

Nov. 10, 1964

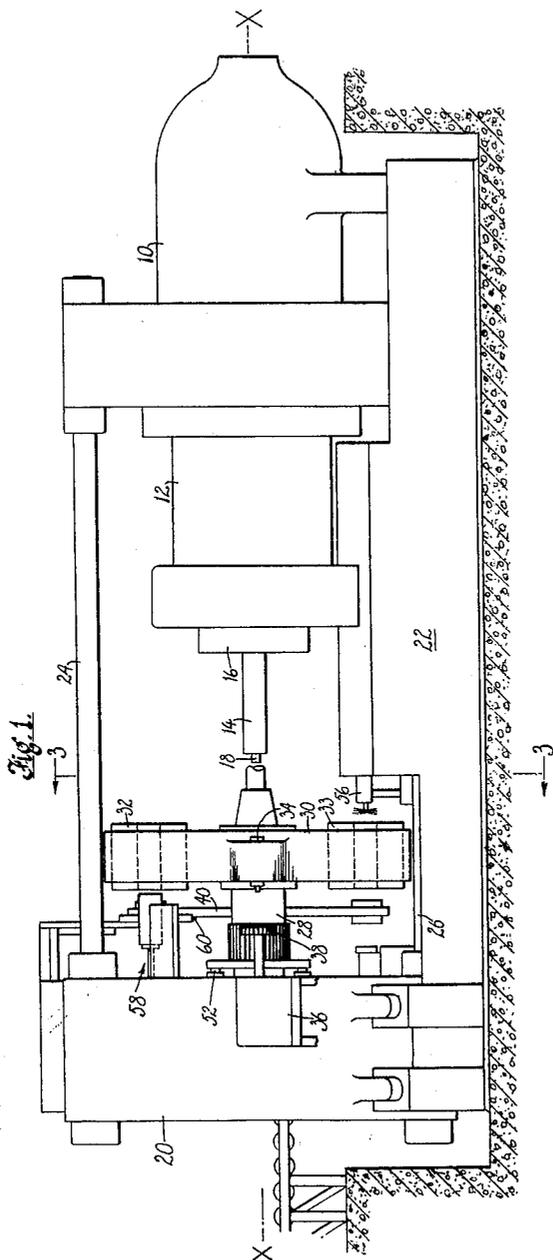
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3,156,359

METAL EXTRUSION PRESS WITH ROTARY CONTAINER

Filed July 5, 1962

6 Sheets-Sheet 1



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METAL EXTRUSION PRESS WITH ROTARY CONTAINER

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6 Sheets-Sheet 2

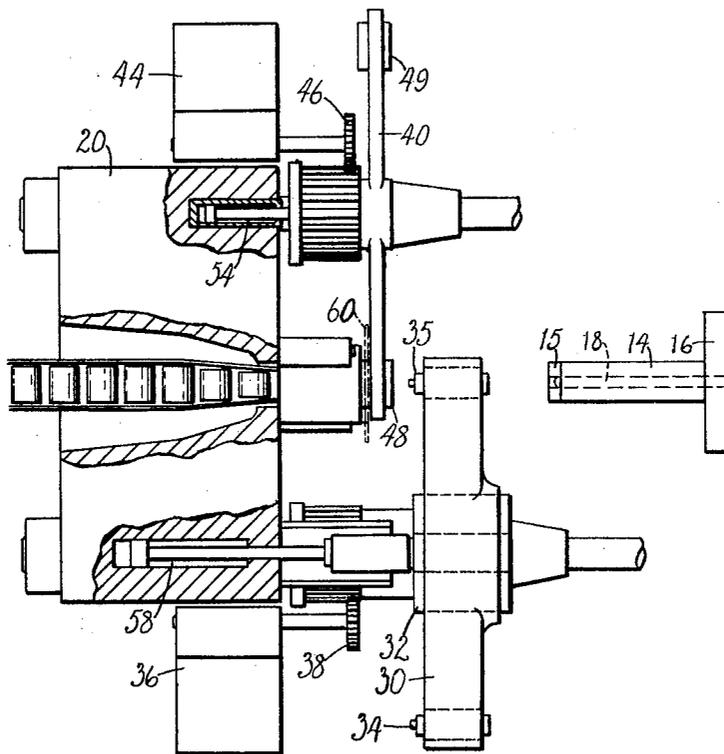


Fig. 2.

