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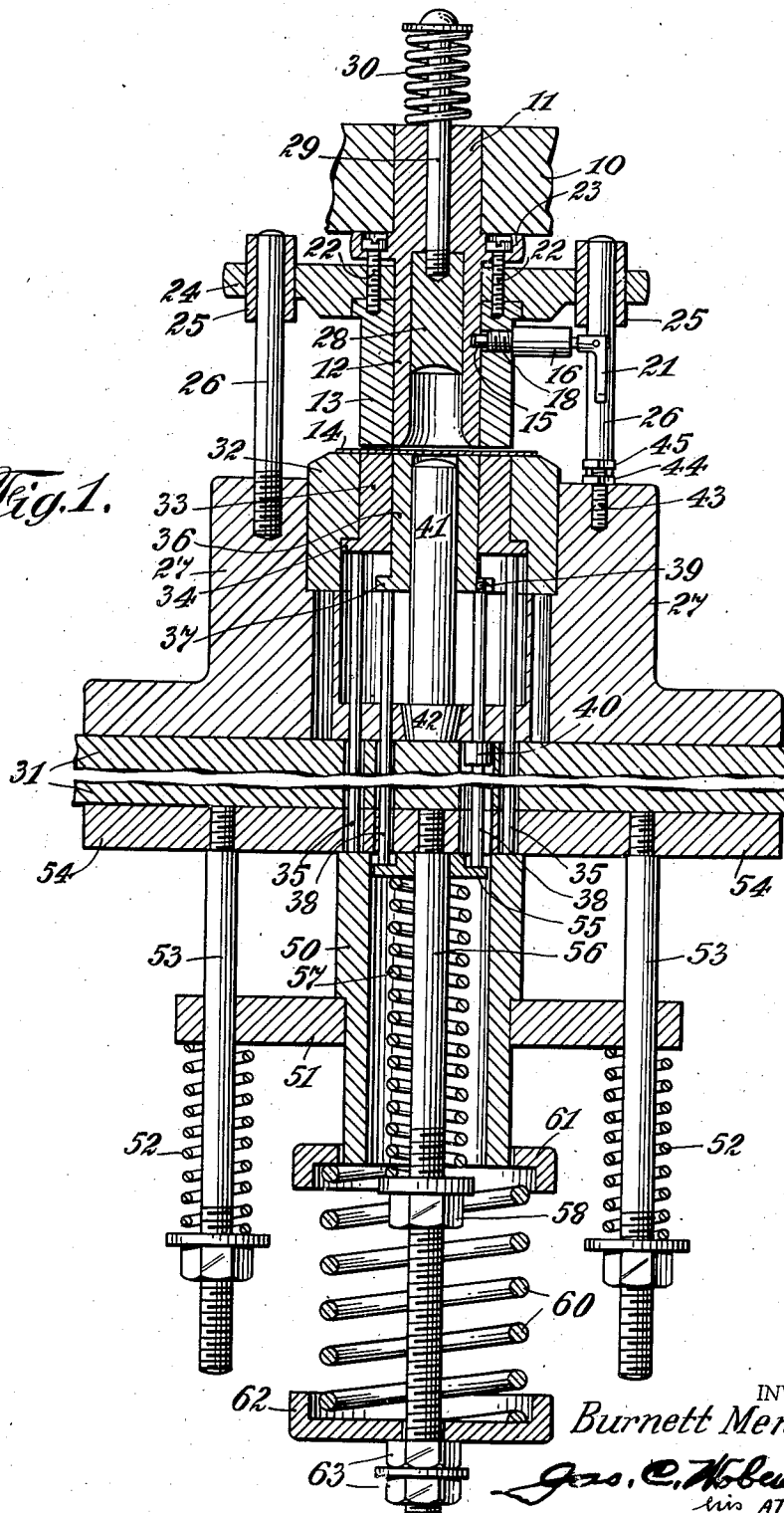
2,331,491

BLANKING AND FORMING DIE

Filed Dec. 4, 1941

4 Sheets-Sheet 1

Fig. 1.



