April 30, 1929. W. T. ABEL 1,711,218

BUTTON FORMING MACHINE

Filed Feb. 2, 1927 3 Sheets-Sheet 1

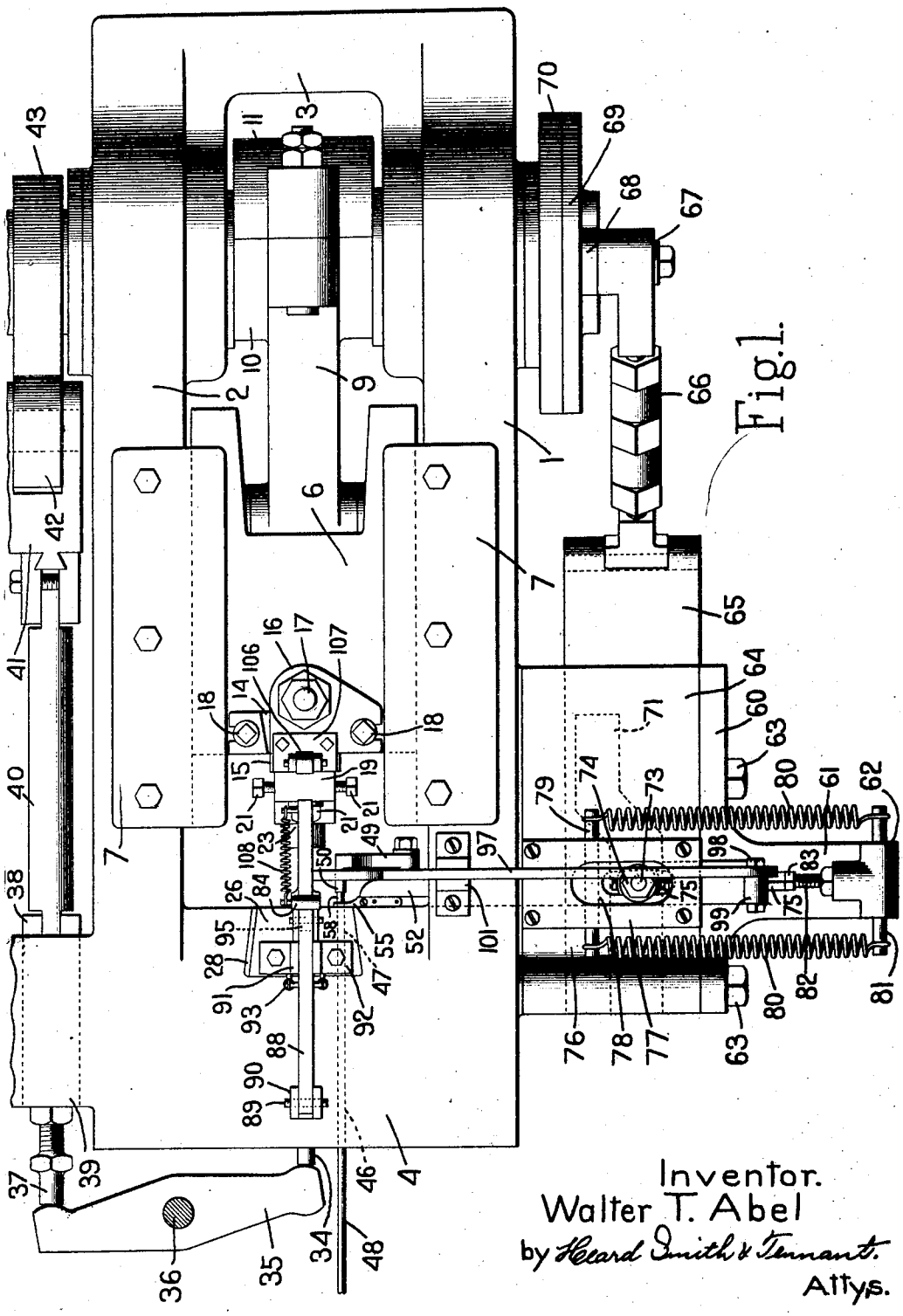


Fig. 1.

