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BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BRIAN BENICEWICZ, ALAN DECHO, LEI WANG, and KRISTEN MILLER

Appeal 2019-004426
Application 14/677,328
Technology Center 1600

Before JOHN E. SCHNEIDER, RACHEL H. TOWNSEND, and CYNTHIA M. HARDMAN, *Administrative Patent Judges.*

HARDMAN, *Administrative Patent Judge.*

DECISION ON APPEAL

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1–9, 21–25, 29, and 30. *See* Final Act. 3. We have jurisdiction under 35 U.S.C. § 6(b).

We REVERSE.

[1] We use the word Appellant to refer to "applicant" as defined in 37 C.F.R. § 1.42. Appellant identifies the real party in interest as University of South Carolina. Appeal Br. 3.

CLAIMED SUBJECT MATTER

Claims 1–9, 21–25, 29, and 30 are directed to a method comprising attaching a plurality of polymer chains onto a surface of a nanoparticle to form a polymer brush, and attaching a plurality of cyclic saccharides to each of the polymer chains. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A method, comprising:

> attaching a plurality of polymer chains onto a surface of a nanoparticle to form a polymer brush on the nanoparticle surface, each polymer comprising a plurality of methacrylate groups; and
>
> attaching a plurality of cyclic saccharides to each of the polymer chains, each cyclic saccharide being attached via reaction of a methacrylate group with the cyclic saccharide.

Appeal Br. 18 (Claims Appendix).

REFERENCES

The prior art relied upon by the Examiner is:

Name	Reference	Date
Benicewicz	US 2013/0041112 A1	Feb. 14, 2013
Bowen	US 5,792,821	Aug. 11, 1998

REJECTION

Claims 1–9, 21–25, 29, and 30 stand rejected under 35 U.S.C. § 103 as being unpatentable over Benicewicz and Bowen.[2] Final Act. 3.

[2] In the Final Rejection, the Examiner refers to Bowen as "Brown '821." *See* Final Act. 3.

OPINION

The Examiner found that Benicewicz discloses attaching a plurality of polymer chains onto a surface of a nanoparticle, wherein each polymer comprises methacrylate groups. *See* Final Act. 3–5. The Examiner found that Bowen teaches polymerizable methacrylated cyclodextrin monomers, which can form "inclusion complexes" by encapsulating other molecules. Final Act. 6. The Examiner asserted that it would have been obvious to one of ordinary skill in the art to substitute Benicewicz's methacrylate or methylmethacrylate monomers with Bowen's methacrylated cyclodextrin monomers, because the latter can form inclusion complexes, and because it would have been a simple substitution of one known element for another to obtain predictable results. Final Act. 6–7.

Appellant admits that "Benicewicz clearly teaches the first step of the method of claim 1," i.e., "Benicewicz teaches a method that includes attaching a plurality of polymer chains onto a surface of a nanoparticle to form a polymer brush on the nanoparticle surface, each polymer comprising a plurality of methacrylate groups." Appeal Br. 10. Appellant argues, however, that "[n]either Benicewicz nor Bowen teach attaching a cyclic saccharide such as a cyclodextrin to a polymer of a polymer brush via a methacrylate group of the polymer." Appeal Br. 13. Appellant further argues that the proposed combination of Benicewicz and Bowen is based on impermissible hindsight, including because the suggested modification would result in a crosslinked network, whereas the intended function in Benicewicz is a polymer brush with functionality along the individual strands of the brush. Appeal Br. 14–15; Reply Br. 3. Appellant additionally argues that even if one of skill in the art were to make the Examiner's

proposed substitution, the resulting method would not reach the limitations of the pending claims because it would result in a cyclodextrin monomer as a component of a polymer backbone, as opposed to a cyclodextrin monomer attached to a polymer backbone per claim 1. Appeal Br. 12–13.

"[T]he examiner bears the initial burden, on review of the prior art or on any other ground, of presenting a *prima facie* case of unpatentability." *In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992). We determine that the Examiner has not carried the burden of presenting a *prima facie* case of unpatentability.

