July 29, 1958 L. S. HEYM 2,845,171

DRAW BENCH

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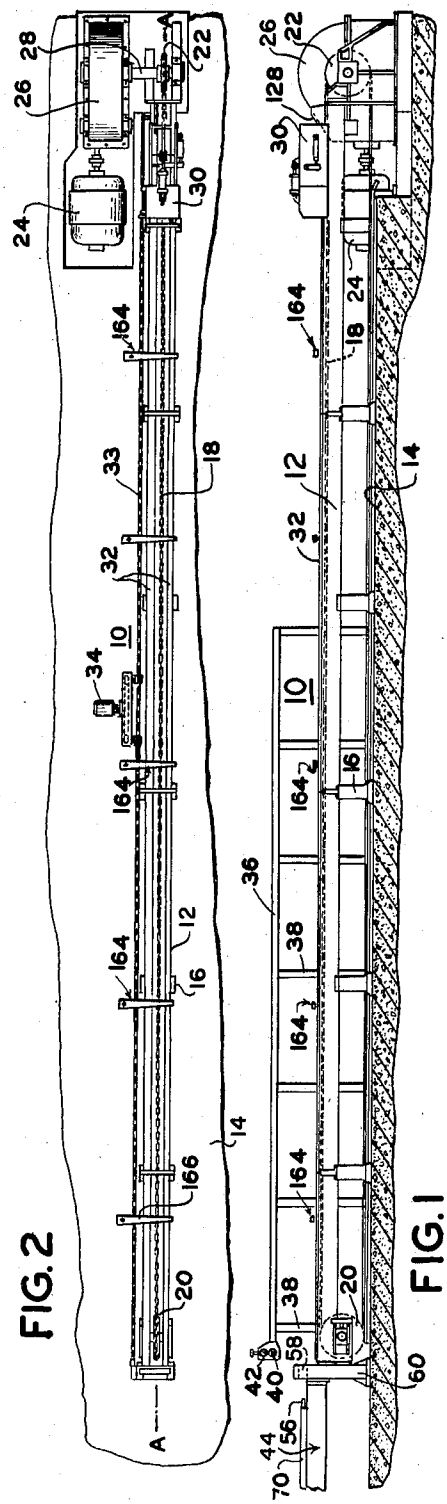


FIG. 2

FIG. 1

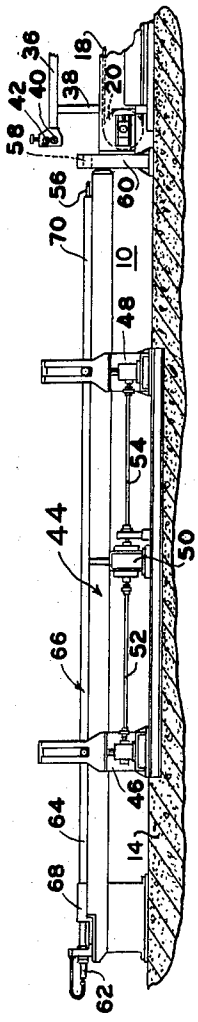


FIG. 3

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DRAW BENCH

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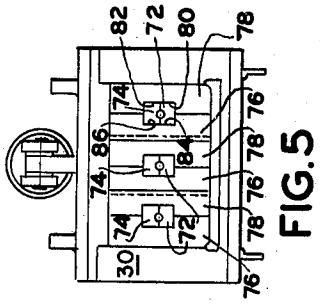


FIG. 5

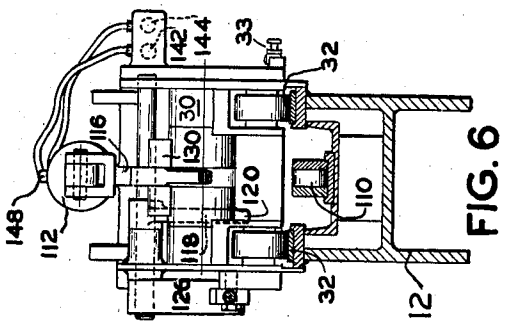


FIG. 6

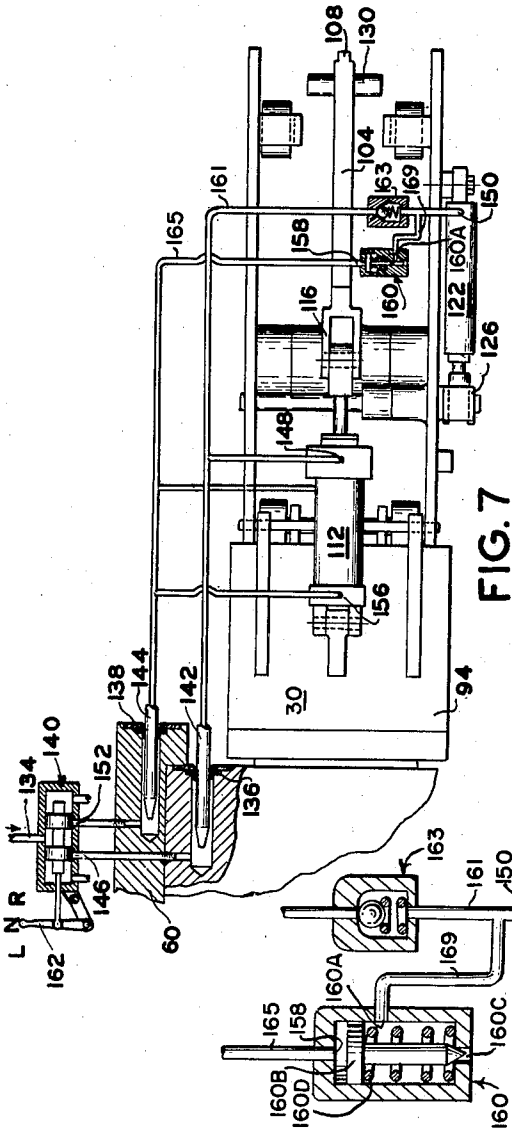


FIG. 7

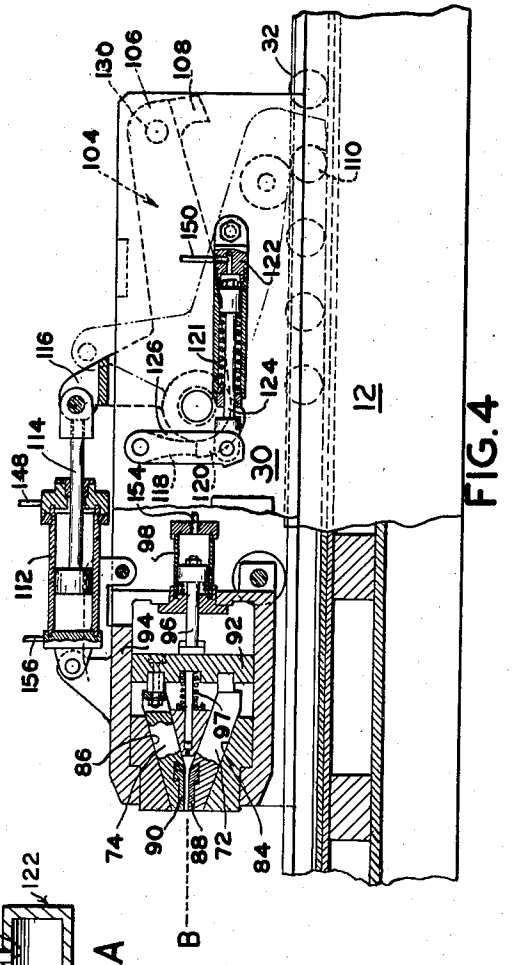


FIG. 4

FIG. 7A

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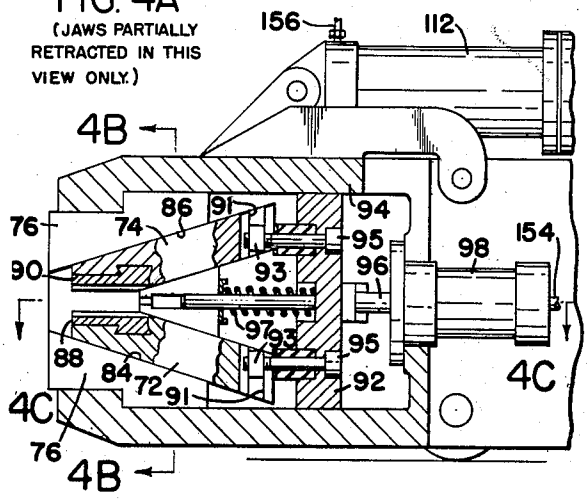
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DRAW BENCH

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FIG. 4A
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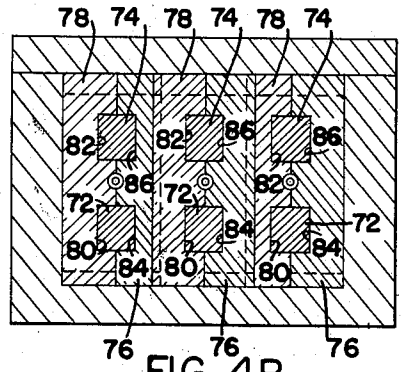


