

[54] **BLANK FEED DEVICE IN A TRANSFER PRESS**

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[58] Field of Search 198/24, 218

[56] **References Cited**

UNITED STATES PATENTS

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[57] **ABSTRACT**

A blank feed device in which there is provided a pair of feed bars each having a plurality of grippers and connected together by a cross plate having elongated slots by means of pins which are slidingly received in said slots, a pair of links pivoted at one end to said pins, a common coupling member pivotally supporting the other ends of said links, a reciprocating means integrally connected at one end to said coupling member, a pinion rotatably supported at the other end of said reciprocating means, a stationary rack engaging one side of said pinion, a movable rack engaging the other side of said pinion and a pusher fixedly mounted on said movable rack.

4 Claims, 6 Drawing Figures

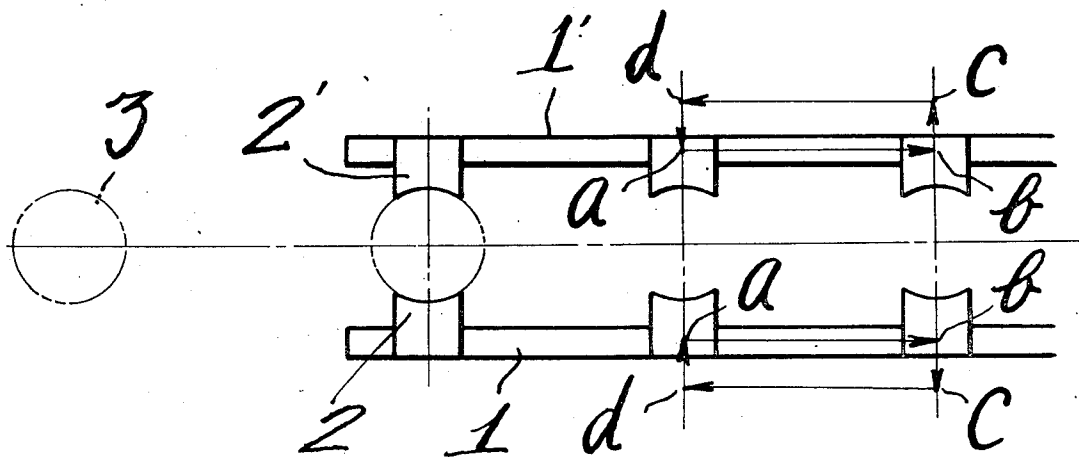


FIG. 1

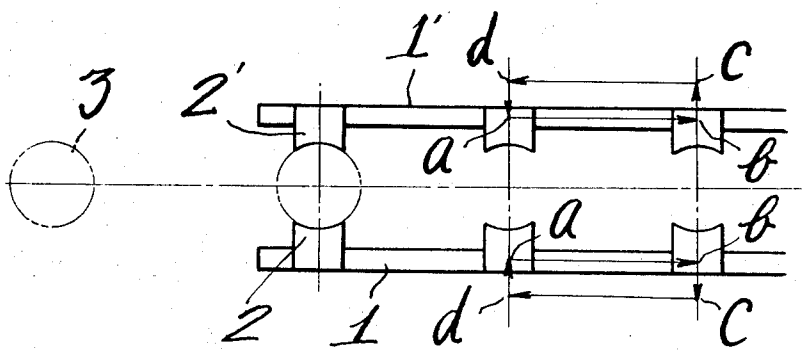
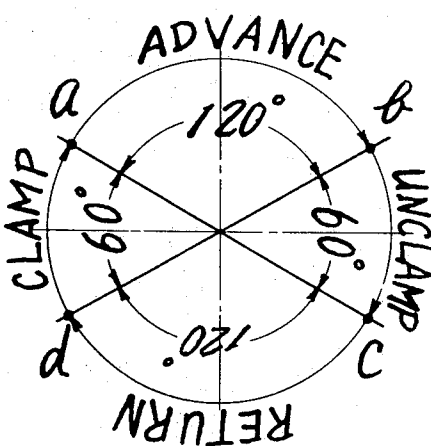
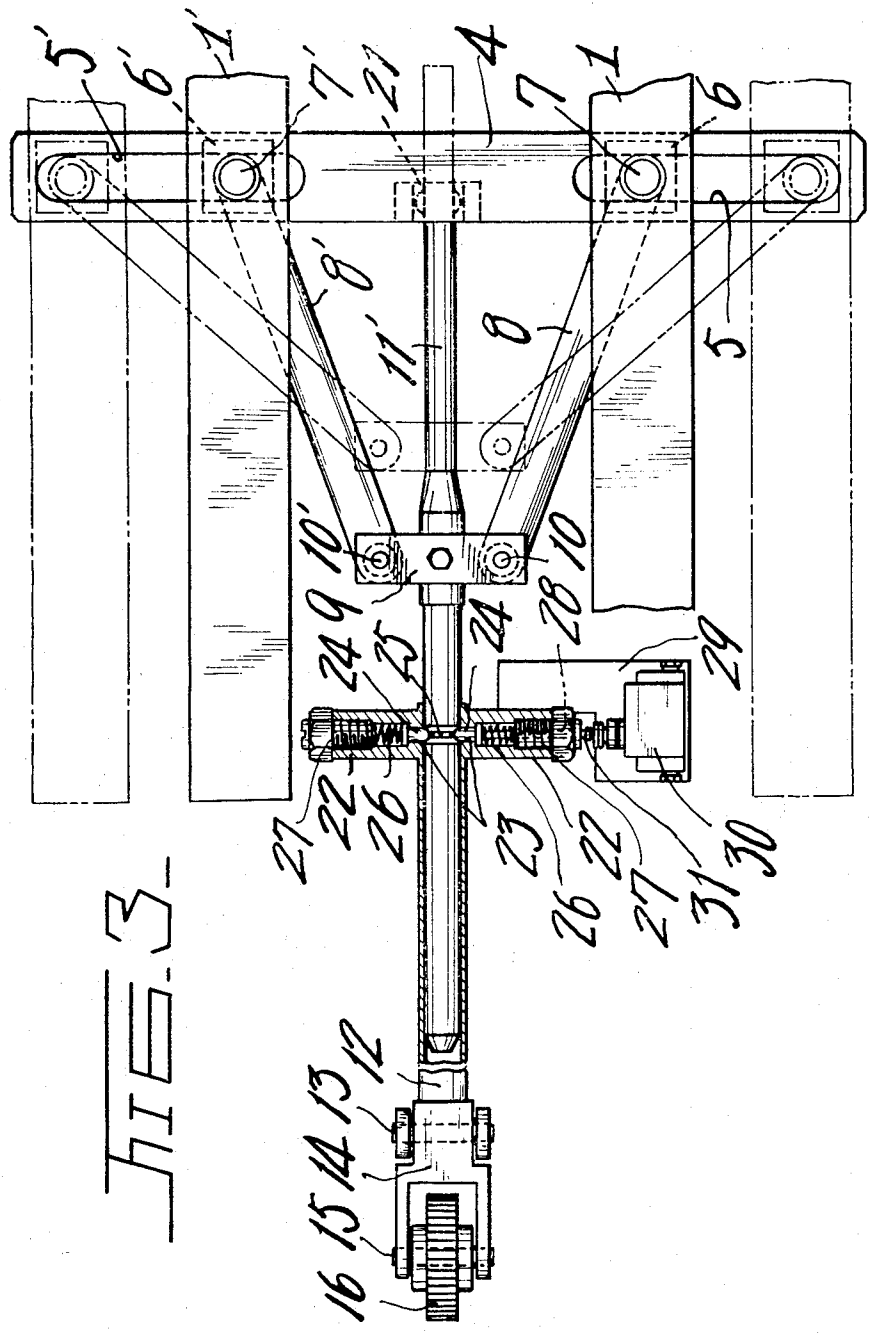
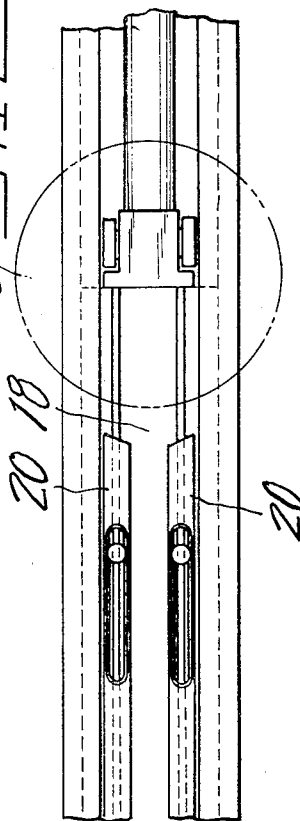
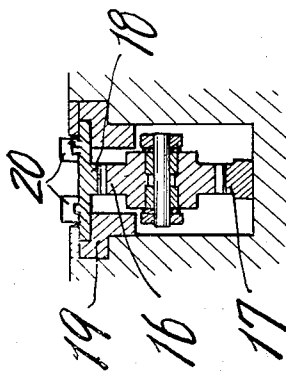
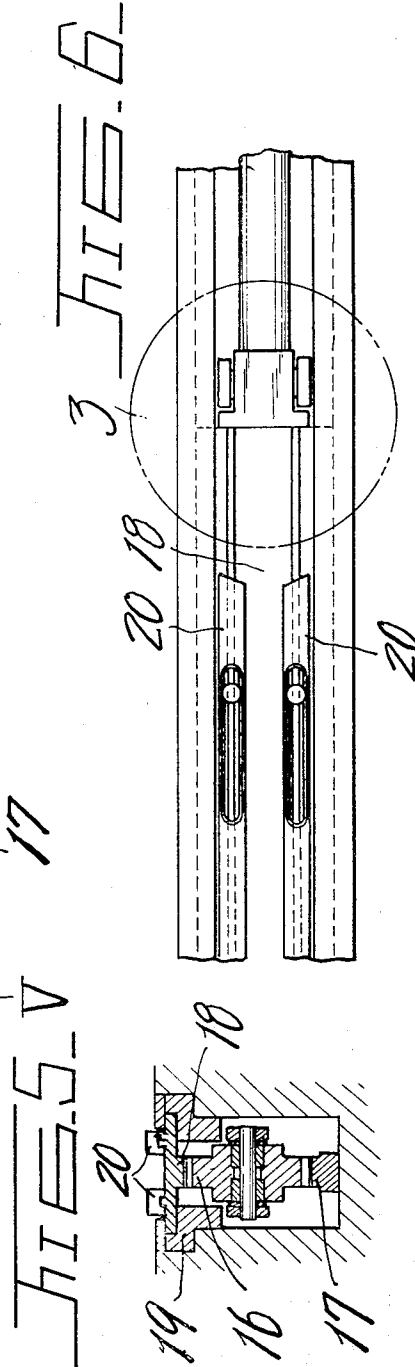
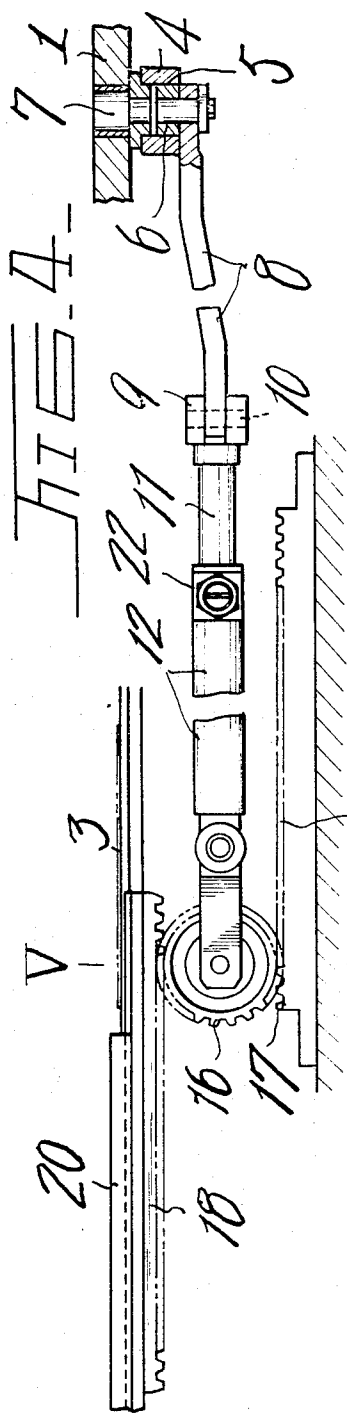


