Nov. 28, 1950 O. F. A. BIGINELLI ET AL 2,531,663

PUNCHING AND DRAWING PRESS

Filed Dec. 12, 1947 2 Sheets-Sheet 1

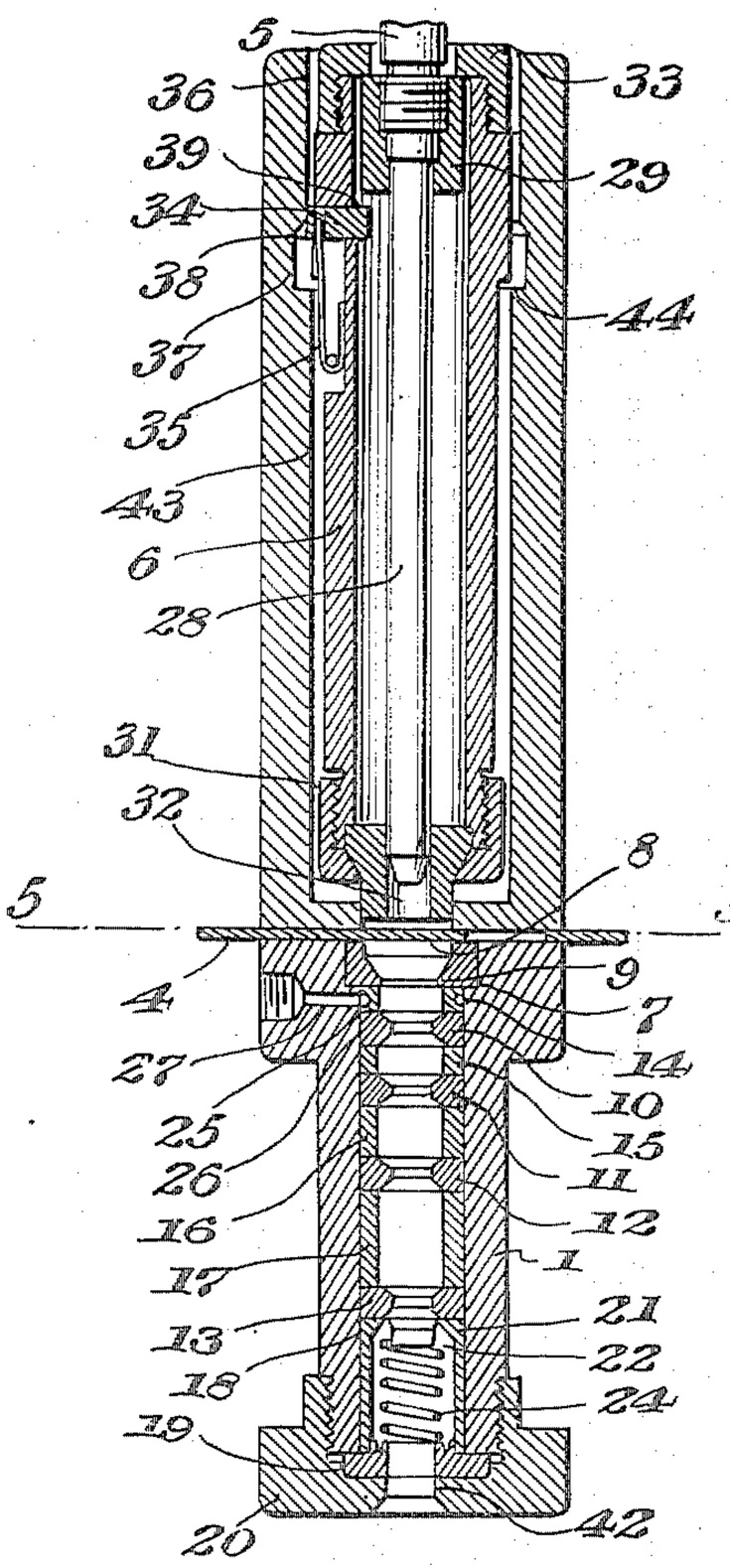


Fig. 1.

