April 12, 1960 R. S. McGRANAHAN 2,932,428

SLUG FEEDER

Filed Nov. 7, 1957 3 Sheets-Sheet 1

FIG. 1

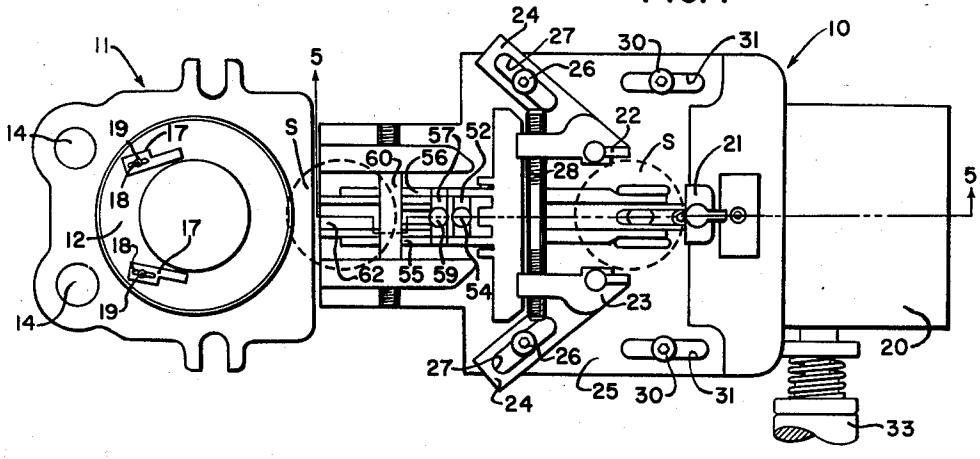
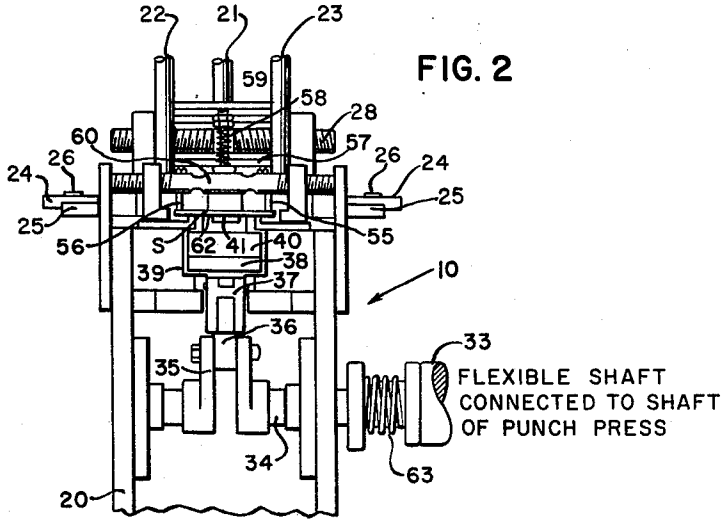


FIG. 2



SLUG FEEDER

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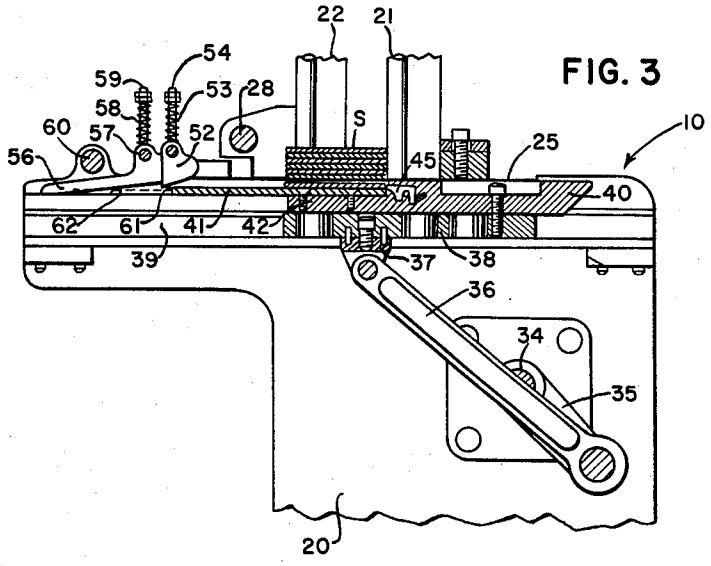