FIG. 2







BLANK FEED DEVICE IN A TRANSFER PRESS

BACKGROUND OF THE INVENTION

This invention relates to a blank feed device in transfer blank and more particularly, to a novel and improved blank feed device for feeding successive blanks toward a first press in a transfer press.

In a transfer press, it has been common practice that a pair of feed bars each having a plurality of grippers feed successive works through in a series of successive presses in the transfer press for processing. In each of the conventional transfer presses of the type, one operation cycle by the feed bars includes a clamping stroke, an advance stroke, an unclamping stroke and a return stroke which cover a first 60° sector, a first 120° sector, a second 60° sector and a second 120° sector, respectively of one complete rotation of a press crank. With the conventional blank feed device of the type referred to above, the feeding of a blank toward the first press in a series of presses in the transfer press has been effected by means of a pusher during only advance stroke of the feed bars or in the first 120° sector of one complete rotation of the press crank. However, in order that the pusher may feed the blank in a long distance feed stroke in the first 120° sector of one complete rotation of the press crank, it has been necessary to move the pusher at a high rate in the feed stroke. Such movement of the pusher at the high rate would necessarily impair stability in the feeding operation and improper blank position in processing stations resulting in the production of unacceptable products.

SUMMARY OF THE INVENTION

One object of the present invention is to provide a novel and improved blank feed device in a transfer press of the above type which can effectively eliminate the disadvantages inherent in the conventional blank feed devices as referred hereinabove.

According to the present invention, by the utilization of the time period for the unclamping stroke of the feed bars during which no processing operation is performed in a transfer press and which has not been utilized in the conventional feed devices, the pusher is moved in its feed stroke at a relatively low rate during both the advance stroke and the unclamping stroke which cover a 120° sector and an ensuing 60° sector, respectively of one complete rotation of a press crank whereby the blank feeding operation can be performed with a greater stability even if the pusher stroke is long.

Accordingly, the present invention is to provide a blank feed device which is particularly advantageously employed in conjunction with a zigzag blanking device which blanks a strip material in a two-row zigzag pattern and feed blanks in the two-row zigzag pattern to a press. When the feed device is employed in conjunction with such a blanking device, the pusher of the feed device should be moved in a relatively long feed stroke.

Furthermore, according to the present invention, there has been provided a blank feed device in a transfer press comprising a pair of feed bars which is adapted to perform a work transfer cycle including clamping, advance, unclamping and return strokes, characterized in that a pusher pushes said blank from a blank supply position toward a blank processing position during the time period from the beginning of said advance stroke to the termination of said unclamping stroke of the feed bars.

