United States Patent [19]

Varga

[11] **3,709,419**

[45] **Jan. 9, 1973**

[54] ADJUSTABLE FEED APPARATUS FOR STRIP MATERIAL

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[73] Assignee: **Weldon Tool and Engineering Co.,** Bridgman, Mich.

[22] Filed: **March 8, 1971**

[21] Appl. No.: **121,747**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 38,251, May 18, 1970, abandoned.

[52] **U.S. Cl.** **226/67,** 226/115, 226/141, 226/151, 226/162

[51] **Int. Cl.** **B65h 17/40**

[58] **Field of Search**.....226/67, 68, 108, 115, 134, 226/141, 146, 147, 151, 162, 167

[56] **References Cited**

UNITED STATES PATENTS

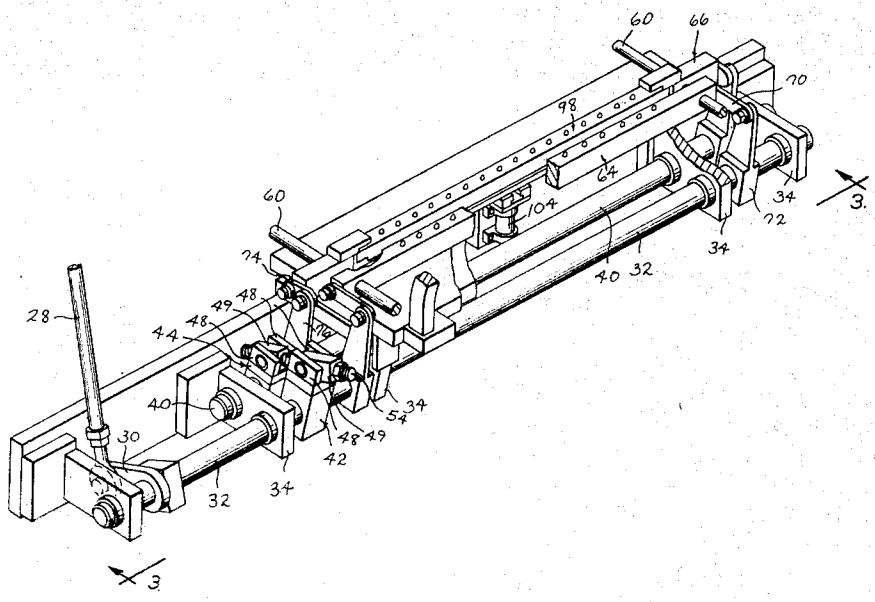
3,123,270	3/1964	Olson	226/162 X
3,477,627	11/1969	Webers	226/115 X

Primary Examiner—Richard A. Schacher
Attorney—Oltsch & Knoblock

[57] **ABSTRACT**

Apparatus for advancing material along a course including first and second reciprocable members which are each shiftable between first and second positions and which carry material engaging parts for advancing the material along the course as each member shifts from its first into its second position. The material engaging parts carried by the second member are shiftable relative to the second member into and out of a material engaging position. The members reciprocate simultaneously with the second member traveling further between its first and second positions than the first member travels between its first and second positions so as to cause the material engaging parts carried by the second member when positioned in their material engaging position to advance the material a greater distance along the course than the material engaging parts carried by the first member advance the material. A power unit is provided to shift the material engaging parts carried by the second member into and out of their material engaging position without interrupting the advance of the material.

