# United States Patent

[11] 3,633,930



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[33] Great Britain
[31] 5,678/68

Continuation-in-part of application Ser. No. 719,511, Apr. 8, 1968, now abandoned. This application Oct. 16, 1969, Ser. No. 866,841


[54] **FEED DEVICES FOR AUTOMATIC MACHINES**
**6 Claims, 11 Drawing Figs.**


[52] U.S. Cl. ..... 279/44
[51] Int. Cl. ..... B23b 31/10
[50] Field of Search ..... 279/41, 102, 103, 44, 1 SG, 46, 54



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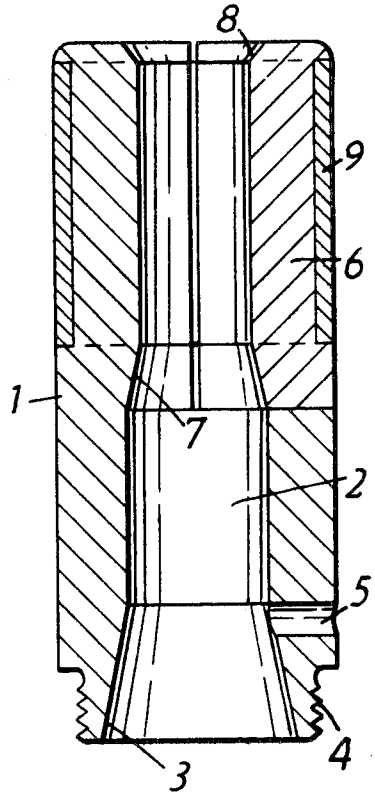
**ABSTRACT:** A work stock feed device for automatic machines which comprises a cylindrical body with a bore related to the diameter of work stock to be fed thereby with at least a part of the length of the body at the discharge end separately formed and acted upon by an encircling almost circular web of spring steel and with the bore formed with a taper at each end of the separate part or parts, such that the internal taper provides a lead in for the work stock while that at the end allows reentry of the stock, in arrangement such that work stock on engaging a taper displaces substantially radially the separate part or parts against the action of the spring to enter between such part or parts and the adjacent portion(s) of the body to be gripped thereby.

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SHEET 1 OF 2

Fig.1.

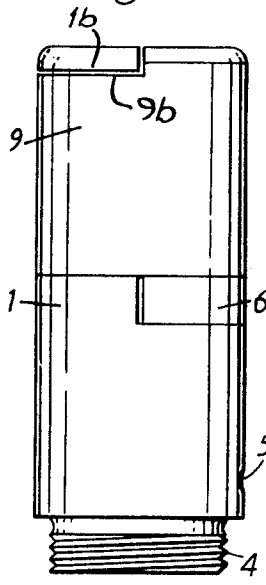


Fig.2.

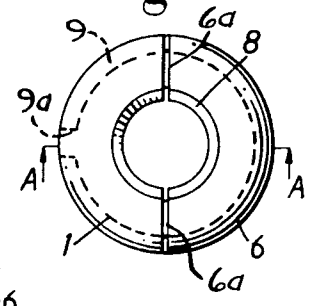


Fig.3.

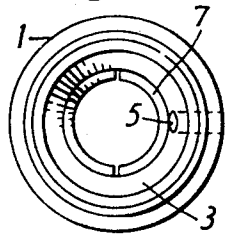


Fig.4.

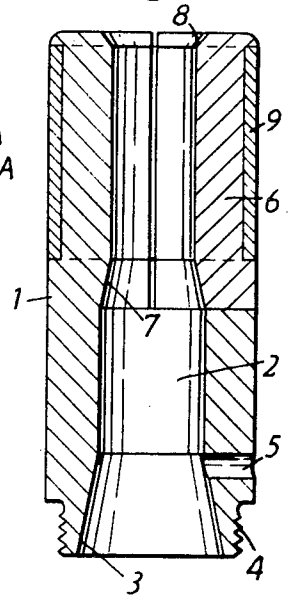


Fig.5.