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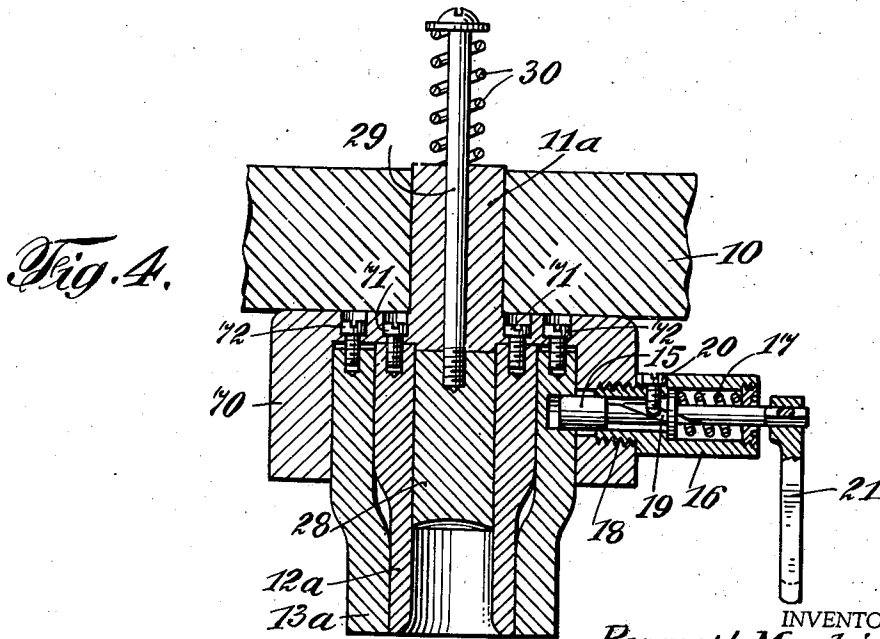
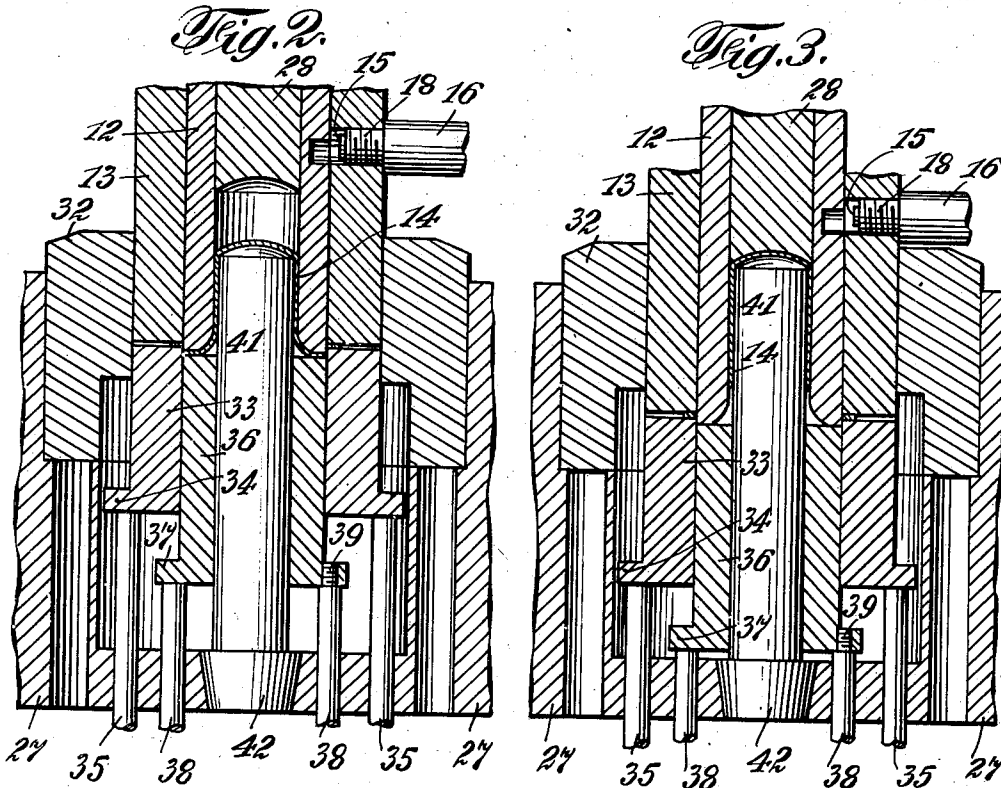
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BLANKING AND FORMING DIE