The above and other objects and attendant advantages of the present invention will be more readily apparent to those skilled in the art from a reading of the following detailed description in conjunction with the accompanying drawings which show one preferred form of the invention for illustrative purpose only, but not for limiting the scope of the same in any way.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic plan view of a feed bar assembly of a work feed device in a transfer press;

FIG. 2 is a diagram showing relationship between a motion of feed bars and crank angles in a press;

FIG. 3 is a plan view on an enlarged scale of the principal parts of the blank feed device of the invention;

FIG. 4 is a side elevational view of the device in FIG. 3;

FIG. 5 is a view taken along line V—V of FIG. 4;

FIG. 6 is a plan view of the movable rack and blank pusher as shown in FIGS. 3 and 4.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will be now described referring to the accompanying drawings and more particularly, to FIGS. 1 and 2 thereof. The transfer press to which the blank feed device of the invention is employed comprises generally a feed bar assembly including a pair of spaced parallel feed bars 1 and 1' which have a plurality of equally spaced grippers 2 and 2' on the opposite or inner sides thereof, respectively. Each of the grippers 2 and 2' has a concave gripping face complementary to the circular configuration of a blank 3 so that the opposite grippers may co-operate with each other to grip blanks 3 therein, respectively. As more clearly shown in FIG. 2, during each rotation of the crank of a press with which the feed device of the invention is employed, the feed bars 1 and 1' advance in the feed direction at a crank angle of 120° (a-b), unclamp at the ensuing crank angle of 60° (b-c), return to the original position at the further ensuing crank angle of 120° (c-d) and clamp at the rest crank angle of 60° (d-a). By repeating the operation cycle mentioned above, the feed bars in succession feed successive blanks 3 to and through successive processing stations in the press (as the press and the mechanism which actuates the feed bars is well known in the conventional transfer press, they are not shown and described herein).

Turning now to FIG. 3 in which the principal parts of the feed device of the invention are shown on an enlarged scale, a cross plate 4 extends transversely of the feed bars 1 and 1' on the underside of the latter with the opposite ends of the cross plate extending beyond the outer side edges of the bars and being provided at points adjacent to the opposite ends with elongated slots 5 and 5' extending longitudinally of the cross plate. Slidably received in the slots 5 and 5' are apertured slidable members 6 and 6' and the heads of pins 7 and 7' are loosely fitted in the feed bars 1 and 1' through the slidable members 6 and 6', respectively. Links 8 and 8' are loosely fitted at one end on the shanks of the pins 7 and 7', respectively for pivotal movement about the pins and the other ends of the links are pivotally connected to a common coupling member 9 by means of pins 10 and 10' respectively. The coupling member 9 has a rod 11 integrally connected thereto and the rod extends at right angles to

the cross plate 4 and in parallel to the feed bars in a spaced relationship to the bars. A tubular member 12 telescopically receives the rod 11 so that the rod may slidably extend from and retract into the tubular member when subject to an impact and the tubular member 12 has, at one end remote from the coupling member 9 a pinion holder 14 pivotally connected thereto by means of a pin 13. The rod 11 and tubular member 12 constitute a reciprocating means. The rod and tubular member 11 and 12 respectively are normally maintained as a unitary assembly by means of which description will be made hereinafter. The other end of the pinion holder 14 rotatably supports a pinion 16 by means of a transverse shaft 15. The pinion 16 is in engagement on one side with a rack 17 fixedly supported on the machine frame (not shown) of the press. A movable rack 18 (see FIGS. 4 and 5) is slidably supported by a suitable mounting member 19 (see FIG. 5) and in engagement with the other side of the pinion 16. The movable rack 18 has a pair of parallel spaced blank pushers 20 fixedly secured thereto. The rod 11 has on the end remote from the pinion supporting end an extension 11' which extends loosely through a swivel bearing 21 mounted on the underside of the cross plate 4 in the center of the length of the plate.

