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SENT BY:PRAVEL, GAMBRELL ;12- 3-90 ; 11:36 ; PRAVEL, GAMBRELL→

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

WU et al. §  
§ Interference No. 102,447  
v. §  
§ Examiner-in-Chief:  
CHU § Ronald H. Smith

DECLARATION OF C. W. CHU

Box Interference  
Commissioner of Patents  
and Trademarks  
Washington, D.C. 20231

Attention: Ronald H. Smith  
Examiner in Chief

Dear Sir:

I have read the statements contained in the Declaration by Maw-Kuen Wu dated November 6, 1990 and filed in the above identified interference.

1. Maw-Kuen Wu worked under my supervision from 1977 until he received his Ph.D. in 1982. Thereafter M.K. Wu worked as a post-doctorate fellow under my direction until 1984 when he left to assume an assistant professorship at the University of Alabama.

2. During November - December 1986, researchers operating under my supervision reproduced and confirmed as being superconducting a composition composed of La-Ba-Cu-O as had previously been reported by Bednorz and Müller, Z. Phys. B, p. 189, in September, 1986 as possibly superconductive.

3. During December, 1986, researchers at my direction examined the effect of application of great pressure to compositions of La-Ba-Cu-O with regards to the temperature at which such compositions became superconductive ( $T_c$ ) and the application

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of such pressures was found to unexpectedly enhance the  $T_c$  temperature of such La-Ba-Cu-O compositions at an unusually high rate.

4. Based upon this pressure effect, I conceived of the idea that the enhancing effect on  $T_c$  of the application of pressure to a composition of La-Ba-Cu-O could be chemically reproduced by substituting for either the La atom or the Ba atom of a La-Ba-Cu-O composition an alkaline earth metal atom of smaller atomic radius than Ba or a rare earth metal atom of smaller atomic radius than La. I had already discussed with M.K. Wu during a meeting of the Material Research Society held in Boston, Massachusetts on December 4, 1986 his willingness to collaborate in synthesizing and testing new compounds in the research I was directing with respect to the La-Ba-Cu-O system of superconducting compositions. On Monday, December 8, 1986, I called M.K. Wu and asked him to make and test compositions wherein Sr replaced the Ba atom of a La-Ba-Cu-O composition. Later, about mid-December 1986, I began to consider substitute elements for replacement of the La atom of a La-Ba-Cu-O composition and conceived of Y and Lu as substitutes. I disclosed this concept to Ru-Ling Meng who was then a research associate working under my direction. These discussions with Ru-Ling Meng focused specifically on the substitution of Y for La within a formula range for such substituted composition of  $(Y_{1-x}Ba)_aCu_1O_y$  wherein "x" = 0.075 to 0.5 and "a" is 1 to 2 with "y" being variable within a range of 2 to 4. These discussions with Ru-Ling Meng occurred during a telephone call I had with Ru-Ling Meng about

mid-December 1986 and I requested Ru-Ling Meng to begin making compositions of Y-Ba-Cu-O for evaluation.

5. During the third week of December 1986 (Dec. 14-20), I received a call from M.K. Wu who reported that signs of superconductivity had been observed in compositions of La-Sr-Cu-O without application of pressure. Arrangements were made for M.K. Wu to come to the University of Houston for the purpose of pressure and magnetization testing of the La-Sr-Cu-O compositions.

6. From December 27, 1986 until about January 4, 1987, M.K. Wu and James R. Ashburn were present at my laboratories for purposes of testing of samples of La-Sr-Cu-O which they had made at my earlier request pursuant to my conception that Sr substitution for Ba in a superconductive composition of La-Ba-Cu-O would chemically reproduce the enhancing effect on  $T_c$  which pressure produced when applied to an La-Ba-Cu-O. Testing of the La-Sr-Cu-O composition prepared by Wu confirmed that  $T_c$  was enhanced, although the quality of the Wu made samples of La-Sr-Cu-O was too poor to support a publication. For this reason, Ru-Ling Meng, whom I had previously requested to prepare samples of Y-Ba-Cu-O for evaluation, was assigned to make better quality samples of La-Sr-Cu-O.

7. On January 12, 1987, U.S. Patent Application Serial No. 002,089 in which I am named as the inventor was filed which describes the enhancement of the  $T_c$  of an La-Ba-Cu-O composition by application of high pressures and further that such pressure enhancement may be achieved chemically by substituting of either

the La or Ba atoms thereof by other specifically identified atoms. Among this discussion of these two means for enhancing the  $T_c$  in the application as filed are the following two paragraphs from page 6 there of:

"Reducing the interatomic distances between the atoms of the elements in a lanthanum, barium, copper oxide composition can increase the superconducting transition temperature  $T_c$  of the composition. Consequently, any means for reducing this interatomic distance should enhance the  $T_c$  of the composition. One means for reducing this distance is to apply a pressure that exceeds atmospheric pressure. The  $T_c$  increases as the applied pressure is increased."