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BLANKING AND FORMING DIE

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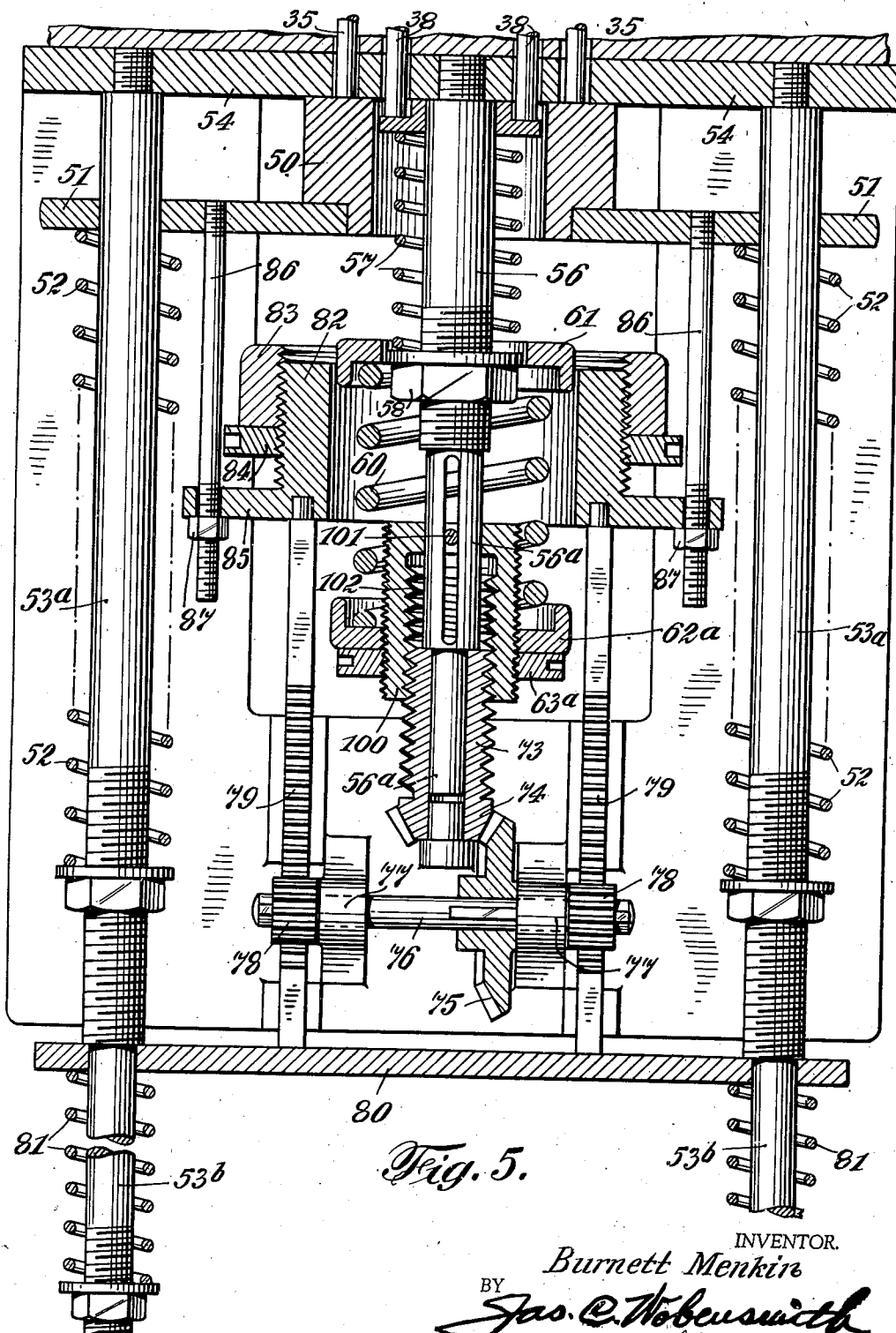


Fig. 5.

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UNITED STATES PATENT OFFICE

2,331,491

BLANKING AND FORMING DIE

Burnett Menkin, New York, N. Y.

Application December 4, 1941, Serial No. 421,622

10 Claims. (Cl. 113—42)

This invention relates to blanking and forming dies for punch press operations, and it relates more particularly to combination dies adapted to make articles of various forms from sheet metal.

Heretofore in the manufacture of articles from sheet metal, by blanking and forming operations, where the process involves what is known in the industry as "deep drawing," it has been necessary, by reason of the distortion of the edges of the article, due to the more or less unpredictable flow of the metal during the deep drawing operation, to trim the edges of the article in a separate operation after the article leaves the punch press.

The principal object of the present invention is to provide combination dies, and associated mechanism, by means of which deep drawn sheet metal articles may be made in a single operation, eliminating the separate subsequent trimming of the edges which has heretofore been necessary in the production of such articles.

A further object of the invention is to provide combination dies, and associated mechanism, of the character aforesaid which will be simple, efficient and entirely automatic in their operation, whereby press forming work of a good quality may be rapidly, expeditiously and economically performed.

A further object of the invention is to provide combination dies, and associated mechanism, of the character aforesaid, which may, if desired, be made by the alteration of existing die structures.

More specifically considered, this invention relates to a modified form of the invention described and shown in my application for Letters Patent, filed Dec. 4, 1941, Serial No. 421,621.

The nature and characteristic features of the invention will be more readily understood from the following description, taken in connection with the accompanying drawings forming part hereof, in which:

Figure 1 is a transverse vertical sectional view of a combination blanking and forming die structure, and associated mechanism to assist in the operation and control thereof, embodying the main features of the present invention;

Fig. 2 is a fragmentary section, somewhat enlarged, of a portion of the structure shown in Fig. 1, but with the parts in their respective positions at an intermediate stage of the drawing operation;

Fig. 3 is a view similar to Fig. 2, but with the parts in their respective positions at the completion of the drawing operation;

Fig. 4 is a vertical central sectional view of a modified form of upper die structure;

Fig. 5 is a vertical sectional view, certain parts being shown in elevation, of a modified form of

mechanism for assisting in the operation and control of the die structure; and

Fig. 6 is a similar view of another modified form of such mechanism.

