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**D E C I S I O N**  
**of 26 June 2001**

**Case Number:** T 0442/98 - 3.2.5

**Application Number:** 92303103.3

**Publication Number:** 0508742

**IPC:** B41J 13/076

**Language of the proceedings:** EN

**Title of invention:**  
Sheet conveying apparatus

**Patentee:**  
SEIKO EPSON CORPORATION

**Opponent:**  
Canon Inc.

**Headword:**  
-

**Relevant legal provisions:**  
EPC Art. 56

**Keyword:**  
"Inventive step (yes)"

**Decisions cited:**  
-

**Catchword:**  
-



Case Number: T 0442/98 - 3.2.5

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.5**  
**of 26 June 2001**

**Appellant:** Canon Inc.  
(Opponent) 30-2, Shimomaruko 3-chome  
Ohta-ku  
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**Representative:** Chivarov, Gueorgui (BG)  
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**Respondent:** SEIKO EPSON CORPORATION  
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Tokyo (JP)

**Representative:** Sturt, Clifford Mark  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 23 February 1998  
rejecting the opposition filed against European  
patent No. 0 508 742 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** W. Moser  
**Members:** A. Burkhart  
C. G. F. Biggio

## Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the opposition division rejecting the opposition against the patent. Opposition was filed against the patent as a whole and based on Article 100(a) EPC (lack of inventive step).

The opposition division held that the ground for opposition under Article 100(a) EPC did not prejudice the maintenance of the patent in suit unamended, having regard to the following prior art documents:

E1: EP-A-0 397 090,

E2: Japanese Utility Model No. 60-32424 an English translation thereof, and

E3: Japanese Utility Model No. 64-30251 an English translation thereof.

II. Oral proceedings before the Board of appeal took place on 26 June 2001.

(i) The appellant requested that the decision under appeal be set aside and the patent in suit be revoked as a whole.

(ii) The respondent (patent proprietor) requested, as main request, that the appeal be dismissed and, as auxiliary request, that the decision under appeal be set aside and the patent in suit be maintained in amended form on the basis of independent claims 1 and 6 filed on 25 May 2001.

(iii) Independent claims 1 and 6 of the patent in suit as granted (main request) read as follows:

"1. A sheet conveying apparatus comprising at least one primary roller (11,21) arranged downstream in a sheet conveying direction (A) and at least one secondary roller (14,25) arranged upstream in the sheet conveying direction (A), characterised in that both the primary (11,21) and the secondary (14,25) roller have resilient burrs on their surface and arranged such that the apexes of the burrs on the primary (11,21) roller point in the same direction as the sheet conveying direction (A) and the apexes of the burrs on the secondary (14,24) roller point in the opposite direction to the sheet conveying direction (A)."

"6. A sheet conveying system in a printer in which at least one sheet conveying roller (14,25) is arranged upstream in a sheet conveying direction (A) and at least one sheet discharging roller (11,21) is arranged downstream in the sheet conveying direction (A), and a printing section (1,12,22) is arranged between said sheet conveying roller (14,25) and said sheet discharging roller (11,21), characterised in that the surface portions of said sheet conveying roller and sheet discharging roller are made of a rubber material, the surface portion of said sheet conveying roller has been treated with a grinding stone to form projections, the apexes of the projections on the sheet

conveying roller pointing in the direction which is opposite to said sheet conveying direction, while the surface portion of said sheet discharging roller has been treated with a grinding stone to form projections, the apexes of the projections on the sheet discharging roller pointing in the direction which is the same as said sheet conveying direction."

III. The appellant argued essentially as follows:

The closest prior art as represented by document E1 refers to a sheet conveying apparatus comprising primary rollers arranged downstream in a sheet conveying direction and secondary rollers arranged upstream in the sheet conveying direction, wherein the primary rollers are rotated at a higher peripheral speed than the secondary rollers in order to achieve an appropriate tensioning of the sheet.

Starting from the above disclosure, the technical problem to be solved by the alleged invention defined in claim 1 of the patent in suit is objectively to be regarded as finding an alternative way as to how to achieve a peripheral speed of the primary roller which is greater than the peripheral speed of the secondary roller.