17 Claims, 12 Drawing Figures



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SHEET 1 OF 6

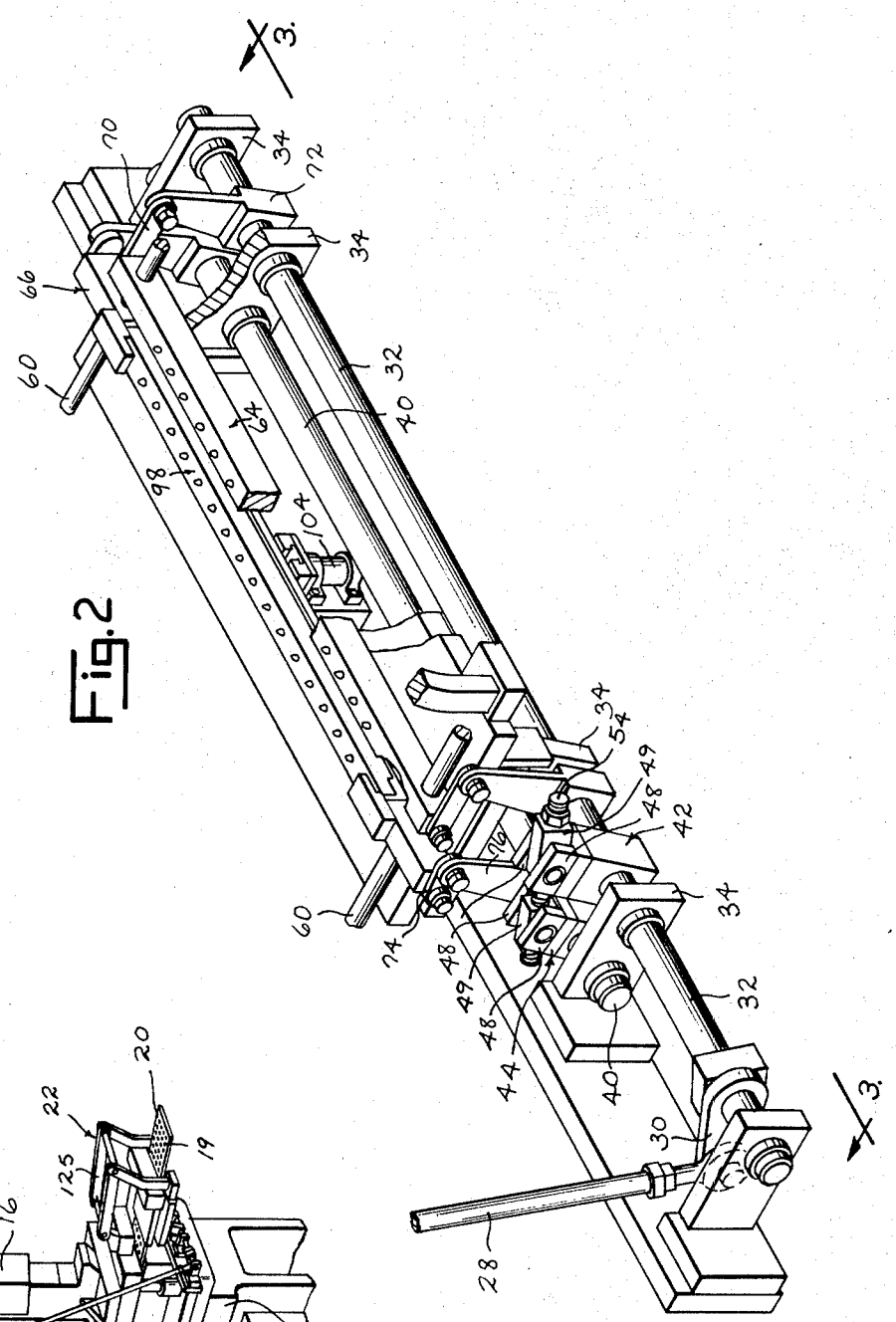


Fig. 2

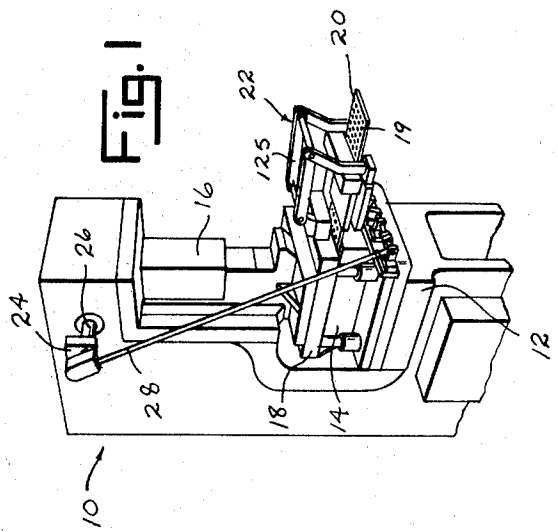


Fig. 1

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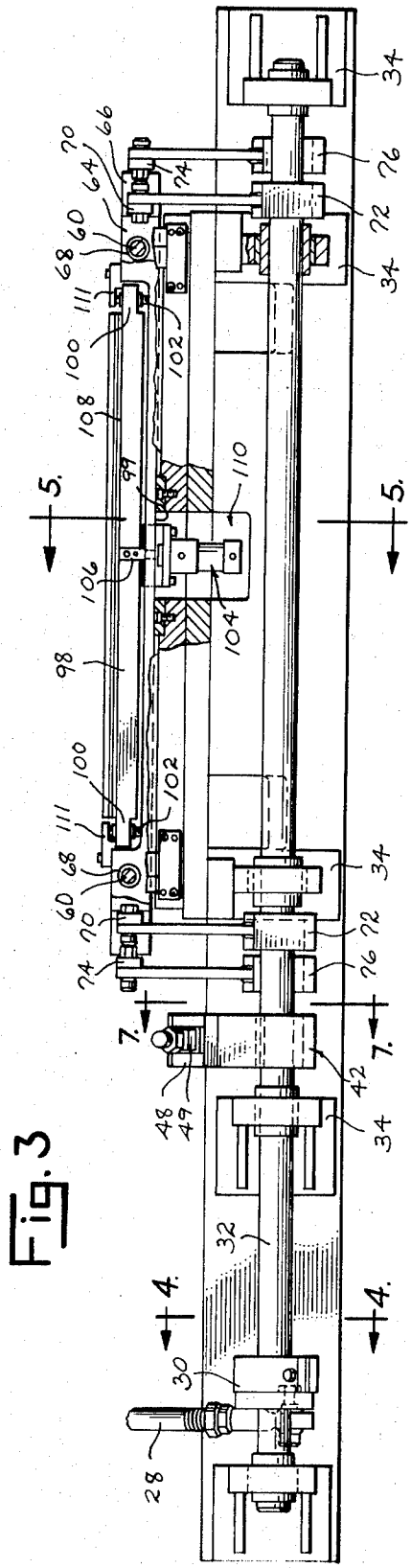


