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(71) Applicant: **Sagem SA**
75017 Paris (FR)

(72) Inventors:
- **Veigl, Johann, Ing.**
  1230 Wien (AT)
- **Pichler, Michael**
  1140 Wien (AT)

(74) Representative: **Gibler, Ferdinand**
Patentanwalt
Dorotheergasse 7
1010 Wien (AT)

(54) Paper feed cassette

(57) In a paper feed cassette (1) for a printer, a copier, a fax machine, or the like, having a first housing (2), to elevate the loadable quantity of paper, it is suggested that a second housing (3) for receiving sheets be positioned in the first housing (2), the second housing (3) being mounted so it is movable in the first housing (2), and a blocking device (4) be provided for a motion direction of the second housing (3) in relation to the first housing (2).

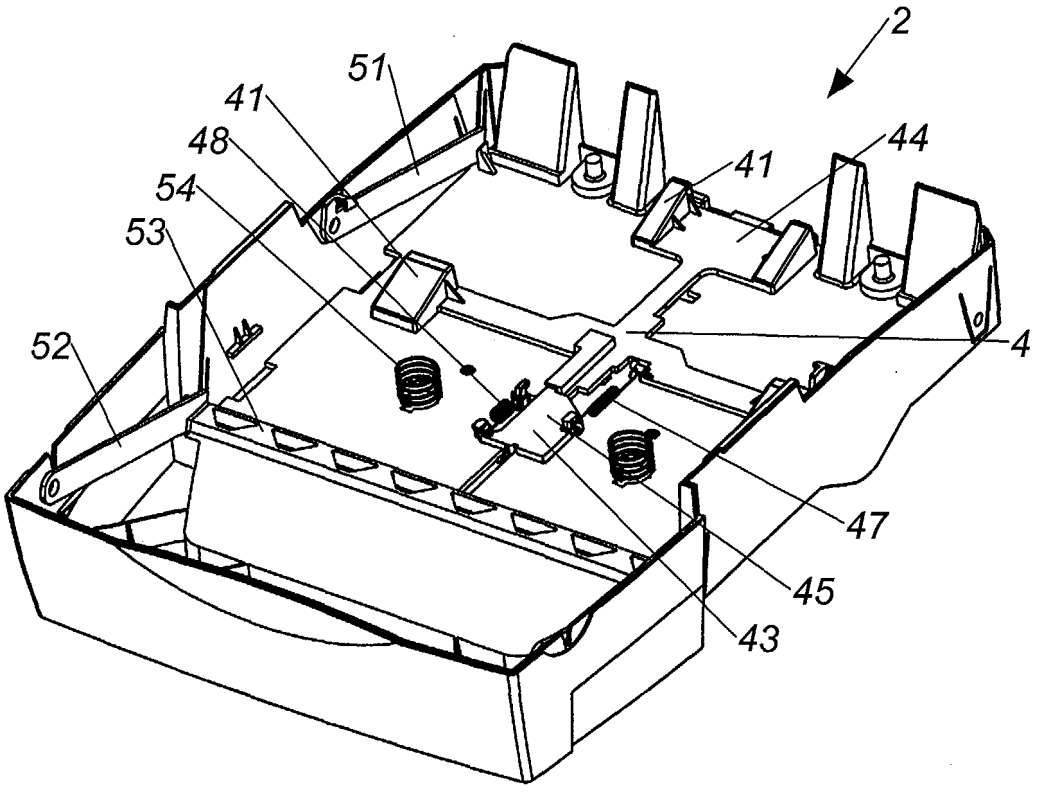

Fig. 2

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Description

[0001] The present invention relates to a paper feed cassette for a printer, a copier, a fax machine, or the like, having a first housing.

[0002] Paper feed cassettes of this type offer a paper reserve to a printer, a copier, a fax machine, or the like, the paper feed cassettes working together with a paper receiving device, the paper stack being pressed down by the paper receiving device and the paper subsequently being received. The processable stack height of the paper is limited by the maximum travel height of the paper receiving device.

[0003] The object of the present invention is to specify a paper feed cassette of the type described at the beginning, which avoids the known disadvantages and in which a quantity of paper exceeding the processable stack height of the paper receiving device may be provided.

[0004] This is achieved according to the present invention in that a second housing for receiving sheets is positioned in the first housing, the second housing being mounted so it is movable in the first housing, and a blocking device is provided for a motion direction of the second housing in relation to the first housing.

[0005] The advantage thus results that the second housing may be blocked in relation to the first housing by the blocking device when paper is removed, particularly when paper is removed against the force direction of the paper receiving device, through which yielding of the paper stack through the pressure of the paper receiving device is prevented and perfect functioning of the paper removal may be ensured.

[0006] An elevated quantity of paper may thus be provided to a paper receiving device by the paper feed cassette according to the present invention, because of which paper has to be refilled less often. In this way, it may be ensured, particularly in the event of long absence, that a fax machine has a sufficient paper reserve and the danger of data loss because of a lack of output and/or memory capacity is significantly reduced.

