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IN THE  
**United States Patent Office**

Before the Board of Appeals.

In re: Interference No. 56,557.

Robert E. Millikan and Royal W.  
Sorensen,

*vs.*

Talma T. Greenwood.

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**BRIEF FOR MILLIKAN AND SORENSEN.**

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**STATEMENT.**

This is an appeal from a decision of the Examiner of Interferences awarding priority to the junior party, Millikan and Sorensen.

This interference involves an application filed by Millikan and Sorensen and an application filed by Greenwood. The application of Millikan and Sorensen, Serial No. 199,580, was filed July 17, 1927, and is a division of an application filed November 15, 1926, Serial No. 148,418, which application has since issued into United States Patent No. 1,784,302 granted December 15, 1930. The drawing in this application is an exact copy of Fig. 1 in application No. 148,418, and the description of the apparatus is substantially the same in both cases.

The Greenwood application is Serial No. 145,328, and was filed October 30, 1926; hence, the party Greenwood is the senior party to this interference by a period of only approximately fifteen days.

No testimony was taken on behalf of the party Greenwood. Testimony was taken on behalf of Millikan & Sorensen, which established conclusively that the identical apparatus shown in the drawings of the application involved in this interference was built and tested at least as early as November 19, 1925. A description of this apparatus, together with a full account of different successful tests of the apparatus, was published at a 1926 meeting of the American Institute of Electrical Engineers in Salt Lake City, September 6, 1926, or nearly two months prior to the filing of Greenwood's application. Application No. 148,418 was executed by Millikan & Sorensen on the 30th day of October, 1925, so that there exists record proof in the Patent Office that Millikan & Sorensen were diligent with reference to their invention as and at the time that Greenwood filed his application. The Examiner of Interferences found:—

“Furthermore, it is entirely immaterial to an award of priority whether switch No. 3 was ever sufficiently tested to establish a reduction to practice, providing it supports the counts and is thus sufficient to establish conception. The filing date of the junior party is only fifteen days after that of the senior party. The oath of the junior party's parent application was apparently executed on exactly the same day the senior party filed.

“As the junior party, Millikan and Sorensen, may prevail by showing prior conception and diligence, from a time just prior to Greenwood's filing date until their own filing date, the question of diligence is

for all practical purposes eliminated and Millikan and Sorensen may prevail on a mere showing of prior conception.”

On page 3 of the brief filed on behalf of Talma T. Greenwood before this Board of Appeals, Greenwood states:—

“REASONS FOR THE APPEAL

“The principal contentions urged below on behalf of the party Greenwood and reiterated here on appeal are:

“1. As the junior party consists of joint applicants the burden is upon them to establish that they jointly conceived the invention of the interference issue, and the junior party has failed to sustain this burden.

“2. The junior party has no right to make the counts in issue.”

An examination of the brief filed on behalf of Greenwood develops that under point (1) the party Greenwood attempts to show that the invention here in issue was either the sole invention of one Pearson, who is not a party to this interference, or that it was the sole invention of Royal W. Sorensen, and not a joint invention of Royal W. Sorensen and Robert T. Millikan. The party Greenwood thus has apparently acquiesced in and accepted the decision of the Law Examiner that Millikan & Sorensen have shown a reduction to practice of the invention here in issue prior to Greenwood’s filing date, and that Millikan & Sorensen were diligent with reference to the invention at the time Greenwood entered the field, and up until they filed their application here in issue. We have therefore not included in this brief a digest of the evidence showing such successful reduction to practice

of the invention and diligence by Millikan & Sorensen, or authorities pertaining to these issues, in view of the acquiescence of the party Greenwood in the Law Examiner's decision relative thereto, but reserve the right, in case the party Greenwood at the final hearing before the Board refers to these issues, to file a proper reply brief thereto.

We shall only briefly hereinafter refer to the history of the development of the Millikan & Sorensen inventions, to the extent which we believe would be helpful to this Board in deciding the two issues presented by Greenwood.

#### **The Invention.**

The invention forming the subject-matter of this interference relates to a vacuum switch for use in interrupting electrical currents. Contrary to the statements appearing in Greenwood's brief on page 2, before the inventions of Millikan & Sorensen there existed, neither in the practical art nor the paper or patent art any disclosure of an operative vacuum switch for interrupting electrical currents flowing under high electrical tension. Previous to the invention of Millikan & Sorensen the practical art, when it sought to interrupt a high-powered electric current, used what is known as an oil switch. This was a switch in which the contacts which were to be separated were immersed in a large batch of oil. These switches were very cumbersome and expensive and did not always operate successfully. The idea of using high vacuum as an insulation between the electrodes of the switch for interrupting power circuits may have occurred to many others, but no one had succeeded in separating contacts in a vacuum, before the invention of Millikan & Sorensen,

without such separation always resulting in the formation of a persistent arc. Millikan & Sorensen succeeded in producing an operative vacuum switch by a process of carefully conditioning the electrodes of the switch before it was to be used to interrupt the power current. While others had made switches to operate in vacuum and had subjected these switches to known processes of outgassing the contacts, Millikan & Sorensen discovered that there still remained a residual quantity of occluded gases which could not be removed by baking operations, and that these residual gases were responsible for the fact that when prior switches were opened in a vacuum to interrupt a power current, the switch produced a persistent arc and failed to cause an interruption of the current.