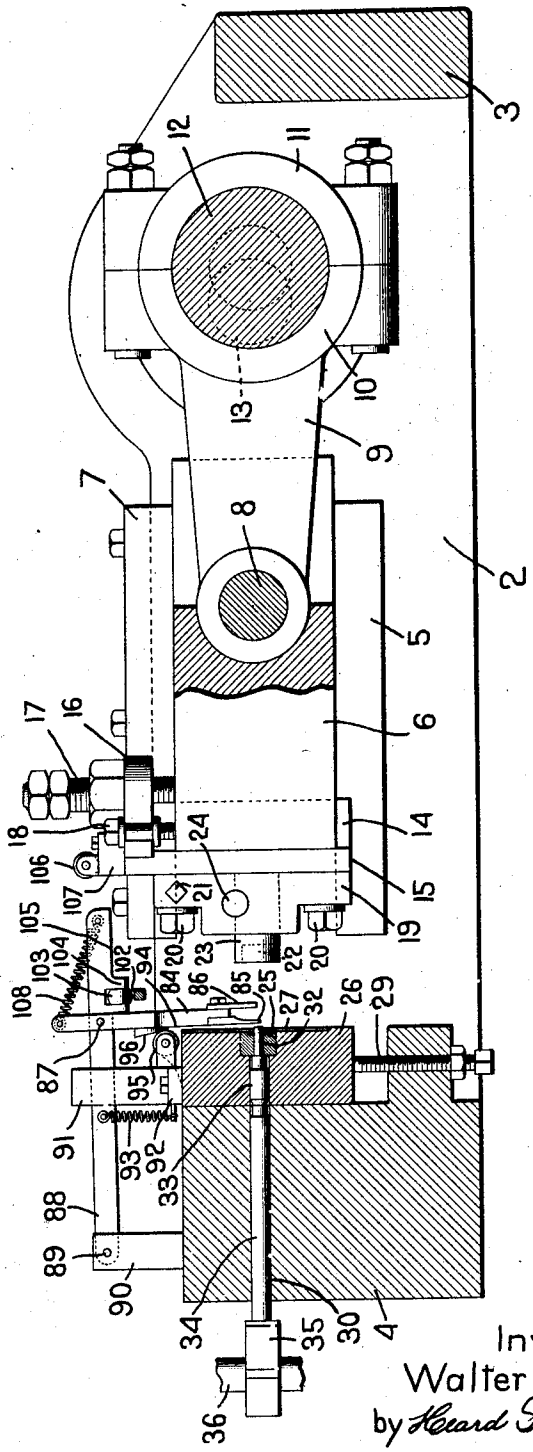
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Filed Feb. 2, 1927 3 Sheets-Sheet 2

Fig.2.



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Filed Feb. 2, 1927 3 Sheets-Sheet 3

Fig. 3.

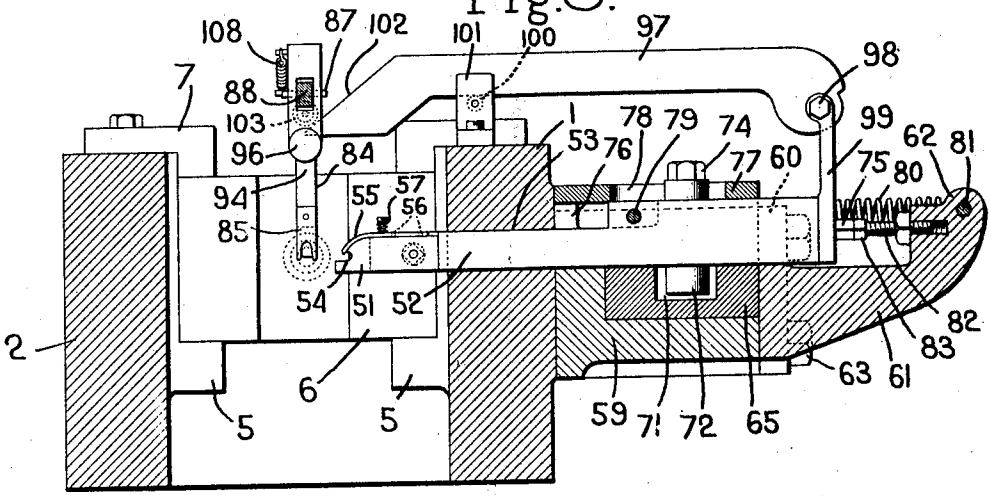


Fig. 4.

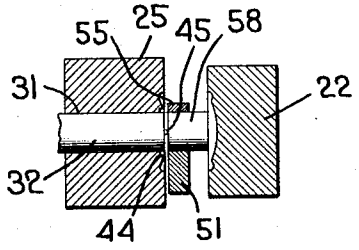


Fig. 5.

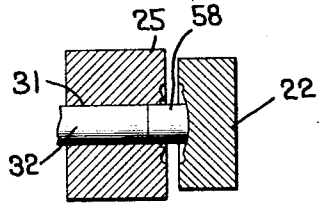


Fig. 6.

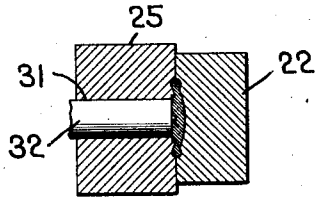
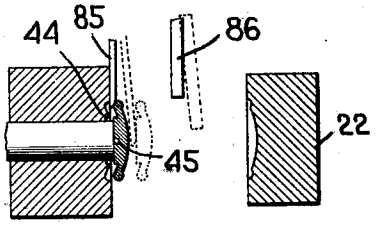


Fig. 7.



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UNITED STATES PATENT OFFICE.

WALTER T. ABEL, OF WATERBURY, CONNECTICUT, ASSIGNOR TO THE PATENT BUTTON COMPANY, OF WATERBURY, CONNECTICUT, A CORPORATION OF CONNECTICUT.

BUTTON-FORMING MACHINE.

Application filed February 2, 1927. Serial No. 165,440.

This invention relates to improvements in machines for forming buttons and like articles by the action of complementary dies, and particularly to machines in which solid articles are swaged from a solid blank of material.

In the operation of such machines considerable difficulty has heretofore been experienced in removing the formed articles from the dies and discharging them properly from the machine.

The present invention relates to novel mechanism for releasing the formed article from the die to which it is caused to adhere and for discharging the same positively from the machine thereby preventing obstruction to, or improper operation of, the machine.

A further object of the invention comprises the provision of means controlled by the action of the feeding mechanism to permit or cause the operation of the article-discharging mechanism.

A further object of the invention is to provide an article-discharging device which may be conveniently adapted to usual types of machines for forming buttons and other articles.

Other objects and features of the invention will more fully appear from the following description and the accompanying drawings and will be particularly pointed out in the claims.

A preferred embodiment of the invention is illustrated in the accompanying drawings as applied to a machine for forming buttons from a blank or slug of solid material, such as aluminum, in which the button is formed between a pair of complementary dies under pressure which causes the metal of the blank or slug to flow and fill the cavities of the dies.

In the drawings:

Fig. 1 is a plan view of a button-forming machine embodying the invention;

Fig. 2 is a view, partly in vertical longitudinal section and partly in elevation, of the machine illustrated in Fig. 1;

Fig. 3 is a detail view, mainly in vertical section, of the mechanism for cutting a blank from a rod and transferring it to the dies, together with the discharging mechanism and the means operable by the blank-feeding mechanism for controlling the actuation of the discharging mechanism;

Fig. 4 is a detail view, mainly in vertical section, illustrating the blank-feeding mechanism presenting a blank to the dies with the dies in substantially the position in which they engage the blank;

Fig. 5 is a detail view, mainly in vertical section, showing the blank after having been engaged by the die and the blank-feeding mechanism withdrawn;

Fig. 6 is a detail view in vertical section showing the dies in closed position with the button formed therebetween; and,

Fig. 7 is a detail view, mainly in vertical section, showing the dies in separated position with a button released from the die and illustrating in full lines the discharging mechanism engaging the button and in dotted lines the position of the button-discharging mechanism and of the button when released from the button-retaining mechanism of the die.

The machine for forming buttons or like articles comprises a heavy main frame of metal of general rectangular form having sides 1 and 2, an integral connecting end 3, and a heavy massive integral end 4 for supporting a die block and one of the complementary dies of the button-forming mechanism. The sides 1 and 2 are provided with inwardly extending flanges or ways 5 upon which a cross head 6 is slidably mounted. Guides 7, bolted to the upper surfaces of the sides 1 and 2, engage the upper face of the cross head and, together with the guides 5, form guideways which insure accurate reciprocation of the cross head. The cross head is recessed at its rear end and a heavy shaft 8 extends across the recess. A pitman 9 is pivotally mounted upon this shaft and at its opposite end is provided with a two-part bearing 10 and 11 which embraces an eccentric 12 upon a main shaft 13 which is journalled in suitable bearings in the sides of the frame.

