BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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File No.: T 0440/90 - 3.2.4

Application No.: 82 107 335.0

Publication No.: 0 072 981

Classification: B65H 3/06

Title of invention: Sheet feeding device

D E C I S I O N
of 28 April 1993

Applicant:

Proprietor of the patent: Hitachi, Ltd.

Opponent: OI) Océ-Nederland B.V., Venlo
OII) Canon Inc.

Headword:

EPC: Art. 56; R. 29(6)

Keyword: "Public prior use (left open)" - "Inventive step (after amendment) yes"

Headnote
Catchwords

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0440/90 - 3.2.4

D E C I S I O N
of the Technical Board of Appeal 3.2.4
of 28 April 1993

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dispatched on 28 March 1990 revoking European patent No. 0 072 981 pursuant to Article 102(1) EPC.**

Composition of the Board:

Chairman: C. Andries
Members: M. Ceyte
M. Lewenton
M. Hatherly
J-C. De Preter

Summary of Facts and Submissions

I. The Appellant is proprietor of European patent No. 0 072 981 (application No. 82 107 335.0) granted on 29 October 1986.

II. The patent was opposed by the Respondents I and II (Opponents I and II) on the grounds of lack of patentability.

The following state of the art was *inter alia* relied upon:

- D23: US-A-3 768 803
- D25: JP-U-55/46492
- D26: US-A-3 949 979
- D27: US-A-3 981 497 (cited in the description of the opposed patent)
- D28: US-A-4 174 102
- Prior use of an optional device called "ADF" (automatic document feeder) for the Canon copying machine NP 8500.

Names of witnesses were cited in support of the alleged prior use.

During oral proceedings held on 6 June 1989, the taking of evidence by hearing two witnesses (Art. 117(1)(d) EPC), who were employees of Canon Inc., took place.

III. In its written decision of revocation dispatched on 28 March 1990, the Opposition Division held that the public prior use was convincingly proven and that the claimed subject-matter lacked an inventive step over this prior use and document D27.

IV. The Appellant (patent proprietor) appealed against the decision on 22 May 1990 and paid the prescribed fee on the same date.

The Statement of Grounds of Appeal was filed on 7 August 1990.

In a communication accompanying the summons to oral proceedings the Board expressed the view that a part of the Appellant's argumentation could be taken into consideration only on condition that the features of Claims 3 and 4 were introduced into Claim 1.

V. At the oral proceedings held on 28 April 1993, the Appellant filed a completely revised description and a set of two amended claims and requested that the decision under appeal be set aside and that the patent be maintained on the basis of these new documents.

Amended Claim 1 is worded as follows:

"A sheet feeding device for separating one sheet at a time from a stack of sheets (1) piled on a sheet feed tray (3) and feeding same to the next processing station, comprising

feeding means (4) comprising pickup rollers in frictional contact with the uppermost sheet (1-a) of the stack of sheets (1) piled on the sheet feed tray (3) for feeding same to separating means (5, 6);
pressing means (2) for forcing the stack of sheets (1) piled on the sheet feed tray (3) against the feeding means (4); and
separating means (5, 6) for offering a reaction force to the sheets (1) fed by the feeding means (4), said separating means (5, 6) comprising a supply roller

(5) and a friction member (6) in pressing contact with the supply roller (5),

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a pressing force W exerted by the pressing means (2) against the feeding means (4) is given by the following formula:

$$W = F_p/\mu p$$

where F_p designates a frictional feeding force acting between the sheets (1-a, 1-b) pressed by said pressing means (2), and μp designates a coefficient of friction between the sheets (1-a, 1-b), and that in a diagram wherein the abscissa represents a distance L between a point (18) at which the feeding means (4) exerts the feeding force on the sheets (1) and a point (19) at which the separating means (5, 6) exerts the reaction force on the sheets (1) and which is the point of contact between the supply roller (5) and the friction member (6) and the ordinate indicates said frictional feeding force F_p, said distance L and said frictional feeding force F_p are located in a range below the curves of figure 6 representing the buckling reaction force P of the separating means (5, 6) in dependence of the thickness of the sheets (1), whereby buckling of the sheets (1) to occur between the feeding means (4) and the separating means (5, 6) during sheet feeding is avoided and whereby said distance L and said frictional feeding force F_p have lower limits that are decided by design."

