

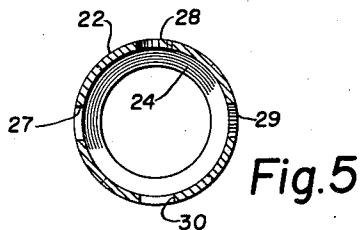
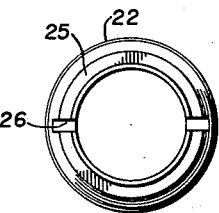
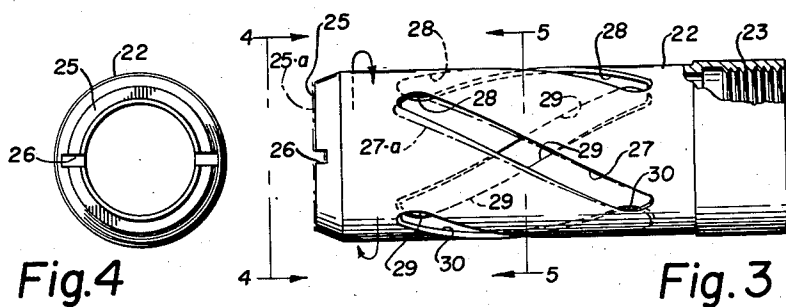
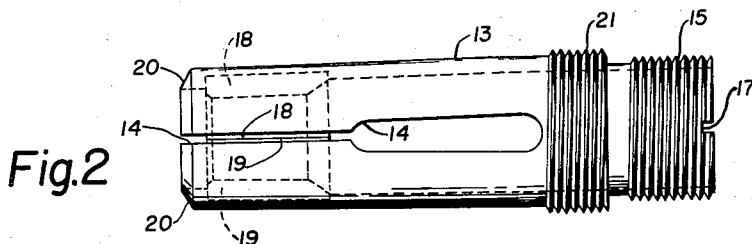
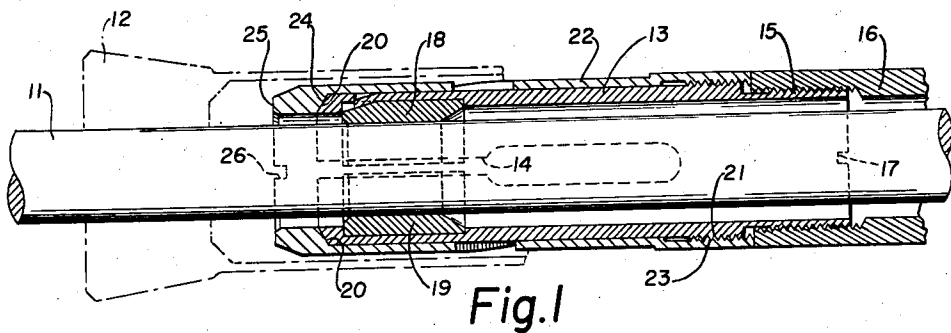
May 6, 1958

L. F. SMREKAR

2,833,545

PUSHER DEVICE HAVING ADJUSTABLE TENSION

Filed March 1, 1957



INVENTOR.
LARRY F. SMREKAR

BY

W. S. Smith and Son, Inc.

1

2,833,545

PUSHER DEVICE HAVING ADJUSTABLE TENSION

Larry F. Smrekar, Solon, Ohio, assignor to The Balas Collet Manufacturing Company, a corporation of Ohio

Application March 1, 1957, Serial No. 643,301

9 Claims. (Cl. 279—47)

My invention relates to pushers or feeders for advancing stock in a machine tool, such as an automatic screw machine.

An object of my invention is to provide an improved pusher device having means for adjusting the grip of the pusher upon the stock being advanced.

Another object is the provision for varying the grip of the pads of a pusher to meet operating requirements.

Another object is the provision for obtaining the amount of grip of a pusher upon stock being advanced by the pusher to a fine degree not otherwise obtainable.

Another object is the provision for obtaining in a novel and highly useful manner the precise amount of tension upon stock by a pusher advancing the stock.