From document E2, the person skilled in the art was able to learn that grinded rubber rollers, which are widely used as conveying rollers in a sheet conveying apparatus, show many inclined projections in their outer periphery. Moreover, document E2 teaches the person skilled in the art that a roller the projections

of which point in the same direction as the sheet conveying direction provides an increased peripheral speed compared to a roller rotated in the same direction, but having projections pointing in the direction opposite to the sheet conveying direction, said roller being able to provide only a comparatively low peripheral speed.

The same teaching can also be gathered from the disclosure of document E3, which states that "when the projection direction A is counter to the rotating direction B, the initial sheet feeding power is approximately 1/2 to 2/3 the sheet feeding power when the projection direction A and the rotating direction B are the same".

From the disclosures of documents E2 and E3 it is clear that an increased peripheral speed of the primary roller in the device according to document E1 compared to the secondary roller, rotated in the same conveying direction as the primary roller, can be achieved by means of commonly used grinded rubber rollers by arranging the primary roller, such that its projections point in the sheet conveying direction, whereas the projections of the secondary roller point in the direction opposite to the sheet conveying direction.

It is admitted that documents E2 and E3 are also concerned with specific technical problems, like transverse deviation of the sheet or wear of the roller surface. However, the person skilled in the art looking for a solution of the problem underlying the subject-matter of the patent in suit would disregard these specific problems and would mainly concentrate on those suggestions in documents E2 or E3 which teach him how

to increase the peripheral speed of the primary rollers compared to the secondary rollers in the device according to document E1.

Therefore, the subject-matter of claim 1 of the patent in suit does not involve an inventive step. The same applies to the subject-matter of claim 6, which refers to a conventional printing arrangement comprising the sheet conveying apparatus as defined in claim 1.

IV. The respondent argued essentially as follows:

Document E1 is the only document under consideration dealing with an apparatus comprising primary rollers and secondary rollers, wherein the primary rollers are rotated at a higher peripheral speed than the secondary rollers, in order to achieve an appropriate tensioning of the sheet. Document E1, cf. Figure 14, teaches that the primary rollers should comprise a lower tension roller and two upper tension rollers which are inclined and oriented to apply to the sheet a feeding force directing outwardly in the transverse direction of the sheet. The solution proposed in document E1 is directed to a sheet feed mechanism comprising an upstream roller means different to the downstream roller means. From Figure 14 of document E1 it will be seen that the upstream and downstream rollers are clearly not interchangeable, and therefore this mechanism is not suitable for a reverse feeding operation of the sheet.

Document E2 teaches that, in order to avoid deviation of the sheet from the conveying direction, a sheet conveying roller in the form of a foam roller the outer periphery of which has many inclined resilient projections should consist of a plurality of

cylindrical foam sections, wherein the sections are on the same axis and are so arranged that the projections of the surface of one section point in another direction as the projections of the surface of the adjacent section. Such a roller having mixed directions for the projection does not produce the effect of increasing or decreasing its diameter upon rotating, and, therefore, the teaching of document E2 does not lead the person skilled in the art to the subject-matter of claim 1 of the patent in suit.

Document E3 teaches that the wear of a sheet conveying roller surface can be reduced, if the roller has squamous projections the apexes of which are directed counter to the rotating direction of the conveying roller. Thus, also the teaching of document E3 does not lead the person skilled in the art to the subject-matter of claim 1 of the patent in suit.

The fact that documents E2 and E3 mention that the peripheral speed of a conveying roller having resilient projections on its surface depends on the direction of the projections with respect to the rotating direction of the roller does not suggest to the person skilled in the art the subject-matter of claim 1. Both documents E2 and E3 give the general teaching that rollers having projections are disadvantageous with respect to a proper sheet feeding. Moreover, documents E2 and E3 do not deal with sheet tensioning devices having downstream primary rollers and upstream secondary rollers, and, therefore, these documents cannot give any hint to the person skilled in the art about the nature of upstream secondary rollers.

The invention according to claim 1 of the patent in



suit proposes a relatively simple sheet tensioning device capable of being stably operated both in a forward and a reverse direction. Such a device is not obvious in the light of the prior art documents.