Suitable means (not shown) are provided for driving the main shaft 13, desirably including a heavy balance wheel to provide sufficient momentum to insure the smooth running of the machine. The button-forming dies are carried respective by the massive end portion 4 of the frame and by the reciprocating cross head 6.

In the particular construction illustrated the front end of the cross head is provided with a dovetail recess which receives a complementary rib 14 upon a die block carrier 15

which is provided at its upper end with a rearward extension 16 which is adjustably mounted upon the cross head by vertical adjusting screws 17 and 18. A die block 19 is secured to the die block support by suitable machine bolts 20 which pass through horizontal slots in the die block. Oppositely disposed adjusting screws 21, seated in the die block 19 and engaging the bolts 20, serve to permit lateral adjustment of the die block. By reason of the vertical adjustability of the die block support and the lateral adjustability of the die block the die can be accurately positioned. The die 22 is secured in a preferably cylindrical die block holder 23 which is seated in a cylindrical recess in the die block 19 and is held therein by a transverse pin 24 which is seated in a recess in the die block and a semi-cylindrical recess in the die block holder 23.

A complementary die 25 is seated in a suitable recess in a die block 26 which desirably has a slightly countersunk face 27. The die block 26 is seated in a dovetail groove in the massive end 4 of the frame and a suitable shim 28 may be located in the dovetail groove to prevent any lateral movement of the die block. An adjusting screw 29 seated in a boss located beneath the die block and abutting at its upper end against the die block provides means for vertically adjusting the die block 26 into proper position.

The die block 26 and the massive end 4 of the frame are provided with alined cylindrical apertures 30 and the die is provided with a smaller concentric cylindrical aperture 31. A plunger 32 fits closely in the aperture 31 of the die 25 and is provided with an enlarged portion 33 which slidably fits the aperture in the die block and desirably is of such length that the plunger when forced forward will not project beyond the rear face of the die block so that the die block can be removed from the machine. A plunger rod 34 is reciprocably mounted in the cylindrical aperture 30 in the die block which registers with the cylindrical aperture in which the plunger 33 is mounted. The plunger rod 34 is of such length as to engage at one end the plunger 33 and at its opposite end to engage the end portion of a lever 35 which is pivotally mounted upon a suitable shaft 36 supported in suitable bearings (not shown) beyond the end of the frame, the other end of the lever 35 being engaged by a rod 37 having a screw threaded section which adjustably engages a cross head 38 which is mounted in a lateral extension 39 of the frame. The cross head 38 is connected by a link 40 to a bifurcated head 41 having mounted therein a follower roll 42 which engages a cam 43 mounted upon the main shaft 13.

In the operation of the dies to form the button a blank, preferably in the form of a cylindrical slug, is presented by suitable blank-feeding mechanism, which will hereinafter be described, in alinement with the recess 31 in the die 26. The rotation of the main shaft 13 causes the eccentric 12 to reciprocate the cross head 6 thereby carrying the die 22 forward until it engages the blank and forces it a short distance into the die 25 as illustrated in Fig. 5, the plunger 32 being forced back during such movement. The plunger 33 then engages the plunger rod 34 which in turn is engaged by the lever 35. Further movement of the cross head 6 closes the die 22 against the die 25. Upon such closing movement the eccentric 43 acting through the follower roll 42, the link 40, and lever 35, forces he plunger rod rearwardly thereby forcing the plunger through the aperture 31 in the die block 26 and causing the metal of the blank to flow into all parts of the cavities of the two dies, as illustrated in Fig. 6. Upon further rotation of the eccentric 12 the cross head 7 is moved rearwardly and the die 22 withdrawn from its engagement with the die 25, the button or other article being retained upon the face of the stationary die 25.

