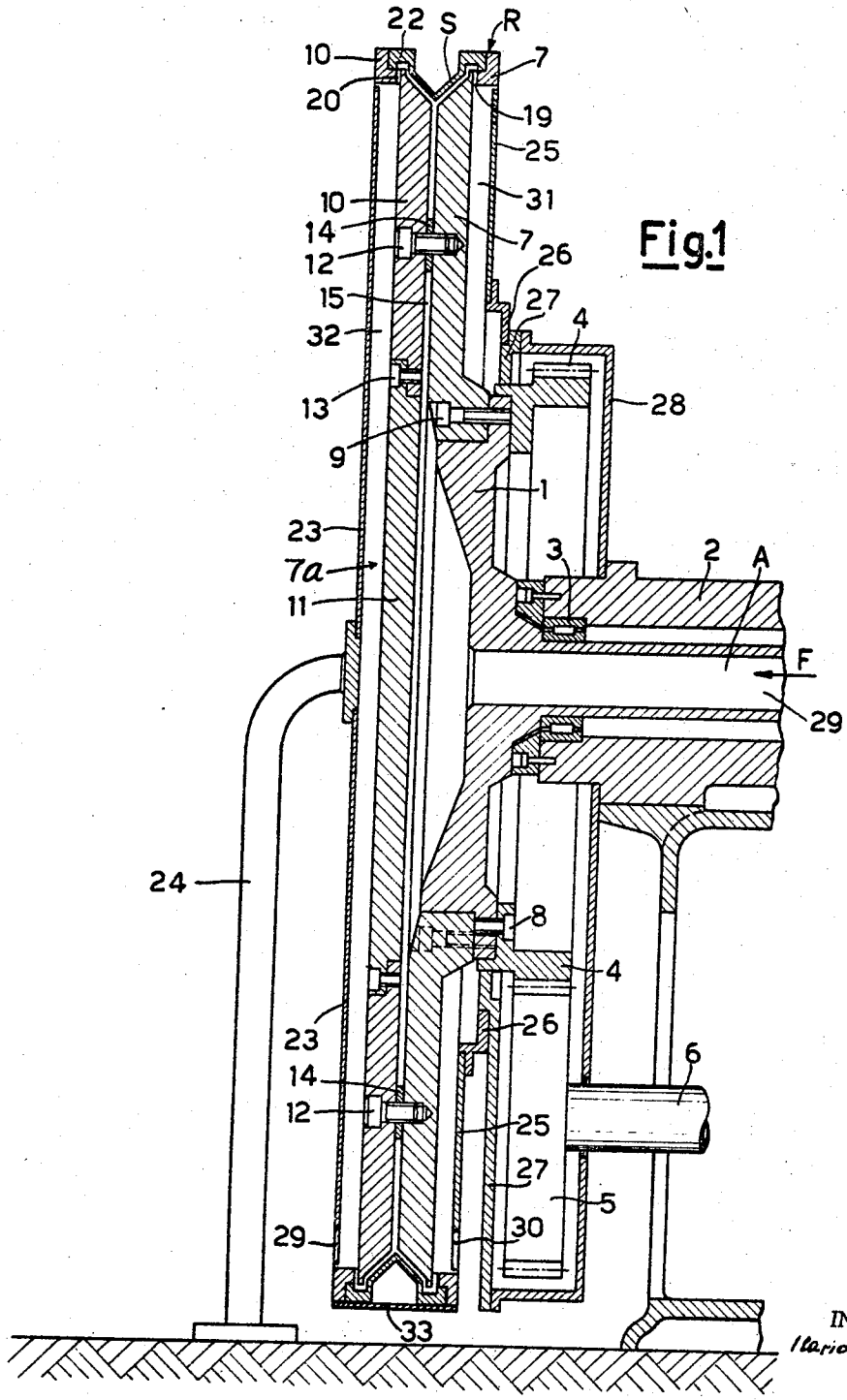
Nov. 19, 1968 I. PROPERZI 3,411,565

COOLING SYSTEM OF A CASTING DRUM BELONGING TO A MACHINE FOR THE PRODUCTION OF METAL RODS

