June 13, 1967 W. S. REILEY 3,324,697

THREAD ROLLER FEEDING MECHANISM

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FIG. 1

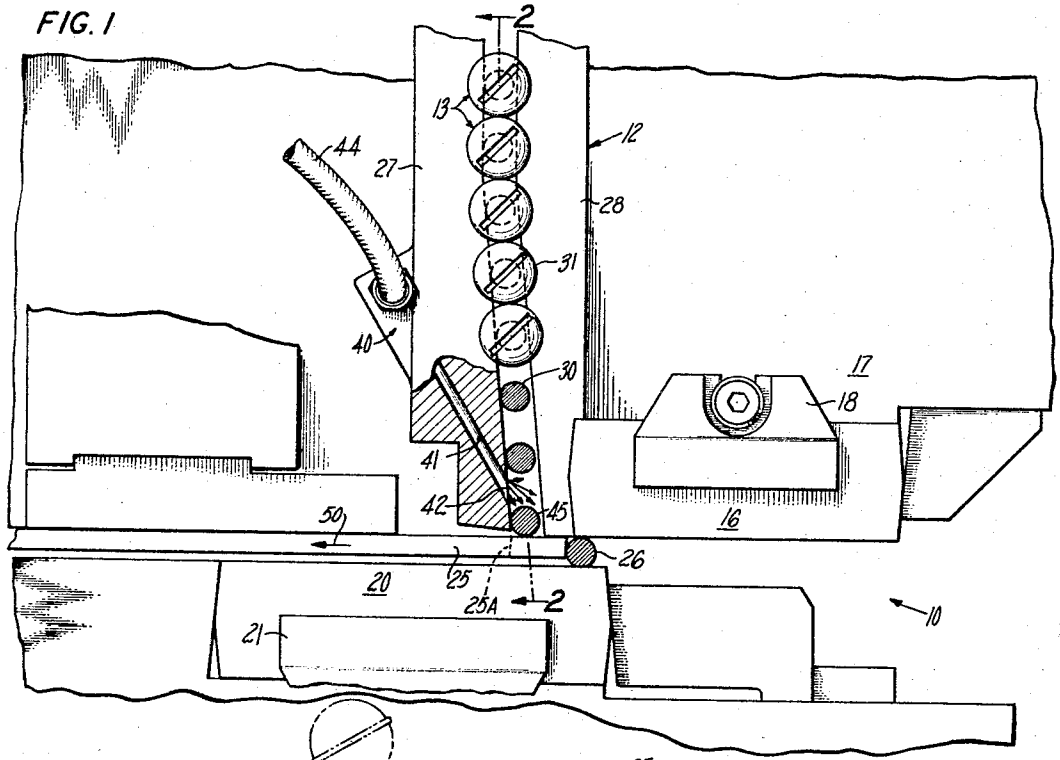
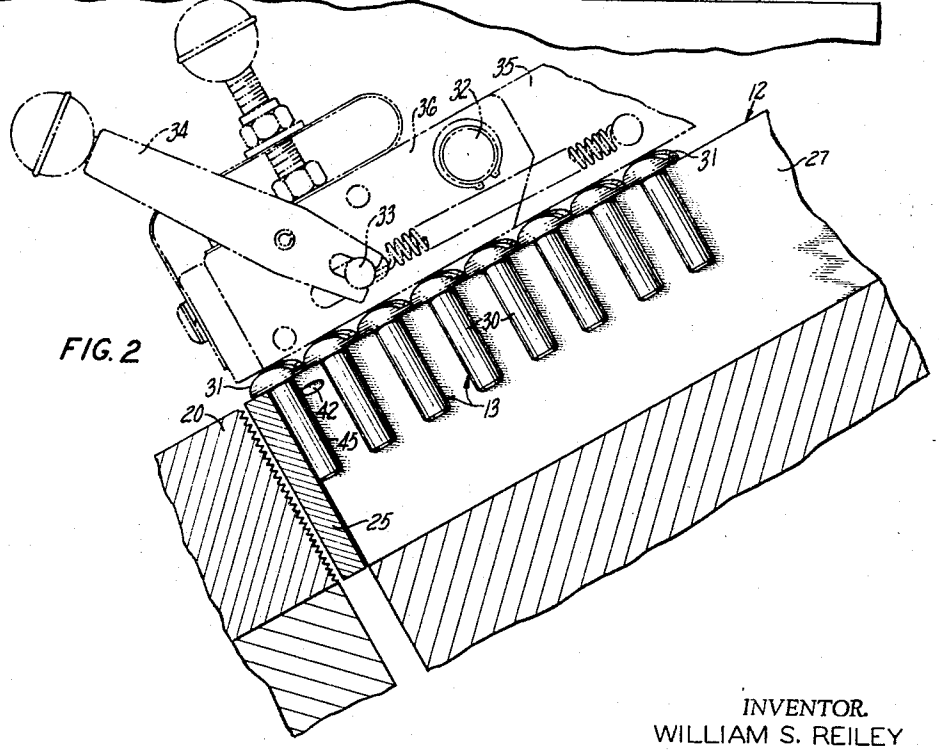


