File
dal

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opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.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. 12

UNITED STATES PATENT AND TRADEMARK OFFICE

MAILED

JUN 24 1996

PAT.&T.M. OFFICE
BOARD OF PATENT APPEALS
AND INTERFERENCES

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DOUGLAS D. MOSELEY
and JAMES W. BURBICK

Appeal No. 96-0152
Application 08/170,950[1]

ON BRIEF

Before STONER, *Chief Administrative Patent Judge*, and ABRAMS and STAAB, *Administrative Patent Judges*.

ABRAMS, *Administrative Patent Judge*.

DECISION ON APPEAL

This is an appeal from the decision of the examiner finally rejecting claims 1, 3 and 6 through 26, which constitute all of the claims remaining of record in the application.

[1] Application for patent filed December 21, 1993

The appellants' invention is directed to a disc brake for aircraft. The subject matter before us on appeal is illustrated by reference to claim 1, which reads as follows:

1. A brake disk for an aircraft multi-disk brake assembly, the brake disk having opposing parallel planar brake wear faces for engagement with associated brake wear faces of other disks of the assembly and comprised of a densified carbon composite material having a specific volume of a phase change material encapsulated in axially oriented cavities within a central core portion and completely internally within the composite material between the brake wear faces, said phase change material comprising 10%-95% of the available volume space within the central core portion between parallel brake wear faces and the arrangement of said cavities defines a structural configuration for maintaining the strength integrity of the brake disk and said core portion includes a means for containing and maintaining the distribution of the phase change material to increase heat energy conduction into the phase change material for enhanced heat energy absorption in the operation of the brake disk.

THE REFERENCES

The references relied upon by the examiner to support the final rejection are:

Scruggs *et al.* (Scruggs)	3,188,961	Jun. 15, 1965
Snyder *et al.* (Snyder)	5,143,184	Sep. 1, 1992
Bailey (British Patent Specification)	1,096,633	Dec. 29, 1967

THE REJECTION

Claims 1, 3 and 6 through 26 stand rejected under 35 U.S.C. § 103 as being unpatentable over Bailey in view of Snyder and Scruggs.

The rejection is explained in the Examiner's Answer.

The opposing viewpoints of the appellants are set forth in the Appeal Brief.

OPINION

After consideration of the positions and arguments presented by both the examiner and the appellants, we have arrived at the following decisions:

(1) The rejection of claims 1, 3, 6 through 13, 17, 18 and 23 through 26 is not sustained.

(2) The rejection of claims 14 through 16 and 19 through 22 is sustained.

Before explaining the reasons for these actions, we wish to point out that the initial burden of establishing a basis for denying patentability to a claimed invention rests upon the examiner. See *In re Piasecki*, 745 F.2d 1468, 1472, 223 USPQ 785, 788 (Fed. Cir. 1984). The question under 35 U.S.C. § 103, which is the basis upon which all of the present claims were rejected, is not merely what the references expressly teach, however, but what they would have suggested to one of ordinary skill in the art at the time the invention was made. See *Merck & Co., Inc. v. Biocraft Laboratories, Inc.*, 874 F.2d 804, 807, 10 USPQ2d 1843, 1846 (Fed. Cir. 1989) and *In re Keller*, 642 F.2d 413, 414, 208 USPQ 871 (CCPA 1981). While there must be some suggestion or

motivation for one of ordinary skill in the art to combine the teachings of references, it is not necessary that such be found within the four corners of the references themselves; a conclusion of obviousness may be made from common knowledge and common sense of the person of ordinary skill in the art without any specific hint or suggestion in a particular reference. See *In re Bozek*, 416 F.2d 1385, 1390, 163 USPQ 545, 549 (CCPA 1969).

In the opening pages of the specification, the appellants have described their inventive contribution as providing a disk for a multi-disk brake comprised of a carbon composite material having at least one particularly configured cavity within the body of composite material adapted to hold a specific volume of phase change material which functions to absorb large quantities of heat. The invention is particularly suited to applications such as aircraft, where short bursts of hard braking are generated.

