Feb. 20, 1934. E. SCHUBARTH 1,948,242

METHOD OF AND MEANS FOR PRESSING METAL ARTICLES

Filed July 26, 1932

Fig. 1

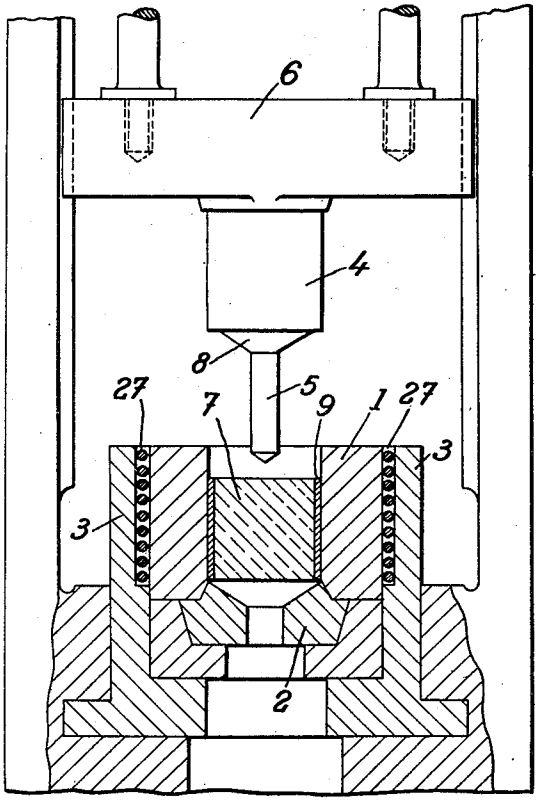


Fig. 4

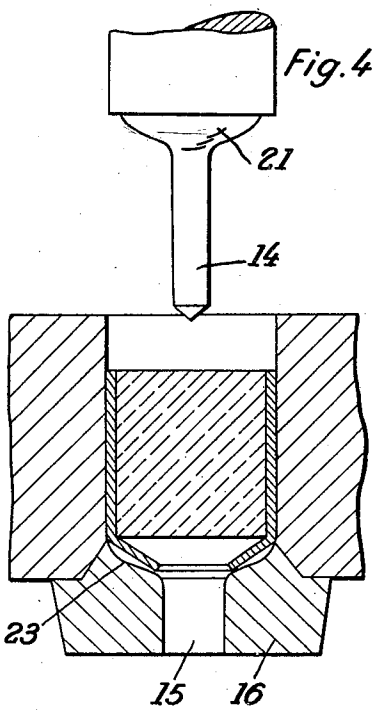


Fig. 6

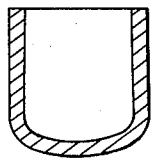


Fig. 2

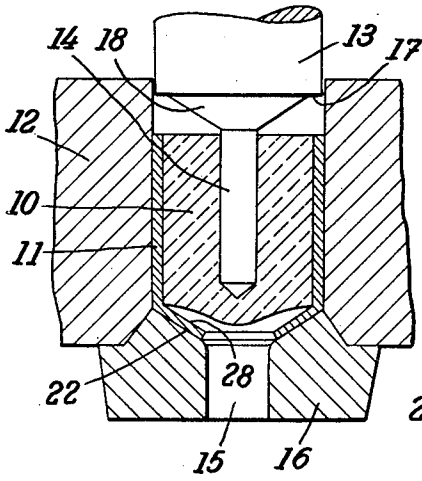


Fig. 3

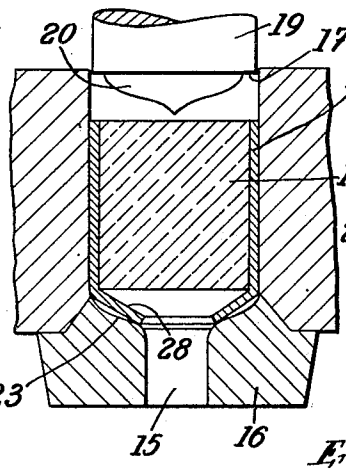
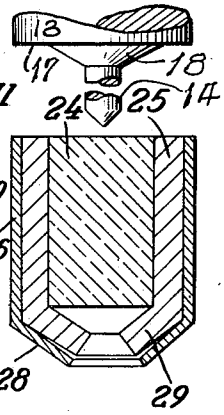


Fig. 5.