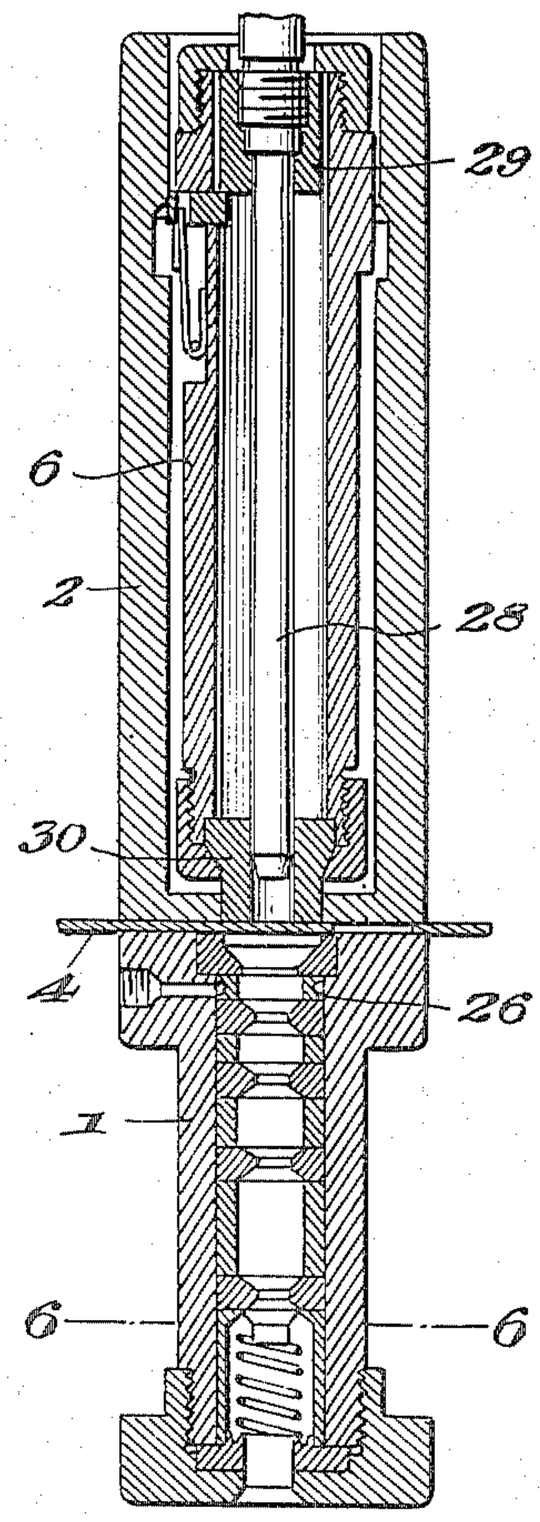


Fig. 2.

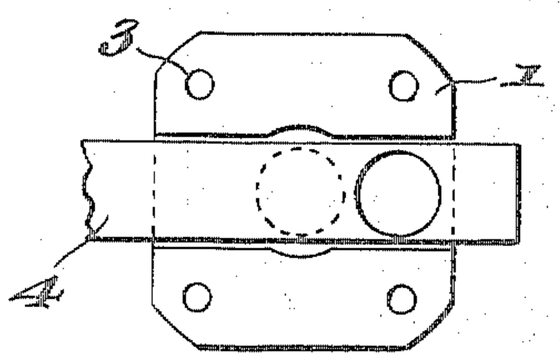


Fig. 5.

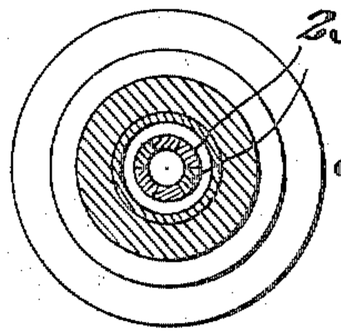


Fig. 6.

