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METHOD FOR THE COLD SPURTING OF TUBES AND THIN WALLED METAL PIPES OF  
LEAD, TIN, AND ESPECIALLY ALUMINIUM  
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Fig. 1

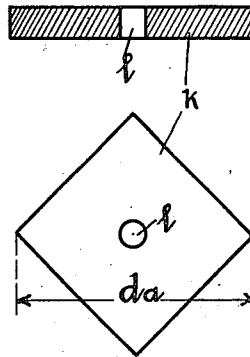


Fig. 2

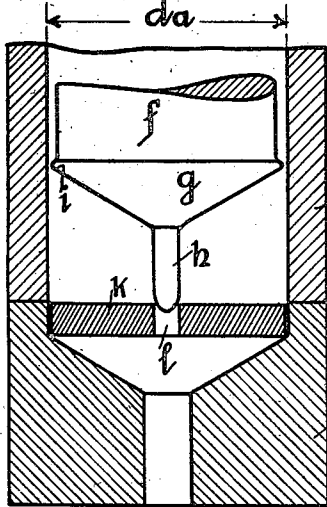
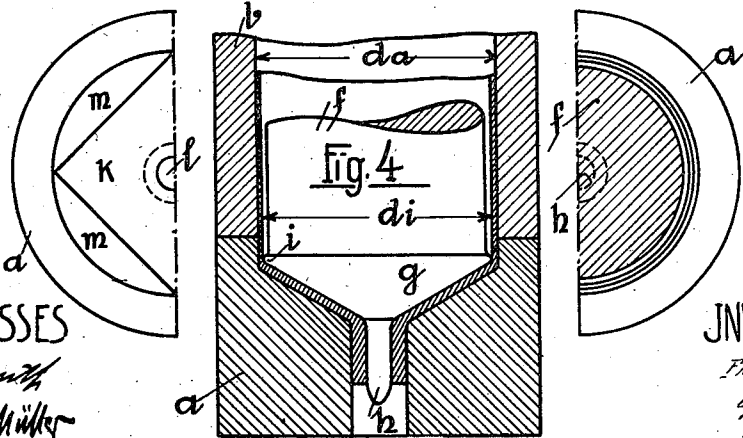
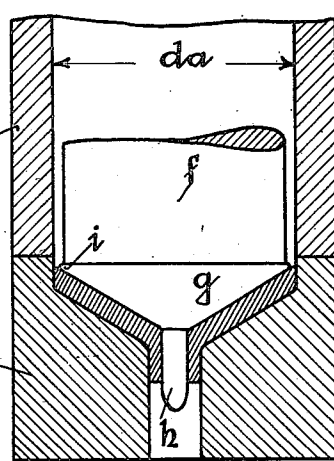


Fig. 3



WITNESSES

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# UNITED STATES PATENT OFFICE.

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METHOD FOR THE COLD SPURTING OF TUBES AND THIN-WALLED METAL PIPES OF LEAD, TIN, AND ESPECIALLY ALUMINIUM.

Application filed February 21, 1922. Serial No. 538,349.

*To all whom it may concern:*

Be it known that I, FRITZ SINGER, a citizen of the German Republic, residing at Nuremberg, Germany, have invented certain  
 5 new and useful Improvements in Methods for the Cold Spurting of Tubes and Thin-Walled Metal Pipes of Lead, Tin, and Especially Aluminium, of which the following is a specification.

10 This invention relates to a method for the production of compressible tubes and thin-walled metal tubes of lead, tin, and especially aluminium by the extrusion (or cold squirting) process and it consists in  
 15 using prismatic, preferably square blanks. The sheet metal plates can be cut into square blanks almost without waste whilst, if circular blanks are stamped out, which have been hitherto used exclusively for the purpose,  
 20 considerable waste is left over. The transformation of this waste material into new plates of sheet metal causes great expenses which are saved according to this invention.

25 Square blanks have been used already for the warm pressing of thick-walled iron hollow bodies and it has been further proposed, although without success, to use such square blanks for the warm pressing of brass  
 30 cartridges. Square blanks have been further used for swaging. These blanks are however of a different kind than those used according to the novel method. The square blanks of known type are forged, hot pressed  
 35 or blanks of larger size are first sawn off from prismatic rods, the shaping of which requires the same amount of material and the same work as the shaping of circular blanks. The saving of material, which is  
 40 one of the principal objects of this invention, is of no account. Erhardt's pressing process, which is a punching process, uses prismatic work pieces in order to provide  
 45 the shortest way of escape for the material to be displaced by the mandrel. The Erhardt's pressing process has the object to reduce as much as possible the work to be done and the strain on the tools. The use  
 50 of square blanks in swaging has for its object to improve the texture by the greater transforming work.

