

May 22, 1962

G. O. CONNER

3,035,684

BLANK FEEDING DEVICE FOR METAL WORKING MACHINES

Original Filed March 12, 1951

7 Sheets-Sheet 1

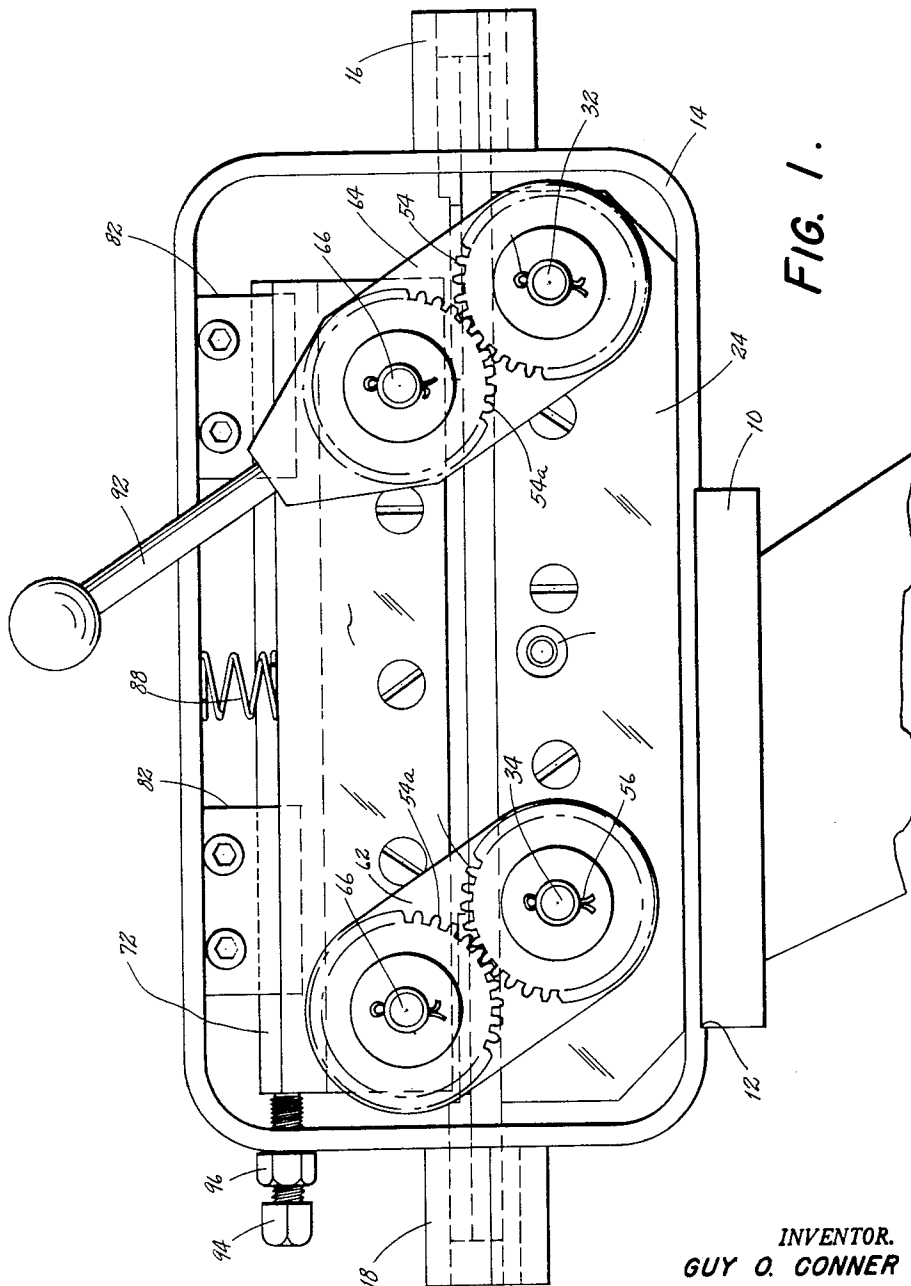


FIG. 1.

INVENTOR.
GUY O. CONNER

BY *W. H. Woodlief*
ATTORNEY

May 22, 1962

G. O. CONNER

3,035,684

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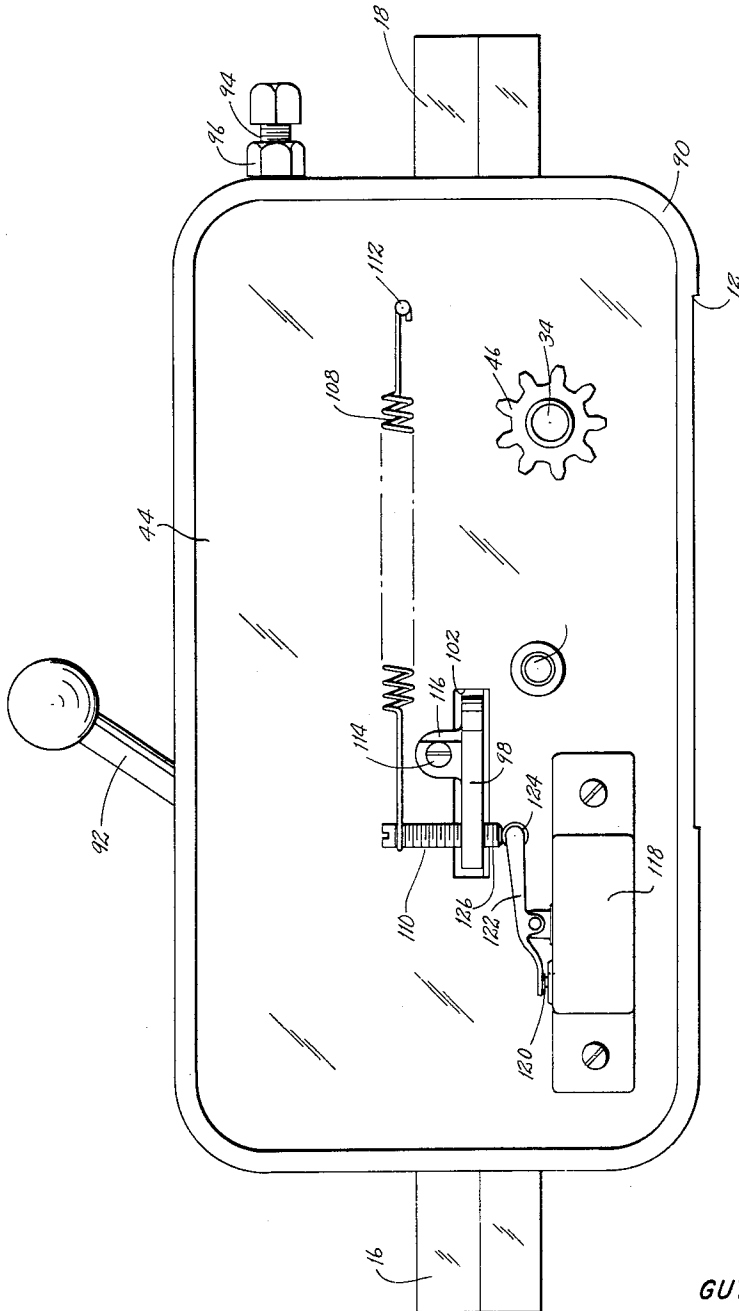