FIG. 3

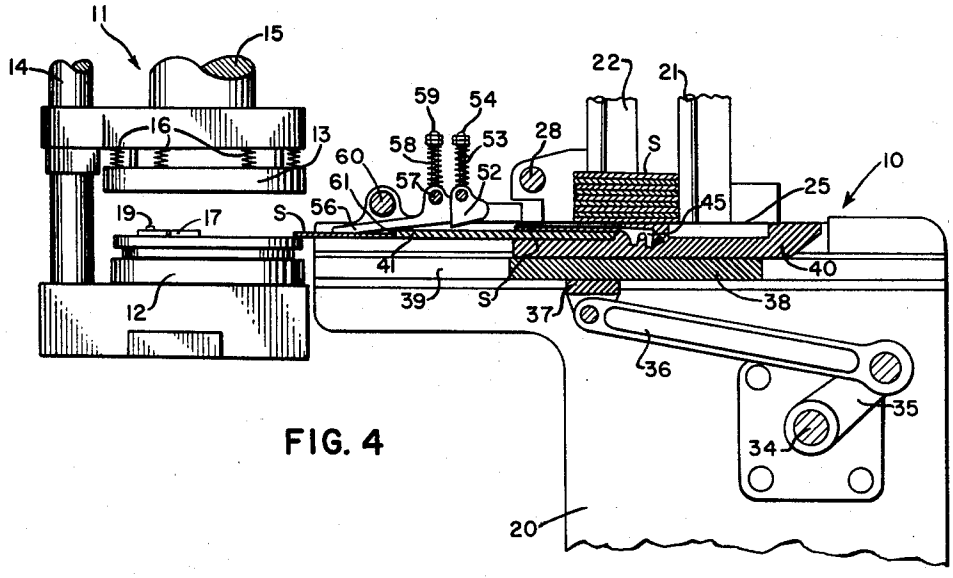


FIG. 4

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FIG. 5

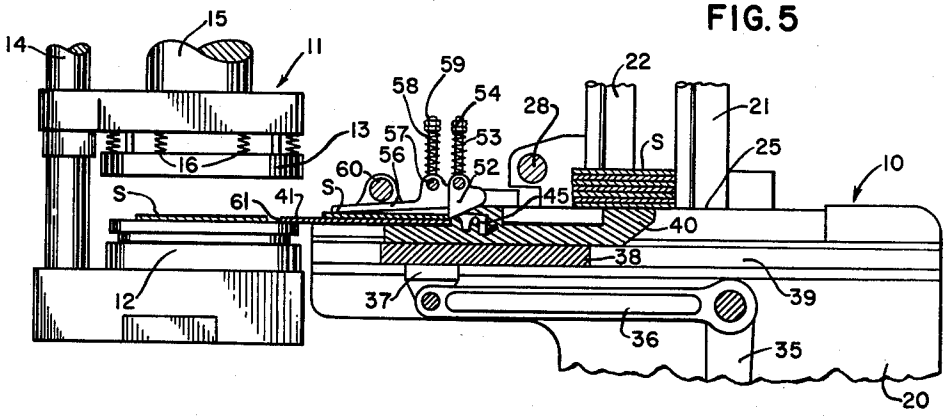


FIG. 8

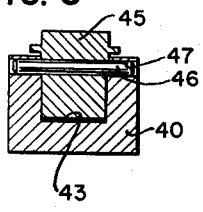


FIG. 7

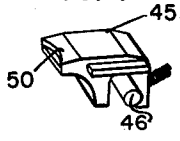
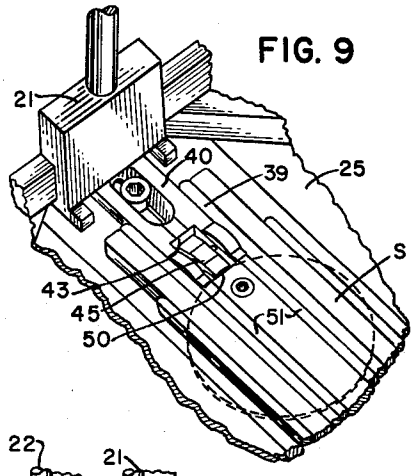