## **Reasons for the Decision**

### 1. *Main request of the respondent*

#### 1.1 Inventive step

##### 1.1.1 Closest prior art

The closest prior art is represented by the sheet conveying apparatus according to Figures 22 and 23, in connection with column 3, lines 9 to 34 of the description, of document E1. This sheet conveying apparatus comprises at least one tension roller (a pair of primary rollers) downstream in a sheet conveying direction and at least one feed roller (a pair of secondary rollers) arranged upstream in the sheet conveying direction, whereby the sheet is tensioned by setting the peripheral speed of the downstream tension rollers to be greater than the peripheral speed of the upstream feed rollers, and wherein the nipping force of the pair of secondary rollers is selected to be greater than the nipping force of the pair of primary rollers.

Such an arrangement requires specific driving and

pressing means for setting a differential peripheral speed and a differential nipping pressure between the primary and secondary rollers, and such an arrangement would require rather complicated control means for operating modes which allow conveying the sheet both in a forward and a reverse direction.

1.1.2 Problem underlying the invention of the patent in suit

With respect to the closes prior art, the problem underlying the invention can be regarded as looking for an alternative and simpler way of how to apply tension to the sheet, not only when conveying it in the sheet conveying direction but also when conveying it in the reverse direction.

1.1.3 Solution

This problem is solved by the sheet conveying apparatus according to claim 1 of the patent in suit in that both the primary and the secondary roller have resilient burrs on their surface being arranged such that the apexes of the burrs on the primary roller point in the same direction as the sheet conveying direction and the apexes of the burrs on the secondary roller point in the direction opposite to the sheet conveying direction.

Thus, when the sheet is conveyed the diameter of the primary roller substantially increases due to the burrs on its surface being raised. Conversely, the burrs on the secondary roller are pushed radially inwardly thereby substantially reducing the diameter of that roller. The total difference in diameters of the primary and secondary rollers results in the peripheral

speed of the primary roller increasing. Tension is thus applied to the sheet in the sheet conveying direction without the necessity of using specific driving or pressing means for setting a differential peripheral speed or pressure between the primary and secondary rollers. This solution further offers the advantage that tension is also applied to the sheet in case that the conveying direction is reversed by simply reversing the direction of rotation of the primary and secondary rollers.

- 1.1.4 The prior art documents under consideration do not render obvious the aforementioned solution, for the following reasons:

Document E1 (see in particular column 3, lines 35 to 47 of the description) teaches that, with the arrangement according to Figures 22 and 23, the floating of the sheet in a direction parallel to the sheet feeding direction cannot be sufficiently prevented and that this drawback can be overcome if an additional tensioning force is applied to the sheet in a transverse direction thereof (see claim 1 of document E1) by providing at the lower primary roller two upper tension rollers which are inclined and oriented to apply to the sheet an additional feeding force directing outwardly in the transverse direction of the sheet (see Figure 14 and column 10, line 26 to column 11, line 3 of the description of document E1).

This teaching of document E1 does not lead the person skilled in the art to the solution according to claim 1 of the patent in suit.

Document E2 discloses a sheet conveying roller made of

foam material which is rotated in contact under pressure with the sheet for feeding it to a printing device. The foam roller has projections on its outer periphery, produced by grinding.

Document E2 gives the following teaching:

When the roller is rotated in the direction in which the apexes of the projections point, the projections are raised; thus, the effective diameter of the roller is increased and thereby the movement of the sheet is increased compared with the movement when the roller is rotated in the reverse direction (see document E2, in particular page 3, lines 14 to 23 and Figure 4). However, because of the anisotropy of the foam roller, the sheet is moved not only in one direction, but is also transversely deviated, when such a roller with inclined projections is rotated (see document E2, in particular, description, page 3, line 23 to page 4, line 4; page 2, line 24 to page 3, line 7; and Figure 5). To avoid the problem of such a deviation of a sheet to be conveyed, document E2 suggests, as a solution to this problem, a roller being axially split into several sections, wherein the sections are on the same axis and so arranged that the projections of the surface of one section point to another direction as the projections of the surface of the adjacent section (see document E2, in particular, description, page 5, lines 2 to 16; and Figures 8 and 9). This means that document E2 teaches that sheet conveying rollers having projections pointing to a single preferred rotation direction are not suitable for a proper sheet feeding.

