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LUBRICATION IN THE HOT EXTRUSION OF METALS

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Fig. 1

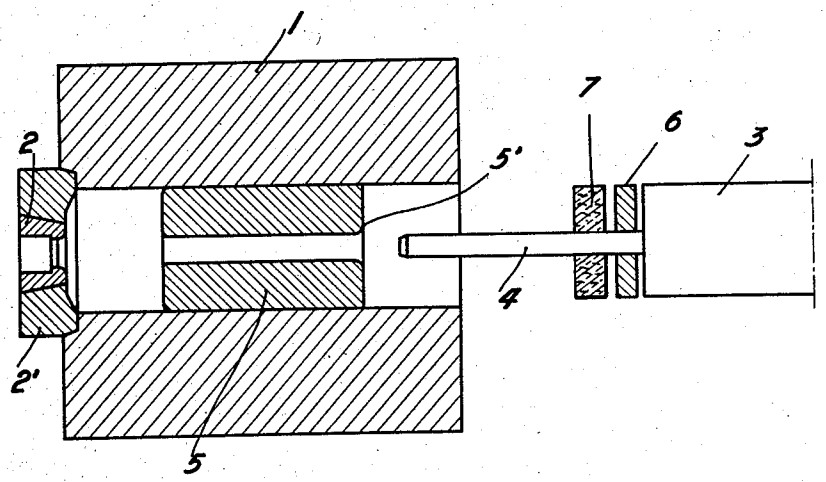
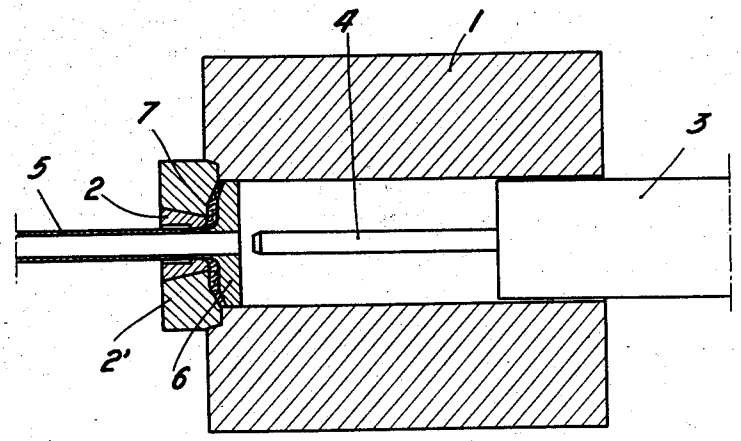


Fig. 2



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LUBRICATION IN THE HOT EXTRUSION OF METALS

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1 Claim. (Cl. 207—10)

The present invention relates to a method of eliminating the butt in hot extrusion of metals.

Generally speaking, the hot extrusion of metals is carried out by placing a heated billet of the metal to be extruded in a container which is open at both its extremities, and in forcing out the said billet by means of a punch or ram passing into one of the extremities of the container, so as to force the metal to pass through a die arranged at the other extremity. In the manner in which this operation is at present carried out, there remains in the container at the end of the operation, a certain length of the billet to be extruded; this length, which is generally known as a "butt," constitutes a manufacturing waste which cannot be used, and which therefore is preferably reduced to a minimum.

A number of end-of-travel devices have been suggested up to the present time in order to ensure that the butt has a constant thickness which is as small as possible. However, these possibilities are limited in practice, either by the increase of pressure at the end of the extrusion, which stops the punch in its travel, or by the risk of deformation of the die and of the die-carrier such as to put them out of service, due to the fact that they are subjected to stresses of too great value, or again by the appearance of internal defects at the extremity of that part of the bar which is extruded last.

In U.S. patent application No. 304,381 of August 14, 1952, there has been described a method for reducing the loss of metal due to the butt, which consists in arranging at the rear of the billet a heated disc made of a metal of lower value than the metal to be extruded, and then in carrying out the extrusion operation in the usual manner by interposing a suitable lubricant between the billet and the extrusion tool. In spite of the advantages conferred by this last method with respect to previously-known practice, it does however still have a certain number of drawbacks, the most serious of which resides in the necessity, in the great majority of cases, of heating the disc independently of the billet to a temperature lower than that of the billet. It is in fact necessary to install two heating devices in this case and to proceed to a double handling operation.

The present invention also enables this latter drawback to be avoided. The invention relates to an improvement in the method of hot extrusion with the insertion of metallic disc behind the hot billet to be extruded, which consists essentially in arranging behind the billet, first of all a lubricating mass of a substance which melts partly or wholly under the action of the heat whilst remaining viscous, followed by a cold disc of malleable metal.