It should of course be understood that the description and drawings are illustrative merely, and that various modifications and changes may be made in the structure disclosed without departing from the spirit of the invention.

Referring now more particularly to Fig. 1 of the drawings, there is there shown a preferred form of combination blanking and forming die and associated mechanism adapted to assist in the operation and control thereof. In said view, 10 is a portion of the ram or reciprocating head of a punch press, in which ram the shank portion 11 of a part of the upper die structure is positioned.

To the shank portion 11 there is secured, in the present instance, an inner sleeve 12 which is surrounded by an outer sleeve 13. The outer sleeve 13 is in effect a blanking punch which serves in connection with the lower die proper, to be presently described, initially to sever the blank from which the article is to be formed from the sheet stock 14.

The outer sleeve 13 has, when free, a slight range of vertical movement with respect to the inner sleeve 12, for a purpose to be presently explained. The inner sleeve 12 is initially locked with respect to the outer sleeve 13 by means of a bolt member 15 which is mounted in a suitable housing 16 and is impelled inwardly to the locking position by means of a coil spring 17 (see Fig. 4). The housing 16 in which the bolt member 15 is mounted is secured to the outer sleeve 13 by having a portion 18 threaded therein. The bolt member 15 is also provided with a cam groove 19 which is engaged by the inner end of a set screw 20 mounted in the housing 16.

The bolt member 15 has mounted thereon an angularly extending arm 21, the arrangement being such that when the arm 21 is engaged by a suitable obstruction presently to be described, the bolt member 15 will be turned on its axis, and by reason of the engagement of the set screw 20 with the cam groove 19 the bolt 15 will be retracted, thereby to free the inner sleeve 12 with respect to the outer sleeve 13.

The outer sleeve 13 is limited in its downward shift with respect to the inner sleeve 12 by means of screws 22 which are threaded into the upper portion of the outer sleeve 13, the heads of said screws being positioned in recesses provided in a flanged portion 23 of the inner sleeve 12 near the shank portion 11 thereof.

Preferably, the upper end of the outer sleeve 13 is set in a yoke member 24 having extensions provided with bushings 25 which serve as bearings engaging the upper ends of guide rods 26.

The lower ends of the guide rods 26 are secured in the bolster 27 presently to be described.

The upper die structure is also provided with the usual internal knock-out block 28, the lower end of which is shaped complementary to the shape of the article being formed. The upper end of the knock-out block 28 is provided with a threaded recess to receive the lower end of a bolt member 29 which bolt is impelled upwardly by the tension of a coil spring 30. In the operation of the press, the head portion of the bolt member 29 is engaged by the usual knock-out bar (not shown) of the press as the ram returns to its uppermost position, which causes the knock-out block 28 to be moved downwardly with respect to the inner sleeve 12, thereby to eject the finished shell from the interior of said sleeve 12 in the usual manner.

The lower die structure is provided with the die proper which is mounted in the usual bolster 27. The bolster is secured to the bed 31 of the punch press in the usual manner.

The die 32 has the blanking opening cut therein, the outline of which is determined by the shape of blank required to produce the particular article which is to be formed and, of course, the same is complementary to the outer sleeve 13. Within the die 32 is mounted an outer pressure sleeve 33, the lower end of which is provided with a flange 34 for engagement by the pressure pins 35. Also slidably mounted in the sleeve 33 is an inner pressure sleeve 36 complementary in shape to the inner sleeve 12 of the upper die structure.

The inner pressure sleeve 36 likewise has, at its lower end, a flange 37 which is engaged by the pressure pins 38. One of the pressure pins 38 is secured to the flange 37, as by a threaded portion 39, and said pressure pin 38 is also provided with an enlarged portion 40 midway its extremities. The enlargement 40 provides a shoulder, which when the ram is raised bears against the under surface of the bolster 27, and thus prevents the upper face of the inner sleeve 36 from extending, at the wrong time, above the upper face of the outer sleeve 33, which in turn is prevented from extending above the upper face of the die 32 by means of its flange 34, which bears against an internal portion of the die member 32.

The forming plunger 41 is disposed within the inner sleeve 36 of the lower die structure, being adapted to extend into the inner sleeve 12 of the upper die structure when the ram descends to its lowermost position. The plunger 41 is provided at its lower end with an enlarged foot portion 42 tapered to fit a complementally tapered opening in a portion of the bolster 27.

The bolster 27 carries a bolt member 43 adjustably mounted therein as by threading, the same being secured in adjusted position by means of the lock nut 44. The head 45 of the bolt 43 provides the obstruction hereinbefore referred to, which is adapted to be encountered by the angularly extending arm 21 of the bolt member 15 when the ram of the press descends to the proper point, at which it is desired to release the outer sleeve 13 of the upper die structure with respect to the inner sleeve 12 thereof, for a purpose presently to be explained.