FIG. 4B

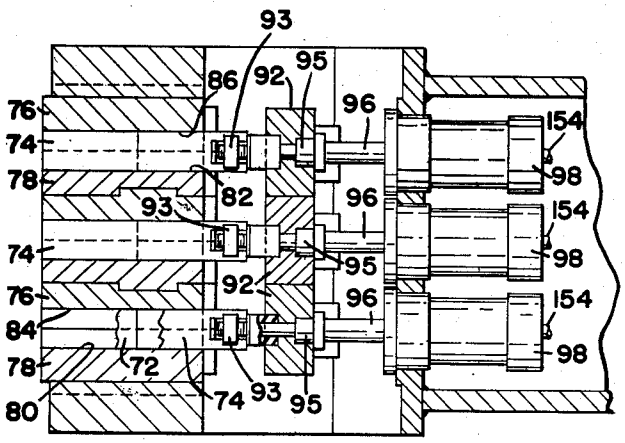


FIG. 4C

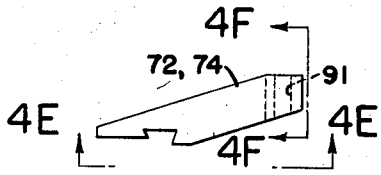


FIG. 4D

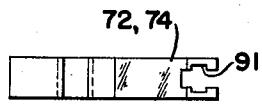


FIG. 4E

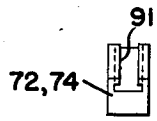


FIG. 4F

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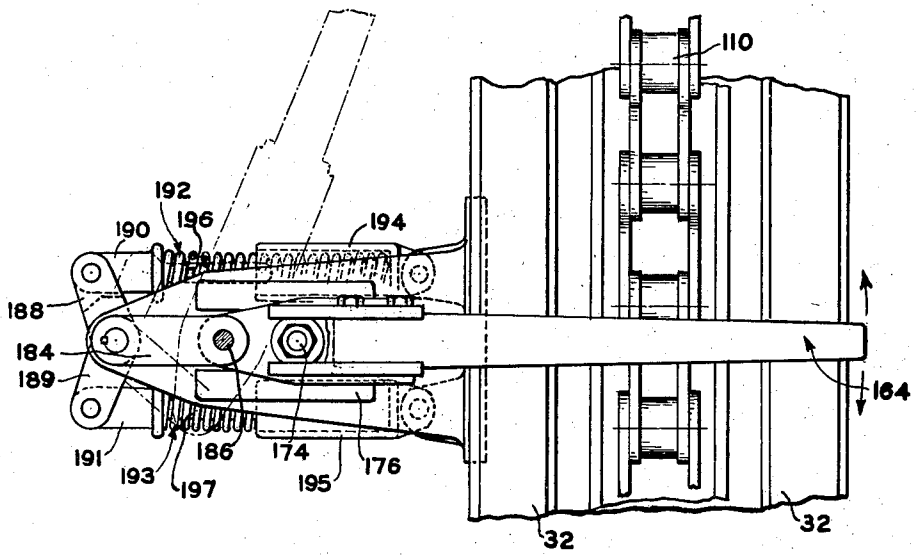


FIG. 10

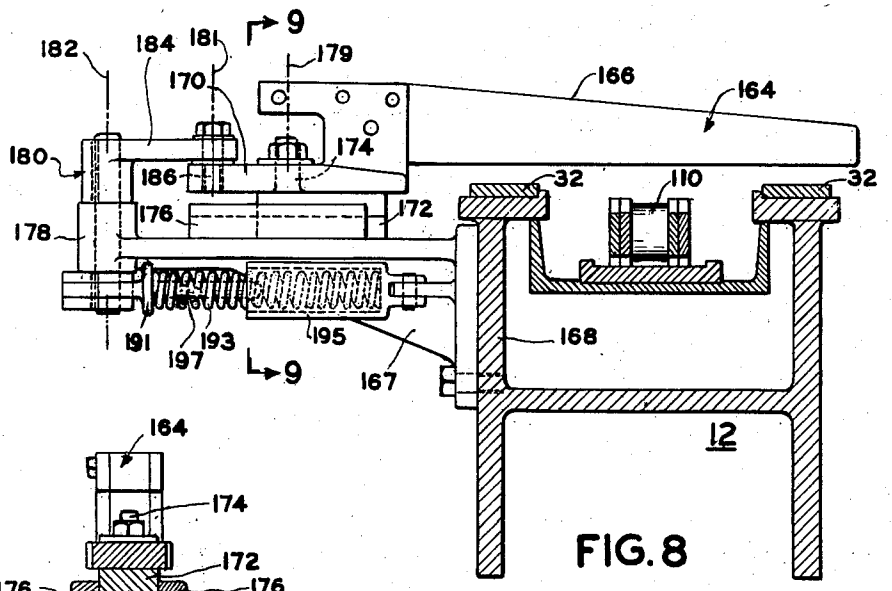


FIG. 8

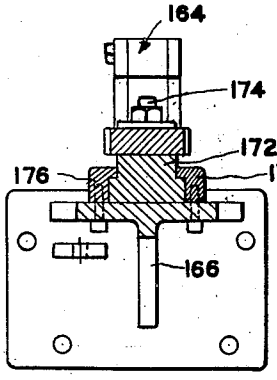


FIG. 9

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United States Patent Office 2,845,171 Patented July 29, 1958

2,845,171

DRAW BENCH

Lothar S. Heym, Youngstown, Ohio

Application January 26, 1956, Serial No. 561,559

6 Claims. (Cl. 205—3)

This invention relates, in general, to draw benches of the type employed in the manufacture of tubes, bars, and the like. More particularly, the invention relates to improvements in a draw bench carriage and the stock gripping means mounted on said carriage to draw the work stock through appropriate dies in accomplishing desired degrees of cross-sectional reduction of stock. The invention also relates to novel means of co-action between a draw bench carriage and a die stand mounted at one end of a draw bench, whereby the drawing operation may be rendered semi-automatic, or fully automatic.

While the invention described hereinafter is with reference to a draw bench particularly adapted to the drawing of tubes, it will be understood that it also is adapted to the manufacture of other articles suitable for processing on a draw bench, and such articles are intended to be included when reference is made hereinafter to "tubes."