The method of claim 1 requires two distinct steps (which can be carried out in either order): (1) attaching polymer chains onto a nanoparticle to form a polymer brush, where the polymer comprises methacrylate groups; and (2) "attaching a plurality of cyclic saccharides to each of the polymer chains, each cyclic saccharide being attached via reaction of a methacrylate group with the cyclic saccharide." Appeal Br. 18 (Claims Appendix). We agree with Appellant that "[i]n order to reach the claimed methods, the prior art must teach or suggest [] attachment of [a] polymer that has methacrylate groups to a nanoparticle to form a polymer brush and must teach reaction of a [cyclic saccharide] with that polymer." Appeal Br. 16.

While claims are to be accorded their broadest reasonable interpretation, the broadest reasonable interpretation does not mean the broadest possible interpretation. Rather, the broadest reasonable interpretation is one that is "consistent with the specification." *See, e.g.*, *In re Hyatt*, 211 F.3d 1367, 1372 (Fed. Cir. 2000). Per claim 1, the step of attaching the cyclic saccharide (e.g., cyclodextrin) to the polymer must occur via reaction of a methacrylate group with the cyclic saccharide. Based on

the structure of the claim, we conclude that the methacrylate group that is involved in this reaction must be located on the polymer, not the cyclic saccharide, in order to result in attachment of the cyclic saccharides to "the polymer chains" that form the polymer brush on the nanoparticles. That is the invention described in the Specification. *See e.g.*, Spec. 6 ("In particular, methods are generally provided to attach cyclic arrangements of saccharides (e.g., cyclodextrin) onto the surface of nanoparticles."); 8 ("Each chain [attached to the surface of the nanoparticle] contains hundreds of cyclic saccharides which allow each nanoparticle to capture a large amount of bacterial communication molecules."). A conclusion that step (2) (noted above) instead requires the cyclic saccharides bear the methacrylate group, would not result in the required "attaching a plurality of cyclic saccharides to each of the polymer chains," but rather would result in simply each cyclic saccharide being attached to each other via reaction of a methacrylate group, with these attached cyclic saccharides somehow then being attached to the polymer chains that also have methacrylate groups and are attached to nanoparticles. The Specification does not describe such an invention.

The Examiner does not propose attaching cyclodextrin to the polymers taught in Benicewicz via reaction with a methacrylate group of the polymer. Rather, the Examiner proposes forming a polymer by substituting at least some of the methyl methacrylate monomers of Benicewicz with the methacrylated cyclodextrin monomers taught by Bowen. *See* Final Act. 6; Ans. 5–6. In the method proposed by the Examiner, methacrylate groups are attached to cyclodextrin monomers prior to polymerization and then the methacrylate cyclodextrin is "substituted" into the methacrylated polymer via some kind of substitution of the methacrylates. Beside the fact that the

Examiner does not explain, and we do not understand from the Examiner's rejection, how the methacrylated cyclodextrin would be substituted into the methacrylated polymer so as to attach the methacrylated cyclodextrin to the polymer, the Examiner's proposed methodology is different from the method of claim 1. As discussed above, the claimed method requires formation of polymer chains having methacrylate groups, and subsequent attachment of the cyclic saccharides to the polymer chains via reaction of the polymer's methacrylate groups with the cyclic saccharides.

Because the Examiner's proposed combination does not meet all of the limitations of the claims, we determine that the Examiner has not established a *prima facie* case of obviousness.

CONCLUSION

We reverse the Examiner's rejection of claims 1–9, 21–25, 29, and 30 under 35 U.S.C. § 103 as being unpatentable over Benicewicz and Bowen.

DECISION SUMMARY

Claims Rejected	**35 U.S.C. §**	**Reference(s)/Basis**	**Affirmed**	**Reversed**
1–9, 21–25, 29, 30	103	Benicewicz, Bowen		1–9, 21–25, 29, 30

REVERSED