

Oct. 12, 1943.

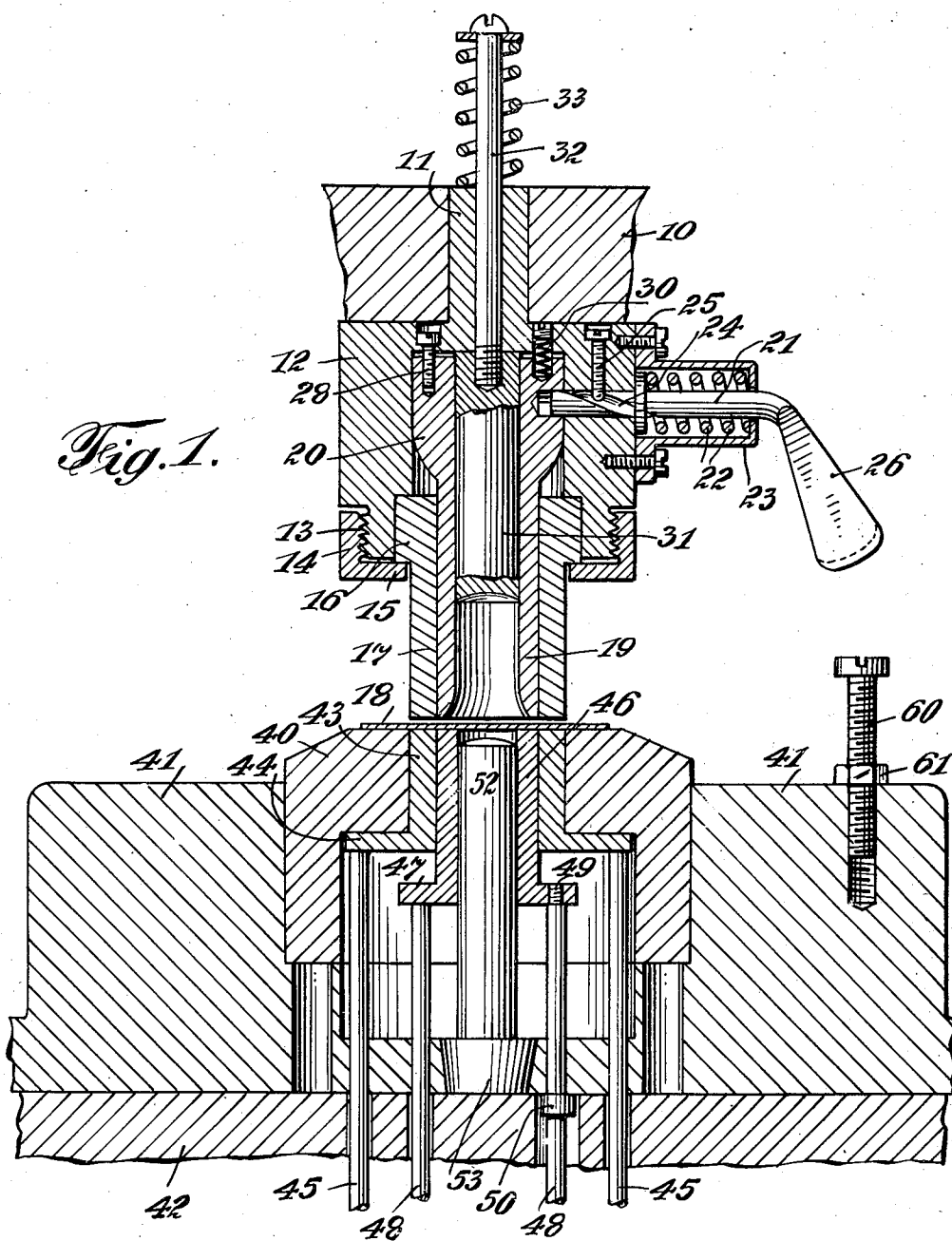
B. MENKIN

2,331,490

BLANKING AND FORMING DIES

Filed Dec. 4, 1941

5 Sheets-Sheet 1



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2,331,490

BLANKING AND FORMING DIES

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5 Sheets-Sheet 2