In the formation of buttons, or like articles, the retention of the buttons upon the same die is insured by the recess 44 which forms the hub of the button. Such retention, however, may be more fully insured by providing the end of the plunger with a slight projection 45 which will also serve as a centering point to engage the positioned blank, as illustrated in Fig. 4. Upon separation, therefore, of the dies the button or other article will be retained in the cavity of the stationary die. The button, or other article, may be released from such engagement by a slight rearward movement of the plunger upon separation of the dies. Such release may occur by virtue of the resilience of the parts of the mechanism which forces the plunger forward to swage the material of the blank into the die, or it may be produced by a special surface upon the cam 43 which will give the plunger a slight additional movement after the completion of the article and following, or coincident with, the separation of the dies.

The present discharging mechanism comprises means for engaging the button, or other article, after it has been released from engagement with the die face and for discharging the button, or other article, from the machine in such a manner that it will not interfere with the subsequent operation of the machine. Preferably the discharging device comprises an arm which is suspended at its upper end and is movable in proximity to, and in parallelism with, the end of the die in which the article is retained upon separation of the dies and upon such engagement is moved laterally to detach the article from the retaining means and project it in a pre-

determined general direction out of the path of the moving parts of the machine. While various ways may be provided for producing the required movement of the discharging device such movement desirably is under the control of the feeding mechanism which presents the blank to the dies. Such feeding mechanism will, therefore, be first described.

In the particular machine illustrated herein the articles are made from blanks or slugs of cylindrical form which are progressively severed from the end of a rod of suitable diameter. The end 4 of the machine and the die block 26 are provided with alined cylindrical apertures 46 and 47 which lie in parallelism with and at a desirable distance from the aperture 30 in which the plunger 34 reciprocates. The apertures 46 and 47 are of a size to receive the rod 48 of stock from which the blanks are formed. A bracket 49, bolted to the inner face of the end 4 and having an offset extension 50 lying in the path of the rod 48 at a predetermined distance from the face of the die, provides a stop for the end of the rod which causes a proper length of rod to form a button or other article to extend beyond the face of the die block 47. A combined reciprocating cutter and carrier is provided to sever the blank from the end of the rod and to present it in the path of the dies. In the preferred construction illustrated a cutter 51 is secured upon the shouldered end of a preferably rectangular cutter bar 52 which is slidably mounted in a suitable guiding aperture 53 in the side 1 of the frame. The cutter has at its end a substantially semi-cylindrical recess 54 which engages the portion of the bar 48 which projects beyond the die block 26. A spring holder, preferably in the form of a flat spring plate 55, is secured by screws or bolts 56 to the upper edge of the cutter bar and preferably a helical spring 57 surrounding a machine screw seated in the upper face of the bar and compressed between the head of the screw and the spring plate 55 tends to hold the spring 55 downwardly upon its seat, the forward end of the spring 55 being curved to conform to the curved upper edge of the knife, as illustrated in Fig. 3. When, therefore, the knife is reciprocated the spring 55 rises over the rod until the rod is engaged in the semi-cylindrical recess 54 of the cutter. Upon further forward or cutting movement of the cutter bar a blank or slug 58 is severed from the rod and is held by the spring 55 until the forward end of the cutter, with the rod so held in it, comes into alinement with the recess 31 in the die 25, as illustrated in Fig. 4. The cutter bar remains at rest in this position until the die 22 moves forward far enough to engage the end of the blank or slug and press it against the centering point 45 of the plunger 32 and advances the blank slightly into the recess 31 in the die block. As at this time the slug is held by the die 22 and the recess in the die 25 the cutter bar is withdrawn out of the path of the die and further movement of the die and subsequent movement of the plunger thereafter effected to close the dies and to cause the material of the slug or blank to flow into the cavities of the dies.

Any suitable mechanism may be employed for reciprocating the cutter and clamp. In the preferred construction illustrated herein the cutter bar 52 extends through a two-piece bracket which is fastened to the side 1 of the frame. One of the members of the bracket comprises an L-shaped guide 59, the vertical side of which abuts against the side 1 of the frame. The other member comprises a plate 60 which engages the edge of the horizontal member and which is provided with an arm 61 having an upturned end or boss 62. The members of the bracket are secured to the side frame by bolts 63. A cap plate 64 is secured to the guide 59 of the bracket in any suitable manner to complete a rectangular guideway for a cutter bar actuating slide 65. The cutter bar actuating slide is reciprocated through an adjustable pitman 66 which engages a stud 67 mounted in a boss 68 upon and located at a distance from the center of a disk 69 which is adjustably secured to a complementary disk 70 which is fast upon the main shaft 13. By reason of this construction the length of travel and timing of the cutter bar actuating slide 65 may be suitably adjusted.