[0007] In a refinement of the present invention, the blocking device may have at least one first wedge element and at least one diametrically opposed wedge element, the first wedge element being assigned to the first housing in the second wedge element being assigned to the second housing, and the first wedge element is positioned so it is displaceable in relation to the first housing and/or the second wedge element is positioned so it is displaceable in relation to the second housing. The wedge elements represent a simple embodiment of the blocking device, automatic setting of the blocking device to the fill level of the paper feed cassette being able to be ensured through the displaceable positioning of at least one of the wedge elements.

[0008] According to a further embodiment of the present invention, the displaceable wedge element may be spring-loaded using a pre-tensioning device in the direction of the diametrically opposing wedge element when the paper feed cassette is inserted. Through the pre-tensioning device, it may be ensured that the wedge elements are always engaged and the motion direction of the first housing in relation to the second housing is effectively blocked in the direction of the wedge elements.

[0009] In a further embodiment of the present invention, a driver element for activating the pre-tensioning device, which may be actuated when the paper feed cassette is inserted, may be provided. Through the driver element, the activation of the pre-tensioning device may be caused easily without an additional operating procedure when the paper feed cassette is inserted, the blocking device being deactivated and refilling of sheets being made possible when the paper feed cassette is removed.

[0010] Furthermore, the present invention relates to a paper feed cassette for a printer, a copier, a fax machine, or the like having a first housing.

[0011] Paper feed cassettes of this type offer a paper reserve to a printer, a copier, a fax machine, or the like, the paper feed cassettes working together with a paper receiving device, the paper stack being pressed down by the paper receiving device and the paper subsequently being received. The processable stack height of the paper is limited by the maximum travel height of the paper receiving device.

[0012] The object of the present invention is to specify a paper feed cassette of the type described at the beginning, which avoids the known disadvantages and in which a quantity of paper exceeding the processable stack height of the paper receiving device may be provided.

[0013] This is achieved according to a second aspect of the present invention in that a second housing for receiving sheets is positioned in the first housing, the second housing being mounted in the first housing so it is movable using at least one lever arm.

[0014] The advantage thus results that the second housing is easily movable in relation to the first housing, only slight friction occurring. Through the interaction of a paper receiving device with the second housing, the sheets of a paper stack may be completely removed using a paper receiving device whose travel height is less than the thickness of the paper stack. An increased quantity of paper may thus be provided to a paper receiving device by the paper feed cassette according to the present invention, because of which paper has to be refilled less often. In this way, it may be ensured, particularly in the event of long absence of an operator, that a fax machine has a sufficient paper reserve and the danger of data loss because of a lack of output and/or memory capacity is significantly reduced.

[0015] In a refinement of the present invention, the sheets in the second housing may be positioned on the narrow side of the sheets at a predefinable angle of incidence, and the motion of the second housing in relation to the first housing may occur between an upper end position and a lower end position essentially along a circuit, the circuit approximating a straight line with the angle of incidence and the maximum deviation - measured perpendicularly to this straight line - being less than 1 cm, preferably less than 8 mm, particularly less than 5 mm, through which the sheets may be provided uniformly over the entire stack height and reliable removal by a paper receiving device may be ensured.

[0016] According to another embodiment of the present invention, the second housing may have a floor corresponding to the format of the sheets, two long side walls, and at least one narrow side wall. In this way, reliable guiding of the sheets in the second housing may be ensured.

[0017] In a further implementation of the present invention, one front lever arm and one rear lever arm may be positioned on each of the long side walls, each two of the lever arms being positioned diametrically opposite and the lever arms having equal lever lengths, through which uniform and reliable motion of the second housing in relation to the first housing may be ensured.

[0018] In this connection, in a refinement of the present invention, the rear lever arms may be connected to one another using a connection element at their ends facing away from the second housing. Through the connection element, a high stability of the mounting of the second housing in the first housing and a high uniformity of the relative motion may be ensured.

[0019] In a further embodiment of the present invention, an equalization element for positioning the current uppermost sheet may be positioned between the first housing and the second housing. If sheets are removed from the second housing, the height of the uppermost sheet falls. Through the equalization element, this height may be compensated for, through which the height of the uppermost sheet is kept approximately constant for at least a part of the stack projecting over the second housing, and reliable removal of the uppermost sheet via the paper receiving device may be ensured.

[0020] According to a further embodiment of the present invention, a blocking device as described at the beginning may be provided, through which the motion of the second housing in relation to the first housing may be blocked easily if necessary.

[0021] The present invention will be described in greater detail with reference to the attached drawing, in which an embodiment is shown.

