May 27, 1930. C. F. MINNIER ET AL 1,760,860

FEED FINGER

Filed May 1, 1928

Fig. 1

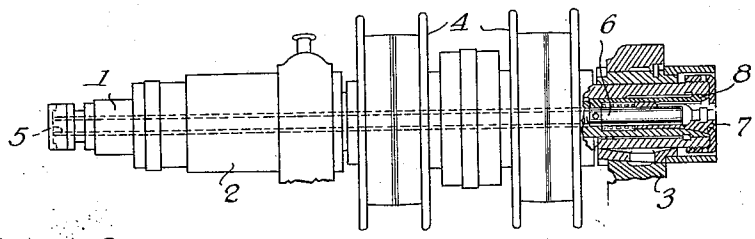


Fig. 2

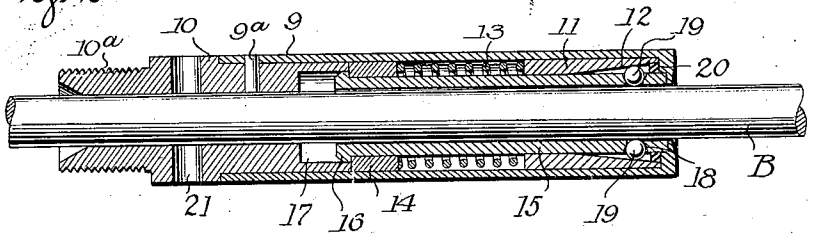


Fig. 3

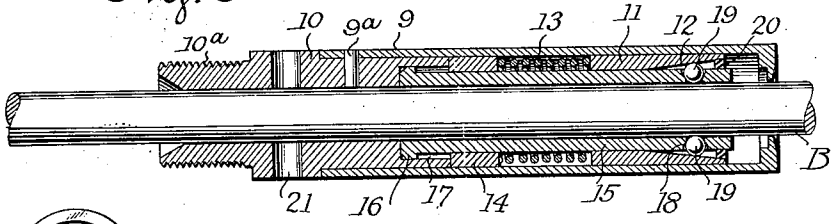


Fig. 6

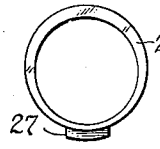
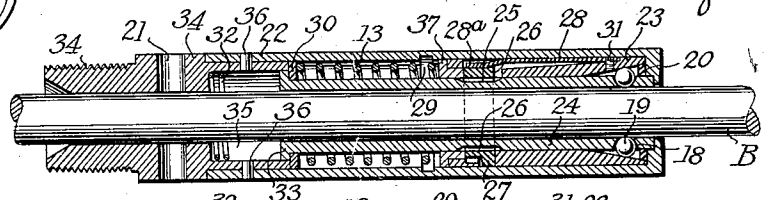


Fig. 4



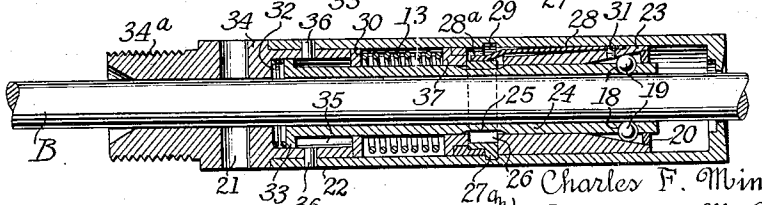


Fig. 5

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Patented May 27, 1930

1,760,860

UNITED STATES PATENT OFFICE

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FEED FINGER

Application filed May 1, 1923. Serial No. 274,326.

Our invention relates to feed fingers for operating on bar or strip material, and is particularly adapted for, though in no way limited to, use in automatic screw machines.

The usual feed finger provided in machines of this type consists of a set of hardened steel jaws which resiliently hold the bar stock in position in the rear of a collet, but allow it to be forced rearwardly whenever the collet jaws are released. When stock is fed forward through the jaws of the collet and into engagement with the usual stop employed in such machines, it is frequently the case that the stock is not fed far enough to produce parts of the proper length and unless the feeding mechanism is very carefully adjusted, the engagement of the stock with the stop causes considerable pressure to be exerted upon this stock and thereby causes rapid wear on the feeding cam. It is also a fact that the usual type of feed finger is very short lived and by its pressure on the stock produces grooves and marks therein so that the parts turned out by the machine are defective.

Among the objects of our invention are the provision of a feed finger which will allow bar stock to feed in one direction but to resist its movement in the other direction; to prevent marring of the stock; to render the finger sufficiently resilient to ensure a full feed during each movement, but to reduce wear on the feeding cam; and to provide means whereby the finger may be manipulated to release the stock without removing the feed tube from the machine.

