

Feb. 8, 1944.

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2,341,462

ARTICLE FORMING APPARATUS

Filed Aug. 16, 1941

3 Sheets-Sheet 1

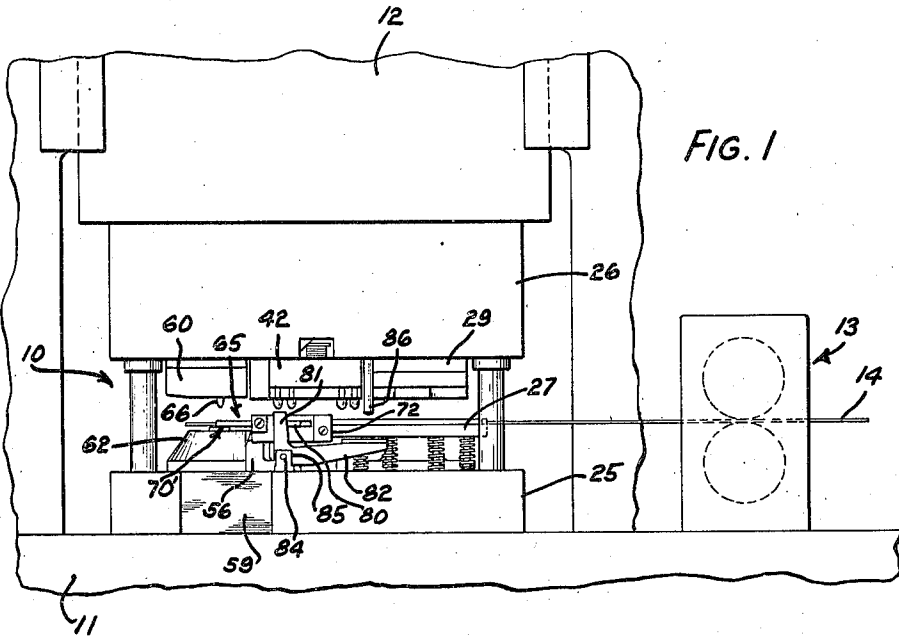


FIG. 1

