

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opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.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. 43

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte SKW TROSTBERG AKTIENGESSELLSCHAFT

Appeal No. 97-2786
Application 90/003,367¹

HEARD: November 14, 1997

Before KIMLIN, WARREN and OWENS, *Administrative Patent Judges*.

OWENS, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal from the examiner's final rejection of

¹ Reexamination proceeding for U.S. Patent No. 5,223,172, issued June 29, 1993, based on Application 07/787,761, filed November 6, 1991. According to applicants, the application is a continuation 07/730,025, filed July 12, 1991, now abandoned, which is a continuation of 07/211,154, filed June 22, 1988, now abandoned, which is a continuation of 07/097,351, filed September 8, 1987, now abandoned, which is a continuation of 06/845,476, filed March 27, 1986, now abandoned, which is a continuation of 06/669,375, filed November 8, 1984, now abandoned.

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claims 1-7, which are all of the claims in this reexamination proceeding. At the oral hearing appellant withdrew the appeal as to claims 1, 2, 4 and 6. Therefore, only claims 3, 5 and 7 are before us for consideration. Claims 3 (with claim 1 from which it depends) and 5 are illustrative and are appended to this decision.

THE REFERENCES

Pregmon	3,882,064	May 6, 1975
Glazar	4,169,187	Sep. 25, 1979
Shimizu et al. (JP '323) ² (Japanese Kokai patent application)	57-47323	Mar. 18, 1982
Yamamoto et al. (JP '920) ² (Japanese Kokai patent application)	57-102920	Jun. 26, 1982

The Condensed Chemical Dictionary 144 (9th ed., Gessner G. Hawley ed., Van Nostrand Reinhold 1977) (Hawley).

THE REJECTION

Claims 3, 5 and 7 stand rejected under 35 U.S.C. § 103 as being unpatentable over Pregmon, Glazar, JP '920, JP '323 and Hawley.

OPINION

We have carefully considered all of the arguments advanced by appellant and the examiner and agree with the examiner that

² Citations herein are to the English translation of this reference, which is of record.

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appellant's invention as recited in claims 3, 5 and 7 would have been obvious to one of ordinary skill in the art at the time of appellant's invention over the applied references. Accordingly, the rejection of these claims will be affirmed.

At the outset, we note that appellant indicates that claim 7 stands or falls with claim 5 (supplemental brief, page 4). Consequently, we limit our discussion to claims 3 and 5. See 37 CFR § 1.192(c)(7)(1995).

Appellant's invention as recited in claim 3 is a composition comprising a dispersion of a dicyandiamide hardener in a liquid epoxide resin, wherein the hardener consists essentially of a ground mixture of 1) dicyandiamide particles at least 90% of which have a size less than or equal to 10 microns, and 2) 0.1 to 30 wt%, based on the weight of the dicyandiamide, of at least one oxide which is selected from silicon dioxide, calcium oxide, magnesium oxide and zinc oxide and which has a specific surface area according to BET of at least 50 m²/g.

Appellant's claim 5 recites a process for preparing a dicyandiamide based hardener by grinding a mixture of dicyandiamide and 0.1 to 30 wt%, based on the weight of the dicyandiamide, of at least one oxide selected from silicon dioxide, calcium oxide, magnesium oxide and zinc oxide, such that

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at least 90% of the particles of the mixture have a size less than or equal to 10 microns.

JP '920 discloses an epoxy resin composition which has excellent blister resistance because it contains a polyamide and a dicyandiamide powder hardener at least 90 wt% of which has a particle diameter of no more than 5 microns (page 3). The use of a silane coupling agent as an additive further improves the blister resistance (page 5). Regarding the particle size of the dicyandiamide, JP '920 states (page 4):

Because the fine powder dicyandiamide used in the present invention has the prescribed particle diameter described above [i.e., at least 90 wt% with a particle diameter no more than 5 microns], it can be uniformly dispersed in the composition, the curing reaction can be conducted smoothly, and the dispersed particles participate almost completely in the curing reaction, so that no unreacted dicyandiamide is left over in the cured product to cause problems such as elution of the inherently water soluble dicyandiamide into water following curing or, conversely, moisture penetration. Because holes in the material resulting from such factors can thus be controlled, the blister resistance can be improved. Such effects are not obtained with the use of a particle diameter outside the range prescribed above.

