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(54) **Extrusion apparatus.**

(57) An extrusion apparatus is described in which a removeable die 12 is located in a die chamber 7 within a body 6 of the apparatus. A passageway 26 leads from an inlet 25 for extrusion material to the die chamber 7. A general squared-section sealing ring 30 is positioned in the passageway adjàcent to the die 12. The sealing member 30 has the corner next to the face of the die 12 and passageway wall 26 chamfered. so that extrusion material pressing against the sealing ring forces that ring into sealing engagement with the die face and passageway wall in order to present undesirable flow of extrusion material about the die into the die chamber.

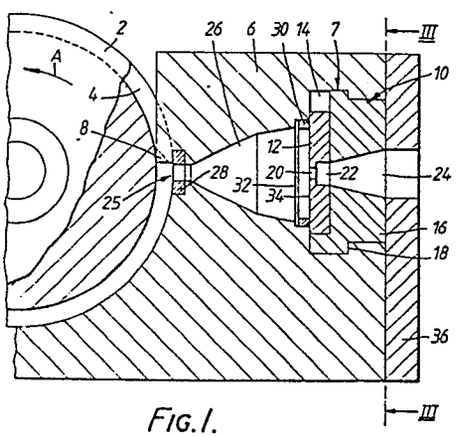


FIG. 1.

EP 0 233 064 A2

Beschreibung

EXTRUSION APPARATUS.

The present invention relates to extrusion apparatus, and in particular, though not exclusively, to a die arrangement for use with an extrusion apparatus of the "Conform" type.

In British Patent Specification No. 1370894, there is described a method of, and apparatus for, continuously extruding metal. The apparatus comprises a rotatable wheel having an endless groove extending around its periphery, a fixed structure covering the groove along part of its length to define a passageway therewith, a blocking member projecting into the groove to close off one end of the passageway and a die orifice leading from the closed off passageway adjacent with blocking member. In use, the wheel is rotated relative to the fixed structure and metal rod to be extruded is fed into the end of the passageway away from the blocking member and the metal is carried along in the groove by frictional drag in the direction towards the blocking member and is forced through the die orifice to produce the metal product.

This process is known as the "Conform" process, and "Conform" extrusion machines are well known and are generally used for extruding aluminium or an alloy, billet or rod. The die assembly is mounted within a stop member, or "shoe", and the blocking member projects into the groove in the rotatable wheel. The material then flows through the die and takes on a cross-section in accordance with that of the die.

This process and machine type has proved to be satisfactory within the aluminium industry where long production runs are concerned. However, when a series of short-run production is demanded, for instance in producing products of different cross sections either in shape or size, frequent changing of dies is necessary. This is a very time-consuming operation, mainly due to the difficulty experienced in separating the die, die-holder, bolster and shoe which tend to be almost welded together by traces of extrusion material, e.g. aluminium or copper which have "escaped" from the normal flow-passages.

The present invention seeks to provide die struture for an extrusion machine of the "Conform" type, whereby die assemblies may be readily removed and hence changed.

According to the invention there is provided an extrusion apparatus comprising: a body having a chamber for receiving a die; an inlet in the body for extrusion material; a passageway from the inlet to an opening into the chamber; a die in the chamber with an input side over the opening to the passageway; a sealing member arranged in the passageway so that extrusion material passing through the passageway to the die can press the sealing member against the die and passageway to prevent extrusion material spreading around the die into the die chamber.

The present invention also extends to an extrusion machine of the "Conform" type incorporating a die assembly as just described.

Preferably the sealing member is in the form of a sealing ring dimension to fit within the passageway. The sealing member preferably is formed so that the surface area of sealing member contactable by the extrusion material is greater than that which contacts the die and passage. In one form the sealing ring is generally square in cross-section with two adjacent faces for contacting the extrusion material and one each of the other two faces for contacting the die and passageway, and a common corner of the die and passageway contacting faces being cut away, so that the area of each of these faces is less than area of the corresponding extrusion material contacting face.

A preferred embodiment of the present invention will now be described by way of example and with reference to the accompanying drawings, wherein:

Figure 1 is a part section through an extrusion machine of the "Conform" type;

Figure 2 is a scrap view in section of parts seen in Figure 1; and

Figure 3 is a section view along the line III - III of Figure 1.

