

March 26, 1935.

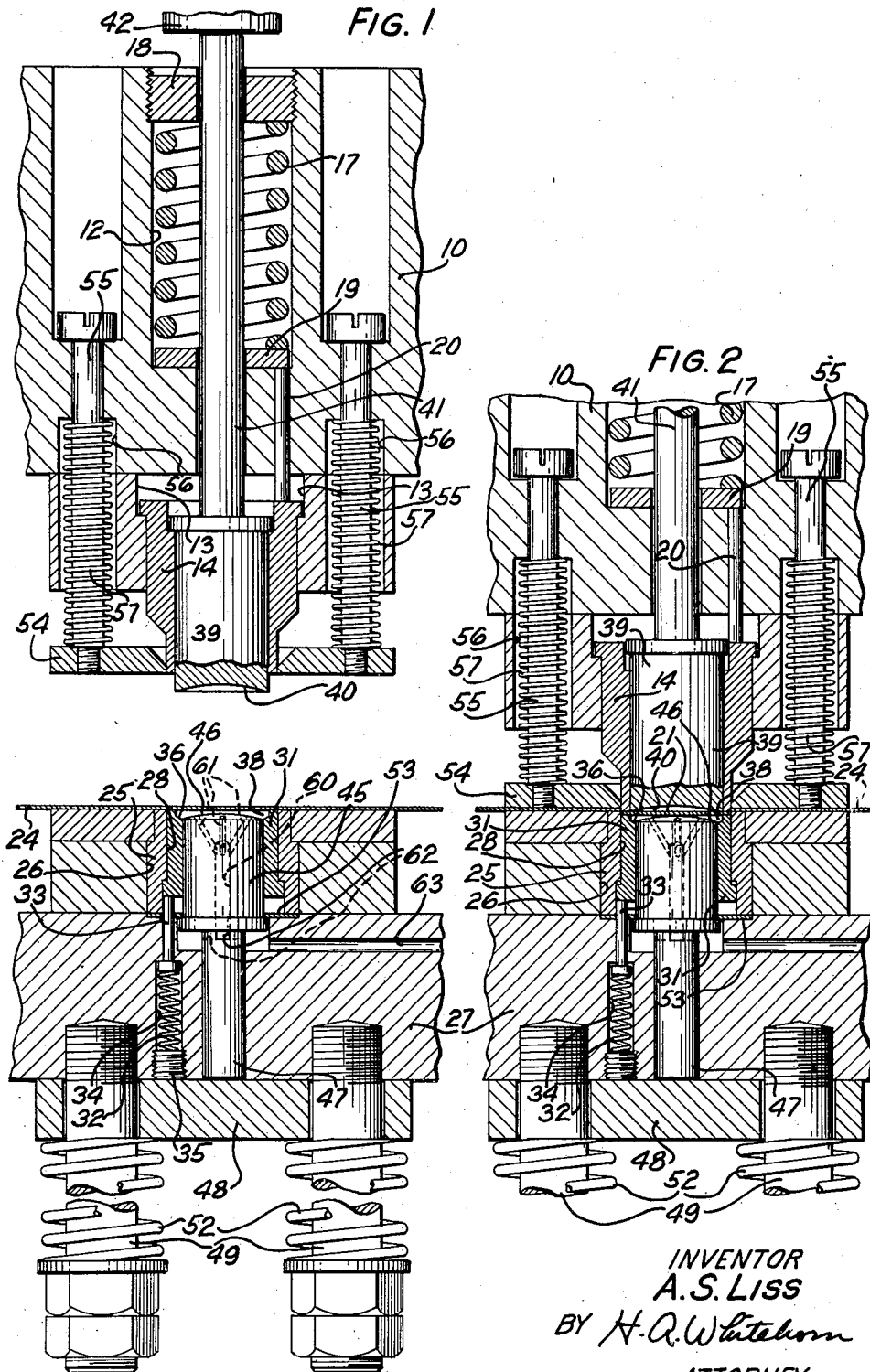
A. S. LISS

1,995,357

APPARATUS FOR FORMING ARTICLES

Filed July 27, 1933

2 Sheets-Sheet 1



March 26, 1935.