Independent claim 1 sets forth the invention as a brake disk having opposed parallel planar brake wear faces comprised of a densified carbon composite material having a specific volume of a phase change material encapsulated in axially oriented cavities within a central core portion located between the brake faces. The phase change material comprises 10 to 95 percent of the available volume space within the central core portion and the

arrangement of the cavities defines a structural configuration for maintaining the strength integrity of the brake disk. The core portion also includes

> a means for containing and maintaining the distribution of the phase change material to increase heat energy conduction into the phase change material for enhanced heat energy absorption in the operation of the brake disk.

The examiner has rejected this claim as being unpatentable over the combined teachings of the three references. According to the examiner, the claimed invention differs from Bailey "only in the type of material forming the disc and the intended use in an aircraft multi-disc brake" (Answer, page 3). The examiner finds the type of material claimed to have been obvious in view of Snyder, and in Scruggs the use of such along with phase change material in an aircraft multi-disk brake structure (Answer, page 4).

In the Bailey arrangement the disk contains a quantity of phase change material encapsulated in a plurality of cavities (9) within a central core portion of the disk by walls (3, 5, 7 and 13). Bailey does not show additional structure comprising the claimed "means for containing and maintaining the distribution of the phase change material." According to the examiner, this is taught by Scruggs in the form of "plates 70 and rings 66 and 68" (Answer, page 5), but the examiner has not explained how this

structure, which from our perspective merely comprises Scruggs' encapsulation cavity, would have been incorporated into the Bailey disk.

Moreover, the examiner has not considered the guidance our reviewing court has provided that "means-plus-function" language be construed in accordance with the sixth paragraph of 35 U.S.C. § 112 as being limited to the elements disclosed in the appellants' specification and the equivalents thereof. *In re Donaldson Co.*, 16 F.3d 1189, 1193, 29 USPQ2d 1845, 1848 (Fed. Cir. 1994). On page 16 of their specification, the appellants have stated that an even distribution of the phase change material, and an increase in heat transfer thereto, is achieved within each of the containment cavities "preferably" by "a honeycomb type structure which also provides some structural integrity of the brake disk in the areas of the cavities." Reference then is made in lines 22 through 27 to Figure 7 where

> a containment mechanism 60 may be provided which is shaped to conform to the annular cavity shape. The containment mechanism 60 may comprise any type of high strength carbon matrix material and/or honeycomb type structure and its interstices are filled with the proper volume of phase change material.

Applying the *Donaldson* principle, from this explanation in the specification we conclude that the claimed "means for containing and maintaining" should be interpreted as encompassing a matrix or honeycomb type structure or equivalent which is located within

the confines of the cavities. Nothing even remotely resembling such structure is present in any of the applied references. This being the case, the references fail to establish a *prima facie* case of obviousness with respect to the subject matter of claim 1, and the rejection cannot be sustained. See *In re Fine*, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598-1599 (Fed. Cir. 1988). It follows that the rejection of claims 3 and 6 through 13, which depend from claim 1, also cannot be sustained.

Independent claim 14 does not contain the limitation discussed immediately above with regard to claim 1, which we determined was not present in the combined teachings of the three applied references. Claim 14 describes the invention as an improvement in disk brakes of the multi-disk type having rotors and stators which effect braking by frictional contact of their brake faces "which are defined by the outside diameter 'D1' of the stator disks and an inside bore diameter 'D3' of the rotor disks." The improvement relates to "both stator and/or rotor disks" and comprises a central core of densified carbon composite material having a plurality of cavities within the brake wear area defined as "D1-D3," a "specific volume" of granulated phase change material contained in each cavity, and a brake wear disk of densified carbon composite material on either side of the cavities to effect encapsulation of the phase change material.

