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opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.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. 23

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte RIKURO OBARA

Appeal No. 1997-1162
Application 08/200,455[1]

HEARD: December 6, 1999

Before HAIRSTON, BARRETT, and DIXON, Administrative Patent Judges.

BARRETT, Administrative Patent Judge.

DECISION ON APPEAL

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[1] Application for patent filed February 23, 1994, entitled "Magnetic Disk Unit," which claims the foreign priority benefit under 35 U.S.C. § 119 of Japanese Application 05-57871, filed February 23, 1993.

This is a decision on appeal under 35 U.S.C. § 134 from the final rejection of claims 11-19.

We reverse.

BACKGROUND

The disclosed invention is directed to a disk drive unit in a magnetic disk unit in which the outer races of ball bearing units are formed in a one-piece sleeve-rotor structure to facilitate assembly and to reduce manufacturing costs. The specification discloses both fixed spindle drives (where the spindle is stationary and the rotor rotates around the spindle, e.g., figure 4) and rotary spindle drives (where the spindle is fixed on the rotor, e.g., figure 3). Only the fixed spindle embodiment is claimed. The specification also discloses two different configurations for the stator (yoke) and the magnets which form the motor drive: an inner-rotor type (where the magnets are mounted on the rotor concentrically inside the stator, e.g., figure 4) and an outer-rotor type (where the magnets are mounted on the rotor concentrically outside the stator, e.g., figure 2). Both configurations are claimed.

Claim 11 is reproduced below.

11. In a magnetic disk unit comprising a disk drive unit (22), including a rotor (9) on which a magnetic disk (18) is loaded, a motor rotatably driving said rotor (9), the motor having a spindle (5) fixedly mounted on a base portion (1a) of a casing (1), and a ball bearing unit, said ball bearing unit including a sleeve portion (10) concentrically surrounding said spindle (5),

the improvement wherein:

said disk unit comprises a one-piece integrally formed unit including therein said rotor (9) and said sleeve portion (10) of said ball bearing unit, wherein said sleeve portion (10) is integrally formed in a central portion of a lower surface of said rotor (9);

said spindle (5) is a stepped shaft having a large-diameter shaft portion and a small-diameter shaft portion;

said small-diameter shaft portion is fitted in an inner ring (8);

said integrally formed sleeve portion (10) operating as double-row outer rings of said ball bearing unit and eliminating outer rings therefrom, and including an inner peripheral surface having a pair of ball-running grooves therein;

a first plurality of balls (14) are disposed between a ball-running groove (7) of an outer peripheral surface of said inner ring and a first ball-running groove (12) of said pair of ball-running grooves of said inner peripheral surface of said sleeve portion (10) and free of any outer ring therefor; and

a second plurality of balls (13) disposed between a ball-running groove (6) of an outer peripheral surface of said large-diameter shaft portion and a second ball-running groove (11) of said pair of ball-running grooves of said inner peripheral surface of said sleeve portion (10) and free of any outer ring therefor, said

balls (13) having substantially same diameters as said balls (14).

The Examiner relies on the following prior art references:

U.S. Patents

Stefansky et al. (Stefansky)	5,157,295	October 20, 1992
Jabbari et al. (Jabbari)	5,177,650 (filed November 9, 1990)	January 5, 1993
Fruge et al. (Fruge)	5,200,866 (filed April 9, 1991)	April 6, 1993
MacLeod	5,352,947 (filed August 6, 1991)	October 4, 1994
Simazu et al. (Simazu)	5,391,952 (filed September 4, 1992)	February 21, 1995

Foreign references

Voll et al.[2] (Voll) (German Offenlegungsschrift)	3540363	June 19, 1986

[2] A translation of Voll has been prepared by the Patent and Trademark Office and accompanies this decision.

The objections to claim 11-19, the rejection under 35 U.S.C. § 112, second paragraph, and the warning that claims 11 and 19 are substantial duplicates have been overcome (Examiner's Answer, page 6).

Claims 11-13 and 16-19 stand rejected under 35 U.S.C. § 103 as being unpatentable over one of either Jabbari or Stefansky or Simazu in view of one of either Voll or Fruge.

Claims 11, 12, and 14-19 stand rejected under 35 U.S.C. § 103 as being unpatentable over MacLeod in view of either Fruge or Voll.

We refer to the Final Rejection (Paper No. 10) (pages referred to as "FR__") and the Examiner's Answer (Paper No. 19) (pages referred to as "EA__") for a statement of the Examiner's position and to the Revised Appeal Brief (Paper No. 18) (pages referred to as "Br__") for a statement of Appellant's arguments thereagainst.

OPINION

Obviousness

The Examiner has properly interpreted the terms "one-piece integrally formed unit" (claim 11) and "one-piece integrally formed unitary element" (claim 19) to require a

monolithic construction. See In re Morris, 127 F.3d 1048, 1055, 44 USPQ2d 1023, 1029 (Fed. Cir. 1997) (the term "integral" covers more than a unitary construction); In re Miskinyar, 28 USPQ 1789, 1789 (Fed. Cir. 1993) (unpublished) ("In this case, the drawings show that the term 'one-piece' means a single unit of material and excludes separate but joined elements."). Thus, it is the terms "one-piece" and "unitary" that requires a monolithic construction, not the term "integrally formed." Appellant's arguments about an "integral" or "integrated" construction are interpreted to refer to the unitary or monolithic structure of the rotor and sleeve.

The primary references to Jabbari, Stefansky, Simazu, and MacLeod (figure 5) all disclose fixed spindle disk drive units having a one-piece integrally formed rotor and sleeve portion. From the grouping of claims, it is clear that Jabbari, Stefansky, and Simazu are also cited to show the outer-rotor arrangement of yoke, yoke holder, and magnets recited in claims 12 and 13 (which arrangement is admitted to be prior art in Appellant's figure 12) and MacLeod is cited to show a generic motor arrangement recited in claim 12 or an outer-

rotor arrangement as recited in claims 14 and 15. All primary references disclose a pair of ball bearing units including inner and outer races mounted between the spindle and the sleeve having inner and outer races. Thus, first, none of these references discloses that the sleeve mounting the bearings includes a pair of ball-running grooves to eliminate the outer races of the ball bearings. Second, none of the primary references discloses that the spindle is a stepped shaft. The Examiner relies on Voll and Fruge for these two differences.

Voll discloses a rotating spindle disk drive unit wherein a fixed one-piece outer bush 4 has a pair of ball-running grooves, eliminating the ball bearing outer races. The spindle 1 is a stepped shaft where the large-diameter shaft portion has a ball-running groove on the outer peripheral surface, eliminating the inner race for one set of ball bearings. The small-diameter shaft portion has an inner race mounted on it and the second set of ball bearings are disposed between the inner race and the ball-running groove of the outer bush 4. Voll discloses (translation, pages 4-5): "The elimination of an inner raceway and the one-piece form of the

outer bush which also allows a smaller housing design cause a large space savings. . . . The elimination on inner and outer bushes in addition causes a higher positioning exactness since individual seating locations with their tolerance are eliminated. The one-piece outer bush also makes certain housing segments no long [sic] required." Voll further discloses (translation, page 6): "Further advantages of the spindle in accordance with the invention consist of, because of the low number of parts, a costwise and economically favorable design being present that also allows a more simple assembly during manufacture or in the case of repair." We recognize that Appellant did not have a copy of the translation in preparing the Brief, so we rely just on the drawings and the English language abstract.

Fruge discloses a disk drive spindle for a disk drive unit having a fixed spindle shaft 28 and a pair of ball bearing sets mounted in a cartridge bearing assembly. Fruge discloses in the background (col. 1, lines 21-26): "Some spindles use cartridge bearing assemblies, that is, bearing assemblies in which the outer races of the individual bearings are formed (such as by machining) in a single sleeve. In

others, the outer races of the individual bearings are formed in separate rings that are axially separated by a spacer." Cartridge bearings have several advantages over individual, spacer separated bearing rings (col. 1, lines 53-65). The hub 22 is heated to expand the opening 62 and assembled over sleeve 36 of the cartridge bearing assembly 34 to form a shrink fit. Fruge has a stepped shaft where the large-diameter shaft portion has a ball-running groove, race 50, on the outer peripheral surface, eliminating the inner race for one set of ball bearings. The small-diameter shaft portion has an inner race 52 mounted on it and the second set of ball bearings are disposed between the inner race and the ball-running groove 42 of the sleeve 36. Fruge discloses that the shaft 28 and stator mount cup, which are mounted by heat shrinking, "could be formed with as monolithic (i.e., integral) structure from a single piece of material" (col. 9, lines 25-26).