FIG. 2



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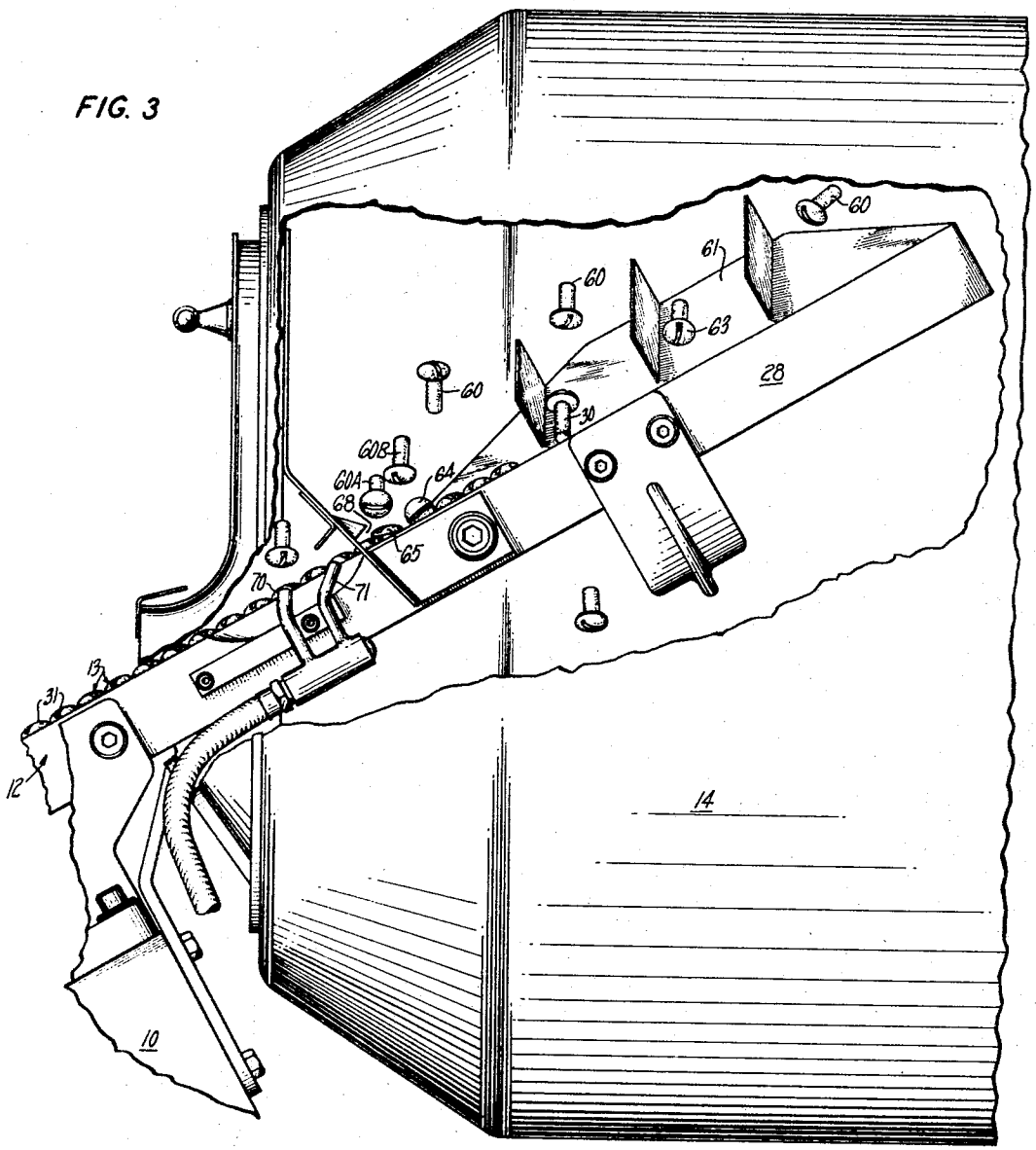
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FIG. 3



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THREAD ROLLER FEEDING MECHANISM

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3 Claims. (Cl. 72—90)

This invention generally relates to devices for feeding objects to a work station, and is more particularly directed to the provision of improved apparatus particularly suited for feeding headed blanks in thread rolling machines.