Following this discovery of Millikan & Sorensen, they developed a method of removing these last traces of occluded gases by utilizing the energy of the arc itself. The process of conditioning the switch invented by Millikan & Sorensen was briefly as follows: A switch, with or without a preliminary outgassing treatment in accordance with the hitherto art, was taken and placed upon a power line and opened with the formation of an arc. The arc was continued for a short interval of time, causing occluded gases from the contacts to be expelled. The arc was then extinguished and the switch again pumped out. Another arc was then formed, and this process of alternately forming an arc, extinguishing the arc, and pumping out the vessel, continued until an arc would no longer be formed when the switch was opened.

THE MILLIKAN & SORENSEN RECORD CLEARLY ESTABLISHES THAT THE INVENTION WAS A JOINT ONE.

The joint conception of the invention in issue by Millikan and Sorensen is clearly established by the testimony taken on behalf of Millikan & Sorensen. Sorensen testifies that when he first discussed his ideas concerning vacuum switches with Dr. Millikan, he knew that Dr. Millikan had also been studying the phenomena of arcing in vacuum and that they agreed to operate together in their investigations of this subject. He states [R. 13]:—

“We agreed immediately upon his return to again discuss the matter and proceed with a series of experiments and to arrange for the assignment of assistants to carry on the laboratory work incident to the performing of such experiments.”

He further testifies concerning the early experiments conducted by the students Otis and Mendenhall:—

“Q. 24. The work done by Otis and Mendenhall was under their sole supervision or the supervision of someone else?

“A. Initially, under the direct supervision of Dr. Millikan, as was natural, because he is chairman of the physics and electrical engineering division. As such he directly assigns or approves the assignment of all technical assistants and teaching fellows, because these assignments always include approval of their compensation for the work. In this case Mendenhall and Otis were both graduate students studying to obtain a P. H. D. degree in physics and electrical engineering, a condition which made natural the assignment of the work in the manner I have outlined.” [R. 14-15.]

His testimony is clear that Pearson and Clancy were respectively merely a mechanic and glassblower, employed in the Institute.—

“Q. 31. Who did the work of making the parts of this switch and assembling it?”

“A. The mechanical work requiring skill on metal parts was done by Mr. Julius Pearson. The glass work was done by Mr. William Clancy. The balance of the work being done by Mr. Mendenhall.”  
[R. 17.]

The mechanical means of operating the movable switch member embodied in Switch No. 3 or Exhibit 12, including the Sylphon bellows which is employed to seal the moving switch member to the evacuated container, was also a joint conception of Professor Sorensen and Dr. Millikan. Both of these joint applicants have expressly testified to this effect.

Thus, Professor Sorensen testified:—

“Q. 93. What led to the development of switch No. 3, particularly the different operating mechanism of it?”

“A. *Our* desire to have a positive mechanical connection between the movable switch electrode and the exterior mechanism, because such a mechanical linkage is necessary to insure a positive opening and closing of a switch.” [R. 34.]

Professor Sorensen’s testimony thus quoted clearly shows that the conception of the invention here in issue was a joint concept, rather than a sole concept.

The party Greenwood makes much of Sorensen’s answer to Q. 95, reading in part:—

“After a long process of thinking about some means of providing a method whereby positive mechanical motion could be transmitted from inside a vacuum housing to the exterior without the use of a packing joint, I conceived the idea of a flexible bellows. I discussed with Mr. Julius Pearson the de-

sirability of obtaining positive mechanical motion from inside to outside of the vacuum housing and he informed me that flexible bellows could be purchased from some company in Tennessee. This was considered valuable information, because I was relieved of the idea I had in mind, which involved necessity of constructing some such bellows." [R. 35.]

The language of the answer by Professor Sorensen reading, "I conceived the idea of a flexible bellows", contained in the above, is the party Greenwood's sole ground for pretending that the invention of the counts of this interference was the sole invention of Sorensen. The witness had, immediately before, in answering Q. 93, expressly indicated that the invention was a joint one. He does not, in answer to Q. 95, say that he conceived the invention solely or separately from Dr. Millikan, and there is nothing in his answer inconsistent with the fact that the invention was a joint one. If Professor Sorensen and Dr. Millikan jointly conceived the invention, both of them could properly say that, "I conceived the invention." It requires great subtlety and imagination, from the answers to Q's 93 and 95 by Professor Sorensen to construe his testimony as indicating that he *solely* conceived the invention.

