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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte BRETT PARENDO, MARCUS CARLI, BRYAN WARD, and ANDREW SCHULZ

Appeal 2019-002904
Application 15/366,420
Technology Center 3700

Before JOHN C. KERINS, CHARLES N. GREENHUT, and LEE L. STEPINA, *Administrative Patent Judges.*

STEPINA, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

Pursuant to 35 U.S.C. § 134(a), Appellant[1] appeals from the Examiner's decision to reject claims 1–6. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[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 Milwaukee Electric Tool Corporation. Appeal Br. 1.

CLAIMED SUBJECT MATTER

The claims are directed to a hole saw with open end cap geometry. Claim 1, reproduced below with emphasis added, is illustrative of the claimed subject matter:

> 1. A hole saw comprising:
> a cylindrical body having a first edge located at a first end of the cylindrical body and a second edge located at a second end opposite the first end;
> cutting teeth extending from the first end of the cylindrical body;
> an end cap coupled to the second end of the cylindrical body, the end cap including a hub, the end cap including a plurality of end cap openings located radially between the hub and an outer perimeter edge of the end cap, *wherein the plurality of end cap openings occupy a relatively large portion of the area of the end cap, the relatively large portion being at least 50% of the area bounded by the outer perimeter edge of the end cap*; and
> an arbor configured to couple the hole saw to a driving tool, the arbor coupled to the hub and extending outward from the end cap in a direction opposite from the cutting teeth.

Appeal Br. 8 (Claims App.). In the Summary of the Claimed Subject matter, Appellant identifies Figure 2 as providing support for claim 1. Appeal Br. 2. We reproduce Appellant's Figure 2 below.

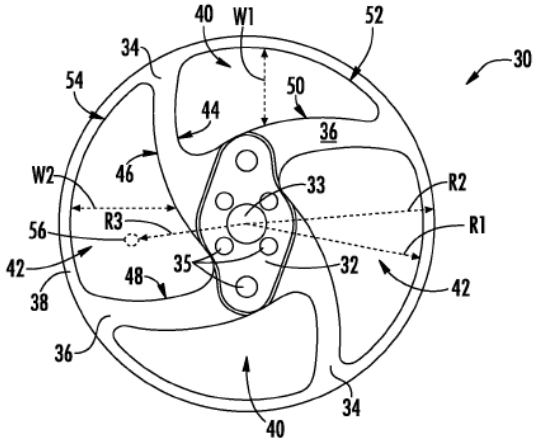

FIG. 2

Appellant's Figure 2 is a plan view of an end cap of a hole saw. Spec. ¶ 13.

REFERENCE

The prior art relied upon by the Examiner is:

Name	Reference	Date
Singh	US 2009/0035082 A1	Feb. 5, 2009

REJECTION

Claim 1–6 are rejected under 35 U.S.C. § 103 as unpatentable over Singh. Final Act. 2.

OPINION

The Examiner finds that Singh discloses many of the elements recited in claim 1, but does not explicitly disclose that the plurality of end cap openings occupy at least 50% of the area bounded by the outer perimeter edge of the end cap. Final Act. 2–3. However, referring to paragraph 45 of

Singh, the Examiner finds that Singh recognizes the size of weight reduction slots 72 as a result-effective variable. *Id.* at 3. Based on this finding, the Examiner reasons that it would have been an obvious matter of routine optimization to provide an open portion of at least 50% of the area bounded by the outer perimeter edge of the end cap. *Id.*

Appellant contends that the Examiner erred in finding Singh recognizes the relevant parameter as a result-effective variable because "the relevant 'parameter' recited in claim 1 is the relation between total area of *all* end cap holes to the *total* end cap area." Appeal Br. 5. In contrast, Appellant contends, "Singh teaches the importance of *hole size* and *hole location* in relation to end cap design, but Singh does not teach the relation between total area of *all* end cap holes to the *total* end cap area or how these variables relate to acceptable hole saw strength." *Id.* (citing Singh ¶ 45). Appellant argues,

> [w]hile the Examiner is correct that Singh does provide a *general* teaching related to the desirability of adequate strength, weight reduction and overall weight balance when selecting the size and location of end cap holes (see Final Office Action, pages 3-4, Singh, para. [0045]), Singh does not provide teaching that would direct one of ordinary skill in the art to arrive at the specific large open end cap area, recited in amended claim 1.

Id.

In response, the Examiner reiterates the finding that the "at least 50%" limitation in claim 1 would have been a matter of routine optimization, and, further, finds that Appellant does not disclose that the "at least 50%" range is critical. Ans. 4–6 (citing Spec. ¶¶ 21–22).

In reply, Appellant argues that (i) Singh does not teach or suggest specific dimensions or calculations of the open end cap area, (ii) the

disclosure in Singh is too broad to support an obviousness determination for the "at least 50%" limitation, and (iii), in Singh, the amount of open area in the end cap is not disclosed as critical, and, therefore, is not recognized as a result-effective variable. Reply Br. 2–4.