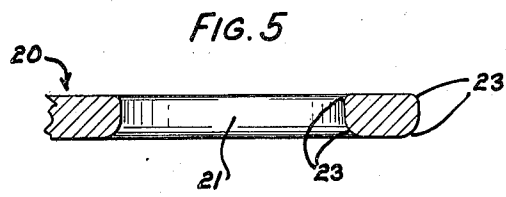


FIG. 5

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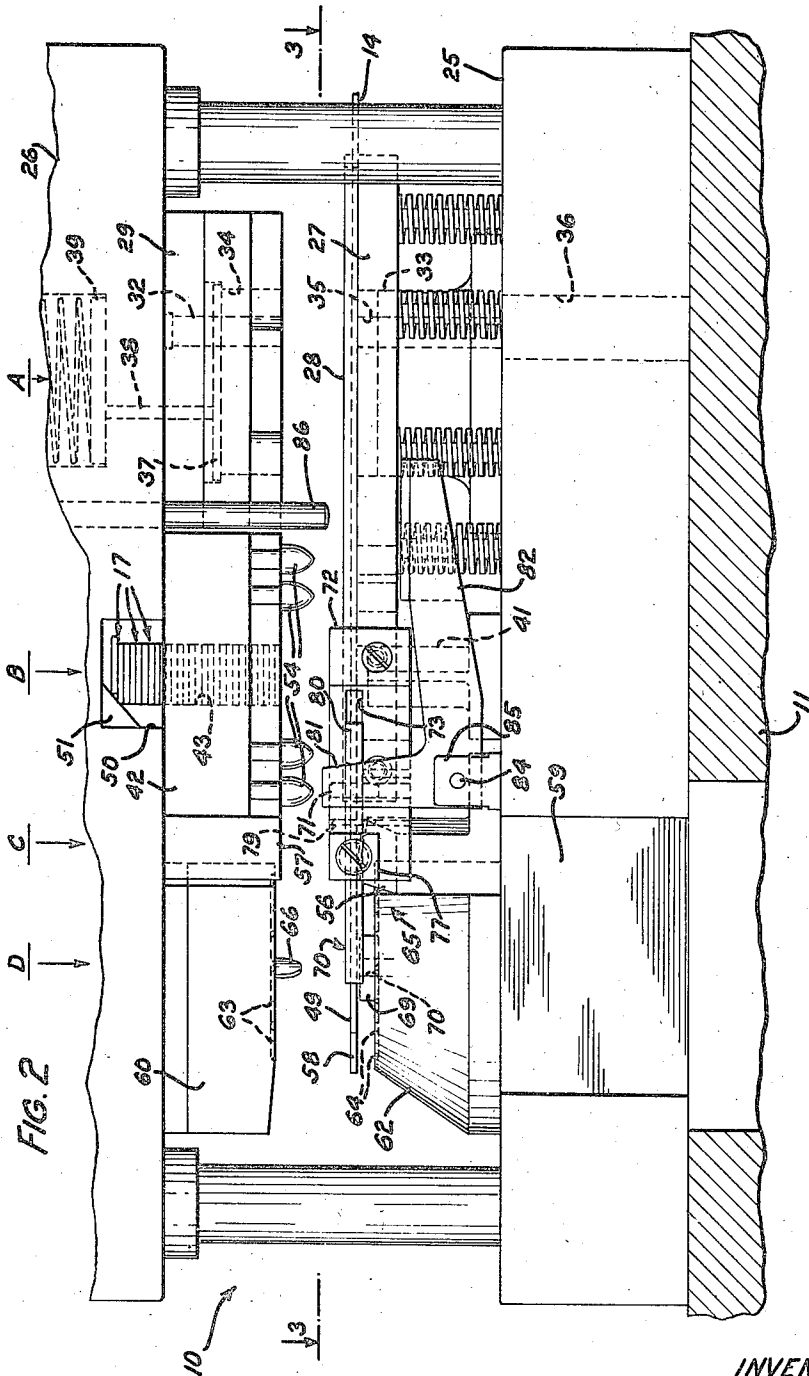
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ARTICLE FORMING APPARATUS