Figure 1 shows a paper feed cassette according to the present invention in section;
Figure 2 shows a diagonal view of the first housing shown in Figure 1;
Figures 3 through 5 show diagonal views of the second housing shown in Figure 1;
Figure 6 shows an enlarged illustration of the front part of the second housing; and
Figure 7 shows an enlarged illustration of the front part of the second housing, additional first wedge elements being shown.

[0022] An embodiment of a paper feed cassette 1 according to the present invention having a first housing 2 is shown in Figures 1 through 7. The paper feed cassette 1 is suitable for use with a printer, a copier, a fax machine, or similar devices which remove sheets from a supply stack. A second housing 3 for receiving sheets is positioned in the first housing 2, the second housing 3 being mounted so it is movable in the first housing 2. Through the motion of the second housing 3, the sheets received in the second housing 3 may be moved in relation to the first housing 2. The sheets may be made of paper, cardboard, a film, or other materials typical for such devices.

[0023] Furthermore, a blocking device 4 for a motion direction of the second housing 3 in relation to the first housing 2 is provided. Using the blocking device 4, in the embodiment shown, the downward motion of the second housing 3 in the first housing 2 may be blocked. When sheets are removed from the paper feed cassette 1 by a paper receiving device, the paper receiving device presses the second housing 3 in the direction of the first housing 2, the second housing 3 being held by the blocking device 4. In this case, it is sufficient if the maximum travel height of the paper receiving device corresponds to the depth of the second housing 3. If a paper feed cassette 1 is filled completely, the second housing 3 is positioned lowered in the first housing 2 and the stack of sheets projects over the second housing 3, Durirlg removal by the paper receiving device, only a slight travel is necessary, since the travel motion executed is limited by the stack itself. If the height of the stack is greater than the maximum travel height of the paper receiving device, if the second housing 3 is connected fixed to the first housing 2, only a part of the stack may be removed. In the paper feed cassette 1, the second housing 3 is positioned so it is movable in the first housing 2. If the second housing 3 is raised in relation to the first housing 2, it may be ensured that the paper receiving device may engage the uppermost sheet of the stack, even if the stack only comprises one sheet. Using the blocking device 4, unintentional displacement of the second housing 3 in relation to the first housing 2 by the paper receiving device may be prevented, so that only the depth of the second housing is active in relation to the paper receiving device. In this way, using the paper feed cassette 1, a stack of sheets which is higher than the maximum travel height of the paper receiving device may be

processed by the paper receiving device.

[0024] The blocking device 4 may have at least one first wedge element 41 and at least one diametrically opposite second wedge element 42, the first wedge element 41 being assigned to the first housing 2 and the second wedge element 42 being assigned to the second housing 3. In the embodiment shown, the first wedge element 41 is positioned so it is displaceable in relation to the first housing 2. In other embodiments, the second wedge element 42 may also be positioned so it is displaceable in relation to the second housing 3. However, both the first wedge element 41 and the second wedge element 42 may be positioned so they are displaceable in relation to the first housing 2 and the second housing 3, respectively.

[0025] In this case, the displaceable wedge elements 41, 42 may be displaceable in essentially perpendicularly to the motion direction of the second housing 3 in relation to the first housing 2. Depending on the position of the wedge elements 41, 42 to one another, the motion of the second housing 3 in relation to the first housing 2 may be blocked in different positions.

[0026] The displaceable wedge element 41, 42 is preferably spring-loaded in the direction of the diametrically opposite wedge element 41, 42 using a pre-tensioning device 43 when the paper feed cassette 1 is inserted. In this case, in the event of a motion of the second housing 3 in relation to the first housing 2 against the blocked motion direction, the displaceable wedge element 41, 42 is moved along, so that the action of the blocking device 4 in the particular position occurs essentially immediately.

[0027] When the paper feed cassette 1 is removed, the blocking device 4 may be deactivated, through which unobstructed displacement of the second housing 3 in relation to the first housing 2 is made possible and the paper feed cassette 1 may be loaded with sheets. In this case, a driver element 46, which may be actuated when the paper feed cassette 1 is inserted, may be provided for activating the pre-tensioning device 43.

[0028] The mode of operation of a preferred embodiment of the blocking device 4 may be seen in Figure 6. In this case, multiple first wedge elements 41 and multiple second wedge elements 42 are provided, second wedge elements 42 particularly being positioned in the region below the paper receiving device - in the inserted state. In this embodiment, the first wedge elements 41 are positioned so they are displaceable in relation to the first housing 2, these elements being connected to a guide element 44 and the guide element 44 being mounted so it is displaceable in the first housing 2. Furthermore, a tension element 45 is mounted so it is displaceable in the first housing 2, the tension element 45 also being displaceable in relation to the guide element 44. The guide element 44 and the tension element 45 are connected to one another using a first tension spring element 47. Furthermore, the tension element 45 is connected to the first housing 2 using a second tension spring element 48. Furthermore, the tension element 45 has the driver element 46.