As seen in the drawings an extrusion machine of the "Conform" type has an extrusion wheel 2 with a groove 4, rotatably in the direction of the arrow A seen in Figure 1. The machine includes a frame member 6 which is provided with a blocking member 8 which protrudes into the groove 4, and a die assembly 10 carried within a chamber 7 in the body of frame 6.

The die assembly 10 consists of a die 12 mounted in a U-shaped recess 14 formed in a die carrier 16. The die carrier 16 is slideably mounted in slideways 18 machined in the frame member.

The die 12 has an extrusion orifice 20 and an enlarged recess 22 is formed behind the orifice. A further enlarged and tapered hole 24 is formed in the die carrier.

Adjacent the blocking member 8 is an inlet 25 and an expansion chamber 26 forms a passageway from inlet 25 to the die assembly 10 in chamber 7. About the inlet 25 is a wear ring 28. A sealing member in the form of a pressure ring 30 is located in a recess 32 in expansion chamber 26 adjacent one face 34 of the die 12.

A reaction plate 36 is secured to the rear of the frame of the machine.

The pressure ring 30 is generally square in cross-section and is chamferred on the corner adjacent the die face and recess 22 so that the face 38 of ring which is in contact with the die has a smaller area than its opposite face 40. and similarly the face 39 of the ring in contact with recess 32 is a smaller area than the opposite face 41.

As seen in Figure 3 the die carrier 16 has a recess 42 which receives a hook-shaped member 44 on the end of a piston rod 46 of a piston cylinder unit 48, piston cylinder unit 48 is mounted on a bracket 50 secured to one side of the frame 6. On the opposite side of the frame 6 is a bracket 52 which is provided with a slideway 54 aligned with the slideway 18

formed in the frame.

In use, the machine operates in the well known "Conform" manner, whereby rod is fed into the groove 4 of the rotating wheel 2. The friction from the surfaces of the groove drags the rod towards the blocking member 8 where the metal of the rod turns and flows through inlet 25 into expansion chamber 26. The pressure of the flowing metal causes the chamber to be filled, and then metal to be extruded through the die orifice 20 and out through the hole 24 where it is cooled and coiled as required.

The pressure of the metal in the chamber 26 acts on the face 40 of the ring 30 causing the face 38 of the ring 30 to seal hard against the face 34 of the die and thereby prevent any leakage or extrusion of metal between the die and the ring, because the pressure exerted on the surface 38 is greater than the pressure on the face 40. Similarly the pressure on the face 41 opposite the passageway contacting face 39, is greater than that exerted on that face so that the face 39 seals against the passageway. When it is desired to extrude a different product necessitating replacement of the die with another die, the rotary drive to the wheel is first stopped, which causes a cessation of flow of metal from the groove 4 into the chamber 26 with an immediate reduction in pressure on the sealing ring 30. Next, piston cylinder unit 48 is actuated to cause the die carrier 16, with die 12, to move to the left as seen in Figure 3. The first part of that movement shears the extrudate from the metal in the expansion chamber, after which it moves further to take up that position shown in chain lines in Figure 3 resting on the bracket 52. There the die may be lifted out of its U-shaped slot and replaced by a new die, or else a replacement die carrier, already assembled with a new die, may be exchanged with the old assembly. To this end, the old die carrier is lifted off the bracket, being thus disconnected from the hook 44 of the piston rod 46, and a new die assembly placed on the bracket 52 in engagement with the slideway 54 and with its recess 42 engaged by the hook 44. The piston cylinder unit is then actuated to draw the new die assembly into position within the machine whereby the die aligns axially with the chamber 26. The metal feed and extrusion is then repeated as already described.

Although there has been described one specific embodiment of the invention, variations and modifications are possible without departing from the scope of the invention.

For example, the die change arrangement may include die assembly supporting brackets on both sides of the machine so that a replacement die assembly may be replaced in readiness on one side while extrusion is still taking place in the extrusion axis. The piston cylinder unit 48 would then be located further from the extrusion axis. Besides the hook and recess connection between piston rod and one sliding die assembly, a further, similar, hook and recess connection would be provided between the second replacement assembly and the assembly which is in operation.