This teaching of document E2, which is contrary to the teaching of claim 1 of the patent in suit, cannot

suggest the arrangement as defined in claim 1 of the patent in suit.

Document E3, which discloses a sheet feeding apparatus comprising a feed roller having squamous projections formed by grinding, gives the following teaching (see page 3, lines 2 to 23):

When the direction of the projections and the rotating direction of the roller are the same, the problems arise that a desired sheet feeding power, required after long use, can no longer be obtained, and the sheet would move obliquely when a plurality of adjacent feed rollers are used, since the sheet feeding powers of the various feed rollers do not balance.

As a solution to these problems, document E3 suggests to arrange the projections on the feed roller such that the projection direction of the squamous projections is counter to the rotating direction of the feed roller, during sheet feeding.

Thus, document E3 teaches to use the roller with projections only in one direction. If such a roller were to be used as primary and secondary rollers in the sheet conveying apparatus according to document E1, both rollers would show projections pointing in the same direction. These rollers would not produce the effect of different speed and thus would not apply tension force to the sheet being conveyed. No hint can thus be found in document E3 to use the roller as a primary and secondary roller and to provide each roller with a different orientation of the projections.

Thus, the application of the teaching of document E3 to

the sheet feeding apparatus according to document E1 does not lead to the subject-matter of claim 1 of the patent in suit.

The Board accepts that documents E2 and E3 generally teach that the peripheral speed of the conveying roller having resilient projections on its surface depends on the direction of the projections with respect to the rotating direction, in the sense that the peripheral speed of the roller is higher when the projections point to the rotating direction than when the projections point to a direction counter to the rotating direction.

However, the Board cannot agree to the view of the appellant that this teaching would incite the person skilled in the art to modify the arrangement according to Figures 22 and 23 of document E1 in such a way that the apexes of the projections on the primary roller point in the same direction as the actual sheet conveying direction, and the apexes of the projections on the secondary roller point in the direction opposite to the actual sheet conveying direction.

As already pointed out above, document E1 itself suggests to the person skilled in the art an arrangement how to improve the sheet tensioning device according to Figures 22 and 23, namely an arrangement according to claim 1 and Figure 14 of document E1, comprising two additional upper inclined rollers cooperating with a primary roller, such an arrangement not leading the person skilled in the art to the solution according to claim 1 of the patent in suit.

Moreover, documents E2 and E3 do not refer to a

tensioning device having primary and secondary rollers, and there is nothing in documents E2 and E3 to suggest that in the device according to Figures 22 and 23 of document E1 both the primary and secondary rollers should be provided with peripheral projections. Even if the person skilled in the art considered the possibility of replacing the primary roller of the arrangement according to Figures 22 and 23 of document E1 by a conveying roller having projections, in order to impart a higher speed to the primary roller, it would not be obvious to him also to replace the secondary roller by a roller having projections, let alone by a roller having its projections pointing opposite the sheet conveying direction. The most obvious option for the person skilled in the art would be to change the diameter or the drive gear of the secondary roller in order to obtain a speed difference between the primary and secondary rollers.

Furthermore, there is no mention in documents E1, E2 or E3 that a sheet conveying and tensioning device according to Figures 22 and 23 of document E1 should be capable of conveying a sheet both in a forward and in a reverse direction, and therefore, the person skilled in the art cannot get any suggestions from these documents towards an arrangement having the capacity of forward and reverse sheet conveyance.

- 1.1.5 Therefore, the subject-matter of claim 1 of the patent in suit involves an inventive step within the meaning of Article 56 EPC.
  
- 1.1.6 The independent claim 6 refers to a sheet conveying system in a printer which comprises the sheet conveying apparatus defined in claim 1. Thus, also the subject-

matter of claim 6 involves an inventive step for the same reasons as set out in respect of the subject-matter of claim 1. Dependent claims 2 to 5 are concerned with embodiments of the subject-matter of claim 1, and therefore, the subject-matters of these claims likewise involve an inventive step.

2. Since the main request of the respondent is allowable, the auxiliary request of the respondent that the patent be maintained in amended form did not have to be considered.

## **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

M. Dainese

W. Moser