Fig. 3

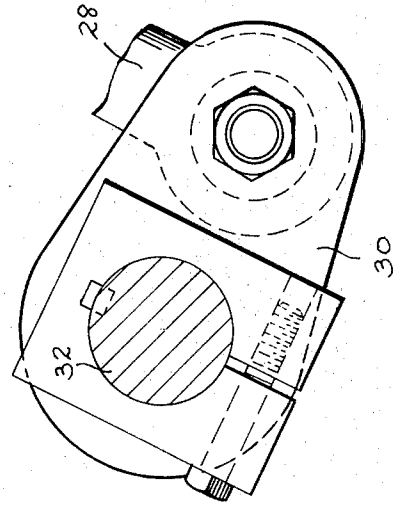


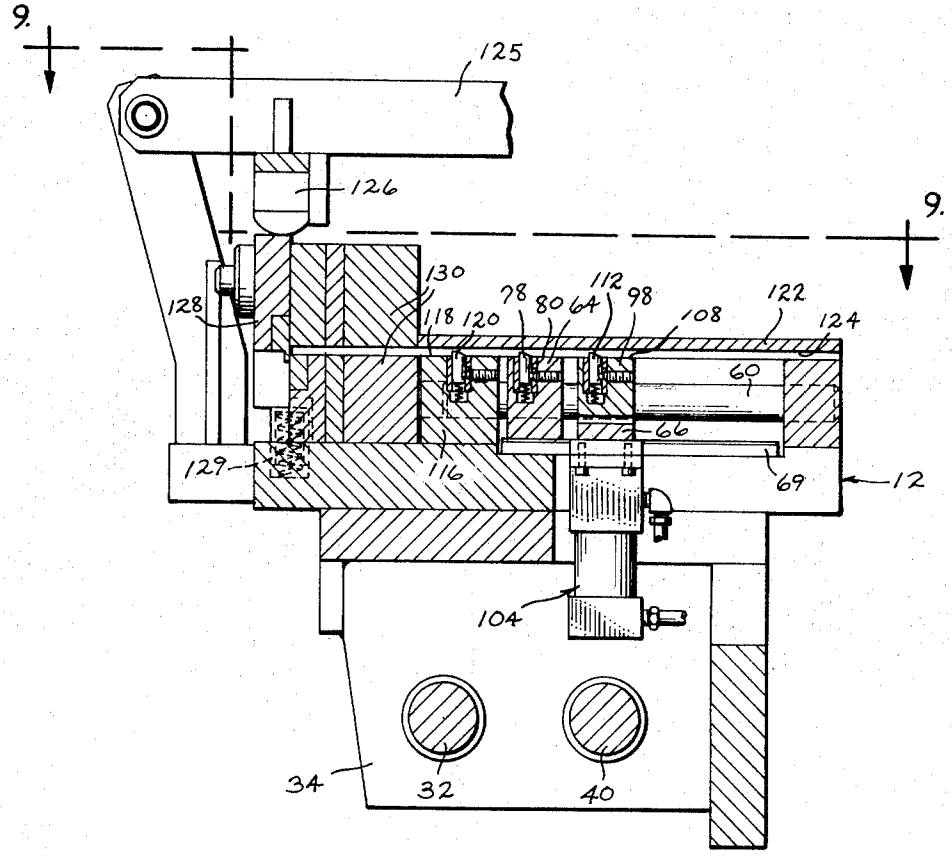
Fig. 4

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Fig. 5



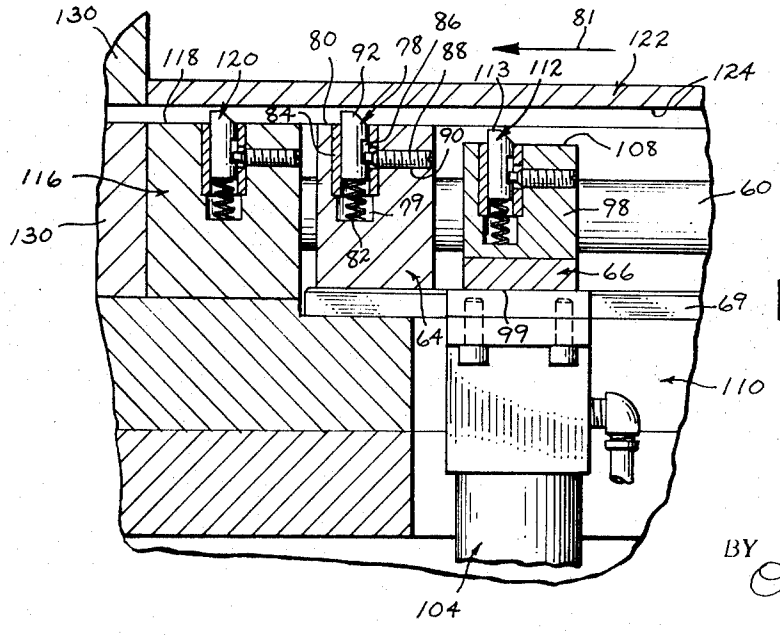


Fig. 6

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Fig. 8

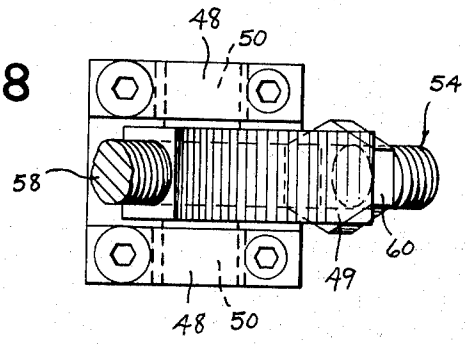
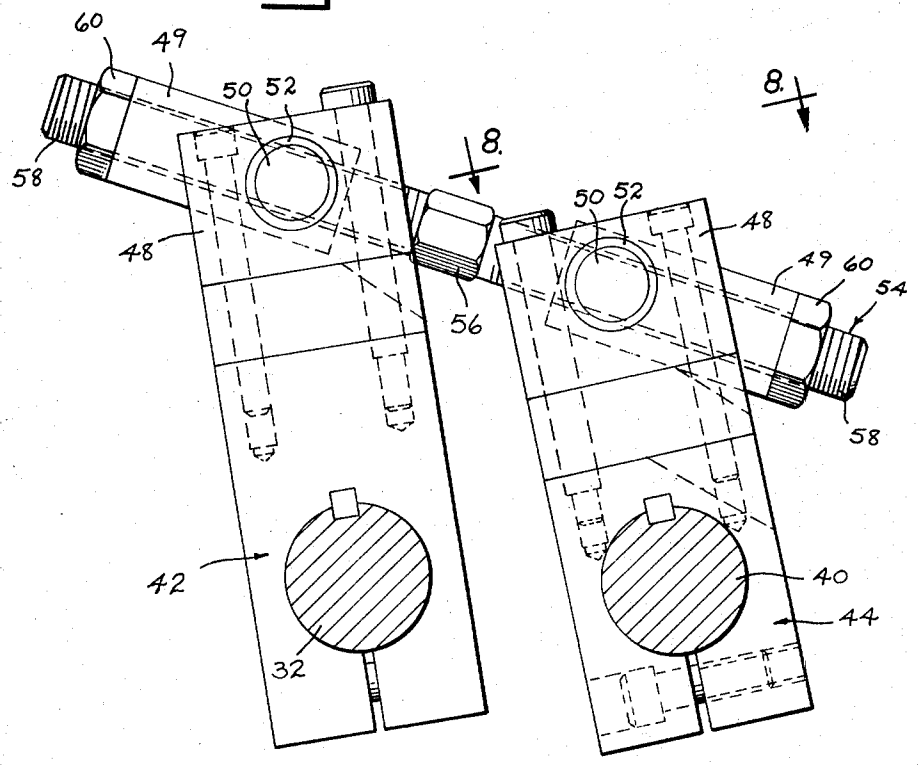
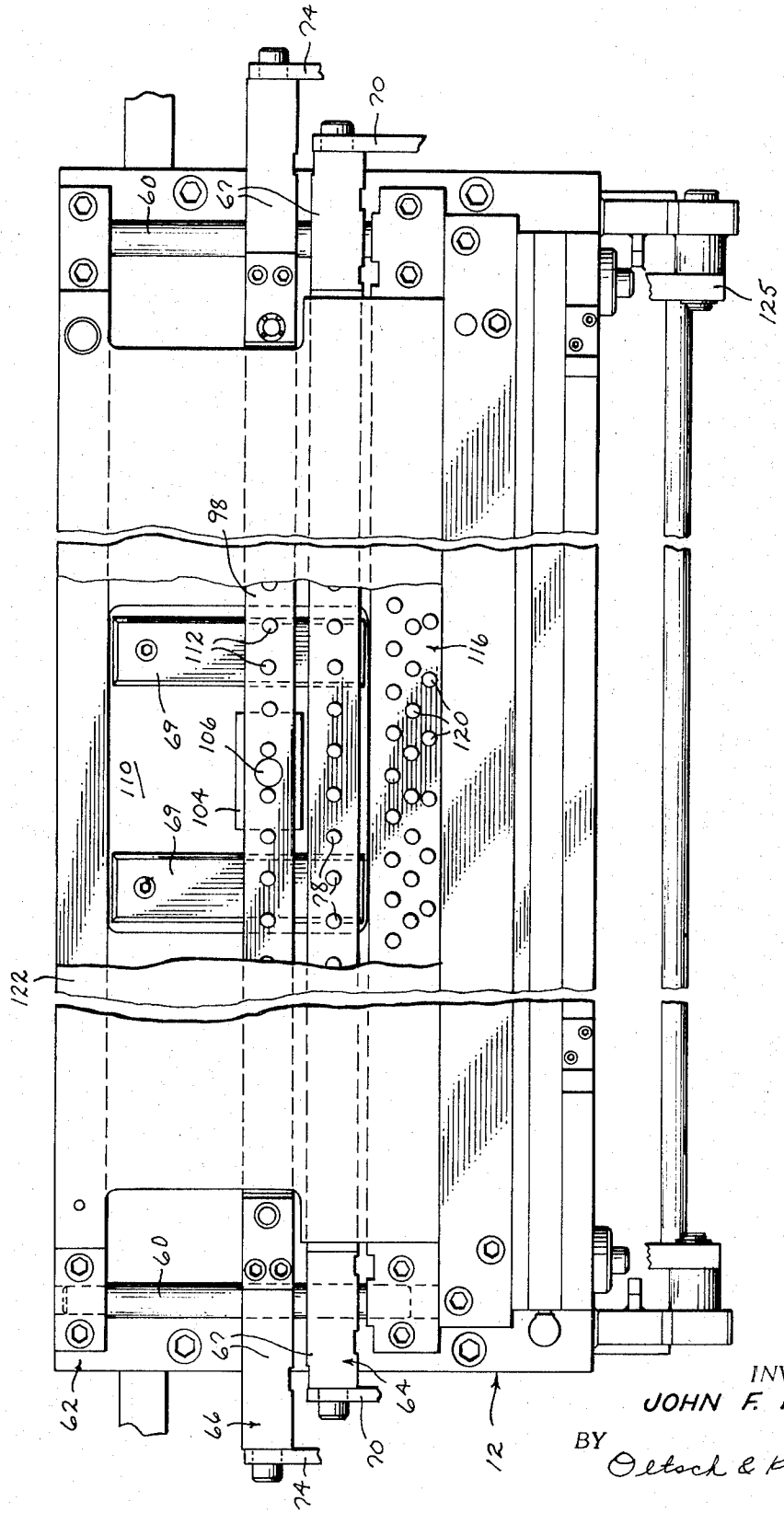