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3 Sheets-Sheet 3

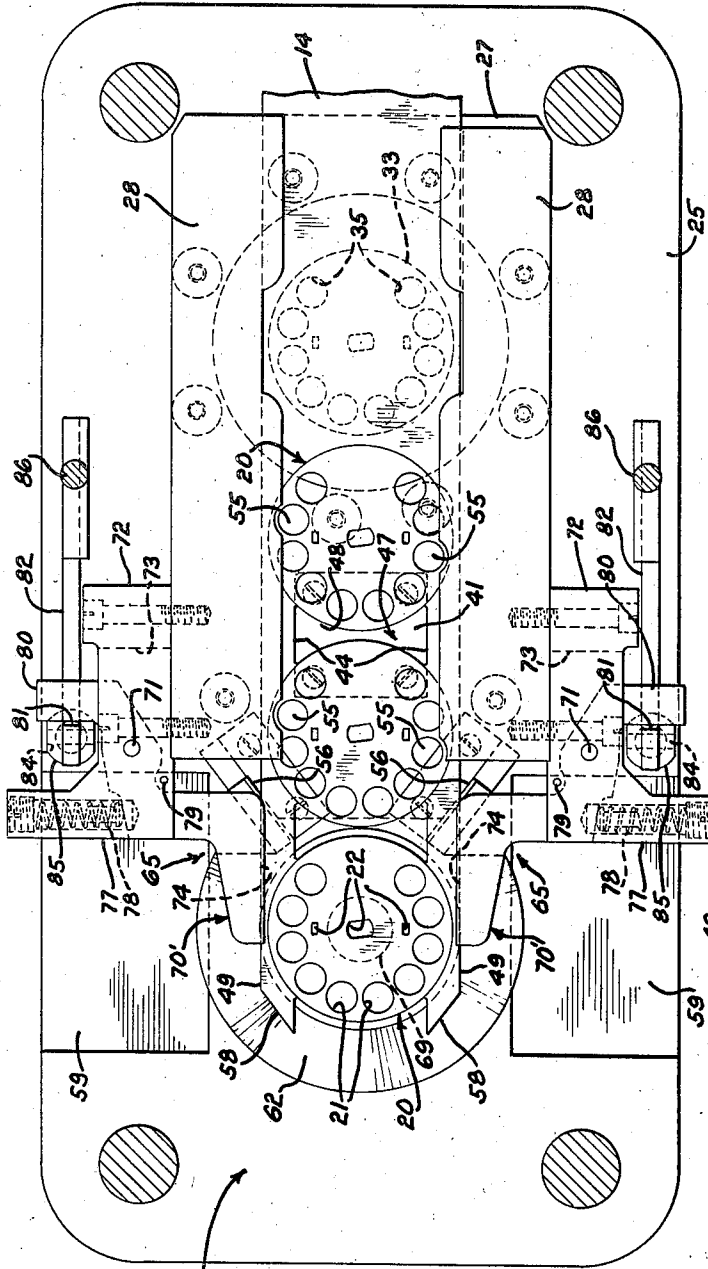


FIG. 3

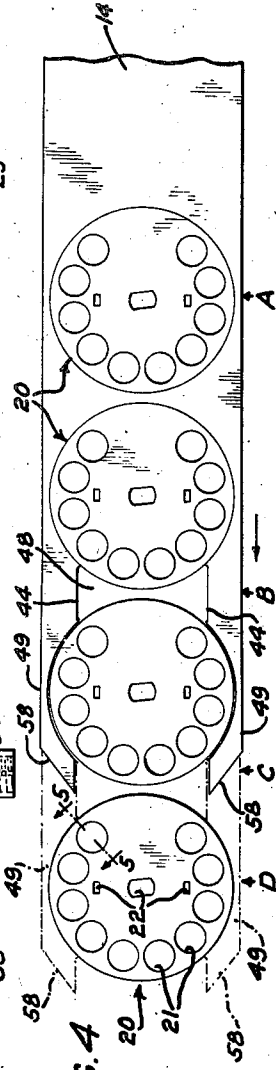


FIG. 4

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ARTICLE FORMING APPARATUS

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5 Claims. (Cl. 29—34)

This invention relates to article forming apparatus and more particularly to a compound punch and die mechanism for forming articles.

In the usual type of progressive punch and die mechanism, articles are produced in a plurality of steps, such as perforating, notching and forming and throughout these steps, as the article is assuming shape, it remains part of the strip material that is being worked on and not until the article is completed, is it completely severed from the material. In a compound type punch and die mechanism, the article is usually formed complete in one step and after being blanked or severed from the material is reinserted in the opening in the material and remains therein during the advance of the material and until removed by suitable means. In the production in a compound punch and die mechanism, of articles requiring a working on their peripheral edges, such as, for instance, a dial finger wheel for automatic telephone sets, which require rounding preferably effected by a swaging operation, it is necessary that the wheel be positively transferred to and accurately positioned at the swaging position and preceding the swaging operation to be freed from the scrap material to permit swaging dies to operate on its peripheral edges.

An object of the present invention is to provide a simple, efficient and practical mechanism for use in a compound punch and die mechanism for clamping an article to the material from which it was blanked to insure its accurate transfer to the final tools.

In accordance with the general features of this invention, there is provided in one embodiment thereof, as used in connection with a compound punch and die mechanism, an apparatus for clamping an article to the material from which it was blanked for insuring accurate transfer of the blanked article which is to be peripherally swaged from the blanking position to the swaging position.

Specifically, the clamping apparatus comprises a pair of spring pressed pivotal arms between which opposite forward portions of the advancing strip material, formed by cutting a portion of the material between two articles from the material, are forced to apply pressure on the outer edges thereof in order to positively clamp and center the article carried therebetween, thus causing the article to be transferred to and accurately positioned at the swaging position. Immediately preceding the operation of the swaging dies, the forward portions are severed from

the scrap material and in timed relation therewith the spring pressed clamping arms are drawn or forced open by means carried on the punch head, which is descending to perform the swaging operation and the severed scrap portions fall away, whereupon the freed article is moved into position on the lower swaging die ready for the descending upper swaging die.