Another object is the provision for obtaining unique results by a new and useful construction.

Other objects and a fuller understanding of my invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawing, in which:

Figure 1 is a longitudinal sectional view of a form of my device showing the device gripping a piece of round stock;

Figure 2 is a side elevational view of the internal tubular member of my device;

Figure 3 is a side elevational view of the external tubular member or shell of my device removed from the internal tubular member;

Figure 4 is an endwise view looking in the direction of the arrows 4—4 of Figure 3; and

Figure 5 is a cross-sectional view through the line 5—5 of Figure 3.

In Figure 1, I show my device in assembled condition gripping a piece of cylindrical stock 11 which extends along the axis of my device. My pusher device may be used for advancing the stock 11 in increments to a collet 12 shown in broken lines. Upon each reciprocal movement of my pusher device, the stock 11 is moving into the collet 12 while it is in an open or relaxed position and after the collet 12 seizes or grips the stock, then the pusher device slides back along the stock 11 to a withdrawn position where it again grips the stock ready for an advancing movement. Because the pusher must alternately hold the stock 11 firmly enough to advance it, and then be able to slide along the stock to a withdrawn position when the stock is held by the collet, the pusher device should have a fine degree of tension in order to obtain just the precise amount of required grip on the stock. This grip must be such as to firmly hold and push the stock when necessary and also be able to slide along the stock in the rearward movement of the pusher when the stock is firmly held by the collet. My invention provides means for obtaining this fine degree of tension and the required amount of grip on the stock.

My device incorporates in general two tubular members mounted concentric to each other and having a common axis along which the stock is disposed. The inner tubular member 13, preferably made of suitable

2

heat-treated steel, is split to have forwardly extending fingers. In the form of the invention illustrated, there are two opposed slots 14 which separate two opposed fingers which extend forwardly from a rear annular portion. The fingers of the inner member 13 are heat-treated so as to be resilient and at the same time have the required degree of strength.

Adjacent the forward end of the inner member 13 and facing the bore thereof are a pair of arcuate pads 18 and 19 disposed to engage and grip the stock 11 extending through the pusher device. The resilient fingers of the inner member 13 are biased toward each other sufficiently to urge the pads 18 and 19 toward each other when there is no stock between the pads so that the pads 18 and 19 are held in the position shown in Figure 2. However, this bias is readily overcome so that the fingers may be spread apart and the pads 18 and 19 separated by the insertion of the stock 11 into the pusher, such as shown in Figure 1. It is to be noted that in Figure 1 the fingers and the pads 18 and 19 are spread farther apart than in Figure 2 by reason of the presence of the stock 11 between the pads 18 and 19. However, this inwardly directed bias of the fingers of the member 13 alone, as in Figure 2, is obtained only by the setting and heat-treating of the fingers. As is known, such a bias is not exact and it is difficult to predeterminedly fix and maintain the exact degree required to obtain the precise amount of grip on the stock during operation of the pusher device. Therefore, in my improved device there is only sufficient inward-bias on the fingers to hold the pads in the position shown in Figure 2, but I do not depend upon this bias set in the fingers during manufacture of the inner member 13 for obtaining the required degree of grip upon the stock 11.

At the rearwardmost end of the inner member 13, there is a threaded portion 15 which is threadably engaged to a support 16. This support 16 carries the pusher device and reciprocates it along its axis during the operation of the pusher device. A transverse notch 17 is provided in the rearward annular wall of the inner member 13, this notch 17 being provided for accommodating a cross-piece when it is desired to turn the inner member 13. In short, the notch 17 provides a surface for wrenching of the inner member 13.

The forward end of the inner member 13 has a chamfered surface 20 extending therearound. This chamfered surface 20 provides a camming surface in the operation of my device. The angular disposition of this surface 20 is at an angle to the axis of the device of more than 45 degrees and preferably is at an angle in the range of 60 degrees to the axis of the device. Stated otherwise, the angle of the surface 20 is less than 45 degrees to a transverse plane normal to the axis of the device and most preferably is in the range of about 30 degrees to such a transverse plane. This camming surface 20 is annular in form as it extends around the forward wall of the tubular member 13, being interrupted by the opposite slots 14.