Fig. 7



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Fig. 9



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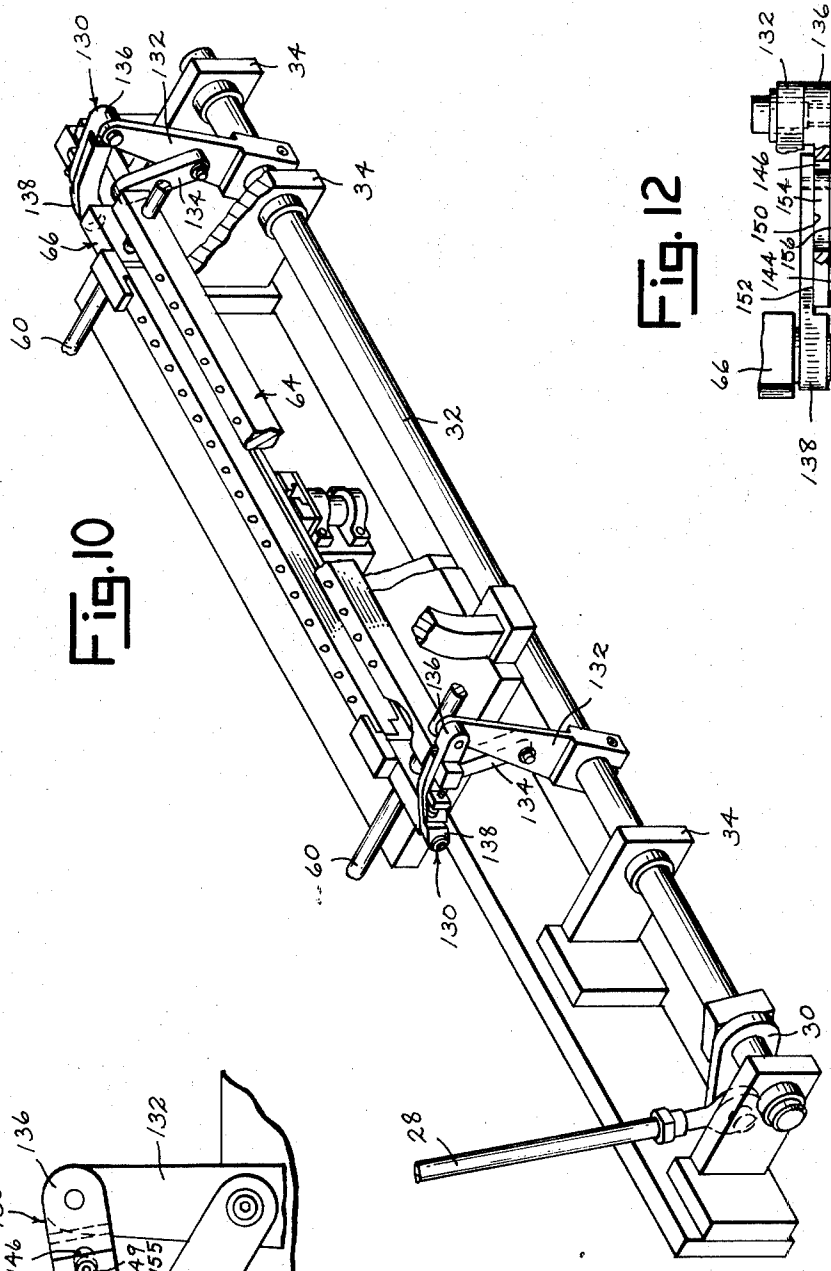


Fig. 10

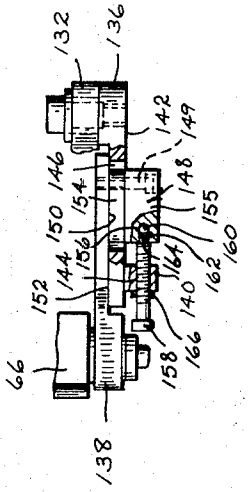


Fig. 12

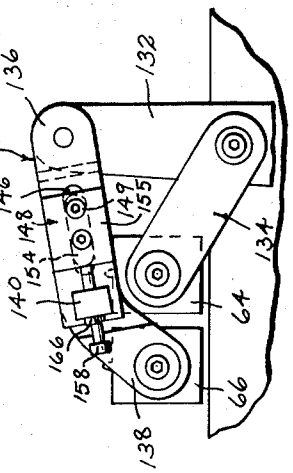


Fig. 11

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ADJUSTABLE FEED APPARATUS FOR STRIP MATERIAL

CROSS REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of application Ser. No. 38,251, filed May 18, 1970 and now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to a feeder for strip material and includes means for varying the rate of material advancement without interrupting the advancement of the material itself.

It has heretofore been the practice to vary the rate of advancement of strip material without interrupting the feed operation by adjusting the throw of the crank assembly utilized to actuate the material advancing means. Such a practice is described in U. S. Pat. Nos. 3,076,368 and 3,410,130. In U.S. Pat. No. 3,076,368 the throw of the crank assembly is varied by the turning of a hand wheel which carries a rotatable screw which is threaded into a slide member connected to the crank arm of the assembly. In U.S. Pat. No. 3,410,130 the throw of the crank assembly is varied by the actuation of a pressure fluid actuator having its piston connected to the crank arm. In utilizing the prior art means above described, the accuracy of the feed rate is dependent upon the accuracy of the crank arm setting. Thus, machine and human error in setting the crank arm will directly affect the accuracy of the feed rate. Additionally, continued use of the hand wheel and pressure fluid actuator in the above patents will subject such parts to wear and, therefore, contribute to the difficulty in making accurate adjustments in feed rate. In the subject invention, the change in feed rate of the material is not made by adjusting the throw of the feeder's crank arm assembly.

SUMMARY OF THE INVENTION

In this invention first and second reciprocable members are provided. Each member is shiftable between first and second positions and carries a material engaging part for advancing the material along the feed course as the member shifts from its first position into its second position. The material engaging part carried by the second member is shiftable relative to the second member into and out of a material engaging position. Drive means is provided to cause the first and second members to reciprocate simultaneously between their respective first and second positions with the second member, including the material engaging part carried thereby, traveling a greater distance between its first and second positions than the first member, including its material engaging part, travels between its first and second positions. Means is provided for shifting the material engaging part carried by the second member into and out of its material engaging position so that the material is advanced along the feed course at one rate by the first member when the material engaging part of the second member is shifted out of its material engaging position and at another rate by the second member when the material engaging part thereof is shifted into its material engaging position.

The drive means for causing the reciprocation of the first and second members, unlike in the above discussed prior art, is not adjusted during operation of the feed apparatus, and, therefore, the respective distance of travel of the members remains constant. Variation in feed rate is accomplished by moving the material engaging part of the second member into and out of engagement with the material. In this manner a precise and very accurate change in feed rate can be consistently made.

Accordingly, it is an object of this invention to provide feed apparatus for strip material in which the feed rate of the material can be adjusted with consistent accuracy in a rapid manner without interrupting the advancement of the material.

Another object of this invention is to provide means for accurately adjusting the feed rate of strip material without interrupting the advancement of the material in which a plurality of material engaging parts, each serving when material contact is made to advance the material at a different rate, are selectively utilized to contact and advance the material.

Still another object of this invention is to provide an adjustable feed apparatus for strip material in which wear of the parts thereof for effecting a change in feed rate is minimal.

Other objects of this invention will become apparent upon a reading of the invention's description.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a punch press having the feed apparatus of this invention attached thereto.

FIG. 2 is an enlarged fragmentary perspective view of the feed apparatus which is attached to the punch press of FIG. 1.

FIG. 3 is a front elevation of the feed apparatus with portions broken away for purposes of illustration as viewed from line 3—3 of FIG. 2.

FIG. 4 is a fragmentary sectional view taken along line 4—4 of FIG. 3.

FIG. 5 is a fragmentary sectional view taken along line 5—5 of FIG. 3 showing the feed apparatus in one operative position.

FIG. 6 is an enlarged detail view of a portion of FIG. 5 showing the feed apparatus in another operative position.

FIG. 7 is an enlarged fragmentary sectional view taken along line 7—7 of FIG. 3.

FIG. 8 is a fragmentary sectional view taken along line 8—8 of FIG. 7.