JP '920 further teaches that epoxy resins can be used in liquid, paste, sheet or powder form (page 2).

JP '323 discloses an epoxy resin composition which has excellent resistance to hot water at elevated temperatures because it contains a dicyandiamide hardener in the form of

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particles at least 90 wt% of which have diameters of no more than 5 microns in combination with a silane based coupling agent (page 3). Concerning the particle size of the dicyandiamide, JP '323 states (pages 2-3):

The inventors have already discovered that when the hardener dicyanodiamide is used in the form of a fine powder in various epoxy resin compositions and is dispersed uniformly throughout the composition, the hardening reactions proceed smoothly, and virtually all of the dispersed particles contribute to the hardening reactions, with the result that no unreacted dicyanodiamide remains in the hardened product; there are no such adverse effects as the elution of dicyanodiamide (which originally is an aqueous solution) into water following hardening or, conversely, the penetration of moisture, so that the formation of pinholes caused by these effects is suppressed, and materials suitable for use as plastic solders can be obtained.

JP '920 (page 6) and JP '323 (page 7) each disclose applying the epoxy resin composition with a spatula, but do not state that the composition is in the form of a liquid rather than a paste. However, appellant acknowledges that it was known in the art to disperse dicyandiamide in liquid epoxy resins (col. 1, lines 21-45 of the patent under reexamination).³ For this reason and because JP '920 teaches that epoxy resins can be used in a

³ It is axiomatic that our consideration of the prior art must, of necessity, include consideration of the admitted state of the art. See *In re Hedges*, 783 F.2d 1038, 1039-40, 228 USPQ 685, 686 (Fed. Cir. 1986); *In re Davis*, 305 F.2d 501, 503, 134 USPQ 256, 258 (CCPA 1962).

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variety of forms including liquids and pastes (page 2), one of ordinary skill in the art would have been motivated to prepare the JP '920 and JP '323 compositions in liquid form and would have had a reasonable expectation of success in doing so. Consequently, preparing these compositions in liquid form would have been *prima facie* obvious to such a person. See *In re Vaeck*, 947 F.2d 488, 493, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991); *In re O'Farrell*, 853 F.2d 894, 902, 7 USPQ2d 1673, 1680 (Fed. Cir. 1988); *In re Longi*, 759 F.2d 887, 892-93, 225 USPQ 645, 648 (Fed. Cir. 1985).

The JP references do not disclose mixing an oxide with the dicyandiamide. However, both Pregmon (col. 2, lines 49-55) and Glazar (col. 4, lines 3-8) teach that adding finely divided silica to dicyandiamide in an amount such as 5 parts of silica to 95 parts of dicyandiamide improves the handling characteristics of the dicyandiamide. Glazar teaches that a suitable silica is Cab-O-Sil®, which Hawley states has a surface area of 50-400 m²/g (page 144). In view of these teachings by Pregmon and Glazar, it would have been *prima facie* obvious to one of ordinary skill in the art to add a finely divided silica such as Cab-O-Sil® to the dicyandiamide in the JP '920 or JP '323 compositions in order to improve the handling characteristics of the dicyandiamide.

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The JP references do not state that the fine particle dicyandiamide is formed by grinding. However, given the teaching that the a small particle size is to be used, it would have been *prima facie* obvious to one of ordinary skill in the art to obtain the small particles by a conventional method such as grinding. This method is disclosed by both Pregmon (col. 3, lines 54-55) and Glazar (col. 5, lines 11-12). Since the purpose of the silica is to improve the handling characteristics of the dicyandiamide, it would have been *prima facie* obvious to one of ordinary skill in the art to grind the dicyandiamide and silica together to prevent agglomeration of the fine dicyandiamide particles produced by the grinding.

Appellant argues that JP '920 teaches away from the claimed invention by giving the impression that it is totally sufficient to use finely divided dicyandiamide as a hardener without any silica additive, and that Example 1 of the patent under reexamination shows that such dicyandiamide forms agglomerates up to 40 microns (supplemental brief, pages 13-15). We are not persuaded by this argument because in view of the teaching by Pregmon (col. 2, lines 49-55) and Glazar (col. 4, lines 3-8) that finely divided silica improves the handling characteristics of dicyandiamide, it would have been *prima facie* obvious to one of

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ordinary skill in the art to combine finely divided silica with the JP '920 dicyandiamide particles in order to obtain that benefit.