The Examiner concludes as to the stepped shaft difference that it would have been obvious to use a stepped shaft in any of the primary references "because the stepped shaft allows for precise alignment of the bearings" (FR4; FR5).

Appellant argues that the Examiner's rationale is hindsight because nothing in the prior art suggests that precise alignment results from the use of a stepped shaft (Br21). We do not find any teaching in Fruge or the English language abstract of Voll that a stepped shaft allows for precise alignment. It would be best if examiners refrained from making up reasons to combine that are not supported by the record or are only found in an applicant's disclosure because this points to hindsight analysis. In our opinion, sufficient motivation for one of ordinary skill in the disk drive art to use a stepped shaft spindle to mount a rotor is found in the express disclosure in Voll and Fruge that a stepped shaft spindle is one known structure to mount a rotor. That is, it would have been within the level of skill of one of ordinary skill in the art to substitute any known spindle mounting for the spindle mountings in the primary references.

In addition, we find that one of ordinary skill in the art would have had sufficient knowledge to recognize the advantages of a stepped shaft in Fruge and Voll from the drawings without any express description. Fruge does not describe any advantages, perhaps because they were so well

known in the art. The translation of Voll describes that the elimination of inner and outer races "causes a higher positioning exactness since individual seating locations with their tolerance are eliminated" (translation, page 5, lines 4-5), which sounds very much like the Examiner's reasoning of allowing precise alignment. Voll also discloses that elimination of the inner race by putting a groove on the spindle allows the spindle to be thicker (translation, pages 4-5). Thus, Voll expressly discloses advantages for a stepped shaft that provide express motivation for use in a compact disk drive. We do not rely on the translation in Voll because it was not relied on during prosecution. Nevertheless, we maintain that one of ordinary skill in the art of designing disk drives would have been motivated to use a stepped shaft spindle because he or she would have had a sufficient level of skill to recognize the advantages of a stepped shaft from the drawings in Voll and Fruge. The fact that Voll is a rotating spindle drive rather than a fixed spindle drive as claimed does not lessen the obviousness of using a stepped shaft spindle.

The Examiner concludes as to the one-piece sleeve-rotor structure with ball-running grooves on the sleeve that it would have been obvious to put ball-running grooves in the one-piece sleeve-rotor of Jabbari, Stefansky, Simazu, or MacLeod "because doing this would simplify the manufacturing process, create less parts, and still reliably rotate the rotor" (EA5; EA6).

Appellant argues that there is no basis for suggesting that it would have been obvious to modify Jabbari, Stefansky, Simazu, or MacLeod to attain the claimed structure by eliminating an outer ring and by providing ball running grooves in the sleeve surface of a unitary rotor and sleeve. It is argued that Voll and Fruge fail to show a unitary rotor-sleeve structure (Br16).

The primary references to Jabbari, Stefansky, Simazu, and MacLeod all disclose fixed spindle disk drive units having a one-piece integrally formed rotor and sleeve portion. The arrangement of a stepped shaft spindle and a sleeve having a pair of ball-running grooves where the large-diameter shaft portion has a ball-running groove on the outer peripheral surface and the small-diameter shaft portion has an inner

race mounted on it is shown in both Voll and Fruge. What is missing is some teaching or suggestion that the sleeve having the ball-running grooves could be formed as one-piece with the rotor.

Both Voll and Fruge show a bearing cartridge having a sleeve that is mounted into the rotor by shrink-fit (e.g., Fruge, col. 5, lines 8-20) or adhesive (e.g., Fruge, col. 9, lines 31-33) or mounted into the stationary housing 5 (Voll). The sleeves in Voll and Fruge are strong enough that they do not need to be surrounded by a sleeve; e.g., the sleeve 36 in Fruge is supported only at its top half by the hub 22 and the sleeve 6 in Voll is supported only at its bottom half by the axial section 5' of housing 5. Thus, the sleeves are structural and more than just a common outer race which must be supported by a sleeve. The sleeves in both Voll and Fruge are clearly intended to be rigidly connected and made integral with the housing (Voll) or the rotor (Fruge). There is a teaching in Fruge that the shaft 28 and stator mount cup, which are mounted by heat shrinking, "could be formed with as monolithic (i.e., integral) structure from a single piece of material" (col. 9, lines 25-26), which indicates that one of

ordinary skill in the art would have known to make separate pieces as a unitary element. However, there is no express teaching to form a sleeve with ball-running grooves and the rotor as a unitary structure. "The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." In re Fritch, 972 F.2d 1260, 1266, 23 USPQ2d 1780, 1783-84 (Fed. Cir. 1992), citing In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984). The teachings of Voll and Fruge would have suggested only that a cartridge assembly be mounted in the sleeves of the primary references. Therefore, we conclude that the Examiner has failed to establish a prima facie case of obviousness with respect to independent claims 11 and 19. Dependent claims 12-18 fall with claim 11. The rejections of claims 11-19 are reversed.

