(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 748 697 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.12.1996 Bulletin 1996/51

(51) Int Cl.[6]: **B41J 25/308**

(21) Application number: **96401273.6**

(22) Date of filing: **12.06.1996**

(84) Designated Contracting States:
DE FR GB IT

(30) Priority: **13.06.1995 KR 9515542**

(71) Applicant: **LG ELECTRONICS INC.**
Seoul (KR)

(72) Inventor: **Sim, Kwan-Bo**
Dongjak-Ku, Seoul (KR)

(74) Representative: **Loisel, Bertrand**
Cabinet Plasseraud,
84, rue d'Amsterdam
75440 Paris Cédex 09 (FR)

(54) Ink jet printer head gap controlling apparatus

(57) The present invention is an ink jet printer head gap controlling apparatus which is provided with the capability of regulating the gap between a print head (82) and a paper sheet (22) so that a variety of paper sheets can be automatically processed therethrough irrespective of the thicknesses of each paper sheet thereof. The invention includes a pickup roller (40) for picking up a paper sheet (22) one-by-one from a plurality of paper sheets stacked in a cassette (20), a transfer roller (50) for transferring the picked-up paper sheet (22) forwardly along the periphery thereof, a first supporting member (60) for guiding and elastically supporting the transferred paper sheet, a supporting roller (70) formed at one side portion of a cartridge carrier (80) so as to move horizontally along with the first supporting member (60) and supporting the first supporting member (60), a second supporting member (90) elastically supporting another side portion of the cartridge carrier (80) to maintain a certain distance between a rotation axle of the supporting roller (70) and the first supporting member (60) and regulating the gap between the print head (82) and the printing paper sheet (22) transferred onto the guiding plate, and an extracting roller (100) for outwardly extracting therefrom the paper sheet (22) printed using the ink jetted from a nozzle (84) of the print head (82).

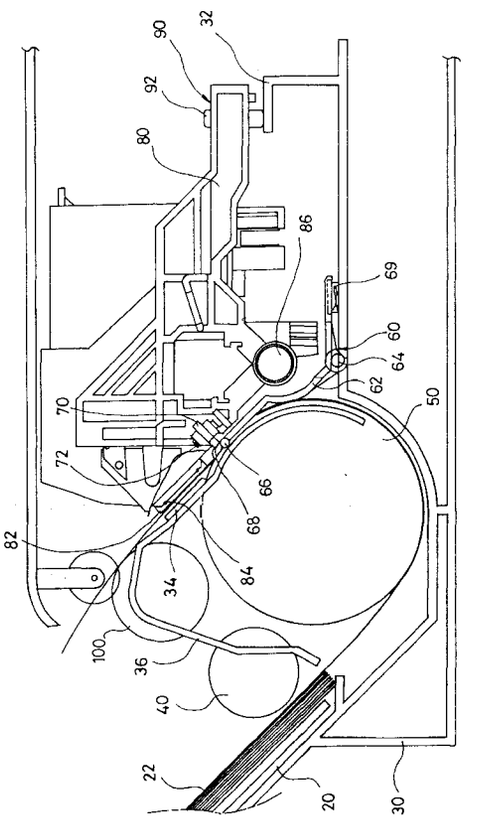


FIG. 4

EP 0 748 697 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an ink jet printer head, and more particularly to an ink jet printer head gap controlling apparatus capable of regulating the gap between a print head and a paper sheet so that a variety of paper sheets can be automatically processed therethrough irrespective of the thicknesses of the paper sheets.

2. Description of the Prior Art

As shown in Figures 1 through 3, a conventional ink jet printer such as disclosed in Japanese Patent Publication No. 6-135090 includes a cartridge carrier 1 having a print head 4 at one end portion thereof and carried horizontally on a cartridge carrier axle 2, on which carrier an ink cartridge is to be placed. A transfer roller 5 is provided for forwardly transferring a paper sheet picked up by a pickup roller (not illustrated). A cradle 6 is inclined toward the transfer roller 5 for adhering the guided paper sheet to the transfer roller 5. A printing platen 7 is located opposite the print head 4, on which platen 7 printing is to be performed on the paper sheet by the ink jetted from a nozzle (not illustrated) of the print head 4. A combining hole 10 is formed in each side plate 15 of a carrier frame 18, into each of which combining holes 10 a bush 9 is inserted. An eccentric bush 11 is rotatable in an eccentric bore within the bush 9. An insertion hole 12 is displaced a certain distance from the center of the eccentric bush 11, and an end portion of the carrier axle 2 is insertingly fixed therein. A selecting arm 13 formed on the outer periphery of an extension 14 extended from the eccentric bush 11, for controlling the position of the print head 4 in accordance with the thickness of each printing paper sheet.