FIG. 2.

INVENTOR.
GUY O. CONNER
BY *W. H. Woodlief*
ATTORNEY

May 22, 1962

G. O. CONNER

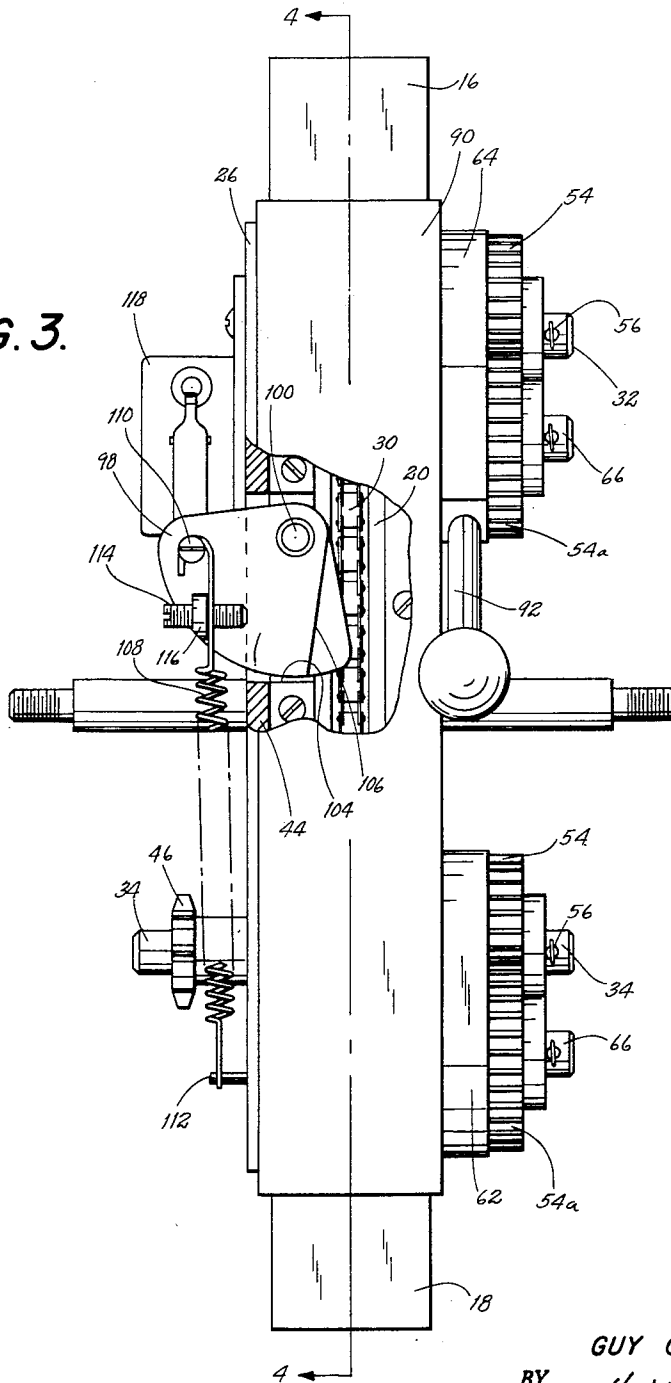
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BLANK FEEDING DEVICE FOR METAL WORKING MACHINES

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FIG. 3.



INVENTOR.
GUY O. CONNER
BY *W. H. Woodlief*
ATTORNEY

May 22, 1962

G. O. CONNER

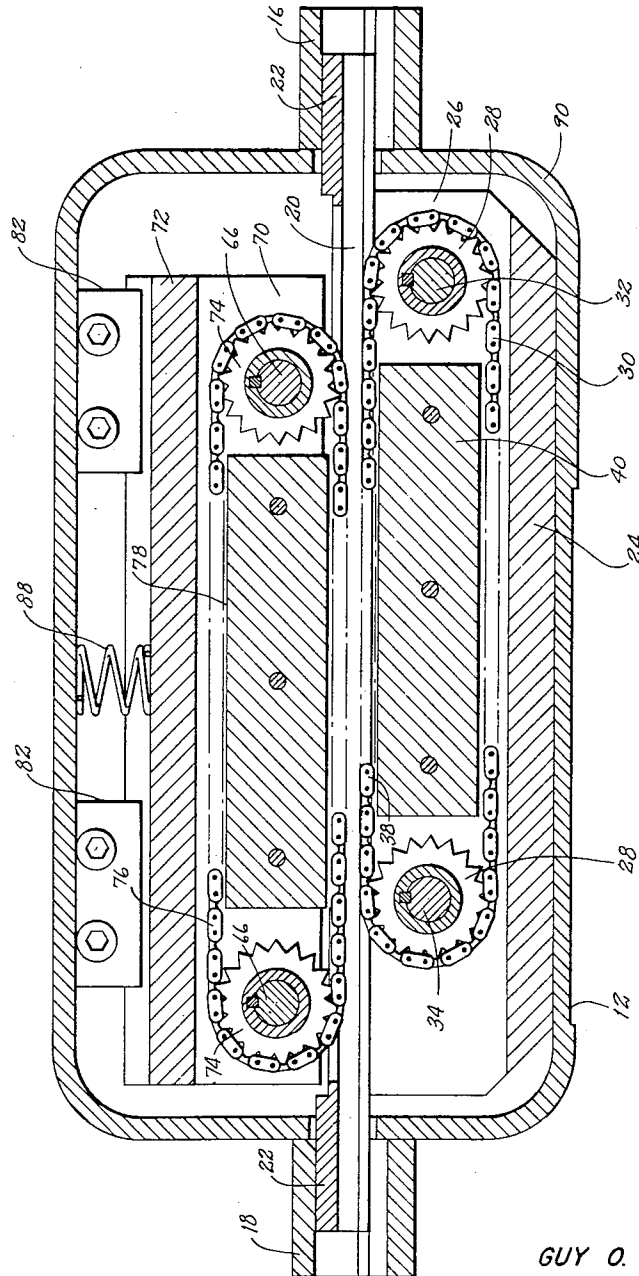
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BLANK FEEDING DEVICE FOR METAL WORKING MACHINES

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FIG. 4.