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METAL EXTRUSION PRESS WITH ROTARY CONTAINER

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6 Sheets-Sheet 3

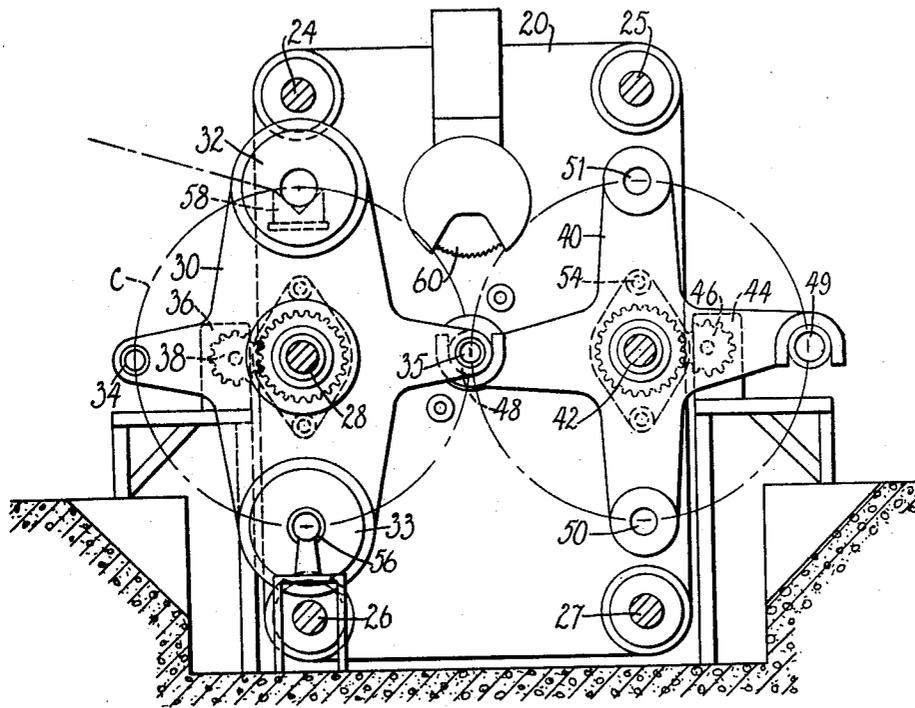


Fig. 3.

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6 Sheets-Sheet 4

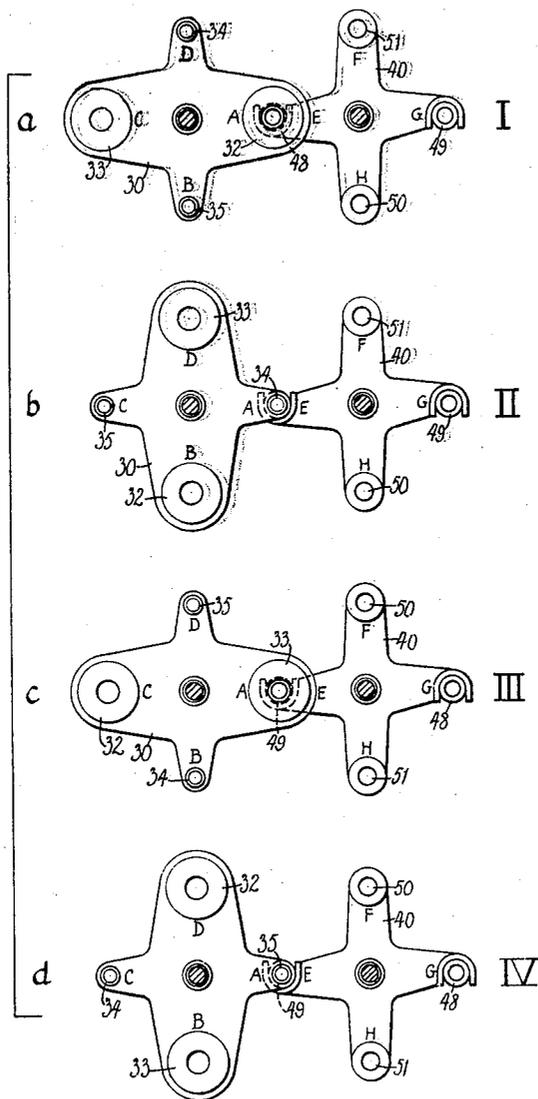


Fig. 4.