Other objects and advantages of this invention will more fully appear from the following detailed description, taken in conjunction with the accompanying drawings, in which

Fig. 1 is a fragmentary side view of a punch press for operating a compound punch and die mechanism equipped with an article clamping apparatus embodying the features of this invention;

Fig. 2 is an enlarged fragmentary view of Fig. 1;

Fig. 3 is a plan sectional view taken on the line 3—3 of Fig. 2;

Fig. 4 is a plan view of the strip material removed from the apparatus shown in Fig. 3, illustrating more clearly the blanked and perforated dial finger wheels carried in the material, the material removed from between a pair of wheels in a following step, the forward end portions of the scrap material severed at the final swaging position being shown in broken outline and the forward wheel freed of the material; and

Fig. 5 is an enlarged fragmentary horizontal sectional view taken on the line 5—5 of Fig. 4 through a completed wheel showing the peripheral edges rounded by swaging.

Referring to the drawings, particularly to Fig. 1, one embodiment of this invention is illustrated as used in connection with a compound punch and die mechanism, indicated at 10, which is operatively connected to a punch press frame 11 and a reciprocatory ram 12 of the press, which is fragmentarily illustrated. Carried on the frame 11 is a set of feed rolls 13, by means of which strip material, indicated at 14, is intermittently advanced from a supply in coil form (not shown) in a horizontal plane through the punch and die mechanism from right to left, as shown in Fig. 1. Since the punch and die mechanism 10, punch press and feed rolls 13 are well known in the art, only such parts thereof will be described which are believed necessary to a full understanding of the present invention.

The dial finger wheel for automatic telephone sets, indicated at 20 (Figs. 4 and 5), is an example of an article requiring working on its peripheral edges. Such a wheel comprises a flat disk shaped

article having ten finger apertures 21 and three mounting apertures 22 formed therein, the peripheral edges of the disk and the apertures 21 being rounded at their opposite edges, as shown in Fig. 5 at 23, to prevent injury to a user of the telephone.

It may be stated at this point that several sets of punches and cooperating die apertures, shearing blades and swaging dies which are included in the mechanism 10 and at suitable distances apart, operate simultaneously on the material 14 while it is stationary (Figs. 2 and 4) at positions A, B and C and at position D on the blank dial finger wheel 20 during each downward movement of the press ram 12. Thus, at each advance movement of the material 14 it will be acted upon successively at the positions A, B and C and the blank wheel at the position D. Furthermore, it will be understood that the feed rolls 13 are operated in timed relation to the reciprocatory movements of the ram 12, through suitable well-known means (not shown) so that the material 14 is intermittently advanced an equal distance during each upward movement of the ram to successively position the material 14 and the dial finger wheel to the several sets of tools.

As shown in Figs. 2 and 3, the punch and die mechanism 10 comprises a lower or fixed punch bed 25 and a vertically reciprocable punch and die head 26, shown in its upper retracted position (Figs. 1 and 2). Carried on the bed 25 is a spring actuated stripper plate 27 supporting spaced guide plates 28 between which opposed longitudinal edges of the strip material 14 pass in its intermittent advance through the mechanism. At position A the head 26 carries a punch and die plate 29 in which is mounted a series of perforating punches for forming the finger and mounting apertures 21 and 22 in the dial finger wheel 20. One of the perforating punches is indicated in dotted outline at 32 in Fig. 2. Carried on the punch bed 25 is a blanking punch 33 which in cooperation with a blanking die aperture 34 in the plate 29 blanks the wheel 20 from the material 14. Formed in the punch 33 is a series of perforating die apertures for cooperation with the perforating punches 32 and aligned therewith are apertures in the bed 25 for the passage of the punched slugs. One of the perforating die apertures is indicated in dotted outline at 35 and at 36 is an aligned aperture in the bed 25 for the passage of slugs. Carried in the blanking die aperture 34 is a shouldered spring pressed shedder 37 for pressing, in cooperation with the spring actuated stripper plate 27, as the ram 12 moves upwardly, the blanked wheel 20 from the die aperture 34 of the plate 29 into the opening in the strip material 14 from which it was punched. A plurality of pins, one of which is indicated at 38 (Fig. 2), backed up by a plate and compression spring 39 constantly act against the upper surface of the shedder 37 to maintain it in its normal position with its lower face aligned with the lower end of the blanking die aperture 34 in the punch and die plate 29.

