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D E C I S I O N
of 21 February 1994

Case Number: T 0651/92 - 3.4.2

Application Number: 87850372.1

Publication Number: 0277469

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Title of invention:
Projector apparatus

Applicant:
Optica Nova ONAB AB

Opponent:
-

Headword:
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Relevant legal norms:
EPC Art. 56

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"Inventive step (no)"

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Case Number: T 0651/92 - 3.4.2

D E C I S I O N
of the Technical Board of Appeal 3.4.2
of 21 February 1994

Appellant: Optica Nova ONAB AB
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Decision under appeal: **Decision of the Examining Division of the European Patent Office dated 10 March 1992 refusing European patent application No. 87 850 372.1 pursuant to Article 97(1) EPC.**

Composition of the Board:

Chairman: E. Turrini
Members: W.W.G. Hofmann
L.C. Mancini

Summary of Facts and Submissions

I. The Appellant (Applicant) lodged an appeal against the decision of the Examining Division to refuse the application No. 87 850 372.1 (publication No. 0 277 469).

The Examining Division had expressed the view that the application did not meet the requirements of Articles 52(1) and 56 EPC, having regard to the following documents

(D1) CH-A-607 652,
(D2) DE-C-1 153 915,
(D3) DE-A-34 43 356 and
(D4) Patent Abstracts of Japan, Vol. 4, No. 100 (P-19)(582).

II. In a communication, the Board also mentioned

(D5) EP-A-0 115 900

which had already been cited in the European search report.

III. The Appellant implicitly requested that the decision under appeal be set aside and a patent granted on the basis of the following documents (which had already been the basis for the decision of the Examining Division):

Description: pages 1, 3 to 11, filed with the letter of 12 August 1991,
page 2, filed with the letter of 23 October 1991;

Claims: 1 to 8, filed with the letter of 23 October 1991;

Drawings: Figures 1 to 6 as originally filed.

IV. The wording of Claim 1 according to the single request on file at the time of the decision reads as follows:

"Projection apparatus including a projection head (7) comprising a projection lens and, in the case of an overhead projector apparatus, deflecting means, and a projection stage aperture (5) for an object, the image of which is to be projected, the stage aperture being placed in the ray path between at least one light source (1) and the projection head (7) and defining a stage aperture plane, at leat one ellipsoidal mirror (4) being situated in the ray path between the light source (1) and the aperture (5), one focal point of each ellipsoidal mirror (4) substantially coinciding with the light source (1), the other focal point of each ellipsoidal mirror (4) substantially coinciding with the projection head (7),
characterized in that the projection onto the stage aperture plane of either the centre of the deflecting means, in the case of an overhead projector apparatus, or the centre of a projection lens, in the case of a projection apparatus without deflecting means, is either on an edge of said aperture or spaced from an edge of said aperture by not more than ¼ of the width of the aperture."

Claims 2 to 8 are dependent on Claim 1.

V. The Appellant essentially argued as follows:

D1 does not represent the prior art from which the person skilled in the art would start to come to the

present invention since it relates to a "straight" projector and thus does not even address the projector type of interest. In such a "straight" projector, the problem of unsatisfactory image quality does not arise. Therefore, an inventor having said problem, would have no motive to take up D1 for consideration.

The parallel displacing projectors described in D2 to D5 all use Fresnel lenses for focusing the light into the projection lens. Such Fresnel lenses produce unacceptable glare, spread the colours of the remaining light and produce a ring pattern in the projected image. There is no reason for the skilled person to pick among the existing "straight" projector constructions precisely D1, apply thereto the formula of parallel displacement according to D2 to D5 and not use the Fresnel lens shape of D2 to D5. The study of D2 to D5 does not provide any indication that there is an advantageous solution to the problem of how to transform a "straight" projector into a parallel displacement projector. Moreover, in D1, simply displacing the projection head would not be possible since the projection head must remain in the focal point of the ellipsoid.

In addition, the fact that D1 was published in 1978, and nevertheless in 1984 parallel displacement projectors including Fresnel lenses were still conceived (D3 and D5), points to the non-obviousness of such a combination.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

2.1 D1 (cf. in particular the abstract; Claim 1; page 2, right-hand column, lines 25 to 47; Figures 1 and 2) discloses a projection apparatus, in particular an overhead projector apparatus. This known projector has all the features specified in the pre-characterising portion of Claim 1, i.e. in particular a projection head including a projection lens, deflecting means, a projection stage aperture in the ray path between the light source and the projection head, and an ellipsoidal mirror situated in the ray path between the light source and the aperture, one focal point of the ellipsoidal mirror substantially coinciding with the light source and the other focal point of the ellipsoidal mirror substantially coinciding with the projection head.