Appellant's arguments regarding the "at least 50%" limitation do not apprise us of Examiner error.

In *In re Aller*, 220 F.2d 454, 456 (CCPA 1955), the court set forth the rule that the discovery of an optimum value of a variable in a known process is normally obvious. *See also In re Boesch*, 617 F.2d 272, 276 (CCPA 1980). Exceptions to this general rule include where the parameter optimized was not recognized to be a result effective variable, *In re Antonie*, 559 F.2d 618, 621 (CCPA 1977), and where the results of optimizing a variable, which was known to be result effective, were unexpectedly good. *In re Waymouth*, 499 F.2d 1273, 1276 (CCPA 1974). "In cases in which the disclosure in the prior art was insufficient to find a variable result-effective, there was essentially no disclosure of the relationship between the variable and the result in the prior art." *In re Applied Materials, Inc.*, 692 F.3d 1289 (Fed. Cir. 2012). Furthermore,

> [w]hile the absence of any disclosure regarding the relationship between the variable and the affected property may preclude a finding that the variable is result-effective, the prior art need not provide the exact method of optimization for the variable to be result-effective. A recognition in the prior art that a property is affected by the variable is sufficient to find the variable result-effective.

Id.

Appellant's Specification explains that an open end cap geometry "provides a number of improved functional advantages" including *lowering*

weight of the end cap without decreasing hole saw cutting performance. Spec. ¶ 22.

Singh discloses a similar benefit from providing weight reduction slots 72 in the bottom (end cap) 70. "[T]he bottom 70 of the hole saw 52 includes a plurality of weight reduction slots 72 which allow the hole saw 52 in the hole saw system to be lighter than various prior art hole saws." Singh ¶ 44. Singh explains that the locations and size of the weight reduction slots 72 is determined by the manufacturer and is not held to a specific design. *Id.* ¶ 45. Further, the configurations of weight reduction slots 72 can be determined *based on the size of the hole saw* (while maintaining adequate strength in the hole saw). *Id.* Thus, Singh teaches that slots 72 serve the function of reducing the weight of the saw and that the size of the hole saw is a factor in determining the configuration of these slots. Accordingly, a person of ordinary skill in the art would understand Singh to recognize the size of weight reductions slots 72 to be a result-effective variable (with the effect being a reduction in the weight of the hole saw).

Reciting this variable in terms of its size relative to the size of the end cap, as Appellant has done in claim 1, does not change the fact that the end cap openings recited in claim 1 reduce the weight of the hole saw the same way weight reduction slots 72 perform this function in hole saw 52 of Singh. In light of Appellant's Specification, it is clear that the relationship between the size of the openings and the size of the end cap provides no unexpected result. Rather, Appellant's Specification discloses a wide range of percentages and ratios of the open area of the end cap vis á vis the total end cap area (or the solid end cap area) without indicating that any of these

percentages and ratios provides any particular benefit over any of the others. Specifically, the Specification states:

> In various embodiments, the openings are sized such that *at least 10% of the total end cap area* is occupied by the openings. In various embodiments, the openings are sized such that *at least 30% of the total end cap area* is occupied by the openings. In various embodiments, the openings are sized such that *at least 60% of the total end cap area* is occupied by the openings.
>
> In various embodiments, the ratio of the area of the openings to the area of the solid portions of end cap is between 0.15 and 2. In various embodiments, the ratio of the area of the openings to the area of the solid portions of end cap is between .15 and .45. In various embodiments, the ratio of the area of the openings to the area of the solid portions of end cap is between .3 and .7. In various embodiments, the ratio of the area of the openings to the area of the solid portions of end cap is between 1 and 2.

Spec. ¶¶ 5–6 (emphasis added). "The open area has a first area and the upper surf ace of the end cap has a second area, and the first area is between 20% and 70% of the second area." *Id.* ¶ 9; *see also id.* ¶¶ 31–34. Accordingly, we agree with the Examiner that, in light of the disclosure of weight reduction slots 72 in Singh, it would have been a matter of routine optimization to provide weight reduction slots 72 occupying a portion of at least 50% of the area bounded by the outer perimeter edge of the end cap as required by claim 1. Consequently, we sustain the rejection of claim 1 as unpatentable over Singh.

Appellant provides no arguments in support of the patentability of claims 2–6 aside from those discussed above regarding claim 1. *See* Appeal

Br. 3–7. Accordingly, these claims fall with claim 1, from which they depend.

CONCLUSION

The Examiner's rejection is affirmed.

More specifically, we affirm the rejection of claims 1–6 as unpatentable over Singh.

DECISION

In summary:

Claims Rejected	35 U.S.C. §	Basis	Affirmed	Reversed
1–6	103	Singh	1–6	
Overall Outcome			1–6	

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED