Nov. 27, 1945. N. M. OLNEY 2,389,738

ARTICLE FORMING MACHINE

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FIG. 1

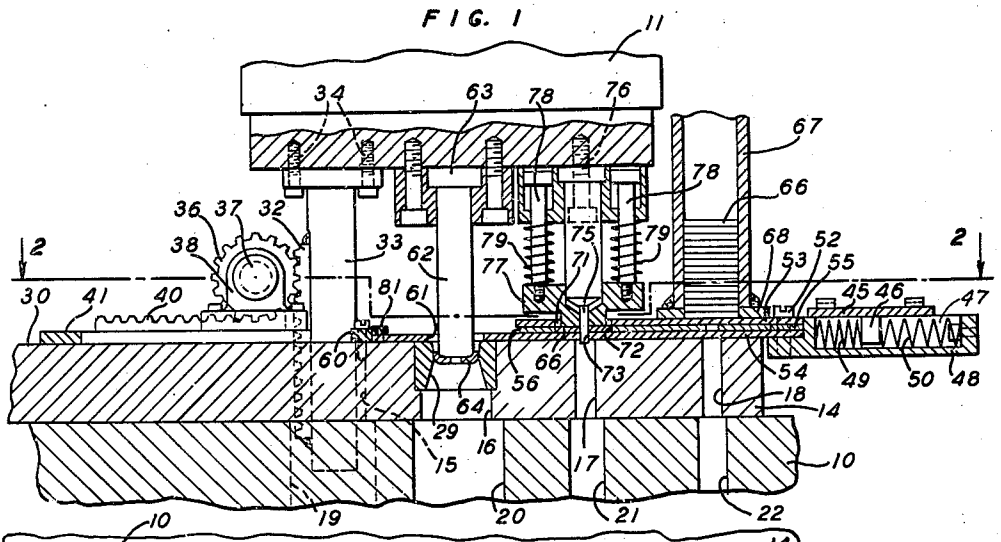


FIG. 2

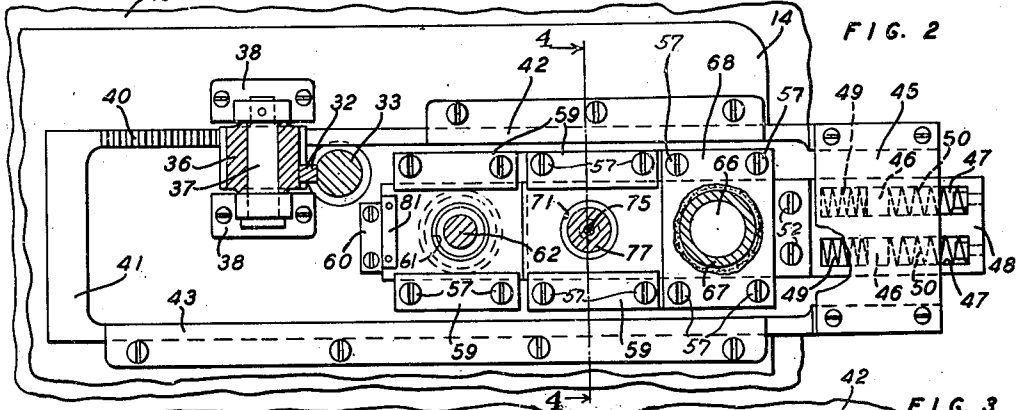
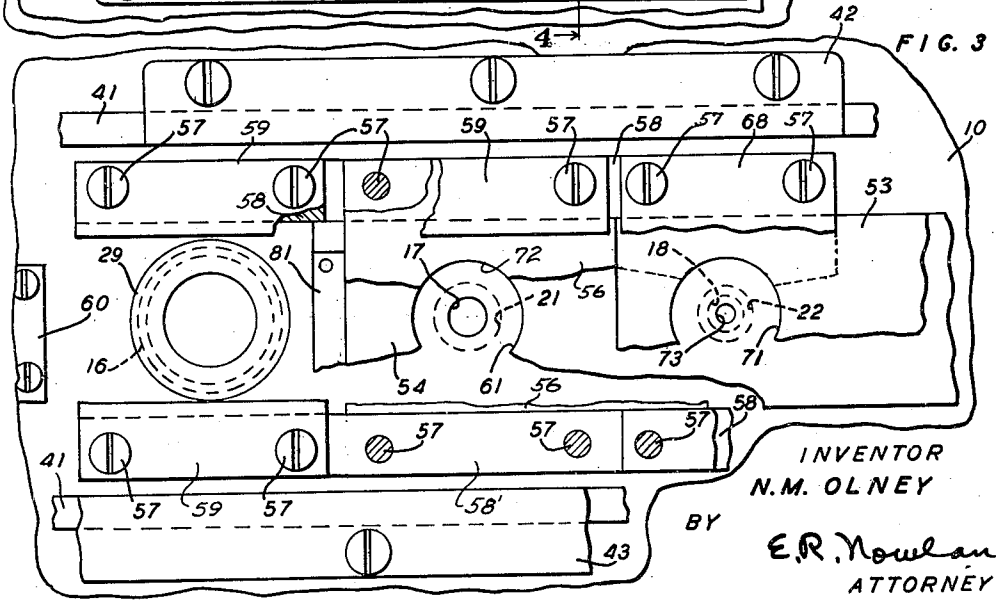


FIG. 3



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FIG. 5

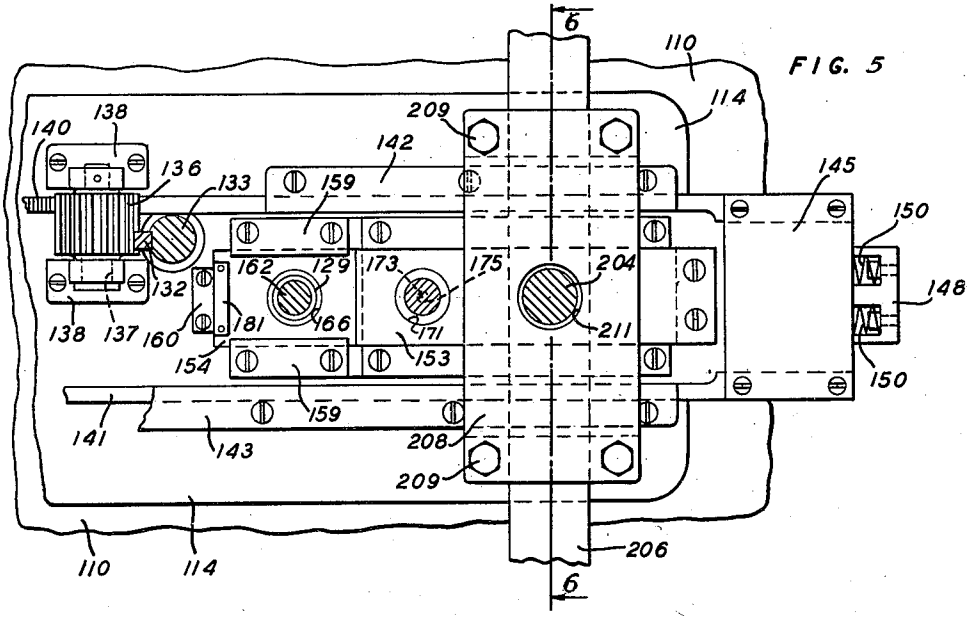


FIG. 6

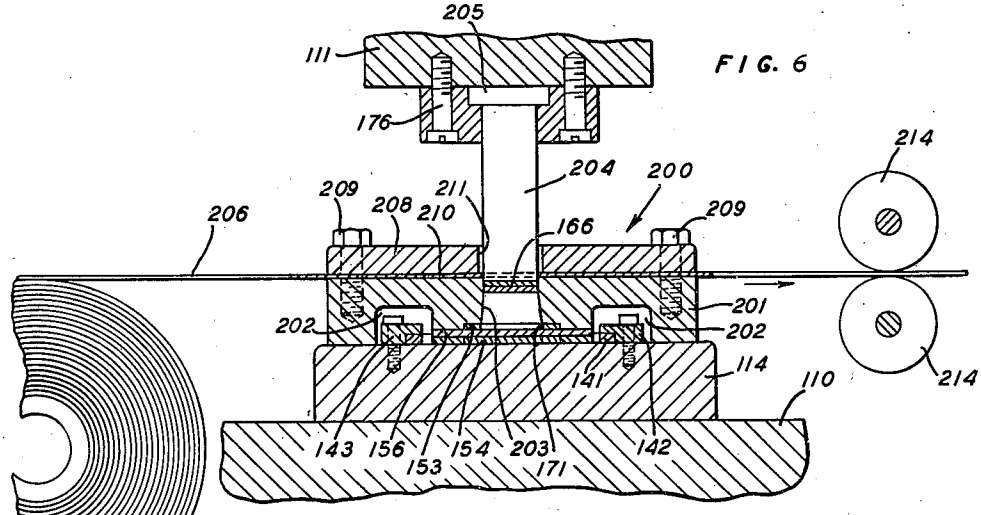
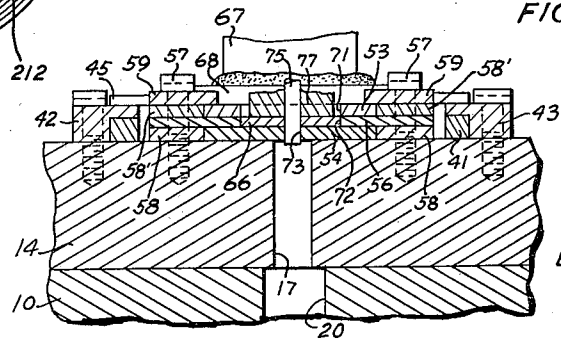