It is a primary object of this invention to provide a high speed thread roller having an improved work blank feeding mechanism that reliably delivers work blanks to the thread rolling dies in a rapid manner with the blank properly positioned for the thread rolling operation.

It is also a primary object of this invention to provide an improved feeding mechanism which continuously delivers work blanks in a controlled manner and at high delivery rates.

It is a still further object of this invention to provide an improved feeding device which assists the transfer of the workpiece to the work station.

It is a still further object of this invention to provide an improved work blank feeding device particularly useful with thread rollers that is economically manufactured and easily installed as an accessory to provide high speed, reliable delivery of properly oriented work blanks.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application which will be indicated in the appended claims.

In the drawings:

FIG. 1 is a fragmentary top plan view partially in cross section of a thread rolling machine incorporating the improved feeding mechanism of this invention;

FIG. 2 is a fragmentary side elevation view taken generally along the lines 2—2 of FIG. 1 with the track cover mechanism shown in dotted lines; and

FIG. 3 is a fragmentary elevation view with a portion of the feed drum removed to show the upper terminus of the feeding mechanism.

For illustrative purposes, the present invention is shown installed on portions of a thread rolling machine **10** of the type disclosed in U.S. Patent No. 3,117,473, entitled, Thread Rolling Machine and assigned to the assignee of the present invention. The machine **10** incorporates a screw blank feeding device generally designated **12** which conducts the blanks **13** from the rotatable drum or hopper **14** to the thread forming portion of the machine which includes a fixed die **16** that is secured to the bed **17** of the machine by a clamp **18** and a reciprocating or movable die **20** which is driven by any suitable mechanism (such as that shown in U.S. Patent No. 3,117,473) so as to reciprocate in a direction parallel to fixed die **16**. A suitable clamp **21** secures the die **20** to a movable carriage or slide and a movable combination gate and starter finger **25** of the type also shown in the aforementioned patent is provided between the dies **16** and **20** to control the discharge of screw blanks **13** from feeding mechanism **12** and to wedge the blanks between the dies at the commencement of each thread rolling operation. FIGS. 1 and 2 show the dies **16** and **20** at the beginning of the thread forming operation on blank **26** which was positioned by finger **25** after being discharged from feeding mechanism **12** by movement of the finger **25** to the position shown by the dotted line **25A**.

The feeding device **12** includes a pair of parallel feed rails **27, 28** which extend from a position within the drum **14** (see FIG. 3) to a lower terminal point which is adjacent the leading edge of the fixed die **16**, the rails being spaced by an amount sufficient to receive shank portion **30** of each blank while supporting the head portion **31** of each blank. In FIG. 1 the lower end of rail **27** and the blanks adjacent thereto are shown in cross section to facilitate description of certain aspects of the invention. For completeness, a track cover mechanism of the type shown in copending U.S. patent application Ser. No. 267,717 now abandoned and assigned to the assignee of the present invention is disclosed in dotted lines as including a main cover portion **35** and a movable extension cover portion **36** pivotally secured at **32** and provided with a latch mechanism **33** controlled by handle **34** to permit pivoting of the cover extension **36** away from the rails to permit easy removal of malformed work blanks. For further details of the thread rolling machine itself and the preferred track cover, reference is made to the above identified patent and patent application.

As the speed of operation illustrated on the thread rolling machine is increased, the time available for proper positioning of a work blank at leading edges of the dies is decreased. For example, operation of the machine of U.S. Patent No. 3,117,473 at speeds of approximately 400 strokes of the movable die per minute allow approximately .01 second for movement of a work blank from its position at the end of the feed rails to its position at the starting edge of the dies. At speeds of 800 strokes per minute, the gate at the end of the feed rails is open approximately ½ the aforementioned time; i.e., .005 second thereby making work blank feeding and positioning an important requirement if the number of workpieces to be produced is to be equal to the number of strokes of the movable die. Normal variances in work blank configuration as well as normal wear and tear causes the screw production rate of a typical machine to be substantially less than the actual number of strokes per minute of the movable die.