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Patented Feb. 20, 1934 1,948,242

UNITED STATES PATENT OFFICE

1,948,242

METHOD OF AND MEANS FOR PRESSING METAL ARTICLES

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Application July 26, 1932, Serial No. 624,677, and in Germany June 18, 1932

3 Claims. (Cl. 207—10)

This invention relates to a process of pressing solid or hollow bar profiles and utilizes the well known procedure which substantially consists in introducing a cylindrical metal block heated to pressing temperature into the mould of the press, and then pressing the said block into solid or hollow bars by means of a pressure member which for the manufacture of hollow bodies, and in particular pipes, is provided on its front surface with a mandrel.

The invention substantially consists in utilizing for the pressing of solid or hollow bars a block composed of at least two concentrically disposed pieces of different metals, the outer one of which consists of the metal which is desired to form the outer surface or layer of the bar to be produced. The invention can be utilized for producing solid or hollow bars, rods or tubes, the surface or outer layer of which consists of a metal diffrent from that forming the core or inner layer. In another application, the invention can be utilized for producing pipes the inner and outer walls of which consist of different metals from that of the core of the wall of the tube. This is generally the case with rods or pipes the outer covering of which is desired to consist of a more valuable metal while the rigidity and strength of the rods or pipes is produced by a cheaper material.

The invention will be more readily understood with reference to the accompanying drawing showing by way of examples some embodiments thereof and in which:—

Fig. 1 shows a press, partly in vertical section,

Figs. 2 to 4 show different forms of the mould together with the die, the pressure member and the block introduced into the mould,

Fig. 5 shows a block suitable for producing pipes in which the inner and outer surfaces consist of metals different from that of the core of the pipe and Fig. 6 shows an intermediate stage in the formation of the outer cover or sheath of the pipe.

Referring to Fig. 1, 1 is the receiving box closed at the bottom by the die 2 and surrounded by the receiving mantle 3. The pressure member is indicated at 4 and its conical face 8 is provided with a mandrel 5 for producing pipes or other similar hollow bodies. The advancing mechanism of the press is indicated at 6. From the point of view of the invention the type of the press is of secondary importance and it may be a hydraulic press, or a crank, eccentric or screw press may be utilized at will. The block to be drawn is indicated at 7, and it is introduced into the receiving box surrounded with a mantle 9 of a different metal. The other details of the construction of the press can conform with the usual arrangement.

Referring to Fig. 2, the process of pressing a pipe in accordance with the invention is diagrammatically indicated. The block used for the pressing comprises a core 10, which constitutes the material for the main part of the wall of the pipe. For providing the surface or the outer layer of the pipe, which consists of a different metal, the core 10 is surrounded by a metal mantle 11. Both pieces of metal are heated up to the necessary pressing temperature prior to being introduced into the receiving box 12, whereupon the pressure member or piston 13 is advanced by the press mechanism, whereby the mandrel 14 disposed on its front surface 18 is pressed into the block. By this means first of all a hole is produced in the block and the latter is pressed into a hollow bar through the aperture 15 of the die 16 when the piston 13 is further advanced. By this operation the material of both metals 10 and 11 is forced through the aperture 15 of the die 16 in such a manner that the body of the pipe is substantially produced from the metal of the core 10, while the outer layer or surface of the pipe is produced from the metal of the mantle 11. The thickness of the core 10 and the mantle 11 is dimensioned from the respective metals in such a manner that they will suffice for the proportion of the walls of the pipe to be produced.