FIG. 4



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ARTICLE FORMING MACHINE

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FIG. 7

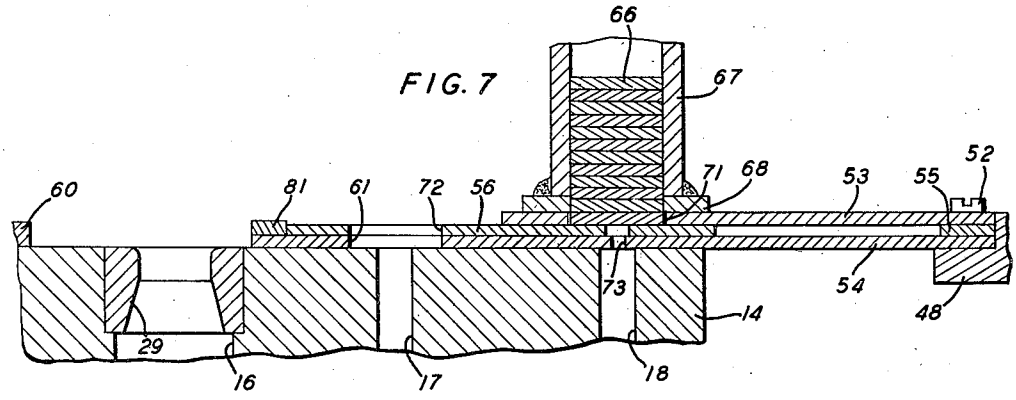


FIG. 8

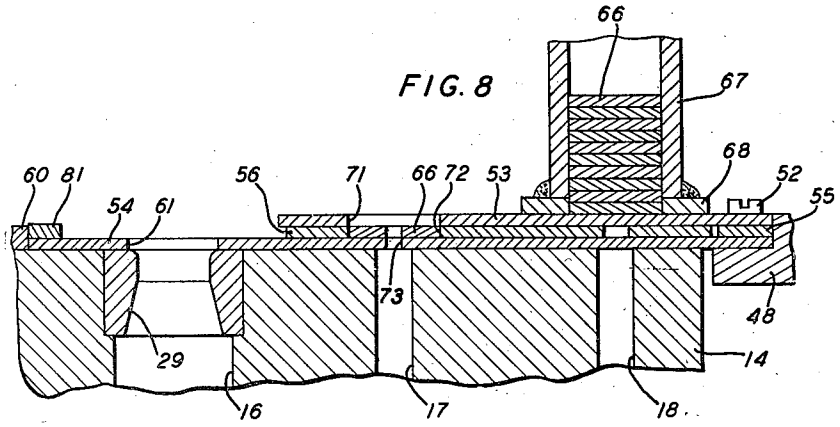
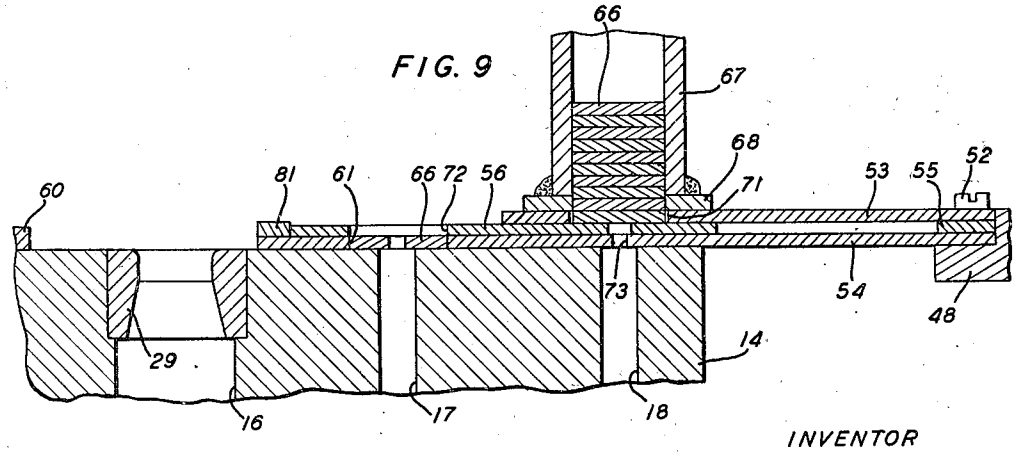


FIG. 9



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2,389,738

UNITED STATES PATENT OFFICE

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ARTICLE FORMING MACHINE

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Application April 9, 1943, Serial No. 482,364

6 Claims. (Cl. 113—42)

This invention relates to article forming machines, and more particularly to machines for performing a plurality of successive operations on materials to form articles therefrom.

The speed of production and the cost of manufacture of articles depend greatly upon the necessary handling of the articles from the original material, of which the articles are to be formed, to the completion of the final step in the forming process. The elimination of the intermediate handling steps between the forming steps during such manufacturing processes increases the speed of production and decreases the cost of manufacture of the article.

An object of the invention is to provide a simple, efficient and highly practical article forming machine capable of performing successive operations upon material and intermittently feeding the material from one operating position to another.

With this and other objects in view, the invention comprises an article forming machine having sets of relatively movable forming tools adapted for forming successive operations upon material in the forming of an article and a unit operable to feed material successively to the sets of tools.

Other objects and advantages will be apparent from the following detailed description when considered in conjunction with the accompanying drawings, wherein

Fig. 1 is a vertical sectional view of one species of invention;

Fig. 2 is a horizontal sectional view taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is an enlarged fragmentary top plan view of the lower half of the machine, portions thereof being broken away;

Fig. 4 is an enlarged fragmentahy sectional view taken along the line 4—4 of Fig. 2;

Fig. 5 is a fragmentary horizontal sectional view similar to Fig. 2 but of another species of the invention;

Fig. 6 is a fragmentary sectional view taken along the line 6—6 of Fig. 4, and

Figs. 7, 8 and 9 are enlarged fragmentary sectional views of a portion of the structure shown in Fig. 1 illustrating various positions of the feeding mechanism.