Bailey discloses a rotor disk having a central core within which are located a plurality of cavities (9) configured axially within the annular brake wear surface defined by the rotor and the stator elements, the latter not being shown. Each cavity contains a phase change material which cools the disks. While not shown or described in the reference, it is our view that one of ordinary skill in the art would have recognized that the Bailey disk has two oppositely oriented braking surfaces (5 and 7), which would be engaged by cooperating braking surfaces on stators. Bailey states that each cavity is "filled" with a phase change material (page 1, line 57), and in the absence of evidence to the contrary, it is our conclusion that to "fill" a cavity is to place a "specific volume" therein, which is all that the claim requires, and therefore Bailey meets this limitation of the claim. In this regard, we point out that the pending claims in an application must be interpreted as broadly as their terms reasonably allow, without reading any limitations from the specification into the claims. See *In re Zletz*, 893 F.2d 319, 321, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989).

We further conclude, again in the absence of evidence to the contrary, that one of ordinary skill in the art would have recognized that the Bailey cavities are placed within the annular brake wear face area, in view of the showings in the drawings,

for to do otherwise would be to locate the phase change material at a point other than that at which it is directly exposed to the heat generated by braking and can accomplish the objectives of the patent.

Bailey fails to teach that the central core and the brake wear face of the disk are made of carbon composite and that the phase change material is finely granulated. Since Bailey is not directed to a multi-disk brake, Bailey also does not explicitly relate the placement of the cavities to diameters D1 and D3, a situation with which we will deal below.

Bailey makes no mention of a particular material for making the disk, however, according to Snyder, the use of carbon composite material for both the rotor and the stator disks of multi-disk stacked aircraft brakes is "well-known" (column 1, lines 11 through 16). It therefore is our view that one of ordinary skill in the art would have found it obvious to manufacture the brake disk of Bailey of carbon composite material, for the self-evident advantages thereof, which would have been known to the artisan, who is presumed to have skill, rather than the lack thereof. *In re Sovish*, 769 F.2d 738, 742, 226 USPQ 771, 774 (Fed. Cir. 1985). We also point out that the

appellants have acknowledged on page 2 of their specification that the use of carbon composite material in brake disks was known at the time of their invention.

Bailey describes the phase change material as being "solid at atmospheric temperatures but which is a fluid at working temperatures of the disc" (page 1, lines 17 through 19). The appellants state on page 15 of their specification that

> [i]t will be recognized by those persons who are knowledgeable of phase change materials that expansion of the material must be allowed within the cavities 40. Thus, it was to be determined that a void fraction should exist with respect to the total cavity capacity so as to accommodate phase change material expansion.

It therefore is our opinion that one of ordinary skill in the art would have found it obvious to provide the "solid" phase change material in finely granulated form for the self evident advantage thereof, that is, to facilitate placing the desired amount in each of the cavities. It also would have been obvious to have provided less than the maximum amount in each cavity, as has been admitted by the appellant in the statement quoted above.

The use of multi-disk stacks of frictional braking disks arranged as rotors and stators in aircraft wheel and brake assemblies, as set out in the preamble to claim 14, is taught in both Snyder and Scruggs. We also note in this regard that the appellants have presented their invention in the opening sentence of the specification as pertaining to "[a]n improvement in"

aircraft multi-disk stacked brake assemblies, which we take as an acknowledgment that such assemblies were known at the time of their invention. It is basic to the operation of this type of braking assembly that there be frictional contact surfaces defined by the overlapping portions of the rotors and stators. As shown in Scruggs, these can be defined by the outside diameter of the stator disk (48, 62) and the inside bore diameter of the rotor disks (42). The same applies in Snyder, with rotor disks (110) and stator disks (112). As we stated above, the presence of overlapping frictional contact surfaces also is essential to the operation of the Bailey brake.

With regard to the placement of the phase change material between the diameters D1 and D2, we first draw attention to the fact that Scruggs teaches that a large amount of heat can be generated in multi-disk brake assemblies in aircraft, and that cooling of these components can be accomplished by the incorporation into the brake assemblies at suitable locations of cavities containing phase change materials (column 1, Figure 2). In Scruggs, each rotor disk has a braking surface on only one side, and a pair of oppositely oriented rotor disks is placed

between each pair of stator disks. Interposed between the pair of oppositely oriented rotor disks, and rotating with the rotor disks, is a heat absorbing element (64) containing phase change material (72). See column 5, line 19 *et seq*. Thus, Scruggs teaches placing phase change material in cavities interposed between oppositely oriented brake wear surfaces, although each wear surface is located on a separate rotor disk rather than in a single disk with wear surfaces on both sides.