"Another method for decreasing the interatomic distance is to completely or partially substitute the barium atoms, atomic radius of 2.22 angstroms, with the smaller alkaline earth metal atoms, i.e., strontium, atomic radius of 2.15 angstroms, calcium, atomic radius of 1.97 angstroms, or magnesium, atomic radius of 1.6 angstroms. Similarly, complete or partial substitution of the lanthanum atoms, atomic radius of 1.87 angstroms, with the smaller lutetium, atomic radius 1.75 angstroms, or yttrium, atomic radius 1.78 angstroms, will provide this same effect.

On January 26, 1987 another U.S. patent application Serial No. 006,991 was filed in which I am named as the inventor. *W.K. Wu*

8. On January 29, 1987 I received a call from M.K. Wu which related that in a composition which he had prepared zero electrical resistance had been observed at a temperature of 77°K or greater and that Wu would bring samples of the composition to my lab for testing for Meissner effect to confirm if the composition was superconducting.

9. On January 30, 1987, M.K. Wu and James R. Ashburn arrived at my lab; four pieces of sample which they brought were tested for resistance and Meissner effect at varying temperatures. The best

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specimen tested for zero resistance at a temperature of about 78.8°K and it exhibited <sup>at 4K</sup> less than 15% of the superconducting signal of a Pb sample of similar dimension. The three other samples failed to exhibit zero electrical resistance at a temperature above 77°K. EUC  
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10. On January 30, 1987, while M.K. Wu was in my laboratory, he advised me that the atomic composition of the sample was that of Y-Ba-Cu-O having the formula  $Y_{1.2}Ba_{0.8}Cu_1O_y$ . Later while in my office M.K. Wu advised me that personnel at University of Alabama were pressing him to file an application for patent on the composition of his sample. At that time, I made available to Wu for his review a copy of my U.S. Patent Application Serial No. 006,991 (filed January 26, 1987 as a CIP of Serial No. 002,089) wherein he reviewed the disclosure and related that the composition of his sample was within the genus of compositions disclosed in my application wherein La is replaced by Y.

11. On or about January 31, 1987, I prepared a manuscript of an article for submission to Physical Review Letters which named as co-authors, among others, M.K. Wu and James R. Ashburn who both reviewed and approved the manuscript. On February 1, 1987 M.K. Wu and James R. Ashburn departed to return to Alabama.

12. After the departure of Wu and Ashburn, this manuscript was subsequently revised to incorporate further data concerning the composition and properties of the Y-Ba-Cu-O material therein described. The material described in this manuscript is one prepared at my lab by Ru-Ling Meng under my supervision to a

nominal formula of  $Y_{1.2}Ba_{0.8}Cu_1O_y$ . This material was observed to be comprised of a mixture of compounds, green and black phases, neither of which was of a crystalline structure like that of  $K_2NiF_4$  which is the crystalline structure type of a superconductive La-Ba-Cu-O composition. Further, this Y-Ba-Cu-O material was observed to exhibit at 4°K a superconducting signal which was about 24% of that of a Pb sample of similar dimensions. A copy of the so revised manuscript was forwarded to M.K. Wu at or about the time of February 5, 1987 when it was forwarded by Federal Express delivery to Physical Review Letters wherein, after manuscript corrections I called in on February 18, 1987, the article was published in the March 2, 1987 edition at Vol. 58, pp. 908-910 of the Physical Review Letters.

13. It is my understanding that after my mid-December 1986 discussion with Ru-Ling Meng of my concept of simulating the pressure effect by substituting smaller elements such as Y for La in a La-Ba-Cu-O composition to produce one consisting essentially of Y-Ba-Cu-O which would exhibit enhanced  $T_c$  that Pei Hor and Ru-Ling Meng in a subsequent discussion with M.K. Wu while Wu was at Houston from December 27, 1986 to about January 4, 1987 described to M.K. Wu the concept for Y substitution.

14. I further am aware that Ru-Ling Meng who otherwise during the period of January 1987 would have made samples of substituted species, including those of Y-Ba-Cu-O, in accordance with my directions, diverted her efforts to production of La-Sr-Cu-O materials of higher quality than those which Wu had made.

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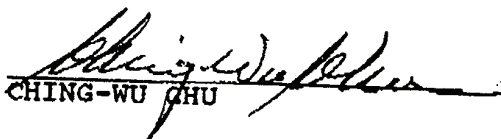
15. In the Declaration by M.K. Wu, I noted the following statement:

" At no time prior to January 29, 1987, had I ever discussed with Chu the possibility of the preparation of, or the potential superconducting properties of, the oxide composition described in paragraphs 2 and 3 above [i.e.,  $Y_{1.2}Ba_{0.8}CuO_y$  composition]." (Bracket added)

While such statement is correct insofar as it goes considering the qualifications therein, it is misleading if read to mean that my conception of a composition consisting essentially of Y, Ba, Cu and O as one of enhanced  $T_c$  was at no time prior to January 29, 1987 discussed in the presence of or communicated to M.K. Wu. I understand that my concept was discussed with and communicated to M.K. Wu by Pei Hor and Ru-Ling Meng sometime between December 27, 1986 and January 4, 1987 while M.K. Wu was present in my laboratories at the University of Houston.

16. I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the Chu Application or any patent issued thereon.

EXECUTED this 15<sup>th</sup> day of December, 1990.

  
CHING-WU CHU