March 23, 1954 A. PAUL 2,672,835

SHEET FEEDING MECHANISM

Filed Jan. 9, 1951 2 Sheets-Sheet 1

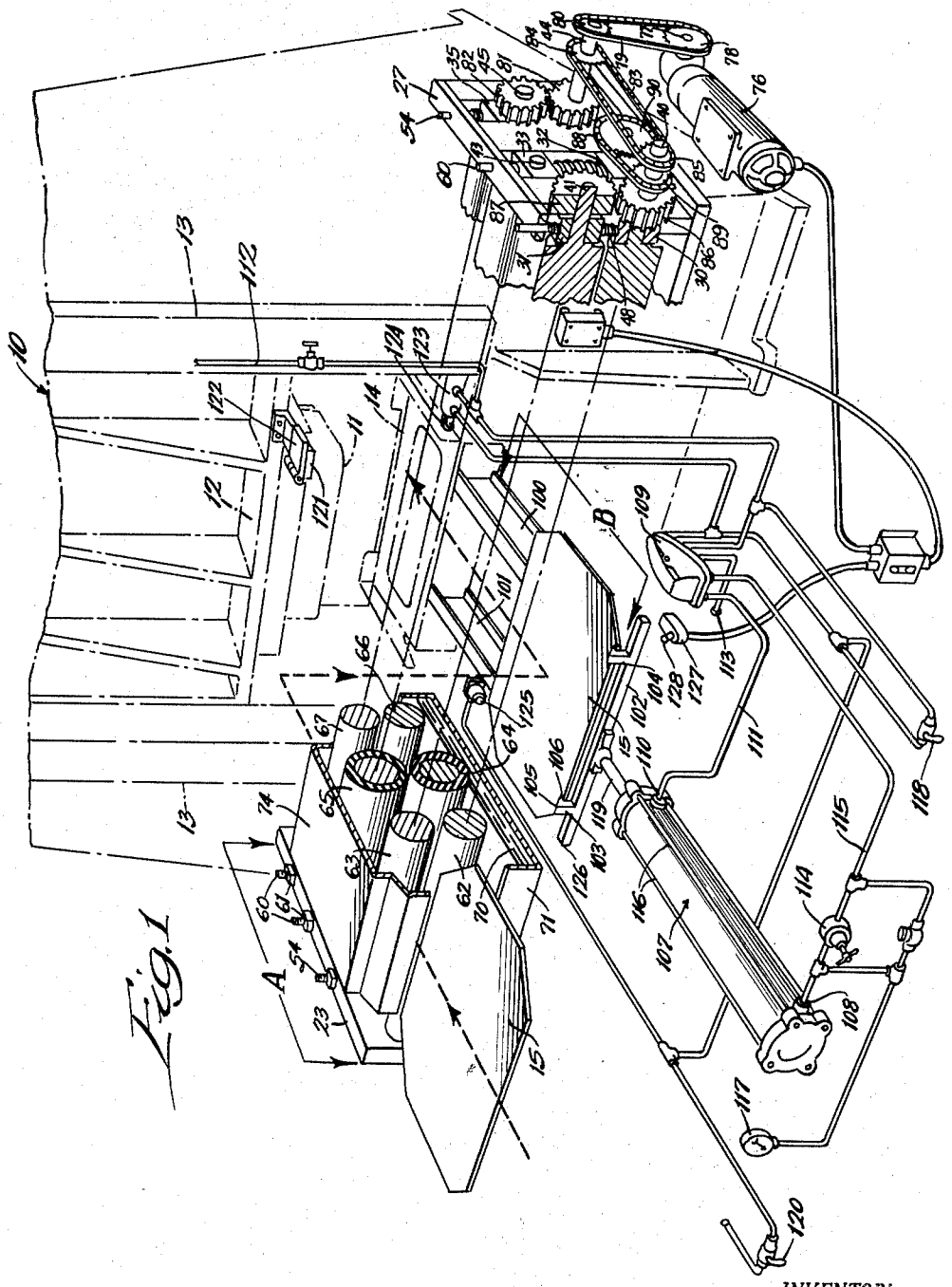


Fig. 1

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Fig. 2

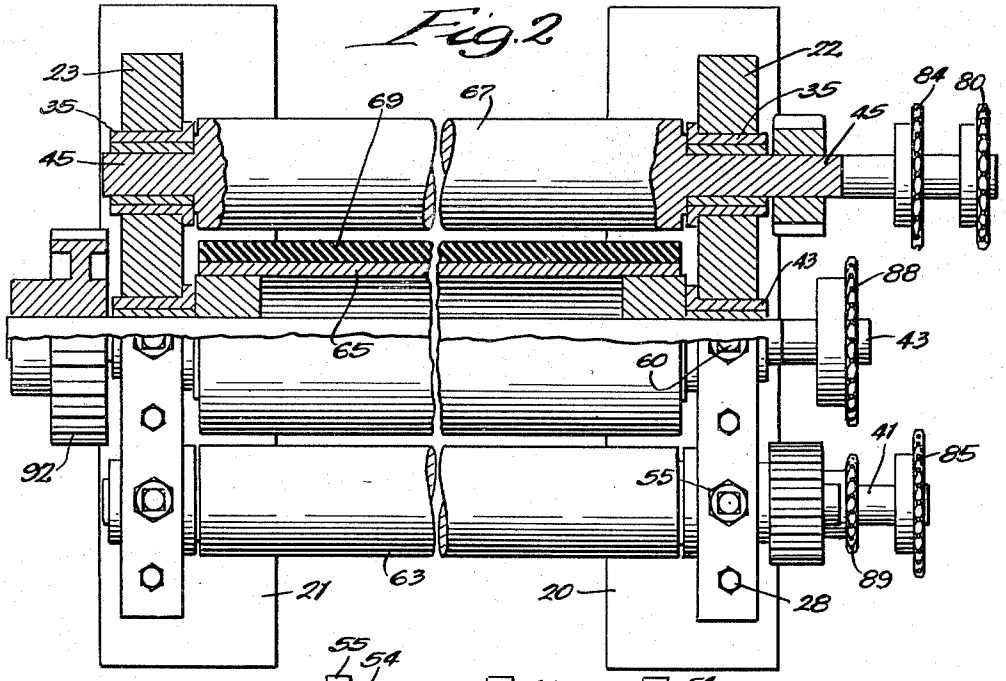
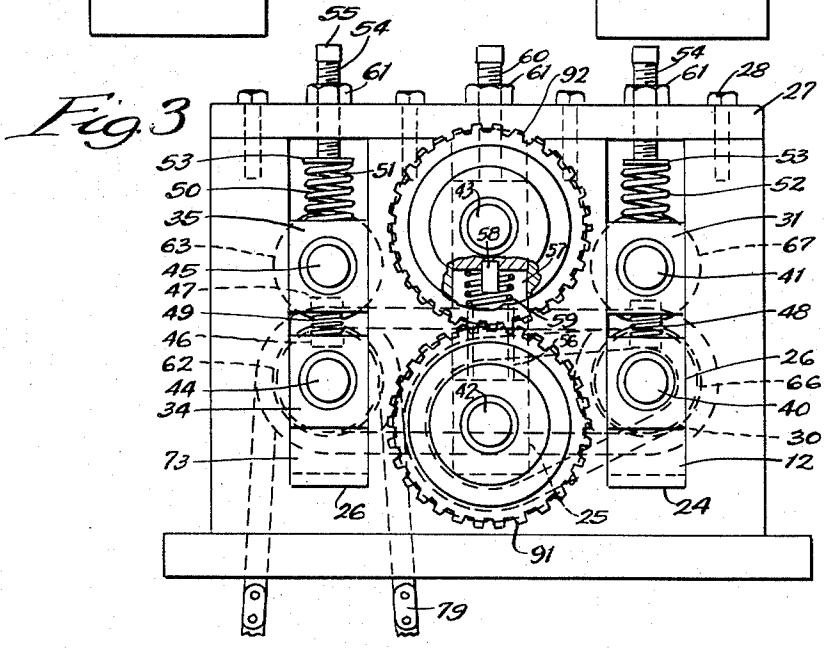


Fig. 3



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Patented Mar. 23, 1954

2,672,835

UNITED STATES PATENT OFFICE

2,672,835

SHEET FEEDING MECHANISM

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Application January 9, 1951, Serial No. 205,063

8 Claims. (Cl. 113—1)

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This invention relates to mechanism for feeding sheet stock into position for processing by other machines, such as a stamping press or the like, and it relates more particularly to a new and improved sheet feeding device having safety features for determining the sequence of operations for the purpose of avoiding harm to the operator, material being operated on and to the feed system.

It is an object of this invention to produce a new and improved sheet feeding mechanism which is simple in construction and safe and easy in operation and it is a related object to produce a mechanism of the type described for feeding metallic sheet stock in timed relation with the operation of a processing unit and in timed relation with the position of elements embodied within the feed system.

Another object is to produce a mechanism for advancing sheet stock in stepwise movements into feeding relation with a stamping press and it is a related object to embody means within said feed mechanism for treating the surfaces of the sheet in preparation for the operations for which it is fed.

A further object is to produce a mechanism for advancing sheet stock onto the bed of a forming machine, said mechanism including means for treating the surface of the sheet as it is advanced.

A still further object is to provide a mechanism of the type described embodying separate mechanism for advancing the sheet through a first portion of its travel while the surfaces are being treated and for receiving said sheet from said first feed portion and advancing it to the bed of the forming machine, and it is a related object to provide means in said mechanism for inactivating the first feed section during operation of the second thereby to avoid advancing a sheet while the second feed system is out of position for receiving same.

More specifically, it is an object of this invention to provide mechanism which is simple in construction and easy in operation for feeding metal sheet stock onto the bed of a metal stamping press, said mechanism embodying separate feed units operating in timed relation with each other and with the press whereby the sheet is advanced through a portion of its travel by one feed section which may embody means for applying a lubricant onto the surfaces of the sheet as it advances the sheet into position for actuation by the second feed unit to the bed of the press in timed relation with the movements of the press, the first feed unit and the second feed

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unit operating in timed relation whereby the first is deactivated during the feeding cycle of the second so that a sheet will not be fed thereto while it is out of position.

These and other objects and advantages of this invention will hereinafter appear and for purposes of illustration, but not of limitation, an embodiment of the invention is shown in the accompanying drawings in which—

Figure 1 is a schematic view partially in section showing the arrangement of parts in a feed system embodying features of this invention;

Figure 2 is a top plan view partially in section of the first roller feed section shown in Figure 1; and

Figure 3 is an end elevational view of the roller feed section.

As shown in the drawing, description herein will be made to feed mechanism embodying features of this invention for advancing sheet stock to a stamping press 10 having a male mold member 11 carried on the under side of an upper platen 12 for up and down movement in molding relation between side frame members 13. The male mold member cooperates with a stationary female mold member 14 having a cavity 14a for shaping metal sheets 15 fed between the mold dies. It will be understood that feed mechanism of the type embodying features of this invention may also be adapted for use in cooperation with other sheet processing devices adapted to make use of intermittent feed.

The sheet feeding mechanism, ordinarily positioned in front of the press 10, is composed of two separate feed sections, the first of which advances the sheet to the second feed section in timed relation with the operation of the latter. The second feed section advances the sheet the remainder of the distance between the mold dies in timed relation with the press. The first feed section is adapted to embody means for lubricating or otherwise treating the surfaces of the sheet as it is advanced therethrough and it is adapted to become inoperative while the second feed section is effective for advancing the sheet to the press, otherwise a sheet might be fed from the first section to the second before the latter is in position to receive same whereby the feed system would become jammed, as will hereinafter be pointed out in greater detail.

The first feed section A comprises horizontally disposed, laterally spaced base plates 20 and 21 provided with upright side frame plates 22 and 23, each of which is formed with vertically disposed slotted sections 24, 25 and 26 extending

from a substantially equally spaced distance from the bottom of the plate to the upper edge thereof. A top plate 27 extends across the upper edge of each side plate and is fixed thereto, as by bolt members 28. A pair of bearing blocks 30 and 31, 32 and 33, and 34 and 35 are mounted for floating up and down movement in each of the slots 24, 25 and 26, respectively. The extent of up and down movement is limited by the lower end of the slot and by the top plate 27.

Each bearing block in one side wall plate is adapted to provide a journal for rotatably mounting a shaft, the opposite end portion of which is similarly rotatably supported in corresponding bearing blocks in the opposite side wall plate member. For example, horizontally disposed shaft 40 is rotatably journaled in blocks 30 while shaft 41 is rotatably mounted in blocks 31, shaft 42 in blocks 32, shaft 43 in blocks 33, shaft 44 in blocks 34, and shaft 45 in blocks 35.