At the lower portion of Fig. 1 of the drawings, there is shown a preferred form of mechanism for assisting and controlling the action of the several members of the die structure. As there shown, it will be noted that the pressure pins 35 which support the outer sleeve 33 of the lower die structure rest at their lower ends on a sleeve

member 50, which in turn engages a plate member 51 which is normally under tension of the coil springs 52 respectively mounted on the bolt members 53.

The bolt members 53 are secured to a plate member 54 which plate member 54 is secured to the under portion of the bed 31 of the press by fastening bolts (not shown) or other suitable means. Such coil springs 52 or similar means are normally provided, in presses employing combination dies, for the purpose of holding the outer part of the metal of the blank during the forming operation, thereby to prevent wrinkles and creases in that portion of the metal, as the drawing operation takes place. It is, of course, well known that various forms of cushioning springs are used in practice. In some instances solid blocks of rubber, and in other instances pneumatic cushions are employed for this purpose.

The pressure pins 38 which support the inner sleeve of the lower die structure also extend through the bed 31 of the press, and at their lower ends engage a collar 55 which is slidably mounted on a centrally disposed bolt 56. The bolt 56 is secured in the plate member 54 hereinbefore referred to, and is surrounded at its upper portion by a coil spring 57, which serves as an additional cushioning spring, and assists in the holding of the flat portion of the metal of the blank during the first part of the drawing operation.

The spring 57 also functions as a cushioning spring during the final part of the drawing operation after the trimming action of the dies of the present invention takes place, as will be hereinafter more fully set forth. The tension of the coil spring 57 may be adjusted by means of the nut 58 which is threaded on the bolt 56 intermediate the ends thereof.

Surrounding the lower part of the bolt 56 is another coil spring 60 which is much heavier, and is provided for a purpose to be presently explained. The upper end of said heavy coil spring 60 is provided with a collar 61 which is positioned to be encountered by the plate member 51 at the proper point as the said plate member 51 descends during the drawing operation. The lower end of said coil spring 60 is set on a collar 62 which is adjustably mounted on the lower end of the bolt member 56, nuts 63 being provided to effect and maintain the adjustment.

The operation of the parts as above described may now be explained. The ram 10 of the press, being in the elevated position, the sheet metal stock 14 is inserted between the upper and lower die structures in the usual manner. As the ram descends, the outer sleeve 13 and inner sleeve 12 of the upper die structure acting as a unit, by reason of their being locked together by means of the bolt 15, will penetrate the opening of the die 32 to sever the blank from the stock.

The blank will now be carried downwardly into the die and at the same time the outer and inner sleeves 33 and 36 will be respectively depressed against the tension of their respective cushioning springs hereinbefore described, operating through the pressure pins 35 and 38, the spring pressure becoming progressively greater as the various parts descend. The central portion of the blank will encounter the forming plunger 41 and thereby be forced into the interior of the sleeve 12 of the upper die structure, and the cushioning springs 52 which control the outer sleeve 33 of the lower die structure as well as the spring 57 which

operates on the inner sleeve 36 of the lower die structure will meanwhile prevent the portion of the blank which lies between the sleeve of the upper and lower die structures from becoming creased or wrinkled.

As the ram continues to descend the plate member 51 will encounter the collar 61 at the upper end of the heavy coil spring 60 thereby to add the tension of said heavy coil spring 60 to the pressure pins 35 and thence to the outer sleeve 33 of the lower die structure. After this tension is imparted to the outer sleeve 33 the angular arm 21 of the bolt member 15 will encounter the head 45 of the bolt 43 which will cause the bolt member 15 to be rotated and thereby retracted by reason of the engagement of the cam groove 19 with the set screw 20.

When the bolt member 15 is retracted sufficiently to be withdrawn from the inner sleeve 12 of the upper die structure, the outer sleeve 13 will be permitted to rise with respect to the inner sleeve 12 a sufficient distance to shear the metal which still remains beyond the margins of the inner sleeves 12 and 36 (see Fig. 2). This action occurs after the greater part of the article being formed has been shaped within the interior of the inner sleeve 12 of the upper die structure, so that when the forming is completed, as shown in Fig. 3 of the drawings, the edge of the article will be smooth and regular in its formation, and no separate subsequent trimming will be required.

However, as the trimming is effected by means of the shift of the outer sleeves 13 and 33, with respect to the inner sleeves 12 and 36, the pressure of the heavy coil spring 60, which is employed to effect the trimming operation, is not required prior to the time the trimming takes place, and for this reason, there is a predetermined distance of movement of the plate member 51, which through intermediate parts supports the outer sleeve 33 of the lower die structure, before it encounters the collar 61 against which the upper end of the coil spring 60 bears, this distance being adjustable by means of the nuts 63 at the lower end of the bolt 56.