The operation of the above-described conventional ink jet printer head gap controlling apparatus is detailed as follows. First, when the selecting arm 13 is manually moved to shift the print head 4 to a certain position which is regarded as appropriate for the thickness of a paper sheet, the eccentric bush 11 is accordingly rotated. At this moment, the carrier axle 2 fixed in the eccentric bush 11 moves by a certain distance, and at the same time the cartridge carrier 1 carried on the carrier axle 2 is also moved. As a result, the print head 4 placed on the carrier 1 is maintained at a certain distance from the printing paper sheet.

When the printer starts operation, the pickup roller (not illustrated) picks up a top sheet from the papers stacked in a cassette (not illustrated), the picked-up paper sheet being guided thereby onto the cradle 6, and the guided paper sheet is then transferred by the transfer roller 5 through the cradle 6 to the platen 7.

Then, after the paper sheet which is placed on the platen 7 is printed on by the ink jetted from the nozzle (not illustrated) of the print head 4, the printing-completed sheet is outwardly extracted therefrom by means of an extracting roller (not illustrated).

However, when another paper sheet having a thickness different from the former sheet is to be printed on, the selecting arm 13 has to be manually adjusted again for the different paper thickness prior to next performing the above-described printing operation.

So, the conventional ink jet printer has several disadvantages in that printer users have been troubled because the conventional printer has to be adjusted manually according to the thickness of a paper sheet being selected, and additionally, the paper sheets used are confined to limited kinds thereof because the paper selecting arm has a narrow range of adjustment.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide an ink jet printer head gap controlling apparatus capable of regulating the gap between a print head and a paper sheet so that a variety of paper sheets irrespective of the thicknesses thereof can be automatically processed.

To achieve the above-described object in accordance with the present invention, an ink jet printer head gap controlling apparatus includes a pickup roller for picking up paper sheets one by one from a plurality of paper sheets stacked in a cassette, a transfer roller for transferring the picked-up paper sheet forwardly along a periphery thereof, a first supporting member for guiding and elastically supporting the transferred paper sheet, a supporting roller formed on one side portion of a cartridge carrier so as to move horizontally along with the first supporting means and supporting the first supporting member, a second supporting means elastically supporting another side portion of the cartridge carrier to maintain a certain distance between a rotation axle of the supporting roller and the first supporting member and regulating a gap between a print head and the printing paper sheet transferred onto a guiding pad, and an extracting roller for outwardly extracting therefrom the paper sheet after being printed on by ink jetted from a nozzle of the print head.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side view of the printing mechanism of an ink jet printer of the conventional art;

Figure 2 is a perspective view of the ink jet printer of the conventional art;

Figure 3 is an enlarged partial view showing a paper thickness selecting arm mechanism in the ink jet printer of the conventional art;

Figure 4 is a cross-sectional view showing an ink jet printer head gap controlling apparatus in accordance with the present invention;

Figure 5 is a plan view showing the ink jet printer head gap controlling apparatus in accordance with the present invention;

Figure 6 is a front view of the ink jet printer head gap controlling apparatus of Fig.5;

Figure 7 is an enlarged perspective view showing a second supporting member of the ink jet printer head gap controlling apparatus in accordance with the present invention;

Figure 8A is a cross-sectional view showing an embodiment of the second supporting member of the ink jet printer head gap controlling apparatus in accordance with the present invention; and

Figure 8B is a perspective view showing the combination of a roller and an elastic rotation axle of another embodiment of the second supporting member of the ink jet printer head gap controlling apparatus in accordance with the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to Figs.4 through 7, an ink jet printer head gap controlling apparatus in accordance with the present invention includes a cassette 20 provided upwardly extending at a rear portion of a carrier frame 30 for having a plurality of paper sheets stacked therein. A pickup roller 40 is provided adjacent to a lower portion of the cassette 20 for picking up a paper sheet 22 one-by-one from paper sheets stacked in the cassette 20. A transfer roller 50 is provided in a lower portion of the carrier frame 30 for transferring the paper sheet 22 picked up by the pickup roller 40 forwardly along the periphery thereof, and cooperates with a first supporting member 60, a second supporting member 90, and an extracting roller 100, which will be described hereunder.