The following combinations of metals may serve as examples for the application of the process according to the invention:—

Zinc as the base metal for the bar, rod or pipe, and aluminium as the surface. The zinc is heated to 300–350° C. and the aluminium to 400–480° C., according to the purity or composition of the alloy.

Iron as the base metal, copper as the surface. Both metals are heated to 800–900° C.

Copper as the base metal for the production of pipes, nickel-silver as the inner and outer surfaces. These metals yield tubes of high quality. Both metals are heated to 800–900° C.

If the pressing temperature of both metals is the same, they may be assembled to form the block and then heated together.

The mantle or hollow cylinder 11 which serves to cover the outer surface of the body of the tube can be produced with advantage in the manner of a cartridge as a body in itself. This can be effected, for example, in such a manner that

a cylindrical hollow body is produced from a slug or blank of the metal in question by pressing such blank so that it will have a slightly protruding or outwardly arched bottom, as indicated at B in Fig. 6, which illustrates this intermediate stage in the formation of the mantle 11. The bottom is then preferably provided with a central opening approximately corresponding in size to the aperture of the die 16. The bottom ledge 28 formed thereby may fit the slope of the transition surface 22 of the die 16. This has the advantage that the metal of the surface layer follows the pressing pressure with certainty when the same is exerted on the block, so that the bar emerging from the aperture 15 of the die 16 receives a uniform coating surface from the metal of the mantle 11.

The hollow cylinder or cartridge 11 can also be produced in the form described above with the base ledge by casting, for example spray casting. It is also possible to bend the said mantle from a sheet of the metal in question, in which case the seam may be made to overlap to a certain extent or a butt contact between the edges may be provided. In the case of metals of different melting points the block consisting of co-axially disposed layers of different metals can also be produced by casting the outer mantle of the second metal over the core, or by casting the metal of the core into the mantle.

Referring to Fig. 3, if a solid bar is to be produced no mandrel is provided on the pressure member 19. Generally speaking the block to be drawn can be made up of layers in the manner described above. Preferably, the face 20 of the pressure member is of special shape, whereby the effect hereinafter referred to may be produced.

In certain metal combinations some difficulty is experienced in ensuring that the two metals will adhere to each other with certainty during the pressing or molding operation. It has been observed that this frequently occurs if an alloy is to be pressed with a basic metal in the manner described. As an example a combination of zinc and brass may be mentioned. In this case defects often result by reason of the surface layer of the bar, produced from the mantle, being torn off. To overcome this difficultly it is necessary for the pressure member to assume a special shape. Since in this case the press mechanism has to advance two concentrically disposed metals, the front surface of the pressure member is given a form different from the usual shape. In bar presses of the well known type the front surface 18 of the piston 13 is made conical, as will be seen in Fig. 2. For the purposes of the present process this has the advantage that a horizontal pressure component is obtained which presses the metal of the core 10 hard against the mantle 11. In order however, to ensure the feed of the mantle, the conical front surface of the piston is provided with a flat rim 17 (Fig. 2), which approximately corresponds to the thickness of the mantle of the block to be pressed. In case of a plurality of concentric mantles (such as 25, 26) the rim 17 is to be dimensioned accordingly, as indicated in Fig. 5. This will produce the effect that the pressure member 13 will push forward the metal of the mantle 11 or the cartridge, while at the same time the metal of the core 10 is also advanced in the receiving box and simultaneously pressed against the mantle 11 by the horizontal pressure component which is due to the conical front surface of the pressure member.

Instead of the usual conical surface, the front surface of the pressure member may be provided with a parabolic surface or some other surface of rotation generated by a different curve. Such forms are shown in Fig. 3 for a solid bar press at 20, and in Fig. 4 for a pipe bar press at 21.

In order to facilitate the issue of the bar from the aperture 15 of the die, the conical transition surface 22 (Fig. 2) may be substituted by reducing the diameter from the opening of the receiving box 12 to the aperture 15 of the die 16 according to some other curve. In Figs. 3 and 4 one or two examples are shown at 23.