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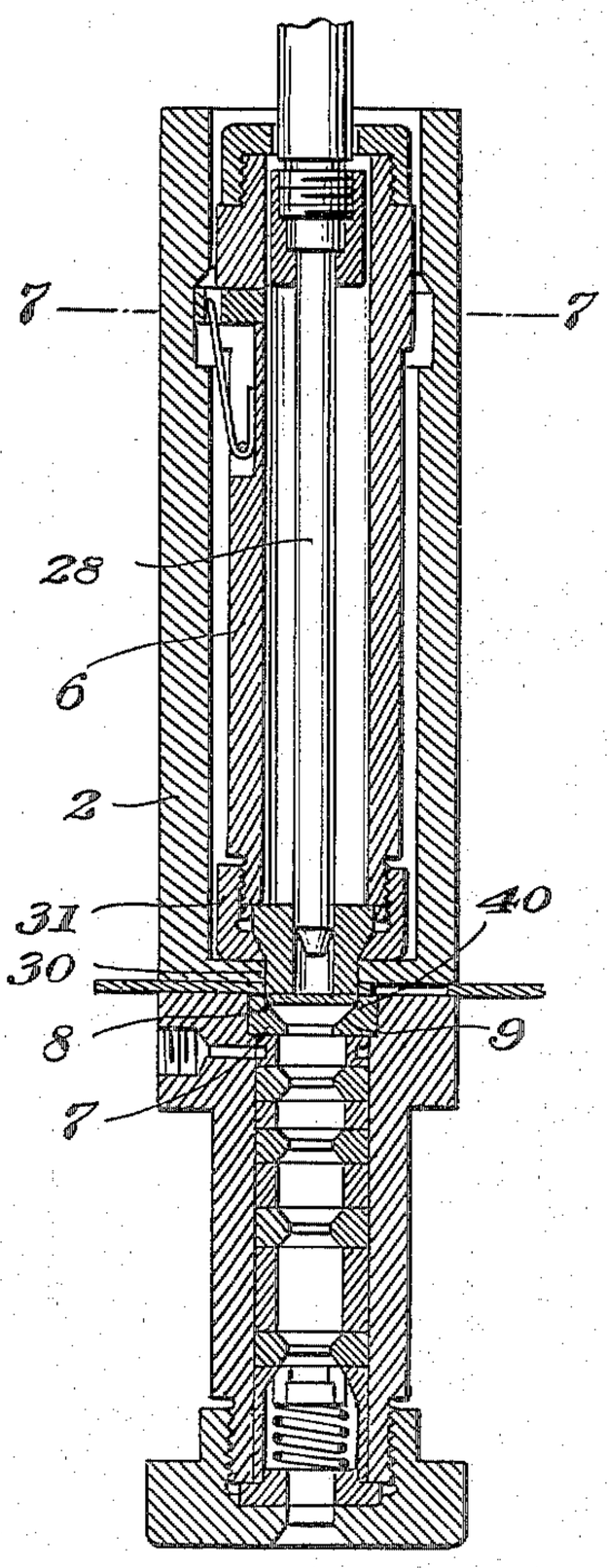


Fig. 3.

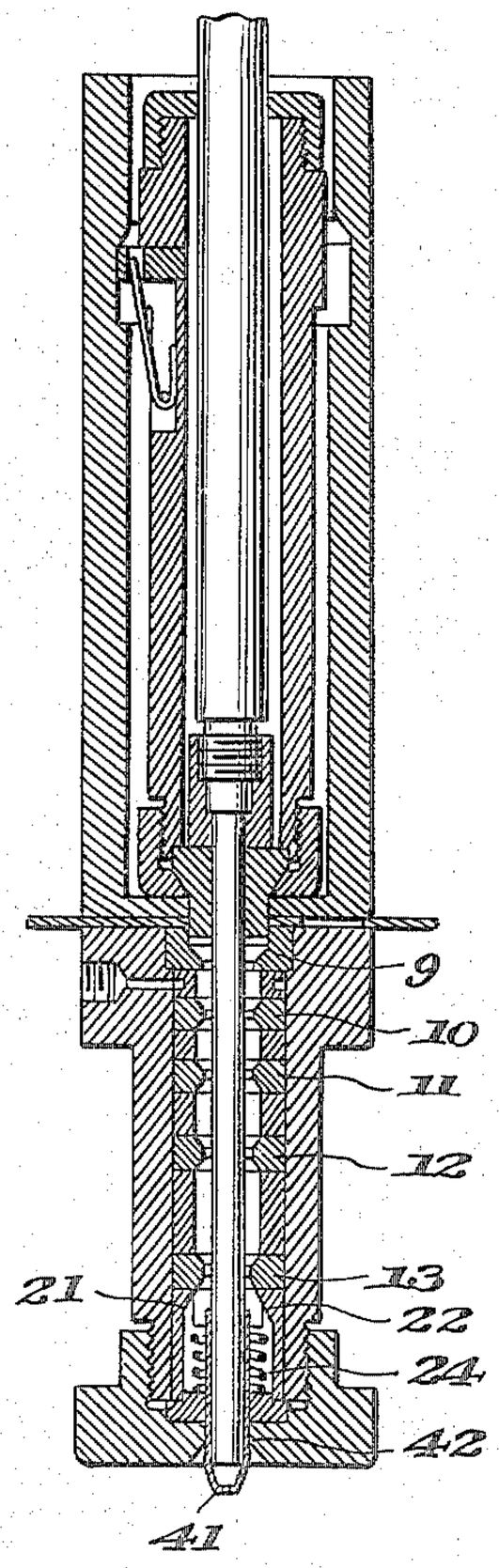


Fig. 4.