Appellant argues that Comparative Examples 2 and 3 in Table 1 of JP '920 show that dicyandiamide particles at least 90 wt% of which have a size of 5 microns or less (Comparative Example 2), which is within the range recited in appellant's claims, gives poorer T peel adhesion than dicyandiamide particles having a size of 20-200 microns (Comparative Example 3), and therefore teach away from the claimed invention (supplemental brief, page 16; reply brief, page 7). This argument is not convincing because a polyamide is included in the composition in Comparative Example 3 but not in that of Comparative Example 2. In Practical Example 2, wherein at least 90 wt% of the dicyandiamide particles have a size of 5 microns or less and the composition includes a polyamide, the T peel adhesion is slightly higher than that of Comparative Example 3.

Appellant argues that there is no basis for considering the teaching by Pregmon and Glazar that adding finely divided silica to dicyandiamide improves the handling characteristics of the dicyandiamide to be a teaching that the finely divided silica serves as an anticaking agent (reply brief, page 2). In our

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view, one of ordinary skill in the art would have considered the improvement in handling characteristics disclosed by Pregmon and Glazar to be a reduction in the caking of the particles. Appellant has proffered no other interpretation. Appellant does not challenge the examiner's assertion (answer, page 4) that silica was a well known anticaking agent at the time of appellant's invention.⁴ Appellant argues that only fine dicyandiamide has a tendency to agglomerate, but does not state that the tendency of small particles to agglomerate to a greater extent than large particles was unknown in the art at the time of appellant's invention.⁵

Appellant argues that the JP references disclose silica only as a filler and in an amount far greater than that recited in appellant's claims (supplemental brief, page 21). We do not find this argument to be convincing because in view of the teaching by Pregmon and Glazar discussed above, one of ordinary skill in the art would have been motivated to add finely divided silica to the dicyandiamide powder in the JP '920 and JP '323 compositions to improve the handling characteristics of the dicyandiamide,

⁴ See Kirk-Othmer, 7 *Encyclopedia of Chemical Technology* 283 (3d ed., John Wiley & Sons 1979).

⁵ See *id.*

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regardless of whether silica is used as a filler.

Appellants argue that JP '920 teaches away from the claimed invention by leading one to believe that there is no improvement in properties where the polyamide and silane coupling agents are omitted, and that JP '323 indicates that only the combination of finely divided dicyandiamide and a silane based coupling agent will lead to good results (supplemental brief, pages 16-18). We are not persuaded by appellant's argument because the "comprising" transition term in appellant's claim 1, from which claim 3 depends, opens claim 3 to components other than those recited, such as a polyamide or a silane coupling agent. See *In re Baxter*, 656 F.2d 679, 686, 210 USPQ 795, 802 (CCPA 1981).

For the above reasons, we conclude that appellant's claimed invention would have been *prima facie* obvious to one of ordinary skill in the art at the time of appellant's invention over the applied prior art.

Appellant argues that Declaration D by Seyerl, filed on February 6, 1992, shows that appellant's invention provides shorter gel times and more complete and quicker reaction compared to compositions which are closer to the invention than any of the applied prior art references (supplemental brief, page 37). We are not persuaded by this argument for the following reasons.

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First, one who presents a showing of unexpected results has the burden of showing unexpected results relative to the closest prior art. See *In re Baxter Travenol Labs.*, 952 F.2d 388, 392, 21 USPQ2d 1281, 1285 (Fed. Cir. 1991); *In re De Blauwe*, 736 F.2d 699, 705, 222 USPQ 191, 196 (Fed. Cir. 1984). Appellant has not explained why the comparison in Declaration D is closer than a comparison to one of the JP references which disclose appellant's dicyandiamide particle size but do not disclose use of silica. Also, the JP references disclose dicyandiamide particles at least 90 wt% of which are less than or equal to 5 microns. Appellant's claims encompass such a particle size, but appellant only provides a comparison wherein the dicyandiamide particles of their invention have a size such that 98% of them are less than 10 microns. In addition, appellant has not explained why the epoxy used in the comparison in Declaration D provides results which are comparable to those which would be obtained with an epoxy used in the JP references.