The subject-matter of Claim 1 is distinguished from this apparatus by the fact that the projection onto the stage aperture plane of the centre of the deflecting means is not in the centre of the aperture, but on an edge thereof or spaced from said edge by not more than quarter of the width of the aperture.

2.2 Each one of D2 to D5 (cf. in particular the Figures) describes an overhead projector including a projection lens in a projection head, deflecting means, and a projection stage aperture in the ray path between the light source and the projection head, wherein the projection onto the stage aperture plane of the centre of the deflecting means is shifted towards the edge of the aperture. Although no quantitative data are given in the text, the figures indicate (cf. Figure 1 in D2, Figures 1 to 3 in D3, the lower figure in D4 (number 11 indicating the aperture), Figure 3A in D5) that the said projection of the deflection means is spaced from an

edge of the aperture by not more than quarter of the width of the aperture.

Neither one of D2 to D5 mentions an ellipsoidal mirror in the ray path between the light source and the aperture.

2.3 Thus, the subject-matter of Claim 1 is new in the sense of Article 54 EPC.

3. *Inventive step*

3.1 The Appellant contests the view of the Examining Division which - for assessing inventive step - considered D1 as the closest starting point for the person skilled in the art. The Appellant rather considers D4 as the closest document.

Both documents relate to overhead projectors, i.e. to the general type of apparatus claimed in the present application. Of the specific problems mentioned in the present application (cf. column 1, lines 16 to 51 of the published application), D1 solves the one part (to avoid: Fresnel structures in the projected image, scattering of light, doubling effects in the image, and colour aberrations (as far as they might occur in a "straight" projector)) by providing an ellipsoidal mirror for focusing the light source into the projection head, and D4, in addition to also avoiding doubling effects, solves the other part (to move the projected image upwards without distortion) by positioning the deflecting means so that the projection of its centre onto the stage aperture plane is close to the edge of the aperture. In the view of the Board, the construction of the illumination system with an ellipsoidal focusing mirror is somewhat more determining for the basic design of the projection apparatus than a shifted projection

head. Therefore, the Board considers D1 as the closest prior art document. However, this question is not of particular importance since, as will appear from the considerations to follow, both lines of thought, whether starting from D1 or D4, lead to the same result.

3.2 Since the ellipsoidal mirror illumination system according to D1 does not contain a Fresnel lens and illuminates the stage aperture from below, it is immediately evident (although not expressly stated) that in this known apparatus the disadvantages related to Fresnel lenses, i.e. in particular the ring structure in the image and the scattering of light, as well as the doubling effects of the image are already avoided.

The remaining objective problem of the present application therefore concerns the displacement of the projected image in relation to the stage while nevertheless maintaining freedom from image distortions and colour aberrations.

For this very purpose of displacing the projected image without distortions, D4 proposes the solution of positioning the projection lens and the deflecting mirror eccentrically above the stage (a similar teaching is contained in each one of documents D2, D3 and D5). It was therefore obvious to provide this eccentric position of the projection head also in the apparatus according to D1.

3.3 It is true that the skilled person could not learn from D4 that freedom from colour aberrations could be maintained even in this eccentric arrangement since the Fresnel lens might not be perfect in this respect. However, with an illuminating system as the one according to D1, which does not use a Fresnel lens but solely an ellipsoidal mirror for focusing the

illuminating light, such a problem does not arise. It lies in the nature of improving the teaching of one piece of prior art by means of another prior art teaching that the person skilled in the art tries to combine the teachings in such a way that the specific advantages achieved by the two pieces of prior art are maintained. In the present case, a person trained in optics is able to do so since he can easily associate the differently described features with differently achieved effects. It is clear to him that only the eccentric projection head (and not the Fresnel lens illumination system) is responsible for the distortionless shifted image, and that a mirror (as the one according to D1) principally does not produce colour aberrations, be it in a straight or an inclined optical path. It is therefore obvious to take from D4 only the idea of an eccentric position of the projection head and apply it to the mirror based illumination system according to D1.

It is clear that for the said combination of teachings the condition expressed in D1, that the light source and the projection head should be located in the focal points of the ellipsoid (cf. page 2, right-hand column, lines 25 to 29 and 43 to 45), has to be maintained. Even with an eccentrically displaced projection head, following this condition does not cause any difficulty for the skilled person since he knows from D1 (cf. Figure 2) that the main axis of the ellipsoid does not have to be perpendicular to the stage aperture plane, but may, if necessary, be inclined.