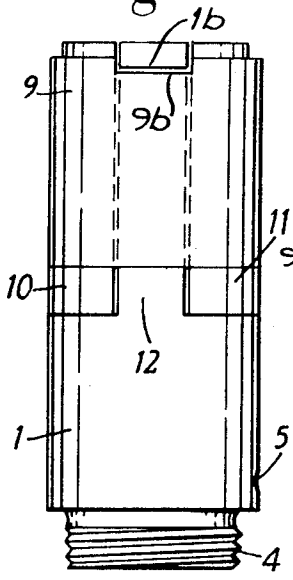


Fig.6.

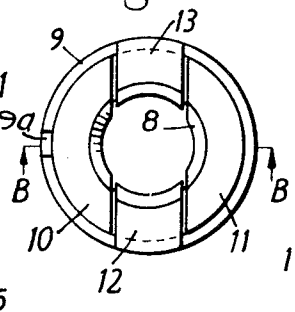


Fig.7.

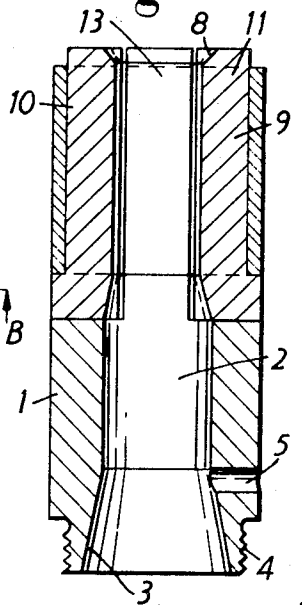


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Fig.8.

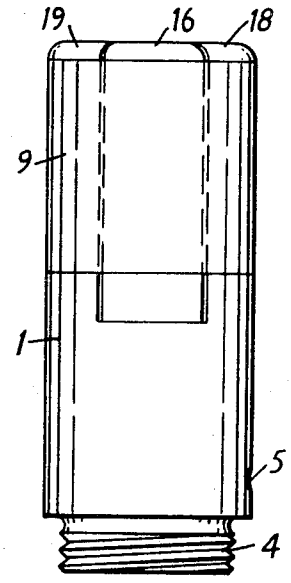



Fig.10.

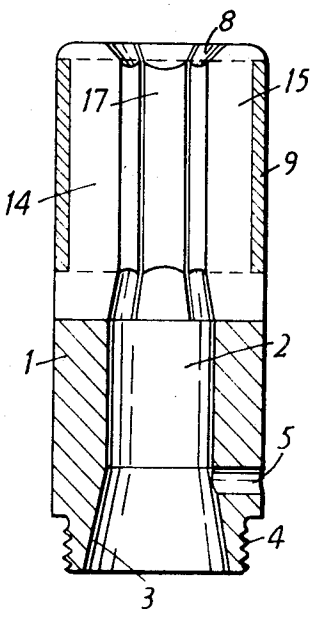



Fig.9.

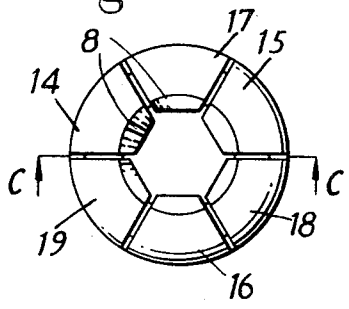
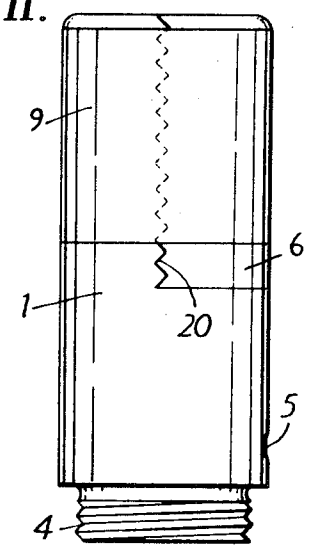



Fig.11.

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# FEED DEVICES FOR AUTOMATIC MACHINES

## CROSS-REFERENCE TO RELATED APPLICATION

The present application comprises a continuation-in-part of our prior copending application Ser. No. 719,511 filed Apr. 8, 1968, and now abandoned, for "Feed Devices for Automatic Machines."

This invention relates to feed devices for advancing the work stock, such as round, hexagon and other section bars or tubes, in automatic machines such as automatic lathes.

The feed devices at present in use comprise a substantially circular section tubular body of spring steel which is split part way along its length and has its wall thickness diminishing towards its split end, where the thickness may again increase, to provide resilient finger portions the ends of which grip on the work stock to advance the same on forward movement of the device by the machine mechanism.

An especial disadvantage of the known feed devices is that reentry of the work stock is not possible even with tapering of the bore at the ends of the finger portions owing to the extent of closing movement of such finger ends and where in use such attempted reentry of the work stock may happen a jamming of the machine occurs. Furthermore for the formation of some workpieces it would be convenient if a degree of reentry of the work stock into the feed device were possible.

Now therefore the object of the invention is to provide a work stock feed device for automatic machines which is as effective as the known devices, yet is capable of allowing reentry of a severed length or workpiece end, and which is in a form providing a more stable grip on the work stock.

A further object of the present invention is to provide a work stock feed device which comprises a cylindrical body with a bore related to the diameter of work stock to be fed thereby, with at least a part of the length of the body at the discharge end being separately formed and acted upon by an encircling almost circular web of spring steel. The bore is formed with a taper at each of the separate part or parts, such that the internal taper provides a lead in for the work stock while that at the end allows reentry of the stock. The arrangement is such that work stock on engaging a taper rocks, or displaces substantially radially, the separate part or parts against the action of the spring to enter between such part or parts and the adjacent portion(s) of the body to be gripped thereby.

The separate part may comprise a substantially semicircular segment with end faces normally abutting the end faces of a substantially similarly shaped portion of the body, and as a plurality of separate parts may comprise two segments with their end faces normally abutting the parallel sides of portions of the body or three or more parallel-sided fingers one located in each of the corresponding number of symmetrically arranged slots in the body.

The body has, as normal, an end portion which is externally threaded for engagement in a threaded bore of the machine-feeding mechanism to position the device.

The encircling spring comprises a single circular web of spring steel. In this respect it has been found, as a result of extensive tests, that plural springs do not operate satisfactorily. The single spring is accommodated and snugly held in a peripheral groove formed, with radially extending edges, in both the body and its separate segment(s) or fingers, and operates to permit the aforementioned radial displacement while simultaneously preventing axial displacement of the separate segment(s) or fingers relative to the body. Means are provided, preferably by shaping a portion of the spring and an adjacent portion of the device it abuts, for preventing possible rotation of the spring with respect to said device.

To ensure positive nonaxial separation of the parts of the device, in a modification of the device comprising a body and separate segment, the normally abutting faces between such parts may be machined to provide parallel mating faces, as sloping mating faces or alternate ribs and grooves.

The encircling spring is located substantially along the length of the separate segment or fingers and its effect is, as stated, to permit substantially radial displacement of such part or parts to allow entry of the tapered end of work stock slightly oversize to the bore of the device, and then hold such segment(s) slightly radially displaced from the other part(s) of the body to grip the work stock by surface contract over the length of such separate segment or fingers.



Normal entry of the work stock into the feed device is facilitated by enlargement taper of its bore, at its entry end, which tapers down to a convenient extent and over a convenient length according to the size and/or cross-sectional shape of the work stock, before the bore reaches the internal taper at the end of the separate part or parts.

The body of the device and its separate segment may be made of mild steel, and the surface of the bore and/or the tapered ends thereof may be hardened by known methods to resist wear.