FIG. 9



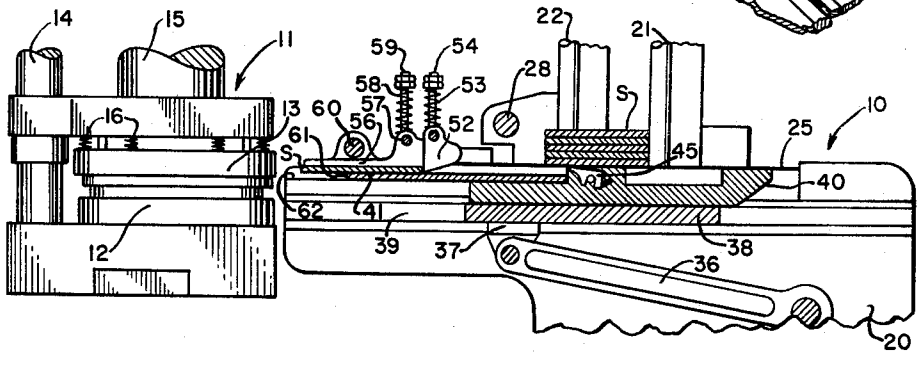


FIG. 6

United States Patent Office 2,932,428 Patented Apr. 12, 1960

2,932,428

SLUG FEEDER

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Application November 7, 1957, Serial No. 695,054

7 Claims. (Cl. 221—238)

This invention relates to an improved device for feeding disc-shaped articles into punch presses and the like, and for accurately positioning them there.

One object of the invention is to provide a machine which can very rapidly and very accurately feed disc-shaped objects into a punch press and similar devices.

Another object of the invention is to provide a machine that will very rapidly feed metal slugs into a punch press and accurately position them therein.

Another object of the invention is to feed slugs one at a time into a punch press and the like.

Other objects and advantages of the innvention will appear from the following description of a preferred form thereof.

In the drawings:

Fig. 1 is a top plan view of a machine embodying the present invention shown adjacent a punch press, only a portion of the lower seating die in the punch press being shown and the remainder of the press being omitted. The size and the shape of the slugs fed through the machine are indicated by broken line circles.

Figure 2 is an end elevational view of the machine looking towards the right of Figure 1 but not including the punch press.

Fig. 3 is a view in elevation and in section taken longitudinally of Fig. 1 showing the device. The line is generally along the line 5—5 in Fig. 1, but the position of the machine is different and some parts are not shown in section in order to clarify their location and construction. Fig. 3 shows the positions of the parts prior to starting the device.

Fig. 4 is a view similar generally to Fig. 3, although some of the section indication has been taken at a different point in order to simplify the illustration, and a portion of the punch press is shown. A first slug is being pushed into the punch press while a second slug is being moved out from under the stack of slugs.

Fig. 5 is a view taken along the line 5—5 in Fig. 1 and indicates the furthest advanced stage of the feeding device. Here the first slug has been fed into the punch press (the positioning means being omitted in order to show more clearly the exact position assumed by the slug) and the second slug has been pushed up into the ready position.

Fig. 6 is a view similar to Fig. 5 showing the return cycle with the punch press closed and the feeding apparatus retracting.

Fig. 7 is a view in perspective on an enlarged scale, as compared with Figs. 1–6, of the feeding finger which advances the slugs of the initial stack to the second feeding portion of the device.

Fig. 8 is a view in elevation and in section of the finger of Fig. 7 mounted in the slide.

Fig. 9 is a fragmentary perspective view of a portion of the feeding device including the finger of Fig. 8 and related parts. An outline of a slug is indicated in a broken line circle.

The device shown in the drawings represents a slug

feeding apparatus 10 located adjacent a punch press 11. Only portions of the punch press 11 are shown, the remainder being well-known in the art and not requiring illustration. Basically considered, the punch press 11 has a stationary lower die member 12, and a movable upper die 13. The upper die 13 is slidably mounted on a pair of guide rods 14 and is fixed at the end of a reciprocating shaft 15, springs 16 acting to cushion the die 13.

In a typical installation of the punch press 11, the upper die 13 moves down into the lower die 12 and trims a slug S, usually while also forming it into some desired shape—for example, into a flanged case for an oil sealing device. The punch press 11 may cut out a smaller disc from the slug S, or it may cut out an annular blank, usually forming a flange thereon at the same time and in a single stroke. In any event, ordinary machines of this kind with ordinary feeding devices have tended to waste a great deal of the slug S, partly because the cuts were usually off center, so that a considerably oversized slug had to be used. This was partly because of inaccurate positioning of the slug. Moreover, where accurate positioning was obtained in the prior art, it was obtained at the expense of speed, and an important feature of this invention is that both accurate centering and speedy operation are obtained.