3.4 Doubts may arise whether the Figure of D4 (or the corresponding Figures of D2, D3 or D5) is conclusive enough to establish that - in the sense of Claim 1 - the spacing of the projection of the deflecting means onto the stage aperture plane from the edge of the aperture

is not more than quarter of the width of the aperture. This point is, however, not decisive since once the teaching has been given to choose an eccentric position for the projection head, the precise position required in dependence on the desired displacement of the image can be easily determined. Moreover, as the Examining Division has pointed out, the spacing from the edge of not more than quarter of the width of the aperture has no technical meaning regarding the construction of the optical system since neither the full width of the aperture nor the focal distances are specified in the claim (or in the description), so that the real degree of eccentricity remains undefined.

3.5 Although one non-inventive alternative covered by a claim necessarily renders the claimed subject-matter non-inventive, it should be mentioned that the further alternatives mentioned in Claim 1 are also obvious. The plane mirror forming the deflection means in the projection head does not modify the essence of the optical system. For a projector lacking such a deflection of the optical path, therefore, essentially the same considerations apply as described above. Similarly, the distinction whether the ellipsoidal mirror is one single piece or split up in several pieces corresponding to several light sources is unessential in connection with the claimed principles of optical construction.

3.6 Even if, instead of D1, D4 were considered as the closest prior art and taken as the starting point for the person skilled in the art, the conclusions would be substantially the same.

Since D4 already solves the problem of avoiding doubling effects (which only occur if the object is illuminated from above) and of moving the projected image upwards

without distortions, the remaining objective problem lies in avoiding the Fresnel structure in the projected image, the scattering of light and colour aberrations. Contrary to the argument of the Appellant, the Board is of the opinion that the skilled person would have been aware of the fact that an observed Fresnel structure in the image is caused by the Fresnel illuminating lens and that this Fresnel structure of the lens can also cause scattering of the light. In the view of the Board, moreover, it would have been obvious from the spatial distribution of any colour aberrations in the observed image that these aberrations are also caused by the Fresnel illuminating lens.

Since an ellipsoidal mirror can evidently neither produce Fresnel structures nor colour aberrations, it was obvious to replace the illumination system of D4 by the focusing mirror illumination system according to D1.

3.7 The Appellant referred to the fact that D1 was published in 1978 and that up to 1984 (the filing date of D3 and D5) nevertheless parallel displacement projectors were conceived with Fresnel lens illumination systems, and argued that this fact was indicative of non-obviousness of the idea to combine the features from D1 and either one of D2 to D5. However, there is no evidence that in the years of 1978 to 1984 really an urgent need was felt to abandon the Fresnel lens illumination system. The other known illumination system, based on an ellipsoidal focusing mirror, might well have been considered, but not put into practice for other reasons, be it of commercial or technical nature, in the sense that this system has its own specific disadvantages which have to be taken into account. If such disadvantages exist (the Appellant mentioned costly production), the present subject-matter also does not provide means to eliminate them; and making a decision now to put up with

disadvantages in exchange for the advantages clearly to be expected cannot be considered as involving an inventive step.

3.8 It is thus concluded that the subject-matter of Claim 1 does not involve an inventive step in the sense of Article 56 EPC and that Claim 1 is therefore not allowable (Article 52(1) EPC).

4. In the letter of 8 November 1993, page 5, last paragraph, the Appellant generally expressed his willingness to limit Claim 1 to the embodiment of Claim 8 without, however, filing a formal request or a corresponding new Claim 1.

The embodiment of Claim 8 relates to the feature that the projection head includes a prism for deflecting the projected light. It is true that D1 to D5 do not show prisms but mirrors as deflecting elements in the projection head. Since, however, in optics, totally reflecting prisms are quite generally a well known alternative to plane mirrors as reflecting elements, and no unexpected effect thereof is apparent in the present case, no inventive step can be seen in the said embodiment. The Board, therefore, does not consider it expedient to propose to the Appellant to file a corresponding new Claim 1.

5. The fact that for the feature of dependent Claim 7 (i.e. the arrangement, in the projection stage aperture, of a sheet or plate of material having a light transmission substantially adjusted to the distribution of light from the light source) no documents have been cited in the European search report, has been mentioned in the communication of the Board. The Appellant, however, took no account of this comment.

6. A substantially horizontal orientation of the aperture plane and a generally horizontal direction of the projected light after deflection (Claim 2) is known from each one of documents D1 to D5.

A position of the projection head next to the "foremost" border of the aperture (Claim 5) is known from each one of documents D2 to D5, while the opposite position (requiring an image inverting means) (Claim 6) is an obvious alternative. A substantially vertical orientation of the aperture and the screen (Claims 3 and 4) is the usual arrangement in conventional projection apparatuses. Where the apparatus is located (near the ceiling or near the floor) and in which orientation (projection head up or down), is not a feature of the claimed apparatus.

Thus, the Board cannot see inventive features in any one of these dependent claims.

Order

For these reasons, it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

P. Martorana E. Turrini