Claim 2 is dependent on Claim 1.

VI. In support of his request, the Appellant made essentially the following submissions:

(i) the public prior use of an ADF device of Canon has not been convincingly established;

(ii) if such ADF device has been made available to the public before the priority date, it has not been convincingly demonstrated which device was available, i.e. which development stage of the device with which technical specifications;

(iii) even if available to the public, the ADF device is not a sheet feeding of the generic type of Claim 1 where the supply roller and the friction member of the separation means are in pressing contact and where sheets are fed by a pressing force exerted by pressing means against the feedings means which are stationary.

In addition the construction of the ADF device is not suited to establish the criteria of a buckling reaction force P versus the length parameter L as is defined in the present Claim 1 and given in Figure 6 of the patent in suit. In particular a physical quantity such as buckling reaction force would be meaningless in the ADF device since buckling is not a problem there. In the ADF separation means, the reaction force is small due to a mere loose edge contact of the sheet with the separating roller.

The problem of preventing buckling is solved in the printed prior art references in a completely different way compared with the present case. These prior art references could thus not foreshadow the claimed solution.

VII. The above submissions were contested by the Respondents I and II who argued essentially as follows:

As stated in the appealed decision, the distance L in the prior used ADF device, measured between the point at which the feeding means exerts the feeding force on the sheets and the point at which the separating means exerts the reaction force, is 40 mm.

The value of the pressing force (60gf) exerted on the stack of sheets has been determined during the development of the ADF device by the second witness, Mr Hayakawa, by experimentation as being the most appropriate.

Moreover the ADF device is designed to use sheets of paper between 35 and 110g/m^2, that is, according to the definition given in the patent in suit, sheets of between 30 and 95 kg.

The frictional feeding force as calculated from the relationship given in Claim 1 and the measured distance in the ADF device fall clearly within the claimed range.

Furthermore it was possible for any skilled person to open the ADF device without damaging it in order to measure the distance L and the pressing force, since this device was made available to the public.

It is true that the distance L in the ADF device is not constant and may in principle depend on the stack height. The feed tray of the ADF device was nevertheless designed to hold a maximum of 50 sheets, that is to say a height of 4 mm in the case of 64 g/m^2 paper. Thus the influence of the height, which can vary from 0 to 4 mm, on the distance L is quite negligible.

Although the ADF device is not a sheet feeding device of the generic type of Claim 1, where the supply roller and the friction member of the separation means are in pressing contact with each other and where sheets are fed by a pressing force exerted by pressing means against the feeding roller which is stationary, there is no difference in the functioning between the ADF and the claimed sheet feeding device. It is to be noted that these two distinguishing features are known from document D27 cited in the disputed patent.

In document D23 the tray is also forced against the feeding means which is stationary. The sheet feeding device disclosed therein is also intended to solve the problem of sheet buckling or jamming, as is stated *expressis verbis* in column 1, lines 25 to 28. Furthermore this document supplies the teaching that the distance between the feeding means and the separation means and the feeding force are to be adjusted relative to the thickness of the sheets.

Document D28 provides the teaching that the frictional feeding force should be adjusted relative to the thickness of the sheet, to yield a larger force in the case of heavy-weight sheets and a reduced force in the case of light-weight sheets (column 1, lines 50 to 58).

Document D25 teaches that the distance L between the point where a feeding force is exerted on the sheet and the point where a reaction force is applied is to be adjusted relative to the paper thickness in order to avoid buckling.

For the skilled person confronted with the problem of buckling it would be obvious to apply the teachings of documents D23, D28 or D25 which point in the same direction to the known sheet feeding device of document D27 and thus to arrive at the subject-matter of Claim 1.

Reasons for the Decision

1. The Appeal complies with Articles 106 to 108 and Rule 64 EPC and is admissible.

2. *Formal matters*

2.1 There are no formal objections under Article 123(2) EPC to the present Claims 1 and 2 since they are adequately supported by the original disclosure.

The features of present Claim 1 are in essence disclosed in original Claims 1, 5, 6, 7, Figure 6 and the corresponding part of the description.

Claim 2 corresponds to the original Claim 8.