When the ram of the press returns to its uppermost position, the formed article will be ejected from the interior of the inner sleeve 12 of the upper die structure by the knock-out block 28 operated in the usual manner, and as hereinbefore set forth. Also, at the same time, the inner sleeve 36 and outer sleeve 33 of the lower die structure will be returned to their initial positions with the top faces thereof flush with the blanking die 32, so that the scrap, both from the initial blanking operation and from the subsequent trimming operation, may be removed either by gravity, when the press is used in an inclined position, or by the usual sweeps (not shown).

In Fig. 4 of the drawings there is shown a modified form of upper die structure in which the inner sleeve 12^a and outer sleeve 13^a are mounted in an enlarged head portion 70 of a suitable holder, the inner sleeve 12^a being fixedly secured therein as by means of the screws 71, whereas the outer sleeve 13^a is permitted the necessary slight shift with respect to the other parts as by means of the screws 72. In this instance, the head portion of the holder is provided with an upwardly extending shank portion 11^a which is mounted in the ram of the press.

In Fig. 5 of the drawings there is shown a modified form of arrangement for the control of the heavy coil spring 60 used for the trimming

of the edge portion of the metal stock. This arrangement is preferred for use in the working of metals of a heavier gauge which therefore require a greater tension of the coil spring 60, which is primarily employed to effect the trimming operation, and in this form there is provided mechanism for relieving the tension of the heavy coil spring 60 after the trimming operation has been completed, and it is no longer necessary to maintain this high tension on the outer pressure sleeve 33.

In this arrangement the collar 62^a upon which the lower end of the heavy coil spring 60 rests, instead of being mounted directly on the central bolt member 56^a, is threaded on a sleeve 100 which is slidably mounted on the central bolt 56^a, being keyed against rotative movement thereon by means of a pin 101. A lock nut 63^a serves to secure the collar 62^a in adjusted positions on the sleeve 100.

The sleeve 100 is internally threaded as at 102, and said threaded portion is engaged by the complementally threaded portion of a sleeve 73 which is rotatably mounted on the lower end of the bolt member 56^a. The threaded sleeve 73 is provided at its lower end with a bevel pinion 74 which is engaged and driven by a complemental bevel gear 75.

The bevel gear 75 is secured to a horizontal shaft 76 which is journaled in suitable bearings 77 carried by a stationary portion of the press. The horizontal shaft 76 is provided with pinions 78 which are engaged by vertically extending racks 79. The lower ends of the racks rest on a horizontal plate 80, portions of which slidably engage extensions 53^b at the lower ends of the bolts 53^a. The plate 80 and the parts supported thereby are normally impelled to their uppermost positions by means of coil springs 81 which surround the extensions 53^b at the lower ends of the bolts 53^a.

The upper ends of the racks 79 support a suitable collar 82 which is externally threaded for the adjustable mounting thereon of a complementally threaded collar 83. A lock nut 84 is provided to hold the collar 83 in its proper adjusted position with respect to the collar 82 which is supported at the upper ends of the racks 79. The collar 82 is also provided with a flange 85 through which extend rods 86 depending downwardly from the plate member 51.

The operation of the mechanism as shown in Fig. 5 of the drawings may now be explained. When the sleeve 50 is forced downwardly by the pressure pins 35, and the plate 51 engages the collar 61, which rests upon the upper end of the coil spring 60, thereby to impart the pressure of the heavy coil spring 60 to the outer pressure sleeve 33, to effect the trimming operation at the proper time, as hereinbefore set forth.

However, in the present instance, the plate member 51 will also encounter the sleeve 83 in its downward movement, which will serve to push the racks 79 downwardly, thereby rotating the horizontal shaft 76 and through the intermediary of the bevel gears 75 and 74 will cause the threaded sleeve 73 to rotate with respect to the internally threaded sleeve 100. The sleeve 100 will be pulled downwardly, thus relieving the tension of the heavy coil spring 60, after the trimming operation has been effected.

To return the parts to their initial positions, it will be noted that the rods 86, which depend downwardly from the plate 51, will be pushed upwardly by the cushioning springs 52, and as

the same moves to its uppermost position, the nuts 87 which are mounted on the depending rods 86 will engage the flange 85 of the sleeve member 82 and thereby bring the sleeve 83, which is mounted thereon, to its initial position.

At the same time, the auxiliary springs 81 which are mounted on the extensions 53^b at the lower ends of the bolts 53^a will push the plate 80 upwardly causing the horizontal shaft 76 to be rotated in a reverse direction which, through the intermediary of the bevel gears 75 and 74 and the threaded sleeve 73 rotating with respect to the internally threaded sleeve 70, will cause the collar 62^a, upon which the lower end of the coil spring 60 rests, to be brought to its initial position.