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Fig.1



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Fig.2

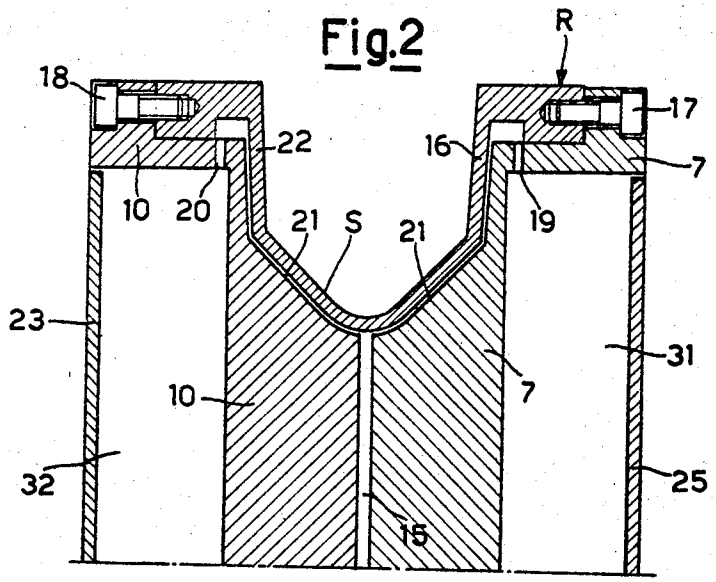
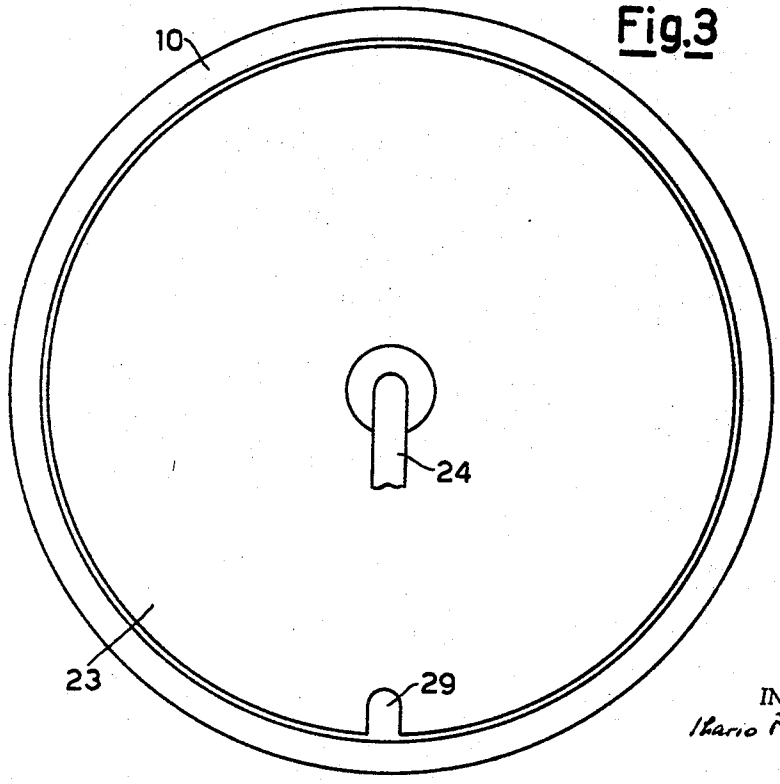