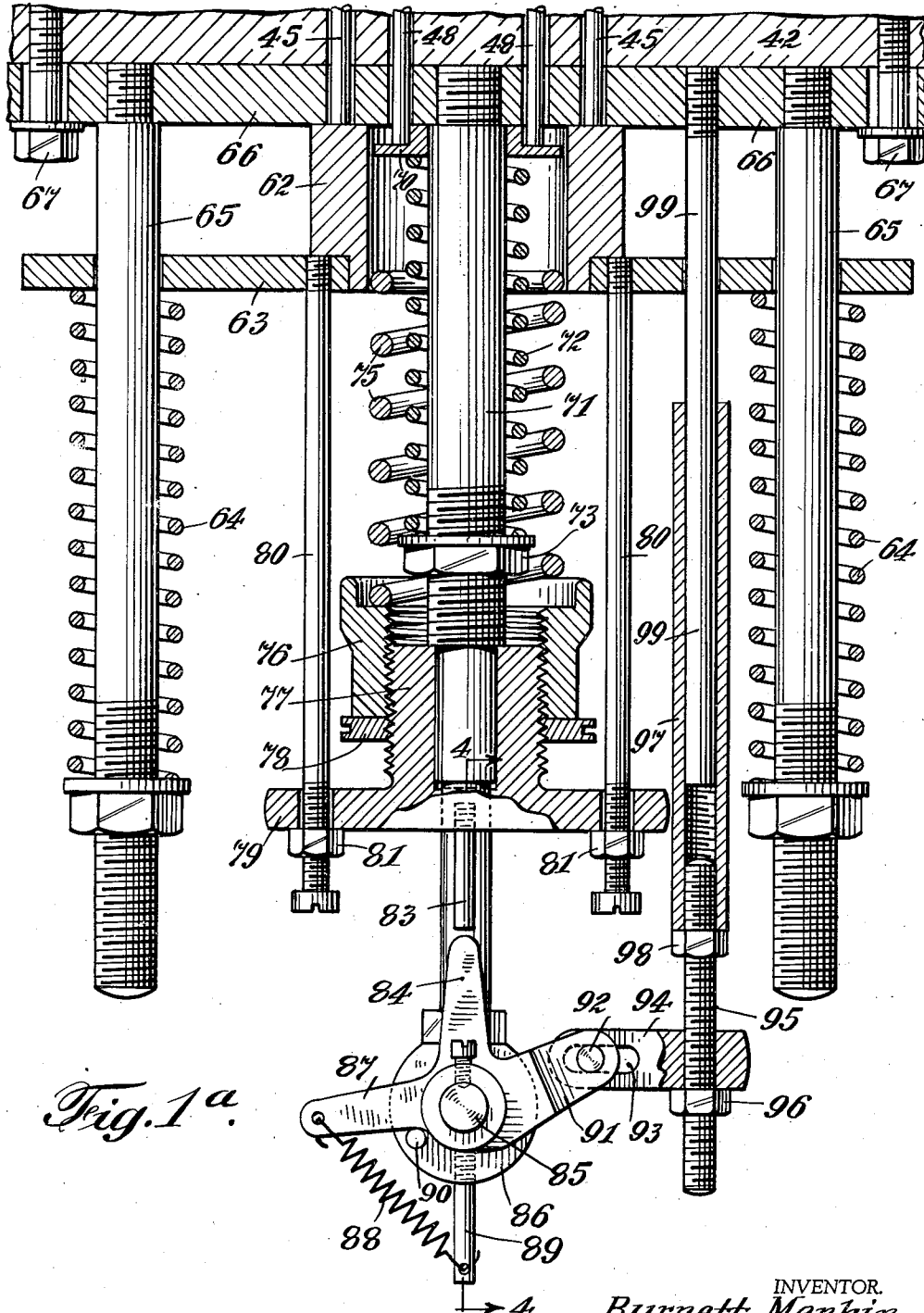


Fig. 1a.

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BLANKING AND FORMING DIES

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5 Sheets-Sheet 3

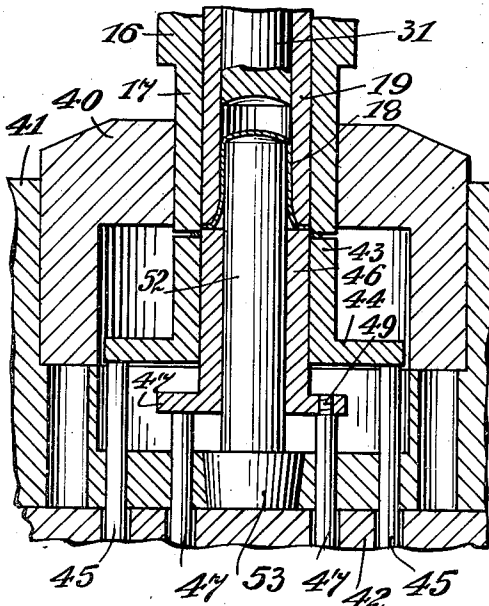


Fig. 2.

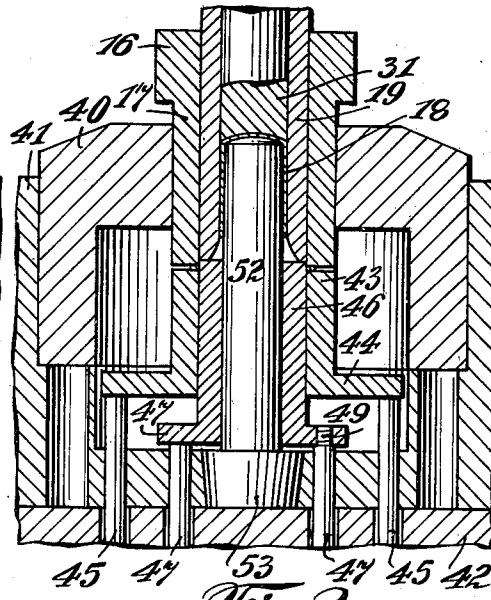


Fig. 3.

