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ALIGNING DEVICE FOR METAL EXTRUDING PRESSES

Filed Dec. 11, 1968

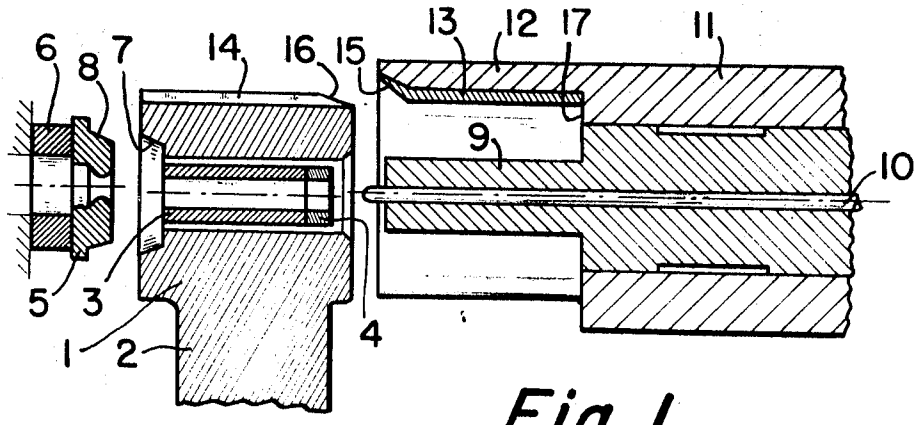

Fig. 1

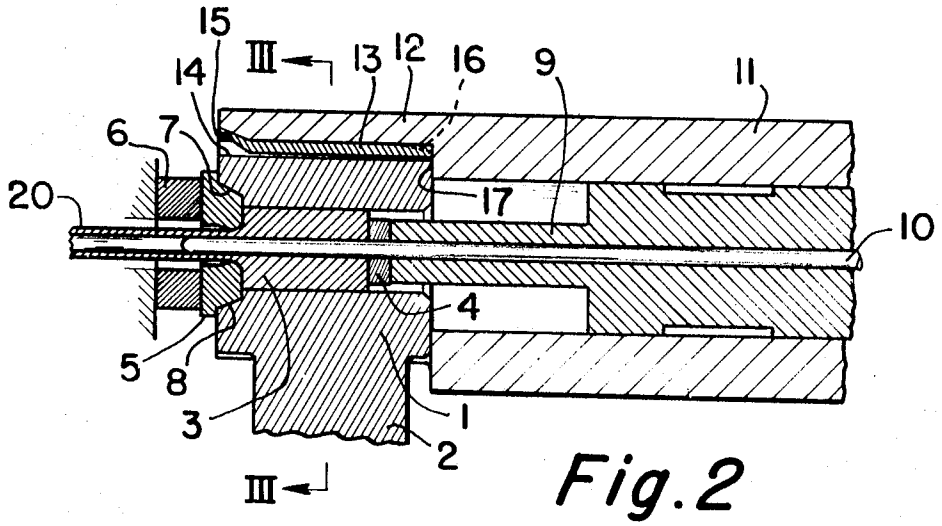

Fig. 2

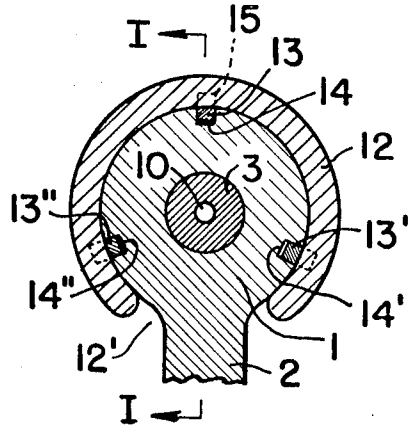

Fig. 3

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ALIGNING DEVICE FOR METAL EXTRUDING PRESSES

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Int. Cl. B21c 27/00
U.S. Cl. 72—272 7 Claims

ABSTRACT OF THE DISCLOSURE

A press for hot extruding a billet into products comprising a container for holding and positioning the billet along an extrusion axis, a die positionable at one end of said container, and a ram approaching said container from the opposite end of the die for forcing the billet through the container and a hole in the die. The ram, billet and container are aligned with the extrusion axis by an aligning means comprising a sleeve positioned concentrically and slideably about the ram and engageable with the container means in a manner to provide for thermal expansion of the container.