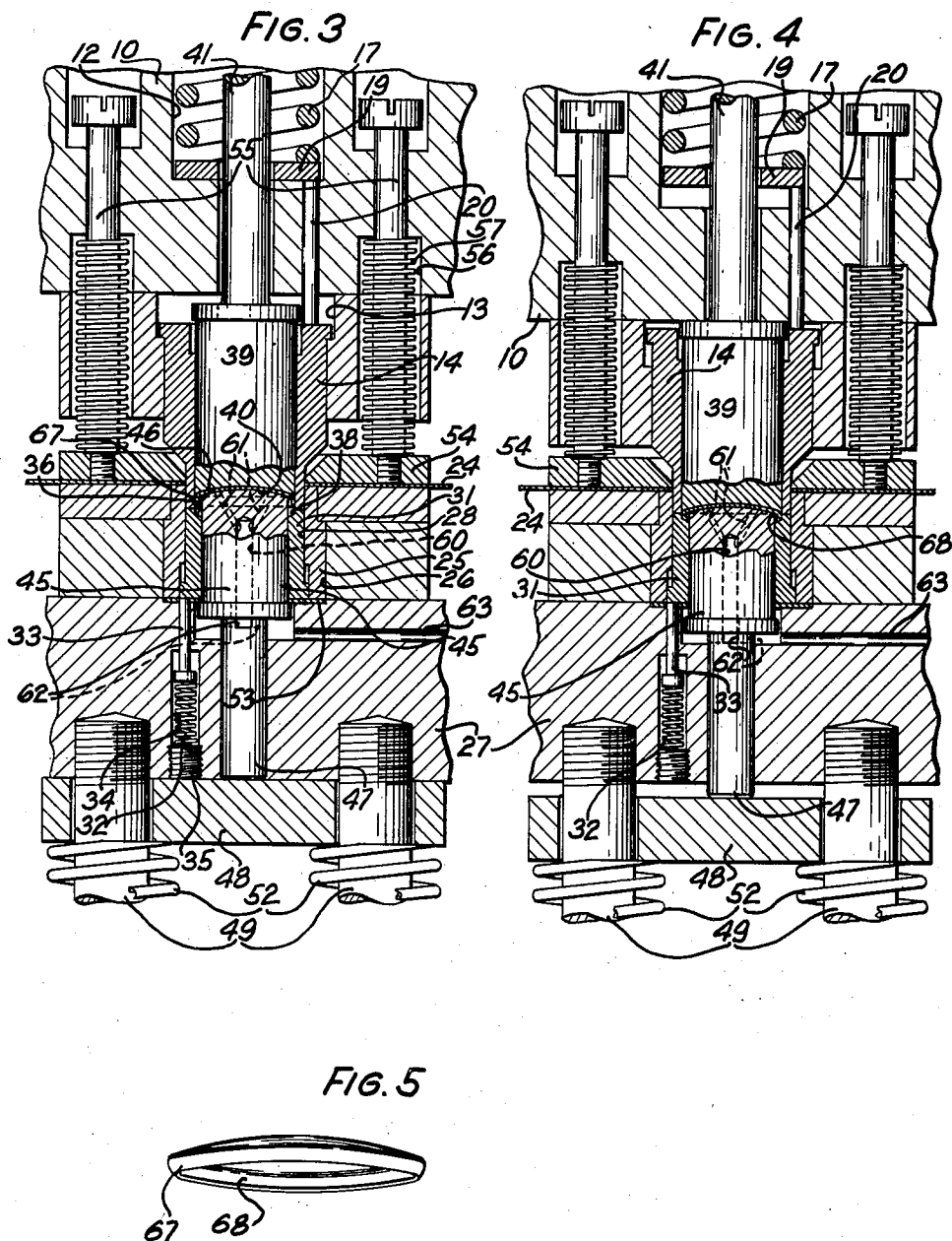
A. S. LISS

1,995,357

APPARATUS FOR FORMING ARTICLES

Filed July 27, 1933

2 Sheets-Sheet 2



INVENTOR
A. S. LISS
BY *H. A. Whitehorn*
ATTORNEY

UNITED STATES PATENT OFFICE

1,995,357

APPARATUS FOR FORMING ARTICLES

August S. Liss, Chicago, Ill., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York