INVENTOR.
GUY O. CONNER
BY *W. H. Woodlief*
ATTORNEY

May 22, 1962

G. O. CONNER

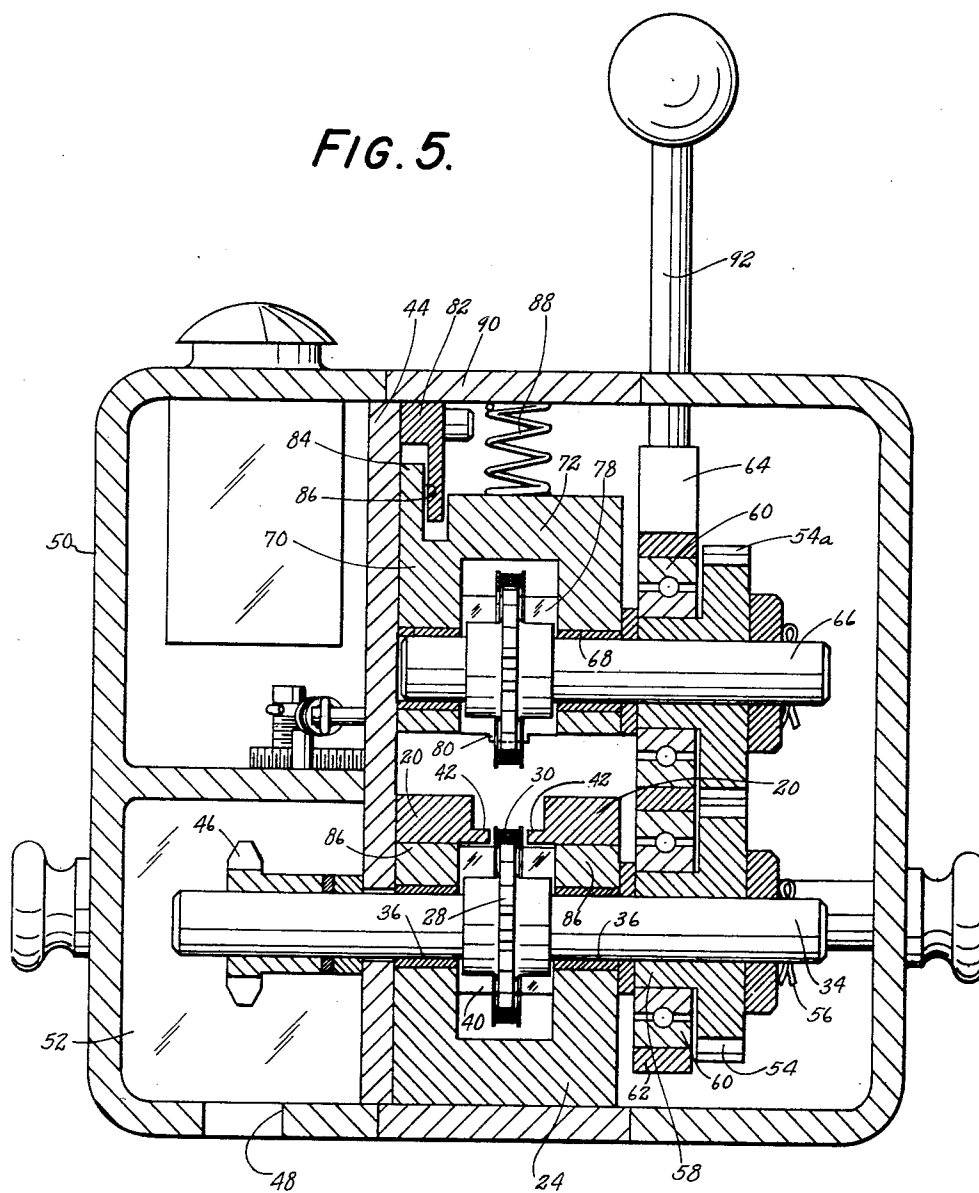
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BLANK FEEDING DEVICE FOR METAL WORKING MACHINES

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FIG. 5.