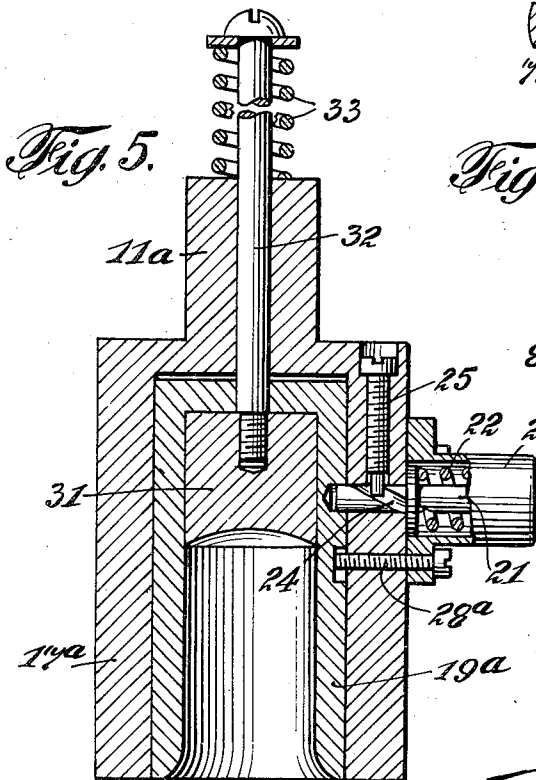


Fig. 5.

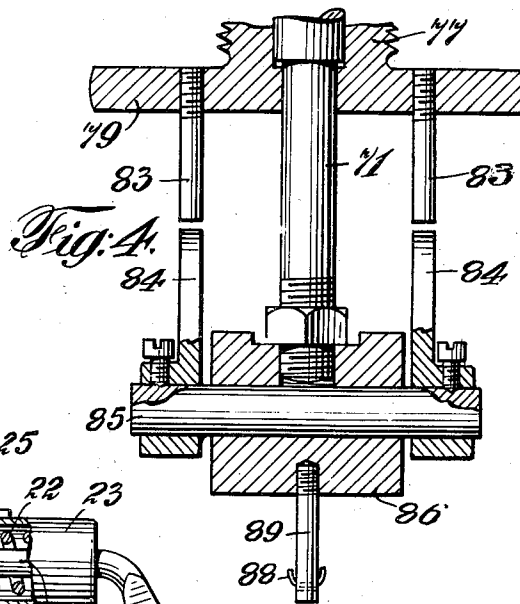


Fig. 4.

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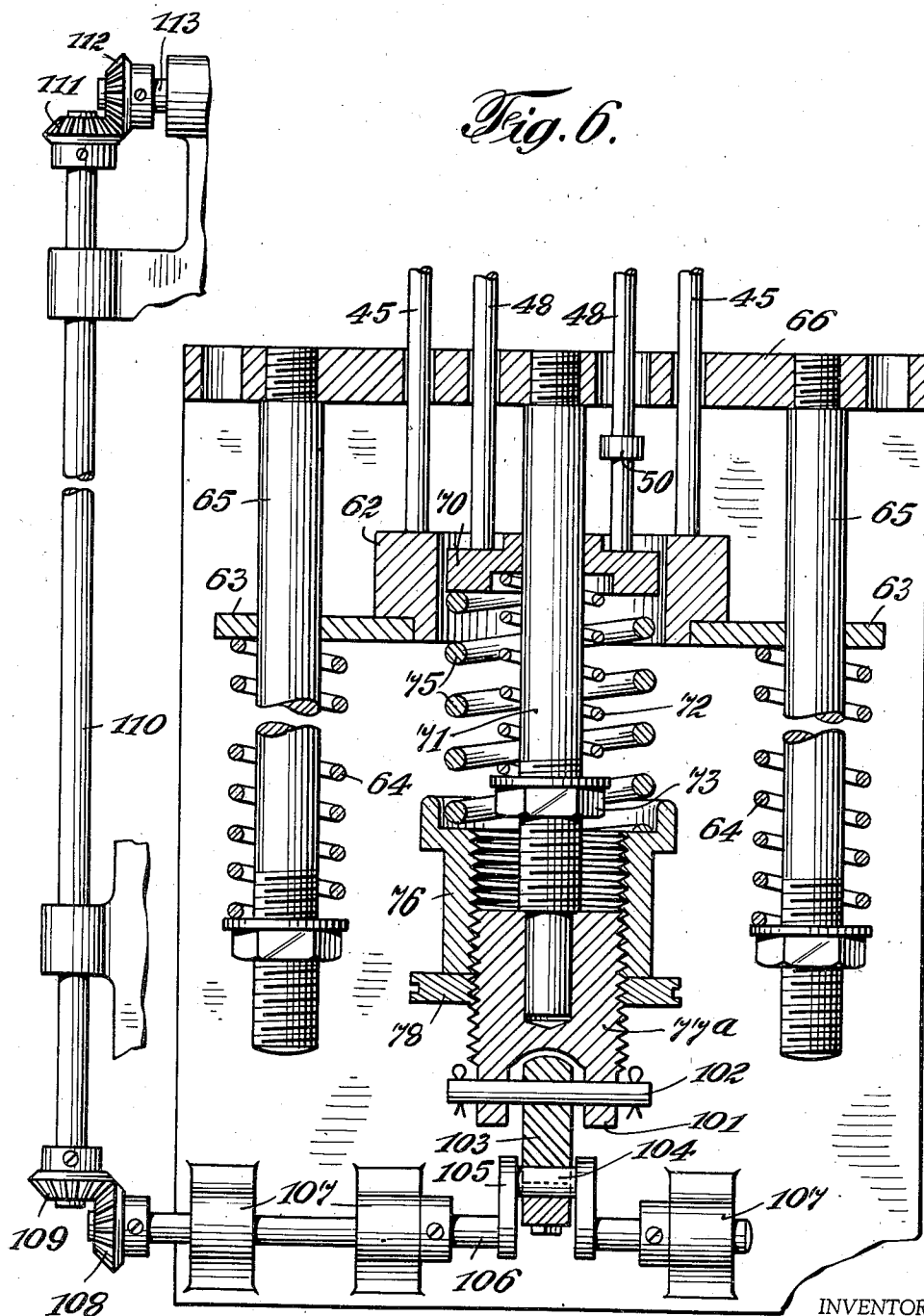
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BLANKING AND FORMING DIES