To cope with the speed of the feeder 10 and to counteract the inertial tendency of the slug S to slide on past the point where it should come to rest, the lower die 12 is preferably provided with a pair of adjustable stop bars 17, each with a slot 18 through which projects a bolt 19 or other tightening member. The adjustment makes it possible to accommodate different diameters of slugs S and to obtain accurate positioning in the punch press 11. However, it is very important in practicing this invention that not too much reliance be made upon the stops 17 because if the slug S is thrust too hard from too great a distance it will tend to bounce, and therefore the feeding apparatus 10 of this invention carries the slug S quite close to the stops 17.

The slug feeding apparatus 10 includes a base frame 20 on which are mounted a plurality of vertical guide members 21, 22 and 23, preferably three, to retain a stack of the slugs S. The rear guide member 21 is preferably made stationary to define the slug pickup point, while the two forward guide members 22 and 23 are mounted on movable bases 24 secured to a table 25. For example, Allen head screws 26 may extend through a slot 27 in each base 24, so that the guides 22 and 23 can each move out along a line at 45° to the axis of movement of the slug S, their axes of movement converging at the rear guide 21. In this way, different sizes of discs S can be accommodated. For this purpose, and for accurate centering of the discs S, these two forward guide members 22 and 23 are linked for synchronous movement by a threaded member 28 which may be rotated by a suitable wrench or keyed device to move the supporting edges synchronously away from each other and the rear guide 21, or toward each other and simultaneously toward the rear guide 21. The table 25 may be mounted on the frame 20 by similar Allen head screws 30 passing through longitudinal slots 31, so that some adjustment may also be obtained in that manner. The table 25 also has a central slot 32 along which moves the reciprocating parts of the feeding device 10.

A flexible shaft 33 may lead to a suitable power source (preferably the crankshaft or camshaft for the punch press 11 thereby assuring synchronization), to a crankshaft 34 which is journaled to the frame 20 and, in turn, drives a crank 35 which rocks a crank arm 36 pivoted at one end to the crank 35. The other end of the arm 36 is pivoted to a bracket 37 on the bottom of a sliding member 38, which may be a solid plate or may have

holes in it for the sake of lightness, as shown in Fig. 3. The sliding member **38** moves in a guideway **39** beneath the table **25**, supported by the frame **20** for true rectilinear movement back and forth in accordance with the rotation of the crankshaft **34** and the movement of the crank **35**. This reciprocating member **38** is preferably bolted or otherwise secured to a narrow elongated upper member **40** which slides with it in the guideway **39**. This upper member **40** includes a plate **41** threadably secured to it by screws **42** and projecting beyond it at its forward end.

This plate **41** comprises the forward or second stage of the slug-projecting or slug-feeding means. The member **40** is also provided with a recess **43** in which is mounted, as shown in Figs. 8 and 9, a pivoted pickup member **45**, whose pivots **46** are journaled in openings **47** in the member **40**. The pickup member **45** is spring-mounted, as shown in the drawings, and is retractable behind a stack of slugs S in the guides **21**, **22**, and **23**. The perspective view of the pickup member **45** in Fig. 7 shows a preferable shape of the pickup member **45**, with forward concave lip **50** adapted to engage the rear edge of one of the slugs S.

As shown particularly in Fig. 3, when the crank **35** is in its rear position, the slides **38** and **40** are in their rear position and the pickup member **45** lies just behind the stack of slugs S. At this time, one slug S falls by gravity down onto the slide member **41** and the side portions **51** of the member **40**. A member adjacent the forward side of the stack of slugs permits the passage of only one slug at a time through it. The pickup member **45** itself is sufficiently thin—projecting less than the thickness of one slug above the member **41**—so that it does not tend to pick up a second slug.

Thus, as shown in Fig. 4, the pickup member **45** will pick up from the bottom of the stack one slug S and move it forward, while at the same time riding beneath the remainder of the stack of slugs as do the adjacent parts of the slide member **40**. Thus, the pickup member **45** carires the one slug S forward on the upper surface of the impelling member **41** and at the rear thereof, as shown in Fig. 4.

When the device passes from the position shown in Fig. 4 to that shown in Fig. 5, the slug S passes beneath a pivoted spring-urged dog **52**. The passage of the slug S forces the dog **52** to swing up and compress its spring **53** against a bolt **54** secured to the frame. Thus, the dog **52** permits the slug S to pass, but after the slug S passes, the spring **53** forces it down behind it and when the pickup member **45** begins to retract, as shown in Fig. 5, the dog **52** engages the rear edge of the slug S to prevent further retraction holding the slug S in that position. There are also a pair of hold-down arms **55** and **56** shown in Figs. 1, 2, and 5, pivotally connected adjacent their rear ends to a lateral bar **57** which is urged downwardly by a spring **58** bearing against a bolt **59** secured to the frame. The forward ends of the arms **55** and **56** extend beneath a lateral hold-down bar **60**. Thus, the slug S is held down by the hold-down arms **55** and **56** during this stage and is prevented from retracting along with the sliding bar **41** and the pickup member **45** by the dog **52**.

When, as shown in Fig. 6, the sliding member **41** and the pickup member **45** are reciprocated back, the slug S will not be returned but will be held back by the dog **52**, and the spring-urged hold-down arms **55** and **56** will gradually flatten out to hold the whole surface of it. The pickup member **45**, however, slides back beneath the stack of members which have been held elevated by the rear portion of the pickup member. As it retracts, it moves back into the position shown in Fig. 3. Meanwhile, the forward member **41** upon which the slug S was originally carried moves beneath it by virtue of its being never trapped by the dog **52** which trapped the slug S. The relative sliding movements shown in Fig. 6 terminates when the forward end **61** of the slide **41** passes beyond the dog **52** and the slug S then drops down in front of the forward end **61**. This places it in the position indicated in dotted lines in Fig. 3.

Further forward movement of the device in the next cycle will not only pick up another slug S from the bottom of the stack, as shown in Fig. 4, and as already described, but will also, as shown in that same view, begin projecting the first slug S forward in the position shown at the left-hand part of Fig. 4. Here the hold-down arms **55** and **56** prevent the slug S from being urged up vertically or tilted out of its flat position, while the forward edge **61** of the sliding member **41** impels it along a surface **62** upon and into the punch press **11**. As shown best in Fig. 2, the surface **62** upon which it slides comprises a pair of spaced-apart members supporting its edges. As the device reaches the position shown in Fig. 5, it has been forced beyond the bed **62** into the punch press **11** and is thrust forward upon the return of the slide feeding member by virtue of its own inertia. Then is when it is stopped by the stop members **17**.

When the slide **41** is retracted in the second stage, the punch press **11** closes and the slug S is cut and formed as desired. It will be noted that the apparatus works in synchronization with the punch press by virtue of mechanism well-known in the art which may be, for example, a synchronization of the camshaft or crankshaft shown in Fig. 2 with a similar crankshaft for the punch press itself. Preferably, the shaft **33** is provided with a breakaway coupling or clutch **63**, so that if the machine jams, the clutch **63** will slip and the machine will not damage itself by running.

To those skilled in the art to which this invention relates, many additional changes in construction and widely differing embodiments of the invention will suggest themselves without departing from the spirit and scope of the invention as defined in the claims.

What is claimed is:

1. A device for feeding slugs into a punch press while accurately positioning them therein, said punch press having a cyclic power means, said device including in combination a rigid frame having a table surface; means for retaining a stack of slugs above said table surface; a feeding member mounted for reciprocating sliding movement over said table surface and passing beneath said stack, said feeding member having an elongated plate, longer than the diameter of a slug with a forward end and a rear end and a pickup member projecting above said rear end a distance less than the thickness of a slug; means for reciprocating said feeding member in synchronization with the cycle of said punch press; means mounted above said table surface forward of said stack and above said elongated plate by a distance greater than the thickness of a single slug and less than the thickness of two slugs so that only one slug is fed at a time from the bottom of said stack; catch means positioned slightly forward of the forward end of said elongated plate when the latter is in its rearmost position, and barely rear of the rear end of said elongated plate when the latter is in its forwardmost position, said catch means being yieldably mounted to permit passage therebeneath of a slug carried forward on said elongated plate by said pickup member but preventing its retraction with said pickup member so that it drops on said table in front of said forward end of said elongated plate when said plate is retracted and is later propelled along said table by the forward end of said elongated plate into said punch press; hold-down means for said slug as it is pushed by said elongated plate front end; and stop means in said punch press for limiting the movement of said slug into said punch press.

2. The device of claim 1 wherein said means for retaining the stack of slugs comprises a stationary rear vertical bar and a pair of forward vertical bars syn-

chronously adjusted for movement together away from said rear bar and from each other.

