ADJUSTABLE FEED APPARATUS FOR STRIP MATERIAL

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References Cited
UNITED STATES PATENTS
3,123,270 3/1964 Olson..........................226/162 X

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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
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 a 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 removal 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 5—5 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 adjacent 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 relatively 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 projected 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.
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 abuts 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 member 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 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.
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 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 shiftable 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:

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 member means 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 shiftable 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 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 member means 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,
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 shiftable 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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