The cutter bar actuating slide 65 is provided with a cam slot 71 which receives a follower 72 upon a stud shaft 73 which extends through a longitudinal slot in the cutter bar and is adjustably secured therein by a suitable nut and washer 74. A positioning screw 75, having an angular end, mounted in the end of the cutter bar and extending into the slot of the cutter bar and into engagement with the stud shaft 73, serves to insure the retention of the follower in proper position. The cover plate 64 is provided with an upwardly extending rectangular boss presenting vertical walls 76 and is covered by a plate 77 having a longitudinal slot 78 to permit the reciprocation of the stud shaft 73 of the follower. A rod 79 fixedly secured to the cutter bar extends through slots in the vertical walls 76 of the boss and is connected by helical springs 80 to a rod 81 which is mounted in the boss 62 of the bracket 61. The springs 80 hold the follower in engagement with the cutter-bar-advancing wall of the cam slot 71. A stop bolt 82, which is adjustably seated in the bracket 62, has its head 83 positioned in alinement with the positioning screw 75 and serves to limit the rearward movement of the cutter bar.

By reason of the above construction the reciprocation of the cutter bar actuating slide

65 is properly synchronized with the movement of the cross head 6 which actuates the movable die so that the cutter bar will be moved to sever a slug from the bar of stock and position the slug in the path of the dies while the dies are separated. The cam slot 71 is of such contour as to cause a rapid cutting and retracting movement of the cutter bar, thus enabling the slug or blank to be positioned during the approaching movement of the dies, and, after the dies have engaged the slug, to retract the cutter bar before the dies have sufficiently closed to engage it. The continued movement of the dies after the slug has been delivered to the dies and the cutter bar removed from their path completes the closure of the dies and the subsequent actuation of the plunger while the dies are closed causes the metal of the slug to flow into and fill the cavities of the dies in the manner above described. Upon the separation of the dies the completed article is retained in the die cavity of the fixed die by reason of the extension of the hub of the button into the cavity and also by the engagement of the centering pin 45 with the material of the article as heretofore described.

The principal feature of the present invention relates to the mechanism for discharging the finished article from the means by which it is retained upon the stationary die. It has heretofore been mentioned that the movement of the plunger 32 after the separation of the dies serves wholly or partially to release the article from the cavity of the stationary die 25.

By the present invention means are provided positively to engage the button, or other article, when thus released and discharge it from the retaining means. Desirably the discharging device is moved in substantial parallelism with the face of the die until it engages the article and upon continued movement is also caused to move laterally away from the die in such a manner as to strip the article from the means by which it is retained and project it out of the machine. Any suitable mechanism may be employed to actuate the article-discharging device in the manner aforesaid within the spirit of this invention. The preferred form of discharging device and means for actuating the same which is illustrated in the accompanying drawings comprises a vertical arm or lever 84 having secured to one side of its lower end an article-engaging finger 85 and to the opposite side of its lower end a guard 86 adapted to direct the article, when detached from the retaining means by the finger 85, into a suitable receptacle, and also to prevent the article from being projected into the path of the moving parts of the machine.

The article-discharging arm 84 is suspended upon a pivotal stud 87 upon a lever 88 the end of which is fulcrumed upon a stud 89 in a bracket 90 which projects upwardly from the end 4 of the frame. The lever 88 is guided vertically between a pair of arms 91 of a bracket 92 which is secured to the die block 26. A helical spring 93, connected at one end to the lever 88 and at its other end to a pin extending from the bracket 92, tends to depress the lever 88 and thereby cause the lever or arm 84 to move downwardly so that the finger 85 will engage the button, or other article. The lever 84 is provided with a flat face 94 which is engaged by a roller 95 mounted in a boss extending from the bracket 92 so that while the roller 95 is in engagement with the flat surface 94 of the arm 84 the arm will be guided vertically in parallelism with, and in close proximity to, the face of the die 25 and thereby brought into engagement with the article in the die, or which has been released or slightly displaced from the die. Engagement of the face 94 and of the cam 96 with the roller 95 may be caused by gravity, but desirably the action of gravity is supplemented by a spring suitably connected to the arm 84 and lever 88.