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5 Sheets-Sheet 4

Fig. 6.



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BLANKING AND FORMING DIES

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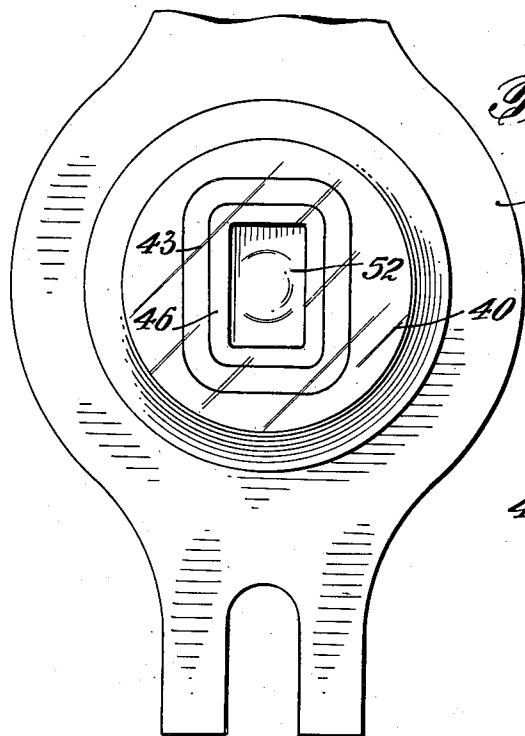


Fig. 7.

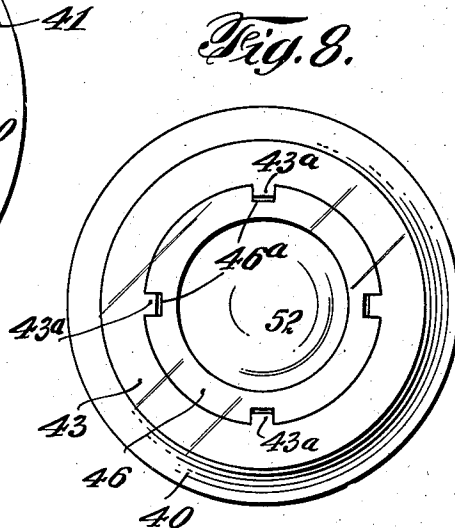


Fig. 8.

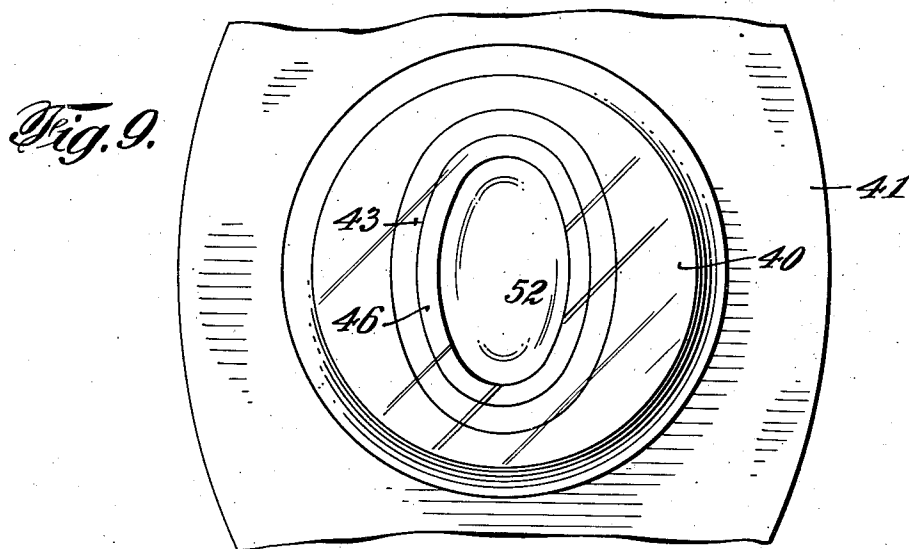


Fig. 9.