Second, it is not enough for appellant to show that the results for appellant's invention and the comparative examples differ. The difference must be shown to be an unexpected difference, and appellant has not done so. See *In re Freeman*, 474 F.2d 1318, 1324, 177 USPQ 139, 143 (CCPA 1973); *In re Klosak*,

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455 F.2d 1077, 1080, 173 USPQ 14, 16 (CCPA 1972). It appears that one of ordinary skill in the art would have expected smaller particles to react faster and more completely because they have, per unit volume, a larger surface area for contacting the materials with which they react. Appellant argues that Declaration E by Seyerl, filed on November 16, 1992, shows that one of ordinary skill in the art would have expected the silica to envelope finely divided dicyandiamide and result in reduced activity (supplemental brief, page 37). Appellant provides in Declaration F by Hammer, filed on September 25, 1995, micro-photographs which show small silica particles adhered to finely divided dicyandiamide, but does not argue that it was unknown in the art at the time of appellant's invention that this is the manner in which anticaking particles function.⁶ As indicated by the micro-photographs in Declaration F, after the silica is adhered to the surfaces of the dicyandiamide particles, much of the dicyandiamide particle surfaces remain exposed and available for reaction. Thus, it is not clear that any reduction in reactivity due to the reduction in dicyandiamide surface area caused by the presence of silica will not be more than offset by the increased reactivity resulting from the use of smaller

⁶ See Kirk-Othmer, *supra* note 4.

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particle sizes which the presence of the silica makes possible. We note that appellant has not shown that silica does not decrease the reactivity of the dicyandiamide particles; i.e., appellant has not provided a comparison of the reactivity of finely divided dicyandiamide particles having silica on their surfaces according to appellant's invention versus that of dicyandiamide particles of the same size which are free of silica.

Third, the evidence presented in Declaration D is not commensurate in scope with the claims. See *In re Grasselli*, 713 F.2d 731, 743, 218 USPQ 769, 778 (Fed. Cir. 1983); *In re Clemens*, 622 F.2d 1029, 1035, 206 USPQ 289, 296 (CCPA 1980). Appellant's claims encompass dicyandiamide having particles of which at least 90% are less than or equal to 10 microns. In the comparison, however, only the upper end of the recited range, i.e., at least 98% greater than 10 microns, is used. Also, the claims encompass ranges of silica contents of 0.1 to 30 wt% based on the dicyandiamide, yet the comparison includes only one silica content, i.e., 1.5 wt%. In addition, appellant's claim 3 encompasses use of epoxides generally, but only one epoxide is used in the comparison. We find in the evidence of record no reasonable basis for concluding that the great number of

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materials encompassed by appellant's claims would behave as a class in the same manner as the particular materials tested. See *In re Lindner*, 457 F.2d 506, 508, 173 USPQ 356, 358 (CCPA 1972); *In re Susi*, 440 F.2d 442, 445-46, 169 USPQ 423, 426 (CCPA 1971).

Appellant argues that Declaration F by Hammer, filed on September 25, 1995, shows that appellant's invention provides unexpected results compared to Pregmon (brief, page 10). We do not find this argument to be convincing for the following reasons. First, the epoxy used in the declaration appears to be different than that used by Pregmon. The declaration therefore does not appear to provide a comparison with the closest prior art. Second, the increased reactivity resulting from use of smaller particles would be expected by one of ordinary skill in the art as discussed above. Also, such a person would have expected small particles to provide a smoother coating than particles which are large enough that they stick out above the coating surface. Third, the showing is not commensurate with the broad ranges of the amount of silica encompassed by appellant's claims.

Appellant argues that Declaration G by Hammer, filed on September 25, 1996, shows that finely ground dicyandiamide agglomerates quickly and that adding silica after agglomeration

will not break the agglomeration (supplemental brief, page 38). We are not convinced by this argument because the benefit of combining silica with dicyandiamide set forth in this declaration would have been expected by one of ordinary skill in the art in view of the teachings by Pregmon (col. 2, lines 49-55) and Glazar (col. 4, lines 2-8) that adding finely divided silica to dicyandiamide particles improves the handling characteristics of the dicyandiamide. One of ordinary skill in the art at the time of appellant's invention would have realized that small particles have a relatively high tendency to agglomerate because they have a greater exposed surface area per unit volume.⁷ Also, such a person would not have expected silica to break up an agglomeration since it functions as an anticaking agent by coating the surfaces of the particles.⁸

Appellant argues that the two Sturm declarations (Sturm I filed on January 17, 1995, and Sturm II filed on September 25, 1995) show that appellant's invention has enjoyed commercial success as evidenced by increasing sales volume of the claimed product and increasing market share of the claimed product despite a premium price compared to the product replaced by the

⁷ See Kirk-Othmer, *supra* note 4.