We will now describe two forms of feed finger embodying our invention and then point out the novel features thereof in claims.

In the accompanying drawings:

Figure 1 is a view partly in elevation and partly in section showing the relation of our feed finger to a conventional automatic screw machine;

Fig. 2 is a vertical sectional view of one form of feed finger, the parts being shown in a position to grip a bar of stock;

Fig. 3 is a view similar to Fig. 2 with the bar in retracted position;

Fig. 4 is a vertical sectional view of a modified form of feed finger with the parts in position to grip a bar of stock;

Fig. 5 is a view similar to Fig. 4 with the parts locked in position with the bar of stock released; and

Fig. 6 is a detail view of the locking ring employed in the form of feed finger shown in Figures 4 and 5.

Similar reference characters refer to similar parts in each of the several views.

In Figure 1 the reference character 1 designates the usual spindle of a conventional automatic screw machine. As here shown this spindle is supported in bearing boxes 2 and 3 and is actuated by driving pulleys 4. Within the spindle 1 and projecting rearwardly therefrom is a feed tube 5 carrying at its forward end a feed finger 6.

When operated in the usual manner bar stock is fed through the tube 5 until it enters and is gripped by the feed finger 6. The spindle 1 also carries at its forward end a spring collet 7 which is adapted to be closed by a tapered sleeve 8. Inasmuch as the operating mechanism for this collet is not a part of our invention and is well known in the art, further description will not be necessary. It will be sufficient to state that bar stock is fed forward through the feed tube 5 and the feed finger 6 so that it projects through the jaws of the spring collet 7 which is then closed and holds the stock in position while being worked upon by the usual cutting tools.

As shown in Figure 2 our feed finger comprises a hollow tubular shell 9 which is partially closed at its forward end, but is open at the rear end and closely engages with the reduced portion of a plug 10 and is secured thereto by any suitable means such as a pin 9^a. The rear end of plug 10 is threaded at 10^a so that the finger can be secured to the feed tube in the usual manner. This plug contains sockets 21 into which a tool may be inserted for the purpose of screwing the finger into position. Slidably mounted within the shell 9 is a tubular member 11 having an inclined inner wall 12 which diverges outwardly toward the forward end of the shell. This member is normally biased to the position shown in Fig. 2 by a coil spring 13 which

reacts against a collar 14 also carried within the shell 9 and engaging the forward end of plug 10 adjacent to a countersunk portion 17.

Within the member 11 is an elongated tubular sleeve 15 having an annular flange 16 engaging the collar 14. This sleeve 15 contains a plurality of spaced apertures 18 near its forward end shaped to accommodate balls 19. Any suitable number of these balls may be provided, it only being necessary that they be symmetrically placed around the periphery of the sleeve 15. As here shown a small collar 20 embraces the forward end of sleeve 15 and engages the forward end of member 11 so as to prevent the balls 19 from ever leaving their proper position within the apertures 18.

It will be clear from an inspection of Fig. 3 that under normal conditions the spring 13 will force the member 11 forward within the shell 9 so that the balls 19 engage with the inclined wall 12 of this member and are thereby forced inwardly toward the axis of sleeve 15 and lock the bar B against movement in a rearward direction. When, however, the finger is drawn backward these balls roll up the diverging wall 12 sufficiently to release the bar and to allow the finger to slide backward over the stock. Although when in locked position no relative movement between the locking balls 19 and the bar of stock B can occur, yet due to the resiliency of spring 13, this bar may move rearwardly for a short distance carrying with it sleeve 15, balls 19 and member 11 as clearly shown in Figure 3. This resiliency is an important feature of our invention because it makes it possible for us to feed the bar of stock forward against the stop through a distance slightly in excess of the length of material required, and to hold it resiliently in this position. This causes a full feed during each stroke of the feeding mechanism, eliminates the wear on the parts occasioned by moving the stock backward through the finger, and prevents breakage.

By suitably proportioning the countersunk portion 17 the finger may be designed to permit the bar of stock to move backward through the finger when the sleeve 15 is pushed back into portion 17 of plug 10 far enough to release balls 19 (see Fig. 3). The parts will be returned to gripping position whenever the excess pressure is removed from spring 13.

During the operation of machines of the type with which we are concerned, it sometimes happens that when a bar of stock is nearly used up, the stock is withdrawn from the feed finger, but extends back far enough from the collect so that upon the next forward stroke of the feeding mechanism the feed finger strikes against the rear end of the bar. Inasmuch as the bar is being rigidly held by the collect, breakage of some of the parts frequently occurs. Such breakage can not occur with our feed finger because as the finger moves forward, the rear end of the bar enters the sleeve 15 and is again clutched by the balls 19 ready to feed forward upon the next stroke.