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UNITED STATES PATENT OFFICE

2,331,490

BLANKING AND FORMING DIE

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Application December 4, 1941, Serial No. 421,621

12 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.

Heretofore in the manufacture of articles from sheet metal, by blanking and forming operations, where the process involved 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.

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 section of a combination blanking and forming die structure embodying the main features of the invention;

Fig. 1^a is a similar view of a preferred arrangement of mechanism, disposed beneath the press bed, to assist in the operation and control of the combination die structure shown in Fig. 1 of the drawings;

Fig. 2 is a fragmentary section 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 transverse section of a portion of the mechanism shown in Fig. 1^a, said section being taken approximately on the line 4—4 of Fig. 1^a;

Fig. 5 is a central sectional view illustrating the application of the invention to the upper part of an existing die which has been reconstructed to utilize the invention;

Fig. 6 is a view similar to Fig. 1^a illustrating

another arrangement of mechanism adapted to assist in the control and operation of the dies; and

Figs. 7, 8 and 9 are respectively plan views of portions of the lower part of the die structure, illustrating the applicability of the invention to the formation of articles of various shapes.

It should, of course, be understood that the description and drawings herein 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 embodying the present invention. 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 the upper die holding block 12 is positioned. The lower part of the block 12 is threaded as at 13, and mounted on said threaded portion is a complementary threaded member 14 having an internal flange 15 which bears against a shouldered portion 16 of an outer sleeve 17 of the upper die structure. The shouldered portion 16 is positioned in a recess in the block member 12.

The outer sleeve 17 is, in effect, a blanking punch which serves, in connection with the lower die to be presently described, to initially sever the blank, from which the article is to be formed, from the sheet stock 18.

Within the outer sleeve 17 of the upper die structure is another sleeve 19 having, when free, a slight range of vertical movement with respect to the outer sleeve 17 for a purpose to be presently explained. The upper end of the inner sleeve 19 has an enlarged head portion 20 which is initially locked, with respect to the outer sleeve 17, by means of a bolt member 21, which is mounted in the block member 12, and which is impelled inwardly to the locking portion by means of a coil spring 22 mounted in a housing 23 secured to the block member 12.

The bolt member 21 is also provided with a cam groove 24 which is engaged by the inner end of a set screw 25 mounted in the block member 12. The outer end of the bolt member 21 has an angularly extending arm 26, the arrangement being such that when the arm 26 is engaged by a suitable obstruction presently to be described, the bolt member 21 will be turned on its axis and, by reason of the engagement of the set screw 25 with the cam groove 24, the bolt will be re-

tracted, thereby to free the inner sleeve 19 with respect to the outer sleeve 17.

The inner sleeve 19 of the upper die structure is limited in its downward movement with respect to the outer sleeve 17 by means of a screw 28 which is threaded into the upper part of the head portion 20 of the inner sleeve 19, and the head of which screw 28 is positioned in a suitable opening in the block member 12. The inner sleeve 19 of the upper die structure is impelled to the position to be engaged by the locking bolt 21 by means of a spring 30, one end of which is mounted in the block member 12, and the other end of which extends into a recess in the enlarged head portion 20 of the inner sleeve 19 of the upper die structure.

The upper die structure is also provided with the usual internal knock-out block 31, the lower end of which is shaped complementary to the shape of the article being formed, and the upper end of which is provided with a threaded recess to receive the lower end of a bolt member 32, which normally is pushed upwardly by the tension of a coil spring 33. In the operation of the press, the head portion of the bolt member 32 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 31 to be moved downwardly with respect to the inner sleeve 19, thereby to eject the finished shell from the interior of said sleeve 19 in the usual manner.

The lower die structure is provided with the die proper 40, which is mounted in the usual bolster 41, which in turn is secured to the bed 42 of the punch press in the usual manner.

The die 40 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 17 of the upper die structure. Within the die 40 is mounted an outer pressure sleeve 43, the lower inner end of which is provided with a flange 44 for engagement by the pressure pins 45. Slidably mounted in the sleeve 43 is an inner sleeve 46 of the same shape in cross section as the inner sleeve 19 of the upper die structure. The inner sleeve 46 likewise has, at its lower inner end, a flange 47 which is engaged by the pressure pins 48. One of the pressure pins 48 is secured to the flange 47 as by a threaded portion 49, and said pressure pin 48 is also provided with an enlarged portion 50. The enlargement 50 provides a shoulder which when the ram is raised bears against the under surface of the bolster 41, and thus prevents the upper face of the inner sleeve 46 from getting out of alignment, at the wrong time, with the upper face of the outer sleeve 43, which in turn is prevented from extending above the upper face of the die 40, by means of its flange 44 which bears against an internal portion of said die member 40.