Draw benches now in common use ordinarily comprise narrow elongated beds upon which are mounted longitudinally traversible carriages provided with jaws with which to grip tubes, bar stock, and the like, and to draw them through forming dies that are secured in die stands positioned at the ends of the beds. In the case of tube stock, the tube is first supported on a mandrel rod which is provided with a mandrel at one end over which the tube is drawn before entering one of the aforesaid dies. To increase production, draw benches have been built with a plurality of mandrel rods and cooperating dies having parallel axes lying in a common horizontal plane, so that a plurality of tubes may be gripped at one time and may be drawn simultaneously through respective dies. Greater or lesser numbers of tubes may be simultaneously drawn, and, for the purpose of this discussion, it will be understood that any description relative to one tube and its drawing means is equally applicable to the other tubes similarly and simultaneously drawn on the draw bench.

The draw bench bed is substantially an endless conveyor which supports the aforesaid carriage thereon to be traversed in suitable carriage ways on the top surface of the bed. The draw bench provides the power for pulling or drawing the carriage longitudnially along the length of the draw bench while, at the same time, jaws mounted on the carriage grip one end of a piece of work stock to draw the stock through the said die in a die stand anchored at one end of the draw bench. The means for powering the endless conveyor is usually located at one of the ends of the draw bench, and means are provided with the draw bench carriage for engaging a link of an endless conveyor chain when the carriage is adjacent the die stand. Means are also provided for disengaging the carriage from the conveyor chain at the opposite end of the draw bench, and ancillary means are provided to return the carriage to its initial position adjacent the die stand prior to a further drawing operation.

It is a general object of the invention to provide a

novel draw bench of the conveyor chain powered type, which includes an improved die stand, mandrel trough lift, and carriage means. The improved features of these draw bench mechanisms renders the draw bench smoother operating and more efficient, and makes possible novel semi-automatic or automatic operation.

Other provisions of the draw bench include a novel draw bench carriage having improved gripper jaw means; a novel draw bench carriage having improved means for connecting the carriage with the draw bench endless conveyor chain, and for disengaging the carriage from this chain; the improved draw bench carriage which is adapted to operate automatically upon being traversed into engagement with a die stand for contact therewith by novel carriage actuating means; and the provision of a novel mandrel trough lift mechanism provided for use in co-operation with the said novel draw bench means for feeding tubular stock into the improved die stand.

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention itself, both as to its organization and use, together with the foregoing and further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is an elevational view of a preferred embodiment of the draw bench.

Figure 2 is a plan view of the draw bench shown in Figure 1.

Figure 3 is an elevational view of the mandrel trough lift used in conjunction with the draw bench of Figure 1.

Figure 4 is an elevational view of a preferred embodiment of the draw bench carriage used in conjunction with the draw bench of Figure 1.

Figure 4A is a sectional elevational view of the gripper jaw portions of the draw bench carriage, showing in detail the means for slidingly moving the gripper jaws toward and away from a workpiece.

Figure 4B is a sectional view substantially taken along the line 4B—4B of Figure 4A showing the channel means employed to provide sliding ways for the gripper jaws shown in Figure 4A.

Figure 4C is a sectional view substantially taken along the line 4C—4C of Figure 4A to further illustrate the co-action of crosshead **92** with gripper jaws **72** and **74**.

Figure 4D is a detailed elevational view of the interchangeable gripper jaws **72** and **74**.

Figure 4E is a view of the gripper jaw shown in Figure 4D taken along the line 4E—4E of Figure 4D.

Figure 4F is an elevational view of the gripper jaw shown in Figure 4D taken along the line 4F—4F.

Figure 5 is a left end view of the draw bench carriage shown in Figure 4.

Figure 6 is a right end view of the draw bench shown in Figure 4.

Figure 7 is a schematic plan view of the pneumatic system employed in conjunction with the operation of the draw bench carriage of Figure 4.

Figure 7A is an enlarged fragmentary sectional view of the pressure relief and check valve means shown in Figure 7.

Figure 8 is an elevational view of a preferred embodiment of a skid arm employed with the draw bench shown in Figures 1 and 2.

Figure 9 is a section taken on the line **9—9** of Figure 8, and

Figure 10 is a top plan view of the skid arm shown in Figure 8.

Referring now to the drawings in greater detail and, in particular, to Figure 1, the draw bench **10** comprises a bed **12** made up of structural members and supported above a shop floor **14** by a series of piers **16**. An endless-

type chain conveyor 18 is mounted on sprockets 20 and 22 rotatably journaled beneath the top surface of the draw bench bed 12 and in line with the longitudinal axis A—A thereof (see Figure 2). The means for powering the endless chain drive comprises a motor 24, and a reduction gear box 26 which is drivingly connected to the drive sprocket 22, mounted on drive shaft 28. The draw bench carriage 30 is provided to slide on ways 32 from left to right employing the endless chain conveyor 18 as a prime mover, whereinafter the carriage is returned to its initial starting position on the left end of the draw bench by secondary conveyor means including an endless chain as drive 33, powered by a motor 34.