In Fig. 6 of the drawings there is shown another form of mechanism also adapted for use in the working of metals of a heavier gauge, which mechanism is, in some respects, similar to that shown in Fig. 5. However, in this instance the rack 79^a which operates the pinion 78^a on the horizontal shaft 76^a is actuated by means of a connecting rod 90 which extends to a crank pin 91 carried by the crank arms 92. The crank arms 92 are connected to a horizontal shaft 93 on the end of which is secured a bevel gear 94. The bevel gear 94 meshes with a bevel gear 95 secured to the lower end of a vertically extending shaft 96.

The vertically extending shaft 96 also has a bevel gear 97 secured to the upper end thereof, which meshes with and is driven by a bevel gear 98 mounted on the end of the horizontal shaft 99. The shaft 99 may be and preferably is an extension of the main shaft of the punch press. The foregoing arrangement is such that the tension of the heavy coil spring 60 is controlled in timed relationship with the operation of the press.

It will be readily understood that, if desired, the drawing operation may be terminated at any point after the trimming has occurred, and in this manner the articles produced may be provided with flanges, and also that the flanges thus provided do not necessarily have to be concentric with the body of the shell. For example, a cylindrical shell body might be provided with a square shaped flange, or any other shape of body shell may be provided with other shapes of flanges, all as is more particularly set forth in detail in my other application for Letters Patent hereinbefore referred to.

Likewise the end edge of the article, when the same is made without any flange, may be of a variety of shapes, which is also set forth more in detail in my other application for Letters Patent hereinbefore referred to.

It will thus be seen that there is provided simple and efficient means whereby the trimming of deep drawn articles may be accomplished at the same time the articles are formed in the press, whereby great economies may be effected in such operations, and that the invention is applicable to the production of a wide variety of forms of articles.

1. Blanking and forming die structure comprising a blanking die proper, inner and outer sleeves adapted to penetrate said blanking die to effect the blanking operation, a forming plunger adapted to extend into the inner sleeve to effect the forming operation, the outer sleeve having a limited and controlled movement with respect to the inner sleeve, outer and inner pressure sleeves cooperating with the aforesaid

die penetrating sleeves, resilient means for supporting said pressure sleeves and maintaining the requisite pressure to prevent wrinkling of the outer portions of the blank during the forming operation, means for imparting additional pressure to the outer pressure sleeve at a predetermined point in the operation of the press prior to the completion of the formed article thereby to trim the same, and means for automatically releasing said additional pressure when the trimming operation has been effected.

2. Blanking and forming die structure comprising a blanking die proper, inner and outer sleeves adapted to penetrate said blanking die to effect the blanking operation, a forming plunger adapted to extend into the inner sleeve to effect the forming operation, the outer sleeve having a limited range of movement with respect to the inner sleeve, a device initially locking the outer sleeve to the inner sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, outer and inner pressure sleeves cooperating with the aforesaid die penetrating sleeves, resilient means for supporting said pressure sleeves and maintaining the requisite pressure to prevent wrinkling of the outer portions of the blank during the forming operation, and means for imparting additional pressure to the outer pressure sleeve when the outer die penetrating sleeve is released with respect to the inner die penetrating sleeve thereby to trim the formed article prior to its completion.

3. Blanking and forming die structure comprising a blanking die proper, inner and outer sleeves adapted to penetrate said blanking die to effect the blanking operation, a forming plunger adapted to extend into the inner sleeve to effect the forming operation, the outer sleeve having a limited range of movement with respect to the inner sleeve, a device initially locking the outer sleeve to the inner sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, outer and inner pressure sleeves cooperating with the aforesaid die penetrating sleeves, resilient means for supporting said pressure sleeves and maintaining the requisite pressure to prevent wrinkling of the outer portions of the blank during the forming operation, and resilient means for imparting additional pressure to the outer pressure sleeve when the outer die penetrating sleeve is released with respect to the inner die penetrating sleeve thereby to trim the formed article prior to its completion.

4. Blanking and forming die structure comprising a blanking die proper, inner and outer sleeves adapted to penetrate said blanking die to effect the blanking operation, a forming plunger adapted to extend into the inner sleeve to effect the forming operation, the outer sleeve having a limited range of movement with respect to the inner sleeve, a device initially locking the outer sleeve to the inner sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, outer and inner pressure sleeves cooperating with the aforesaid die penetrating sleeves, resilient means for supporting said pressure sleeves and maintaining the requisite pressure to prevent wrinkling of the outer portions of the blank during the forming operation, resilient means for imparting additional pressure to the outer pressure sleeve when the outer die penetrating sleeve is released with respect to the inner die penetrating sleeve there-

by to trim the formed article prior to its completion, and means for automatically releasing said additional pressure when the trimming operation has been effected.