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6 Sheets-Sheet 5

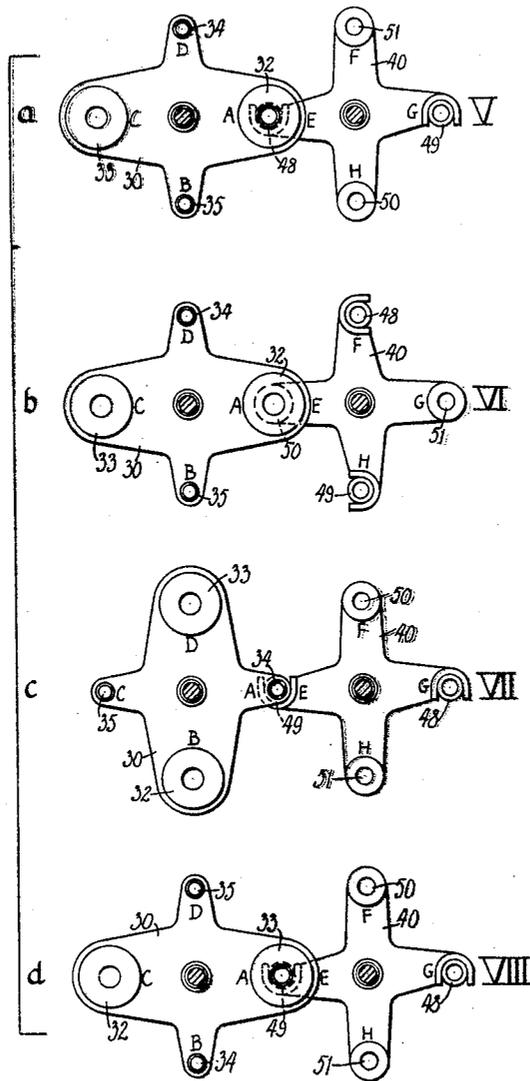


Fig. 5.