FIG. 9 is a fragmentary top plan view of the feed apparatus which is attached to the press of FIG. 1 with portions thereof broken away for purposes of illustration.

FIG. 10 is a fragmentary perspective view of the feed apparatus of this invention shown in modified form.

FIG. 11 is an enlarged fragmentary view in elevational form of the feed adjustment means for the feed cross members of the apparatus shown in FIG. 10.

FIG. 12 is a top elevational view of the feed adjustment means shown in FIG. 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The preferred embodiments illustrated are not intended to be exhaustive or to limit the invention to the precise forms disclosed. They are chosen and described in order to best explain the principles of the invention

and its application and practical use to thereby enable others skilled in the art to best utilize the invention.

Referring to FIG. 1, the feed apparatus of this invention is illustrated as forming a part of a press **10** having a bed **12** supporting a lower die **14** and a vertical reciprocable column **16** carrying an upper die **18**. Dies **14** and **18** include punches and have corresponding punch-receiving openings therein, which, upon reciprocating movement of column **16** of the press, causes holes **19** to be formed in a strip of material **20** which is fed by the apparatus of this invention between dies **14** and **18**. A shear **22** is mounted to bed **12** and, when actuated, serves to cut the punched material **20** into selected lengths. The press **10** thus far described is considered to be of conventional design.

A crank **24** may be connected to one end of the main shaft **26** of the press or to a separate power source, such as a drive motor, which is correlated in operation to the reciprocating motion of press column **16**. A connecting rod **28** has one end pivotally connected to crank **24** and its opposite end pivotally connected to a link **30**, as best shown in FIGS. **2** and **4**. Connecting link **30** is rigidly connected to a shaft **32** which extends transversely of the path of advancement of material **20** through press **10** and which is journaled in longitudinally spaced bearing blocks **34** secured to press bed **12**. The throw of connecting rod **28** is such that connecting link **30** is caused to experience oscillatory movement which in turn causes a rocking of shaft **32** about its longitudinal axis and within bearing blocks **34**. To vary the angle through which shaft **32** is rocked, crank **24** may be connected to the upper end of connecting rod **28** by a suitable, well known adjustable connector which allows the distance between the pivotal axis of the connecting rod at the upper end thereof and the pivotal axis of press main shaft **26** to be varied.

A shaft **40** extends transversely of the feed path of material **20** and parallels shaft **32**. Shaft **40** is adjacently spaced from shaft **32** and is journaled in bearing blocks **34**. An arm **42** is rigidly connected at one end to shaft **32**, and an arm **44** is rigidly connected at one end to shaft **40** adjacent arm **42**. The opposite end of each arm **42** and **44** is slotted to define opposed end parts **48**. An internally threaded fitting **49** is carried between the end parts **48** of each arm **42** and **44**. Each fitting **49** includes oppositely projecting pins **50** which are pivotally received within opposing apertures in the end parts **48** of the arm which carries the fitting. To facilitate pivotal movement of each fitting **49** relative to its arm, a bushing **52** may be pressed into each aperture at the end parts **48** of the arm and journal the fitting pin **50** received therein. A connector **54** interconnects fittings **49**. Connector **54** includes a central wrench-engaging part **56** and oppositely extending reverse-threaded end parts **58**. Each end part **58** of connector **54** is threadably received within fitting **49**. Rotation of connector **54** causes fittings **49** to move toward or away from each other depending upon the direction of rotation of the connector. Each connector end part **58** preferably extends through its fitting **49** and has a lock nut **60** threaded on its exposed end which abuts the fitting.

As best shown in FIG. **7**, the distance between the axis of shaft **32** and the pivotal axis of the fitting **49** which is carried by arm **42** is greater than the distance between the axis of shaft **40** and the pivotal axis of the fitting **49** which is carried by arm **44** so that as shaft **32** is rocked by connecting rod **28** through a selected angle, shaft **40** will be rocked through a greater angle whose relationship to the angle through which shaft **32** is rocked will vary depending upon the distance fittings **49** are spaced from the axes of shafts **32** and **40**.

Two laterally spaced guide rods **60** are secured at opposite ends to a suitable support part **62** of press bed **12**. Rods **60** parallel and are positioned on opposite sides of the feed path of material **20**. Cross bars or members **64** and **66** extend transversely of the feed path of material **20** and are supported for reciprocating movement along the material feed path by guide rods **60**. Each end portion **67** of cross members **64** and **66** has a bore which receives a bushing **68** through which a guide rod **60** passes with slight clearance.

Cross member **64** is connected at each end to shaft **32** by a pivotal link **70** and an arm part **76** which is pivotally connected at one end to link **70** and which is rigidly connected at its opposite end to shaft **32** so that rocking of shaft **32** causes reciprocating movement of cross member **64** along guide rods **60**. Likewise, cross member **66** is connected at each end to shaft **40** by means of a pivotal link **74** and an arm part **76** which is pivotally connected at one end to the link **74** and which is rigidly connected at its opposite end to shaft **40** so that when shaft **40** is rocked, cross member **66** will reciprocate along guide rods **60**. Therefore, referring to the embodiment illustrated, connecting rod **28** causes a rocking of shaft **32** which, because of interconnecting arms **42** and **44**, causes simultaneous, corresponding bi-directional rocking movement of shaft **40**. The rocking of shafts **32** and **40** in turn causes the corresponding reciprocating movement of cross members **64** and **66** in which the distance of movement of cross member **66** is greater than the distance of movement of cross member **64**. Cross members **64** and **66** may be additionally supported by one or more bearing plates **69** which are mounted to press bed **12**.

Cross member **64** carries a plurality of work-engaging fingers **78** which extend between guide rods **60**. Each finger **78** is positioned within a bore **79** formed in the upper or material engaging surface **80** of channel member **64** and is urged outwardly so as to protrude beyond surface **80** by a spring **82** positioned in the base of the bore. Each bore **79** preferably receives a bushing **84** which encircles the finger **78** therein. Each finger **78** has a slot **86** formed in its side wall. A set screw **88** is threaded into a bore **90** which intersects finger bore **79** and is positioned therein so as to protrude slightly into slot **86** and thereby prevent the finger from being urged entirely out of its bore **79** by spring **82**. The spacing between fingers **78** in channel member **64** correspond to the spacing between the transversely aligned holes formed in work material **20** so as to protrude upwardly through the holes as the work material overlies surface **80** of the cross member. The work-engaging tips **92** of fingers **78** are beveled, as shown in FIGS. **5** and **6**, so as to cause the fingers to be cammed into their respective bores **79** and the tips **92** thereof disengaged from advancing contact with the work material **20** whenever cross member **64** moves relative to material **20** in the opposite direction of material advancement or material

20 is moved relative to cross member 64 in the direction of material advancement. To aid in the understanding of this invention, the direction of material advancement is indicated by arrow 81 in FIG. 5.

Cross member 66 carries a bar 98 which extends from one end portion 67 to the other of cross member 66. Each end 100 of bar 98 has a bore therein which receives a guide pin 102 with slight clearance. Each guide pin 102 is carried by an end portion 67 of the cross member and extends at a right angular relationship to guide rods 60 so as to permit movement of bar 98 relative to cross member 66 and in a plane perpendicular to the plane of movement of the cross member. Mounted to cross member 66 is a power unit 104 for causing movement of bar 98 relative to the cross member. Power unit 104 may be attached to the lower surface 99 of cross member 66 and consist of a hydraulically actuated device having a reciprocable plunger 106 which projects with clearance upwardly through the cross member and which is secured to bar 98. Actuation of power unit 104 causes the upper surface 108 of bar 98 to be shifted between a position below the upper surface 80 of cross member 64 as shown in FIG. 6 and a position within the plane of surface 80 of cross member 64 as shown in FIG. 5. Support part 62 of bed 12 is open at 110 so as to accommodate power unit 104 and permit reciprocating movement of cross member 66. As best shown in FIG. 3, the bar supporting parts 111 of cross member 66 act as stops to position bar 98 as it is moved relative to the cross member.