In order that the invention may be clearly understood and readily carried into effect embodiments of the work stock feed device are, by way of example, hereinafter more fully described with reference to the accompanying drawings, in which:

FIG. 1 shows a two-part feed device in elevation;
FIG. 2 is a plan view looking down on FIG. 1;
FIG. 3 is an end plan view;
FIG. 4 is a section on the line A—A of FIG. 2;
FIG. 5 shows a three-part feed device in elevation;
FIG. 6 is a plan view looking down on FIG. 5;
FIG. 7 is a section on the line B—B of FIG. 6;
FIG. 8 shows a multipart feed device in elevation;
FIG. 9 is a plan view looking down on FIG. 8;
FIG. 10 is a section on the line C—C on FIG. 9; and
FIG. 11 shows a modification of the feed device of FIG. 1 in a view corresponding to that Figure.

In each embodiment in the said drawings, in which like parts bear like reference numerals, the feed device comprises a substantially cylindrical body 1 (see FIG. 1) with a bore 2 (see FIG. 4) the diameter of which is related to the diameter or maximum cross section of the work stock the device is intended to feed. The bore 2 at one end is enlarged to provide a lead-in taper 3, and that end of the device has an external screw thread 4 enabling the device to be positioned with respect to the feed mechanism of an automatic machine, and also has a tommy bar socket 5 to assist tightening the device in operative position.

In the embodiment illustrated in FIGS. 1 to 4, a part 6 of the body 1 is made separate therefrom by a diametrical cut cooperating with an intersecting radial cut to form a substantially semicircular segment having its ends abutting the ends of a substantially similarly shaped portion of the body 1. The bore between the segment 6 and abutting portion of the body is of smaller diameter than the bore 2, and an internal taper 7 extends from the region of the end of the segment to the full diameter bore 2 substantially as illustrated. The smaller diameter bore is also enlarged by the provision of a taper 8 at the other end of the segment 6.

A peripheral groove provided with radially extending edges is formed in the external surface of the body 1 and over the greater part of the length of the segment 6, and in such groove is located an encircling spring 9 comprising an almost circular web of spring steel. The marginal portions of the body and of the segment 6 at the radial edges of such groove firmly and positively hold the spring 9 in position and also cause the spring to hold the segment 6 against axial displacement with respect to the body 1. The gap 9*a* in spring 9 must be located against the nondisplaceable part 1*a* of the device and should be substantially equally spaced for the edges 6*a* of the displaceable segment 6. This holding of the spring in this position is achieved by providing a notch or local reduction 9*b* in the length of the spring with a corresponding shaping of the portion 1*b* of the portion of the device it abuts.

In use of the feed device in an automatic machine, the entering work stock guided by the taper 3 enters the bore 2 and then engages the taper 7 with the effect that the segment 6 is

rocked or displaced outwards radially against the action of the spring **9**. The work stock is then clamped between the segment **6** and the adjacent portion of the body substantially over the length of the segment.

After separation from the feed device, the work stock may reenter the feed device by virtue of the taper **8**.

In the embodiment illustrated in FIGS. **5** to **7**, the body **1** is provided with two segments **10**, **11**, as by parallel cuts parallel to tangents to the bore, the end faces of which segments abut the parallel sides of fingerlike portions **12**, **13** of the body **1**. The tapers in the bore are similar to those in the other embodiment as is the provision of the spring **9**, the peripheral groove, and the arrangement used to prevent rotation of the spring. In this embodiment the end wall of the groove in the segments may be removed (as illustrated). Entry of the work stock into the minimum bore between the segments **10** and **11** rocks those segments or moves them radially outwards away from the body portions **12**, **13** against the action of the spring **9** so that they function equivalently to the segments **6** and like it, they are restrained against axial displacement by the spring **9**.

In the further embodiment illustrated in FIGS. **8** to **10**, three separate parallel sided fingers **14**, **15** and **16** are formed by a plurality of diametrical cuts and by radial cutting so that such fingers are disposed one in each of three symmetrically disposed slots between fingerlike portions **17**, **18** and **19** of the body **1**. The bore is similar to that already described, and there is again provision of the spring **9** in the peripheral groove provided in said fingers and fingerlike portions along with an appropriate arrangement for preventing rotation of the spring. The work stock entering the minimum bore defined by the fingers **14**, **15** and **16** causes rocking or radial outward movement of such fingers against the action of the spring **9**. In this embodiment the internal faces of the fingers **14**, **15** and **16** and the faces of the portions **17**, **18**, **19** of the body **1** therebetween may be made flat, as shown in FIG. **9** in order to obtain an even greater surface grip on hexagonal section work stock.