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METAL EXTRUSION PRESS WITH ROTARY CONTAINER

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6 Sheets-Sheet 6

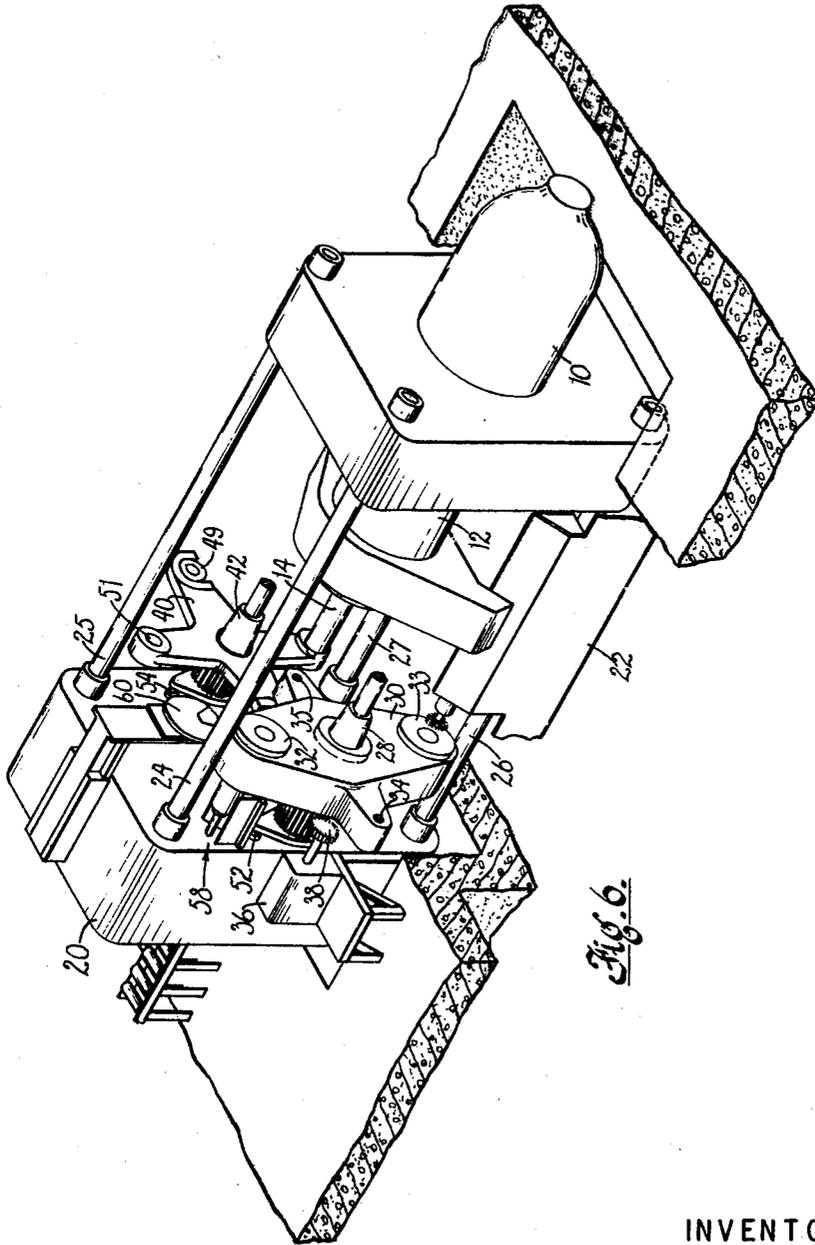


Fig. 6.

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3,156,359

METAL EXTRUSION PRESS WITH ROTARY CONTAINER

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Claims priority, application Great Britain, July 11, 1961, 25,109/61

8 Claims. (Cl. 207—1)

This invention relates to metal extrusion presses and, in particular, to metal extrusion presses in which a billet container is mounted on a rotary carrier. By rotating the carrier about an axis parallel to the main working axis of the press (referred to hereafter as the "press axis"), a container mounted on said carrier is moved from a position in the press axis to one outside this axis. When in the first position, the container is in alignment with the main ram of the press and with other press tools, including pressing stem, mandrel and die, and is then ready for the extrusion of a billet. In the second position, auxiliary operations can be performed on the container while the latter is being prepared for an extrusion operation by removing from it any residue or remnants from the preceding operation, and by loading it with a fresh billet.

These auxiliary operations constitute together a substantial part of a full cycle of operations. By mounting two or more containers on a rotatable carrier, it is possible to carry out one or more of these auxiliary operations on a container at an outside station while extrusion is in progress at another container in the press axis. In this manner, considerable time can be saved, and the production of the press correspondingly increased.

One of the auxiliary operations which must be carried out after the extrusion of a billet is the separation of the extruded article from the unextrudable billet metal, the discard. This can be effected in several ways. In the case of the extrusion of tubular articles, separation of the discard from the extruded article is often carried out by means of a punch which is moved into the press axis and advanced towards the die under hydraulic power, so as to separate the extruded article from the residue at the face of the die. This method has the advantage of limiting to a minimum the amount of discard which is cut off from the extruded article.

It is an object of the present invention to provide a metal extrusion press having a rotatable container-carrier in which a discard-shearing punch is arranged in a novel and improved manner.

According to the present invention, a metal extrusion press having a container-carrier which is rotatable about an axis parallel to the main axis of the press, has at least one discard-shearing punch arranged on said carrier and at the same distance from the axis of rotation of said carrier as said container, so that by rotation of said carrier, the discard-shearing punch and the container change places with each other in the main axis of the press.

When in that axis, the discard-shearing punch on the container-carrier is in line with the main ram of the press and may then be moved forward and toward the die under the power of said ram. Thus, the power of said ram can be utilised for the shearing or severing of the discard.

Preferably, the press according to the invention has, in addition to a working station in the main axis of the

press, at least one station outside this axis where an auxiliary operation can be performed on the container or discard-shearing punch and an auxiliary device may be provided at the outside station for that purpose. Such an auxiliary operation may be, for instance, the cleaning of a container after an extrusion operation, or the loading of a container with a billet prior to an extrusion operation.