The forming plunger 52 is disposed within the inner sleeve 46 of the lower die structure, being adapted to extend into the inner sleeve 19 of the upper die structure, when the ram descends to its lowermost position. The plunger 52 is provided at its lower end with an enlarged foot portion 53 tapered to fit a complementally tapered opening in a portion of the bolster 41.

The bolster 41 carries a bolt 60 adjustably mounted therein as by threading, the same being secured in adjusted positions by means of the lock nut 61. The head of the bolt 60 provides the obstruction hereinbefore referred to which is adapt-

ed to be encountered by the angularly extending arm 26 of the bolt member 21 when the ram of the press descends to the proper point at which it is desired to release the inner sleeve of the upper die structure with respect to the outer sleeve thereof, for a purpose to be presently explained.

Reference may now be had to Figure 1* of the drawings wherein there is shown a preferred form of mechanism for assisting and controlling the action of the several members of the die. As there shown, it will be noted that the pressure pins 45 which support the outer sleeve 43 of the lower die structure rest at their lower ends on a sleeve member 62, which in turn engages a plate member 63 which is normally under tension of the coil springs 64 respectively mounted on the bolt members 65.

The bolt members 65 are secured to a plate member 66 which in turn is secured to the under portion of the bed 42 of the press by fastening bolts 67, or other suitable means. Coil springs 64 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 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 48, which support the inner sleeve 46 of the lower die structure, also extend through the bed 42 of the press and at their lower ends engage a collar 70 which is slidably mounted on a centrally disposed bolt 71. The bolt 71 is secured in the plate 66 hereinbefore referred to, and is surrounded at its upper portion by the coil spring 72 which serves as an additional cushioning spring, and will assist in the holding of the flat portion of the metal of the blank during the first part of the drawing operation. The spring 72 also functions as a cushioning spring during the final part of the drawing operation, after the novel 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 72 may be adjusted by means of the nut 73 which is threaded on the bolt 71 intermediate the ends thereof.

Surrounding the cushioning coil spring 72, which is provided for the inner sleeve of the lower die structure, is another coil spring 75 which is much heavier and is provided for a purpose to be presently explained. The upper end of said heavy coil spring 75 is positioned to be encountered by the collar 70 as the same descends during the drawing operation, and the lower end of said coil spring 75 is seated on a collar 76.

The collar 76 is threaded on a flanged member 77 so as to be adjustable with respect thereto, a lock nut 78 being provided to maintain the adjustment. The member 77 is slidably mounted on the central bolt 71 so as to have a limited range of vertical movement for a purpose to be presently explained.

The member 77 also has an extending flange 79 through which vertical rods 80 extend, the upper ends of which rods are threaded in the plate member 63, which engages the cushioning springs 64 which, as hereinbefore set forth, are provided for maintaining the pressure of the outer sleeve 43 of the lower die structure during the drawing

operation. The rods 80 are provided at their lower ends with threaded portions on which nuts 81 are mounted to bring the same to adjusted positions to engage the flange 79 of the member 77 when the ram of the press is raised.

The flange 79 of the member 77 is also provided with two downwardly extending pins 83, the lower ends of which are positioned above the upwardly extending fingers 84 of a trigger device disposed beneath the member 77. The finger members 84 are mounted on a horizontal shaft 85, which is journaled in a block 86 secured at the lower end of the central bolt member 71 hereinbefore referred to. At least one of the trigger members has an arm 87 extending on one side, which arm 87 is engaged by one end of a coil spring 88. The other end of the coil spring 88 is secured to a pin 89 projecting downwardly from the block member 86, hereinbefore referred to. The block member 86 also has a stop pin 90 which is engaged by the arm 87 of the trigger device and serves to limit the positions of the upwardly extending fingers 84 of the trigger device to bring the same directly under the lower ends of the downwardly extending pins 83 carried by the flange 79 of the member 77. At least one of the trigger members also carries a projecting arm 91 having a pivot pin 92 at the end thereof. The pin 92 is engaged by the slotted portion 93 of an arm member 94, which is mounted on a threaded rod 95, being secured thereon in its adjusted position by means of the lock nut 96. The rod 95 is threaded at its upper end in a sleeve 97, and is secured at its proper adjusted position with respect thereto by means of the nut 98. The sleeve member 97 slidably engages the lower end of a downwardly extending rod 99, the upper end of which is threaded in the plate member 66 hereinbefore referred to, which is secured to the under side of the bed 42 of the press. The upper end of the sleeve 97 is normally positioned so as to be engaged by the plate member 63 as the same descends, during the forming operation, against the tension of the cushioning springs 64. The foregoing arrangement is such that, when said plate member 63 arrives at a certain point in its descent, the fingers 84 of the trigger mechanism may be sprung out from beneath the pins 83 and thus permit the member 77, which supports the collar 76, to move downwardly on the central bolt, thereby to relieve the tension which has at that point been imparted to the heavy coil spring 75 as will hereinafter be more fully set forth.

The operation of the parts as above described may now be explained. The ram of the press being in the elevated position, the sheet metal stock 18 is inserted between the upper and lower die structures in the usual manner. As the ram descends, the outer sleeve 17 and inner sleeve 19 of the upper die structure, acting as a unit by reason of their being locked together by means of the bolt 21, will penetrate the opening in the die 40 to sever the blank from the stock.

The blank will now be carried downwardly into the die 40, and at the same time the outer and inner pressure sleeves 43 and 46 will be respectively depressed against the tension of their respective cushioning springs, hereinbefore described, operating through the pressure pins 45 and 48, the spring pressure becoming progressively greater as the various parts descend. The central portion of the blank will encounter the forming plunger 52, and thereby be forced into the interior of the inner sleeve 19 of the upper

die structure, and the cushioning springs 64 which control the outer sleeve 43 of the lower die structure, as well as the spring 72 which operates on the inner sleeve 46 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 collar 70, against which the upper end of the spring 70, against which the upper end of the spring thereby to add the tension of said heavy coil spring 75 to the pressure pins 48 and thence to the inner sleeve 46 of the lower die structure. After this additional tension is imparted to the inner sleeve, the angular arm 26 of the bolt member 21 will encounter the head of the bolt 60, which will cause the bolt member 21 to be rotated and thereby retracted by reason of the engagement of the cam groove 24 with the screw 25.

When the bolt member 21 is retracted sufficiently to be withdrawn from the head portion 20 of the inner sleeve 19 of the upper die structure, said inner sleeve will be permitted to rise, with respect to the outer sleeve, a sufficient distance to shear the metal which still remains beyond the margins of the inner sleeves 19 and 46 (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 19 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, after the trimming is effected by means of the shift of the inner sleeves 19 and 46 with respect to the outer sleeves 17 and 43, it is necessary to relieve the pressure of the heavy coil spring 75 which is primarily employed to effect the trimming operation, and which consequently must have more power than would be required for mere cushioning or wrinkle prevention purposes.

There is therefore provided the trigger mechanism illustrated more particularly in Fig. 1^a of the drawings, which is brought into play by the plate 63 encountering, in its descent, the top of the sleeve 97, pushing the same downwardly so that the threaded bolt 95, which is mounted therein, will cause the slotted arm 94, which engages the pin 91 of the trigger mechanism, to rotate the shaft 85 and thus bring the trigger fingers 84 from beneath the pins 83, whereupon the flanged member 77 and the collar 76 carried thereby will be permitted to drop. As the collar 76 supports the lower end of the coil spring 75, the tension on said coil spring will thus be relieved.

After the forming operation has been completed, and as the ram of the press returns to its uppermost position, the plate 63 will be caused to rise by the spring 64, whereupon the depending bolts 80 will also be raised, thereby raising the flanged member 77 by reason of the engagement of the nuts 81 therewith, and the flanged member 77 will thus be restored to its initial position.

As the above action takes place, the trigger mechanism will also be returned to its initial position, by means of the coil spring 88 acting on the arm 87, it being understood that when the flanged member 77 is raised as above set forth, said coil spring will cause the trigger fingers 84 to return to their positions beneath

the pins 83, and at the same time the arm 94, which is controlled by the lever arm 91, will be raised to restore the sleeve 97 to its initial position.

When the ram of the press returns to its uppermost position, the formed article will be ejected, from the interior of the inner sleeve 19 of the upper die structure, by the knock-out block 31, operated in the usual manner, and as hereinbefore set forth. Also, at the same time, the inner and outer sleeves of the lower die structure will be returned to their initial positions, with the top faces thereof flush with the top face of the blanking die 40 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. 5 of the drawings, there is shown a pre-existing upper die structure, which has been altered to permit the same to be used in accordance with the present invention. In this instance, the original die proper is rebored, thereby to provide the outer sleeve 17^a, and the original shank 11^a is utilized to mount the die in the ram in the usual manner. In the hollowed-out portion of the original die there is mounted the inner sleeve 19^a within which the knock-out block 31 is slidably mounted. The other portions of the structure are substantially the same with the exception that the limiting screw 28^a there provided is one of the screws used to secure in place the housing 23 within which is mounted the coil spring 22 for the control of the bolt member 21.

In Fig. 6 of the drawings there is shown, to a certain extent diagrammatically, a modified form of arrangement for the control of the heavy coil spring 75 used for the trimming of the edge portion of the metal stock. In this instance, in lieu of the trigger mechanism shown in Fig. 1^a of the drawings, there is employed, for the control of the coil spring 75, a crank motion which is actuated from an extension of the main operating shaft of the press.

In this arrangement, in lieu of the flanged member 77, there is provided a similar threaded member 77^a which is provided with lugs 101, in which a transverse shaft 102 is mounted. The shaft 102 is connected by a link 103 to a crank pin 104, which is carried by the crank arms 105 extending from the crank 106. The crank shaft 106 is suitably journaled in bearings 107 attached in any preferred manner to a stationary part of the press. The crank shaft 106 carries at its outer end a bevel gear 108, which meshes with and is driven by a complementary bevel gear 109. The bevel gear 109 is mounted on the lower end of a vertical shaft 110, on the upper end of which there is secured a bevel gear 111. The bevel gear 111 meshes with and is driven by a complementary bevel gear 112, which is mounted on an extension 113 of the main shaft of the press.