At position B (Figs. 2 and 3) the punch bed 25 supports a fixed punch 41 and the punch and die head 26 carries a die plate 42 provided with a die aperture 43, indicated in dotted outline, which cooperates with the punch 41 to cut at spaced points 44 (Fig. 3) a portion 47 of the material from between two advanced wheels 20. This leaves an opening 48 between the two wheels

20 and results in forward end portions 49 on the scrap material, as shown in Figs. 3 and 4. The scrap portions 47 are forced into the die aperture 43, in stack formation (Fig. 2) and into a transverse opening 50 in the punch and die head 26 which extends from side to side thereof. Carried in the opening 50 and in the path of one corner of the stacked scrap portions 47 is a stationary cam plate 51 which serves to displace the portions, as they come into contact therewith, to one side of the stack to permit the portions to be removed from the opening 50 and into a receptacle at one end of the opening by a blast of air supplied to the opening at its opposite end. The means for supplying the blast of air and the receptacle are not shown since they are not believed necessary to an understanding of this invention. Also at position B the die plate 42 supports at each side of the die aperture 43 a pair of pilot pins 54 which enter aligned pilot apertures 55 in the stripper plate 27 after passing through a pair of finger apertures 21 in the wheels 20 at each side of the punch 41 for the purpose of accurately positioning and holding the wheels while the portion 47 of material between the wheels is cut out.

At position C the punch bed 25 supports a pair of angularly arranged spaced shearing blades 56 which cooperate with aligned shearing edges 57 formed on the die plate 42. The blades 56 and edges 57 are arranged to sever the forward end portions 49 on the scrap material, the portions being severed at an angle, as indicated at 58 (Figs. 3 and 4) from their outer edges forwardly to their inner edges for a purpose which will be referred to hereinafter. The material end portions 49 upon being severed from the material 14 fall onto inclined faces 59 formed in the punch bed 25 which direct them into receptacles (not shown).

At the final position D where the wheels 20 are completed the punch and die head 26 carries a swaging die 60 and the punch bed 25 supports a cooperating swaging die 62, die formations therein being indicated in dotted outline at 63 and 64, respectively. The die formations 63 and 64 are effective to produce the rounded edges 23 (Fig. 5) upon the peripheral edges of the wheel and the finger apertures 21 upon closing in upon the wheel 20. The wheel 20 was previously transferred between and aligned with the swaging dies 60 and 62 by means of the forward end portions 49 of the scrap material and cooperating clamping and transfer apparatus, indicated in general at 65 (Figs. 1, 2 and 3), to be presently described. Depending from the swaging die 60 is a pilot pin 66 which is adapted to enter the central mounting aperture 22 of the wheel 20 in advance of it being freed from the severed forward end scrap portions 49 of the material 14 and thus insure the correct alignment of the wheel with the die formations 63 and 64. A spring pressed plunger 69 is carried in the swaging die 62 and is provided with an aperture 70 for receiving the pilot pin 66. During the downward movement of the swaging die 60 to complete the swaging operation the wheel 20 is held between the die 60 and the plunger 69, the plunger receding into the die 62 as the wheel reaches the die formations 64. After the swaging operation, as the swaging die 60 moves upwardly, the plunger 69 also moves upwardly to the position shown in Fig. 2 carrying therewith the completed wheel 20 which is then removed by a blast of air directed thereagainst by suitable means (not shown), such means not

being shown since it is not believed necessary to an understanding of this invention.

The cutting out of the scrap portion 47, hereinbefore referred to, at position B from between two wheels 20 is the first step in the freeing of the leading wheel from the material 14, which is completely freed therefrom at the swaging position D. It will be appreciated that the cutting out of the portion 47 naturally causes the resulting forward end portions 49 of the material 14 to spring outwardly and this condition, unless counteracted, tends to free the wheel 20 between positions B and C (Fig. 4) from the material or at least produces a condition in which the wheel would be loosely carried in the material during its final transfer to position D and thereby resulting in an inaccurate positioning of the wheel at the swaging position.