Two or more containers and two or more discard-shearing punches may be arranged on the same rotary carrier. In this case, the containers and discard-shearing punches are arranged with their respective axes on a circle about the axis of rotation of said carrier, so that the containers and the discard-shearing punches are then, by rotation of the carrier, moved one after another into the working station or into one of the outside stations. Preferably containers and discard-shearing punches alternate with each other on the circumference of the circle and are spaced-apart on that circle by equal distances, so that by rotating the carrier step by step about the same angle, the containers and discard-shearing punches are moved step by step through all the stations.

More than one outside station may be arranged in respect of a rotary carrier, and there may be an outside station for each container and discard-shearing punch which is outside the press axis at a given time. For instance, if a carrier has two containers and two discard-shearing punches, there may be up to three outside stations at which auxiliary operations may be performed simultaneously and at the same time that extrusion or discard-shearing is in progress in the press axis.

The rotary carrier on which the container and discard-shearing punches are mounted may be movable as a whole parallel to the main axis of the press, for the purpose of moving the parts mounted on said carrier towards or away from other parts of the press with which they co-operate during stages in the extrusion cycle.

A metal extrusion press according to the present invention may further be equipped with a rotary die-carrier rotatable about an axis parallel to the main working axis of the press. Such a carrier may be fitted with a plurality of dies, whereby the changing of dies is expedited and auxiliary operations can be carried out at an outside station while extrusion is in progress. The carrier for the dies and the carrier for the container and discard-shearing punches are preferably rotatable about different axes, which, for instance, may be situated diametrically opposite with respect to each other in relation to the main working axis of the press.

The invention will now be described in detail by way of example with reference to the accompanying drawings in which:

FIG. 1 is a side elevation of a horizontal metal extrusion press according to the invention.

FIG. 2 is a top plan view of the working zone of the press shown in FIG. 1.

FIG. 3 is a section along line 3—3 of FIG. 1.

FIGS. 3a-d shows diagrammatically four different stages in a cycle of operation of the press.

FIGS. 4a-d shows diagrammatically four different stages in a cycle operation of the press.

FIG. 6 is a perspective view of the extrusion press.

The press shown in the drawings is of the horizontal four-column type and comprises a main cylinder 10 with a main ram 12 displaceable therein, to which a pressing stem 14 is attached by a holder 16. A mandrel 18 projects from the pressing stem and can be withdrawn into it. Arranged opposite the main cylinder 10 is a platen 20. Main cylinder 10 and platen 20 are mounted on a bed-plate 22 and connected to each other by four columns 24, 25, 26 and 27. These columns may be arranged at the

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four corners of a rhomb or as shown in FIG. 3 may be arranged at the four corners of a rectangle whose centre is in the main horizontal working axis X—X of the press and whose diagonals are in planes passing through this axis.

Supported on the platen 20 by means of a rotary shaft 28 is a carrier 30. Arranged on this carrier are two containers 32 and 33 and two discard-shearing punches 34 and 35, which may be advanced toward the die by hydraulic power, such as by the main ram 14. Containers and punches are arranged alternately and at equal angular distances from each other on a circle *c* round the axis of rotation of the carrier 30. This circle passes also through the press axis X—X. The shaft 28 of the carrier 30 is rotated by a motor 36 and a reduction gear 38. By rotating the carrier 30 by an angle equal to the angular distance between a container and a punch, containers and punches are alternately moved in and out of the press axis. In this way, the containers and punches are moved step by step and in succession through a working station A in the press axis and through three outside stations B, C and D respectively outside this axis, as will be described more in detail with reference to FIGS. 4a-d and 5a-d.

A further carrier 40 is supported on the platen 20 by means of a shaft 42 rotated by a motor 44 and a reduction gear 46. This second carrier is in the shape of a cross. Two dies 48 and 49 are mounted on two of its diametrically opposite arms, while the two other diametrically opposite arms are formed at their ends with troughs 50 and 51. The die-carrier 40 has therefore also four stations, one working station E in the axis X—X and three outside stations F, G and H.

The carriers 30 and 40 are adapted to be moved in directions parallel to the axis X—X by means of one or more hydraulic cylinder units 52 and 54 respectively.