Application July 27, 1933, Serial No. 682,394

1 Claim. (Cl. 113—42)

This invention relates to an apparatus for forming articles, and more particularly to an apparatus for forming button or badge bodies from sheet material.

An object of this invention is to provide an improved apparatus for forming articles, which are simple and efficient.

One form of apparatus embodying the features of the invention when applied to the forming of button or badge bodies from sheet metal, comprises a punch and die apparatus which includes an upper reciprocable member supporting a combined blanking and forming punch yieldably carried thereon, and a forming punch freely slidable in the blanking and forming punch. A stationary lower supporting member has fixed thereto a blanking die within which is yieldably carried a curling die, and within the latter die is yieldably carried a forming punch. The upper and lower supporting members are fixed to the platen or ram and the bed, respectively, of a punch press of a usual type and during a single uninterrupted downward stroke of the press platen the several punches and dies cooperate to sever a button blank from sheet material inserted between the opposed punches and dies, draw or form an endless peripheral flange on the blank, and then curl or turn the flange inwardly to provide an endless channel in the button body.

The invention will be more clearly understood by referring to the following detailed description, read in conjunction with the accompanying drawings forming a part thereof, in which

Fig. 1 is a fragmentary vertical section showing a punch and die apparatus embodying the features of this invention as applied to the forming of button bodies from sheet metal, the parts of the apparatus being shown in their normal position;

Fig. 2 is a view similar to Fig. 1 with portions of the apparatus removed, showing the parts in an operated position after a blanking operation;

Figs. 3 and 4 are views similar to Fig. 2 with the parts further operated to show different stages of development of a complete button body, and

Fig. 5 is an enlarged perspective view of a button body completed by the apparatus of this invention.

The punch and die apparatus illustrated in the drawings and embodying the features of this invention may be operatively associated with a punch press which may be of any usual type.

Since it is not essential to a complete understanding of the invention the punch press has not been illustrated. Although the apparatus as illustrated in the drawings is capable of forming only one button body during a single downward stroke of the punch press ram it is to be understood that in a practical commercial embodiment of the apparatus a plurality of punch and die units similar to the one illustrated may be included in a single apparatus so that a plurality of button bodies are simultaneously completed during a single downward stroke of the press ram. The plurality of units have not been illustrated for the sake of simplifying the disclosure of the invention.

Secured to the platen of the press (not shown) so that it reciprocates vertically therewith is a two-part punch holder 10, the upper and lower parts of the holder being provided with aligned circular shouldered apertures 12 and 13, respectively. Slidably carried in the aperture 13 is an apertured combined blanking and drawing punch 14, the lower outer peripheral edge of which serves as a severing edge. The punch 14 has an upper annular flange normally resting on a shoulder of the aperture 13 through the force of a compression spring 17 carried in the aperture 12, opposite ends of the spring bearing against an apertured screw plug 18 in the top of the holder and an apertured disk 19 engaging a shoulder of the aperture 12. The upper end of the punch 14 is engaged by the lower ends of three equally spaced pins 20 slidably carried in apertures in the holder 10, only one of the pins being shown in the drawings, the upper ends of the pins engaging the under surface of the disk 19. It will thus be apparent that the blanking and drawing punch 14 is normally held against the shoulder of the aperture 13, the compression of the spring 17 being such that as the punch 14 travels downwardly with the holder 10, the punch without yielding, blanks a disk 21 from a sheet of metal or other material 24 positioned therebelow and resting on a lower blanking die 25 fixed in a shouldered aperture 26 of a multiple part die holder 27 carried on the bed of the punch press (not shown), the upper end of the die being in the plane of the upper surface of the holder. This latter position of the blanking and drawing punch 14 is shown in Fig. 2.

