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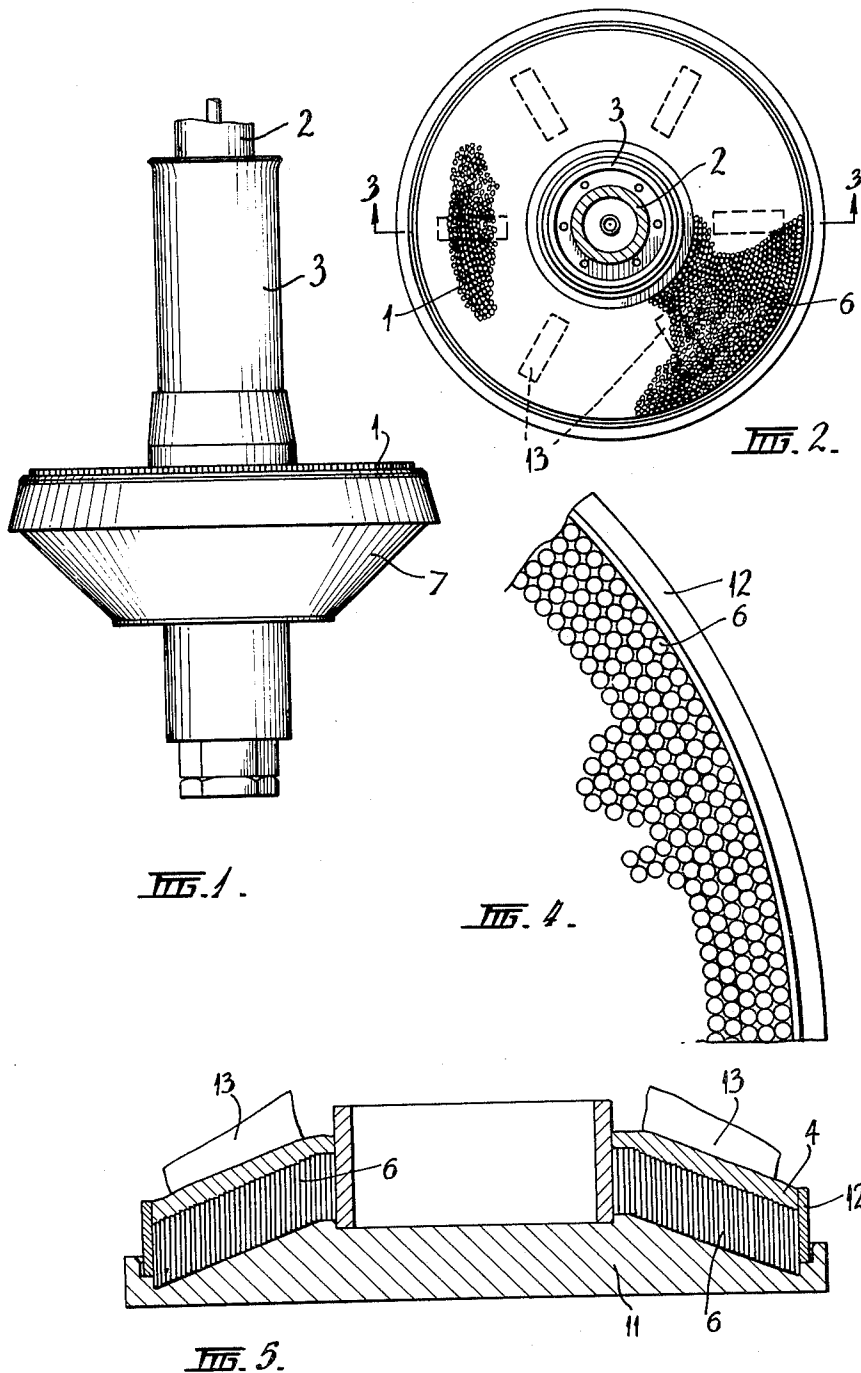
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3,238,029