A tube loading rack 36 supported on legs 38 is parallel and to one side of the left end of the draw bench 10 to carry a supply of tube stock. A pair of power driven pneumatic tire pinch rolls 40 and 42 (Figure 3) are secured to the left end of the tube loading rack 36, and a mandrel trough mechanism 44 is provided with a lift which in its elevated position is aligned with the pneumatic tube pinch rolls. The lift for raising and lowering the trough 44 comprises a pair of screw jacks 46 and 48 which are power driven by motor 50 and drive shafts 52 and 54. Tube stock is fed from the tube loading rack 36 through the pinch rolls 40 and 42 onto mandrel bars or rods 56 carried on the mandrel trough lift 44. The mandrel trough lift is then lowered by the screw jacks 46 and 48 to the level of the dies 58 in the die stand 60. A pneumatic cylinder 62 is mounted on the end of the trough lift mechanism 44 and adapted to engage the left ends 64 of the mandrel mounted tubes 66. Adapters 68 are secured to cylinder 62 to urge the tubes 66 to the right into engagement with the dies 58, whereby the right ends 70 of the tubes 66 will project a suitable distance to the right side of a die stand 60 for engagement with the draw bench carriage workstock gripping means, to be described more fully hereinbelow.

The draw bench carriage 30 comprises a plurality of sets of tube gripper jaws 72 and 74, and, as shown in Figure 5, three sets aligned side by side to engage and draw three pieces of tube stock through the die stand simultaneously. Each set of gripper jaws 72 and 74 are housed to slide in a matching set of gripper jaw blocks 78 and 76 having matched inclined ways 80 and 82, and 84 and 86, respectively, (see also Figure 4) machined therein so that one-half of each jaw member will be contained in each jaw block. The ways are inclined to intersect at the pass line B of the stock being drawn, so that movement of the gripper jaws 72 and 74 to the left will cause the gripper bits 88 and 90 to converge and seize the right end of a piece of tube stock. Conversely, if the gripper jaws 72 and 74 are moved to the right, they diverge whereby the gripper bits part and release the tube stock held therebetween. The nature of the gripper jaws is such that they will automatically grip and increase their tension on a workpiece secured between the gripper bits as the carriage is traversed to the right if resistance against movement is provided by the stock being drawn through the dies 58.

Movement of the gripper jaws is provided by a cross head 92 slidably mounted in the carriage frame jaw housing 94 and secured to the piston rod 96 of a single action spring return pneumatic cylinder 98, also mounted on the jaw housing 94. As the crosshead 92 is drawn by the cylinder 98 to the right (as seen in Figure 4) gripper jaw 74 will slide upwardly in its ways 82 and 86, and gripper jaw 72 will slide downwardly diverging from gripper jaw 74 in ways 80 and 84 to separate the gripper bits 88 and 90 and release the work stock held therebetween. Conversely, as the air cylinder 98 is energized with air pressure, the crosshead 92 will be urged to the left thereby causing the gripper bits 88 and 90 to converge and seize work stock which has been placed therebetween. The means for connecting the gripper jaws 72 and 74 to the crosshead 92 for sliding movement does not per se constitute a portion of the invention. There are many known means for providing this kinematic connection, such as T-head bolts secured to the crosshead 92 and adapted for sliding engagement in vertically aligned T-shaped slots in the ends of the gripper jaws remote from the gripper bits. Other connecting means familiar to those skilled in the art include ball and socket connections, pivotal link and pin connections, toggle link connecting means and the like.

By way of further illustration, reference is made to Figures 4A and 4C. The gripper jaws 72 and 74 are provided with vertically disposed cruciform-shaped slots 91 (see also Figures 4D, 4E and 4F) adapted to slidingly receive therein nuts 93 secured to the ends of connecting rods 95, horizontally projecting from crosshead 92. Thus, it will be seen that as crosshead 92 is drawn to the right, as shown in Figure 4A, the slotted end portions of gripper jaws 72 and 74 are free to slide relative to nuts 93 whereby the gripper jaws diverge from the horizontal axis in the plane of secton line 4C—4C. Conversely, as crosshead 92 is urged to the left, as shown in Figure 4A, the nuts 93 transmit a thrust to the gripper jaws 72 and 74 and, because of the vertical slot portions 91, the gripper jaws are enabled to converge toward the horizontal axis in the plane of section line 4C—4C to preliminarily grip a workpiece prior to a drawing cycle.

Figure 4B is a sectional view taken along the line 4B—4B of Figure 4A to supplement the disclosure of Figure 5. Figure 4B illustrates the inclined ways comprising channel portions 80, 82, 84 and 86.

A carriage traversing hook 104 is pivotally secured near the center of the carriage opposite from the gripper jaws 72 and 74, and is provided at its free end 106 with a conveyor chain engaging tooth 108. The tooth 108 engages with a chain link 110 when pivoted downwardly below the surface of the carriage ways 32 thereby causing the carriage 30 to traverse from left to right on the draw bench bed 12. A double acting pneumatic cylinder 112 is secured to the top portion of the jaw housing 94 and the piston rod 114 is connected to a hook lever arm 116 adapted to assist in raising and lowering the hook 104. With the hook in the raised position, a latch 118 is adapted to be pivoted into abutting contact with a flange or boss 120 integral with the left or back side of the hook, thereby functioning as a detent to prevent the hook from pivoting downwardly into engagement with the conveyor chain 110. A single acting spring return pneumatic cylinder 122 is mounted on the carriage 30, and its piston rod 124 is pivotally connected to a lever 126 integral with the latch 118. The lever 126 is adapted to pivot the latch out of abutting engagement with the boss 120 thereby permitting the hook to pivot downwardly.