Although we have reversed the rejection of all claims, we have some comments on Appellant's other arguments regarding the dependent claims.

Appellant argues (e.g. Br18) that the Examiner failed to identify any teaching of positioning of the magnets and yokes,

but merely provided an unsupported conclusion that "the prior art does teach the particular claimed positions of the magnets and yokes as set forth in the rejections" (FR7). It is argued (Br31): "The Final Action has not identified any prior art describing the structure of claims 12-15 and 17-18, thus failing to provide any support for a conclusion of obviousness of the structure recited therein over the applied art and failing to establish even prima facie obviousness."

Stefansky, figure 1, Fruge, figure 2, and Simazu, figures 1 and 8, disclose the arrangement of yoke, yoke holder, magnets, and rotor flange as recited in generic claim 12 and, specifically, the outer-rotor arrangement of claim 13. This outer-rotor arrangement is also admitted to be prior art in Appellant's figure 12. Although it would have been far better if the Examiner had specifically addressed how the references disclosed the claimed arrangement, the teachings are so plain that Appellant cannot profess ignorance of how the references are intended to be applied to meet the claims. We do find, however, that the yoke holder (stator support 7) in Jabbari, figure 2, is not "concentrically surrounding said sleeve

portion" as recited in claim 12 and shown by element 2 in Appellant's figure 2.

MacLeod, figure 5, discloses the arrangement of yoke, yoke holder, and magnets recited in generic claim 12 and the inner-rotor arrangement of claims 14 and 15. Again, although it would have been far better if the Examiner had specifically addressed how the references disclosed the claimed arrangement, the teachings are self-evident.

Appellant argues that the Examiner has failed to address the molded limitation of claims 17 and 18 (Br30-31). We agree. It is not known what teachings in the references the Examiner relies on for these limitations. We find that Simazu discloses that most of the embodiments have a rotor casing and hub that are "integrally molded" (col. 5, line 17); however, this teaching is not pointed out and, in any case, is only applicable to the rejection of Simazu over Voll and Fruge.

Recommendation

In the Final Rejection (FR6, second-to-last line), the Examiner refers to Hishida et al. (Hishida), U.S. Patent 5,045,738, issued September 3, 1991, as showing a sleeve

portion with ball-running grooves cut into the sleeve. Appellant argues that Hishida is "not applied in the rejection and thus cannot be considered unless prosecution is reopened" (emphasis omitted) (Br12); see also Br17. Hishida is not part of the rejection and cannot be considered. See In re Hoch, 428 F.2d 1341, 1342 n.3, 166 USPQ 406, 407 n.3 (CCPA 1970) ("Where a reference is relied on to support a rejection, whether or not in a 'minor capacity,' there would appear to be no excuse for not positively including the reference in the statement of the rejection."). Introducing references through the "backdoor" is improper.

Nevertheless, we recommend that the Examiner consider entering a new rejection using Hishida. Hishida, figure 1, expressly discloses a one-piece integrally formed rotary member 6 having rotor and sleeve portions where the sleeve has a pair of ball-running grooves therein to act as outer races. This is the teaching missing from the rejections on appeal. Hishida, figure 10, also discloses an embodiment where a bearing unit 316 has a sleeve member 318 which is secured to the rotary member. Thus, Hishida would have taught one of ordinary skill in the art that the sleeve forming the outer

races for the bearings can be either a separate piece secured to the rotary member (figure 10) or formed as one piece with the rotary member (figure 1). Thus, Hishida provides a teaching that the sleeve and rotor of Fruge, for example, can be made unitary.

CONCLUSION

The rejections of claims 11-19 are reversed.

REVERSED

KENNETH W. HAIRSTON Administrative Patent Judge	)
LEE E. BARRETT Administrative Patent Judge	) BOARD OF PATENT APPEALS AND INTERFERENCES
JOSEPH L. DIXON Administrative Patent Judge	)

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