Fig.3



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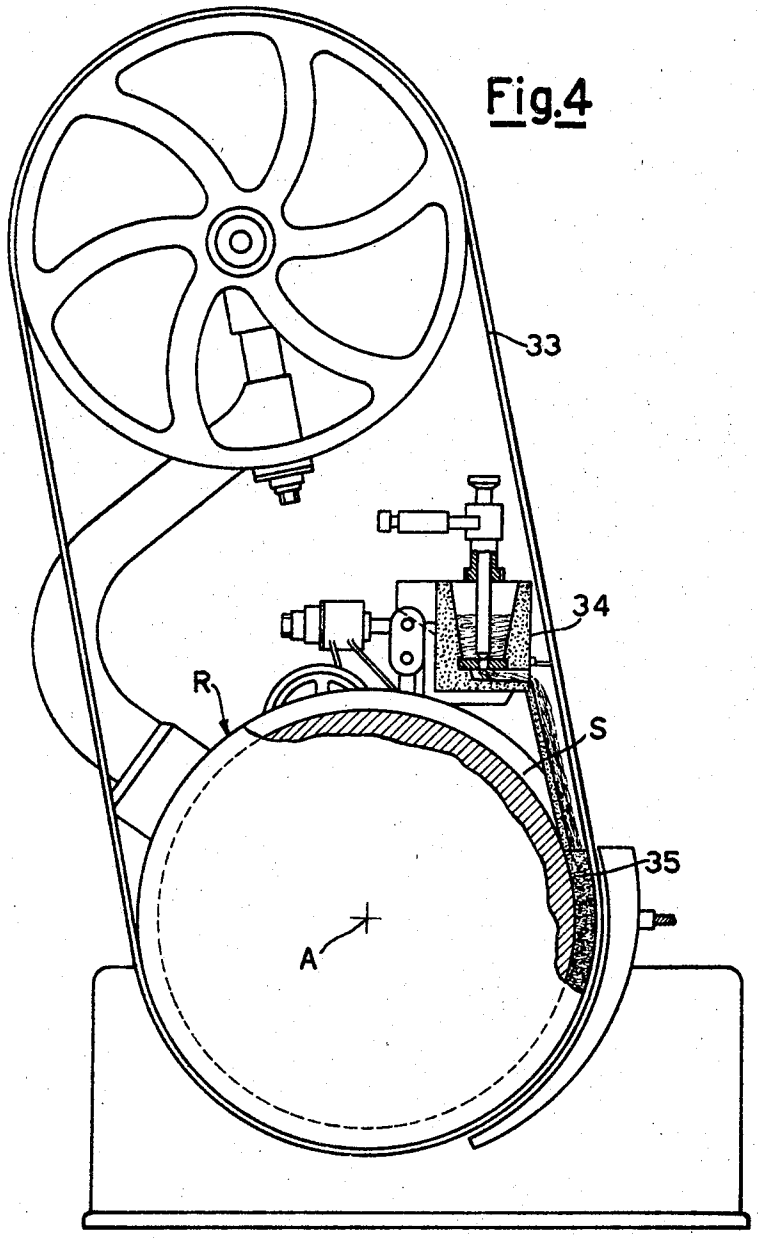
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Fig.4



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COOLING SYSTEM OF A CASTING DRUM BELONGING TO A MACHINE FOR THE PRODUCTION OF METAL RODS

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Claims priority, application Italy, Mar. 20, 1965, 6,195
5 Claims. (Cl. 164—276)

ABSTRACT OF THE DISCLOSURE

A rotatable casting wheel for a continuous casting machine includes an annular wall having an outer circumferential surface which bounds a casting groove and an inner circumferential surface which is at least substantially coextensive with said outer circumferential surface. A pair of supporting discs are connected to the annular wall member and are located within the confines of the inner circumferential surface. The discs define with one another an interior gap and have respective peripheral edge faces which define with the inner circumferential surface an unobstructed circumferential channel coextensive with the inner circumferential surface and communicating with the gap. The channel is provided with outlets. Supply means communicates with the gap and discharges thereinto a stream of cooling liquid which circulates into and through the channel and leaves the same through the outlet, cooling the inner circumferential surface by intimate engagement therewith.

The present invention relates to a cooling system for the casting drum of a machine for the continuous production of metal rods consisting, for example, of copper and alloys thereof.

Such casting drums are used in machines which include a crucible containing the molten metal. The metal is introduced from the crucible into a peripheral casting groove provided on the casting drum. To prevent escape of the metal from the casting groove the latter is closed by a belt which engages the periphery of the drum in such a manner as to overlie the groove along a portion of arc. The casting drum rotates and the metal, which cools and solidifies after entering the covered portion of the casting groove, issues from the latter as a continuous rod when the drum has rotated to an extent corresponding to the aforementioned portion of arc. The cross-section of the rod will, of course, correspond to the cross-section of the groove itself.

To obtain proper solidification of the molten metal which has been introduced into the casting groove, so that it will subsequently issue therefrom as a rod, it is necessary to subject the metal to cooling. This is accomplished, in accordance with the present invention, by constructing the casting drum in form of two disks which are connected to one another so as to be located in two parallel juxtaposed planes. Thus, a space exists between the opposed surfaces of the two disks. A central inlet, which is rigid with one of the two disks, communicates with this space. The inlet may be provided in form of a tubular member coaxial with the disks. An annular element whose outer circumferential face is formed with a circumferential cavity which is to constitute the peripheral casting groove of the drum, surrounds the two disks and is secured thereto along the peripheries of the same. Its inner or bottom wall thus faces the space between the two disks. The peripheries of the disks are so configurated as to each provide a stepped annular recess into which the associated

edge portion of the annular element extends. There is, however, a clearance between the respective edge portion and the facing surface bounding the associated recess and this space constitutes an unobstructed circumferential annular channel which laps the wall of the annular element over practically the entire extension thereof and which is in direct communication with the space between the two disks. Thus, cooling water which has been introduced into this space by means of the aforementioned inlet can flow directly into the unobstructed circumferential annular channel and thus contacts the entire circumferential wall of the annular element in heat-exchanging relationship. In the region of the axially outermost edges of the respective disks each of the unobstructed circumferential annular channels is closed, except for the provision of small apertures which communicate with a pair of chambers provided at the opposite axial ends of the drum by the presence of two fixedly mounted plates which define with the respective axially outwardly directed end faces of the disks two clearances with which the apertures communicate. Outlet means is provided through which cooling water which has entered into these clearances, can escape.

The appended drawing illustrates one embodiment of the invention. In particular,

FIG. 1 shows a vertical section through a casting drum embodying the invention;

FIG. 2 is an enlarged detail view of FIG. 1;

FIG. 3 is a side-elevational view of the drum shown in FIG. 1;

FIG. 4 is a schematic illustration of a machine embodying my invention.

Discussing now the drawing in more detail it will be seen that in FIG. 1 the casting drum comprises a central body portion **1** which is supported, via bearings **3**, by a body portion **2** of substantially tubular configuration and which is stationary. The body portion **1** is rotatable with reference to the body portion **2** about an axis of rotation A.

A gear **4** is secured to the body portion **1** with screws and meshes with a further gear **5** which is keyed to a shaft **6**. The latter is rotated by a non-illustrated motor. Rotation of the shaft **6** will therefore result in rotation of the body portion **1** about the axis A.

The body portion **1** carries a pair of disks. One of these, identified with reference numeral **7**, is secured to the body portion **1** by means of screws **9** and the other of which, identified with reference numeral **7***a* and mounted on the disk **7** with screws **12**, consists of two sections **10**, **11** which are secured to one another by screws **13**.

As FIG. 1 clearly shows, the disks **7** and **7***a* are arranged in parallel planes. A spacer **14** is located between the juxtaposed inner faces of the disks **7** and **7***a* so that the faces will remain spaced from one another and a clearance **15** exists between the disks. The spacer of course also acts as a reinforcement to prevent the possibility that the disks might be deformed by bending.

Along its periphery the disk **7** is provided with a plurality of small apertures **19** which are arranged equiangularly spaced from one another. The section **10** of the disk **7***a* has a similarly arranged plurality of apertures **20**.

The casting groove of the casting drum is provided in an annular element **22** which surrounds the disks **7** and **7***a* along the peripheries thereof. Specifically, the annular element **22** is provided in its radially outwardly directed edge face with an annular circumferential cavity S which constitutes the peripheral casting groove for the drum. The cross-sectional configuration of the element **22**, on any plane passing through the axis A, is shown in FIGS. 1 and 2 and this cross-section is, of course, determinative

of the cross-section of the metal rod which is to be formed in the groove S. The annular element **22** is connected with the disks **7** and **7***a*. For this purpose, a set of screws **17** connects the element **22** with the disk **7** and a further set of screws, numbered **18**, connects the element **22** with the section **10** of the disk **7***a*. FIG. 1, and even more clearly FIG. 2, shows that the circumferential edge faces of the disks **7** and **7***a* are so configurated that they each provide an axial annular recess into which an edge portion of the element **22** extends. FIG. 2 shows clearly that the edge portion of the disks **7** and **7***a* project axially outwardly beyond the main portions of the respective disks. Two stationary circular walls **25** and **23** are located respectively within the confines of the axially outwardly projecting edge portions of the disks **7** and **7***a* in such a manner as to define with these disks respective chambers **31** and **32**. In other words, the walls **23** and **25** are not connected with the disks **7** and **7***a*, as is most clearly shown in FIG. 2 and are stationary with respect to the casting drum. FIG. 1 shows that the wall **23** is rigidly connected with a support **24** and that the wall **25** is similarly rigidly connected, by means of elements **26** and **27**, with a casing **28** which in turn is rigid with the body portion **2** which, as has already been indicated, is stationary with reference to the casting drum. The walls **23** and **25** are each provided with an aperture, respectively identified with reference numerals **29** and **30** in FIG. 1, through which cooling water can escape from the chambers **31** and **32**. Of course, these outlets **29** and **30** must be located rather low, for instance in the positions shown in FIG. 1, to provide for proper escape of the cooling water.

During operation of a machine utilizing the casting drum disclosed herein (compare FIG. 4), the casting drum comprising the portions **1**, **7**, **7***a* and **22** will rotate about the axis A. While this rotation takes place, molten metal is poured from the crucible **34** of the machine into the groove S of the casting drum. The latter is closed over a portion of arc, as already discussed and as also clearly shown in FIG. 4, by a belt **33** which is trained about the periphery of the casting drum and which thus constitutes with the closed portion of the groove S a mold cavity traveling in the direction of rotation of the casting drum. The metal introduced into this mold cavity must solidify into a bar, a rod, or the like during the time the drum takes to rotate by an angular distance corresponding to the enclosed portion of arc. To accomplish this solidification it is necessary to cool the molten metal in the mold cavity.