2.2 The present Claim 1 contains all the features of the granted Claim 1, so that Article 123(3) EPC is not contravened.

2.3 Figure 6 shows, as stated in the original disclosure, the results of experiments conducted on the buckling characteristics of sheets in relation to their weight and the distance L between the point (18) at which a feeding force is exerted on the sheet by feeding means and the point (19) at which a separating force is exerted on the sheet by separating means. As those results of experiments are only contained in the original disclosure

by means of the curves of Figure 6, the reference in Claim 1 that "said distance L and said functional feeding force F_p are located in a range below the curves of Figure 6 ..." constitutes an allowable exception to Rule 29(6) EPC which stipulates that the claims must not rely on references to the description or drawings "except where absolutely necessary". Indeed, since the way the curves according to Figure 6 are obtained is clearly described and explained in the description and more particularly in the description of the Figures 4 and 5, and since it is not possible to express by appropriate wording the relevant technical content of the information given by these curves, the Board has no objection under Rule 29(6) EPC to the present version of Claim 1.

3. *Closest prior art*

3.1 The present Claim 1 has been formulated so as to state in its prior art portion all these features of the claimed subject-matter which in combination are known from the Figure 1 device of the disputed patent, which is described in the patent as representing the prior art, and which was acknowledged by the parties as being state of the art in the meaning of Article 54(2) EPC.

3.1.1 In the Board's view, the Figure 1 device is to be considered as the closest prior art, on the basis of which the technical problem to be solved is to be determined.

3.1.2 In comparison with the sheet feeding device of document D27 and the alleged prior use of an ADF device, it is the Figure 1 device which has the most technical features in common with the claimed invention.

As stated in the prior art part of Claim 1, the Figure 1 device comprises:

(i) feeding means having pick up rollers (Ro) in frictional contact with the uppermost sheet (1-a) of the stack of sheets piled on the sheet feed tray (A) for feeding same to separating means (R1, R2);

(ii) pressing means for forcing the stack of sheets piled on the sheet feed tray (A) against the feeding means; and

(iii) separating means (R1, R2) for offering a reaction force to the sheets fed by the feeding means, said separating means comprising a supply roller (R1) and a friction member (R2) in pressing contact with the supply roller.

3.1.3 Although not expressly claimed, the feeding means of the claimed invention as interpreted in the light of the description as laid down in Article 69(1) EPC is to be considered as being stationary, the pressing means being displaced for forcing the stack of sheets piled on the sheet feed tray against the stationary feeding means.

3.1.4 In contrast, in document D27 there is only one pick up roller used as feeding means which is mounted so as to be lifted and dropped from and into engagement with the stack of sheets. There is also in this citation no disclosure of the teaching of the characterising part of Claim 1.

3.1.5 The ADF device does not have any of the afore-mentioned features i), ii) and iii). It comprises only one feeding roller which also serves as pressing means which is forced against the stack of sheets piled on the sheet

feed tray which is fixed. Moreover, the supply rollers and the friction rollers of the separating means in the ADF device are horizontally displaced and overlap vertically. The friction rollers are thus located between the supply rollers, so that they are not in pressing contact with each other.

It is noted that, as substantiated below, the ADF device in no way discloses the whole teaching of the characterising part of Claim 1, that the frictional feeding force, the distance L and the weight of the paper can be brought into a certain relationship and be selected for avoiding buckling of the paper sheets.

3.2 The Figure 1 device was not cited in the opposition proceedings. However, it is the basis for the prior art portion of Claim 1 and forms the basis on which the technical problem set out in the contested patent was formulated. A knowledge of the essential elements of the Figure 1 device is thus a prerequisite for a correct understanding of the claimed invention and for this reason cannot be disregarded when assessing patentability (see decision T 536/88, OJ EPO 1992, 638).

4. *Problem and solution*

4.1 As stated in the disputed patent, the supply roller R1 of the separating means rotates, in the Figure 1 device, clockwise, but the friction member R2 which is in pressing engagement with the supply roller R1 remains stationary or rotates in the reverse direction to separate one sheet from another sheet as they are introduced between the two rollers. Thus the uppermost sheet fed by the pick up rollers RO acting as feeding means moves towards the friction member R2 and the supply roller R1. If the sheet is thick and has high rigidity, the rigidity of the uppermost sheet might overcome the

frictional force of the friction member R2 to allow the leading edge to move forwardly. However if the sheet is thin and has low rigidity the movement of the sheet is prevented because the frictional force of the friction member R2 is too high for the leading edge to move forwardly by overcoming it. Therefore the first sheet buckles and if the pick up rollers RO continue rotating, the trailing end portion of the sheet is moved forwardly until the sheet is warped between the pick up rollers RO and the supply roller R1, resulting in a sheet jamming.

