THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 42

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte KAZUO SAWADA et al.

Appeal No. 98-2457
Application No. 08/851,312[1]

ON BRIEF

Before ABRAMS, FRANKFORT, and NASE, Administrative Patent Judges.

FRANKFORT, Administrative Patent Judge.

DECISION ON APPEAL

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[1] Application for patent filed May 5, 1997. According to Appellants, this application is a continuation of Application No. 08/451,034, filed May 25, 1995, now abandoned; which is a continuation of Application No. 08/364,006, filed December 27, 1994, now abandoned; which is a continuation of Application No. 07/979,449, filed November 20, 1992, now abandoned; which is a continuation of Application No. 07/579,666, filed September 7, 1990, now abandoned; which is a division of Application No. 07/152,713, filed February 5, 1988, now abandoned.

This is a decision on appeal from the examiner's final rejection of claims 28 through 36, 39 through 49, 51, 91 and 92,

which are all of the claims remaining in the application. Claims 1 through 27, 37, 38, 50 and 52 through 90 have been canceled.

Appellants' invention relates to a method of fabricating a superconductive article from a metal tube containing a superconductive material powder. Independent claims 28 and 40 are representative of the subject matter on appeal and a copy of those claims is attached to this decision.

The prior art references of record relied upon by the examiner in rejecting the appealed claims are:

Jin et al. (Jin) 4,952,554 Aug. 28, 1990
(filed Apr. 6, 1987)

Carl G. Johnson and William R. Weeks, Metallurgy, page 345 (5th ed., American Technical Society, 1977)

Claims 28 through 36, 39 through 49, 51, 91 and 92 stand rejected under 35 U.S.C. § 103 as being unpatentable over Jin "with/without the state of the art" (answer, page 3).

Rather than reiterate the examiner's full statement of the above-noted rejection and the conflicting viewpoints advanced by the examiner and appellants regarding the rejection, we make reference to the examiner's answer (Paper No. 41, mailed April 17, 1998) for the examiner's reasoning in support of the rejection, and to appellants' brief (Paper No. 40, filed January 12, 1997) for appellants' arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to appellants' specification and claims, to the applied prior art references, and to the respective positions articulated by appellants and the examiner. As a consequence of our review, we have made the determination that we will not sustain the examiner's rejection of claims 28 through 36, 39 through 49, 51, 91 and 92 on appeal. Our reasons follow.

Independent claim 28 on appeal sets forth a process for manufacturing a superconducting elongated article including

the steps of: filling a metal pipe with material powder of a superconducting compound oxide; subjecting the filled metal pipe first to cold-plastic deformation and then to hot-plastic deformation to reduce the cross section of the metal pipe; sintering the material powder filled in the metal pipe; and then

> controlling the cooling of the resulting metal pipe containing sintered ceramic material powder to a rate of less than 50°C/min.

Independent claim 40 is similar to claim 28, except that it does not require a first cold-plastic deformation of the filled metal pipe prior to hot-plastic deformation thereof, but instead sets forth only hot-plastic deformation. Independent claim 40 also sets forth materials for the metal pipe and, more importantly, a dimensional reduction ratio ranging from 16% to 92% under a heated condition, so that the material powder filled in the metal pipe is sintered. Like claim 28, claim 40 requires cooling of the resulting metal pipe containing sintered ceramic material therein "slowly at a rate of less than 50°C/min."

According to the examiner (answer, pages 3-5),

> Jin et al. discloses a process for manufacturing a superconducting elongated article, comprising the steps of:
>
> filling a silver pipe with material powder of a superconducting compound oxide;
>
> subjecting the silver pipe filled with the material powder to first and second plastic deformation steps, thereby reducing the cross section of the silver pipe and producing a composite body;
>
> sintering the material powder filled in the silver pipe; and then
>
> slowly cooling the composite body. (See the final paragraph of column 5 and the initial paragraph of column 6).
>
> Jin et al. fails to expressly disclose the following: 1) that the first plastic deformation step is "cold-plastic deformation", and the second plastic deformation step is "hot-plastic deformation"; and 2) controlling the cooling rate of the cooling step to be "less than 50EC/min".
>
> Regarding 1), in column 5, lines 59-65, Jin et al. states that the powder-filled tube is subjected to "cross section-reducing steps . . . either at room temperature or at . . . elevated temperatures". Accordingly, one having ordinary skill in the art would have found it obvious to have the cross section-reducing steps be all of one type, i.e. "hot" or "cold", or any combination thereof, depending on the results sought to be attained with regard to the oxide powder or the silver pipe. Alternatively, the exact type and sequence of plastic deformation steps performed by Appellant are deemed to be matters of design choice, because such type and sequence per se solve no stated problem nor serve any apparent purpose. The significance of performing cold- plastic deformation and then