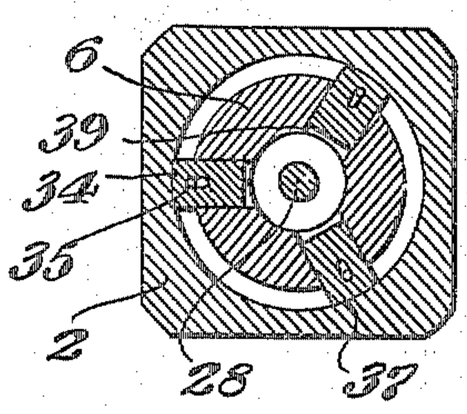


Fig. 7.

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PUNCHING AND DRAWING PRESS

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1 Claim. (Cl. 113—42)

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Metallic cases of cylindrical shape are generally worked on mechanical presses which successively effectuate the operations which consist in cutting out the blank, dishing said blank, drawing the dished piece.

It is then necessary to arrange different presses following one another and successively effectuating the three operations of cutting out, dishing and drawing; each of said presses being made especially for one of said operations.

Furthermore, each press is generally provided with a device supplying the pieces automatically and increasing the capacity of production of the press.

The plant which is necessary for making the finished cases is thus very important and very expensive since it comprises three presses and three automatic piece supplying devices.

The present invention has for its object to remedy said inconveniences.

The invention relates to a machine for the manufacture of deep metallic vessels such as cases, characterized in that female cutting out, dishing and drawing tools are arranged axially after one another which makes it possible, in one and the same working operation, to cut out, dish and draw the blank in order to obtain a deep vessel in its definitive shape.

According to a form of execution of the invention the female cutting out, dishing and drawing tools are combined with male tools such as punches actuated by a press mechanism.

According to a feature of the invention the punches comprise a cut out punch and a dishing and drawing punch concentric with the preceding one and capable of projecting through this cut out punch which makes it possible successively to effectuate the cutting out of the blank and then the deformation of said blank.

According to a form of execution of the invention a retaining device such as an extractor is arranged after the female tools in order to retain the worked piece while the dishing and drawing punch returns to its initial position after its working stroke.

The invention also covers a machine characterized in that the dishing and drawing punch alone receives the thrust of the press mechanism, the cutting out punch being capable, at certain moments, of being rendered fast with said dishing and drawing punch.

According to a feature of the invention the dishing and drawing punch passes axially through the cutting out punch which is fast with a stop able to recede, the dishing and drawing

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punch carrying along the cutting out punch in its movement when it strikes against the stop of the latter.

Lastly, the invention covers the features which will be described now and their various possible combinations.

A machine made in accordance with the invention is shown by way of example in the appended drawings, in which:

Figure 1 is a sectional axial view, the cutting out and dishing punches being in their raised position.

Figure 2 is a sectional axial view showing the machine at the moment when the cutting out punch comes into contact with the strip to be cut out.

Figure 3 is a sectional axial view of the machine, the cutting out punch being at the end of its working stroke.

Figure 4 is a sectional axial view of the machine showing the dishing punch at the end of its working stroke.

Figure 5 is a cross-sectional view of this machine through line 5—5 of Figure 1.

Figure 6 is a cross-sectional view of the machine through line 6—6 of Figure 2.

Figure 7 is a cross-sectional view of the machine through line 7—7 of Figure 3.

The apparatus shown in Figures 1 to 7 forms only the working device of the machine, it being actuated through a press mechanism of known type.

It comprises the following essential elements:

(1) A fixed casing fast with the yoke of the press and formed of two parts 1 and 2 assembled through four screws 3 so as to provide between them a rectangular port serving as a guide for the passage of the metal strip.

(2) A movable rod 5 entirely fast with the press work and sliding along the longitudinal axis of the stationary casing.

(3) A sliding sleeve 6 which can be rendered fast with the rod 5 or remain independent of said rod. This sleeve 6 can slide in the casing 2 on a rather reduced length while the rod 5 itself can slide in the bore of the sleeve.