4.2 Thus the technical problem addressed and solved by the subject-matter of Claim 1 is in essence the same as that stated at column 4, lines 3 to 8 of the disputed patent, that is to render the known sheet feeding device capable of accurately separating thin sheets one by one by avoiding buckling or jamming, and this without complicating its mechanism.

4.3 The teaching of the characterising part of Claim 1 provides instructions on the design of a sheet feeding device of the kind defined in the prior art part of Claim 1, that is to say on the selection, dependent on a specific kind of paper, of the constructional distance L and the feeding force F_p (by adjusting the pressing force W), so as to avoid the problem of paper buckling.

5. *Novelty*

It is evident from the statements in section 3.1 above that the device according to Claim 1 is novel vis-à-vis the Figure 1 device representing the closest prior art, the ADF device and the device according to document D27.

The subject-matter of Claim 1 is also not known from the other cited documents (D23, D25, D26 and D28). This is, for example, because none of these publications concerns

a sheet feeding device having the feature iii) (separating means in form of a supply roller and a friction member in pressing contact with the supply roller).

The device according to Claim 1 is therefore new *vis-à-vis* the prior art (Art. 54 EPC).

6. *Inventive step*

6.1 The teaching as defined in the characterising part of Claim 1 is based on the idea that a buckling reaction force P (i.e. the reaction force produced when the buckling phenomenon occurs) can be determined empirically as a function of the constructional distance L and the type of paper, and that these values of P can be brought into relationship with the pressing force W, the distance L and the type of paper, to provide a feeding means in which the resulting frictional force F_p always falls below the determined value of the buckling reactive force.

This teaching is therefore based on the recognition of the importance of the correlation between three parameters (F_p, L, type of paper) in order to avoid buckling or jamming.

6.2 There is no disclosure or suggestion in the ADF device to correlate two design parameters (F_p and L) with a third (type of paper) so as to avoid the problem of buckling.

In the ADF device the parameter of the type of paper is not determinable, since it is an original document feeding device whose feeder is designed to receive original documents from which copies are to be made. Original documents can and do vary widely depending on the user and for each user frequently a large variety of

different "originals" are to be copied, from thin air-mail paper to cardboard. Such original feeders must be designed to receive almost any type of paper of which the user happens to need a copy. This may range from standard 64 g paper to transparencies, high-gloss brochures, thin carbon copy paper etc. and such different originals may also be stacked upon one another. Hence, the ADF device is designed to use essentially undefined types of paper.

6.3 The ADF device furthermore does not disclose or suggest the claimed teaching since in the sheet feeding device of the present invention, the axis of the pick-up roller of the feeding means is fixed and the sheets placed on a tray are forced upwards by pressing means. In contrast thereto the tray in the ADF device is fixed and the pick-up roller is forced downwards on the sheets.

This difference is however important for the functioning of the devices. Indeed, in the claimed sheet feeding device the sheets are fed horizontally at one and the same vertical elevation for every sheet from the top of the stack towards the separating means. Thus the uppermost sheet always hits the friction member at the same position, so that the reaction force P varies for each sheet only with respect to the distance L and the paper weight. This situation was used to establish the curves of Figure 6 to which the present Claim 1 refers.

The situation is completely different in the ADF device, wherein the distance L, which is defined in the claimed invention as being the distance "between a point at which the feeding means exerts the feeding force on the sheets and a point at which the separating means exerts the reaction force", varies for each sheet with respect to its position in the stack. It is clearly recognizable that the upper sheets in the stack contact at first not the friction member but the supply roller of the

separating means, which exerts a feeding force on them. On the contrary, the lower sheets in the stack are brought into contact at first with the friction member of the separating means which exerts a reaction force on them, this reaction force also not being constant but depending on the point where the leading edge of the sheet hits the friction member. There is thus no well defined situation.

6.4 It is therefore impossible for the skilled user of the ADF device to empirically determine the buckling reaction force only with respect to the distance L and the paper weight since both these parameters are not determinable with such a kind of device.