Facing the outside station B which is at the bottom of the circle *c* is a container-brushing tool 56. Facing the outside station D which is at the top of the circle *c* is a billet loading trough and piston 58. As shown in FIG. 2, the brushing tool 56 and the loading trough and piston 58 are arranged at either side of the carrier 30. The loading trough and piston 58 are mounted on the platen 20.

A discard-shearing saw 60 which can be moved both in a direction parallel to the press axis X—X and perpendicular to this axis is supported on the platen 20 and can, if desired, be used for discard shearing in place of the punches 34 and 35. The saw 60 is shown here as a pendulum saw.

For the extrusion of a billet, one of the containers 32 and 33, with a billet loaded therein, and one of the dies 48 and 49 are moved by rotation of the respective carriers into the axis X—X, so as to be in alignment with the pressing stem 14 and the mandrel 18, a pressing disc 15 having been placed in front of the stem 14 beforehand. After the billet has been extruded, the container is moved axially away from the die, whereby the unextruded portion of the billet, its discard, and the pressing disc 15 are stripped out of the container by the stem 14. The latter is then withdrawn and the container moved out of the axis X—X by rotation of the carrier 30. In the next step, the discard is cut off from the extruded article by one of the punches 34 or 35 under the power of the main ram of the press.

FIG. 4a-d shows a full cycle of operation of the press, the cycle comprising four stages I, II, III and IV, with the punches 33 and 34 being used for a shearing of the discards. FIG. 5a-d shows a full cycle of operations of the same press, the cycle comprising four stages V, VI, VII and VIII, with the saw 60 being used for the shearing of the discard.

In stage I (FIG. 4a), the container 32 and the die 48 are both in the press axis X—X at the stations A and E respectively, ready for the extrusion of a billet from the container through the die by means of the pressing stem 14. The other container 33 and the other die 49 are at

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the outside stations C and G respectively, diametrically opposite the working stations. The punch 35 is at the outside station B ready for the removal of the discard sheared off in a previous operation. The die which is at the outside station G is ready to be either reconditioned or replaced by another die. No work is done at this stage at the outside stations C, D, F and H.

After extrusion of a billet from the container 32 has been terminated and the discard resulting therefrom and the pressing disc stripped from this container by axial movement of the latter, the carrier 30 is rotated in a clockwise direction by 90° into the position shown in FIG. 4b; the carrier 40 is left in the same position as before. This is stage II. In this stage, the punch 34 is at station A and is advanced towards the die 48 under the power of the main ram, whereby the discard is cut off from the extruded article at the face of this die. At the same time, the container 32 which has arrived at station B is cleaned by brushing tool 56. The container 33 has arrived at station D and receives a fresh billet from the loading trough and piston 58. The punch 35 has arrived at the station C where it can be cleaned or otherwise reconditioned if required.

After the work of stage II has been completed, the carrier 30 is again rotated in a clockwise direction by 90° and the carrier 40 is rotated in the same direction, but by 180°. The parts are then in the positions shown in FIG. 4c which represents stage III. In this stage, the container 33 is at the working station A and the punch 34 is at the outside station B where it is freed from the discard. The die 49 is at the working station E and the die 48 at the outside station G where it can be reconditioned or replaced by another die. Another extrusion of a billet now takes place, this time from the container 33 through the die 49.

After this extrusion has been terminated, the carrier 30 is again rotated by 90° into the position shown in FIG. 4d while the carrier 40 remains stationary. This is stage IV. In this stage, the punch 35 is at the working station A and the container 33 is at the outside station B where it is cleaned by the brushing tool 56. The container 32 is at the station D where it is loaded with a fresh billet by the trough and piston 58. Rotation of 90° and 180° moves the carriers 30 and 40 respectively and the parts mounted thereon into the positions shown in stage I (FIG. 4a), and another cycle of operations can be started.

It will be seen from the foregoing that the work carried out in stage III is the same as that of stage I, and the work carried out in stage IV is the same as that in stage II, with the difference, however, that the container 33, the punch 35 and the die 49 have taken the places of the container 32, the punch 34 and the die 48 respectively. Thus, two extrusions are performed during one rotation of the carriers 30 and 40.