The apparatus 65 (Figs. 2 and 3) which in cooperation with the forward end portions 49 of the material 14 serves to positively clamp the wheels 20 to the material for accurately transferring to and positioning the same at the swaging position D comprises a pair of spring pressed pivotal clamping arms 70', one at each side edge of the material 14 at its forward end between which the outer edges of the material end portions 49 are advanced.

Since similar apparatus 65 is arranged at opposite sides of the material 14 the following description applies to both, but is particularly directed for convenience to the apparatus associated with the forward and lower edge of the material 14, as viewed in Figs. 2 and 3, respectively. The arm 70' is flat and of irregular shape and is pivoted at 71 to a plate 72 fixed to the forward side edge of the stripper plate 27, the plate being slotted at 73 to receive the arm. Opposite ends of the arm 70' project from the plate 72 and its inner end is concave along the edge thereof which lies in the path of the side edge of the end portion 49 of the material 14, as indicated at 74. A hollow arm 77 of the plate 72 supports a compression spring 78, one end of which engages the arm 70' at the left side of its pivot 71 (Fig. 3) for constantly urging the same in a clockwise direction against the edge of the material end portion 49, the pressure of the opposite arms 70' on the end portions 49 being sufficient to firmly clamp the wheel 20 in its original normal position therebetween. To limit the inward clamping movement of the arms 70' a stop pin 79 is secured in the plate 72 in the path of the arm.

An outer end 80 of the arm 70' extends from the slotted plate 72 and is engaged by a vertical arm 81 of a bell crank lever 82 which is pivoted at 84 to a bracket 85 fixed to the punch bed 25. The upper faces of the horizontal arms of the levers 82 at their outer ends (Figs. 1 and 2) are arranged in the path of vertical push rods 86 carried by the reciprocable punch and die head 26. During each downward movement of the head 26 the rods 86 engage and rock the levers 82 clockwise and through the engagement of the vertical arms 81 thereof with the ends 80 of the spring pressed pivotal clamping arms 70' the latter arms are rocked counterclockwise (Fig. 3) thus drawing them away from and releasing the material end portions 49, the arrangement being such that the shearing of the portions 49 by the shearing blades 56 and edges 57 and the withdrawal of the clamping arms therefrom occur at substantially the same instant.

In the operation of the compound punch and

die mechanism 10, as the reciprocable punch and die head 26 is retracted each time from the punch bed 25, the material 14 is intermittently advanced by the feed rolls 13 to carry the blanked and perforated dial finger wheel 20 mounted therein, between positions B and C, to the swaging position D and during such advance the angular end faces 58 on the material end portions 49 engage the concave faces 74 of the spring pressed clamping arms 70' which at this time are in their innermost position limited by the stop pins 79. The advance of the material end portions 49 between the arms 70' cams and forces the portions 49 inwardly and thereby serves to positively clamp and center the wheel 20 therebetween in its original normal position. This is the position of the parts as shown in Figs. 2 and 3.

Thereafter in each following downward movement of the punch and die head 26 a wheel 20 is blanked and perforated at position A and a scrap portion 47 cut out between two previously blanked and perforated wheels at position B. Also the pilot pin 66 at the swaging position D enters the central aperture 22 of the wheel 20 held by the clamping arms 70' and the material end portions 49 and in timed relation therewith the shearing blades 56 and edges 57 coact to shear the end portions 49 at 53 from the material 14. Simultaneously with the shearing operation the push rods 86 actuates the levers 82 to draw or force open the spring pressed clamping arms 70', thus permitting the sheared material end scrap portions 49 to fall away from the periphery of the wheel 20 and onto sloping sides of the die 62 which directs them onto the inclined faces 59 of the punch bed 25. The wheel 20 now being free of the material drops onto the plunger 69 guided by the pilot pin 66. At this point in the downward movement of the punch and die head 26 the pilot pin 66 has entered the pilot aperture 70 and the wheel 20 is held between the die 60 and the receding plunger 69, the wheel being guided to the die formations 64 of the bottom die 62 and the upper die formations 63 of the descending die 60 immediately engage the upper face of the wheel 20 and the swaging operation is effected. Thereafter the punch and die mechanism and apparatus 65 return to their normal positions as shown in Figs. 1 and 2, during which the material 14 is again advanced for the following operation.