The arm 84 is also provided with a wedge-shaped cam 96 which upon further downward movement of the arm engages the roller 95 and swings the arm 84 about its pivot 87 away from the face of the die. Thus the article is stripped from the retaining means by the combined longitudinal and lateral movement of the arm 84.

Suitable means are provided for controlling the movement of the article-discharging arm in proper synchronism with the reciprocation of the die so that the discharging movement of the arm will take place while the dies are separated. In the present construction the mechanism for raising the discharging device out of the path of the dies is controlled by the movement of the blank-feeding mechanism and means are also provided for preventing the descent of the article-discharging arm until the dies are properly separated. The mechanism for raising the discharging mechanism out of operative position, which is illustrated herein, comprises a bar 97 which desirably is pivotally mounted upon a stud 98 in the upper end of an arm 99 which extends upwardly from the rear end of the cutter bar. The bar 97 is slidably supported upon a roller 100 mounted between the arms of a bracket 101 which is mounted upon the side 1 of the main frame. The bar 97 is provided with a downwardly extending end presenting an inclined cam face 102 which is adapted upon forward movement of the bar 97 to engage a roller 103 which is mounted in bosses 104 which extend downwardly from the under side of the lever 88. By reason of this construction forward movement of the cutter bar to cutting position, which of course takes place during the separation of the dies, causes the cam 102 to engage the

roller 103 and upon further movement to raise the lever 88 thereby raising the arm 84 out of the path of the dies.

In order positively to prevent the dropping of the discharging device in advance of the closing of the dies and until the dies are separated a predetermined distance, the lever 88 is provided with an extension presenting a flat under surface 105 which is adapted to be engaged by a roller 106 which is mounted upon a bracket 107 secured to the die block support 15. In the operation of the device, therefore, the forward movement of the cutter bar to sever a blank and place it in the path of the dies causes the cam face 102 of the bar 97 to raise the end of the lever 88 and thereby raise the discharging arm 84 out of the path of the dies. Upon approach of the dies the roller 106 passes beneath the flat face 105 of the lever 88 and holds the lever 88 and the discharging device, which is suspended therefrom, in elevated position while the cutter bar is retracted and also until the dies have separated a predetermined distance, whereupon the roller 106 passes from beneath the surface 105 of the lever 88 and permits the lever 88 and arm 84 to drop by gravity and under the urge of the spring 93. The fingers of the lever are forced toward the die during this descent by a helical spring 108 which is connected to an extension of the arm or lever 84 beyond its pivot 87 and to a stud in the end of the lever 88 so that the flat portion 94 of the arm 84 is held in engagement with the roller 95 during the preliminary descent of the article-discharging arm 84 and until it has engaged the button or other article which is retained on the die 25. Further downward movement of the arm causes the cam 96 to engage the roller 95 thereby swinging the arm 84 laterally away from the die face and causing the engaged article to be stripped from the retaining means and projected out of the machine.

The operation of the discharging mechanism is very important in a machine of this type in which the buttons, or other articles, are swaged with great rapidity and in which it is necessary quickly to discharge the articles away from the machine to avoid interference with the proper operation thereof.

It will be understood that the embodiment of the invention disclosed herein is of an illustrative character and is not restrictive and that various changes in form, construction and arrangement of parts may be made within the spirit and scope of the following claims.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. In a machine for forming buttons and like articles comprising a plurality of relatively movable dies, actuating means for closing and separating said dies, means for retaining the formed article upon one of said dies, means for releasing the article from said die during the initial separation of the dies, an article-discharging device, means for moving the same longitudinally to engage the article and means for moving the same laterally to discharge the article from said retaining means and project the same out of the path of the movable die.

2. In a machine for forming buttons and like articles comprising a plurality of relatively movable dies, actuating means for closing and separating said dies, means for retaining the formed article upon one of said dies, means for releasing the article from said die during the initial separation of the dies, an article-discharging device, means for moving the same longitudinally to engage the article, means for moving the same laterally to discharge the article from said retaining means and a guard carried by said article-discharging device to direct the discharged article from the machine.