FIGS. 5a-d shows the various stages of operation occurring during rotation of the carriers 30 and 40, in the case of the discard being cut off by the saw 60 instead of by the punches 34 and 35. In FIG. 5a (stage V) the container 32 is at the working station A and the die 48 at the working station E. The punches 34 and 35 are at the stations D and B, but not in use, and the container 33 at station C is ready to be rotated to station D for loading. The discard which in a previous operation has been cut off and dropped into the trough 51 is removed at the station F and a new die 49 inserted in the carrier at station G. A billet is then extruded from the container 32 through the die 48 and afterwards the discard is cut off by the saw 60.

In stage VI, the carrier 40 is rotated by 90°, whereby the trough 50 is moved to station E, while the carrier 30 remains in the same position as before. The trough receives the discard which was cut off in stage V by the saw 60.

In stage VII, both carriers 30 and 40 are moved by 90° in the clockwise direction into the positions shown in

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FIG. 5c. The container 32 has arrived at station B where it is cleaned by the brushing tool 56. The container 33 has arrived at station D and is loaded with a fresh billet by the piston 58. The die 49 is at the working station E.

Further rotation of the carrier 30 moves the container 33 to the station A so that extrusion of a billet from this container and through the die 49 can take place. This is stage VIII shown in FIG. 5d. At the same time, the discard, previously cut off in stage VI by the saw 60, is moved from the trough 50, and a die at the outside station G either reconditioned or replaced.

It will be seen that here again a full rotation of the carriers 30 and 40 includes two complete extrusions. Rotation by 180° of both carriers 30 and 40 moves them and the parts mounted on them into the positions shown in FIG. 5a.

The invention may be carried out in various other ways and is not limited to the embodiment shown.

The number of containers on a carrier may be altered as well as the number of punches. Auxiliary operations, such as cleaning of container and punch or the loading of a container may be effected at stations other than those described here.

It is further possible to incorporate the invention into other types of extrusion presses, for instance, extrusion presses having a transversely movable die-slide or a single die or vertical extrusion presses.

What we claim is:

1. A metal extrusion press having a main axis, a die arranged in said axis, a billet-container adapted to be positioned into the main axis of the press so as to enable the major portion of a billet in that container to be extruded through said die while the remainder of the billet stays in the container, a carrier for said container, said carrier being rotatable about an axis parallel to the main axis of the press, a discard-severing punch mounted on said carrier, both said container and said punch being mounted on said carrier with their centers equidistant from the axis of rotation of said carrier, this distance being equal to the distance of the two axes from each other, means for rotating said carrier, means for moving said carrier parallel to the main axis of the press and relative

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to said die so as to strip the unextruded portion of a billet from the container, and means for moving said discard-severing punch when in the main axis of the press towards said die so as to sever the unextruded portion of a billet from the extruded article.

2. A metal extrusion press according to claim 1 having a plurality of billet containers and a plurality of discard severing punches on the same carrier.

3. A metal extrusion press according to claim 2 in which the billet containers and punches are alternately arranged and equally spaced apart on the same carrier.

4. A metal extrusion press according to claim 1 having a rotary die carrier rotatable around an axis parallel to the main axis of the press.

5. A metal extrusion press according to claim 4 in which the die carrier and the container carrier are rotatable about separate axes located diametrically opposite to each other with reference to the main axis of the press.

6. A metal extrusion press according to claim 1 having a rotatable container and discard severing punch carrier and having auxiliary stations outside the main axis of the press, said auxiliary stations being positioned in a circle concentric with the axis of rotation of the container and punch carrier and means at said auxiliary stations to perform operations on said containers and said discard severing punches respectively.

7. A metal extrusion press according to claim 1 in which the rotatable carrier for said containers and said discard severing punches is movable parallel to the main axis of the press relative to the die.

8. A metal extrusion press according to claim 1 having four columns surrounding the main axis of the press, said columns being arranged at the four corners of a rhomb.

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1,163,770 France Apr. 28, 1958

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,156,359

November 10, 1964

Ronald John Elger et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, lines 53, 58, 61 and 64, after "discard-shearing", each occurrence, insert -- or severing --; column 2, line 58, for "FIGS. 3a-d" read -- FIGS. 4a-d --; line 60, for "FIGS. 4a-d" read -- FIGS. 5a-d --; column 3, line 66, for "33 and 34" read -- 34 and 35 --.

Signed and sealed this 20th day of April 1965.

(SEAL)

Attest:

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