July 7, 1959 K. BEISNER 2,893,277

PROCESS AND TOOL FOR PERFORATING INGOTS

Filed July 25, 1957 2 Sheets-Sheet 1

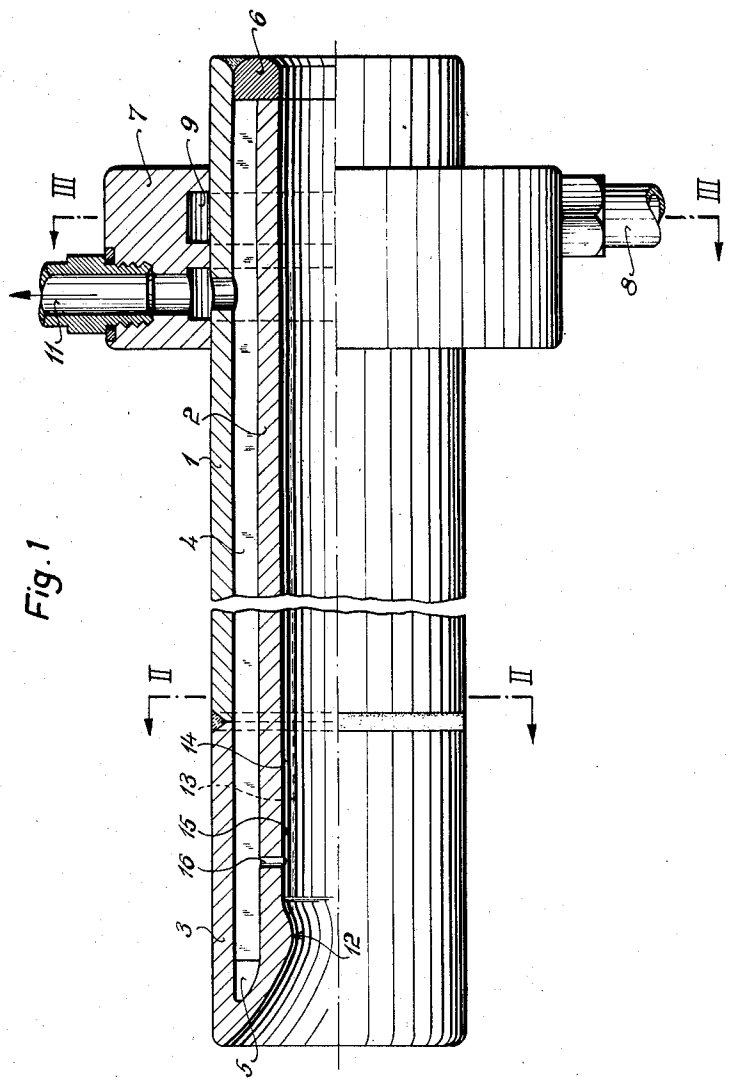


Fig. 1

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July 7, 1959 K. BEISNER 2,893,277

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Filed July 25, 1957 2 Sheets-Sheet 2

Fig. 3

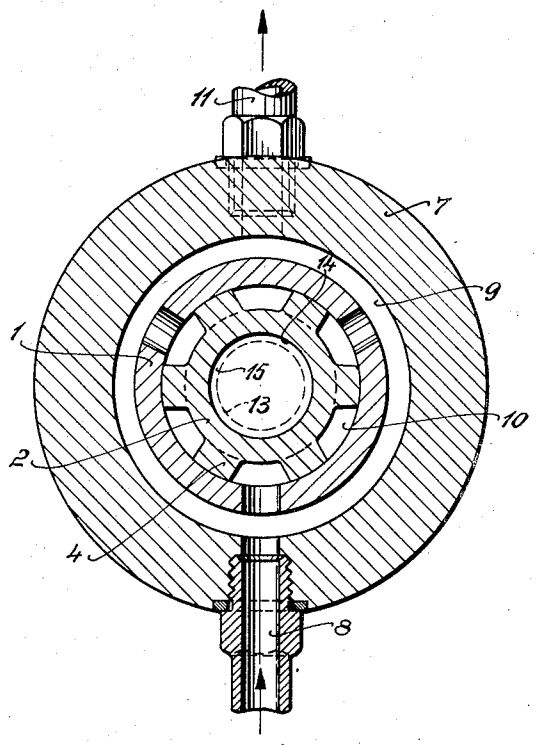
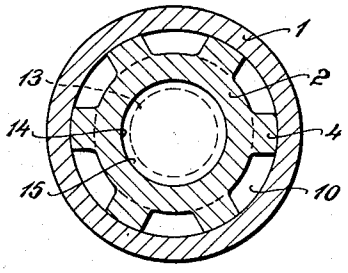