The lower blanking die 25 is provided with a shouldered aperture 28, the upper inner peripheral edge of which serves as a severing edge. Within the aperture 28 is slidably carried an apertured curling die 31 having formed on its lower

end an external annular shoulder normally engaging an annular shoulder of the aperture 28, as shown in Fig. 1, through the force of three equally spaced compression springs 32 engaging the lower headed ends of associated pins 33, the upper ends of the springs engaging the under surface of the shouldered end of the curling die 28. Only one of the springs 32 and pins 33 is shown in the drawings. The springs 32 and pins 33 are carried in shouldered apertures 34 formed in the die holder 27, the lower ends of the springs 32 engaging a screw plug 35 in the lower surface of the die holder. The cooperating shoulders on the blanking and curling dies 25 and 31, respectively, serve to limit the upward movement of the curling die under the force of the springs 32. At its upper end the wall of the apertured curling die 31 is reduced in thickness so that its inner diameter is the same as the inner diameter of the apertured blanking and drawing punch 14, the reduced wall portion of the die extending downwardly for a suitable distance and terminating in a downwardly sloping annular shouldered surface or bottom wall 36 of an endless channel 38.

Slidably carried in the aperture of the blanking and drawing punch 14 is an upper forming punch 39 having its lower surface concave, as indicated at 40. The upper end of the punch 39 terminates in a reduced pin portion 41 which extends upwardly through the apertures 12 and 13 of the holder 10, the apertured disk 19, screw plug 18, and through the spring 17 and projects for a suitable distance from the upper end of the holder 10 for the purpose of engaging a stationary knock out bar 42, shown fragmentarily, carried on the frame of the punch press. The purpose of the knock out bar 42 will be made apparent hereinafter. The upper end of the forming punch 39 where it adjoins the pin portion 41 is provided with an external annular shoulder which normally engages an external annular shoulder of the blanking and drawing punch 14, as shown in Fig. 1, thus limiting its downward movement relative to the blanking and forming punch 14. The upward movement of the punch 39 relative to the punch 14 during the operation of the apparatus is limited by the enlarged upper end thereof engaging the lower surface of the upper part of the holder 10 within the aperture 13.

Cooperating with the upper forming punch 39 is a lower forming punch 45 which is slidably carried in the aperture of the curling die 31 and provided with an upper convex surface, as indicated at 46, the convex surface complementing the concave lower surface of the upper forming punch, the two surfaces cooperating in the operation of the mechanism as shown in Fig. 3 to form a convex outer face on the button body. The upper surface of the punch 45 normally is positioned slightly below the upper end of the curling die 31 and the lower surface of the sheet 24. Engaging the lower forming punch 45 at its lower end is a pin 47 which is slidably carried in the shouldered aperture 26 of the multiple part die holder 27, the pin engaging at its lower end a push plate 48 slidably guided on a pair of pins 49 threaded at their upper ends into the die holder 27, the pins passing through apertures in the plate and having at their lower ends adjustable nuts for varying the force of compression springs 52 surrounding the pins, the springs at opposite ends engaging the lower surface of the die holder and a washer supported by the nuts. To limit the upward movement of the lower forming punch 45 to its normal position, as shown in Fig. 1, through

the force of the springs 49, it is formed at its lower end with an external annular shoulder, the shoulder normally engaging the lower surface of a ring 53 fixed between abutting surfaces of the two lower parts of the die holder 27. The upper surface of the ring 53 serves as a stop to limit the downward movement of the curling die, as shown in Figs. 3 and 4.