It will be manifest from the foregoing that our feed finger not only provides a ball bearing surface for the bar of stock to travel on, and holds the stock resiliently against the stop, but it provides a resilient feeding mechanism which ensures a full feed during each stroke of the feeding cam, materially reduces wear on this cam and greatly reduces breakage.

The feed finger shown in Figures 2 and 3 provides for movement of the stock in one direction only, and it does not allow the gripping means to be released. Under some conditions it is desirable to have this finger arranged to permit the stock to be removed from the rear of the feed tube without removing the finger from the machine and for this purpose we provide the mechanism shown in Figures 4 and 5.

Referring now to Figure 4, the device there shown comprises a shell 22 similar to the shell 9 of Fig. 2, but provided in the central portion thereof with an annular groove 29 extending around its inner wall. Fitted into the rear end of this shell is a plug 34 having a deep countersunk portion 35 and a rearwardly extending threaded portion 34a. As here shown, the plug 34 is held within the shell 22 by means of pins 36, and is provided with openings 21 for the accommodation of the tool used in screwing the finger into the feed tube. Slidably mounted within the shell 22 is a tubular member 23 similar to the member 11 hereinbefore described, but provided with a cut-out portion to accommodate a flat spring 28 the function of which will be described later. Mounted inside of the member 23 is a sleeve 24 having a rear flange 33 and containing a plurality of spaced apertures 18 carrying balls 19 which cooperate with the inclined inner wall of the member 23.

As so far described, the sleeve 24 is similar to sleeve 15 described in connection with Figs. 2 and 3, but in addition thereto it contains midway between its ends, an annular groove 25 having inclined shoulders sloping from the outer surface of the sleeve to the bottom of the groove. Mounted within the groove 25 is a locking ring 26 (shown in detail in Fig. 6), having a small projecting lug 27. Abutting the side of ring 26, remote from the lug 27, is the leaf spring 28 having a projecting tongue 28a and secured to the member 23 by suitable means such as a screw 31. Fitted within the shell 22 and contacting with the rear end of member 23 is a stepped ring 37 which closes the rear end of member 23 in proximity to the locking ring 26. The member 23 is normally biased to the forward end of shell 22 by means of a spring 13 reacting

against an annular collar 30 which fits against the forward end of plug 34. Also mounted within the countersunk portion of plug 34 is a small spring 32 which functions in a manner which will be hereinafter described.

From an inspection of Fig. 4, it will now be clear that when rod B is forced through the opening in plug 34 and through the tubular shell 24, the spring 13 will force the member 23 forward so that the balls 19, riding down the inclined wall of the member are forced into contact with the bar B so as to prevent its being withdrawn rearwardly, but to allow it to slide forward freely. When the bar is drawn forwardly the balls rotate and move up the inclined surface of the wall of member 23 to a release position.

Under some circumstances it is desirable to release the gripping mechanism so that the bar of stock may be withdrawn from the rear of the feed tube and to so arrange the parts that the locking mechanism may be released without withdrawing the feed tube from the machine. As shown in Figure 5 the locking means is shown in operative position with the bar B released and free to slide within the sleeve 24. It will be noted from this figure that when the bar B has been withdrawn from the position shown in Figure 4, the member 23 and sleeve 24 are drawn backward against the tension of spring 13 until the small lug 27 on locking ring 26 is above the groove 29 on the inner wall of shell 22. When the parts reach this position, the top side of locking ring 26 drops into the groove 25 in the surface of sleeve 24 and lug 27 is forced into groove 29 and is held there by the tension of the flat spring 28. When it is desired to release this locking mechanism the bar of stock B may be withdrawn far enough so that the front end of the bar can be tilted slightly and to engage the rear end of flange 33 on tube 24. When the tube 24 is moved forward the top side of ring 26 rides upon the rear inclined shoulder of groove 25, thereby raising the lug 27 from groove 29 and freeing member 23 and sleeve 24 which are then moved forward by spring 13 to the position shown in Fig. 4.

When the parts are locked in the release position as shown in Figure 5 it is essential that sufficient tension be placed on the rear end of sleeve 24 to release the balls 19 and move them out of contact with bar B. For this purpose we provide the small coil spring 32 which is capable of exerting a small force against the sleeve 24 sufficient to move the balls 19 forward and up the inclined wall of member 23, but insufficient to cause locking ring 26 to be released. It will be apparent that the spring 32 must be materially smaller than the spring 13 in order to prevent the locking means from being released prematurely. By making the opening through plug 34 slightly larger than the size of stock with which it is to be used and making the bore of sleeve 24 slightly smaller in diameter than the opening through this plug, a projecting shoulder is formed against which the stock may be pushed in order to release the locking mechanism.