Furthermore, there is no limitation in any of the counts of this interference to a "flexible bellows." The limitation in the counts of this interference is to the use of "flexible metal wall." Such flexible metal wall is not defined in the counts or required to be in the form of a bellows or "Sylphon," and there are many forms of flexible metal walls, useful in the construction of these vacuum switches, which would not be in the shape of a bellows or Sylphon. For some purposes a simple metallic diaphragm would

suffice. If after Millikan & Sorensen had jointly conceived of the use of a mechanical connection, as testified by Sorensen in Q. 93, Professor Sorensen had solely and independently conceived of having this flexible connection in the form of a "bellows," this would be immaterial to the issues of this interference, because no count is limited to such "bellows".

Dr. Millikan's testimony is clearly to the effect that the invention was a joint one. All of the work done on these switches was jointly undertaken by Professor Sorensen and Dr. Millikan, as shown by the following answer of Dr. Millikan:—

"Q. 4. When did you first conceive of switching power currents in high vacuum?

"A. I took out an application for a patent on a complete electrical vacuum system, I think, in the year 1921. The particular application of the same principles underlying the 1921 application as applied to the special problem of high power switching grew out of discussions with Professor Sorensen which had been going on for two or three years prior to the summer of 1923, when these ideas became crystallized and definitely formulated by the two of us in the initiation of a series of experiments to see whether such a vacuum switch would actually work in the way in which I told Professor Sorensen that I felt sure it would from my preceding experiments and experience in conditioning electrodes in vacuum so that they would withstand very much higher potentials upon separation of contacts than had previously been known to be possible." [R. 85-6.]

Professor Millikan also testified:—

"Q. 23. I show you another piece of apparatus, which is Millikan and Sorensen Exhibit No. 12, and ask you if you can tell us what that apparatus is.

“A. Another one of these high vacuum switches that embodies modifications most of which were introduced by Professor Sorensen. This earlier one which we have been discussing is mostly of the form of my original switches. Mr. Sorensen and Mr. Pearson were dissatisfied with electro-magnetic control and wished to replace it by the positive action switch represented here, and the Sylphon attachment at the top represented one of their contributions. Also, the way the two contacts meshed together in this is a later development which I was partially responsible for, to the extent of discussing the change with them before it was made, but those changes were a part of the later developments in which I was not a main initiator.” [R. 101.]

While in the above answer Dr. Millikan says that he was not mainly interested in the mechanical features of the exhibit, at the same time he indicates that *he participated in suggestions as to these features*. That this positive action switch, as Dr. Millikan describes it, was a joint concept of his and Sorensen's, is clearly proven by the following:—

“XQ. 1. Did you make any suggestions regarding the design of switch No. 3, which includes the bellows arrangement on a vertical neck of a glass container, through which bellows arrangement a rod extends to support an upper electrode?”

“A. The transition from an electro-magnetically controlled switch to a positive action switch was *the result of long discussions between Professor Sorensen and myself*, discussions in which he originally urged the superiority of the latter mode of control, and we then discussed the matter with our mechanic, Mr. Pearson, and the final design of positive action switch was the result of all these discussions. In that sense I was a party to the development, but, so far as my memory serves me, Professor Sorensen was the most ardent early advocate of the positive action switch.

"XQ. 2. Can you point to any element of the said switch No. 3, exhibit No. 12, which you yourself suggested? \* \* \*

"A. The reason that this appears as a joint invention of Sorensen and myself is because the whole problem was discussed an exceedingly large number of times between us and no new steps of any importance were ever taken without such discussion. In group work of this sort it is often completely impossible to trace the genesis of all ideas within the group. As I have already indicated, in the beginning of this development I had large responsibility for the details of designs. In the subsequent stages, when the importance of the results became evident to us all and a large group of experimental workers was drawn into it, the initiation of changes became more difficult to follow and it would be impossible for me or anybody else, I think, to say just what elements I was responsible for and what elements Sorensen was responsible for. With respect to this particular switch concerning which you inquire, I have already said that the chief pressure for the positive action switch came from Professor Sorensen. *With respect to the mode of making contact, I remember distinctly discussing carefully with him all the possibilities, which are very small in number, and selecting the particular one that we chose.*"

[R. 102-3.]

Dr. Millikan was asked the direct question as to whether Professor Sorensen suggested the use of the "bellows arrangement," and testified positively that this resulted from a joint discussion.—

"XQ. 3. Regarding the bellows arrangement on an extending neck on exhibit 12, am I to understand that Professor Sorensen first suggested the use of such element? \* \* \*

"A. No, Professor Sorensen was urging a positive action switch, as I remember it, and, as practically always happens in our laboratory, we went into