hot-plastic deformation is not clear from the claims.

Regarding 2), in column 6, lines 4-12, Jin et al. states that the composite body is subjected to "slow cooling", and column 8, lines 33-37 state that the composite body is "furnace cooled". This demonstrates that Jin et al. "controls" the cooling rate and recognizes that rapid cooling and moderate cooling are to be avoided. Accordingly, a cooling rate of less than 50EC/min is at least suggested by Jin et al., because it would be difficult to cool the composite body at a rate greater than 50EC/min while it is within a "furnace". Furthermore, Example I in column 8 of Jin et al. implies that the heating to 900EC and cooling to 600EC are performed in the same furnace. This also indicates that the cooling rate is less than 50EC/min, because it appears to be physically impossible to lower the temperature of the furnace form [sic] 900EC to 600EC quick enough such that the cooling rate of the composite body would be greater than 50EC/mn [sic]. Alternatively, the exact cooling rate is deemed to be a matter of design choice, because such rate per se solves no stated problem nor serves any apparent purpose. The significance of cooling the metal pipe at a rate of less than 50EC/mn [sic] is not clear from the claims. For analogous reasons, the subject matter of claim 92 is at least suggested by Jin et al. It is important to note that the claims do not require that the cooling rate is "constant" over time.

In addition, on page 8 of the answer, the examiner has made the further determination that

> If it is determined that Jin et al. does not fairly suggest "hot-plastic deformation", then one having ordinary skill in the art would have found it obvious to subject the composite body thereof to hot plastic deformation in order to more easily deform the metal pipe, since it is the state of the art to subject metal to hot-plastic deformation during a wire forming operation, as evidenced by Fig. 15-15 of "Powder Metallurgy".

After reviewing the teachings of Jin, we must agree with appellants that the mere fact that Jin (col. 5, line 33, to col. 6, line 11) may disclose the possibility of cross section reducing steps that can occur "either at room temperature or at some other (typically elevated) temperature" and relatively slow cooling of the sintered article from 700º-950º C to a temperature in the range of 300º-700º C, would not appear to have been fairly suggestive to one of ordinary skill in the art at the time of appellants' invention of the particular processes set forth by appellants in the claims before us on appeal. With regard to independent claim 28, there is nothing in Jin or in Metallurgy which would have been suggestive of a

process for manufacturing a superconducting elongated article wherein the filled metal pipe would be subjected first to cold-plastic deformation and then to hot-plastic deformation to reduce the cross section of the metal pipe and compact the powdered filling material. Nor do we agree with the examiner that the particular sequencing of the cross section reducing or deformation of the filled metal pipe as in claim 28 on appeal can be treated or accounted for by merely urging that such sequencing is "deemed to be matters of design choice" (answer, page 4). Appellants' brief, at page 9, clearly indicates that the combination of cold and hot working of the filled metal pipe as claimed results in increased density of the material powder and is much more effective in this regard than either cold or hot working alone.

As for the requirement in claim 28 concerning controlling the cooling of the resulting metal pipe containing sintered ceramic material powder to a rate of less than 50°C/min, we must agree with appellants that the examiner has failed to demonstrate that such a rate of cooling is taught or fairly suggested by Jin. Nor do we find the examiner's alternative

position that the claimed rate of cooling is merely "deemed to be a matter of design choice" (answer, page 5) persuasive. Appellants' specification (e.g., page 25) makes clear that certain improvement in the property of superconductivity can be achieved by the heat treatment phase of the process including a slow cooling of the sintered body at a rate of less than 50°C/min. Appellants' brief (pages 5-6) more particularly states that the claimed cooling rate is important in ensuring that the superconducting compound oxide receives sufficient oxygen so that its superconducting property is not deteriorated.