SPINNER FOR PRODUCING MINERAL FIBERS

Filed May 22, 1963

2 Sheets-Sheet 1



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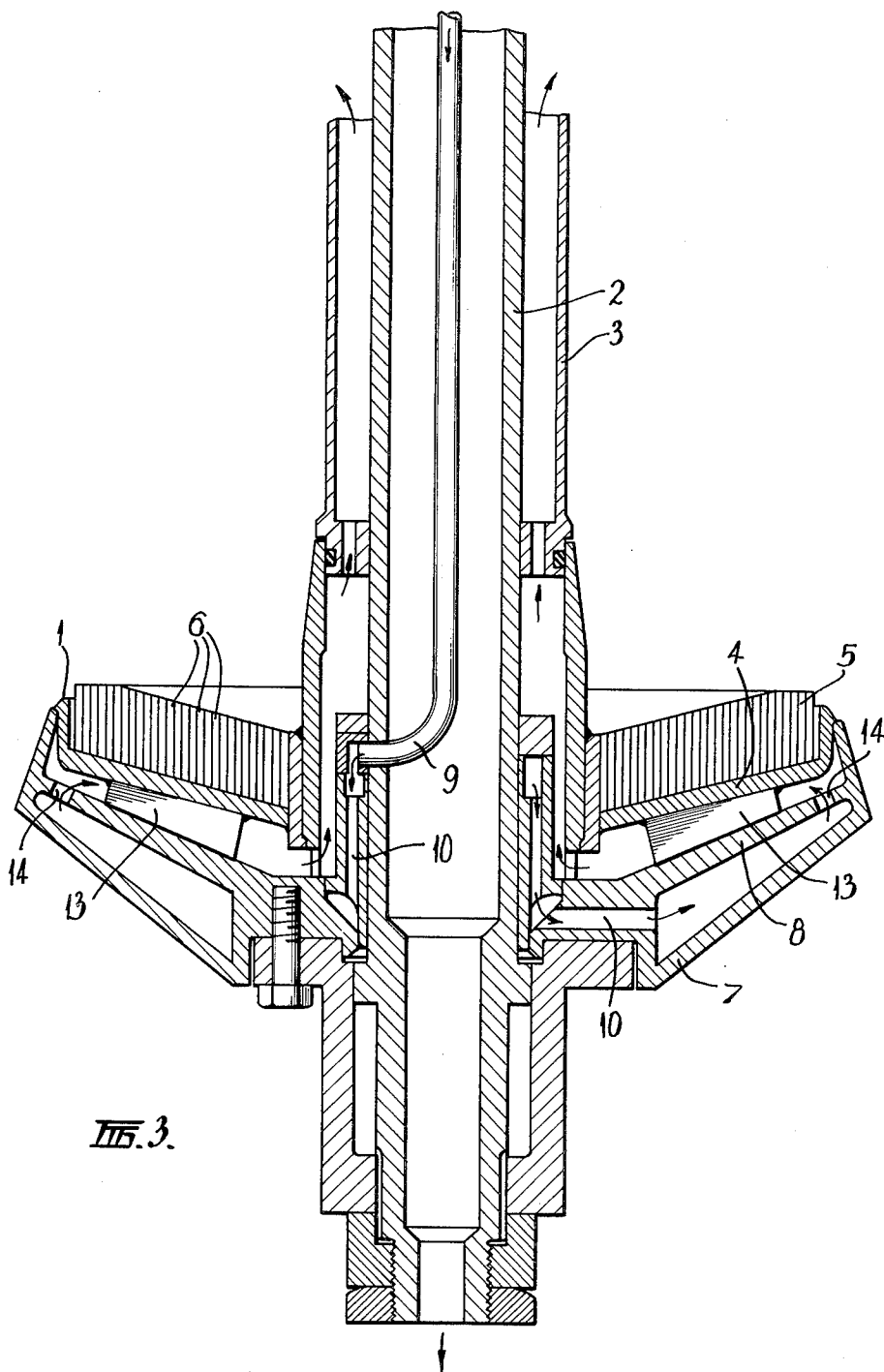


Fig. 3.

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SPINNER FOR PRODUCING MINERAL FIBERS

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5 Claims. (Cl. 65-15)

This invention relates to an improved construction for elements having a surface exposed in use to severe thermal shock. The invention is particularly applicable to the construction of a spinner for use at high temperature in a mineral fiber spinning plant, but is not confined thereto.

Metal surfaces which are subject in use to high temperatures may be provided with water cooling in order to limit the temperature reached, but even so, the severe changes in local temperature from one point to another which are experienced in high temperature service cause surface checking of the material and produce cracks which eventually lead to severe surface erosion and failure of the material. Deterioration of this type is not avoided by the use of stainless steel or other special alloys because these inevitably have a relatively poor co-efficient of heat conduction which causes the local temperature differences to be accentuated.

Accordingly, it is an object of the invention to provide a structure having exceptional heat resistance.

Another object of the invention is to provide a spinner for use at high temperatures in a mineral fiber spinning plant, having a surface structure which has much greater durability when subjected to the erosive action of molten slag than surfaces used hitherto.

The above and other objects and advantages of the invention will be apparent from the following description of an exemplary embodiment thereof, reference being made to the accompanying drawings which illustrate a spinner assembly for a mineral fiber melt spinning process.

In the drawings:

FIGURE 1 is an elevation of such a spinner assembly, FIGURE 2 is a plan view of the spinner shown in FIGURE 1,

FIGURE 3 is a sectional elevation taken along the line 3-3 of FIGURE 2,

FIGURE 4 is a fragmentary view to enlarged scale of portion of the spinner shown in FIGURE 2, and

FIGURE 5 is a sectional elevation illustrating the method of fabricating the spinner.