There is a second threaded portion 21 disposed on the rear annular portion of the inner member 13. This threaded portion 21 has a somewhat larger diameter than the threaded portion 15 and is positioned in advance of the threaded portion 15. The threading of the threaded portion 21 is similar to the threading of the threaded portion 15. For example, in the illustration shown, the threaded portion 15 has a left-hand thread and the threaded portion 21 has a left-hand thread.

My device includes a second tubular member or shell 22 which is concentrically mounted around the inner member 13. The outer tubular member 22 has a rearward threaded end portion 23 which is adapted to threadably engage the threaded portion 21 of the inner member

13. As shown in Figure 1, the interengagement of the threaded portions 21 and 23 of the respective tubular members secures the outer tubular member 22 to the inner tubular member 13.

Adjacent the forward end of the outer member or shell 22 and extending therearound is an inner shoulder 24. This shoulder 24 is directed toward the rear of the outer member 22 and is in alignment with the camming surface 20 of the inner tubular member 12. Preferably, the angular disposition of the shoulder 24 relative to the axis of the device is such as to complement the angular disposition of the camming surface 20, as for example, shown in Figure 1. The forward end 25 of the outer member 22 has a transverse notch 26 formed therein, this notch 26 being adapted to accommodate a cross-piece for the wrenching or turning of the outer member 22.

Formed in the wall of the outer tubular member 22 intermediate of the plane of the shoulder 24 and of the threaded portion 23 are four slots 27, 28, 29 and 30. These slots are in generally spiral form and extend through the wall of the outer tubular member 22. The slots 27, 28, 29 and 30 are preferably equidistant from each other around the circumferential extent of the tubular member 22. This outer tubular member 22 is made of suitable steel and is heat-treated so that the tubular member 22 intermediate the four slots is resiliently distortable. In effect, the heat-treated steel between the four slots constitutes four steel spirally disposed springs which may be resiliently elongated upon applying longitudinal tension to the tubular member 22.

Upon the mounting of the outer tubular member 22 to the inner tubular member 13 so as to concentrically dispose them in the relationship shown in Figure 1, the shoulder 24 is in longitudinal alignment with the camming surface 20. By forcibly turning the outer tubular member 22 relative to the inner tubular member 13, such as by using cross-pieces in the respective notches 17 and 26, the threaded interengagement of the threaded portions 21 and 23 of the respective members may be varied. By forcibly turning the tubular members relative to each other so as to move the threaded portion 23 rearwardly, that is, toward the end of the inner tubular member 13, a longitudinal tension is applied to the outer tubular member 22 by reason of the abutment of the shoulder 24 on the camming surface 20. The resiliency of the slotted tubular member 22 then is such as to resiliently urge the shoulder 24 rearwardly against the camming surface 20. This longitudinal urging of the opposed surfaces 20 and 24 cammingly forces the opposed fingers of the inner member 13 radially inward and thus increases the grip of the pads 18 and 19 upon the stock 11. A fine degree of adjustment of this grip on the stock may be obtained by turning the members 13 and 22 relative to each other so as to vary the threaded interengagement of the complementary threaded portions 21 and 23. A relatively small amount of turning of the outer member 22 relative to the inner member 13 will provide a corresponding change in the inwardly directed force of the pads 18 and 19 against the stock 11. The tension of the shoulder 24 against the camming surface 20 is maintained substantially constant by reason of the resiliency of the portions of the outer member 22 intermediate the four slots 27, 28, 29 and 30. This longitudinal tension imposed by the outer member 22 on the camming surface 20 is adjustably determined by turning the outer member 22 in such a way as to change the longitudinal position of the threaded portion 23 along the threaded portion 21. As the outer member 22 is resiliently elongated, the spirally disposed slots 27, 28, 29 and 30 tend to extend more parallel to the axis of the outer member 22. For example, the spiral slot 27 tends to move to the position shown in broken lines by the reference character 27-a when the outer member 22 is thus resiliently elongated.