In some cases it may be desirable to provide alternative or additional means for preventing displacement of the segment **6** in the embodiment of FIGS. **1** to **4** from axial displacement relative to the body **1**; and in this case, as illustrated in FIG. **11**, the normally abutting surfaces are milled or machined to provide parallel mating faces indicated at **20** as sloping mating faces rather than as alternate ribs and grooves.

In each embodiment of the feed device in use, the work stock may freely enter the enlarged portion of the bore in the device, and once such work stock has entered the minimum diameter portion of the bore between the segment and cooperating part of the body or between the two segments or the three or more fingers, it or they, as the case may be, make linear contact with the work stock substantially over the whole of it or their length and it is or they are continuously urged into such engagement by the spring thereby firmly and stably gripping the work stock to advance the same on forward movement of the feed mechanism of an automatic machine, while allowing the feed device to move relative to such work stock during retracted movement of the feed mechanism.

The feed device may be made of mild steel or other suitable metal, and the surfaces forming the bore therein and/or the surfaces of the tapers leading to the normal and reduced portions of such bore may be hardened to reduce wear thereof.

We claim:

**1**. A work stock feed device for an automatic machine comprising a cylindrical body defining a first bore extending into said body from an entry taper at one end of said body and merging through an internal taper into a second bore of smaller diameter extending to a taper at the other end of said body, at least a portion of said body beyond said first bore and extending to said other end of said body being separately formed for selective displacement relative to the remainder of said body; a single, wide, almost circular web of spring steel encircling both said separately formed relatively displaceable body portion and the relatively nondisplaceable portion of said body it normally abuts for permitting relative radial displacement of said body portions, said relatively displaceable and nondisplaceable portions of said body each being provided with radially extending projections engaging both opposing edges of said single web for preventing axial displacement of said web relative to said body portions while simultaneously preventing relative axial displacement of said body portions, said web of spring steel having an axially extending gap therein located adjacent the relatively nondisplaceable portion of said body at a position substantially equidistant from the axially extending abutting surfaces of said relatively displaceable and relatively nondisplaceable body portions, and means for preventing rotation of said gap relative to said body portions, said last-named means comprising a notch formed in an edge of said web and cooperating with a segment of one of said body portions extending from said body portion into said notch, said device being operative to permit work stock of a diameter larger than said smaller diameter bore to enter said entry taper and pass along said first-mentioned bore to said internal taper and on abutting said internal taper to force said separately formed body portion substantially radially outwardly against the action of said web to be gripped between said separately formed portion and said body portion against which it normally abuts, reentry of said work stock being possible on engaging said taper of said smaller diameter bore at said other end of said body.

**2**. A work stock feed device as claimed in claim **1**, in which said separately formed body portion is separated from said body along a diameter of said body.

**3**. A work stock feed device as claimed in claim **1**, in which abutting surfaces of said separately formed body portion and the adjacent relatively nondisplaceable portion of said body are provided with parallel mating faces to assist in preventing relative axial displacement of said body portions.

**4**. A work stock feed device as claimed in claim **1**, in which there are two separately formed relatively displaceable body portions having edge surfaces which normally abut the parallel sides of axially extending fingerlike relatively nondisplaceable portions of said body.

**5**. A work stock feed device as claimed in claim **1** in which there are three separately formed body portions comprising three parallel-sided pieces disposed respectively in three axially extending symmetrically spaced slots in said body.

**6**. A work stock feed device as claimed in claim **6**, in which the work stock engaging surfaces of said pieces and of the portions of said body defining said slots are made flat to grip hexagon section work stock.

* * * * *