5. Blanking and forming die structure comprising a blanking die proper, inner and outer sleeves adapted to penetrate said blanking die to effect the blanking operation, a forming plunger adapted to extend into the inner sleeve to effect the forming operation, the outer sleeve having a limited range of movement with respect to the inner sleeve, a device initially locking the outer sleeve to the inner sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, outer and inner pressure sleeves cooperating with the aforesaid die penetrating sleeves, resilient means for supporting said pressure sleeves and maintaining the requisite pressure to prevent wrinkling of the outer portions of the blank during the forming operation, means for imparting additional pressure to the outer pressure sleeve when the outer die penetrating sleeve is released with respect to the inner die penetrating sleeve thereby to trim the formed article prior to its completion, and means for automatically releasing said additional pressure when the trimming operation has been effected, said pressure releasing means comprising the combination, with spring means for imparting said additional pressure, of a releasable support therefor, and means for releasing said support at a predetermined point in the operation of the press.

6. Blanking and forming die structure comprising a blanking die proper, inner and outer sleeves adapted to penetrate said blanking die to effect the blanking operation, a forming plunger adapted to extend into the inner sleeve to effect the forming operation, the outer sleeve having a limited range of movement with respect to the inner sleeve, a device initially locking the outer sleeve to the inner sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, outer and inner pressure sleeves cooperating with the aforesaid die penetrating sleeves, resilient means for supporting said pressure sleeves and maintaining the requisite pressure to prevent wrinkling of the outer portions of the blank during the forming operation, means for imparting additional pressure to the outer pressure sleeve when the outer die penetrating sleeve is released with respect to the inner die penetrating sleeve thereby to trim the formed article prior to its completion, and means for automatically releasing said additional pressure when the trimming operation has been effected, said pressure releasing means comprising the combination, with spring means for imparting said additional pressure, of a releasable support therefor, means for releasing said support at a predetermined point in the operation of the press, and means for resetting said support.

7. Blanking and forming die structure comprising a blanking die proper, inner and outer sleeves adapted to penetrate said blanking die to effect the blanking operation, a forming plunger adapted to extend into the inner sleeve to effect the forming operation, the outer sleeve having a limited and controlled movement with respect to the inner sleeve, outer and inner pressure sleeves cooperating with the aforesaid die penetrating sleeves, resilient means for supporting said pressure sleeves and maintaining the requisite pressure to prevent wrinkling of the outer portions

of the blank during the forming operation, and resilient means for imparting additional pressure to the outer pressure sleeve at a predetermined point in the operation of the press thereby to trim the formed article prior to its completion, and for automatically releasing said additional pressure when the trimming operation has been effected, said means comprising the combination, with spring means for imparting said additional pressure, of a support therefor, a crank shaft connected to said support, and means for driving said crank shaft in synchronism with the press shaft.

8. Blanking and forming die structure comprising a blanking die proper, inner and outer sleeves adapted to penetrate said blanking die to effect the blanking operation, a forming plunger adapted to extend into the inner sleeve to effect the forming operation, the outer sleeve having a limited range of movement with respect to the inner sleeve, a device initially locking the outer sleeve to the inner sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, outer and inner pressure sleeves cooperating with the aforesaid die penetrating sleeves, resilient means for supporting said pressure sleeves and maintaining the requisite pressure to prevent wrinkling of the outer portions of the blank during the forming operation, and resilient means for imparting additional pressure to the outer pressure sleeve when the outer die penetrating sleeve is released with respect to the inner die penetrating sleeve, thereby to trim the formed article prior to its completion, and for automatically releasing said additional pressure when the trimming operation has been effected, said means comprising the combination, with spring means for imparting said additional pressure, of a movable support therefor, a crank shaft connected to said support, and means for driving said crank shaft in synchronism with the press shaft.

9. Blanking and forming die structure comprising a blanking die proper, inner and outer sleeves adapted to penetrate said blanking die to effect the blanking operation, a forming plunger adapted to extend into said inner sleeve to effect the forming operation, said outer sleeve having a limited movement with respect to said inner sleeve, means for effecting timed control of the movement of said outer sleeve with respect to said inner sleeve thereby to trim the formed article prior to its completion, outer and inner pressure sleeves cooperating with the aforesaid die penetrating sleeves, and resilient means for supporting said pressure sleeves and maintaining the requisite pressure to prevent wrinkling of the outer portions of the blank during the forming operation.

10. Blanking and forming die structure comprising a blanking die proper, inner and outer sleeves adapted to penetrate said blanking die to effect the blanking operation, a forming plunger adapted to extend into said inner sleeve to effect the forming operation, inner and outer pressure sleeves cooperating with the aforesaid die penetrating sleeves, means for locking the outer of the die penetrating sleeves with respect to its inner sleeve, and means for releasing said locking means at a predetermined time after the drawing operation has progressed thereby to permit shifting of said outer sleeves with respect to said inner sleeves to trim the formed article to the desired end edge shape.

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