For producing pipes in which it is desired that the outer as well as the inner surface or layer should consist of a metal different from that of the core of the pipe, a block is utilized the composition of which is shown in Fig. 5. This block comprises the core 24, the metal of which will be formed to constitute the inner wall after being pierced by the mandrel of the pressure member, the mantle 25 which will provide the pipe wall proper, and a second mantle 26 surrounding the mantle 25, which will be pressed to form the outer surface of the pipe.

Such pipes are of importance in those cases where the inner and outer surfaces of the pipe are required to consist of a valuable metal, while for reasons of economy of material the intermediate mantle, which lends the pipe its strength, may consist of a metal of less value. In this manner, for example, nickel-silver pipes may be produced in which a very thin inner and outer coating only is made of a layer of nickel-silver, while the body of the pipe between these two coatings may consist of iron or some other cheap metal. Obviously, by suitably selecting the metals the outer surface of the pipe may be made of a metal different from that of the inner surface.

In most cases the two or three metals which are to be joined to form a solid or a hollow bar will require different pressing temperatures. In this case care must be taken that particularly the higher temperature of one of the metals should not be led off to an extent which is unnecessary. The leading off of the heat, especially from the receiving box, can be prevented according to the invention by causing said receiving box to be strongly heated from outside. For this purpose, means may be provided to heat the receiving box up to the required temperature, for instance electrical resistance heating may be employed. In Fig. 1 this electrical resistance heating arrangement is shown at 27. Instead of the electrical resistance heating a pipe coil may be provided for the same purpose, through which for example hot oil is forced. The arrangement is substantially the same as that indicated in Fig. 1 at 27.

The invention is not restricted to the production of round or cylindrical profiles, as other profiles, for instance profiles with square cross section may be produced with the same advantage. For this purpose only a die with a square aperture is required and preferably the cross section of the receiving box or receiver is also made square. Correspondingly, the pressure member also assumes a square shape and it is obvious that the cartridge must have the same form.

The solid or hollow bars produced in accordance with the present process can be subjected to further treatment by means of the usual drawing process so as to produce rods or pipes of any desired diameter or inner diameter and wall thickness. The semi-finished products obtained by the process according to the invention can be

also subjected generally speaking, to cold treatment. It is, however, advisable that in this case annealing should be effected between the drawing operations in order to eliminate internal stresses.

I claim:

1. Means for pressing metal bars, rods, tubes and pipes having one layer formed from a metal different from that forming another layer, comprising a receiver for a block of metal including a plurality of layers conforming in arrangement and characteristics with those of the articles to be produced, there being an aperture in said receiver forming a die defining the external contour of the finished article, and means for urging the metals constituting said block through said die, said latter means comprising a pressure member having a flat rim, the width of which corresponds with the width of the outer metal layer of the block, and an inner outwardly projecting portion for urging the inner part of the block towards the outer layer as it presses against said block.

2. The method of forming compound metal bodies, which consists in providing a plurality of pieces of different metals of complementary shape adapting them to be nested, heating each of said pieces separately to extrusion temperature, nesting the pieces thus heated, to form a composite block in which said pieces constitute co-axial layers, placing such block, while hot, in the receiver of a press, and extruding said block from such receiver by pressure-exerting means acting directly on all of said co-axial layers.

3. Means for forming compound metal bodies, comprising a receiver for surrounding and engaging the outer surface of a block of metal including a plurality of layers conforming in arrangement and characteristics to those of the article to be produced, a die located at the extruding end of said receiver and defining the external contour of the finished article, and means for urging the metals constituting said block through said die, said latter means comprising a pressure member having a flat rim, the width of which corresponds with the width of the outer metal layer of the block, and an inner outwardly projecting portion for urging the inner part of the block towards the outer layer as it presses against said block.

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