Referring now to the drawings, attention is first directed to Figs. 1 to 3 inclusive, which illustrate the essential features of the invention, other parts of the macihne being similar to commercially known punch and die machines. For example, a base 10 may be of the well known type and a ram 11 may be reciprocated relative to the base through any suitable power means (not shown).

Upon the base 10 is mounted a die plate 14, with apertures 15, 16, 17 and 18 therein in alignment with similar apertures 19, 20, 21 and 22 of the base. A forming die 29, of the contour shown, is nested in an enlarged portion of the aperture 16 and has its upper surface lying flush with a surface 30 of the die plate 14. The apertures 15 and 19 are formed to receive a rack 32 which is mounted upon a member 33 fixed to the ram 11 as at 34. The rack 32 interengages a pinion 36 pivotally supported at 37 in brackets 38 mounted upon the die plate 14. The pinion 36 also interengages a rask 40 of a reciprocable feeding frame 41.

The feeding frame 41 is rectangular in general contour, the side members thereof movable beneath guides 42 and 43 to control the movement of the frame upon the surface 30 of the die plate in a given path. At the right end of the frame, a plate 45 completes the structure of the frame and has fixed thereto, or formed integral therewith, downwardly projecting lugs 46, disposed in spring retaining pockets 47 of a member 48. The pockets 47 are disposed in parallel spaced positions in the member 48, as is illustrated in Fig. 2, these pockets having sets of springs 49 and 50 respectively functioning during the movement of the frame to the left and to the right.

The member 48 is fixed, as at 52, to parallel reciprocable members 53 and 54 positioned a given distance from each other by a spacing member 55. A fixed member 56 is interposed between the members 53 and 54, spaced the desired distance from the surface 30 of the die plate 14 and secured in place by suitable means such as screws 57. In other words, the member 56 together with lower spacing members 58 and the surface 30 of the die plate 14, provide a passageway for the reciprocable movement of the member 54 (Fig. 4). The member 53 in its reciprocable movement, rides upon the upper surface of the stationary or fixed member 56, the edges of the member 53 being disposed between upper spacing members 58' and guides 59 disposed upon each side thereof and secured in place by the screws 57.

In Figs. 1 and 2 the machine is shown at the center of its operating cycle, with the sets of tools completing their punching and forming steps or operations. Thus the members 53 and 54 are illustrated in their innermost positions,

that is their farthest positions to the left, where the member 54 is limited in its movement by a stop 60. At this position an aperture 61 in the member 54 is in central alignment with the die 29 and also with a forming tool or punch 62 carried by the ram 11, as at 63, and cooperating with the die 29 to complete the forming of an article 64.

The article 64 in this embodiment is formed from blanks 66 of material disposed in stacked formation in a hopper 67. The hopper 67 is mounted or formed integral with a plate 68 which extends over the reciprocable member 53. The plate 68, at this position, takes the place of a set of guides 59 and is secured in place over the adjacent set of upper spacing members 58' by the screws 57. The reciprocable member 53 is apertured, at 71, to receive the blanks 66 singly from the hopper 67 when the aperture is disposed in alignment therewith, which occurs when the frame 41 has been moved to its loading position at the extreme right, as suggested in Fig. 3. The stationary member 56 is apertured, at 72, to receive the blanks singly from the aperture 71 when the latter is disposed in the operating position shown in Figs. 1 and 2. A centrally aligned die aperture 73 in the member 54 functions as a perforating die backed up by the die plate 14 at the aperture 17 (Figs. 1 and 4). A punch 75, positioned to cooperate with the die aperture 73 in the member 54 when in the position shown is supported by the ram 11 as indicated at 76. A holding element 77, cooperating with the punch 75, supported by rods 78 and assisted by springs 79, functions to hold the blank 66 in position during the punching operation.