The resiliency of the heat-treated steel in the outer member 22 is such that the outer member is urged to assume its unstressed shape and position shown in full lines in Figure 3. When the outer member 22 has been resiliently elongated, its longitudinal dimension is slightly longer so that in effect the end wall 25 is in the position of the broken lines shown by the reference character 25-a. Under longitudinal tension, the forward end of the outer member 22 is under such stress that the forward end then revolves slightly in the direction of the curved arrows circling the forward end of the member 22 in Figure 3 and thus modify the form shown in full lines in Figure 3.

It is thus seen that by the novel construction here disclosed and the utilizing of the principle of my invention, a fine adjustment in the gripping action of a pusher may be obtained. When more or less gripping force is required, the pusher may be readily adjusted by turning the outer member 22 relative to the inner member 13 and thus imparting just the required amount of radially inward force upon the pads 18 and 19.

After adjusting the position of the outer member 22 relative to the inner member 13 as described, the assembly of members 13 and 22 is turned relative to support 16 to the point where the rear end of outer member 22 abuts the forward end of the support 16. Thus the support 16 by its jamming action frictionally resists further turning of outer member 22 relative to inner member 13.

The present disclosure includes that contained in the appended claims, as well as that of the foregoing description.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as hereinafter claimed.

What is claimed is:

1. A pusher for advancing stock extending axially of the pusher comprising in combination, a feed member having a bore adapted to accommodate stock therein, said feed member having a rearward portion and forwardly extending fingers resiliently movable at the forward end of the feed member toward the axis of the feed member, said fingers carrying pad portions adapted to engage stock in said bore, said feed member at the forward end thereof being chamfered to provide a camming surface therearound disposed at an included angle of more than 45 degrees to the axis of the feed member, and a shell member concentrically mounted around said feed member, said shell member having an internal shoulder adjacent the forward end thereof interengaging the said camming surface of said feed member, said shell member and said feed member at an axial distance rearwardly from said interengaged camming surface and shoulder having complementary threaded portions threadably interlocked, said shell member along its length intermediate said shoulder and its respective said threaded portion having a plurality of spirally disposed slots provided therein at circumferentially spaced locations therearound, the said shell member intermediate said slots being resiliently distortable under axial tension, the adjustment of the threaded interlocking of said threaded portions relative to said shoulder engaging said camming surface varying the longitudinally directed resilient tension imposed by the resilient shell member upon said camming surface by the said shoulder, said longitudinally directed tension of said shoulder on said camming surface urging said fingers radially inward toward said stock whereby said pad portions engage said stock in accordance with the degree of said tension.

2. A pusher for advancing stock extending axially of the pusher comprising in combination, concentrically dis-

posed members, the first of said members having resilient fingers adapted to exert radially inward directed force for gripping said stock in accordance with said inward force, the second of said members being resiliently extendible in a longitudinal direction, said first member and second member adjacent their forward ends having interengaged camming surfaces adapted to move said resilient fingers radially inward upon tension of the second member urging the camming surface of the second member in a rearward direction, said first member and second member at an axial distance rearwardly of said camming surfaces being threadably interconnected by complementary threads concentric with the common axis of said members, said second member having a plurality of spirally disposed slots spaced circumferentially therearound, said second member intermediate said slots being resiliently distortable to provide resilient elongation of said second member, adjustment of the threaded interconnection of said members to vary the spacing of the threaded interconnection along said first member from said interengaged camming surfaces varying the longitudinal resilient tension on said camming surfaces by the resiliently distortable elongation of said second member, the inward force on said fingers by said camming surfaces causing said resilient fingers to provide a radial inward force adjustably determined by the said varying of the said threaded interconnection along the first member.

3. In a pusher for advancing stock along the axis of the stock comprising the combination of resilient finger means for gripping said stock, camming means for moving said finger means radially inward for gripping of said stock in accordance with the force imparted by the camming means on said finger means, resilient tension means for exerting force on said camming means longitudinally of said finger means to move said finger means radially inward under longitudinal resilient tension of said resilient tension means, and adjustable means for varying the degree of longitudinal resilient tension provided by said tension means.