Bar 98 includes a plurality of work engaging fingers 112. The tips 113 of fingers 112 protrude from upper surface 108 of the bar. Fingers 112 extend along bar 98 and are preferably each aligned relative to the direction of advancement of material 20 with a corresponding finger 78 carried by cross member 64. The construction and operation of fingers 112 are the same as the construction and operation of fingers 78 and, as such, need not be further described. The movement of bar 98 relative to the cross member 66 upon actuation of power unit 104 causes surface 108 of the bar to be positioned at one stop location in substantially the same plane as work contacting surface 80 of cross member 64 with tips 92 and 113 of fingers 78 and 112, respectively, being located at approximately the same level, as shown in FIG. 5, and to be positioned at another stop location with tips 113 of fingers 112 being located level with or preferably slightly below the plane of work contacting face 80 of cross member 64 so as to preclude material advancing contact of fingers 112 with work material 20.

A stationary cross member 116 is positioned transversely of the feed path of material 20 and supported by bed 12. Stationary cross member 116 includes a work contacting surface 118 which is substantially coplanar with work contacting surface 80 of cross member 64 and carries a plurality of work engaging fingers 120 projecting upwardly therefrom. Fingers 120 are of the same construction and operation as fingers 78 carried by cross member 64 and are selectively spaced along the length of cross member 116 so as to be received within the holes formed in material 20 as the material is advanced over the stationary cross member.

A horizontal hold-down plate 122 is mounted to bed 12 and overlies cross members 64, 66 and 116. Lower surface 124 of hold-down plate 122 is spaced at least the thickness of material 20 from work contacting faces 80 and 118 of cross members 64 and 116, respectively, so as to enable the material to be advanced between plate 122 and the cross members.

Shear 22 mounted at the discharge end of press 12 includes, as illustrated in FIG. 5, a pivoted arm 125 which carries an abutment part 126. Abutment part 126 engages a cutter bar 128 which is positioned transversely of the feed path of material 20 and which is forced downwardly against return spring 129 to cut material 20 into selected lengths as the material is fed outwardly of the press from between guide blocks 130.

The punches carried by dies 14 and 18 of press 10 may be of the progressive forming type and arranged in multiple rows of two or more so as to allow the material 20 to be advanced in increments of two or more times the center-to-center distance between adjacent longitudinally aligned holes. To describe the operation of this invention, it will be assumed that the punches carried within press 10 are in multiples of four so as to enable material 20 to be advanced a center-to-center distance of four holes each time dies 14 and 18 perform a punching operation. The ratio of the distance between the axis of shaft 32 and the pivot axis of fitting 49 carried by arm 42 to the distance between the axis of shaft 40 and the pivot axis of fitting 49 carried by arm 44 is selected to cause cross member 64 to have a one-way path of travel along guide rods 60 equal in length to the center-to-center distance of three punched holes in material 20 and to cause cross member 66 to have a one-way path of travel equal in length to the center-to-center distance of four holes in the material. Connector 54 is turned so as to vary the distance between the pivotal axis of fittings 49 and as a result thereof vary the spacing between cross members 64 and 66. In this manner, the spacing between aligned fingers 78 and 112 of cross members 64 and 66 respectively is adjusted so as to equal, at the end of the advancement stroke of members 64 and 66, the center-to-center distance between adjacent longitudinally aligned holes in material 20. Assuming that a specified number of sections of material 20 are each to be of a length equal to the total center-to-center distance of 28 holes, the power unit 104 is actuated to cause bar 98 of cross member 66 to be lowered so that fingers 112 thereof will not engage material 20. As cross members 64 and 66 move counter to the direction of intended material advancement, fingers 78 carried by channel member 64 will be cammed into their receiving bores 79 and slide over the lower surface of material 20 until cross member 64 reaches the end of its return stroke and fingers 78 can extend upwardly through the overhead holes in the material so as to engage the leading margins of the holes as cross members 64 and 66 begin movement in the direction of intended material advancement. As cross member 64 moves forwardly material 20 is pushed ahead the center-to-center distance of three holes with the fingers 120 of stationary cross member 116 being cammed downwardly to allow the material to pass thereover and out of the discharge end of the press. When cross member 64 has reached the forward end of its stroke, the fingers 120 of

cross member **16** are caused to protrude upwardly into certain holes in member **20** and thereby prevent the material from being pulled back into the press as the cross members **64** and **66** complete their return stroke and cross member **64** can again advance material **20** another three-hole increment. This operation is repeated three times or until cross member **64** has advanced material **20** a distance equal to the center-to-center spacing of twelve holes. Power unit **104** is then actuated during the return stroke of cross members **64** and **66** to raise bar **98** until fingers **112** thereof are positioned to make advancing contact with material **20**. As the cross members **64** and **66** move counter to the direction of material advancement, fingers **78** and **112** will be cammed into their respective bores until the cross members reach the end of their return stroke and the fingers are urged upwardly into aligned holes in material **20**. During the forward movement of cross members **64** and **66**, cross member **66** is advanced a distance equal to the center-to-center spacing of four holes or one center-to-center hole space farther than cross member **64** moves so as to cause material **20** to move forwardly relative to cross member **64** as well as stationary cross member **116**. This sequence is repeated three more times or until material **20** has been advanced an additional distance equal to the center-to-center spacing of twelve holes, thus making the total advancement of the material equal to the center-to-center distance of 28 holes. Handle **125** is then pulled downwardly causing cutter **128** to sever the advanced portion of material from the remainder of the material. This sequence is repeated until the selected number of pieces of material have been cut.

While the actuation of power unit **104** may be through a hand-actuated pump, and the actuation of cutter **28** may also be by hand, the operation of shear **22** and power unit **104** is preferably controlled by an automated tape control system which is synchronized with the punching operation of dies **14** and **18** and programmed so as to automatically advance and sever selected lengths of material **20**. When utilized in an automated system, power unit **104** would be connected to a hydraulic pump which would be actuated by a suitable electrical circuit when change in the material feed rate is desired.

In FIGS. **10–12** the drive linkage from connecting rod **28** to cross members **64** and **66** is shown in modified form. Shaft **40**, which is shown in the embodiment of FIG. **2**, has been eliminated. Connecting rod **28** is interconnected to shaft **32** by connecting link **30**, as previously described, so that shaft **32** will experience a rocking movement about its longitudinal axis within bearing blocks **34** upon rotation of press main shaft **26**. Cross member **66** is connected at each end to shaft **32** by an adjustable link **130** and an arm **132** which is pivotally connected at one end to adjustable link **130** and which is rigidly connected at its opposite end to shaft **32** so that rocking movement of shaft **32** causes reciprocating movement of cross member **66** along guide rods **60**. Cross member **64** is connected at each end to shaft **32** by a non-adjustable link **134** which is pivotally connected at one end to cross member **64** and which is pivotally connected to arm **132** between the ends thereof, as best shown in FIG. **10**.