The operation of the above structure will be readily apparent, as it will be seen that the crank shaft 106 rotates in synchronism with the main shaft of the press, and the crank pin 104 is so disposed as to cause the member 76, which supports the lower end of the coil spring 75, to be in its raised position so as to provide the greatest tension of the coil spring 75 at the time the edge portion of the metal is being trimmed during the formation of the article in the die. It will also

be noted that as the shaft 106 continues to rotate, after the trimming operation has taken place, the pressure of the spring 75 will be relieved.

In Figs. 7, 8 and 9 of the drawings, there are shown plan views of portions of the lower part of several die structures to illustrate how the invention may be applied in the formation of articles of various shapes, as it should be understood that the same is by no means limited to the drawing of mere cylindrical shells. In Fig. 7 there is shown the arrangement for the formation of a rectangular box; and in Fig. 9 there is shown the arrangement for the formation of an elliptical receptacle; whereas in Fig. 8 there is shown an arrangement for the making of a fitting used for electrical purposes, in which the cylindrical side walls are provided with notches which may be cut in the metal at the time the trimming operation occurs. These notches are cut as shown in Fig. 8 by the provision of recesses 46^a in the inner sleeve 46 of the lower die structure, and corresponding complementary inwardly extending projections 43^a in the outer sleeve 43 of the lower die structure. The upper die structure parts are of course formed in like manner to cooperate therewith.

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.

Likewise the end edge of the article, when the same is made without any flange, may be of a variety of shapes, as is indicated by the form shown for example in Fig. 8.

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.

I claim:

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 inner sleeve having a limited and controlled movement with respect to the outer sleeve, inner and outer 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 inner 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 inner sleeve

having a limited range of movement with respect to the outer sleeve, a device initially locking the inner sleeve to the outer sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, inner and outer 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 inner pressure sleeve when the inner die penetrating sleeve is released with respect to the outer 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 inner sleeve having a limited range of movement with respect to the outer sleeve, a device initially locking the inner sleeve to the outer sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, inner and outer 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 inner pressure sleeve when the inner die penetrating sleeve is released with respect to the outer 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 inner sleeve having a limited range of movement with respect to the outer sleeve, a device initially locking the inner sleeve to the outer sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, inner and outer 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 inner pressure sleeve when the inner die penetrating sleeve is released with respect to the outer 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.

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 inner sleeve having a limited range of movement with respect to the outer sleeve, a device initially locking the inner sleeve to the outer sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, inner and outer 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 inner pressure sleeve when the inner die penetrating sleeve is released with respect to the outer 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 trippable support therefor, and means for tripping 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 inner sleeve having a limited range of movement with respect to the outer sleeve, a device initially locking the inner sleeve to the outer sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, inner and outer 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 inner pressure sleeve when the inner die penetrating sleeve is released with respect to the outer 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 trippable support therefor, means for tripping 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 inner sleeve having a limited and controlled movement with respect to the outer sleeve, inner and outer 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 inner 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 inner sleeve having a

limited range of movement with respect to the outer sleeve, a device initially locking the inner sleeve to the outer sleeve, means for withdrawing said locking device at a predetermined point in the operation of the press, inner and outer 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 inner pressure sleeve when the die penetrating sleeve is released with respect to the outer 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 the inner sleeve to effect the forming operation, the inner sleeve having a limited and controlled movement with respect to the outer sleeve, inner and outer 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 initially locking the inner of the die penetrating sleeves with respect to its outer sleeve, means for releasing said locking means at a predetermined point in the operation of the press, and means for thereafter shifting the inner sleeves with respect to the outer sleeves thereby to trim the formed article prior to its completion.

10. Blanking and forming die structure comprising a blanking die proper, inner and outer

sleeves adapted to penetrate said blanking die to effect a blanking operation, a forming plunger adapted to extend into said inner sleeve to effect the forming operation, said inner sleeve having a limited movement with respect to said outer sleeve, means for effecting timed control of the movement of said inner sleeve with respect to outer sleeve thereby to trim the formed article prior to its completion, inner and outer 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.

11. 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, inner and outer pressure sleeves cooperating with the aforesaid die penetrating sleeves, means for initially locking the inner of the die penetrating sleeves with respect to its outer sleeve, and means for releasing said locking means thereby to permit shifting of the inner sleeves with respect to the outer sleeves at a predetermined time after the drawing operation has progressed to trim the formed article to the desired end edge shape.

12. 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, inner and outer pressure sleeves cooperating with the aforesaid die penetrating sleeves, means for initially locking the inner of the die penetrating sleeves with respect to its outer sleeve, and means for releasing said locking means thereby to permit shifting of the inner sleeves with respect to the outer sleeves at or near the termination of the drawing operation to provide the formed article with a flange suitably trimmed to the desired edge shape.

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