6.5 Moreover the supply roller and the friction member of the separation means are in pressing contact in the claimed sheet feeding device, so that a sheet being fed encounters relatively hard separation forces of the separation means. The outer surface of the friction member is in complete contact with the sheet to be separated and can exert a large reaction force against the leading edge of the paper. If this force is too large compared to the frictional feeding force buckling can occur.

In contrast, in the ADF device the feeding rollers and the friction rollers of the separating means are horizontally displaced with respect to one another. Due to this lateral displacement, there is no closed gap and the separating force is only applied by one edge of a friction roller with no significant force pressing the original into engagement with this edge. The result of these small separating forces is that it is easy for a document to enter the separating means and the separating forces are so small that no buckling occurs. There was no

incentive for a skilled person to determine the buckling reaction with such a kind of device, since this would have been meaningless.

Stated in another way, the problem of buckling is mainly to be solved in the ADF device by displacing laterally the rollers of the separating means so that the reactive or separating forces are relatively small. The problem to be solved in the present case is solved in this prior use in a completely different way when compared with the claimed sheet feeding device. This prior use could therefore not foreshadow the claimed teaching.

6.6 In document D26 as well in document D23, the sheet feeding devices disclosed comprise a belt-type feeding system in which the feeding belt is in frictional contact with the uppermost sheet of the stack, and the supply roller of the separating means is formed by the same belt.

The sheets are fed singly between the belt and a retard pad (D23: column 3, line 50; D26: column 6, line 46) acting as a friction member over a longer distance; and the belt applies a feeding force along the entire surface of the sheet. Thus the concept of a distance L between "a point at which the feeding means exerts the feeding force on the sheets and a point at which the separating means exerts the reaction force on the sheets" does not arise in these two citations. Thus there is no suggestion of the claimed invention, i.e. of determining a buckling reaction force which depends on the distance L and this as a function of the paper weight employed.

In the contested patent it is stated that an upward as well as a downward buckling may occur in a sheet feeding device of the kind defined in the pre-characterising part of the claim. Nevertheless, as convincingly argued by the

patent proprietor, downward buckling remains a negligible phenomenon when compared with upward buckling.

It is noted that the upward buckling is completely avoided in the documents D26 and D23, since the sheets are held by the feeding belt along their entire path. It follows that the problem of buckling is solved in these prior art citations in a completely different way, so that these citations are to be considered irrelevant as a basis for a possible pointer for the skilled person towards the claimed teaching.

6.7 In the sheet feeding device according to document D25 sensors recognise the presence of thin sheets and, in order to prevent the occurrence of buckling, the tension roller (18) is lifted to remove feeding force in this case. Here again, the problem of buckling is solved in a completely different way.

This reference states that the distance 1 between the end of the paper separating plate (25) and the end of the auxiliary paper plate (27) is made very small. However, this separation occurs on a moving sheet feeding belt which is inherently different from the arrangement defined in the present Claim 1. In addition, a well defined point of application of feeding force cannot be recognised since the sheet lies upon the belt (16) and has a feeding force applied along the entire length of paper sheet. Therefore this reference cannot give any suggestion of the claimed teaching.

6.8 For the above reasons, the Board finds that the subject-matter of Claim 1 involves an inventive step within the meaning of Article 56 EPC.

7. The patent can therefore be maintained on the basis of the independent Claim 1 and dependent Claim 2, which concerns a particular embodiment of the invention.

8. Since the Board comes to the conclusion that the subject-matter of Claim 1 is inventive over the teaching of the alleged public prior use of an ADF device, it is not necessary to further examine whether this alleged prior use is indeed proven as being made available to the public in accordance with Article 54(2) EPC, so that this question is left open.

9. The description as amended and the drawings take account of the requirements of the EPC.

10. The opposition grounds therefore do not prejudice the maintenance of the patent in amended form.

11. At the end of the oral proceedings, the parties were given an opportunity to comment on the amendments submitted by the Appellant. Therefore, a communication under Rule 58(4) EPC is not necessary in the present case (see Decision T 219/83, OJ EPO 1986, 211).

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order that the further procedure, i.e. the maintenance of the patent be based on the following text of the patent:

   - Claims 1 and 2 as filed during the oral proceedings;

   - description, columns 1 to 8, as filed during the oral proceedings;

   - drawings: sheets 1 to 4 as granted.

The Registrar: The Chairman:

N. Maslin C. Andries