[0029] When the paper feed cassette 1 is inserted, the tension element 45 is moved against the action of the second tension spring element 48 using the driver element 46. In this case, the first wedge elements 41 are spring-loaded against the second wedge elements 4% by the guide element 44 using the first tension spring element 47. If the second housing 3 is raised in relation to the first housing 2, a space is produced between the first wedge elements 41 and the second wedge elements 42, the first wedge elements 41 being displaced, because of the action of the first tension spring element 47, until the first wedge elements 41 engage again with the second wedge elements 42.

[0030] If the paper feed cassette 1 is removed from the printer, the copier, the fat machine, or the like, the driver element 46 is disengaged and the tension element 45 is displaced by the action of the second tension spring element 48. In this case, the guide element is also displaced in such a way that the first wedge elements 41 are moved against the direction of the second wedge elements 42, the blocking device 4 being deactivated and the second housing 3 able to be moved freely in relation to the first housing 2.

[0031] The second housing 3 may be mounted so it is movable in the first housing 2 using at least one lever arm 51, 52. A circular motion is predefined by the lever arm 51, 52, friction forces particularly being able to be kept low. In other embodiments of the paper feed cassette 1, the second housing 3 may also be movable along a slide rail or the like in relation to the first housing 2.

[0032] Through the lever arms 51, 52, a simple construction results for the motion of the second housing 3 in relation to the first housing 2, the axes of rotation being able to be implemented by projections molded onto the lever arms 51, 52 and diametrically opposed recesses in the first housing 2 and/or the second housing 3. In this case the construction may be manufactured.having a small overall volume from components which are simple to implement, particularly one-piece plastic parts.

[0033] The sheets may be positioned in the second housing 3 at a predefinable angle of incidence on the narrow side of the sheets, the motion of the second housing 3 in relation to the first housing 2 between an upper end position and a lower end position being essentially approximated by a straight line having the angle of incidence and the maximum deviation - measured perpendicularly to this straight line - being less than 1 cm, preferably less than 8 mm, particularly less than 5 mm. In an embodiment having lever arms 51, 52, the motion occurs along a circuit, the circuit being approximated by the straight line having the angle of incidence. The deviations from the straight line are essentially a function of the lever length and the angle of incidence in this case.

[0034] Reliable guiding of the sheets through the second housing 3 may be ensured if the second housing 3 has a

floor 31 corresponding to the format of the sheets, two long side walls 32, and at least one narrow side wall 33. In this case, the narrow side wall 33 may be implemented as the rear wall and the diametrically opposite delimitation of the sheets may be implemented by the first housing 2. The implementation of angle of incidence in particular may be ensured by the first housing 2, as is shown in Figure 2.

[0035] In this case, the dimensions predefined by the printer, the copy or, the fax machine, or the like and its paper receiving device may be maintained easily if the implementation of angle of incidence is ensured by the first housing 2, because of which no additional components are required by the second housing in the region in which the paper receiving device removes sheets.

[0036] One front lever arm 51 and one rear lever arm 52 may be positioned on each of the long side walls 32, each two of the lever arms 51, 52 being positioned diametrically opposite and the lever arms 51, 52 having equal lever lengths. Using this positioning of the lever arms 51, 52, uniform motion of the second housing 3 in the first housing 2 is ensured and a stable construction is achieved. Furthermore, the rear lever arms 52 may preferably be connected to one another at their ends facing away from the second housing 3 using a connection element 53. Through this measure, especially uniform motion and especially stable construction may be achieved.

[0037] An equalization element 54 for positioning the current uppermost sheet may be positioned between the first housing 2 and the second housing 3, reliable removal of the particular uppermost sheet by the paper receiving device being able to be ensured. Using the equalization element 54, it is ensured that, independently of the fill level of the second housing 3, the current uppermost sheet is positioned in the operating region of the paper receiving device. If sheets are removed from the second housing 3, the height of the uppermost sheet falls. In this case, the equalization element 54 may have an elongation which is a function of the total weight of the stack of sheets, it being able to be implemented as a spring element, for example. Using the equalization element 54, the altered height of the stack of sheets is thus compensated for, through which the height of the uppermost sheet may be kept approximately constant, at least for a part of the stack projecting above the second housing 3. For the precision requirement of the equalization element 54, it is sufficient if it is ensured that the current uppermost sheet is located in the operating region of the paper receiving device, this applying for a large number of different types of sheets, particularly paper, film, and cardboard. From a predefinable lower fill level of the second housing 3, the second housing 3 may be kept in the upper end position by the equalization element 54

[0038] In other embodiments, the equalization element 54 may also be implemented by a motion of the second housing 3 using the blocking device 4 or a lever mechanism, for example.

Claims

1. A paper reed cassette (1) for a printer, a copier, a fax machine, or the like, having a first housing (2), **characterized in that** a second housing (3) for receiving sheets is positioned in the first housing (2), the second housing (3) being mounted so it is movable in the first housing (2), and a blocking device (4) is provided for a motion direction of the second housing (3) in relation to the first housing (2).