In accordance with the present invention, improvement have been made to the feeding mechanism so as to insure a constant flow of properly oriented work blanks down the feed rails and proper discharge of the work blanks from the lower terminus of the feed rails. Turning first to FIGS. 1 and 2, a preferred embodiment of the work blank discharging mechanism is shown as being positioned at the discharge end of the feed rails **27, 28** and as including an air jet generally designated **40** including a passageway **41** extending through feed rail **27** and terminating in air jet aperture **42**, the air being supplied from any suitable source through tubing **44**. The aperture **42** of air jet **40** is positioned in feed rail **27** to discharge air from a location in back of lowermost work blank **45** as its shank portion rests against the gate-starter finger **25**, the air being directed so as to engage the shank portion of the blank in the preferred embodiment thereby to urge the blank out from between the feed rails. Additionally the passageway **41** is positioned at an acute angle relative to the work blank engaging face of the rail **27**, such angle being approximately 30° in the preferred embodiment so as to direct the major portion of the air stream along the direction of feed while providing a component of pneumatic force extending transversely to the direction of feed.

With the feed rails inclined relative to the horizontal, the work blanks are gravity fed to the position shown in FIG. 2 with the heads of the blanks in edge to edge engagement. When the gate-starter finger **25** is moved in the direction of the arrow **50** (as the movable die **20** is moved to its fully retracted position), to reach its fully re-

tracted position (shown at dotted lines 25A), the gravity force and the force exerted by air emitted from jet 42 combine to force the work blank out from between the rails 27, 28 into abutting engagement with the movable die. The additional force exerted on the work blank by the jet of air reliably insures that each time the gate 25 opens and closes a work blank will be discharged into proper position for the thread rolling operation.

A further advantage of the air jet which can be called an "air escapement" is obtained by providing a component of pneumatic force which is directed transversely of the feed rails. Because the work blanks are in head to head engagement on an inclined track, the work blank being transferred tends to tilt, such tilting being partially caused by the next adjacent work blank. However, the component of pneumatic force extending transversely to the pneumatic feed rails tends to retard the second blank upon opening of the gate 25, thereby introducing a slight spacing between the blank being transferred and the next adjacent blank so as to eliminate tilting force exerted by the second blank so as to insure proper seating of the transferred blank against the movable die.

Reliable high speed operation of a machine such as a thread roller also requires that the feed rails be kept filled with properly oriented work blanks which move smoothly to the discharge end. The present invention in feeding apparatus comprehends the provision of improvements at the upper or starting end of the feed rails to increase the reliability of delivery of blanks to the discharge end of the rails.

As most clearly seen in FIG. 3, a drum or hopper 14 is supported for rotation in any suitable manner such as that shown in Patent No. 3,117,473 and provided with internal vanes (not shown) which lift work blanks from the bottom of the drum to let them tumble from the top of the drum as generally indicated by the blanks 60. As these blanks fall towards the bottom of the drum, they engage plate 61 which is inclined to the horizontal to permit blanks which impinge thereon to slide towards the inclined feed rails 27, 28. Because these blanks engage the rails in a random fashion, only a portion of blanks which reach the rails will be properly oriented so that the shank drops between the rails with the head properly resting thereon. Under normal conditions some of the blanks will be oriented head first as with blank 63 so as to assume a position transverse to the feed rails as with blank 64. Similarly, certain of the blanks may have their head portion resting on the preceding blank as at 65 or may be deposited on a portion of the feed rail already filled with blanks as with blanks 60A and 60B. Such work blank conditions tend to create a jam at the exit slot 68 and may permit improperly oriented blanks to proceed down the feed rails.

In accordance with this invention, air jets are provided adjacent the exit point of the drum which jets have been arbitrarily designated the knock-off jet 70 and the clearing jet 71. The clearing jet 71 continuously directs a stream of air into exit aperture 68 of the drum and at an angle above the feed rails so as to dislodge any improperly oriented blanks which would otherwise clog the drum exit. The knock-off jet 70 continuously directs a jet of air across the top surface of the feed rails so as to remove from the feed rails any blanks which may be extending transversely of the rails and to settle blanks which are (as with blank 65) not properly seated on the feed rails.

The foregoing arrangement has been found to effectively provide a continuous row of properly oriented work blanks to the aforementioned air escapement so as to coact therewith in providing the improved feeding mechanism of this invention.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

I claim:

1. Apparatus for feeding headed objects comprising a pair of feed rails for conducting the headed objects from the inlet end of the rails to the discharge end of the rails, a movable gate member extending across the discharge end of the feed rails, and means for effecting high speed discharge of the first headed object from the discharge end of the rails while retarding the second headed object, said means comprising a jet of air directed against the shank portion of the headed object positioned adjacent the gate.

2. The apparatus as set forth in claim 1 wherein said jet of air includes an orifice positioned in one of the feed rails adjacent the discharge end, said orifice being positioned to direct air toward the discharge end at an acute angle relative to the feed rail.

3. The apparatus as set forth in claim 1 wherein said air jet is directed against the shank portion toward a position adjacent the head of the headed object positioned adjacent the gate.

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