Upon considering now the operation of this embodiment of the invention, let it be understood that the hopper 67 is supplied with blank 66 and that the ram 11 is reciprocated repeatedly through its operating cycles. Briefly, the feeding mechanism including the reciprocable members 53 and 54 has a starting position shown in Fig. 7 where the lowermost blank 66 from the hopper 67 enters the aperture 71 of the member 53. Movement of the members to the left (Fig. 8) transfers the first blank to the aperture 72 in the stationary member 56, the blank riding on the stationary member until it reaches the aperture. During the next movement of the members 53 and 54 to the right, the first blank remains in the aperture 72 resting on the member 54 until the aperture 71 again registers with the hopper 67 to receive the second blank, at which time the aperture 61 registers with the aperture 72 to receive the first blank (Fig. 9). When the members 53 and 54 are again moved to the left (Fig. 1) the first blank is fed to the die 29 in the aperture 61 and the second blank is fed to the aperture 72 in the aperture 71. Considering the machine in the closed position shown in Figs. 1 and 2, it will be understood that the next movement of the ram will move the tools 62 and 75 out of their dies to free the members 53 and 54 for movement to the right. The holding element 77, through the force of its spring 79, will hold the members 53 and 54 against such movement until the tools 62 and 75 have been moved free of the members. It is apparent that during this time the rack 40 on the frame 41, through the actuation of the pinion 36 by the rack 32, will move the frame to the right. Such movement of the frame relative to the reciprocable members 53 and 54 is permitted through the springs 50. However, as soon as the holding member 77 releases its holding force, the force created in the springs 50 together with the continued driving force between the pinion 36 and racks 32 and 40, will cause movement of the reciprocable members to the right limited by a stop 81 carried by the end of the member 54 and positioned to engage the left edge of the stationary member 56 (Fig. 3). At this time the aperture 71 is positioned beneath the hopper 67, to receive the lowermost blank 66 therefrom, and the aperture 61 is disposed beneath the aperture 72 in the member 56 to receive the article or perforated blank at this station. The thickness of the members 53 and 54 is approximately the same as the thickness of the blanks, and the apertures 71, 72 and 61 together with the blanks are of approximately the same diameters.

With the perforated blank shown in Fig. 1 now in the aperture 61 and with a new blank in the aperture 71, the apparatus is in readiness for the beginning of the next cycle of operation. First, the frame 41 is moved to the left, moving the perforated blank with the member 54 in the aperture 61 to a position, controlled by the stop 60, in central alignment with the die 29 and punch 62 and simultaneously feeding the new blank through the movement of the member 53 to a position where this blank will drop into the aperture 72. This takes place through a portion of the movement of the ram 11 to cause movement of the rack 32, pinion 36, rack 40 and the frame 41. There will be continued movement of the ram 11 and the parts supported thereby, for example the member 33, the tool 62 and the punch 75. The holding member 77 comes to rest upon the new blank 66 prior to the perforation of the blank through the cooperation of the punch 75 and die 73. During this portion of the ram's movement the tool 62 cooperating with the die 29 forms the perforated blank into an article. The continued movement of the rack 32 and its associated driving means will continue movement of the frame 41 against the force of the spring 49, but will not effect further movement of the associated members 53 and 54.

It will thus be apparent that as long as blanks are supplied to the hopper 67, the machine may automatically operate through repeated cycles to advance a blank from the hopper to the perforating station and simultaneously advance a perforated blank from this station to the final forming station, after which the advanced blanks will be operated upon simultaneously. Furthermore, the additional movements required for the blanking and forming operations are absorbed by springs 49 and 50.