As the carriage 30 approaches the right end of the draw bench (as seen in Figure 1), an inclined plane-type cam 128, secured to the draw bench bed 12, is positioned to intercept a cross pin 130 in the hook adjacent the tooth 108. The inclined plane 128 contacts the underside of the cross pin 130 as the carriage is drawn to the right, and lifts it free from engagement with the conveyor chain link 110. Thereafter, the carriage chain drive 33 mounted on the back side of the draw bench and powered by a carriage return motor 34, makes engagement with the carriage by suitable means. The carriage chain drive 33 rotates in the opposite direction from the main chain drive 18 for the purpose of returning the carriage to its initial position adjacent the die stand 60.

The die stand 60 (see Figure 7) is provided with a source of pneumatic pressure 134, a pair of automatically sealing pneumatic pressure outlets 136 and 138, and suitable valve means 140 to direct the pneumatic pressure selectively to outlet 136 or 138, or neither. A pair of bayonets 142 and 144 are mounted on the side of the carriage and aligned with pneumatic pressure outlets 136

and 138, respectively, and are adapted to be forced into their respective outlets when the carriage comes to a stop adjacent the die stand 60. Engagement of the bayonets 142 and 144 in the outlets 136 and 138 transmits air pressure to cylinders 98, 112, and 122 in a predetermined sequential order. Actuation of these cylinders automatically grips stock between the gripper bits 88 and 90 of the gripper jaws 72 and 74 and controls the lowering of the hook 104 into engagement with the conveyor drive chain 18, as wil now be described in greater detail.

The valve means 140 which directs pneumatic pressure to either port 146 or port 152 may be operated manually if desired. With manual operation, a valve lever 162 is provided for three positions, left or L, neutral or N, and right or R. Position L opens port 146 to admit pneumatic pressure into outlet 136. Position R closes port 146 and opens port 152 to direct air pressure into outlet 138, and position N is a neutral position wherein both ports 146 and 152 are closed. For fully automatic operation, the valve means 140 can be solenoid operated, wherein the lever will be replaced by suitable solenoids and limit switch means positioned and adapted to accomplish the same operation, but fully automatically. For instance, suitable solenoid means may be positioned on and secured to the carriage 30 to be made operable by the movement of hook 104 to shift valve means 140 and re-direct fluid pressure from port 146 to port 152.

When the bayonets 142 and 144 engage the pressure outlets 136 and 138 of the die stand 60, and with the lever 162 at the L (left) position, pressure will discharge through valve 146 of the valve control means 140 which is connected to outlet 136. Air pressure is thus transmitted to the outlet 136, into the bayonet tube 142, and then to ports 148 and 150 of cylinders 112 and 122, respectively. Cylinder 112 will raise the hook 104 slightly while cylinder 122 unlatches the hook 104 by pivoting the lever 126 to the left (see Figure 4). Lever 162 is then shifted to the R (right) position. Port 146 of valve means 140 is then closed and port 152 is opened to admit air pressure through the outlet 138, and the bayonet tube 144 to ports 154 and 156 of cylinders 98 and 112, respectively, and to port 158 of a pilot-operated pressure relief valve mechanism 160 which functions to maintain the pressure in cylinder 122 of sufficient duration to positively hold latch 118 out of engagement with hook 104 until the hook is lowered into engagement with chain link 110. The arrangement of the relief valve 160 and check valve 163 does not per se comprise a part of this invention, any valve means being acceptable which will permit pneumatic pressure to slowly bleed from cylinder 122 into the atmosphere as required. During the traverse of the carriage 30, spring 121 of cylinder 122 will exhaust the air from the cylinder, whereby latch 118 is ready to re-engage boss 120 after hook 104 is raised by cam 128 shown in Figure 1. The actuation of cylinder 112 through port 156 will move the hok downwardly in a controlled manner for positive engagement with the drive chain link 110. Otherwise, the hook 104 would be free to drop and, should it strike the top surface of a chain link 110, it would be inclined to bounce and then drop again, which is destructive of both the chain link 110 and the hook 104 as well as its pivotal mountings.

Actuation of cylinder 98 through port 154 (see Figure 4) will advance the crosshead 92 to the left and force the gripper bits 88 and 90 toward each other to grip the stock to be drawn through the dies 58 of the die stand 60. When the hook 104 has been engaged with the chain link 110, the drawing of the tubing through the dies 58 is started, and the valve means 140 is then closed, cutting off pressure from both pressure outlets 146 and 152. As a tube is pulled with the carriage 30 and gripper jaws 72 and 74 through the dies 58, the tension developed in the tube due to die resistance will force the gripper jaws toward the center of the draw axis due to the angular inclination of the gripper jaws in the jaw ways formed by machined partial ways 80, 82, 84 and 86 (see Figures 4A and 4B). A vertical pressure component is thereby developed which is of much greater magnitude than that of the horizontal draw component. Thus the jaws 72 and 74 will remain in gripping contact with the tube as long as there is resistance maintained by way of tension in the tube being drawn. Only after the tube is disengaged from the die 58 at the end of the traverse of the carriage is the tension in the tube relieved and the jaws 72 and 74 operable by spring 97. The crosshead 92 will be moved to the right by the spring 97, thereby opening the gripper bits 88 and 90 and releasing the tubing therefrom.