4. In a pusher for advancing stock in increments along its axis, the combination of stock-gripping means disposed about said axis and adapted to be moved radially inward toward said axis for gripping said stock, camming means engaging said stock-gripping means for moving said stock-gripping means radially inward, resilient tension means disposed concentrically of said stock-gripping means for resiliently urging said camming means in a direction longitudinally of said pusher, and adjustable connecting means interconnecting said resilient tension means and said stock-gripping means for adjustably varying the resilient tension of the tension means on said camming means whereby the force of the camming means moving the stock-gripping means radially inward may be adjustably determined.

5. In a pusher for advancing stock along its axis, the combination of a first tubular member adapted to accommodate stock therein along said axis, said first tubular member having resilient feed fingers formed at its forward end and having an annular portion adjacent its rearward end, said fingers being adapted to carry pads for gripping said stock, said pads gripping the stock with a force dependent upon the inward thrust of said fingers toward said axis, the forward end of said first tubular member being chamfered to provide an annular camming surface disposed at more than 45 degrees to said axis, and a second tubular member mounted concentrically around said first tubular member, said second tubular member having an internal annular shoulder adjacent its forward end and interengaging said camming surface of the first tubular member to cammingly force said feed fingers inwardly toward said axis upon the urging of said shoulder against said camming surface longitudinally

of said first tubular member toward said rearward end, said second tubular member having a threaded end portion concentric with, and threadably engaged to, said annular portion of the first tubular member, the said second tubular member intermediate said shoulder and the said threaded end portion having spirally disposed portions resiliently distortable to permit resilient elongation of said second tubular member under longitudinal tension, said resilient elongation being adapted to urge said shoulder against said camming surface toward said rearward end, the longitudinal tension applied to said second tubular member being adjustable by varying the threaded engagement of the threaded end portion of said second tubular member along the annular portion of said first tubular member.

6. In a pusher for advancing stock therethrough along its axis, the combination of stock-gripping means movable toward said axis for gripping said stock, longitudinally movable means concentric with and carried by said stock-gripping means, camming means operatively connecting said stock-engaging means and said longitudinally movable means for moving said stock-engaging means toward said axis upon longitudinal movement in one direction of said movable means, and resilient means operatively connecting said stock-gripping means and said movable means for resiliently urging said movable means in said one direction.

7. In a pusher for advancing stock therethrough along its axis, the combination of stock gripping means movable toward said axis for gripping said stock, longitudinally movable means concentric with and carried by said stock-gripping means, camming means operatively connecting said stock-engaging means and said longitudinally movable means for moving said stock-engaging means toward said axis upon longitudinal movement in one direction of said movable means, resilient means urging said movable means in said one longitudinal direction, and adjustable means for adjustably varying the tension of said resilient means to obtain the required amount of inward movement of said stock-gripping means.

8. In a pusher for advancing stock therethrough along its axis, the combination of stock-gripping means movable toward said axis for gripping said stock, longitudinally movable means concentric with and carried by said stock-gripping means, camming means operatively connecting said stock-engaging means and said longitudinally movable means for moving said stock-engaging means toward said axis upon longitudinal movement in one direction of said movable means, resilient means operatively connecting said stock-gripping means and said movable means for resiliently urging said movable means in said one direction, and adjustable means for adjustably varying the resilient urging by said resilient means to obtain the required amount of inward movement of said stock-gripping means.

9. The combination of a hollow feed member having resilient fingers adapted to exert radial inward pressure toward stock within the feed member and a hollow actuating member carried by, and concentric with, the feed member, said members having opposed camming surfaces adapted to actuate the feed member to move said fingers radially inward upon longitudinal tension of said actuating member, said actuating member including resilient means for providing said tension and adjustable means for adjusting the force of said resilient means.

References Cited in the file of this patent

UNITED STATES PATENTS

2,159,388	Klute	May 23, 1939
2,426,200	Green	Aug. 26, 1947
2,741,483	Cox	Apr. 10, 1956