(4) Female tools arranged in the central bore of part 1 of the casing (1, 2). These tools comprise from the top to the bottom:

(*a*) A ring 7 the upper part 8 of which acts as a die for cutting out the blank and the lower part of which serves as a dishing die;

(*b*) A series of drawing rings 10, 11, 12, 13, four in the case of the example shown, the diameters of which are more and more reduced

from the top to the bottom. These rings 10, 11, 12, 13 are maintained spaced from one another, as desired, through a series of spacing rings 14, 15, 16, 17. The upper ring 14 outwardly comprises a groove 25 into which open holes 26 which, on the other hand, open into the inner bore of the ring 14.

The groove 25 of the ring 14 is placed opposite the opening of a passage 27 provided in the casing 1. A pump, not shown, forces oil through the passage 27, the groove 25 and the holes 26 into the bore of the ring 14.

The whole of the drawing dies 10, 11, 12, 13 and of the spacing rings 14, 15, 16, 17 is located in the axial bore of part 1 of the casing; it is maintained in said bore through a sleeve 18 locked through a washer 19 itself maintained applied against the casing 1 through a nut 20 screwed on said casing. The washer 19 and the nut 20 are provided with an axial hole 42.

The sleeve 18 comprises in its upper part a conical bore 21 against which the six clamping members such as sectors 23 of an extractor 22 are pressed through a spring 24 located in the sleeve 18. The spring 24 rests, on the other hand, on the washer 7. The six sectors 23 of the extractor 22 which are shown in Figure 6 have each an opening of 60° and form through their bringing together a continuous ring resting through a conical part against the conical bore 21 of the sleeve 18.

(5) Male tools formed of:

(*a*) A dishing and drawing punch 28 secured through a nut 29 to the end of rod 5;

(*b*) A cutting out punch 30 secured through a nut 31 to the lower part of the sliding sleeve 6; said cutting out punch 30 comprises an axial bore 32 rendering possible the passage of the dishing and drawing punch 28.

The above mentioned punches can be rendered fast with one another by means of a cap-nut 33 screwed on the upper part of the sliding sleeve 6 and against which the nut 29 which is fast with the punch 28 can come to rest.

Three radial keys 34 (Figures 1 and 7) are slidably mounted in three guides spaced by 120° and provided in the sliding sleeve 6. These keys are urged by a pin-spring 35 which tends to move them apart radially and to cause them to rest against the internal surface of the cylindrical part 2 of the casing.

This internal surface comprises in its upper part a first cylindrical bore 36, then a second cylindrical bore 37 of larger diameter connected with the first bore through a conical bearing surface 38 the angle of which is about 45° with respect to the general axis. Lastly, the cylindrical bearing surface 37 blends with the general bore 43 of the casing through a transversal bearing surface 44 acting as a stop.

The radial keys 34, which are moved away resiliently through the springs 35 can thus occupy two positions:

(*a*) The position of Figures 1 and 2 in which the keys 34 in contact with the restricted part of conical bearing surface 38 are brought nearest to the general axis.

In this position the keys 34 form through their internal end which projects into the bore of the sliding sleeve 6 a stop for the nut 29 which is fast with the punch 28.

(*b*) The position of Figures 3, 4 and 7 in which the keys 34 spaced from the axis through the springs 35 rest against the bore 37 which forms the bottom of the groove. In this position the keys 34 do no longer project into the bore of the sliding sleeve 6 and the nut 29 can slide freely in said bore.

The above described machine works in the following manner:

The metallic strip 4 which is chosen with a width larger than the diameter of the blank which will be punched out by the cutting out punch 30 is introduced into the space forming a guide between parts 1 and 2 of the casing (Figures 1 and 2, 5). The dishing and drawing punch 28 is in its upper position and maintains the cutting out punch 30 in its higher position owing to the fact that the nut 29 strikes against the cap-nut 33 which is fast with the sliding sleeve 6 (Figure 1).

The press-work being actuated the dishing and drawing punch 28 begins its downward stroke, the nut 29 comes then to strike against the keys 34 which project into the bore of the sliding sleeve 6 and carries along this sleeve and the cutting out punch 30 in its downward movement. Figure 2 shows the position of the various organs at the moment when the cutting out punch comes into contact with the strip 4 during its downward stroke.