The tubular member 12 has a pair of hollow lateral projections 22 which extend outwardly from the opposite sides of the tubular member at right angles to the longitudinal axis of the member and have openings 23 and engaging pieces 24 are loosely received in the hollow projections, respectively with the rounded inner ends of the pieces projecting from the holes so as to resiliently engage in an annular groove 25 formed about the rod 11 and extending through the tubular member by the action of springs 26 which are received in the respectively associated openings 23 as the projections 22 whereby the rod and tubular member are maintained in a unitary assembly. The opening 23 in each lateral projection 22 has a stepped configuration including an inner smaller diameter plain opening portion and an outer larger diameter threaded opening portion with the latter threadedly receiving a bolt 27 and thus, the spring 26 is held in compression within the opening 24 between the associated engaging piece 24 and bolt 27. One of the bolts 27 is a hollow bolt for the purpose to be described hereinbelow. A pin 28 is connected at one end to one of the engaging pieces 23 (the lower engaging piece as seen in FIG. 3) and loosely extends through the associated hollow bolt 27 with the other or outer end extending beyond the head of the bolt so as to engage an actuating piece 31 of a microswitch 30 mounted on a supporting plate 29 which is in turn suitably mounted on the machine frame so that the microswitch is normally maintained in the open circuit state.

In operation, as the feed bars 1 and 1' are initially moved in the advance stroke covering the sector $a - b$ corresponding to the first 120° crank angle (see FIG. 2) assuming that the leading grippers on the opposite feed bars have one blank 3 gripped therebetween with the distance between the bars maintained a predetermined lowest value, the slidable members 6, 6' and pins 7, 7' slidably move along the slots 5, 5' in the cross plate from the full line positions toward the chain line positions (see FIG. 3) so as to pivot the links 8, 8' about their respectively associated pins 7, 7' and pins 10, 10' from the full line positions toward the chain line positions (see FIG. 3) which in turn moves or advances the

coupling member 9 from the full line position toward the chain line position (see FIG. 3). The advancement of the coupling member 9 also advances the rod 11 and tubular member 12 in unison. As the tubular member 12 advances, the pinion 16 pivoted to the tubular member 12 follows the movement of the tubular member in engagement with the stationary rack 17 and the movable rack 18 which engages the pinion 16 on the side opposite to the stationary rack 17 also moves in the same direction as the pinion, but at a rate higher than that at which the pinion moves. After the feed bars 1, 1' have advanced by a predetermined pitch covering the first 120° crank angle ($a - b$) or when the line bars 1, 1' have terminated the advance stroke, they initiate to move in the unclamping stroke, covering the ensuing 60° crank angle corresponding to the sector $b - c$ (see FIG. 2) until the slidable members 6, 6' and pins 7, 7' will have reached the extreme ends in their outwardly directing slide movement along the slots 5, 5' in the cross plate 4 (the chain line positions for the parts as shown in FIG. 3) where the distance between the links 8, 8' also assume the chain like positions (FIG. 3) the feed bars are a predetermined highest value and the blank 3 now gripped in the leading grippers on the bars is released for further feeding by the successive grippers. After the termination of the unclamping stroke, the feed bars 1, 1' with the distance therebetween maintained in the highest value move to the original positions in the return stroke covering the ensuing 120° crank angle corresponding to the sector $c - d$ (see FIG. 2) leaving the released blank 3 as it is whereby the slidable members 6, 6' and pins 7, 7' move inwardly from the chain line positions toward the full line positions of FIG. 3 and the links 8, 8' also pivot from the chain line positions toward the full line positions of FIG. 3. Upon the termination of the return stroke, the feed bars 1, 1' initiate the clamping stroke covering the last 60° crank angle movement corresponding to the sector $d - a$ until the leading grippers on the bars will positively grip another or a second blank 3 which has been supplied to the position to be gripped by the grippers and at the same time, as the leading grippers grip the second blank, the succeeding two opposite grippers next to the leading grippers grip the first blank which has been fed by the predetermined pitch during the previous advance and unclamping stroke movements of the feed bars and left behind at the outset of the return stroke movement of the bars. As mentioned hereinabove, the movable rack 18 which is in engagement with and moves at a higher rate than the pinion 16, the pusher 20 has pushed the second blank 3 to a position ready to be gripped by the leading grippers during the return stroke of the feed bars. Thereafter, another blank feed operation cycle is effected in the same manner as mentioned hereinabove from the full line positions of the slidable members 6, 6', pins 7, 7' and links 8, 8'. As the same feed operation cycle is in succession carried out, at last the last opposite grippers (the rightmost grippers on the bars 1, 1' as seen in FIG. 1) feeds the first blank to a position for processing in a first processing station of a series of stations in the press (not shown). By repeating the above-mentioned feed operation cycle, the succeeding blanks which are in succession supplied to the feed device can be in succession fed to the press for processing.