Arranged below and spaced from the lower surface of the punch holder 10 is a spring actuated stripper plate 54 which serves to remove the blanked sheet material 24 from the blanking and forming punch 14 as the latter moves upwardly after a blanking and forming operation. The plate 54 is yieldably secured to and guided upon the holder 10 by means of a plurality of screws 55, only one of which shows in the drawings, threaded at their lower ends into the plate and freely slidable in shouldered apertures 56 provided in the holder and surrounded by compression springs 57 pressing at opposite ends against the upper surface of the plate and shoulders of the apertures 56. The upper ends of the screws 55 are provided with heads which normally engage shoulders of the apertures 56, as shown in Fig. 1, thus serving to predeterminedly position the plate 54 relative to the punch 14, which is arranged to slide in an aperture in the plate. In the normal position of the plate 54 and the punch 14 the lower surfaces thereof are flush (Fig. 1).

The lower forming punch 45 is formed with a vertical central channel 60 extending from its lower surface to a point adjacent its upper end where it communicates with a plurality of smaller radiating channels 61 terminating at the convex surface 46 of the punch. At its lower end the channel 60 communicates by means of grooves or channels 62, formed at right angles to each other, in the upper end surface of the pin 47 with a channel 63 formed in the die holder 27 and communicating at one end with the shouldered aperture 26 of the die holder below the punch 45. The opposite end of the channel 63 is connected to a suitable compressed air source (not shown) and in the operation of the apparatus as the upper punches 14 and 39 return to their normal position (Fig. 1) a blast of air through the communicating channels 63, 62, 60 and 61 ejects the completed button body 64 (Fig. 4) from the lower punch 45.

It is believed that the operation of the apparatus will be evident from the foregoing description of the several parts and the following detailed description of its operation.

While the upper members are in the position shown in Fig. 1, which is the normal position, or just after the completion of an operation, the sheet of metal 24 is advanced and positioned against a suitable stop or stops (not shown) to accurately align a lithographed portion of the sheet, forming the outer face of the button, with the cooperating punches and dies. Power is then applied to the press platen by tripping a suitable clutch (not shown), causing the platen to descend a predetermined distance without interruption and carrying with it the attached punch holder 10, and immediately thereafter to ascend to its normal position. In the descent of the holder 10 the lower end of the forming punch 39, which is freely slidable in the blanking and drawing punch 14, first engages the sheet 24 and moves upwardly relative to the punch 14 and immediately thereafter the lower flush surfaces of the slidable spring backed stripper plate 54 and the punch

14 engage the sheet. The downward motion of the plate 54 is now stopped and this serves through the force of the springs 57 to grip the sheet 24 tightly against the flush upper surfaces of the lower die holder 27 and the lower blanking die 25. The punch 14 which is also bearing against the sheet 24 will continue its downward movement, since its associated spring 17 is strong enough to overcome the resistance offered by the sheet supported on the die 25, and the lower outer peripheral severing edge of the punch 14 cooperating with the upper inner peripheral severing edge of the die 25 severs the blank 21 from the sheet, as is clearly shown in Fig. 2. The spring backed curling die 31 bearing against the lower surface of the blank 21 is moved downwardly with the blank, the peripheral portion of the blank being gripped between the punch 14 and the die 31. As the punch 14 continues to move downwardly without moving relative to the holder 10, due to the force of the spring 17, it serves to draw the blank 21 over the convex surface 46 of the lower punch 45, the upper punch 39 freely following, and the peripheral portion of the blank which is gripped between the opposed ends of the punch 14 and the curling die 31 is drawn inwardly and turned downwardly to form an endless peripheral flange on the blank, indicated at 67 (Fig. 3), the drawn or formed flange being positioned within the channel 38. At this time the opposed ends of the punch 14 and the curling die 31 are in abutting relation and the lower surface of the die in engagement with the stop provided by the upper surface of the ring 53, thus preventing any further downward movement of the punch 14 and the die 31.