With further design modifications it is possible to provide a rotatable die carrier in place of the sliding die assembly, and such an arrangement would have two or more die stations and be pivotable about an axis parallel to, but offset from, the extrusion axis.

The die illustrated in the drawings shows a circular extrusion orifice, but may of course be of any desired shape and size. For instance it has been found possible, with the use of the expansion chamber 26, to extrude slabs of aluminium with a width which is many times greater than its thickness. For tubes and hollow sections, a bridge die is used.

Further, although the illustrative embodiment described the process where rod is fed to the groove 4 in the wheel, the invention is equally applicable where molten metal is fed into a machine of the type described and illustrated in our European Patent Application No. 83307110.3, published as specification No. 0110653 A2.

Still further, the invention is applicable to a similar type of machine wherein metal particles, e.g. granules or powder, are fed into the groove 4.

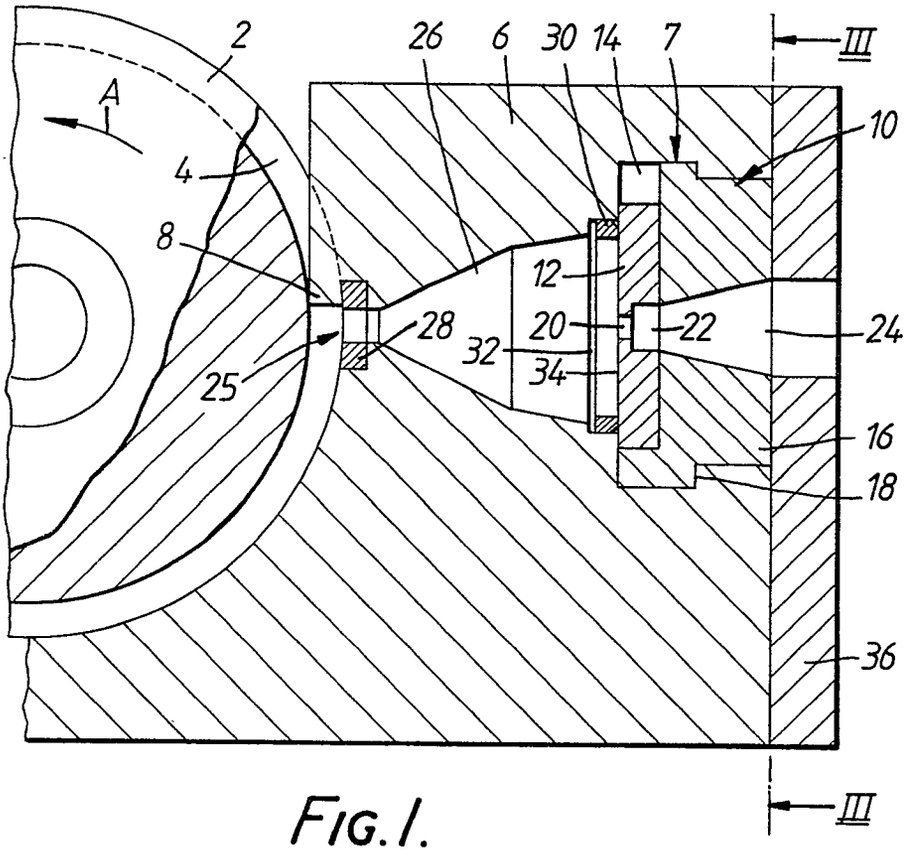
Claims

1. An extrusion apparatus comprising: a body (6) having a chamber (7) for receiving a die (10, 12); an inlet (25) in the body for extrusion material; a passageway (26) from the inlet (25) to an opening into the chamber (7); a die (10, 12) in the chamber with an input side juxtaposed with the opening to the passageway (26); a sealing member (30) positioned in the passageway (26) so that extrusion material passing through the passageway (26) towards the die (12) can press the sealing member (30) against the die (12) and the passageway to prevent extrusion material spreading around the die (12) into the die chamber (7).

2. An extrusion apparatus as claimed in claim 1, wherein the sealing member (30) is a sealing ring (30) dimensioned to fit within the passageway (26).

3. An extrusion apparatus as claimed in claim 1 or 2, wherein the sealing member (30) preferably is formed so that the surface area of sealing member contactable by the extrusion material is greater than that which contacts the die (12) and passageway (26).

