The opinion in support of the decision being entered today was not written for publication and is not precedent of the Board.

Paper No. 18

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ANDREAS MANZ, D. JED HARRISON,
CARLO S. EFFENHAUSER[1]

Appeal No. 1997-3328
Application No. 08/226,605

ON BRIEF

Before STONER, Chief Administrative Patent Judge, WALTZ and LAZARUS, Administrative Patent Judges.

LAZARUS, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 2-11 and 13-20, which are all of the claims pending in this application.

We reverse.

[1] Appellants' declaration and the official filing receipt list the third inventor as "Effenhauser" and "Effenhauer", respectively. During further prosecution before the examiner an appropriate corrected filing receipt should be provided.

BACKGROUND

The appellants' invention relates to a method and a device for controlled sample introduction in microcolumn separation techniques (specification, p. 1). A copy of the claims under appeal is set forth in the appendix to the appellants' brief.[2]

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

Verheggen et al. (Verheggen), "Simple Sampling Device for Capillary Isotachophoresis and Capillary Zone Electrophoresis", Journal of Chromatography, Vol. 452, pp. 615-622 (1988).

Harrison et al. (Harrison), "Capillary Electrophoresis and Sample Injection Systems Integrated on a Planar Glass Chip", Analytical Chemistry, Vol. 64, No. 17, pp. 1926-1932 (1992).

Claims 2-11 and 19 stand rejected under 35 U.S.C. § 103 as being unpatentable over Verheggen in view of Harrison.

Claims 13-18 and 20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Verheggen in view of Harrison.[3]

[2] In the appendix to the brief the second word "sampling" has been omitted from each of claims 14-16.

[3] The rejection of the claims under 35 U.S.C. § 112, second paragraph, has been overcome by appellants' amendment filed February 1, 1996 (Paper No.

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellants regarding the above-noted rejections, we make reference to the examiner's answer (Paper No. 14, mailed September 30, 1996) and the supplemental examiner's answer (Paper No. 16, mailed March 18, 1997) for the examiner's complete reasoning in support of the rejections, and to the appellants' brief (Paper No. 13, filed July 3, 1996) and reply brief (Paper No. 15, filed December 2, 1996) for the appellants' arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellants' specification and claims, to the applied prior art references, and to the respective positions articulated by the appellants and the examiner. As a consequence of our review, we make the determinations which follow.

In accordance with 37 CFR § 1.192(c)(7), and consistent with appellants' grouping of the claims (brief, page 3), we have selected claim 19 (the independent method claim) as

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7) entry of which was indicated by the examiner in the communicated dated March 28, 1996 (Paper No. 10).

representative of claims 2-11 and 19, and claim 20 (the independent article claim), as representative of claims 13-18 and 20, to decide the appeal on the respective rejections under 35 U.S.C. § 103 before us.

The 35 U.S.C. § 103 rejection of claim 19.

Claim 19 recites,

> 19. A method of introducing a sample into a electroporesis device,... which method comprises the step of electrokinetically injecting the sample as a sample plug into said electrolyte channel by applying an electric field across the supply and drain channels, wherein said electric field is applied for a time period which is at least long enough that the component of said sample having the lowest electrophoretic mobility migrates into the geometrically defined sample volume, such that the injected sample plug reflects the original sample composition.

Appellants describe in the BACKGROUND OF THE INVENTION that "sample components from the feeders may diffuse into the capillary tube when the sample has already left the sampling position" whereby "at the detector there not only arrives a more or less broadened plug of injected sample fluid" but the "electrolyte in front and after or between individual plugs of sample fluid is 'polluted' with unpredictable amounts of sample components" (specification, page 2). The SUMMARY OF

THE INVENTION PORTION provides "[i]t is therefore an object of the present invention to provide a method for controlling sample introduction in microcolumn separation techniques ... which overcomes the disadvantages of the prior art" (specification, pages 2-3).

The step of assuring that "the composition of the sample in the sample volume 27 reflects the actual composition in the reservoir" is described, at least in part, in terms of parameters for calculating the minimum time the electric potential is applied across the supply and drain channels (specification, page 7).

The examiner's rejection of claim 19 states "[c]laim 19 is rejected for reasons already given in the office action mailed May 16, 1995" (final, page 2).[4] The examiner explained that "Verheggen teaches separating the sample using the same

[4] The final rejection (Paper No. 6) rejects claim 19 by reference to "the office action mailed May 16, 1995" for an explanation of the rejection. We interpret the May 16, 1995 rejection of claim 1 as the basis for rejection of claim 19 (claim 1 was replaced by claim 19 pursuant to the amendment filed August 22, 1995, Paper No. 5).

current used to introduce the sample, which would lead one to conclude the sample was electrokinetically introduced", that Harrison teaches a "[s]ample is introduced electrokinetically by applying a voltage between the separation channel and supply channel" and that "[i]t would have been obvious to one of ordinary skill in the art to combine the method of Verheggen and Harrison because electrokinetic injection is conventional technique in the art of electrophoresis. Furthermore, both references deal with control of sample introduction and electrophoretic separation" (the office action of May 16, 1995, Paper No. 3, pages 3-4).

Appellants state that "[t]he Examiner contends that such a solution to the problem is obvious because the period of applying the electric field is an art-recognized variable and it would have been obvious to optimize it. However, the Examiner does not claim that the references suggest to solve the problem recognized by Verheggen by optimizing the time period that the electric field is applied" (brief, page 7).

The examiner notes that "maintaining the electric field for a period of time sufficient to allow for slower moving molecules to migrate is an art-recognized result-effective

variable obvious to one of ordinary skill in the art of electrophoresis" (answer, pages 7-8).

Appellants reply by referring to the device in Figure 1 in Harrison, describing the flow and concluding that in Harrison "the sample volume is not defined-geometrically, but determined by the strength and time of the applied injection voltage... {t]hus the sample volume according to Harrison et al's method is not defined by a section of the electrolyte channel located between the supply port and the drain port; as is require by present claim 19" (reply, pages 4-5).

The examiner responds by averring that appellants have not responded to the argument that the amount of time the voltage is applied is an "art recognized result-effective variable" (supplemental answer, page 2) rather appellants raise a new point, that claim 19 "requires that a voltage be applied to the supply and drain channels of the claimed device so as to allow for a geometrically-defined sample volume to be introduced into the device" (supplemental answer, page 2).

Although the prior art appears to recognize the different migration rates within a sample, and that the sample should be clearly defined, we do not find any prior art recognition of

how to provide a geometrically defined sample in a electrophoresis device as described in claim 19. The claimed method uses a sample composition having different electrophoretic mobilities and claim 19 requires the electric field applied across the supply and drain to be held for a minimum period based on the component with the slowest electrophoretic mobility. We do not find the prior art to be suggestive of this solution.

We reject the examiner's contention that maintaining the electric field for the minimum time is simply an obvious art recognized result-effective variable. The cited and applied prior art does not teach that the electric field across the supply and drain, in the method of operating the device as specified in claim 19, is a known variable. Also, the examiner does not explain why changing, or varying, the dwell time would have been obvious to either Verheggen or Harrison. First, Harrison's device is so dissimilar that if the dwell time were extended it is not apparent that the process of claim 19 (providing a geometrically defined sample) would result. Secondly, Verheggen points to the disadvantages of

using electromigration technique for the sample and refers to alternatives rather than ways to improve the electromigration technique. Finally, although the examiner has urged that the combination of these two prior art teachings would have been obvious, we do not agree that it would have been obvious at the time the invention was made to a person having ordinary skill in the art to use the step of injecting a sample as provided by Harrison in the device of Verheggen and then to further modify the process by providing a minimum injection time based upon the component of the sample with the slowest electrophoretic mobility. Harrison reviews numerous factors affecting flow injection, but does not even remotely suggest consideration of the necessary factors of distance, mobility of the slowest component and field strength across the source and drain channels

to arrive at a way to provide a geometrically defined sample.

Accordingly, the decision of the examiner to reject claim 19 under 35 U.S.C. § 103 is reversed. As noted above, we have grouped claims 2-11 and 19 as standing or falling together.

Thereby, in accordance with 37 CFR ' 1.192(c)(7), claims 2-11 fall with claim 19. Thus, it follows that the decision of the examiner to reject claims 2-11 under 35 U.S.C. ' 103 is also reversed.

The 35 U.S.C. § 103 rejection of claim 20.

Appellants' claim 20 recites,

20. An electrophoresis device which comprises a supply channel, which contains a sample having an original sample composition, a drain channel, and an electrolyte channel, which contains an electrolyte buffer, wherein said supply and drain channels are each inclined with respect to the electrolyte channel, and which supply and drain channels intersect said electrolyte channel at a supply port and a drain port, respectively, such that a geometrically defined sample volume is defined by a section of said electrolyte channel located between said supply port and said drain port, which electrophoresis device further comprises a means for electrokinetically injecting a sample which reflects the original sample composition into said sample volume characterized in that said supply channel and said drain channel each have a resistance to flow with respect to said electrolyte buffer which is about 5% lower than the respective resistance to flow of said electrolyte channel.

Appellants' describe (with respect to Fig. 3) that "[t]he resistance to flow of the supply and drain channel can be deminished by either reducing the length of the respective channels or by increasing their respective widths w"

(specification, page 9). The preferred embodiment being subsequently described with respect to Fig. 4.
The advantages described include "the leakage or diffusion of sample components is considerably decreased ... the noise of the detected signal is reduced ... [and] the sensitivity of the analytic system, that is the limit of detection, is increased" (specification, page 9).

The examiner's rejection of claim 20 is based on Verheggen's description of a basic electrophoretic device and Harrison's teaching of electrokinetically introducing the sample "by applying a voltage (pt electrodes) between the separation channel and supply channel" (examiner's office action mailed May 16, 1995, Paper No. 3, page 5).[5] The examiner also notes "Harrison also teaches that manipulation of channel geometry is possible to control where the applied potential drops. Kindly refer to Fig. 1; 1928, Results and Discussion, the two paragraphs" and concludes that "[i]t would have been obvious to one of ordinary skill in the art to

[5] The final rejection (Paper No. 6) rejects then claim 12 (replaced in Paper No. 7 in favor of claim 20) by reference to "the office action mailed May 16, 1995" for an explanation of the rejection.

combine the method of Verheggen and Harrison because electrokinetic injection is conventional technique in the art of electrophoresis. Furthermore, both references deal with control of sample introduction and electrophoretic separation. With respect to width, depth, distance between channels, and angles, it would have been obvious to one of ordinary skill in the art to determine through routine experimentation optimum apparatus limitations in order to ensure apparatus optimization" (examiner's office action mailed May 16, 1995, Paper No. 3, pages 5-6).

In response, appellants refer to the dimensions of the devices described in Verheggen ("the capillary tube which has a greater diameter (0.55mm) than that of the two feeders, which each have a diameter of 0.44mm") and Harrison ("[t]he dimensions for the separating channel are listed as 1mm wide x 10µm deep versus 30µm wide x 10µm deep for both the sample and mobile phase channels") and point out that "present claim 20 specifically requires the resistance to flow of the supply and drain channels to be about 5% lower..." whereas in both Verheggen and Harrison it is higher such that "even if Harrison was properly combined with Verheggen, and if some

correlation could be made between the channels in Harrison's and Verheggen' sampling devices (or the

present sampling device), the combined disclosure of the references would lead away from the claimed device, not render it obvious under 35 USC 103" (brief, pages 3-4).

The examiner responds that "all structural features which distinguish the claimed invention from the prior art must be set forth in the claims" and "[i]t is the Examiner's position that resistance to flow, although set forth in claim 20, is not a structural feature" (answer, page 5).

Appellants respond by again explaining the reduced resistance to flow feature of claim 20, its advantages and their conclusion that "[s]ince the references do not suggest a device having the flow characteristics required by the present device claims, the present device claims are not properly rejected over the combined disclosure of the references" (reply, page 2).

We note that claim 20 is directed to a combination of elements, with the last element being expressed in means-plus-function format. As explained in In re Swinehart, 439 F.2d

210, 212, 169 USPQ 226, 228,(CCPA, 1971), there is nothing wrong with using functional language to describe something in terms of what it does rather than what it is. Appellants have chosen to express the injection portion of the claimed electrophoresis device as a "means for electrokinetically injecting a sample

which reflects the original sample composition into said sample
volume characterized in that said supply channel and said drain channel each have a resistance to flow with respect to said electrolyte buffer which is about 5% lower than the respective resistance to flow of said electrolyte channel." We interpret this, in light of the disclosed size limitations of the supply and drain channels vis a vis the electrolyte channel, to be a structural limitation. Further, we find such limitation is not found in either of the applied teachings of Verheggen or Harrison. Indeed, both Verheggen or Harrison teach the opposite limitation as noted in the above referenced appellants' argument (brief, pages 3-4).

What we are dealing with in this case is the construction

of the functional aspect of a structural limitation in claim 20. And we are not imputing the specific structural limitations from the specification into the claim to determine the meaning of the functional phrase recited in the claim. We are simply noting that the functional clause is required to be construed as part of the claimed limitations.

We conclude that claim 20 recites a structural feature (means for electrokinetically injecting ...) which is not shown by either Verheggen or Harrison, or any combination thereof.

Appellants have pointed to the portions of those disclosures which show a greater resistance to flow (the opposite of the "means for" clause of claim 20) to which the examiner responds with a general dismissal and without providing any showing of this feature in the prior art.

It is noted that the examiner has pointed out that "with respect to the diameters of the sample, drain, and electrolyte channels, it is clear that the prior art, especially Harrison, deals with the idea of channel geometry which in Harrison's case is manipulated to control where the applied potential

drops" and "it is held that 'the motivation to make a specific structure is always related to the properties or uses one skilled in the art would expect a structure to have'" (answer, page 5).

Notwithstanding the examiner's statements to the contrary we find that the specific structural features of claim 20 are not obvious from Verheggen and/or Harrison. Appellants have recognized specific benefits flowing from manipulation of certain structural features (the supply and drain channel dimensions with respect to the electrolyte channel dimensions, at their intersection to form a geometrically defined sample volume) and neither the structure nor the benefits are described in the prior art. We do agree that some modification of the channel

structures of Verheggen and Harrison would be obvious, but not to the extent of the features of claim 20.

Accordingly, the decision of the examiner to reject claim 20 under 35 U.S.C. § 103 is reversed. As noted above, we have grouped claims 13-18 and 20 as standing or falling together. Thereby, in accordance with 37 CFR ' 1.192(c)(7), claims 13-18

fall with claim 20. Thus, it follows that the decision of the examiner to reject claims 13-18 under 35 U.S.C. ' 103 is also reversed.

CONCLUSION

To summarize, the decision of the examiner to reject claims 2-11 and 13-20 under 35 U.S.C. § 103 is reversed.

REVERSED

BRUCE H. STONER, JR. Chief Administrative Patent Judge	)	
THOMAS A. WALTZ Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
RICHARD B. LAZARUS Administrative Patent Judge	)	

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