INVENTOR.
GUY O. CONNER
BY *W. H. Woodlief*
ATTORNEY

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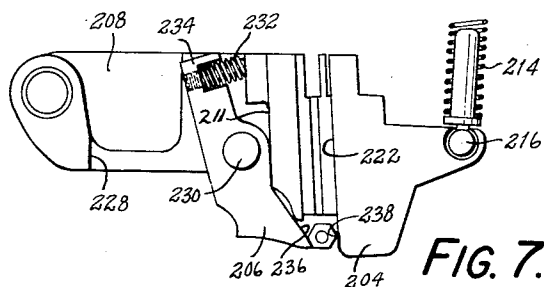
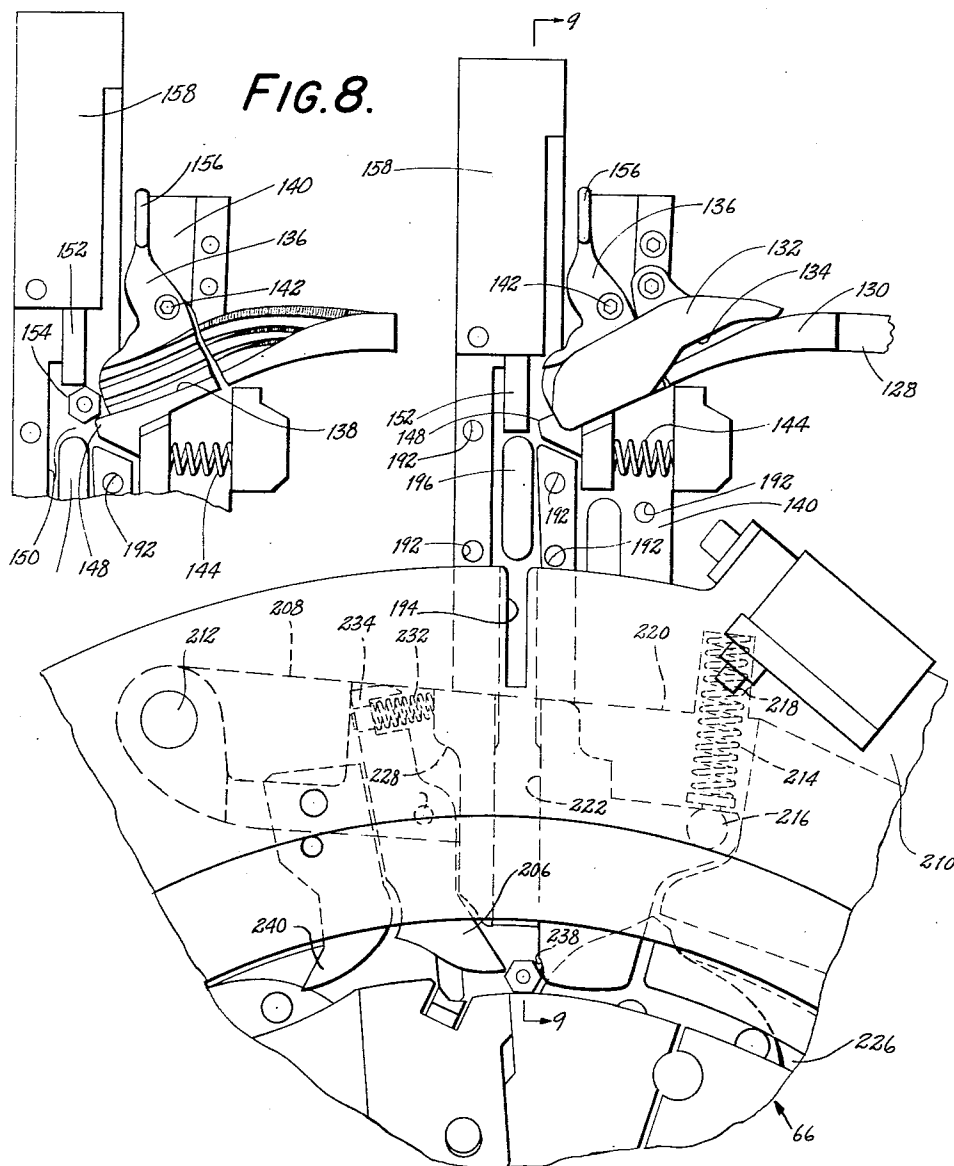


FIG. 6.

INVENTOR.
GUY O. CONNER
BY *W. H. Woodlief*
ATTORNEY

May 22, 1962

G. O. CONNER

3,035,684

BLANK FEEDING DEVICE FOR METAL WORKING MACHINES

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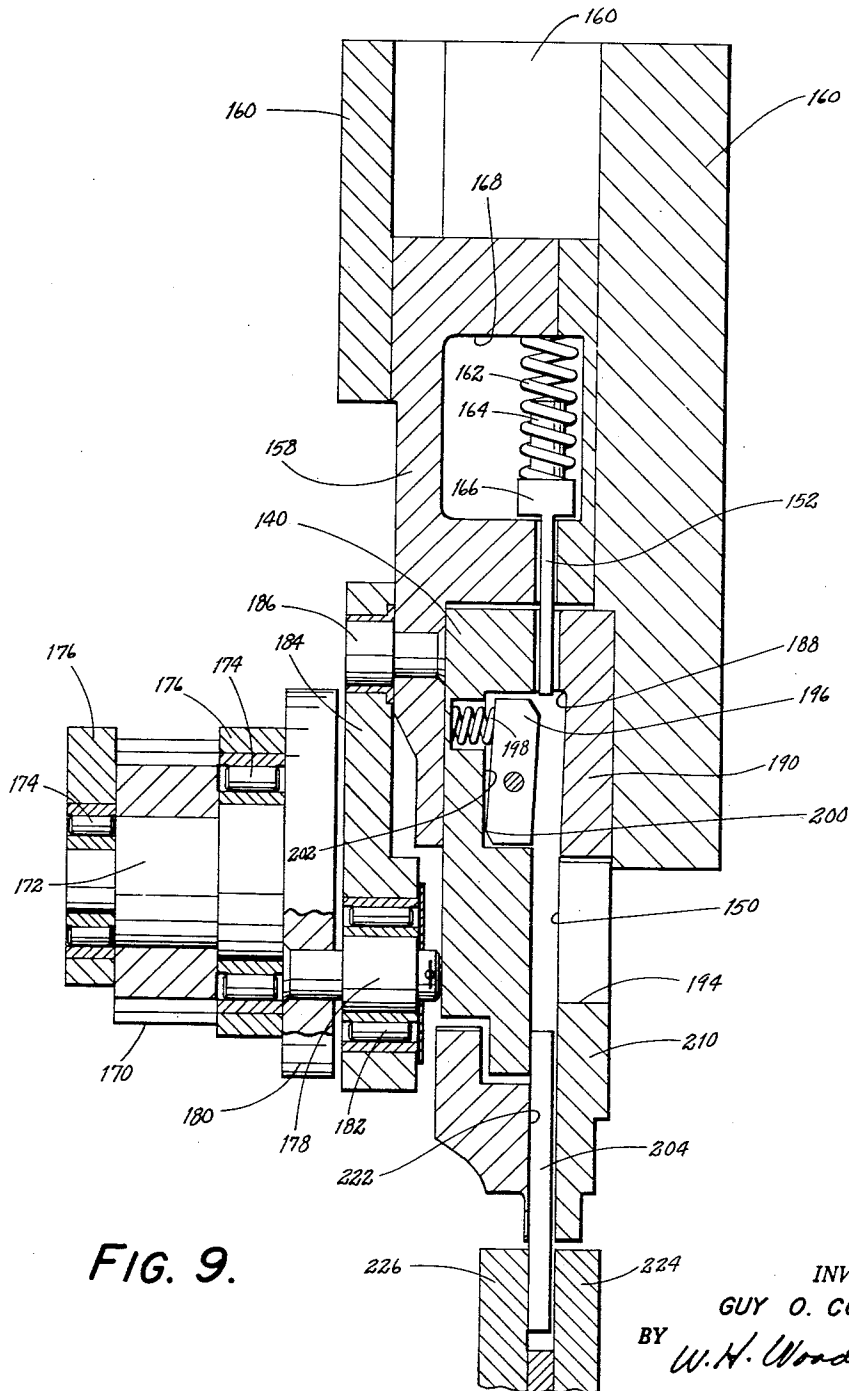


FIG. 9.

INVENTOR.
GUY O. CONNER
BY *W. H. Woodlief*
ATTORNEY

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3,035,684

BLANK FEEDING DEVICE FOR METAL WORKING MACHINES

Guy O. Conner, Cleveland, Ohio, assignor to Republic Steel Corporation, Cleveland, Ohio, a corporation of New Jersey

Original application Mar. 12, 1951, Ser. No. 215,131, now Patent No. 2,828,492, dated Apr. 1, 1958. Divided and this application Mar. 25, 1958, Ser. No. 723,391 5 Claims. (Cl. 198—162)

This invention relates to mechanism for feeding blanks. More particularly, the invention relates to mechanism for feeding nut blanks to a threading machine such as that in my application for United States Patent, Serial Number 215,131, filed March 12, 1951, now Patent No. 2,828,492, for Forming Machine, of which this application is a division.

In my aforesaid application for patent, I have disclosed a forming machine particularly adapted for operations such as the threading of nuts. The machine of that application is adapted for high speed operation on a plurality of nut blanks, simultaneously carried in a rotary turret or work holder. Unless the blanks are fed to the turret of the aforesaid machine rapidly, and in a constant stream, a substantial advantage of a high speed threading operation is lost. The invention herein, therefore, contemplates a device adapted to receive nut blanks from a conventional rotary feed hopper and to feed such blanks in a substantially constant stream of blanks under pressure to an injecting device associated with the work holding turret of a screw machine such that the work holding sockets of the turret are kept filled constantly during the operation of the machine.

It is a further object of the invention to provide a device of the kind indicated which is of such simple construction that there is little likelihood that the same will fail during operation.

Furthermore, it is a further object of the invention to provide a device of the kind stated which is easily adjustable to accommodate nut blanks of different sizes, such that the feeding device can be adapted to the feeding of nut blanks of various sizes without altering the structure of the feeding device or substantially interrupting operation for the purpose of making adjustments.

These and other objects of the invention will be pointed out in the description thereof and yet other advantages will become apparent from a reading of the specification in light of the drawings forming a part of the application, in which drawings like reference numerals indicate like parts, and in which:

FIG. 1 is an elevational view of the blank feeding mechanism herein taken from the right side with the cover removed;

FIG. 2 is an elevational view of the blank feeding mechanism taken from the left side with the cover removed;

FIG. 3 is a top plan view of the blank feeding mechanism with both covers off and with part of the shell broken away to show underlying parts;

FIG. 4 is a sectional view on line 4—4 of FIG. 3;

FIG. 5 is a sectional view along the mutual centerline of the drive gears with the upper part in a raised position;

FIG. 6 is an elevational view of an injector mechanism adapted to receive blanks from the blank feeding mechanism; some of the parts having been removed to show underlying parts;

FIG. 7 is an elevational view of a detail of the injector mechanism of FIG. 6;

FIG. 8 is a detailed view of the inlet of the injector with the cover removed; and

FIG. 9 is a sectional view taken on line 9—9 of FIG. 6, drawn to an enlarged scale.

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The blank feeding mechanism herein is mounted on a bracket 10 which is part of a machine tool such as that shown in my aforesaid application for patent. The bracket serves to position the mechanism between a conventional rotary blank feeding hopper and the work holding turret of the tool. The bracket 10 is engaged in a relief 12 in the outer housing 14 of the device. Fixed to this housing at one end is an intake guide 16 into which blanks are fed from the rotary feed hopper of my aforesaid application for patent. A similar guide 18 is provided at the other end to discharge nuts to the work holding turret of the machine tool. A pair of substantially L-shaped tracks 20 (FIGS. 4 and 5) extend the full length of the device. Protective covers 22 enclose the track at either end to hold the nuts in place as they are fed from the hopper.

A channel shaped block 24 is fixed in the bottom of the housing 14 and the tracks 22 may be fastened to the legs 26 of the block. A pair of sprockets 28 carry a chain 30 between the legs of the block 24. The chain 30 is preferably of the "silent" type. The sprockets 28 are keyed to shafts 32 and 34 which are journaled in bushings 36 in the legs 26. The upper run 38 of the chain is supported by a block 40 supported between the legs 26 to prevent the chain from sagging and to hold it so that its upper surface will be just slightly above the upper surface of the extending lips 42 of the tracks 20.

The shaft 34 extends through a rear wall 44 of the housing (FIG. 5) where a drive sprocket 46 adapted to receive a drive chain, not shown, is fixed to its extending end. The drive chain is adapted to extend through a slot 48 in a cover 50 and may be driven by any suitable drive motor, preferably by a constant torque motor, although an ordinary gear motor has been used satisfactorily. The sprocket 46 is enclosed in a separate compartment 52 formed in the cover 50 to keep dirt and the like from the rest of the device.

At their right hand ends (FIG. 5) each of the shafts 66 and 34 carries a spur gear 54 keyed to the shaft and held in place by suitable means such as a washer and a cotter pin 56. A boss 58 on these gears is journaled, by means of a ball bearing 60, in a pair of parallelogram links 62 and 64 (FIG. 1). A pair of upper gears 54a exactly similar to the lower gears 54 are also journaled in ball bearings 60 in the links 62 and 64 in meshing engagement with the lower gears 54. The upper gears 54a are keyed to, and drive, shafts 66 similar in all respects to the shaft 32. These shafts 66 are journaled in bushings 68 in the legs 70 of an upper movable block 72 similar to the lower block 52. A pair of sprockets 74 are carried by the shafts 66, and these sprockets accommodate a chain 76 between the legs 70 of the block 72 in a manner exactly similar to the lower sprockets 28 and chain 30. A block 78 is supported between the legs 70 and has a narrowed chain engaging rib 80 (FIG. 5) in position to press the chain downward at its lower run in a manner similar to the support provided by the block 40.