3. A device for feeding slugs into a punch press while accurately positioning them therein, said punch press having a cycling power means, said device including in combination a rigid frame having a table surface; a plurality of vertical guide means supported by said frame for retaining a stack of slugs above said table surface; a feeding member mounted for reciprocating sliding movement over said table surface and passing beneath said stack, said feeding member having an elongated plate, longer than the diameter of a slug with a forward end and a rear end, and a pickup member projecting above said rear end a distance less than the thickness of a slug; means for reciprocating said feeding member in synchronization with the cycle of said punch press, including a flexible shaft driven by said punch-press cycling power means and a torque converter for turning rotary movement of said shaft into reciprocating movement of said feeding member; a plate mounted above said table surface and above said elongated plate by a distance greater than the thickness of a single slug and less than the thickness of two slugs; a pivoted spring-urged dog positioned slightly forward of the forward end of said elongated plate when the latter is in its rearmost position, and barely rear of the rear end of said elongated plate when the latter is in its forwardmost position, said dog yielding to permit passage therebeneath of a slug carried forward on said elongated plate by said pickup member but preventing its retraction with said pickup member, so that it drops on said table in front of said forward end of said elongated plate when said plate is retracted and is thence propelled along said table by said elongated plate into said punch press; spring-urged hold-down means for said slug forward of said dog for holding down said slug as it is pushed by said elongated plate front end; and guide means on said punch press for receiving said slug as it is projected forward and limiting its movement in said punch press, so as to center it there.

4. The device of claim 3 wherein there are three of said vertical guide means, a rear stationary one and two forward ones mounted for simultaneous snychronous movement toward and away from each other and said rear one.

5. A device for feeding slugs across a stationary table surface from a stack of slugs held above said table surface, comprising a feeding member mounted for reciprocating movement over said table surface beneath said stack, said feeding member having an elongated flat portion, longer than the diameter of a said slug, with a forward end and a rear end; a pickup member pivotally mounted to said feeding member adjacent said rear end and yieldingly urged to project above said flat portion less than the thickness of a said slug; means for reciprocating said feeding member beneath said stack so that said pickup member can pick up one slug from the bottom of said stack, said feeding member then carrying said slug on said flat portion; means for preventing said pickup member from carrying more than one slug from said stack at a time; and yieldable catch means positioned slightly forward of the forward end of said elongated flat portion when the latter is in its rearmost position, and

barely rear of said pickup member when said feeding member is in its forwardmost position, said catch means yielding to permit passage therebeneath of a slug carried forward on said elongated flat portion by said pickup member but preventing retraction of said slug by and with said pickup member so that said slug drops on said table in front of said forward end of said elongated portion when said feeding member is retracted and is propelled along said table by said forward end of said feeding member on its next stroke, said pickup member yielding to be substantially level with said elongated flat portion as it passes beneath said stack on each retraction of said feeding member.

6. The device of claim 5 wherein there is a yieldable hold-down means forward of and separately mounted from said catch means for holding down a slug therebelow as said slug is moved across said table beyond said catch by said forward end of said feeding means.

7. A device for feeding circular metal slugs, comprising a rigid table surface; means for retaining a stack of slugs above said table surface; a feeding member mounted for reciprocating sliding movement over said table surface and beneath said stack, said feeding member being longer than the diameter of a said slug and having a flat upper surface with a forward end and a rear end; a pickup member pivotally mounted to said feeding member adjacent said rear end and spring-urged to normally project up above said rear end a distance less than the thickness of a slug, said pickup member having an arcuate edge to engage said slug; means for reciprocating said feeding member; a stationary member mounted above said table surface with a clearance above said feeding member greater than the thickness of a single slug and less than the thickness of two slugs, so that only one slug at a time is fed from the bottom of said stack; yieldably mounted catch means positioned slightly forward of the forward end of said feeding means when the latter is in its rearmost position, and barely rear of the pickup member when the latter is in its forwardmost position, said catch means yielding to permit passage therebeneath of a slug carried forward by said pickup member on the flat upper surface of said feeding member but preventing retraction of said slug so that it drops on said table in front of said forward end of said feeding member when the latter is retracted and is then propelled thereby along said table on the next forward stroke of said feeding member, said pickup member yielding downwardly as it passes below said stack on its return stroke; and spring-mounted hold-down means forward of said catch means for holding said slug down flat as it is pushed forward by said forward end of said feeding member.

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