Each adjustable link **130** includes shiftable parts **136** and **138**. Shiftable part **136** is pivotally connected at one end to an arm **132** and includes a protrusion **140** at its opposite end. Protrusion **140** projects outwardly from outer face **142** of part **136** and has a threaded bore **144** formed therein. A slot **146** is formed in part **136** between the pivotal connection of the part to arm **132** and protrusion **140**. Shiftable part **138** is pivotally connected at one end to cross member **66** and carries a slide block **148** at its opposite end. Innerface **150** of part **138** slidably engages innerface **152** of part **136**. Slide block **148**, which is secured to part **138** by screws **149**, includes a reduced cross sectional portion **154** which fits with clearance within slot **146** of part **136** and which abuts innerface **150** of part **138**. Portion **154** of block **148** is sized relative to slot **146** so as to be shiftable longitudinally of link part **136**. The length of slide block portion **154** slightly exceeds the thickness of link part **136** as measured between faces **142** and **152**. The remaining portion **155** of the slide block has a width which exceeds the width of slot **146** in part **136** so as to cause the link parts to be held together at their innerfaces **150** and **152** while permitting sliding movement of one link part relative to the other to vary the spacing between cross member **66** and the pivot connections of each adjustable link **130** to its connecting arm **132**.

Slide block **148** includes a bore **156** which is axially aligned with threaded bore **144** in protrusion **140** of link part **136**. A threaded adjusting bolt **158** extends in threaded engagement through bore **144** in protrusion **140** and has an unthreaded end **160** rotatably received within bore **156** in slide block **148**. End **160** of bolt **158** is retained within slide block bore **156** by suitable lock means which permits the bolt to be rotated relative to the slide block but not advanced therein. One such securement means may constitute a pin **162** which is pressed into slide block **148** and which extends through one edge of bore **156** and with clearance into an annular groove **164** formed in bolt end **160**. A lock nut **166** is threaded about bolt **158** and abutted against protrusion **140**, as shown in FIG. **12**. By rotating bolt **158**, slide block **148** which is secured to link part **138** is caused to shift within slot **146** of link part **136**, thus causing movement of one link part relative to the other and a resulting variation in spacing between cross member **66** and the pivot connection of the adjustable link to its arm **132**.

Because of the arrangement of the pivotal connections of links **130** and **134** to their respective arms **132**, rocking movement of shaft **32** causes a corresponding reciprocating movement of cross members **64** and **66** along guide rods **60** in which the distance of movement of cross member **66** is greater than the distance of movement of cross member **64**. By turning bolt **158** of each adjustable link **130**, the distance of travel of cross member **66** can be varied. In some constructions of this invention, the position of the adjustable link and the fixed link on each drive shaft connected arm could be reversed. Also, the adjustable link could be connected to either cross member.

It is to be understood that the invention is not to be limited to the details herein given, but may be modified within the scope of the appended claims.

What I claim is:

1. Apparatus for advancing material along a course comprising:

a first member reciprocable between first and second positions and carrying first material engaging means for advancing said material along said course as said first member moves from its first position into its second position,

a second member reciprocable between third and fourth positions and carrying second material engaging means for advancing said material along said course when said second material engaging means is in a material engaging position and as said second member moves from said third position into said fourth position,

said second material engaging means being shiftable relative to said second member into and out of said material engaging position,

means for shifting said second material engaging means into and out of its material engaging position,

and drive means connected to said first and second members for causing simultaneous reciprocating movement of said first and second members wherein the distance of material advancing movement of said second member exceeds the distance of material advancing movement of said first member,

said first material engaging means including means permitting relative movement between said material and said first material engaging means when said second material engaging means is shifted into its material engaging position and said second member is moved from its third position into its fourth position,

whereby one rate of advance of said material as determined by the distance of first member movement is effected when said second material engaging means is shifted out of its material engaging position and another rate of advance as determined by the distance of second member movement is effected when said second material engaging means is shifted into its material engaging position,

said drive means including first and second drive parts rockable about parallel axes, means connecting said first drive part to said first member for imparting said reciprocating movement to said first member upon rocking of said first drive part, means connecting said second drive part to said second member for imparting said reciprocating movement to said second member upon rocking of said second drive part, the distance of movement of each first and second member being related to the respective angle through which each first and second drive part is rocked, and means including a pair of arms interconnecting said first and second drive parts, each arm rigidly connected at one end to a drive part, a connecting rod having one end portion pivotally connected to the opposite end of one of said arms and its other end portion pivotally connected to the opposite end of the other of said arms, the distance between the rocking axis of said first drive part and the connecting rod pivot axis of the arm connected to said first drive part exceeding the distance between the rocking axis of said second drive part and the connecting rod pivot axis of the arm connected to said second drive part whereby rocking of said first drive part through one angle causes rocking of said second drive part through a greater angle, thereby varying the respective distances of movement of said first and second members.

2. The apparatus of claim 1 wherein the pivotally connected end portions of said connecting rod are shiftable longitudinally of the connecting rod so as to vary the spacing between opposite ends of said arms.

3. The apparatus of claim 1 and including means for rocking one of said first and second drive parts.

4. Apparatus for advancing material along a course comprising:

a first member reciprocable between first and second positions and carrying first material engaging means for advancing said material along said course as said first member moves from its first position into its second position,

a second member reciprocable between third and fourth positions and carrying second material engaging means for advancing said material along said course when said second material engaging means is in a material engaging position and as said second member moves from said third position into said fourth position,

said second material engaging means being shiftable relative to said second member into and out of said material engaging position,

means for shifting said second material engaging means into and out of its material engaging position,

and drive means connected to said first and second members for causing simultaneous reciprocating movement of said first and second members wherein the distance of material advancing movement of said second member exceeds the distance of material advancing movement of said first member,

said first material engaging means including means permitting relative movement between said material and said first material engaging means when said second material engaging means is shifted into its material engaging position and said second member is moved from its third position into its fourth position,

whereby one rate of advance of said material as determined by the distance of first member movement is effected when said second material engaging means is shifted out of its material engaging position and another rate of advance as determined by the distance of second member movement is effected when said second material engaging means is shifted into its material engaging position,

said first and second members paralleling one another and extending transversely of said course, the end portions of said first and second members being positioned on opposite sides of said course and supported by guides so as to be reciprocable within the same general plane, said drive means including first and second parallel shafts extending transversely of said course, means connecting said first shaft to said first member for imparting

reciprocating movement to said first member as said first shaft is rocked about its axis, means connecting said second shaft to said second member for imparting reciprocating movement to said second member as said second shaft is rocked about its axis, the distance of movement of each first and second member being related to the respective angle through which each first and second shaft is rocked, a first arm having one end rigidly connected to said first shaft, a second arm having one end rigidly connected to said second shaft, a connecting rod having one end portion pivotally connected to the opposite end of said first arm and the other end portion pivotally connected to the opposite end of said second arm, the distance between the axis of said first shaft and the connecting rod pivotal axis of said first arm exceeding the distance between the axis of said second shaft and the connecting rod pivotal axis of the second arm whereby rocking of said first shaft through one angle causes a rocking of said second shaft through a greater angle so as to cause said second member to move a greater distance along said guides than said first member.

5. The apparatus of claim 4 wherein said material engaging means comprises fingers protruding from said first and second members adapted for seating within accommodating holes in said material, each finger being shiftably carried within a bore in a said member and biased outwardly thereof so as to normally protrude from said member, each finger having a material abutment side adapted to engage the margin of a hole in said material and to urge the material forwardly along said course as said member moves from its first into its second position and a beveled portion positioned generally oppositely of said abutment side adapted to engage the margin of said hole and cause the finger to be cammed into its receiving bore and thus disengaged from said material as said member moves from its second into its first position.