As will be appreciated from the foregoing description on the operation of the feed device of the invention, the

feed stroke of blanks can be substantially extended over that in the conventional corresponding devices because in the present feed device both the advance and unclamping strokes, covering the 180° crank angle corresponding to a sum of the sectors $a - b$ and $b - c$ can be utilized for feeding blanks whereas in the corresponding feed devices only the advance stroke of the feed bars can be utilized for feeding blanks.

As compared with the conventional blank feed devices in which only the time period during the advance stroke of the feed bars can be utilized for feeding blanks, the blank feed device of the invention in which both of the time period during the advance and unclamping strokes of the feed can be bars utilized makes it possible to operate the blank pusher at a rate lower than that at which the pushers in the conventional blank feed devices are operated thereby to ensure a more stable feeding of blanks. According to the present invention, during the feeding of blanks by the pusher, if the movement of blanks is obstructed due to any cause or obstacle, the movement of the pinion 16 and tubular member 12 is forcibly stopped, because the rod 11 is telescopically received in the tubular member 12, and the rod is allowed to move along with the moving feed bars 1, 1' whereby the engaging pieces 24 are moved out of the annular groove 25 in the rod 11 against the action of the springs 26 so that the parts of the blank feed device can be effectively protected from possible damage. As the engaging pieces 24 are moved out of the annular groove 25, the pin 28 which now engages the microswitch 30 closes the circuit to the switch thereby to actuate an emergency stop device (not shown) of the press.

While there has been described what is at present considered to be the preferred embodiment of this invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention and it is aimed, therefore, in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. In a transfer press of the type provided with a pair of work feed bars for performing a work transfer cycle including clamping, advancing, unclamping and return strokes, a blank feed device for feeding successive

blanks to the press from a blank press station during the time period from the beginning of the advancing stroke to the ending of the unclamping stroke of the feed bars said blank feed device including a cross plate extending transversely of said pair of feed bars said cross plate having spaced elongated slots extending longitudinally thereof, pins loosely received in said slots for connecting said feed bars and cross plate together and for slidably moving along said slots, a pair of links respectively pivoted at one end to said pins, a common coupling member pivotally supporting the other ends of said links, a reciprocable means, said reciprocable means being connected at one end to said coupling member, a pinion rotatably supported at the other end of said reciprocable means, a stationary rack in mesh with one side of said pinion, a movable rack in mesh with the other side of said pinion and blank pusher means fixedly mounted on said movable rack, whereby as the feed bars move in the advancing stroke, the pins move along the slots in the cross plate pivoting the links about their pins thereby moving the coupling member, the reciprocable means and pinion so the pinion moves the movable rack in the same direction.

2. The blank feed device as set forth in claim 1, in which reciprocable means comprises a rod integral with said coupling member and a tubular member telescopically receiving said rod therein, said rod having an annular groove and said tubular member being provided with a resilient engaging piece engaging in said annular groove to connect the rod and tubular together, with the pinion being supported by the tubular member.

3. The blank feed device as set forth in claim 1, in which said rod assembly further includes a pair of hollow projections extending outwardly from the opposite sides of said tubular member surround said annular groove of said rod and at least one of said projection having an opening through which said engaging piece engaging in said annular groove by the action of an associated spring.

4. The blank feed device as set forth in claim 1, in which said device further includes a microswitch to be actuated by a microswitch actuating pin abutting against said engaging piece.

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