During the further downward movement of both punches 28, 30 which are fast with each other the punch 30 cuts out the blank 4 on the upper ring 8 and forces it into said ring 8 without deforming it till the beginning of the dishing die 9. In this position the cutting out die is locked owing to the fact that the nut 31 strikes against the bottom of the bore of the casing 2 (Figure 3). At the same time the keys 34 which are resiliently moved apart from one another through the springs 35 engage into the groove formed through the bore with the large diameter 37 and free the nut 29 which can then continue its downward movement with the punch 28 while the sleeve is held fast through striking against the casing 2 (Figure 3).

Therefore, the dishing and drawing punch continues its downward movement alone. During this stroke the dishing of the blank through the die 9 and then the successive drawings through the rings 10, 11, 12, 13 are effected successively. At the end of the downward stroke the punch 28 occupies the position shown in Figure 4 and carries at its end the finished piece such as a case 41.

Then the press mechanism produces the displacement of the head in the reverse direction, the punch 28 rises again, the sectors 23 of the extractor 22 are forced through the spring 24 into the conical bore 21 where they press against the case 41 and through clamping oppose any upward displacement of said case. Therefore, the punch 28 gets free from the case 41 which is held fast in the axial passage 42 and which will be ejected during the following press stroke by the following piece through the axial hole 42 of the nut 20.

Towards the end of the upward stroke of the piston 28 the nut 29 comes to strike against the cap-nut 33 and carries the sliding sleeve 6 with it in its upward stroke which causes the raising movement of the cutting out punch 30.

In this upward movement of displacement of the sliding sleeve 6 in the casing 1 the keys 34 are forced back towards the axis while compressing the springs 35 through sliding of the outer end of said keys against the conical part 28 which forms an inclined plane. Then the keys 34 project again into the inner bore of the slid-

ing sleeve 6 and the various organs are again in the initial position of Figure 1.

The freed strip 4 can then be shifted longitudinally either manually or automatically by a length somewhat larger than the diameter of the blank cut out by the punch 30.

While the strokes to and fro of the punches are effected an abundant supply of oil provided at 27 opens through the medium of the groove 25 and of the holes 26 into the inner bore of the dies. This oil has for its duty to lubricate and to cool the tools, punches and dies; it flows out through the ejection hole 42.

The above described machine makes it possible to insure numerous technical advantages and more particularly the following ones:

(1) It makes it possible to obtain a piece such as a case from a metal strip by means of a single machine and with a single press stroke which produces the cutting out, dishing and drawing operations simultaneously.

The work is thus rapid and the efficiency of the machine is very high.

(2) The machine according to the invention can be fed through an automatic supplying device the work of which is reduced to the supply of the strip to the machine which is a simple and not very expensive device.

In short, the machine made in accordance with the invention makes it possible to obtain together with a high efficiency a plant comprising only a single machine and a single automatic supplying device, thus a plant which is much less important and much less expensive than the known plants which comprise machines for each operation and automatic feeding devices for each machine.

We claim:

In a machine for the manufacture of deep metallic containers such as cases from a continuous metallic strip, the combination comprising a casing of generally elongated form, divided into an upper portion and a lower portion by a transverse slot for guiding the strip to be cut, said upper portion having a cylindrical recess, a sliding sleeve displaceable in said cylindrical recess, a cap mounted upon the upper portion of said sliding sleeve, a conical bore forming peripheral inclined slopes in the internal face of

said cylindrical recess throughout all of its periphery, a cylindrical enlarged bore provided in said cylindrical recess below and following said conical bore, a cutting punch carried at the lower end of said sliding sleeve, a dishing-drawing punch sliding axially in said sliding sleeve and capable of projecting beyond said cutting punch, pressure means, an assembling nut connecting the upper portion of said dishing-drawing punch to said pressure means and forming an abutment against said cap for raising said sliding sleeve by said dishing drawing punch, radiating keys mounted radially slidingly in said sliding sleeve, springs applied to said radiating keys and maintaining them in exterior engagement with said conical bore and said enlarged boring, said radiating keys being thus capable of projecting into the bore of the sliding sleeve when they are in exterior engagement with the walls of the conical bore and thus forming an abutment for said nut in its descending stroke, said radiating keys being moved aside when they are in contact with said enlarged cylindrical bore which permits the projection of said dishing-drawing punch across said immobilized cutting punch, cutting female dies, dishing female dies, drawing female dies, said female dies being disposed axially following one another in the interior of the lower portion of the casing upon the trajectory of said punches.

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