2. The paper feed cassette (1) according to Claim 1, **characterized in that** the blocking device (4) has at least one first wedge element (41) and at least one diametrically opposite second wedge element (42), the first wedge element (41) being assigned to the first housing (2) and the second wedge element (42) being assigned to the second housing (3), and the first wedge element (41) is positioned so it is displaceable in relation to the first housing (2) and/or the second wedge element (42) is positioned so it is displaceable in relation to the second housing (3).

3. The paper feed cassette (1) according to Claim 2, **characterized in that** the displaceable wedge element (41, 42) is spring-loaded using a pre-tensioning device (43) in the direction of the diametrically opposite wedge element (41, 42) when the paper feed cassette (1) is inserted.

4. The paper feed cassette (1) according to Claim 3, **characterized in that** a driver element (46), which may be actuated when the paper feed cassette (1) is inserted, is provided for activating the pre-tensioning device (43).

5. A paper feed cassette (1) for a printer, a copier, a fax machine, or the like, having a first housing (2), **characterized in that** a second housing (3) for receiving sheets is positioned in the first housing (2), the second housing (3) being mounted so it is movable in the first housing (2) using at least one lever arm (51, 52).

6. The paper feed cassette (1) according to Claim 5, **characterized in that** the sheets in the second housing (3) may be positioned with a predefinable angle of incidence on the narrow side of the sheets, and the motion of the second housing (3) in relation to the first housing (2) occurs essentially along a circuit between an upper end position and

a lower end position, the circuit being approximated by a straight line having the angle of incidence and the maximum deviation - measured perpendicular to this straight line - being less than 1 cm, preferably less than 8 mm, particularly less than 5 mm.

7. The paper feed cassette (1) according to Claim 5 or 6, **characterized in that** the second housing (3) has a floor (31) corresponding to the format of the sheets, two long side walls (32), and at least one narrow side wall (33).

8. The paper feed cassette (1) according to Claim 7, **characterized in that** one front lever arm (51) and one rear lever arm (52) is positioned on each of the long side walls (32), each two of the lever arms (51, 52) being positioned diametrically opposite and the lever arms (51, 52) having equal lever lengths.

9. The paper feed cassette (1) according to Claim 8, **characterized in that** the rear lever arms (52) are connected to one another using a connection element (53) on their ends facing away from the second housing (3).

10. The paper feed cassette (1) according to one of Claims 5 through 9, **characterized in that** an equalization element (54) for positioning the current uppermost sheet is positioned between the first housing (2) and the second housing (3).

11. The paper feed cassette (1) according to one of Claims 5 through 10, **characterized in that** a blocking device (4) according to one of Claims 1 through 4 is provided.

