M. H. REYMOND.

PROCESS OF MOLDING OR SHAPING PARTS IN MOLDS OR DIES.

APPLICATION FILED OCT. 22, 1919.

1,380,250. Patented May 31, 1921.

Fig. 1.

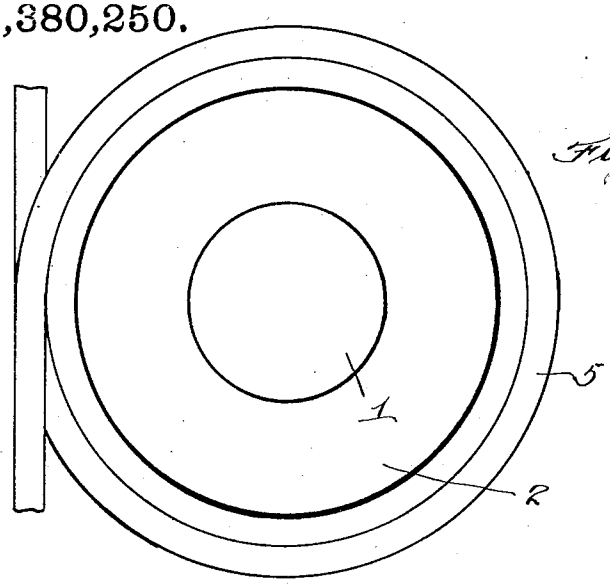


Fig. 2.

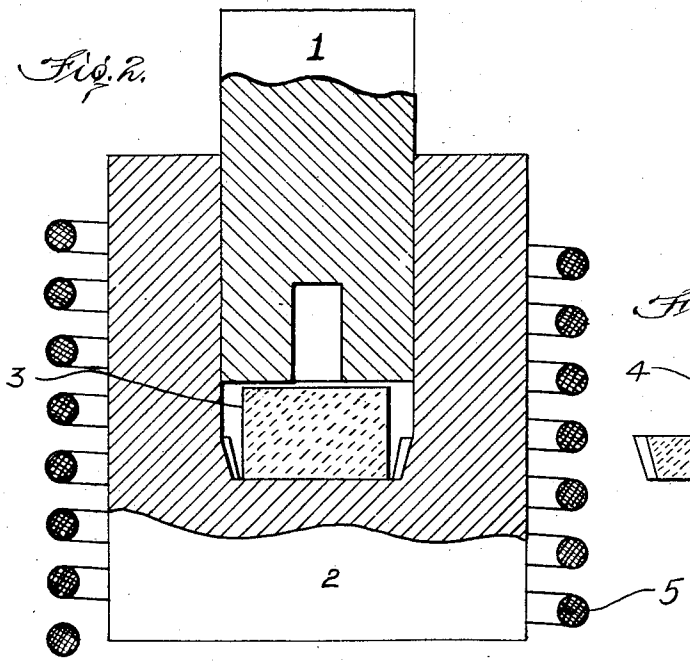
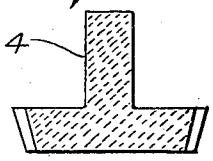


Fig. 3.



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PROCESS OF MOLDING OR SHAPING PARTS IN MOLDS OR DIES.

1,380,250. Specification of Letters Patent. Patented May 31, 1921.

Application filed October 22, 1919. Serial No. 332,498.

To all whom it may concern:

Be it known that I, MARTIN H. REYMOND, a citizen of the United States, and a resident of Anderson, county of Madison, and State of Indiana, have invented a certain new and useful Process of Molding or Shaping Parts in Molds or Dies; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the drawings, in which like numerals refer to like parts.

This invention relates particularly to hot pressing and die molding metals and other materials in various shapes, electromagnetic induction being used as a heating agency.

In the past hot pressing of metals has been performed by preheating the blank to some specified temperature at which the metal is sufficiently plastic, then placing between dies, and pressing into shape. Difficulty has been encountered in the formation of scale during preheating and during transference to the dies, making it difficult to obtain accurate surfaces on the part. Also it has been difficult to maintain the temperature and in consequence the plasticity of the blank with sufficient uniformity to permit using anything but mechanically very strong materials for the dies, such as steel, cast iron, etc., barring materials better suited in other respects, such as in being more refractory and of smaller coefficient of expansion.

Die molding of metals has likewise involved difficulties as performed by the customary methods, *i. e.*, by pouring or injecting molten metal into molds or dies. For instance, the metal has a tendency to chill prematurely, not properly filling out every detail of the dies, or the metal my suffer change by exposure to the air, or if an alloy, the elements may segregate, thus changing the composition.

The electrical molding process herein described is intended to largely overcome the above difficulties and constitutes a generally more practical method of molding various shapes and materials.

In the drawings Figure 1 is a plan view of the means associated with the process herein described. Fig. 2 is a central sectional view of the invention. Fig. 3 is a central sectional view of the completed article showing the same after it has been subjected to the steps of the process.

This process may be illustrated by describing in general principle the shaping by this means of a particular part. The pinion 4 shown on the drawing will be taken as an illustration. The blank metal, which may be in the shape of a slug, granulated, or in any other form desired, in this case shown as a slug 3, is introduced between the dies 1 and 2 as shown on the accompanying drawing. These dies may be made of quartz or other refractory material accurately fitted so as to slide together with as little clearance as necessary to do so freely, variations in size with temperature being taken into consideration. The mold is surrounded by a coil 5 of suitable design, which is supplied with alternating current of proper magnitude and frequency to efficiently induce enough secondary current in the slug 3 to raise it to the desired temperature. The principle involved is the same as in the induction electric furnace. In this way the temperature may be very uniformly raised to almost any degree desired, and by properly regulating the time element may be held within very close limits. When the proper temperature has been reached, the dies are brought together and the part thus pressed into shape. Any plasticity or fluidity that practice indicates is best may be used.

The process may be varied somewhat by using an electrically conducting mold such as graphite or some highly refractory metal, in which case eddy currents will also be induced in the mold, causing this to be heated as well as the blank metal inside.

Another variation would be to mold electrically non-conducting parts in electrically conducting molds, the entire heat being supplied to the substance being shaped by conduction.

Molds and dies, used in connection with such a process may to advantage be made of some mechanically strong material, such as steel, protected from injury by contact with the hot material being shaped by a thickness of some more refractory material, such as quartz.

Although the foregoing describes my invention in general principle, I realize that this molding process may be employed in various modifications and with added refinements. The full scope of the invention, I have attempted to cover in the appended claims.

I claim as my invention:

1. The process of molding material in a

closed die, consisting of electrically heating the material in a coreless high frequency primary transformer by the trasformer reaction between said high frequency primary and the material to be molded, and the shaping of said heated material in a closed die under pressure.

2. The process of molding conducting material in a closed die, consisting of electrically heating the conducting material in a coreless high frequency primary transformer by the transformer reaction between said high frequency primary and the conducting material to be molded, and the shaping of said heated material in the closed die under pressure.

3. The process of molding material in a die, consisting of electrically heating the material by means of an induction heater of the high frequency type which does not involve the use of transformer iron to concentrate the lines of force, and the shaping of the material in the die, said heater being so positioned as to heat the material while said material is in the die.

October 17, 1919.

MARTIN H. REYMOND.