The co-action between pressure relief valve 160 and check valve 163 will now be explained in greater detail, by way of summation of the operation of the fluid pressure system of the carriage 30. With lever 162 at the L position, pressure is transmitted through line 161, through one-way operating spring seated ball check valve 163 into cylinder 122 to actuate lever 126 as aforesaid hereinabove. A by-pass line 169 (see Figure 7A) connects port 150 of cylinder 122 to port 160A of pressure relief valve 160. Pressure relief valve 160 includes a needle valve 160B spring urged away from its seat when no pressure is in line 165. Thus, when pressure is maintained in line 161, to actuate cylinder 122 a slight amount of bleeding takes place from cylinder 122 through by-pass line 169 into pressure relief valve 160 and out through port 160C into the atmosphere. This amount of bleeding however is inconsequential compared to the pressure maintained in cylinder 122 from line 161. Thereafter, when lever 162 is shifted from the L position to the R position, the pressure in cylinder 122 is trapped by one-way operating ball check valve 163. Furthermore, with pressure now in line 165 leading into port 158 of pressure relief valve 160, needle valve 160B is forced by the pressure in line 165 onto its seat thereby overcoming the tendency of the spring means 160D to unseat the valve. With needle valve 160B seated all avenues of escape of air from cylinder 122 are blocked thereby holding latch 118 out of engagement with hook 104 while the gripper jaws are being closed upon a workpiece and hook 104 is being lowered into engagement with chain link 110, all as explained heretofore. After engagement of the carriage 30 with the chain link 110, the carriage moves laterally away from the die stand 60 and the pressure in line 165 is cut off upon the separation of bayonet 144 from pressure outlet 138. Spring means 160D then act to unseat the needle valve 160B and the pressure in cylinder 122 is permitted to slowly bleed through port 150, bypass line 169, port 160A, and port 160C into the atmosphere. This permits latch 118 to return to its normal vertical position, whereupon re-engagement may be made with boss portion 120 of hook 104 upon completion of the traverse of the carriage 30.

As the carriage 30 traverses from left to right along the draw bench bed 12, a plurality of draw bench skid arms 164 are pivotally secured to one side of the draw bench 10 to extend transversely thereover and are adapted to be consecutively pivoted by the leading end of the carriage 30 clear of its path. As each skid arm 164 is cleared by the carriage 30, the skid arm swings back over the draw bench, but beneath the tubes, so that, as the carriage reaches the end of its traverse on the right side of the draw bench, a plurality of skid arms 164 are projecting over the draw bench 10 and under the tubing being drawn thereby. The means for mounting and operating the skid arms 164 on the draw bench bed 12 will now be set forth in detail.

The bracket 167 is bolted to the back side 168 of the draw bench bed 12 (see Figure 8). The base 170 of the skid arm 164 is pivotally fastened to a slide member 172 by a pin 174. The slide member 172 is guided by a pair

of ways **176** which are integrally secured to the top surface of bracket **167**. A boss **178** is cast integral with the bracket **167** to journal a double bell crank **180** for movement about a vertical axis **182**. The bell crank **180** is provided with an upper arm **184** pivotally secured to the base **170** of the skid arm **164** by means of a pin **186**. A pair of lower arms **188** and **189** (see Figure 10) of the bell crank **180** are pivotally connected to spring connecting members **190** and **191**. The inboard ends of springs **192** and **193** are carried in and secured to horizontally pivotal sleeves **194** and **195**. The springs **192** and **193** are secured at their opposite ends to spring connecting members **190** and **191** and are guided on shanks **196** and **197** which extend concentrically within the cores of their respective springs.

Accordingly, it will be seen that as the carriage **30** moves away from the die stand **60** it will consecutively contact each skid arm **164** causing the skid arm to pivot counter-clockwise, as seen in Figure 10, about pivotal pin **174**. This counterclockwise movement will cause the slide member **172** to move outwardly away from the back side **168** of the bed **12** thereby pivoting bell crank **180** whereby bell crank arm **188** urges the spring connecting member **190** into pressure contact with the spring **192**. As the carriage proceeds beyond the skid arm **164** the energy stored in the compressed spring **192** will restore the skid arm to its normal position of rest transversely to the longitudinal axis of the bed **12**. At the conclusion of the drawing operation the carriage **30** is returned to the die stand **60**, as aforesaid, and to do so consecutively counter-pivots the skid arms in a clockwise manner in order to pass thereby. When the skid arms **164** are counter-pivoted, springs **193** are placed in compression thereby storing sufficient energy to return the skid arms to their normal positions of rest after the contact of the carriage **30** releases the compression on the spring.

It is to be understood that the employment of springs **192** and **193** alternately in compression is but one of several mechanical expedients which may be employed to accomplish the same desired end result. Those skilled in the art will readily recognize that fluid power cylinders, counter-weighted devices and the like may be successfully used in place of the springs **192** and **193** shown in the drawings for illustrative purposes only.

At the end of the carriage traverse, remote from the die stand **60**, the tubing is released at its opposite ends from the dies and the gripper bits respectively. The tubing then drops down onto the skid arms **164**, and since the top surfaces **166** of the skid arms are inclined slightly, the tubing is directed to one side of the draw bench. Suitable means are provided for intercepting the tubing as it rolls off of the skid arms, and it may thereafter be transported to a storage area away from the draw bench.

From the foregoing, it will be seen that the invention provides a novel draw bench in combination with a novel draw bench carriage which is suitable for fully automatic operation in a novel and improved manner.

It is to be understood that the embodiments of the invention shown herein are by way of example only and are not intended to be construed in a limiting sense. It is believed that the foregoing discussion and illustrations enable those skilled in the art to practice the invention; and that other arrangements and modifications will occur to those guided by the teaching of this invention and may be resorted to without departing from the scope of the invention.

I claim:

1. In a draw bench including a die stand, a carriage adapted to be traversed toward and away from said die stand, means to traverse said carriage toward said die stand, and means to traverse said carriage away from said die stand, the improvement comprising: fluid power cylinder operable work engaging means on said carriage; a fluid power cylinder operable hook adapted to engage said means to traverse said carriage away from said die stand; fluid power cylinders connected to said work engaging means and to said hook; a source of fluid pressure connected to said die stand; a pair of bayonets secured to said carriage and adapted to engage said source of fluid pressure when said carriage is traversed to a position adjacent to said die stand; valve means adapted sequentially to direct said fluid pressure to said bayonets, one of said bayonets transmitting fluid pressure to said hook cylinder to elevate said hook, and the other of said bayonets transmitting pressure to said work engaging cylinder and to said hook cylinder to engage said work and to lower said hook respectively.

2. In a draw bench including a die stand, a carriage adapted to be traversed toward and away from said die stand, means to traverse said carriage toward said die stand, and means to traverse said carriage away from said die stand, the improvement comprising: fluid power cylinder operable work engaging means on said carriage; a fluid power cylinder operable hook adapted to engage said means to traverse said carriage away from said die stand; fluid power cylinders connected to said work engaging means and to said hook; a hook latch secured to said carriage adapted to hold said hook in an elevated position; a fluid power cylinder adapted to disengage said latch from said hook; a source of fluid pressure connected to said die stand; a pair of bayonets secured to said carriage and adapted to engage said source of fluid pressure when said carriage is traversed to a position adjacent to said die stand; valve means adapted sequentially to direct said fluid pressure to said bayonets, one of said bayonets transmitting fluid pressure to said hook cylinder and to said latch cylinder to elevate and unlatch said hook, and the other of said bayonets transmitting pressure to said work engaging cylinder and to said hook cylinder to engage said work and to lower said hook respectively.

3. In a draw bench having a carriage traversable thereon and a die stand adjacent one end, the improvement in workpiece drawing means comprising: workpiece gripper jaw means mounted on said carriage; a fluid cylinder to operate said jaw means; a hook pivotally secured to said carriage to engage carriage traversing means on said draw bench; a fluid cylinder vertically to pivot said hook; a hook latch pivotally secured to said carriage; a fluid cylinder to pivot said latch; fluid pressure means connected to said die stand; a pair of fluid coupling means mounted on said carriage to make fluid tight engagement with said die stand fluid pressure means; the first of said coupling means being connected to said hook and latch cylinders, the other of said coupling means being connected to said hook, latch and jaw cylinders respectively, and valve means selectively to direct fluid pressure into either of said coupling means, whereby fluid pressure in said first coupling means is directed to said hook and latch cylinders to elevate and unlatch said hook, and fluid pressure in said other coupling means is directed to said jaw cylinder to close said jaws in a gripping manner on a workpiece, to said latch cylinder to hold said latch in a disengaged position, and to said hook cylinder to lower said hook into engagement with said carriage traversing means.

4. The draw bench set forth in claim 3, wherein said coupling means are aligned on said carriage automatically to make sealing contact with said die stand fluid pressure means when said carriage is traversed to a position on said draw bench adjacent said die stand, said sealing contact being automatically broken when said carriage is traversed away from said die stand.

5. The draw bench set forth in claim 3, wherein said hook cylinder is two way fluid operable, said jaw and latch cylinders are one way spring-return operable, and said coupling means are connected to opposite sides of said hook cylinder.

6. The draw bench set forth in claim 3, wherein said hook includes a detent on the end adjacent its pivotal

connection, and said latch depends from its pivotal connection with the lower end thereof pivotable by said latch cylinder into locking engagement with said detent, whereby said hook is held suspended above said carriage traversing means.

References Cited in the file of this patent

UNITED STATES PATENTS

1,132,531	Webster	Mar. 16, 1915
1,541,424	Linderme	June 9, 1925
2,262,432	Rodder	Nov. 11, 1941
2,275,573	Sturm	Mar. 10, 1942
2,340,948	Evans	Feb. 8, 1944
2,367,941	Hackett	Jan. 23, 1945
2,446,438	Strock	Apr. 3, 1948
2,477,879	Kerr	Aug. 2, 1949
2,536,637	Garwig	Jan. 2, 1951
2,560,058	Wrightson	July 10, 1951
2,596,340	Mahns	May 13, 1952

FOREIGN PATENTS

451,481	Great Britain	Aug. 6, 1936
608,001	Great Britain	Sept. 8, 1948