Fig. 2



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PROCESS AND TOOL FOR PERFORATING INGOTS

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2 Claims. (Cl. 78—9)

The invention relates to a process and a tool for perforating ingots.

The procedure hitherto used when perforating ingots, which were later to be forced on the drawn or pressed tubes, has been to perforate the ingots after cooling by a cutting operation, such as drilling out. However, this subjected the turning and drilling tools used to exceptionally heavy wear, in consequence of the blowholes, scabs and other impurities present inside the ingots expenditure on labour and wear on machines are also exceptionally heavy. When relatively large bores and short lengths are involved, the ingots are perforated by means of an uncooled annular punch. However, it is very difficult subsequently to remove the cooled core from the punch. It is quite impossible to carry out core boring with the aid of an uncooled annular punch in the case of relatively small bores.

The invention proposes a process for perforating ingots or the like, the dimensions of the hole playing virtually no part in this case. The process according to the invention and the tool intended for carrying out same allow all kinds of ingot perforation to be effected in the most simple manner and without difficulty.

In the process according to the invention, the ingots or the like are perforated in the hot state, preferably at temperatures of between 800 and 1100°, the annular punch being cooled during perforation, as is known in the case of hollow punches. Coolant is preferably fed to and led away from the face of the punch via separate paths in the interior thereof, in direct contact with the external and internal walls of the annular punch.

If an annular punch having a narrowed bore in the region of the head is used, coolant is fed to the tip of the punch through the interior thereof in direct contact with the external and internal walls of the annular punch, and is led away between the internal wall of the annular punch and the bored-out core of the workpiece.

A hollow punch suitable for carrying out the process according to the invention preferably consists of two substantially concentric tubes, the space between these tubes being fed with coolant. The coolant can be returned via the gap between the core and the inner tube, small outlet apertures being provided in the inner tube in the vicinity of the head, or the space between the substantially concentric tubes can be provided with ducts, the coolant flowing through one group of ducts in the direction of the head of the punch, and flowing back in another group of ducts to the union for the coolant. The ducts are expediently formed by providing at least one of the concentric tubes, preferably the inner tube, with fins, which also serve to support the two tubes against one another.

If fins are arranged in the space between the concentric tubes, the fins in the head of the punch are alternately provided with a reversing aperture, so that coolant flows downwards in the direction of the head of the punch in one groove between two fins, and is conveyed upwards in the adjacent groove. Such a tool

allows perforation to be carried out without difficulty at an ingot temperature of approximately 800 to 1100° C. Pressure is exerted on the hollow punch by a plunger, which is caused to act on the end of the hollow punch remote from the head. The core forced through by the hollow punch emerges at the other end, and can thus be pulled without difficulty.

In order to allow the core to slide upwards in the inner tube particularly easily and with room for play, a further feature of the invention provides for the internal diameter of substantially the front third of the head to be made smaller than the internal diameter of the rest of the hollow punch, so that the said internal diameter at the head determines the diameter of the core.

It has been found to be possible to force the core up to approximately 40 mm. downwards to any desired depth, provided only that the punch is made of corresponding length.

Cooling itself can be effected by a liquid coolant, for example water, but is effected in accordance with a particularly preferred method of carrying out the process according to the invention, by water atomised by means of compressed air, heat being particularly well conducted away by this means. A gas, for example air, can also be used if desired as a coolant.

A further expedient form of embodiment of the tool according to the invention consists in the provision of a helical guide on the outer tube, so that the punch carries out a rotary movement upon being forced in, and is thus centrally guided in positive fashion.