6. The apparatus of claim 5 wherein the fingers carried by said first member normally project into said course and wherein the fingers carried by said second member are mounted to a shiftable part which is carried by said second member and which is shiftable relative to said second member so as to move the fingers mounted thereto into and out of said course, and means for shifting said part to selectively position the fingers mounted thereto into said course.

7. The apparatus of claim 6 wherein said means for shifting said part is carried by said second member.

8. The apparatus of claim 5 and means for rocking one of said first and second shafts.

9. The apparatus of claim 8 wherein said first member carries one row of said fingers and second member carries another row of said fingers, said rows of fingers being parallel, the end portions of said connecting rod being shiftable longitudinally relative to the axis of said rod so as to vary the spacing between opposite ends of said first and second arms and thereby vary the rotational relationship of said first and second shafts independently of said shaft rocking means and thus cause the spacing between rows of fingers to be correspondingly varied.

10. Apparatus reciprocable advancing material along a course comprising:

a first member reciprocable between first and second positions and carrying first material engaging means for advancing said material along said course as said first member moves from its first position into its second position,

a second member reciprocable between third and fourth positions and carrying second material engaging means for advancing said material along said course when said second material engaging means is in a material engaging position and as said second member moves from said third position into said fourth position,

said second material engaging means being shiftable relative to said second member into and out of said material engaging position,

means for shifting said second material engaging means into and out of its material engaging position,

and drive means connected to said first and second members for causing simultaneous reciprocating movement of said first and second members wherein the distance of material advancing movement of said second member exceeds the distance of material advancing movement of said first member,

said first material engaging means including means permitting relative movement between said material and said first material engaging means when said second material engaging means is shifted into its material engaging position and said second member is moved from its third position into its fourth position,

whereby one rate of advancement of said material as determined by the distance of first member movement is effected when said second material engaging means is shifted out of its material engaging position and another rate of advancement as determined by the distance of second member movement is effected when said second material engaging means is shifted into its material engaging position,

said drive means including a rockable drive part, means connecting said first and second members to said drive part, said member connecting means including an arm rigidly connected at one end to said drive part, a first link pivotally connected between one of said first and second members and the opposite end of said arm, a second link pivotally connected between the other of said first and second members and said arm at a location intermediate the ends of said arm, one of said first and second links including shiftable parts, one of said shiftable parts attached to the first or second member which is connected to said one first or second link, another of said shiftable parts attached to said arm, means carried by said one first or second link for shifting its link parts to cause a variation in spacing between the arm and the connection of said one first or second link to the first or second member.

11. The apparatus of claim 10 wherein said first link is pivotally connected between said first member and the opposite end of said arm, said second link pivotally connected between said second member and said arm at a location intermediate the ends of said arm, said first link including shiftable parts, one of said shiftable

parts attached to said first member, another of said shiftable parts attached to said arm, means carried by said first link for shifting into link parts to cause a variation in spacing between the arm and a connection of said first link to the first member.

12. Apparatus for advancing material along a course comprising:

a first member reciprocable between first and second positions and carrying first material engaging means for advancing said material along said course as said first member moves from its first position into its second position,

a second member reciprocable between third and fourth positions and carrying second material engaging means for advancing said material along said course when said second material engaging means is in a material engaging position and as said second member moves from said third position into said fourth position,

said second material engaging means being shiftable relative to said second member into and out of said material engaging position,

means for shifting said second material engaging means into and out of its material engaging position,

and drive means connected to said first and second members for causing simultaneous reciprocating movement of said first and second members wherein the distance of material advancing movement of said second member exceeds the distance of material advancing movement of said first member,

said first material engaging means including means permitting relative movement between said material and said first material engaging means when said second material engaging means is shifted into its material engaging position and said second member is moved from its third position into its fourth position,

whereby one rate of advancement of said material as determined by the distance of first member movement is effected when said second material engaging means is shifted out of its material engaging position and another rate of advancement as determined by the distance of second member movement is effected when said second material engaging means is shifted into its material engaging position, said drive means including a rockable drive part, means connecting at least one of said first and second members to said drive part,

each material engaging means including fingers protruding from said first and second members adapted for seating within accommodating holes in said material, each finger being shiftably carried within a bore in a said member and biased outwardly thereof so as to normally protrude from said member, each finger having a material abutment side adapted to engage the margin of a hole in said material and to urge the material forwardly along said course as said member moves from its first or third into its second or fourth position and a beveled portion positioned generally oppositely of said abutment side adapted to engage the margin of said hole and cause the finger to be cammed into its receiving bore and thus disengaged from said material as said member moves from its second or fourth into its first or third position.

13. The apparatus of claim 12, wherein the fingers carried by said first member normally project into said course and wherein the fingers carried by said second member are mounted to a shiftable part which is carried by said second member and which is shiftable relative to said second member so as to move the fingers mounted thereto into and out of said course, and means for shifting said part to selectively position the fingers mounted thereto into said course.

14. The apparatus of claim 13, wherein said means for shifting said part is carried by said second member.

15. Apparatus for advancing material along a course comprising:

a first member reciprocable between first and second positions and carrying first material engaging means for advancing said material along said course as said first member moves from its first position into its second position,

a second member reciprocable between third and fourth positions and carrying second material engaging means for advancing said material along said course when said second material engaging means is in a material engaging position and as said second member moves from said third position into said fourth position,

said second material engaging means being shiftable relative to said second member into and out of said material engaging position,

means for shifting said second material engaging means into and out of its material engaging position,

and drive means connected to said first and second members for causing simultaneous reciprocating movement of said first and second members wherein the distance of material advancing movement of said second member exceeds the distance of material advancing movement of said first member,

said first material engaging means including means permitting relative movement between said material and said first material engaging means when said second material engaging means is shifted into its material engaging position and said second member is moved from its third position into its fourth position,

whereby one rate of advancement of said material as determined by the distance of first member movement is effected when said second material engaging means is shifted out of its material engaging position and another rate of advancement as determined by the distance of second member movement is effected when said second material engaging means is shifted into its material engaging position,

said first and second members paralleling one another and extending transversely of said course, the end portions of said first and second members being positioned on opposite sides of said course and supported by guides so as to be reciprocable within the same general plane, said drive means including a shaft extending transversely of said course, means connecting said shaft to said first and second members for imparting reciprocating

movement to said first and second members as said shaft is rocked about its axis, said shaft and member connecting means including an arm rigidly connected at one end to said shaft, a first link pivotally connected between one of said first and second members and the opposite end of said arm, a second link pivotally connected between the other of said first and second members and said arm at a location intermediate the ends of the arm.

16. The apparatus of claim 15, wherein one of said first and second links includes shiftable parts, one of said shiftable parts attached to the first or second member which is connected to said one first or second line, another of said shift-able parts attached to said arm, means carried by said one first or second link for shifting said link parts to cause a variation in spacing between the arm and the connection of said one first or second link to the first or second member.

17. The apparatus of claim 16, wherein each material engaging means comprises a row of fingers carried along each of said first and second members, said fingers protruding from said first and second members and being adapted for seating within accommodating holes within said material, each finger being shiftably carried within a bore in a said member and biased outwardly thereof so as to normally protrude from said member, each finger having a material abutment side adapted to engage the margin of a hole in said material and to urge the material forwardly along said course as said member moves from its first into its second position and a beveled portion positioned generally oppositely of said abutment side adapted to engage the margin of said hole and to cause the finger to be cammed into its receiving bore and thus disengaged from said material as said member moves from its second into its first position, whereby a variation in spacing between the arm and first or second member connections of said one first or second link causes a corresponding variation in spacing between the row of fingers carried by said first member and the row of fingers carried by said second member.

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