If it is not desirable to use the locking means, a plug of the type shown in Figures 2 and 3 may be used to replace the plug 34 so as to prevent sleeve 24 from being moved rearwardly far enough to allow lug 27 to enter groove 29, and with this combination the feed finger shown in Figures 4 and 5 can be used without the locking means.

The feed finger shown in Figures 4 and 5 not only has the advantages of the finger shown in Figures 2 and 3, but in addition thereto makes it possible to release the stock from the feed finger and to withdraw the stock for making any required adjustments without stopping the machine or removing the feed tube.

Although we have herein shown and described only two forms of feed finger embodying our invention, it is obvious that various changes and modifications may be made within the scope of the appended claims without departing from the spirit and scope of our invention.

What is claimed is:

1. A feed finger for metal-working machines comprising, a metal shell; a tubular member within said shell, said member having an inclined inner wall diverging toward one end of said shell; a sleeve slidable within said member, said sleeve having a plurality of apertures therein; balls within said apertures and cooperating with said inclined wall; and a spring within said shell for normally forcing said member forward to move said balls to operative position.

2. A stock feed finger for metal-working machines comprising, a metal shell, said member having a locking and a releasing position; a tubular member within said shell; a sleeve within said member; a plurality of balls carried in said sleeve; means for biasing said member to locking position to force said balls radially inward; and means for locking said member in release position, whereby said balls are released.

3. A feed finger for metal-working machines comprising a metal shell; a tubular member within said shell, said member having an inclined wall diverging toward one end thereof; a sleeve within said member, said sleeve having a plurality of spaced apertures therein; a ball in each of said apertures; and means within said shell for forcing said balls and the inclined wall of said member into engagement.

4. A feed finger for metal-working machines comprising a metal shell having an annular groove therein; a tubular member within said shell, said member having an in-

ner inclined wall; a sleeve within said member and having a plurality of spaced apertures therein; a ball in each of said apertures; a spring for forcing said member into contact with said balls and thereby moving them to work-engaging position; a locking ring embracing said sleeve; and a spring for forcing a portion of said locking ring into the groove in said sleeve for locking said member in release position.

5. A stock feed finger comprising a metal shell; a sleeve disposed within said shell; work-engaging means associated with said sleeve; means for biasing said work-engaging means to work-engaging position; and means operated by movement of the stock within the finger for locking said work-engaging means in release position.

6. A stock feed finger comprising a metal shell; work-engaging means within said shell, said means comprising a tubular member having an inclined surface and a plurality of balls cooperating therewith; and means operated by movement of the stock within the finger for locking said work-engaging means in release position.

7. The combination with the feed tube of an automatic screw machine, of a stock feed finger secured to the forward end of said tube and comprising a metal shell; stock gripping means within said shell, said means comprising a tubular member having an inclined wall and a plurality of balls cooperating with said wall to grip or release a bar of stock; means for locking said gripping means in release position; and means whereby said locking means may be released from the rear of said feed tube.

8. A feed finger for automatic screw machines, comprising a metal shell; a tubular member within said shell, said member having an inclined inner wall; a sleeve within said member; a plurality of work-engaging balls carried by said sleeve and cooperating with said inclined wall; and means for yieldably urging said wall into contact with said balls.

9. The combination with the feed tube of an automatic screw machine, of a stock feed finger carried at the forward end of said tube and comprising a metal shell; gripping means within said shell for allowing stock to pass therethrough in one direction only; means for locking said gripping means in release position; and means whereby said locking means may be released with the feed tube in the machine.

10. In a device of the character described, a metal shell; a movable sleeve disposed in said shell; work-engaging members carried by said sleeve; and a spring actuated movable member having an inclined surface for progressively moving said members to work-engaging position.

11. In a device of the character described, a metal shell; a sleeve disposed within said shell; work-engaging members associated with said sleeve; and means supported by said sleeve and coacting with said work-engaging members for moving said members into work-engaging position independently of said shell.

In testimony whereof we have signed our names to this specification.

CHARLES F. MINNIER.
BENJAMIN M. DANIEL.

CERTIFICATE OF CORRECTION.

Patent No. 1,760,860. Granted May 27, 1930, to

CHARLES F. MINNIER ET AL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, lines 108 to 110, claim 2, strike out the comma and words ", said member having a locking and a releasing position" and insert the same to follow after the word "shell" and before the semi-colon in line 110; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 24th day of June, A. D. 1930.

(Seal)

M. J. Moore,
Acting Commissioner of Patents.