Referring to the drawings, the spinner assembly comprises a saucer-shaped metal body 1 which is mounted for rotation on a vertical hollow spindle 2 provided with a protective sleeve 3. The body 1 comprises a conical metal disc 4 provided on the inner surface of the cone with a layer 5 of round stainless steel rods having a suitable depth, 1 inch for example. The metal rods 6 forming the layer 5 extend parallel to the axis of the disc and are packed closely together. Each rod 6 has a diameter of about $\frac{1}{40}$ of an inch and the layer 5 is consequently sufficiently rigid to be machined in a similar manner to a solid body of metal. However, the surface of the layer 5 is not completely continuous, but has a plurality of openings due to the round cross-sectional shape of the rods 6.

The lower face of the disc 4 is enclosed by means of a hollow casing 7 provided with an internal conical baffle 8 which causes cooling water passing down the hollow shaft 2 through the pipe 9 therein to be circulated over the disc 4. After passing through the pipe 9, the cooling

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water passes through passages 10, flows upwardly over the lower surface of the baffle 8 to the ports 14 and then over the lower face of the disc 4. The water passes out of the casing 7 through the protective sleeve 3, the direction of flow being in each instance as shown by the arrows.

The, or some of the, rods may vary in cross-section along their length and may thereby control the flow of heat through the heat resistant layer or the relative flow of heat through or from different portions of the heat-resistant layer.

Construction of the spinner is begun by stacking short cut lengths of round stainless steel rod 6 on and about a pattern 11 (FIGURE 5) which defines the hollow portion of the saucer form. The rods 6 are clamped by means of a circumferential clamp 12 and held down on the pattern by means of a suitably shaped plate having an opening to allow access for welding. The exposed ends of the rods are joined together by depositing weld metal in a number of runs to give a final thickness of welded metal of about $\frac{1}{4}$ inch and thereby form the disc 4. In order to reduce distortion consequent upon cooling to a minimum, the sequence of the weld runs is controlled and the metal is deposited in a suitable series of intermittent runs. However, it is usually desirable to subject the body to a normalising heat treatment after welding has been completed in order to remove residual stresses. Subsequent to the deposition of weld metal to form the disc 4, additional metal is deposited locally to form the locating pads 13. After welding and heat treatment, the spinner body is machined by turning in the same manner as for a spinner body formed from solid metal, and is provided with a hollow casing 7 enclosing the welded side of the body in order to provide for the circulation of cooling water as described above. As will be apparent from FIGURE 4, the surface of the spinner is not completely continuous, but has a plurality of openings due to the round cross-sectional shape of the rods.

When in use, the spinner is rotated rapidly about a vertical axis and molten slag is poured on to the conical surface and then flung off by centrifugal force, additional heat being supplied from gas burners (not shown) located above the peripheral region of the spinner. Heat from the molten slag on the inner surface of the cone is transmitted directly along each of the rods to the solid body of the spinner and then to the cooling water which is directed continuously over the lower face of the body. Thus, the heat to be removed has a direct path to the cooling water, but there is no tendency to checking of the heated surface because cracks are in effect already provided between adjacent rods. The solid body is maintained at a relatively low temperature by the cooling water and is heated only by the heat conducted along the rods so that it is not subjected to sudden changes in temperature or to local temperature variations. Deterioration of the spinner in service consists only of rounding at the ends of the rods and eventual loss of some of their length. The rounding does not affect the structural strength of the spinner and in fact is beneficial to the spinning process, while loss of length of the rods does not have any marked effect on the structural strength of the spinner.

When the rods have been worn away unevenly so as to deform unduly the working surface of the spinner, the body 1 is removed from the spinner assembly and returned in a lathe. This operation is facilitated greatly because the exposed ends of the rods do not become unevenly hardened in service.

When heat resistant bodies are made from material not suitable for the welding process described above, the outstanding rods may be formed by other methods such as

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by slitting the surface of a solid body. The spaces between adjacent rods are not a disability for most purposes as they normally provide an insulating effect at the surface subjected to heat. However, if a continuous exposed surface is required, the rods may be closed together by swaging, peening or other suitable known process. In cases where it is desired to control the flow of heat from the exposed surface of the rods to the solid body in order to give a variation of heat transfer from one portion of the body to another, the rods may be locally increased in length or may be necked down to provide a reduced cross-section for portion of their length. The spaces provided between the reduced portions of the rods may then be used for the circulation of cooling water.

I claim:

1. A spinner for use in a mineral fiber melt spinning process comprising a shaft, a metal disc mounted on the shaft, a plurality of outstanding closely packed substantially parallel metal rods attached at one end to one side of the metal disc to form the major portion of a heat resistant surface layer on said disc, and a casing enclosing the other side of said disc to guide a cooling medium across the said other side of said disc.

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2. A spinner as claimed in claim 1, in which said shaft is hollow and provides an inlet for the passage of cooling medium to the casing.

3. A spinner as claimed in claim 1, in which the said disc is comprised of weld metal.

4. A spinner as claimed in claim 1, in which the said disc is integral with said rods.

5. In a spinner for use in a mineral fiber melt spinning process, a shaft, a metal disc mounted on the shaft, and a plurality of outstanding closely packed substantially parallel metal rods attached at one end to one side of the metal disc to form the major portion of a heat resistant surface layer on said disc.

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