⁸ See *id.*

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claimed product, and show a nexus between the commercial success and the invention (supplemental brief, page 34). We are not persuaded by this argument for the following reasons.

First, the assertion in the Sturm I declaration that customers have chosen the claimed product based on its advantages as determined through extensive testing by the customers is inadequate because it is merely the opinion of the declarant as to the customers' motivation for buying the product. Appellant "must submit some factual evidence that demonstrates the nexus between the sales and the claimed invention - for example, an affidavit from the purchaser explaining that the product was purchased due to the claimed features." *In re Huang*, 100 F.3d 135, 140, 40 USPQ2d 1685, 1690 (Fed. Cir. 1996). Similarly, support is needed for the assertion in the Sturm II declaration that customers have substituted the new product for the old product because the new product has improved reactivity and storage stability and because customers strongly prefer the new product (pages 2-4).

Second, the declarant's assertion in the Sturm I declaration that the claimed invention, "because of its merit has enjoyed market acceptance without expansion of the marketing organization of SKW for the products" (page 3) fails to address how the

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marketing effort for the new product compares to that for the old product.

Third, the statement in the Sturm I declaration that the market share of three products in liquid epoxy resin systems according to appellant's invention is greater than 50% on a worldwide basis is inadequate because the relevant market is not defined, and the declaration does not disclose how the market share has been changing over time. Thus, the significance of this percentage cannot be determined. Although the Sturm II declaration states that the claimed product is not a tied or tying product (page 4), the declarations do not disclose whether appellant has any relationship with the customers in the relevant market, such as the customers being subsidiaries of appellant, which could affect the market share of the products. In addition, the Sturm I declaration does not disclose whether appellant's claimed product fits in with other of appellant's products in a way which would affect the sales of the claimed product. Furthermore, the declaration does not state that the epoxy is the same in the products of the invention and the old product. Therefore, it cannot be determined whether the increased sales are due to use of an improved epoxy resin in the products of the invention rather than being due to the hardener

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recited in appellant's claims.

Fourth, appellant's statement in the Sturm I declaration that the substantial sales of the claimed product in a short time indicates a long-felt need in the industry for the product is not supported by evidence. Thus, it cannot be determined whether the sales resulted from the claimed invention.

For the above reasons, we conclude, based on the evidence of record on balance, that appellant's claimed invention would have been obvious to one of ordinary skill in the art within the meaning of 35 U.S.C. § 103.

DECISION

The rejection of claims 1-7 under 35 U.S.C. § 103 as being unpatentable over Pregmon, Glazar, JP '920, JP '323 and Hawley is affirmed.

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No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED

EDWARD C. KIMLIN)	
Administrative Patent Judge)	
)	
)	
)	
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APPENDIX

1. A composition comprising:
 - a dispersion of a liquid epoxide resin with a dicyandiamide hardener distributed therein, said hardener consisting essentially of
 - a) dicyandiamide having a particle size distribution wherein at least 90% of the dicyandiamide particles are less than, or equal to, 10 microns; and
 - b) 0.1 to 30% by weight, referred to the weight of the dicyandiamide, of at least one oxide selected from the group consisting of silicon dioxide, calcium oxide, magnesium oxide, and zinc oxide, the at least one oxide having a specific surface area according to BET of at least 50 m²/g.
3. The composition of claim 1 wherein the hardener is a ground mixture of the dicyandiamide and the least one oxide.
5. A process for the production of a dicyandiamide based hardener for and epoxide resin dispersion, the hardener consisting essentially of dicyandiamide with a particle size distribution of at least 90% of the dicyandiamide particles less than, or equal to, 10 microns and 0.1 to 30% wt.%, referred to the weight of the dicyandiamide, of at least one oxide selected

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from the group consisting of silicon dioxide, calcium oxide, magnesium oxide and zinc oxide, the process comprising:

measuring the oxide into the dicyandiamide to form a mixture; and thereafter;

grinding the mixture so that the mixture has a particle size distribution so that at least 90% is less than or equal to 10 microns.