In light of the foregoing, we will not sustain the examiner's rejection of independent claim 28, or any of the claims which depend therefrom, under 35 U.S.C. § 103 based on Jin "with/without the state of the art."

With regard to independent claim 40, this claim defines a process for manufacturing a superconducting elongated article including the steps of filling a material powder of a superconducting compound oxide into a metal pipe and

subjecting the filled metal pipe to "hot-plastic deformation" to reduce the cross section of the metal pipe to such extent that the cross section is "reduced at a dimensional reduction ratio ranging from 16% to 92% under a heated condition, so that the material powder filled in the metal pipe is sintered" (emphasis added), and then cooling the resulting metal pipe containing sintered ceramic material powder therein "slowly at a rate of less than 50°C/min."

We find nothing in Jin which would have been suggestive to one of ordinary skill in the art at the time of appellants' invention of subjecting the filled metal pipe therein to "hot-plastic deformation" to reduce the cross section of the metal pipe to such extent that the cross section is "reduced at a dimensional reduction ratio ranging from 16% to 92% under a heated condition, so that the material powder filled in the metal pipe is sintered" (emphasis added), and then cooling the resulting metal pipe containing sintered ceramic material powder therein "slowly at a rate of less than 50°C/min." Even if we might agree with the examiner that Jin (col. 5, lines 62-65) is suggestive of hot-plastic deformation of the filled

pipe, the process therein (e.g., col. 6, lines 1-11) then requires separate heat treatment of the reduced cross section filled pipe to provide substantial sintering of the oxide powder, typically in the range of 700°-950° C. Nothing in Jin is suggestive of hot-plastic deformation and sintering of the superconducting compound oxide powder of the filled pipe in the same operation, as required in claim 40 on appeal. Moreover, we again note that the examiner has failed to demonstrate that the claimed rate of cooling is taught or fairly suggested by Jin. Nor, for the same reasons expressed with regard to claim 28 above, do we find the examiner's alternative position that the claimed rate of cooling is merely "deemed to be a matter of design choice" persuasive here.

Accordingly, the examiner's rejection of independent claim 40, and the claims which depend therefrom, under 35 U.S.C. § 103 as being unpatentable over Jin "with/without the state of the art" is also not sustained.

As should be apparent from the foregoing, the decision of the examiner rejecting claims 28 through 36, 39 through 49, 51, 91 and 92 of the present application under 35 U.S.C. § 103 has been reversed.

REVERSED

NEAL E. ABRAMS Administrative Patent Judge	)	
CHARLES E. FRANKFORT Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
JEFFREY V. NASE Administrative Patent Judge	)	

CEF/sld

Appeal No. 98-2457
Application No. 08/851,312

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Claims

28. A process for manufacturing a superconducting elongated article including the steps of:

filling a metal pipe with material powder of a superconducting compound oxide;

subjecting the metal pipe filled with the material powder first to cold-plastic deformation and then to hot-plastic deformation to reduce the cross section of the metal pipe;

sintering the material powder filled in the metal pipe; and then

controlling the cooling of the resulting metal pipe containing sintered ceramic material powder to a rate of less than 50EC/min.

40. A process for manufacturing s [sic,a] superconducting elongated article [sic] the steps of:

filling material powder of a superconducting compound oxide into a metal pipe made of at least one [sic] selected from the group consisting of Ag, Au, Pt, Pd, Rh, Ir, Ru, Os, Cu, Al, Fe, Ni, Cr, Ti, Mo, W and Ta or alloys including these metals as the base;

subjecting the metal pipe filled with the material powder to hot-plastic deformation [sic] reduce the cross section of the metal pipe to such extent that the cross section of the metal pipe is reduced at a dimensional reduction ratio ranging from 16% to 92% under a heated condition, so that the material powder filled in the metal pipe is sintered; and then

cooling the resulting metal pipe containing sintered ceramic material powder therein slowly at a rate of a less than 50EC/min.

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Appeal No. 98-2457
Application No. 08/851,312

APJ FRANKFORT

APJ NASE

APJ ABRAMS

REVERSED

Prepared: December 3, 1999