Bearing blocks 30 and 31 and blocks 34 and 35 are provided with recesses 46 and 47 in substantially the same position in their adjacent upper and lower walls, respectively, for seating coil springs 48 and 49 therebetween which constantly urge the blocks in a direction away from each other when in normal position of use. Heavy coil springs 50 and 51 are arranged so that their lower ends bear upon the upper walls of the upper blocks 31 and 35, respectively, while the other ends seat about a post 52 depending from a disc member 53 of larger diameter than the spring. The disc member is fixed to the lower end portion of a bolt 54 that threadably engages a threaded opening through the top plate 27 so as to permit vertical adjustment of the bolt member relative thereto responsive to turning movement. A bolt head 55 is provided to permit convenient turning movement of the bolt member with a suitable tool and a hold-down nut 61 is provided above the top plate to secure the parts in position of adjustment by tightening the nut 61 down upon the plate 27.

The intermediate pair of blocks 32 and 33 are provided with similar recesses 56 and 57 in their respective top and bottom walls and are additionally provided with posts 58 more effectively to seat a heavy coil spring 59 therebetween which urges the blocks and the shafts journaled therein in the direction away from each other. The top wall of the upper block is engaged directly by the lower end of an elongate bolt member 60 to regulate the distance of separation between the blocks 32 and 33. As previously pointed out, nut members 61 may be provided in threaded engagement with the bolt 60 to fix the bolt in adjusted position when turned down tightly upon the top plate.

Cylindrical sleeve members formed of metal, hard rubber, plastic or the like, or other substantially rigid material are fixed to or else are formed to be an integral part of the shaft portions disposed between the side plates 22 and 23 to form rollers 62, 63, 64, 65, 66 and 67. The center pair of rollers 64 and 65 are formed of larger diameter than the others and are provided with outer jackets 68 and 69 of rubber or absorbent material. The lower portion of the lower roller 68 is partially submerged in a lubricating bath 70 contained in a pan 71 located beneath the roller system. Lubricant is transmitted from the lower roller to the upper roller 69 when rotating without a plate 15 therebetween to precondition the rollers for application of lubricant onto both surfaces of the plate 15 as it passes therebetween.

The end rollers are free of the bath and in order to align the bite of the rollers with that of the center pair of lubricating rollers so as to permit the sheet 15 to be advanced in a unidirectional path therebetween, the centers of the shafts 40 and 41, and 44 and 45 are spaced farther from the top and bottom of the side plates so as to have a lesser spaced relation therebetween. Spaced blocks 72 and 73 are positioned in the lower end portions of the respective slots 24 and 26 to determine the proper position for the blocks. The roller assembly is enclosed within a cover plate 74 to prevent access to the rollers and to minimize spray of lubricant into the outside atmosphere.

The rollers are driven from a power source in the form of an electric motor 76 having a driving stub shaft 77 which mounts a sprocket 78. A chain 79 operatively connects the sprocket 78 with another sprocket 80 keyed to the end portion of shaft 44 which extends beyond the side plate member 23. The pair of spur gears 81 and 82 in meshing relation causes rollers 66 and 67 formed on shafts 44 and 45 to turn at substantially the same peripheral speed but in opposite direction. Another chain 83 operates between sprocket 84 keyed to shaft 44 and sprocket 85 keyed to shaft 40 whereby shaft 40 is caused to turn in the same direction and at substantially the same speed as shaft 44. Spur gears 86 and 87 in meshing relation and mounted on the end portions of shafts 40 and 41, respectively, cause the rollers on these two shafts to turn at substantially the same peripheral speed but in opposite directions. A third chain 88 operatively connects a small sprocket 89 keyed to shaft 40 with a considerably larger sprocket 90 keyed to shaft 32 to cause the latter shaft to turn in the same direction as shaft 30 but at a rate calculated to cause the respective cylindrical sections to turn at substantially the same peripheral speed. Meshing spur gears 91 and 92 fixed to the ends of the shafts 42 and 43 which extend beyond the side plate member 23 cause the shafts and rollers positioned thereon to rotate in opposite directions but at the same peripheral speed.