From the foregoing, it is believed that the advantages of the article clamping apparatus of this invention shown applied to a single set of tools comprising a compound punch and die mechanism in which an article, requiring a peripheral swaging to complete it, is positively transferred to and accurately positioned by the apparatus between swaging dies, after being freed of the strip material, will be apparent.

It will be understood that the embodiment herein described is merely illustrative of the invention and one application thereof, the invention being limited only by the scope of the appended claims.

What is claimed is:

1. A compound punch and die mechanism for progressively blanking articles from strip material comprising means for blanking an article from the material and reinserting it therein, means for cutting a portion of the material from between two articles to form opposite arms on the advanced end of the material with an article therebetween, means engaging said opposite arms in the advance of the material for urging the

same toward said article to hold the article therebetween during movement thereof to an advanced position, means arranged behind said position for shearing the arms from the material to release the article, and means for withdrawing said holding means from the arms in timed relation to the shearing thereof to permit the article and arms to drop from the plane of the strip material at said advanced position.

2. A compound punch and die mechanism for progressively blanking articles from strip material comprising means for blanking an article from the material and reinserting it therein, means for cutting a portion of the material from between two articles to form opposite arms on the advanced end of the material with an article therebetween, means for peripherally working said article at an advanced position, means engaging said opposite arms for urging the same toward said article to hold the article therebetween during movement thereof to said advanced position, means arranged behind said position for shearing the arms from the material to release the article, and means for withdrawing said holding means from the arms in timed relation to the shearing thereof to permit the arms to drop from the plane of the strip material and the article into alignment with the means for peripherally working the same at said advanced position.

3. A compound punch and die mechanism for progressively blanking articles from strip material comprising means for blanking an article from the material and reinserting it therein, means for cutting a portion of the material from between two articles to form opposite arms on the advanced end of the material with an article therebetween, longitudinally fixed and laterally yieldable pivotal means engaging said opposite arms in the advance of the material for urging the same toward said article to hold the article therebetween during movement thereof to an advanced position, means arranged behind said position for shearing the arms from the material to release the article, and means for withdrawing said pivotal holding means from the arms in timed relation to the shearing thereof to permit the article and arms to drop from the plane of the strip material at said advanced position.

4. A compound punch and die mechanism for progressively blanking articles from strip material comprising means for blanking an article from the material and reinserting it therein, means for cutting a portion of the material from between two articles to form opposite arms on the advanced end of the material with an article therebetween, movable and stationary dies for peripherally working said article at an advanced position, means engaging said opposite arms for urging the same toward said article to hold the article therebetween during movement thereof to said advanced position, means arranged behind said position for shearing the arms from the material to release the article, and means for withdrawing said holding means from the arms in timed relation to the shearing thereof to permit the arms to drop from the plane of the strip material and the article into peripherally working position on said stationary die, said stationary die having outwardly sloping sides for directing said sheared arms from the stationary die.

5. In combination with a compound punch and die mechanism including a reciprocable tool carrier, a series of tools for successively blanking articles from strip material and reinserting them therein, cutting a portion of the material from between two articles to form opposite arms on the advanced end of the material with an article therebetween, shearing the arms from the material to release the article and peripherally swaging the released article, the swaging tools being arranged for operation after the operation of the shearing tool, of pivotal spring pressed clamping arms engaging said opposite arms before the shearing thereof for clamping and centering the article therebetween for transfer to and alignment with said peripheral swaging tools, and means including members carried by said reciprocable tool carrier operatively associated with said clamping arms for withdrawing the same from said arms in timed relation to the shearing thereof to permit the same to drop from the plane of the strip material and the article into alignment with and the operation of the swaging tools thereon.

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