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DIE MECHANISM FOR EXTRUDING COMPRESSED POWDER RODS

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This invention relates to die mechanisms for extruding compressed powder rods, and more particularly to mechanisms for forming a continuous rod of compressed powdered metal which is to be sintered prior to melting in an electric furnace.

The die mechanism which is the subject of the present invention is an improvement over that described in applicant's copending application No. 787,797, filed November 24, 1947. In that application, an extrusion die is disclosed having a reciprocating ram or plunger at one end which packs small incremental portions of the powdered material into the die and compresses them at a predetermined consistency. The die is of constant cross-sectional area and is of such a length that the frictional force of the powdered metal against the walls of the die is always sufficient to prevent axial movement of the rod due to the axial force of the ram. The die is further provided with split portions which are normally held against radial expansion, but which by an arrangement of a cone and springs are released for radial movement upon the attainment of a predetermined axial force, thus reducing the frictional force of the rod in the die sufficiently to allow axial movement of the rod.

This mechanism presents inherent disadvantages which it is the object of the present invention to overcome. The springs which are used to counteract the axial force of the ram are very cumbersome and laborious to load. The die is required to have an axial motion, and bearing problems result due to excessive loads on the cone. Furthermore, the springs and cone operate as a friction brake when the compressed rod is moved through the die, thus causing excessive die wear and wasted power.

It is an object of this invention to eliminate these disadvantages and to provide an improved die mechanism which is extremely flexible in its operation and in which the labor involved in replacing or readjusting the parts is greatly reduced. In particular, it is an object to eliminate the spring arrangement and the attendant vertical motion of the die and compressed rod which is required to operate the cone and springs in the previous structure, substituting instead a mechanism which normally exerts a positive force on the split die portions to prevent their radial expansion, together with tripping means for automatically releasing this force when the axial force exerted by ram reaches a predetermined value. In association with this object, it is with-

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in the contemplation of this invention to provide a hydraulic mechanism in the form of a cylinder and piston for exerting the radial clamping forces on the die, and in which the hydraulic pressure in the ram cylinder is used to trigger the release of pressure in the die cylinder, the pressure at which this triggering takes place being adjustable by the operator.

It is a further object to provide an improved hydraulic system for an extrusion die mechanism of the above character, which is fully automatic in its operation and which includes means for varying the die cylinder releasing point without affecting the efficiency or speed of the system.

Other objects, features, and advantages of the present invention will become apparent from the subsequent description taken in conjunction with the accompanying drawings.

In the drawings:

Figure 1 is a side elevational view of the upper portion of an electric furnace installation, showing the location of the die mechanism and its associated subassemblies.

Figure 2 is a plan cross-sectional view taken along the line 2—2 of Fig. 1 and showing the feeding troughs and the die mechanism.

Figure 3 is a cross-sectional view in elevation taken along the line 3—3 of Fig. 2 and showing the die piston and cylinder as well as other elements of the die.

Figure 4 is a fragmentary cross-sectional view taken along the line 4—4 of Fig. 1 and showing the guide for the ram.

Figure 5 is a plan cross-sectional view taken along the line 5—5 of Fig. 3 and showing the location of the die tension bolts.

Figure 6 is a front elevational view, partly in cross-section along the line 6—6 of Fig. 3 and showing the construction of the entering portion of the die elements.

Figure 7 is a plan cross-sectional view taken along the line 7—7 of Fig. 3 and showing the construction of the die segments and the die collar.

Figure 8 is a plan cross-sectional view taken along the line 8—8 of Fig. 3 and showing the die segment clamping blocks; and

Figure 9 is a schematic view of a preferred hydraulic system for carrying out the principles of operation of this invention.

The principles of this invention are shown as embodied in a device for producing a continuous rod of sintered metal which is fed to the crucible or mold of an electric furnace for melting into an ingot or other object. It will be understood