It will be evident from this description that rollers 62 and 63 will be constantly urged in the direction towards each other in accordance with the adjustment of coil spring 50 by adjusting bolt 54 calculated to effect a frictional grip on the leading edge of the plate 15 as it is advanced into the bite. Lubricating rollers 64 and 65 are constantly urged by spring member 59 in spaced apart relation determined by adjustment by bolt member 60 in an amount calculated to engage the top and bottom surfaces of the plate as it passes therebetween for the purpose of applying lubricating or coating composition thereto. The distance between rollers 64 and 65 with respect to the thickness of the sheet 15 passed therebetween substantially predetermines the amount of lubricating material which may be applied. Cooperating rollers 62 and 63 operate to advance the sheet in one direction through the first feed section and the pair of rollers 66 and 67 are adapted to grip the leading edge of the sheet being fed before the trailing edge has passed through the pair of rollers 62 and 63 so as to maintain a positive grip at all times upon the sheet being fed. It will be further evident that the pair of rollers 66 and 67 will also function in addition to wipe off excess lubricant or treating material from the surface of the sheet.

The second feed section B, located in advance

of the first but in alignment therewith, comprises a pair of laterally spaced, horizontally disposed rail members 100 and 101 supported on top of a suitable platform. The top surface of the rails are adapted to be substantially on the same level as the top wall of the female mold member 14 and are generally positioned just below the level of the bite between the cooperating pairs of rollers in the first feed section. The sheet being fed drops down onto the rails 100 and 101 and is adapted to be advanced along the rails into molding relation between the mold dies by a reciprocable pusher mechanism in the form of a pusher rod 102 having two or more upright fingers 103 and 104. The upper walls of the fingers are inclined downwardly and forwardly so that engagement with the trailing edge of the sheet dropped from the first feed section will cause deflection of the sheet in a forwardly direction into full engagement with the surface of the rails 100 and 101. The sloping portion extends forwardly beyond the front wall 105 of the finger to provide a ledge 106 which prevents inadvertent disengagement with the trailing edge of the sheet as it is engaged by the pusher rod and advanced in feeding relation.

The pusher mechanism is operated in feeding relation and return by a fluid operated piston and cylinder assembly 107 having a fluid inlet 108 in the rearward end portion in communication with a master valve 109 by which the inlet is selectively connected to a fluid pressure source or exhaust. Another inlet 110 is provided in the forward end portion of the cylinder and is connected by conduit 111 to the master valve 109 for the purpose of selectively communicating the inlet with the pressure fluid source to which conduit 112 leads or the exhaust 113. A regulator valve 114 is provided in the conduit 115 leading to the first inlet end of the cylinder 116 and a pressure gauge 117 is provided to measure same. Finger valve 118 is arranged between the source of pressure fluid and the master valve 109 for the purpose of manually communicating the inlet 108 with the pressure fluid source whereby the pusher arm 102 connected by rod 119 is actuated in a forwardly direction by the piston within the cylinder. Another finger operated valve 120 is provided for the purpose of causing return movement of the pusher rod 102 by manual adjustment.

For regulating the sequence of operation in timed relation with the movement of the various elements, a bracket 121 is secured to the edge portion of the upper platen 12 having a laterally extending plate 122 pivoted to the upper end thereof. An air valve member 123 having a trip finger 124 is fixed to extend laterally from the lower portion of the side frame 13 into the path of the portion of plate 122 which extends laterally beyond the bracket. The pivoted plate 122 passes over the trip without effecting movement thereof as the platen 12 travels in a downwardly direction in a molding relation but trips the finger 124 during the return stroke. This adjusts the pilot valve 109 to communicate inlet 108 with the pressure fluid source and inlet 110 with the exhaust so that the pusher rod is advanced.

A pilot button valve 125 is fixed to the front wall of the press in position to be engaged and tripped by the laterally extending end portion 126 of the arm 102, or a button attached thereto, when the pusher arm reaches its forwardly most position of adjustment. Actuation of the button valve 125 upon contact with the pusher arm portion 126 has the same effect as opening valve 120 in that the pilot valve 109 communicates inlet 110 with the fluid pressure source and inlet 108 with the exhaust whereby the pusher arm is caused to return immediately to its normal position of adjustment.

A limit switch 127 having a rocking trip finger 128 for regulating energization and deenergization of the electric motor 76 is located in the path of the pusher arm 102 so that the switch finger 128 will normally be urged forwardly into the path of the pusher arm 102 when the arm is out of position but will be deflected downwardly or depressed upon engagement with the pusher arm 102 as it returns to normal position.