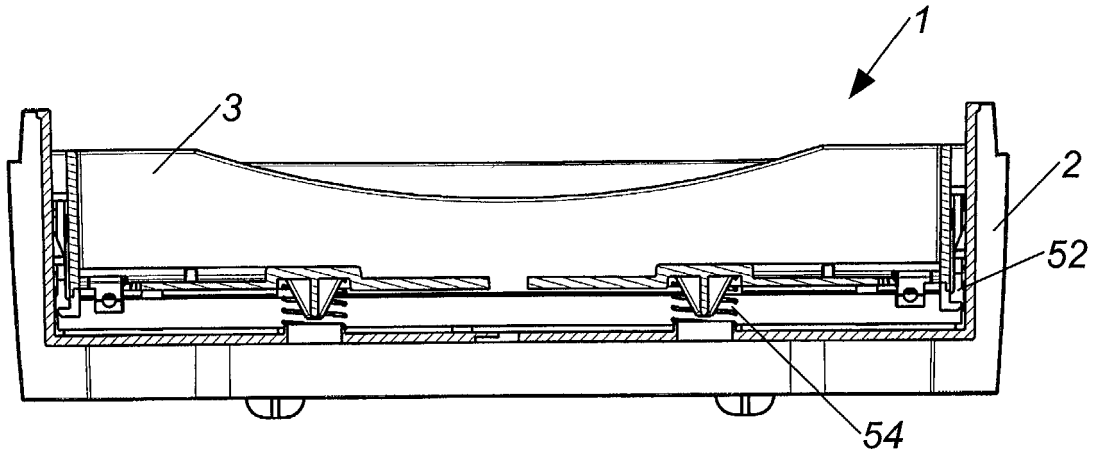

Fig. 1

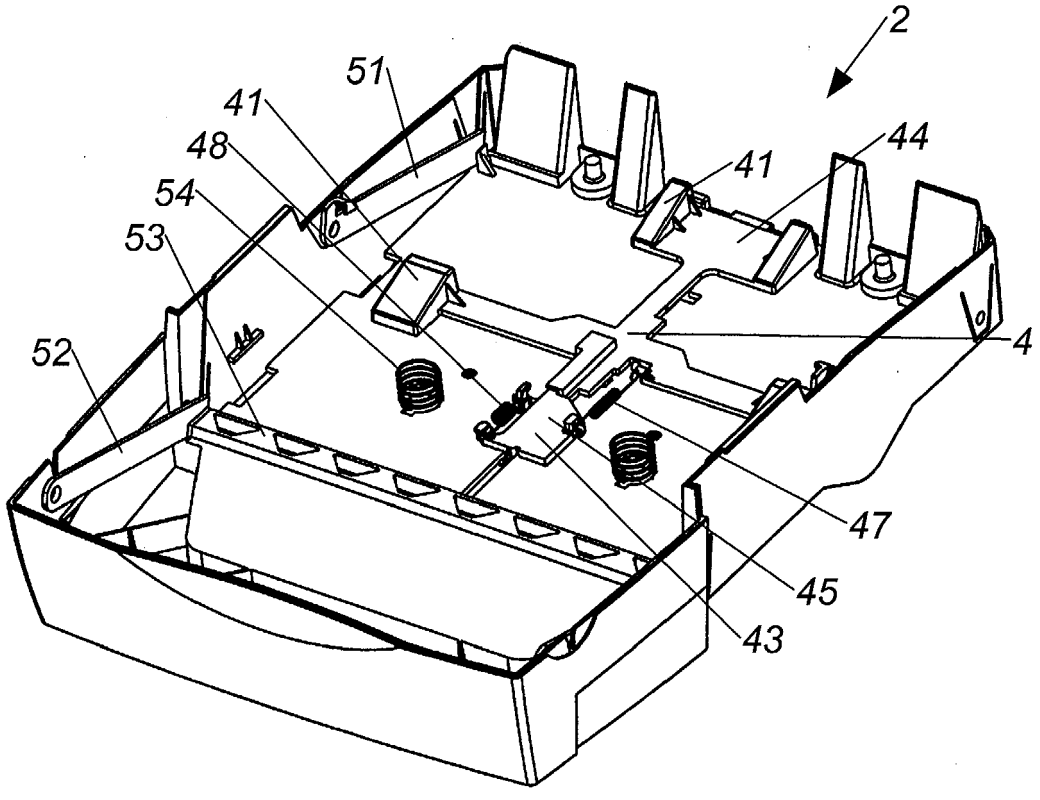

Fig. 2

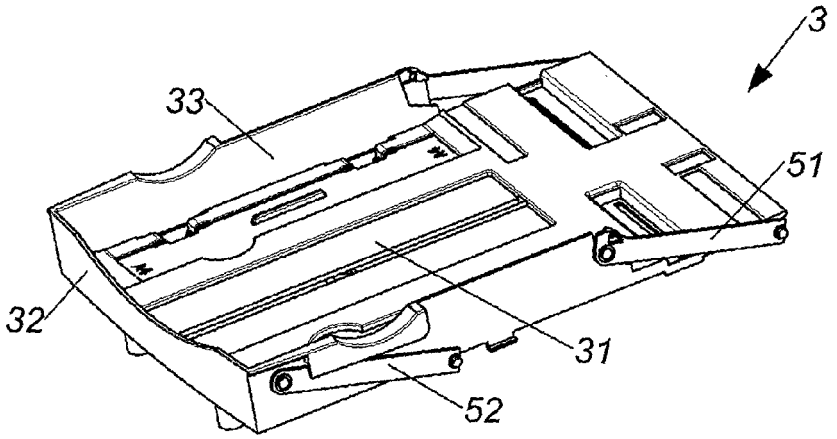

Fig. 3

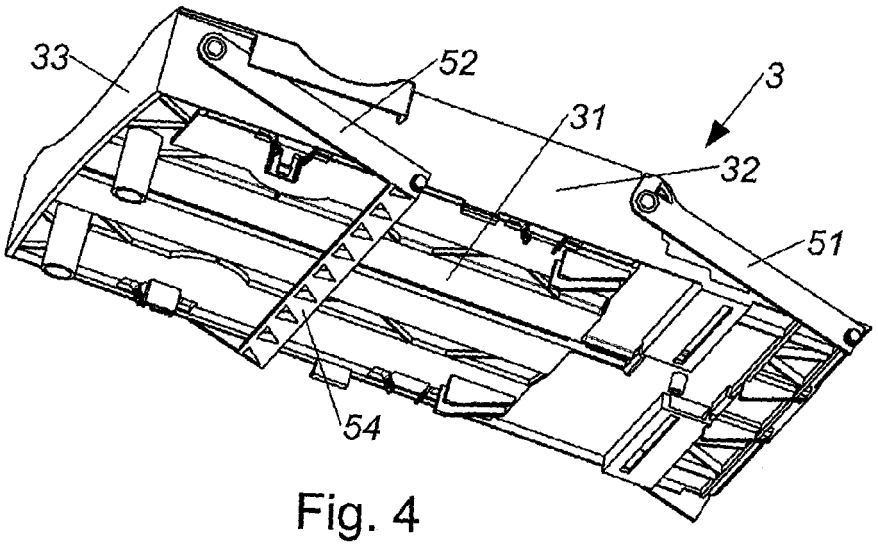

Fig. 4

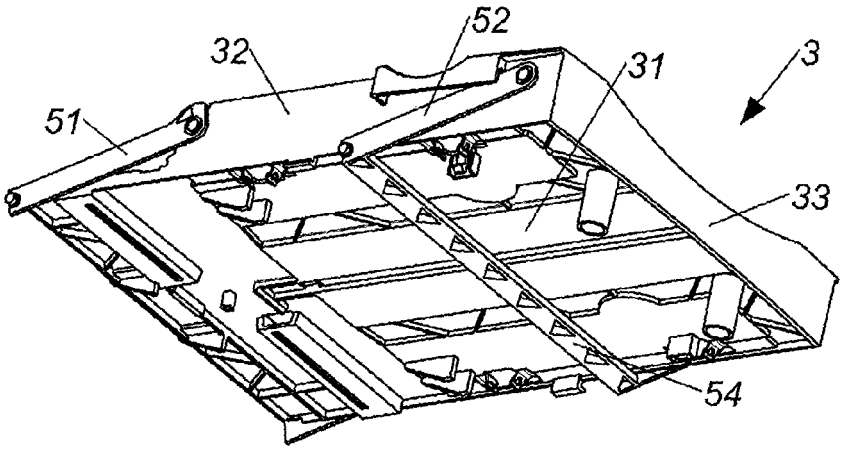

Fig. 5

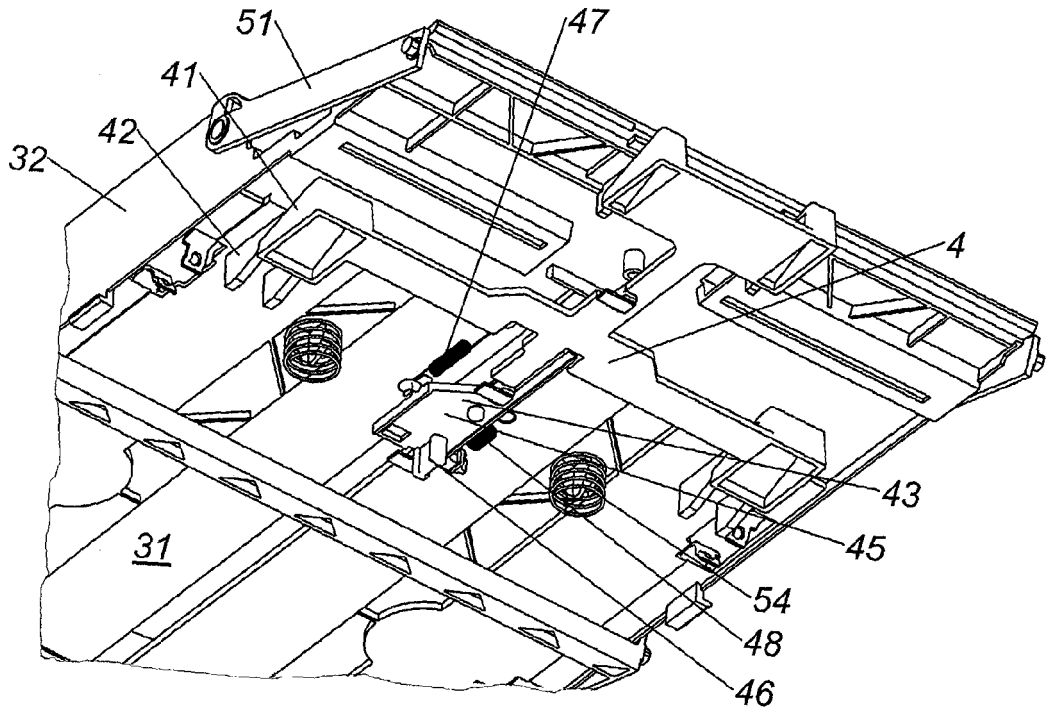

Fig. 6

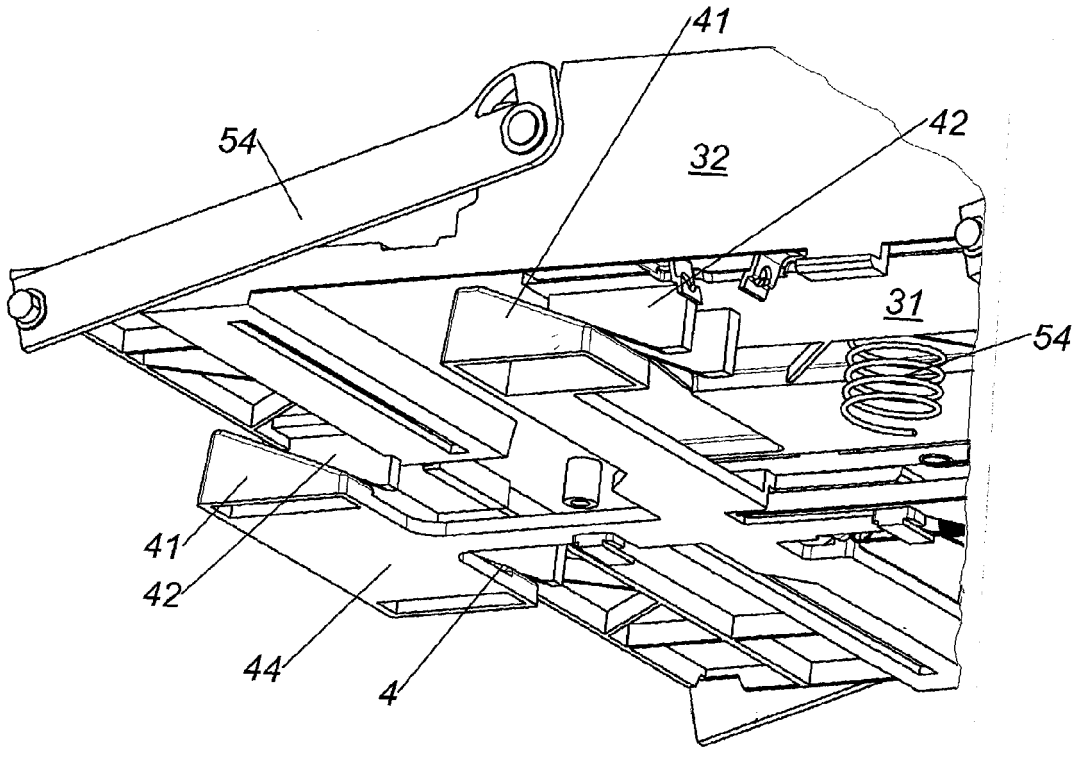

Fig. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 29 0464

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X Y	EP 0 296 820 A (XEROX CORPORATION) 28 December 1988 (1988-12-28)	1,5,7, 10,11 8	B65H1/04 B65H1/12 B65H1/14
Y	US 3 989 236 A (KOMORI ET AL) 2 November 1976 (1976-11-02) * figures 3-7 *	8	
X	PATENT ABSTRACTS OF JAPAN vol. 1996, no. 05, 31 May 1996 (1996-05-31) -& JP 08 002705 A (CANON INC), 9 January 1996 (1996-01-09) * abstract; figures 5,7 *	1,5,7,11	
X	PATENT ABSTRACTS OF JAPAN vol. 2002, no. 02, 2 April 2002 (2002-04-02) -& JP 2001 301994 A (MINOLTA CO LTD), 31 October 2001 (2001-10-31) * abstract; figures 1,2 *	1	