One embodiment of the invention will now be described in more detail with reference to the accompanying drawings in which:

Fig. 1 shows a longitudinal section through a hollow punch according to the invention;

Fig. 2 shows a rear elevation of the hollow punch seen from the line II—II as shown in Fig. 1 and

Fig. 3 shows a section through the punch shown in Fig. 1 along the line III—III.

The punch according to the invention is built up from the two tubes **1**, **2**, which communicate at the front end with the head **3** of the punch. The space between the two tubes **1** and **2** is bridged by the fin **4**, on the inner tube for example (cf. Fig. 3). The head **3** of the punch has reversing apertures **5** where the inner and outer tubes communicate. At the end of the punch is situated the bearing surface **6** for the plunger, not shown, which exerts pressure. A union **7** for the coolant is fitted to the rear end of the hollow punch. The coolant inlet and outlet pipes open out into this union, as may also be seen from Fig. 3. The coolant passes through the inlet pipe **8** into an annular conduit **9**, and passes from there into the grooves **10** remaining between the fins **4**. The coolant in these grooves flows into the head **3** of the hollow punch, and flows via the reversing apertures **5** into the adjacent groove in each case, where it flows back again to the outlet pipe **11** in the union **7**. The head **3** can if desired be externally provided with helical passages, thus facilitating central penetration of the hollow punch into the ingot to be perforated. The narowing of the internal diameter of the inner tube in the front third of the head of the punch is indicated at **12**, the said narrowing causing the core, which slides through the inner tube, to have a smaller diameter than the inner tube. In this form of embodiment, it is possible, and may be expedient, to return the coolant not through the ducts adjacent to the inlet ducts, but through the annular space **15** between the core **13** and the internal wall **14** of the inner tube, but the outlet apertures **16** must then be provided in the head.

The invention is naturally not limited to the form of embodiment hereinbefore described in detail, and illus-

trated in the figures, but can be modified in many ways without departing from its basic idea.

I claim:

1. A punch for perforating hot ingots comprising a pair of spaced concentric tubes, a connection between said tubes at the outer working end thereof, means closing the inner end of the space between said tubes, a plurality of radial fins between said tubes and extending longitudinally thereof to provide channels for fluid coolant, alternate fins being spaced from said outer end connection, a union for coolant on the outer of said tubes in the region of the inner end thereof and having inlet and outlet pipes, an annular conduit in said union surrounding the outer tube and with which said inlet and outlet pipes communicate, and ports in said outer tube communicating with said conduit and certain of the channels, whereby coolant passes through the inlet pipe into the annular conduit and thence through said certain channels to the front of the tool and then through the space at the outer end between the tubes and thence to other channels back to the outlet pipe.

2. A punch for perforating hot ingots comprising a pair of spaced concentric tubes, a connection between said tubes at the outer working end thereof, means closing the inner end of the space between said tubes, a plurality of radial fins between said tubes and extending longitudinally thereof to provide channels for fluid coolant, alternate fins being spaced from said outer end connection, a union for coolant on the outer of said tubes in the region of the inner end thereof and having inlet and outlet pipes, an annular conduit in said union surrounding the outer tube and with which said inlet and outlet pipes communicate, ports in said outer tube communicating with said conduit and certain of the channels, whereby coolant passes through the inlet pipe into the annular conduit and thence through said certain channels to the front of the tool and then through the space at the outer end between the tubes and thence to other channels back to the outlet pipe, and an annular constriction on the inside of said inner tube spaced inwardly from the end thereof thereby to provide a space between the internal walls of the inner tube and the core.

References Cited in the file of this patent

UNITED STATES PATENTS

408,377	Cobb	Aug. 6, 1889
2,039,438	Morgan	May 5, 1936
2,368,980	Frothingham	Feb. 6, 1945
2,385,574	Hyprath	Sept. 25, 1945
2,396,108	Loewy	Mar. 5, 1946
2,778,494	Kreidler	Jan. 22, 1957
2,809,750	Arenz	Oct. 15, 1957

FOREIGN PATENTS

13,154	Norway	Feb. 10, 1904
15,141	Great Britain	July 6, 1904
457,856	Germany	Mar. 26, 1928
498,176	Germany	May 19, 1930