When switch arm 128 is in its forwardly position, as when the pusher arm 102 is out of its normal position during operation, the motor 76 becomes deenergized and rotational movement of the feed rollers is stopped. When the pusher arm 102 returns to its normal position, the switch arm 128 is deflected rearwardly and the driving motor 76 becomes operative once more for turning the pairs of feed rollers in the first feed section in feeding relation.

In operation, the pusher arm 102 is in its normal rearward position of adjustment where it is able to receive a sheet 15 upon delivery from the first feed section A. When in this position, the switch arm 128 is in depressed position, enabling the motor 76 to be energized for turning the feeding rollers of the first feed section. During such operation, the lower of the lubricating cylinders 64 becomes covered with lubricant and transmits a portion thereof to the periphery of the upper roller 65.

The operator causes a sheet 15 to be advanced along a feed table into the bite of the first pair of rollers 62 and 63 which are adjustably tensioned in the direction towards each other to develop sufficient force for gripping the sheet therebetween and feeding it forward to between the center coating rollers 64 and 65. The coating rollers are adjusted, as previously pointed out, by bolt member 60, to permit travel of the sheet 15 therebetween with sufficient clearance to permit application of a uniform calibrated film of lubricant onto both surfaces.

The first pair of feed rollers are adapted to maintain a gripping relation with the sheet 15 at least until the rearward pair of feed rollers 66 and 67 establish a gripping relation with the leading edge thereof and which operate in cooperation with the rollers 62 and 63 or independently thereof for advancing the sheet 15 through the first feed section and into the second feed section.

In the event that the trailing edge portion of the sheet 15 fails to clear the fingers 103 and 104, the sloped upper wall 105 deflects the sheet in the forwardly direction so that the sheet may come into full resting relation on top of the rails 100 and 101. Thus the sheet is lubricated on both surfaces and advanced for feeding into molding relation between the mold dies by the second feed section B.

As the upper platen 12 completes its molding operation and rises to its upper position of adjustment, the plate 122 trips finger 124 which operates on the master valve 109 to communicate the inlet 108 with the fluid pressure source and the inlet 110 with the exhaust so that fluid under pressure, such as air, will cause actuation of the piston in the forwardly direction. This conjointly causes the pusher arm 102 to be advanced in the forwardly direction whereby the sheet located

on the rails 100 and 101 and below the ledge 106 of the fingers 103 and 104 is slid along the rails into proper position between the mold dies.

When the pusher arm reaches its forward position of adjustment, the end portion 126 actuates the button pilot valve 125 which operates upon master valve 109 to communicate inlet 110 with the fluid pressure source and inlet 108 with the exhaust so that the piston and the pusher arm 102 are automatically returned to their original, normal position of adjustment.

When the pusher arm 102 starts its forwardly feeding movement and until it returns to starting position, the trip arm 128 is caused to shift forwardly whereby the driving motor 76 is deenergized so that the unidirectionally feeding rollers of the first feed section are inactivated. This prevents sheets from being advanced from the first feed section while the pusher arm 102 of the second feed section is out of position. In the event that the motor were allowed to continue to operate while the pusher arm was out of position, it would be possible to feed the subsequent sheet onto the rails while the pusher arm 102 was in advanced position whereby the mechanism would become jammed upon return movement of the pusher arm 102 to its normal position of adjustment.

It will be apparent from this description that I have provided a sheet feeding system particularly adapted for advancing sheet metal stock to the bed of a fabricating unit. The sheet feeding system embodies features adapted to advance the sheet into position for molding in timed relation with the operation of the press, the feed system being divided into a first feed section which also applies a lubricant to the surfaces of the metal sheet and a second feed section adapted quickly to advance the sheet between the mold dies and return so as to provide a more efficient feeding relation. It will be apparent from the description that the efficiency of the unit will not be affected by the slower feed of the first feed section since the operating cycle of the processing unit is a controlling factor but that the second feed section adapted to operate in timed relation therewith provides for rapid movement to make most efficient use of time.

The mechanism embodying features of this invention provides for a sequence of operations which militate against possibility of jamming the equipment and for safety features which minimize harm to operator or equipment.

It will be understood that numerous changes may be made in the details of construction and operation without departing from the spirit of the invention, especially as defined in the following claims.