Attention is now directed to the embodiment of the invention illustrated in Figs. 5 and 6. This structure is identical with that shown in Figs. 1 to 4 inclusive, with the exception of the hopper, a blanking punch and die unit being substituted in this embodiment for the hopper. To avoid repetition in the description of the various parts of this structure, reference numerals the same as those applied to the structure shown in Figs. 1 to 3 inclusive and 7 to 9 inclusive plus 100 are applied to the identical parts in Figs. 5 and 6.

To continue with the distinguishing feature in this embodiment, a die unit, indicated generally at 200, has a member 201 mounted upon the die plate 114 and grooved, as at 202, to allow for the members 153, 154 and 156 and guides 142 and 143. A die cavity 203 cooperates with a blanking punch 204 mounted upon the ram 111, as at 205,

to cut blanks 166 from a material 206. A member 208 mounted upon the member 201, as at 209, cooperates with the member 201 to provide a passageway 210 for the material 206, and has an aperture 211 therein through which the punch 204 may pass. The material 206 may be drawn from a supply 212 through the aid of intermittently driven rollers 214, the driving means for the latter not being shown.

In this embodiment with a clear understanding of the operation of the embodiment shown in Figs. 1 to 4 inclusive, it will be apparent that through intermittent advancement of the material 206 by the rollers 214, and the repeated operation of the blanking punch and die, blanks 166 may be formed, that is blanked from the material, and caused to drop into the aperture 171 of the member 153. In this manner the blanks 166 are punched out of the material during the perforating of a similar blank at the next station 173—175 and the forming of a perforated blank at the final station 129—162. In other words, in this embodiment the cutting of the blanks from the material is added to the other operations of the machine.

Although specific improvements of the invention have been shown and described, it will be understood that they are but illustrative and that various modifications may be made therein without departing from the scope and spirit of this invention as defined by the appended claims.

What is claimed is:

1. An article forming machine comprising a punch and a forming tool each movable through an operating cycle, a die for the forming tool, a movable element having a portion formed to serve as a die for the punch to partially form an article from a part and another portion formed to move the partially formed article to the said die for the forming tool for further formation of the article, and means operable to move the element.

2. An article forming machine comprising a punch and a forming tool each movable through an operating cycle, a die for the forming tool, a movable element having a portion formed to serve as a die for the punch to partially form an article from a part and another portion formed to move the partially formed article to the said die for the forming tool for further formation of the article, means operable to move the element and means to feed the part of the element.

3. An article forming machine comprising a punch and a forming tool each movable through an operating cycle, a die for the forming tool, a reciprocable element having a die portion cooperating with the punch to partially form an article of a part and a portion adapted to move the partially formed article from its position adjacent the punch to the said die for the forming tool, means to cause the partially formed article to be transferred from the die portion of the element to the other portion thereof, and means to reciprocate the element.

4. An article forming machine comprising a punch and a forming tool each movable through an operating cycle, a die for the forming tool, a reciprocable element having a die portion cooperating with the punch to partially form an article of a part and a portion adapted to move the partially formed article from its position adjacent the punch to the said die for the forming tool, means to cause the partially formed article to be transferred from the die portion of the element to the other portion thereof and means to reciprocate the element at predetermined intervals during the operating cycles of the punch and forming tool.

5. An article forming machine comprising a punch and a forming tool each movable through an operating cycle, a die for the forming tool, a reciprocable element having a die portion cooperating with the punch to partially form an article of a part and a portion adapted to move the partially formed article from its position adjacent the punch to the said die for the forming tool, means to cause the partially formed article to be transferred from the die portion of the element to the other portion thereof, means to reciprocate the element, means to feed parts singly to the element at the punch, and means to hold the part at the punch during the partial forming of the article.

6. An article forming machine comprising means to supply parts of which articles are to be formed, first and second forming tools spaced from each other and from the supply means, a stationary member formed to receive and hold a part for the first tool, a reciprocable element adapted to move a part from the supply means to the member, and another element reciprocable with the first reciprocable element having a die portion for cooperation with the first tool to partially form the part and an aperture adapted to receive the partially formed part from the stationary member and transfer it to the second tool.

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