In the continued descent of the holder 10 the lower surface thereof, within the aperture 13, engages the upper surface of the flanged portion of the punch 39, which has been moved upwardly relative to the punch 14 during the blanking and flange drawing or forming operations (Figs. 2 and 3), and thereafter the punch 39 moves downwardly with the holder 10. During this latter and final portion of the continuous descent of the holder 10 the lower annular edge of the peripheral flange 67 of the blank 21 is moved into engagement with the downwardly sloping annular shouldered surface or bottom wall 36 of the channel 38 which serves to curl or turn the flange inwardly to form an endless groove or channel, indicated at 68 (Figs. 4 and 5) in the blank 21, thus completing the button body. The button channel 68 is for the purpose of receiving and retaining a usual type of spring pin. In this final downward movement of the punch 39 the concave lower surface 40 thereof engaging with pressure the upper surface of the blank 21, which was previously drawn down over the convex surface 46 of the lower punch 45, serves to further shape and iron the outer crowned face of the blank to remove any irregularities therein. Upon completion of the curling operation the descent of the holder 10 carried by the platen of the press comes to a halt, the platen immediately thereafter ascending and carrying the holder 10 to its normal position (Fig. 1). As the holder 10 ascends the several punch and die members and the stripper plate return to their respective normal positions through the action of their associated springs. In the return movement of the stripper plate 54 the blanked sheet of metal 24 surrounding the lower end of the blanking and forming punch 14 is removed therefrom, and the

upper end of the pin portion 41 of the punch 39 engages the knock out bar 42, thus positively returning the punch to its normal position. Also as the parts return to their normal position the completed button body is ejected from the lower punch 45 by a blast of air therethrough, as previously described.

From the foregoing description it will be obvious this invention provides a simple and efficient unitary article forming apparatus wherein during a single operating stroke or movement in one direction of the holder 10 carrying the punches 14 and 39 that the latter in cooperation with the lower dies 25 and 31 and the punch 45 will form an article of the type illustrated in Figs. 4 and 5 accurately and rapidly.

Although the invention as herein illustrated and described is particularly well adapted for use in connection with the forming of button or badge bodies, it is to be understood that the novel features thereof are capable of many other applications. Therefore, the invention should be limited only by the scope of the appended claim.

What is claimed is:

In an article forming apparatus, a reciprocating supporting member, a second supporting member associated therewith, a combined blanking and drawing punch reciprocally mounted on said reciprocating member, a forming punch freely slidably mounted in said punch, said blanking and drawing punch and reciprocating member being provided with stop surfaces for limiting the movement of said forming punch in either direction, a blanking die fixed to the other of said members and adapted to receive the blanking punch therein to cause a blank to be severed from material inserted therebetween, a curling die yieldably mounted in said blanking die and arranged to support the outer peripheral portion of the blank in cooperation with the blanking punch during the severing of the blank, a stop for limiting the movement of said curling die, and a second forming punch yieldably mounted in said curling die for supporting the center portion of the blank, the inner and outer diameters of said curling die and second forming punch providing an endless groove having a downwardly sloping bottom wall adjacent the point at which the peripheral portion of the blank is supported between said blanking punch and curling die, the continued movement of said reciprocating member and the blanking punch and curling die after the severing of the blank effecting a withdrawal of the outer peripheral portion of the blank from between the curling die and blanking punch while the blank is supported at its center portion by the second forming punch and a drawing of the blank to provide a peripheral flange on the blank, the flange upon completion being positioned in the groove formed by the inner and outer diameters of said curling die and second forming punch, the curling die at this point in the continued movement of the reciprocating member being halted by its said stop, in the continued movement of said reciprocating member the latter engages said freely slidable forming punch thereby moving the flanged blank supported at its center portion on said yieldably mounted forming punch to engage the peripheral edge of the flange with the bottom wall of the groove and thereby curling the flange inwardly to form a continuous channel in the blank.

AUGUST S. LISS.