It is essential for proper extrusion of metals and alloys from an extrusion press, especially where the metals and alloys are difficult to deform, that the ram transmitting the force, the billet holding container and the die must initially be and remain substantially perfectly aligned along an axis of extrusion. This is especially necessary when hollow products are extruded. For example, thin-walled tubes for which the tolerance on wall thickness is very narrow.

In prior presses having a single container, the container moved only along its axis. In these presses, the position of the ram axis is carefully aligned with reference to the press frame and the axes of the die and the container are also carefully positioned with reference to the same press frame. This method of alignment must accommodate the whole mass of bulky equipment submitted to huge and alternating stresses. It lacks simplicity and reliability. In prior multi-container presses, the containers travel normal to the extrusion axis (either along a straight line or a circle) and it is difficult to accurately set each container in its working position. The problem is especially complicated because of the thermal expansion of the container carrier as it is warmed up by the hot billets. In most presses, the dies are carried by mobile devices (sliders or turrets) providing accurate alignment with the axis of the extrusion only if repeatedly checked.

The present invention avoids the aforesaid drawbacks and insures a continuously correct alignment of the die, container and ram along the extrusion axis without any referance to the bulky motionless parts of the press.

Briefly, according to this invention, a hot press for extruding billets into hollow products comprises a container, a die, a ram and a sleeve for aligning the ram and container. The container roughly positions a billet along an extrusion axis but remains slightly movable normal to said axis and parallel with said axis. The die is positioned at one end of the container and rests on to the press frame. The ram approaches the container from the opposite end. The container is aligned with the extrusion axis, i.e., the axis of the ram, by a sleeve which is positioned concentrically and slideably about the ram. The sleeve is engageable with the container and may, for example, slide into a position enveloping and engaging the container along its entire length. The engagement provides for thermal expansion of the container. According to a preferred embodiment of this invention, the sleeve and the container are slideably secured by a plurality of spaced guides and mating guideways. The guideways are deeper than the protruding height of the guides to accommodate thermal expansion of the container. Also, according to a preferred embodiment of this invention, the die is slightly movable relative to the extrusion axis. The die has a frusto-conical surface engageable in a mating frusto-conical surface of the container whereby on enagement the die becomes precisely aligned with the extrusion axis. Furthermore, according to a preferred embodiment of the invention, the cooperating guides and guideways on the sleeve and on the container are respectively rulers (for example, three spaced 120° from each other) protruding from the inside surface of the sleeve and positioned parallel to the axis of the ram and the guideways on the outside surface of the container are distributed in the same manner as the rulers to cooperate with them. This arrangement makes the co-axiality or alignment along and about the axis of extrusion independent of differences in temperature between the sleeve and the container.

The invention will be described in detail with reference to the following drawings illustrating one particular embodiment of this invention wherein hollow products are extruded from the press.

FIG. 1 is an axial section along the extrusion axis showing the container brought close to its working position but not yet sealed. At this stage, the die, the container and the ram are not coaxial.

FIG. 2 is the same axial section as FIG. 1 showing the press where an extrusion has just begun.

FIG. 3 is a cross section along lines III—III of FIG. 2 (seen from the right).

FIGS. 1 and 2 are sections along lines I—I of FIG. 3. In all three figures, the same numbers have the same meaning.

Referring now to the drawings, container **1** is integral with its carrier **2** and its outside surface has a circular cross section along some 240°. Carrier **2** may hold other containers capable of being brought into working position. The hot billet **3** has been previously pierced or bored. It is followed by the dummy block **4**. The die holder **5**, equipped with a die insert is in contact with a backup bolster **6** affixed to the frame of the press (not shown). The die holder can be slightly moved normal to the extrusion axis under the urging of the container **1** when the frusto-conical recess **7** at the end of the container engages the frusto-conical outside surface **8** of the die holder.