Although not illustrated in Bailey, one of ordinary skill in the art would have known that a pair of stators, such as pads, each containing a brake wear surface, would in use be positioned outboard of the rotor disk and would engage the outer surfaces of the disk on surfaces 5 and 7, which flank the cavity containing the phase change material. From the teachings of these two references, it is our opinion that it would have been obvious to one of ordinary skill in the art to locate the cavities containing the phase change material in the brake wear area defined by the outside diameter D1 of the stator disks and the inside bore diameter D3 of the rotor disks, for such would be the position to most efficiently absorb the heat generated at the braking surfaces, which is, of course, the objective of the references.

Therefore, from our perspective, the combined teachings of the references would have suggested to one of ordinary skill in the art not only the structure required by the body of claim 14, but also the use of the disk disclosed in Bailey in a multi-disk stack type of aircraft braking system, which is the environment established in the preamble of the claim. Thus, it is our view that the rejection of claim 14 should be sustained.

The rejection of claim 15 also is sustained, for it is clear to us that the phase change material of the Bailey disk falls within the claimed 10 to 95 percent of the available volume space within the annular brake wear area.

Claim 16 adds the requirement that the cavities be in an arrangement which defines a "truss structural configuration" within the central core. The common engineering definition of truss is a structural frame usually based on the geometric rigidity of the triangle and composed of straight members subject to longitudinal compression, tension, or both, so disposed as to function as a beam (see, for example, *The Random House College Dictionary, Revised Edition,* 1980, page 1411). Such a

construction is presented in Figure 4 of Bailey, wherein the walls defining the cavity comprise a triangular frame within the central core. The rejection of claim 16 is sustained.

The honeycomb-configured mechanism added to claim 16 by claim 17 is not taught by the references, nor is the plurality of geometric shapes added to claim 16 by claim 18. This forms the basis for not sustaining the rejection of these two claims.

The appellant has chosen not to challenge with any reasonable specificity before this Board the rejection of dependent claims 19 trough 22. Therefore, they are grouped with independent claim 14, from which they depend, and fall therewith. See *In re Nielson*, 816 F.2d 1567, 1572, 2 USPQ2d 1525, 1528 (Fed. Cir. 1987).

Claim 23 adds to claim 14 the requirement that the plurality of cavities each comprise a small diameter drilled bore and the bores are arranged to define a truss structural configuration within the brake wear area. This is not taught by the applied references, and compels us not to sustain the rejection.

Independent claim 24 is directed to an improvement in brake disks. It includes the requirement that there be a central core defined by inner and outer rings and having an intermediate ring comprised of a low density and high strength matrix material. The claim further recites a phase change material vapor-deposited on and within the interstices of the matrix material, and a wear face disk of carbon composite on either side of the central core to effect encapsulation of the matrix material. Such structure clearly is not taught by the references applied, and thus a *prima facie* case of obviousness is lacking here and the rejection cannot be sustained. This applies also to dependent claims 25 and 26.

We have, of course, carefully considered all of the arguments presented by the appellants. However, as to those rejections which we have sustained, these arguments have not convinced us that the decision of the examiner was in error. Our position with regard to the various arguments should be apparent from the comments we have made regarding each of the rejections. In addition, we wish to point out that attacking the showings in

individual references is not persuasive argument when, as here, the rejection is based upon a combination of references. See *In re Young*, 403 F.2d 754,757, 159 USPQ 725,728 (CCPA 1968).

The decision of the examiner is affirmed-in-part.

AFFIRMED-IN-PART

BRUCE H. STONER, JR.
Chief Administrative Patent Judge

NEAL E. ABRAMS
Administrative Patent Judge

LAWRENCE J. STAAB
Administrative Patent Judge

BOARD OF PATENT APPEALS AND INTERFERENCES

Germain Patent Services
756 Deerwood Drive
Taloladge, OH 44278-2012