As a malleable metal, a choice is preferably made of aluminum, copper or their alloys. The melting point of aluminum is about 658° C. and that of copper is about 1083° C. The said disc may however be made of any other metal which is ilkely to have in the cold state a deformation under pressure sufficient to make it fit the shape of the die-carrier at the end of the operation. The disc has a diameter substantially equal to that of the billet and its thickness, which is fixed in dependence on the diameter of the extruded product, is in general preferably in the vicinity of 15 mm.

As the substance which melts wholly or in part while remaining viscous at the temperature of the operation, there is preferably employed a glass, an enamel, a salt or a slag, in the form of fiber or multi-cellular, or of agglomerated or calcined powder in a solid plate. Substances may also be employed having a certain level of viscosity such as phosphates, borates, etc. It is of special advantage to employ as the mass inserted between the hot billet and the cold disc, a pad or wad of commercial glass fiber.

By carrying out the operation in accordance with the present invention, it is found that, at the end of the extrusion process, the whole of the metal of the billet to be extruded is ejected from the container, and that the vitreous mass has been applied against the die without damaging it. There only remains in the container the deformed disc, the raw material of which is easily recovered by re-forging, machining or re-melting. The method in accordance with the invention is especially advantageous in the extrusion of steel in accordance with the method described in U.S. Patent No. 2,538,917, issued January 23, 1951, and comprising the use of glass as a lubricant.

In the case of the extrusion of tubes, discs of metal are employed which have been previously drilled to the diameter of the bore of the pierced billet, and there is an advantage in previously machining in the bore and at the rear of the billet a slight rounded-off portion, which enables the vitreous mass to assist in the lubrication of the punch, the wear of which is thereby substantially reduced.

The method which has just been described has the advantage of eliminating all loss of billet metal during the course of the operation of extrusion, and of enabling the transformation to be effected with an efficiency of 100% in extruded metal, which constitutes a result never before achieved up to the present day.

The invention is explained in more detail in the description given below of one example of its embodiment, reference being made to the attached drawings, in which:

Fig. 1 is a diagrammatic cross-section showing the equipment before extrusion of steel tubes.

Fig. 2 is the diagrammatic cross-section of the same equipment after extrusion.

On the container **1** of an extrusion press is mounted the die **2** and the die-carrier **2'**. The ram **3** has integrally secured thereto the punch **4** which corresponds to the internal diameter of the tube to be extruded. In the container **1** is placed the billet **5** which has been previously bored and the bore of which has a slight rounded portion **5'** on its rear face. Over the punch, there is engaged a cold disc **6** of aluminum followed by a wad **7** of glass fiber.

After extrusion, it is found that the wad **7** is located between the die **2** and the disc **6**, which has taken the shape of the die-carrier **2'**.

On an extrusion press of 1500 tons, equipped as shown in the drawing, 10 billets of 18/8 Mo stainless steel were completely extruded into tubes of the following dimensions:

	Mm.
External diameter	41
Internal diameter	35

The dimensions of the billets were as follows:

	Mm.
External diameter	140
Length	380
Bore	39

The diameter of the container was 148 mm., and the billets were heated to about 1200° C.

Between the extrusion ram and the billet, there was placed in accordance with the invention, a disc of aluminium having a thickness of 15 mm. and a diameter of 140 mm., and a wad of glass wool weighing 220 grams. The total length of each of the tubes extruded under the above conditions was utilizable and there was no necessity for separating-off any butt whatever.

The disc **6** may be recovered by any known means after the end of the extrusion operation.

What we claim is:

In a method of extruding a heated metal billet from an extrusion chamber through a die located at one end thereof, the steps comprising heating the billet to a predetermined extrusion temperature, placing, immediately behind the billet, a mass of vitreous substance melting at least partially and remaining viscous at the extrusion temperature, placing behind said vitreous substance a cold push-out disc of metal having a melting point relative to the predetermined extrusion temperature such that it would melt in the extrusion operation if placed adjacent

the heated billet and which disc is more readily deformable in the extrusion operation than the billet, applying pressure to said disc until all of the billet is extruded through the die and said disc is deformed to conform substantially to the shape of the die, and stopping the application of pressure to said disc when said deformed disc has pushed the rear of the billet from the die.

References Cited in the file of this patent

UNITED STATES PATENTS

498,304	Potter	May 30, 1893
2,538,917	Sejournet	Jan. 23, 1951
2,630,220	Sejournet	Mar. 3, 1953
2,653,494	Creutz	Sept. 29, 1953

FOREIGN PATENTS

607,285	Great Britain	Aug. 27, 1948
689,051	Great Britain	Mar. 18, 1953
825,862	France	Dec. 16, 1937
1,101,953	France	Apr. 27, 1955