It will be apparent that the upper block 72 is carried wholly by the shafts 66. It is also slidably engaged with the wall 26 and is guided by a pair of guide clips 82 fixed to the wall 44. These clips extend over a lip 84 and into a slot 86 formed in the block 72 and thus retain it in engagement with the wall 44. It is obvious that a change in the shape of the parallelogram linkage formed by the blocks 24 and 72 and links 62 and 64 from an oblique parallelogram to a rectangle will result in separation of the chains 30 and 76. In order to keep the chains pressed together, a compression spring 88 is engaged between a housing wall 90 and the upper surface of the block 72. If necessary, suitable means may be used to retain the

spring in place. It is apparent that many other locations of the spring or other biasing means may be used to accomplish the purpose of this spring. In order to separate the chains, a handle 92 is provided on the link 64 to make possible, manual movement of that link and, therefore, of the linkage against the spring.

Stop means to prevent complete closure of the space between the chains 30 and 76 is provided in the form of a screw 94 threaded into the housing 14 and retained by a jam nut 96. The end of the screw engages one end of the block 72 to prevent overtravel and therefore maintain the desired space between the chains.

In use, the device is designed to maintain pressure on a stream of nuts through the tracks. The nuts come into the device through the guide 16. The chains are spaced so that the nut blanks will be pressed between them by the spring 88. Thus the nuts are picked up by the chains which are driven in a direction so as to force the nuts through the chutes. This drive is positive on both chains because of the gears 54 and 54a and there is, therefore, no slippage between them. With the preferred type of motor (constant torque), it will be seen that at the exit side of the chains, the nuts would be forced out with a constant pressure. If the stream coming to the control device is not substantially continuous as picked up by the chains, at the exit end, the nut following a space in the stream will be moved up quickly to fill the space. If the stream away from the control becomes too full, the torque motor will merely continue to keep pressure on the stream. The less desirable gear motor drives the chains at nearly a constant speed which must be greater than the maximum feed of the nuts into the machine. With this type of device, the chains are constantly slipping on the stream of nuts and the friction between the chains and the nut blanks creates the pressure on the stream of nuts leaving the device. Thus, even if the hopper feed is not quite steady, the control mechanism insures a full chute leading into the injector mechanism into which it discharges and which places the nut blanks into the clamping mechanism of my aforesaid application for patent.

Further precautions are also taken to prevent operation of the machine without a completely full nut stream. This takes the form of a safety cut-off device adapted to be tripped if there is any substantial break in the stream as it passes through the control device. As best shown in FIGS. 2 and 3, a quadrant plate 98 is pivoted at 100 (FIG. 3) to the block 24. This plate extends through an opening 102 in the wall 44 and through a break 104 in the track member. The inner edge 106 of the plate is somewhat thinner than the rest and is adapted to extend between the chains 30 and 76. A spring 108 engaged between a screw 110 in the plate 98, and a post 112 on the wall 26 urges the plate to the position shown in FIG. 3. A screw 114 engaged closely in threads in an ear 116 on the plate may provide an adjustable stop by engaging the wall 44. It will be apparent that the stream of nuts, if continuous, will force this plate outward, away from the tracks. This motion is utilized to operate a limit switch 118 fixed to the wall 44. The switch is of the type having a plunger 120 biased outwardly of the switch operated by a lever 122 biased by stronger means to hold the plunger pressed into the switch. A roller 124 may be fixed at the free end of the lever to engage an operating device, which, in the present instance, is the end 126 of the screw 110. This screw is so located in the plate 98 that if the stream of nuts is continuous and the plate is held outwardly, the end 126 of the screw engages the roller and presses it downwardly, allowing the plunger 120 to rise and close the circuit through the switch 118. However, if there is any substantial break in the stream of nuts, the plate 98 will be rotated inwardly by the spring 108 causing the end 126 of the screw to become disengaged from the roller 124 and releasing the lever 122.

This results in the breaking of the circuit through the switch 118 and the breaking is utilized to trip a relay and shut down the machine. It will be recognized by those skilled in the art, that this safety cut-off could be mounted anywhere in the stream of nuts where it was important that the flow be continuous. Thus a full stream of nut blanks always under pressure is assured by the use of this novel device.

As the nut blanks leave the above-described feed control device, they pass through a chute 128 (FIG. 6) into an injector device which provides positive injection of one nut blank into each receptacle in the work holding turret of my aforesaid application for patent, a fragment 130 of said turret being shown at the bottom of FIG. 6. The injector device is mounted on a suitable support forming part of the machine tool of said application.

The nut blanks are guided by the chute 128 to an inlet guide 130 which has a cover 132. As best shown in FIG. 8, where the cover 132 has been removed, the guide rotates the nut blank and sets it up on edge. An observation slot 134 may be left between the cover 132 and the inlet guide 130 if desired to watch the progress of the blanks. From this guide, the nut blank enters a movable entry member 136. This member is formed with a slot 138 for the nuts which is also covered by the cover 132. It is pivoted to a supporting frame 140 of the injector by a screw 142. A spring 144 engaged between the member 136 and the framework 140 biases the member 136 to the position shown. A lip 148 guides the blanks to their proper position over a slot 150. A ram 152 movable vertically (FIGS. 6 and 9) normally retracts, receives the nut, and forces it downward in the slot 150 formed in the injector. However, on rare occasions, it may catch the blank 154 as shown in FIG. 8. In this event, the member 136 pivots against the force of the spring 144 and prevents damage to the machine or to the blank. On the next successive stroke, the nut will almost invariably find its way into the channel 150 and pass through the machine. The motion of the entry member 136 may be utilized to operate a shut-down switch (not shown) by forming a vane 156 on the member and mounting a switch in position to be operated thereby. This has been discovered to be an unnecessary precaution, but might be useful in some cases.

The ram 152 is carried by a slide block 158 slidably guided by a guide 160 (FIG. 9). The guide 160 may be bolted to the frame 140 and may be aligned by dowels or the like, not shown. The ram 152 is slidable in the block 158 and is urged downward by a compression spring 162 disposed over a stud 164 formed on the ram upwards of a collar 166. The spring 162 abuts the top wall 168 of an opening in the block 158. Because of the shape of the ram 152, it is desirable that the block 158 be formed of two pieces as shown (FIG. 9) in order to facilitate assembly as will be apparent to those skilled in the art.

The block 158 is reciprocated in timed relation to the rotation of the main drive members of the machine of my aforesaid application for patent by a gear and crank mechanism shown in FIG. 9. A pinion 170 is keyed to a shaft 172 which is journaled in roller bearings 174 between two arms 176 of a yoke attached to aforesaid support member. This pinion is meshed with a ring gear fixed to the cover plate of the spindle carrier of my aforesaid application for patent. The gear ratio between said ring gear and pinion 170 will depend on the number of spindles in the machine into which the blanks are being fed, the ratio being such that the pinion makes one full revolution during the passage of the space between two adjacent spindles. For a machine such as in my aforesaid application for patent which has eight spindles, the ratio would be eight to one. An eccentric 178 is staked into a disk 180 formed on the end of the shaft 172. This pin extends from one face of the disk and is journaled in a roller bearing 182 mounted in a crank

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arm 184. The crank 184 is journaled at its other end on a pin 186 staked into a depending flange 187 of the block 158. Thus the ram 154 carried by the block 158 reciprocates through a complete up and down cycle each time a spindle passes. As noted, each time the ram is withdrawn upward, another blank is pushed into the slot 150 because of pressure on the stream of nuts above imposed by the feed control device. At each stroke of the ram, then, the string of nuts enclosed in the channel 150 will be moved down to inject the last nut into the sockets of the work holding turret.

In order to prevent the row of nuts in the slot 150 from following the ram 152 on its back or upward stroke, a shoulder 188 (FIG. 9) is formed in the cover 190 for the slot 150. This cover, which has been removed in FIG. 6 to show underlying parts, may conveniently be held by screws driven into tapped holes 192 in the framework 140. The cover may also extend over and cover the spring 144. An observation slot 194 is cut through the support 142 and opens into the slot 150 to observe the passage of the nuts if desired. A spring pressed pad 196 is pinned to the framework 140 in the wall of the slot 150 opposite the shoulder 188. A spring 198 disposed in a hole in the frame urges the pad to the position shown in FIG. 9. The movement of the pad is limited by the engagement of its lower edge 200 with the wall of the recess 202 in which the pad is disposed. However, the movement of the pad 196 is sufficient to push each successive nut blank under the shoulder 188 to prevent it from returning upward with the ram 152. In addition to holding the nut under the shoulder, the pad 196 by its motion breaks any bond between the blank and the ram which might be caused by oil or the like on the meeting surfaces. When the machine is in full operation, the slot 150 is completely full of blanks and, therefore, each new one which is pushed under the shoulder 188 by the ram 152 causes a blank to be injected into the machine.

Between injection strokes, the blank at the bottom of the channel 150 is held between two fingers 204 and 206 (FIGS. 6 and 7). The finger 204 is formed as a part of a movable piece 208 pivoted to a support 210 at 212. The piece 208 is biased toward the center of the machine by a spring 214 having an end fitting 216 at one end seated in a socket in the piece 208, and the other end seated in a hole 218 formed in a flange 220 of the support member 210. A continuation 222 of the slot 150 is formed in this piece and is closed by the support 210 so that the channel for the nuts is substantially continuous. Motion of a blank along its axis as it passes out of the slot 222 toward the end of the fingers 204 and 206 is prevented by a spider plate 224 (FIG. 9) and a face plate 226 disposed on opposite sides of the fingers 204 and 206. These plates are a part of the face plate and clamping or work carrying mechanism of my aforesaid application for patent.

The second finger 206 is movably disposed in a hollow 228 in the piece 208 and pivots about the pin 230 (FIG. 7). A compression spring 232 engages a wall of the hollow 228 and the outer end 234 of the finger 206 and thus biases the end of the finger 206 toward the opposite finger 204. At its lower end, the finger 206 is formed with a flat surface 236 slanting at an angle of approximately 60 degrees so as to engage the flat surface of the nut blanks as they come down the channel. In FIG. 6 the blank has been pushed beyond the end of the finger 206 and the face 236 is ready to engage the next succeeding blanks when the lower blank is eventually removed by mechanism 66, as described in my application for patent noted above. Between injection strokes, the lowest nut blank is held between the fingers 204 and 206 as shown in FIG. 7. A slight dimple 238 may preferably be formed in the finger 204 to hold the nuts in place until action of the ram 152 forces them out of the channel. It will also be noted that the hollow or re-

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lieved part 228 extends beyond the finger 206 toward the pivot point to provide clearance for a hook 240 whose purpose is fully explained in my parent application for patent.

While the fundamentally novel features of the invention have been illustrated and described in connection with specific embodiments of the invention, it is believed that these embodiments will enable others skilled in the art to apply the principles of the invention in forms departing from the exemplary embodiments herein, and such departures are contemplated by the claims.

What is claimed is:

1. In a device for controlling the feed of workpieces to an automatic forming machine adapted to receive single workpieces at periodic intervals, elongated track means adapted to carry workpieces being fed, said track means having a pair of spaced upstanding walls along the length thereof for simultaneously engaging opposite faces of a workpiece passing therebetween, lower block means fixed to the underside of said track means and extending along the major portion of the length thereof, upper block means disposed above said track means and extending along the major portion of the length thereof, said block means presenting rigid confronting faces constituting a work feeding channel, said work feeding channel having an inlet adapted to receive workpieces in spaced random order and a discharge throat for delivering workpieces to the forming machine, flexible workpiece feeding means carried in contact with said confronting face of each of said block means and presenting spaced smooth confronting faces throughout said work feeding channel adapted to engage workpieces therein and feed the same therethrough solely by frictional engagement with such workpieces, means for yieldingly urging said block means toward each other to press said workpiece feeding means into contact with opposite faces of workpieces in said work feeding channel, and drive means adapted to drive said workpiece feeding means at a speed adapted to furnish workpieces at said discharge throat at a rate in excess of that required by said forming machine, whereby workpieces received at said inlet in random spaced relation are delivered under pressure at said discharge throat in an oriented closely packed stream while said workpiece feeding means passes idly over the oriented closely packed stream of workpieces at said discharge throat.

2. In a device for controlling the feed of workpieces to an automatic forming machine adapted to receive single workpieces at periodic intervals, elongated track means adapted to carry workpieces being fed, said track means having a pair of spaced upstanding walls along the length thereof for simultaneously engaging opposite faces of a workpiece passing therebetween, lower block means fixed to the underside of said track means and extending along the major portion of the length thereof, upper block means disposed above said track means and extending along the major portion of the length thereof, said block means presenting rigid confronting faces constituting a work feeding channel, link means pivoted to both of said block means near their respective ends to form a parallelogram figure therewith, said links and upper block means being movable relative to said lower block means to allow said parallelogram figure to be changed to cause said upper block means to be displaced in reference to said lower block means, said work feeding channel having an inlet adapted to receive workpieces in spaced random order and a discharge throat for delivering workpieces to the forming machine, flexible workpiece feeding means carried in contact with said confronting face to each of said block means and presenting spaced smooth confronting faces throughout said work feeding channel adapted to engage workpieces therein and feed the same therethrough solely by frictional engagement with such workpieces, means for yieldingly urging said block means toward each other to press said workpiece feeding means into contact with opposite faces of workpieces in said

work feeding channel, and drive means adapted to drive said workpiece feeding means at a speed adapted to furnish workpieces at said discharge throat at a rate in excess of that required by said forming machine, whereby workpieces received at said inlet in random spaced relation are delivered under pressure at said discharge throat in an oriented closely packed stream while said workpiece feeding means passes idly over the oriented closely packed stream of workpieces at said discharge throat.

3. In a device for controlling the feed of workpieces to an automatic forming machine adapted to receive single workpieces at periodic intervals, elongated track means adapted to carry workpieces being fed, said track means having a pair of spaced upstanding walls along the length thereof for simultaneously engaging opposite faces of a workpiece passing therebetween, lower block means fixed to the underside of said track means and extending along the major portion of the length thereof, upper block means disposed above said track means and extending along the major portion of the length thereof, said block means presenting rigid confronting faces constituting a work feeding channel, said work feeding channel having an inlet adapted to receive workpieces in spaced random order and a discharge throat for delivering workpieces to the forming machine, flexible workpiece feeding means carried in contact with said confronting face of each of said block means and presenting spaced smooth confronting faces throughout said work feeding channel adapted to engage workpieces therein and feed the same therethrough solely by frictional engagement with such workpieces, yielding biasing means engaging said upper block means for urging said upper block means toward said lower block means to press said workpiece feeding means into contact with opposite faces of workpieces in said work feeding channel, a positive driving connection engaged between said workpiece feeding means in said lower block means and said workpiece feeding means in said upper block means adapted to drive said upper feeding means in unison with said lower feeding means, and drive means adapted to drive said workpiece feeding means at a speed adapted to furnish workpieces at said discharge throat at a rate in excess of that required by said forming machine, whereby workpieces received at said inlet in random spaced relation are delivered under pressure at said discharge throat in an oriented closely packed stream while said workpiece feeding means passes idly over the oriented closely packed stream of workpieces at said discharge throat.

4. In a device for controlling the feed of workpieces to an automatic forming machine adapted to receive single workpieces at periodic intervals, elongated track means adapted to carry workpieces being fed, said track means having a pair of spaced upstanding walls along the length thereof for simultaneously engaging opposite faces of a workpiece passing therebetween, lower block means fixed to the underside of said track means and extending along the major portion of the length thereof, upper block means disposed above said track means and extending along the major portion of the length thereof, said block means presenting rigid confronting faces constituting a work feeding channel, said work feeding channel having an inlet adapted to receive workpieces in spaced random order and a discharge throat for delivering workpieces to the forming machine, longitudinal channels in said upper and lower block means, a sprocket mounted on a shaft at each end of said channels, a flexible workpiece feeding chain disposed about the sprockets of each of said channels and lying respec-

tively in contact with said confronting face of each of said block means and presenting spaced smooth confronting faces throughout said work feeding channel adapted to engage workpieces therein and feed the same therethrough solely by frictional engagement with such workpieces, means for yieldingly urging said block means toward each other to press said workpiece feeding means into contact with opposite faces of workpieces in said work feeding channel, and drive means adapted to drive said workpiece feeding means at a speed adapted to furnish workpieces at said discharge throat at a rate in excess of that required by said forming machine, whereby workpieces received at said inlet in random spaced relation are delivered under pressure at said discharge throat in an oriented closely packed stream while said workpiece feeding means passes idly over the oriented closely packed stream of workpieces at said discharge throat.

5. In a device for controlling the feed of workpieces to an automatic forming machine adapted to receive single workpieces at periodic intervals, elongated track means adapted to carry workpieces being fed, said track means having a pair of spaced upstanding walls along the length thereof for simultaneously engaging opposite faces of a workpiece passing therebetween, lower block means fixed to the underside of said track means and extending along the major portion of the length thereof, upper block means disposed above said track means and extending along the major portion of the length thereof, said block means presenting rigid confronting faces constituting a work feeding channel, link means pivoted to both of said block means near their respective ends to form a parallelogram figure therewith, said links and upper block means being movable relative to said lower block means to allow said parallelogram figure to be changed to cause said upper block means to be moved toward said lower block means, said work feeding channel having an inlet adapted to receive workpieces in spaced random order and a discharge throat for delivering workpieces to the forming machine, flexible workpiece feeding means carried in contact with said confronting surface of each of said block means and presenting spaced smooth confronting faces throughout said work feeding channel adapted to engage workpieces therein and feed the same therethrough solely by frictional engagement with such workpieces, yielding biasing means engaging said upper block means for urging said upper block means toward said lower block means to press said workpiece feeding means into contact with opposite faces of workpieces in said work feeding channel, and drive means adapted to drive said workpiece feeding means at a speed adapted to furnish workpieces at said discharge throat at a rate in excess of that required by said forming machine, whereby workpieces received at said inlet in random spaced relation are delivered under pressure at said discharge throat in an oriented closely packed stream while said workpiece feeding means passes idly over the oriented closely packed stream of workpieces at said discharge throat.

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