I claim:

1. Sheet feeding mechanism for advancing a sheet to a processing unit comprising the combination of a sheet processing unit, a first sheet feed section and an aligned second sheet feed section to advance a sheet in stepwise fashion by the first feed section to the second feed section and then by the second feed section to the sheet processing unit, unidirectionally rotatable roller means including means for applying a lubricant for the metal sheets onto the rollers for advancing the sheet in said first feed section and coating the surface of the rollers with lubricant, reciprocable pusher means for advancing the sheet by said second feed section, and means responsive to the operation of said sheet processing unit and reciprocable pusher means for rendering

said roller feed means in the first feed section inoperative during operation of the reciprocating pusher feed means while the reciprocal pushed feed means is out of normal position for receiving a sheet fed thereto and for rendering said reciprocable pusher feed means operative to advance the sheet in feeding relation upon substantial completion of the cycle of operations of the sheet processing unit.

2. Sheet feeding mechanism for advancing a sheet to a processing unit comprising the combination of a sheet processing unit, a first sheet feed section and an aligned second feed section spaced in advance of and below said first feed section for advancing a sheet in stepwise fashion by the first feed section to the second feed section and subsequently by the second feed section in feeding relation to the processing unit, unidirectionally rotatable roller feed means including means for applying a lubricant for the metal sheets onto the rollers for advancing the sheet in said first feed section and coating the surface of the rollers with lubricant, reciprocable pusher means for advancing the sheet in said second feed section including a pusher arm reciprocable between advanced and normal position of adjustment, laterally spaced guide rails over which said pusher arms cause the sheet to be slid during feeding movement, a fluid operated piston and cylinder assembly, and an operative connection between said fluid operated piston and cylinder assembly and said pusher arm for actuating said arm between advanced and normal positions of adjustment, and means responsive to the operation of the processing unit and the reciprocable pusher means for controlling the sequence of operations whereby the roller feed means of the first feed section remains operative while the reciprocable pusher means is in normal position and inoperative when out of position and whereby the piston and cylinder assembly operates to advance the reciprocable pusher means responsive to substantial completion of the cycle of operations of the processing unit.

3. Sheet feeding mechanism as claimed in claim 2 in which the pusher arm comprises a cross arm having two or more spaced upright fingers formed with an inclined top wall and a hooked end in the upper portion of their forward walls whereby the trailing edge of the sheet as it drops onto the second feed section is deflected forwardly upon engagement therewith and is prevented from rising beyond the fingers during advancing movement.

4. Sheet feeding mechanism as claimed in claim 2 in which an electric motor drives the unidirectional roller means of the first feed section and the means for controlling the operation of said electric motor responsive to operation of said reciprocable pusher means comprises a switch member constantly urged to extend into the path of the pusher arm when in normal position whereby the electric motor is deenergized during operational movement of said pusher arm when said switch arm is out of engagement with said pusher arm and capable of energization when rocked upon engagement with the pusher arm in normal position of adjustment.

5. Sheet feeding mechanism as claimed in claim 2 in which the first feed section includes the unidirectionally rotatable roller sheet means and also includes a bath of lubricant in contacting relation with one of the rollers of said means whereby the surfaces of the sheet are provided

with a coating of lubricant as it is advanced by the rollers in feeding relation.

6. Sheet feeding mechanism as claimed in claim 2 in which the unidirectionally rotatable roller feed means of the first feed section comprises cooperating pairs of rollers positioned to have an aligned bite, the first and last pairs of rollers gripping the sheet therebetween in feeding relation as it is advanced toward the second feed section, a bath of lubricant beneath the feed rollers positioned to be out of contact with the first and last pairs but in which one of the rollers of an intermediate pair is partially submerged therein to apply a coating of lubricant onto the surfaces of the sheet as it is advanced by the roller feed to the second feed section.

7. Sheet feeding mechanism as claimed in claim 6 in which vertically floating bearing blocks mount the pairs of rollers in the roller feed system, means for determining the lower-most position of the bottom bearing blocks, spring means constantly urging the blocks in a direction away from each other, resilient means urging the upper-most blocks in the end pairs of rollers in the downward direction, and means for adjusting the tension of the resilient means.

8. Sheet feeding mechanism as claimed in claim 7 in which means are provided for adjusting the upper limit position of the upper block in intermediate pairs of rollers.

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