4. An extrusion apparatus as claimed in claim 1 or 2, wherein the sealing ring (30) is generally square in cross-section with two adjacent faces for contacting the extrusion material and one each of the other two faces for contacting the die (12) and passageway (26), and a common corner of the die and passageway contacting faces being cut away, so that the area of each of these faces is less than area of the corresponding extrusion material contacting face.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6
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III

FIG. 1.

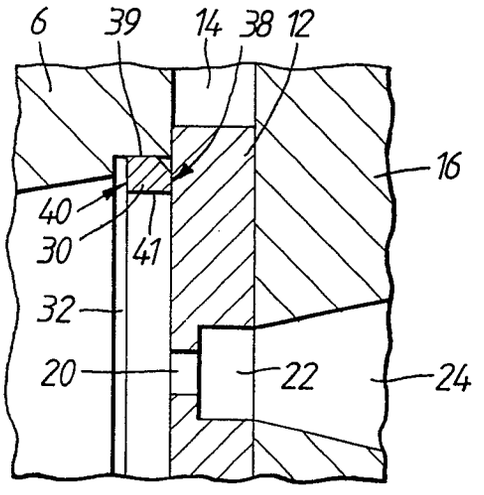
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FIG. 2.

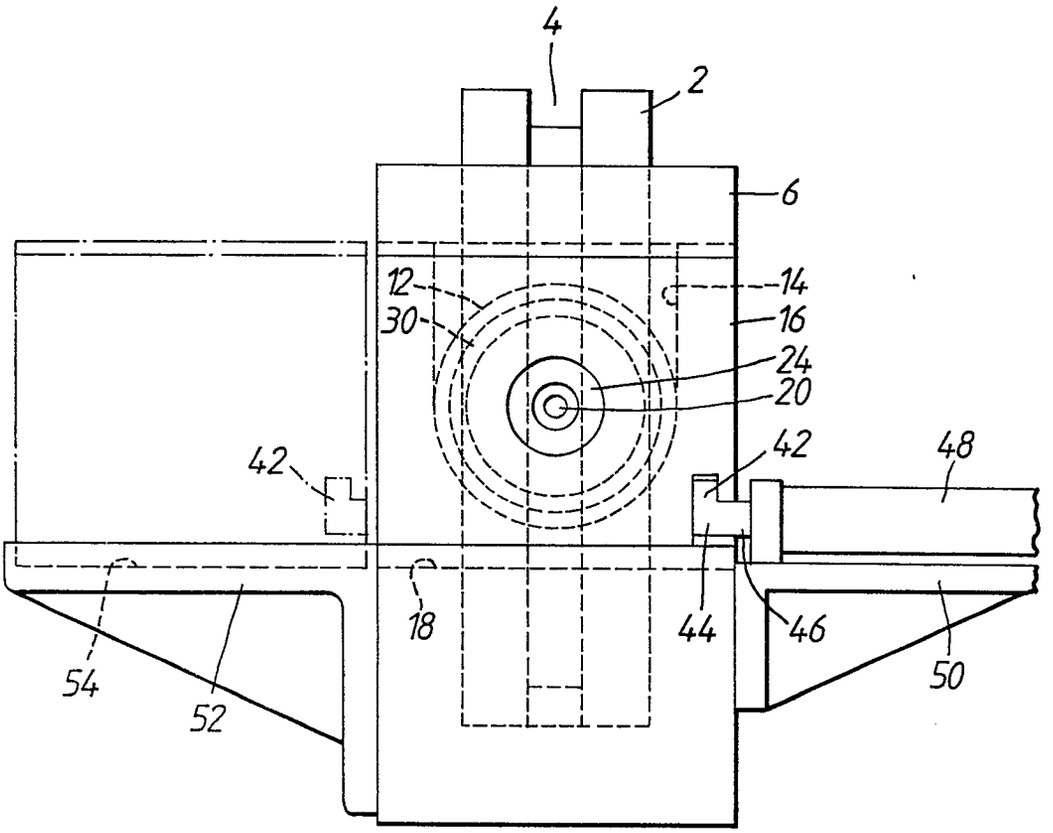

FIG. 3.