The ram **9** is integral with the non-shown piston of a hydraulic press which defines the extrusion axis, that is, the working axis of the press. The press is, of course, mounted to the same frame as the backup bolster. This ram is bored to accept a mandrel **10**. It is enveloped with a very small clearance by a sleeve **11** which can slide along the ram body, while remaining co-axial with it. The front part **12** of the sleeve **11** can envelop the container **1** with the clearance sufficient for permitting a thermal dilation or expansion of the container **1**. When this is done, the carrier **2** occupies the space **12'** provided in the sleeve. The inside of the front part of the sleeve **12** includes three longitudinal rulers (guides) **13**, **13'** and **13''** distributed at 120° from one another and capable of sliding along the parallel sides of the longitudinal grooves (guideways) **14**, **14'** and **14''**, which have been machined with an excess in depth, on the outside surface of the container **1**. This permits the container to be aligned with the sleeve **11** and thus with the ram **9** whatever the working temperature of the container may be. The front end **15** of each ruler **13** and the rear end **16** of each groove **14** are tangentially and radially chamfered to permit an easy engagement of the container when the sleeve **11** begins to move toward it. It is obviously possible to achieve the same result by

associating the grooves with the sleeve and the rulers with the container. The rear part of the sleeve **11** includes a front face **17** which can come into contact with the entry face of the container **1** and seal it through the die holder **5** and the backup bolster **6**.

In FIG. 2, the die, the container, the ram and the mandrel are shown axially aligned. The ram has begun to transmit the force of the press and extruded product appears at **20**.

The press shown in the drawings operates as follows. The container **1** previously loaded with a billet **3**, a dummy block **4** and appropriate lubricating means is brought close to its working position by the carrier **2**. A die holder **5** equipped with a die insert is brought close to its working position also. The sleeve **11** is then moved toward the container. The ends **15** and **16** of cooperative elements **13** and **14** engage with each other. This generally causes the container slightly to move normally to its axis. When the front part **12** of the sleeve **11** has traveled along the whole length of the container **1**, the latter is aligned with the axis of the ram.

Then the sleeve **11** and container **1** integral with each other travel toward the die holder **5**. Engagement of surface **8** into surface **7** causes the die holder slightly to move normal to the extrusion axis. When the container is sealed which is achieved by maintaining an axial effort on the sleeve **11**, the die holder has become co-axial with the container. Then the mandrel **10** is pushed into the die and the extrusion force is applied through ram **9**. All the tools having been correctly centered, the hollow product is also initially correctly centered. The press does not undergo any transverse stresses which would be detrimental to the production of a well centered product so the product is centered over its entire length.

Having thus described my invention in detail and with the particularity required by patent law, what is desired to have covered by Letters Patent is as follows.

1. A press for hot extruding a metal billet into products comprising means for containing and roughly positioning the billet along an extrusion axis, said containing means slightly moveable normal and parallel to said axis, a die positionable on one end of said containing means, a ram for forcing the billet through the containing means and a hole in the die, said ram approaching said containing means from the end opposite the die, the axis of said ram defining the extrusion axis, means for aligning the containing means with the axis of said ram comprising a sleeve positioned coaxially and slideably about the ram, said aligning means sleeve engageable with the lateral surface of said containing means.

2. A press according to claim **1** in which the die is slightly moveable relative to the extrusion axis and has a frusto-conical surface engageable in a mating frusto-conical surface in the container means whereby on engagement the die becomes aligned with the extrusion axis.

3. A press according to claim **1** wherein the aligning means envelops the containing means along the entire length of the containing means.

4. A press according to claim **1** wherein the aligning means and containing means provide for thermal expansion being slideably secured by a plurality of spaced guides and mating guideways parallel to the axis of extrusion, said guideways being deeper than the protruding height of the guides.

5. A press according to claim **4** wherein the guideways are equally spaced about the extrusion axis.

6. A press according to claim **4** in which the ends of said guides and guideways which first come into reciprocal engagement are radially and longitudinally chamfered to permit easy connection.

7. A press according to claim **1** in which the said sleeve seals the containing means during extrusion.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,611,778 Dated October 12, 1971

Inventor(s) Rene Hubert

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1 Line 5 after --France-- insert
--, assignor to CEFILAC, Paris, France--.
Column 3 Line 18 --normally-- should read
--normal--.

Signed and sealed this 2nd day of May 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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