X	US 2004/000750 A1 (TODD DOUGLAS JOHN) 1 January 2004 (2004-01-01) * page 4, paragraph 33 - paragraph 35; figure 6 *	1	TECHNICAL FIELDS SEARCHED (Int.Cl.7) B65H B41J
X	DE 38 44 325 A1 (MANNESMANN AG, 4000 DUESSELDORF, DE) 28 June 1990 (1990-06-28) * column 2, lines 64-67; figure 2 *	1	
X	EP 0 700 851 A (CANON KABUSHIKI KAISHA) 13 March 1996 (1996-03-13) * figures 6a,8g,8i *	1	
X	EP 0 398 220 A (SHARP KABUSHIKI KAISHA) 22 November 1990 (1990-11-22) * figures 4a,4b *	5,7,10, 11	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 August 2005	Kising, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 29 0464

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	US 6 364 309 B1 (TOMATSU YOSHIYA) 2 April 2002 (2002-04-02) * figures 6-8 * -----	5,8,10	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 August 2005	Kising, A

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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

European Patent Office

Application Number
EP 05 29 0464

CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

European Patent Office

LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 05 29 0464

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1,(2-4)

Paper feed cassette for a printer or the like having a second housing for receiving sheets being positioned in a first housing, wherein a blocking device is provided (between the first and second housing)
(Object: Improved paper removal also in cases where merely some sheets are present in the first housing)

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2. claims: 5,(6-11)

Paper feed cassette for a printer or the like having a second housing for receiving sheets which is positioned in a first housing, wherein said second housing is movable within the first housing using at least a lever arm.
(Object: To guarantee a uniform motion of the second housing within the first housing and to achieve a stable construction)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 29 0464

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