For this purpose cooling water is supplied to the interior of the casting drum through an inlet pipe **29** which is located within the confines of the portion **2** and which is coaxial with the axis of rotation A. The pipe **29** is rigid with or an extension of the body portion **1** and communicates at its inner end with the clearance **15** between the disks **7** and **7***a*. Thus, cooling water introduced through the pipe **29** in the direction of the arrow F (see FIG. 1) will enter into the clearance **15** and from there will flow towards the periphery of the drum, entering the unobstructed circumferential annular channels **21** which are defined between the annular element **22** and the respective disks **7** and **7***a*. From these channels **21** the cooling water will escape through the respective holes **19** and **20** and enter into the chambers **31** and **32** to subsequently leave the same through the outlet openings **29** and **30** respectively associated with these chambers. FIG. 2 shows that the cooling water, passing through the respective unobstructed circumferential annular channels **21**, contacts substantially the entire wall of the element **22** bounding the groove S and thus serve to provide highly effifficient cooling of liquefied metal in this groove. Because of the flow resistance resulting from the fact that the cross-section of the channels **21** is smaller than that of the clearance **15**, the cooling water will flow through the channels **21** at high velocity. The provision of a plurality of the openings **19** and **20**, as well as of the outlet openings **29** and **30** through which the cooling water can freely escape without having to pass through valves or similar devices, permits the cooling water to issue rapidly from the cooling drum and this, combined with the high flow velocity, further aids in providing a particularly efficient cooling effect.

It will be noted that while the water passes through the respective unobstructed circumferential annular channels **21**, it will uniformly lap the wall of the element **22** and this, of course, results in uniform and highly efficient heat exchange with the wall of the element **22** and therefore with molten metal contained in the groove S which is bounded by this wall. As is clearly evident in FIG. 2, the cooling water contacts not only the portion of the wall which bounds the bottom of the groove S, but also the side wall portions, because the water will flow towards the outermost peripheral edges of the disks **7** and **7***a* before it can escape through the openings **19** and **20**. Summarizing it might be said that the invention provides a thin wall bounding the groove S of the element **22**, which wall is lapped along the entire periphery of the groove S by water flowing at high speed. The reduced thickness of this wall, through which heat must be withdrawn from molten metal in the groove S, is made possible by this invention; yet, the solidity of the structure is not affected by this reduction in the thickness of the wall. I have found that resort to my invention increases the hourly production of a device so constructed, and that it further increases the life of the element **22**.

I claim:

1. In a machine for the continuous casting of molten metal, the combination comprising a rotatable casting wheel including an annular wall member having an outer circumferential surface forming a casting groove adapted to receive molten metal therein and to be closed over a portion of arc by engagement with an endless belt trained about said member, and an inner circumferential surface at least substantially coextensive with said outer circumferential surface, and further including a pair of supporting discs for said annular wall member fixedly connected to the same positioned within the confines of said inner circumferential surface and defining with one another an interior gap, said discs having respective peripheral edge faces which together define with said inner circumferential surface an unobstructed circumferential annular channel substantially coextensive with said inner circumferential surface and communicating with said gap; outlet means communicating with said channel; and supply means communicating with said gap and operative for discharging thereinto a stream of cooling liquid for passage thereof from said gap into said channel and circulating in the latter to said outlet means in cooling contact with said inner circumferential surface.

2. In a machine as defined in claim **1**, wherein said annular wall member comprises axial end portions with each project axially beyond one of said discs; and further comprising wall means connected to the respective axial end portions spaced from the associated disc and defining with the latter and the respective axial end portion a chamber, said outlet means communicating with the respective chambers; and further comprising discharge means also communicating with the respective chambers for discharge from the same of cooling liquid which has entered into said chambers from said channel via said outlet means.

3. In a machine as defined in claim **1**, wherein said wall member is of substantially constant wall thickness.

4. In a machine as defined in claim **1**, wherein said channel is constructed and arranged so as to effect restriction of the entry of cooling liquid from said gap to thereby increase the flow speed of such cooling liquid in said channel and improve the cooling effect afforded by said liquid in contact with said inner circumferential surface.

5. In a machine as defined in claim **1**, wherein said supply means comprises a tubular extension integral with

and projecting from one of said discs coaxially with the axis of rotation of said casting wheel.

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