3. In a machine for forming buttons and like articles comprising a plurality of relatively movable dies, means for actuating the same, means for retaining the formed article within the cavity of one of the dies upon separation thereof, means for releasing the article from said die, a pivotally supported discharging device, means for moving the same in substantial parallelism with, and in proximity to, the face of the die retaining the formed article to engage the article and means for swinging the discharging device laterally to project the article out of the path of the movable die.

4. In a machine for forming buttons and like articles comprising a plurality of relatively movable dies, means for actuating the same, means for retaining the formed article on one of the dies upon separation thereof, means for releasing the article from said die, a pivotally supported discharging device, means for moving the same in substantial parallelism with, and in proximity to, the face of the die retaining the formed article to engage the article, means for swinging the discharging device laterally to deliver the article and a guard upon said discharging device acting to direct the discharged article from the machine.

5. In a machine for forming buttons and like articles comprising a plurality of relatively movable dies, means for actuating the same, means for retaining the formed article upon one of the dies upon separation of said dies, a pivotally suspended discharging device tending to move downwardly in parallelism with, and in proximity to, the face of the die retaining the formed article, means operable upon separation of the dies to cause said discharging device to descend and engage the formed article and means operable upon further descent of the discharg-

ing device to move the same laterally and thereby discharge the article from the machine and means for raising the article-discharging device in advance of the closing of the dies.

6. In a machine for forming buttons and like articles comprising a plurality of relatively movable dies, means for closing and separating said dies, blank-feeding means and means for actuating the same to present a blank to said dies, means for retaining the formed article on one of said dies, means for releasing said article from said die upon separation of said dies, article-discharging means and means for actuating the same controlled by or through the movement of said blank-feeding means.

7. In a machine for forming buttons and like articles comprising a plurality of relatively movable dies, means for closing and separating said dies, blank-feeding means and means for actuating the same to present a blank to said die, means for retaining the formed article on one of said dies, means for releasing said article from said die upon separation of said dies, a pivotally suspended discharging arm, means tending to move the same in parallelism with and in proximity to the face of the article-retaining die to engage the article, means operable upon continued movement of said arm to swing said arm laterally to discharge the article and means operable by the blank-feeding means for raising the discharging arm out of the path of the dies in advance of the closing of said dies.

8. In a machine for forming buttons and like articles comprising a plurality of relatively movable dies, means for closing and separating said dies, blank-feeding means and means for actuating the same to present a blank to said die, means for retaining the formed article on one of said dies, means for releasing said article from said die upon separation of said dies, a pivotally suspended discharging arm, means tending to move the same in parallelism with and in proximity to the face of the article-retaining die to engage the article, a cam, and a co-operating cam follower carried respectively by said arm and die operable to move said article-discharging arm laterally upon further longitudinal movement of said arm after engagement with the formed article and means including a cam reciprocable in synchronism with said blank-feeding means to withdraw said article-discharging arm from the path of said dies in advance of the closing thereof.

9. In a machine for forming buttons and like articles comprising a stationary die and a relatively movable die and means for actuating the same, means for retaining the formed article upon said stationary die, a vertically swinging lever, a discharge arm pivotally suspended upon said lever to move in proximity to, and in parallelism with, the face of the article-retaining die, a cam on said arm, and a co-operating follower positioned to cause the lateral swinging movement of said discharging arm upon further longitudinal movement after engagement with the formed article, reciprocable means for feeding a blank to said dies and means reciprocable by said blank-feeding means including a cam positioned to raise said lever during the feeding movement of the blank and remove said arm from the path of said dies and means for retaining said lever in elevated position during the closing and initial separation of the dies.

10. In a machine for forming buttons and like articles comprising a plurality of relatively movable dies having cavities presenting faces corresponding substantially to the contour of the article to be formed, means for closing and separating said dies, a blank-receiving recess in one of said dies, a plunger reciprocable in said blank-receiving recess having a centering projection, blank-feeding means, means for positioning a blank in alinement with said recess, means for actuating the plunger after the closing of the dies to cause the material of the blank to flow into and fill the die cavities, means for advancing the plunger after separation of the dies to release the formed article from the die cavity, whereby the formed article may be retained upon the centering projection of said plunger, an article-discharging device, means for causing the same to engage and discharge the formed article upon further separation of the dies and means operable by the blank-feeding mechanism to remove the article-discharging means from the path of the dies prior to the closing thereof.

In testimony whereof, I have signed my name to this specification.

WALTER T. ABEL.