All these processes require hot working which means that the working is done at a temperature at which the solidification and

hardening of the metal at the state of production is destroyed. The malleability of the material in the heat is practically limited only by the cooling of the metal caused by the tools.

According to this invention the cold  
 60 method is used in which the hardening and solidification of the material is increased to the maximum. The production of tubes, especially of thin walled aluminium tubes, submits per se the metal to the utmost stress.  
 65 In one pass a tube-shaped body is produced from a circular blank 4-5 mm. thick, the thickness of the wall of said body being only 5-10/100 mm. This requires pressures exceeding 100 kilograms per square millimeter,  
 70 whilst in the hot process the pressures amount only to 10-20 kilograms per square millimeter. The highest possible demands are therefore made on the tools in the manufacturing of aluminium tubes. The transformation which takes place when the tubes  
 75 are being produced by the cold process is quite different from the transformation which takes place in the hot process. In the hot process segments have to be filled  
 80 in by tangential and radial displacement of the metal but in the working process according to this invention the very complicated formation of a conical body with neck part is in question, which correspond to the collar  
 85 and neck of the finished tube, the formation of the wall of the tube beginning only after this. It could not be expected that this preliminary forming would be successful and that the material would remain intact so  
 90 that the finished tube was free from cracks and pores, as even in the manufacturing of tubes from circular blanks a great number of tubes were cracked and porous and had to be counted as refuse owing to the fact that  
 95 at the somewhat violent transformation the material did crack.

In the manufacturing of tubes from square blanks by the cold extrusion process a considerably greater amount of transforming  
 100 work had to be done. According to the Erhardt's hot pressing process just the opposite is the case.

As the metal as well as the tools are already submitted to the utmost stress in the  
 105 manufacturing of tubes from circular blanks one ought to think that it would be quite useless to increase this stress at the transfor-

mation by using square blanks instead of the circular blanks.

Although for the hot pressing of hollow bodies of simple form and with thick walls the use of square blanks had been known already nobody had thought hitherto, for the reasons mentioned, of using such blanks for the production of lead- tin- or aluminium-tubes by the cold extrusion process.

This idea has been realized by the present invention notwithstanding all the serious reasons which were against it. The considerable economical advantages resulting from this improved method are obvious. Specially the application of the method to the manufacturing of aluminium tubes is an important progress as it is much more difficult to utilize the waste material from the manufacturing of tubes from aluminium than it is to utilize the waste of other material.

The formation of an aluminium tube after the improved process is shown by way of example on the accompanying drawing, wherein:—

Figure 1 shows the square blank in diagonal section and in plan view.

Fig. 2 shows in longitudinal section and in plan view this blank inserted in the pressing die.

Fig. 3 illustrates in longitudinal section and in plan view, the first alteration of shape.

Fig. 4 illustrates in longitudinal section the second and final alteration of shape.

As usual the die for the production of the tube by extrusion consists of the part *a* designed to form the tube-collar, of the ring *b* the inner diameter  $d_a$  of which determines the outer diameter of the tube, of the pressing punch *f* with the collar-forming cone *g*, of the thin mandrel *h* for the formation of the neck and of the transition bead *i*, the diameter  $d_i$  of which determines the inner diameter of the tube and consequently the thickness of the wall. In the working method only the selection of the square blank *k* is novel. The square blank is of the size and thickness of the well known circular blanks and a diagonal length  $d_a$  which is equal to the inner diameter of the ring *b*. The square blank has preferably a hole *l* to facilitate the insertion of and to guide the neck mandrel *h*.

I claim:—

Method for the production of compressible tubes and other thin-walled tubes of lead, tin and especially aluminium consisting in moulding the tubes from square blanks by the cold extrusion process.

In testimony whereof I affix my signature in presence of two witnesses.

FRITZ SINGER.

Witnesses:

ALEXEI V. PHILIPPÖFF,  
ALEXANDER DE LOTO.