock gripping element comprising a plurality of elongated metal pads of arcuate cross-section providing concave wear-resisting internal surfaces, external projections rigid with said pads, a layer of resiliently yieldable material covering said pads adjacent said projections, and a member slidable endwise along said pads to effect endwise compression of said layer.

7. A stock gripping element comprising hardened metal pads of arcuate cross-section adapted to fit around a bar of stock, means for holding

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said pads in angularly spaced relation to form a tube radially collapsible into gripping engagement with said stock bar, an external abutment on said tube, a sleeve of resiliently yieldable material enclosing said pads and axially slidable along said tube and compressible against said abutment, and means disposed between said pads and said sleeve and covering the slots between adjacent pads to prevent the flow of said material in between the pads when the material is compressed.

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