The first supporting member 60 is mounted at one end thereof on a coordinate axle 64 so that a body 62 for guiding the paper sheet 22 can be minutely contacted to a paper sheet 22 which advances by the transfer roller 50, and includes a friction roller 66 carried at one end portion of the body 62 and rolled frictionally with the transfer roller 50. A pressing member 68 is extended upwardly from the friction roller 66 for pressing the transferred paper sheet 22 to the transfer roller 50 by the rotation of the friction roller 66. An elastic supporting member 69 is placed between another end portion of the body 62 and the carrier frame 30 so that the body 62 can be moved elastically as a paper sheet 22 is passed through between the transfer roller 50 and each of the friction roller 66 and the pressing member 68, and specifically the first supporting member 60 guides and elastically supports the paper sheet 22 as it is advanced by the transfer roller 50.

The ink jet printer in accordance with the present invention also includes a supporting roller 70 provided at one side portion of a carriage 80 to support the pressing member 68 of the first supporting member 60 and moving horizontally along the first supporting member 60, and a guiding plate 34 provided on an upper portion of a paper guide 36 and being parallel to a print head 82.

The carriage 80 mounts at a front portion thereof a print head 82 having a nozzle 84 for jetting ink onto a paper sheet 22 positioned opposite thereto. The carriage 80 is carried movably at a lower portion thereof on a carriage shaft 86 by s bearing or like means, along which the carriage 80 may traverse, and about which the carriage 80 may pivot forwardly and backwardly so as to vary the space between the print head nozzle 84 and the paper sheet 22.

As shown in Figs.8A and 8B, another embodiment of the second supporting member 90 in accordance with the present invention includes an elastic rotation axle 98 provided at a lower portion of the carrier frame 30, and a roller 92 fixed on the elastic rotation axle 98 and moving along a guiding shelf 32 of the carrier frame 30. Meanwhile, when a force is transmitted on each side of the elastic rotation axle 98, an elasticity-originated reaction force occurs at a lower portion of the roller 92.

As a result, the first supporting member 60 elastically supports another side portion of the carriage 80 so that a certain distance can be obtained between a rotation axle 72 of the supporting roller 70 and the first supporting member 60, and regulates the gap between the paper sheet 22 transferred onto the guiding plate 34 and the print head 82.

Also, the extracting roller 100 for extracting outwardly the paper sheet printed on the guiding plate 34 is provided at a portion slightly over the transfer roller 50.

The ink jet printer head gap controlling apparatus operation and the effect thereof in accordance with the present invention will follow based upon the above-described composition.

First, when a top paper sheet 22 of the paper sheets stacked in the cassette 20 is picked up by the pickup roller 40, the transfer roller 50 forwardly transfers the paper sheet 22 along the periphery thereof. The paper sheet 22 is guided by the body 62 of the first supporting member 60 into a space between the transfer roller 50 and the body 62 of the first supporting member 60. At this moment, the body 62 rotates on the coordinate axle 64 as much as the thickness of the advancing paper sheet 22. Subsequently, the elastic supporting member 69 which is provided beneath one end portion of the first supporting member 60 generates a reaction force caused by elasticity. Then, the paper sheet 22 is pressingly passed through the interspace between the transfer roller 50 and the friction roller 66 which is rolled fric-

tionally with the transfer roller 50.

The paper sheet 22 pressed to the pressing member 68 upwardly facing the friction roller 66 is guided onto the guiding plate 34. The rotation force being generated when the supporting roller 70 moves upwardly on the carriage shaft 86 as much as the thickness of the paper sheet 22, presses each side of the plate spring 96 mounted at one side portion of the carriage 80, and a reaction force caused by elasticity occurs at a lower portion of the rotation axle 94, so that the supporting roller 70 supports the pressing member 68 of the first supporting member 60.

When the carriage 80 moves horizontally on the carriage axle 86, the supporting roller 70 of the second supporting member 90 moves on the guiding shelf 32, and the plate spring 96 transmits a reaction force caused by elasticity to the supporting roller 70 which subsequently supports the pressing member 68. As a result, even when the carriage 80 horizontally moves, a gap between the transferred paper sheet 22 and the print head 82 can be varied depending on the advancing paper sheet 22.

Subsequently, the nozzle 84 provided in the print head 82 enables to perform the printing while maintaining a prescribed gap between the print head 82 and the transferred paper sheet 22, by jetting ink onto the paper sheet 22 mounted on the guiding plate 34. Thereafter, the printing-completed paper sheet 22 is outwardly extracted from the guiding plate 34 by the extracting roller 100.

As described above, the ink jet printer head gap controlling apparatus in accordance with the present invention enables to provide an enhanced convenience in using printers by removing the disadvantage in which the print head positions have to be controlled manually according to each thickness of paper sheets. Therefore, under the present invention, a variety of paper sheets can be used for printing regardless of the thicknesses thereof.

Claims

1. An ink jet printer head gap controlling apparatus comprising:

   a pickup roller for picking up a paper sheet one-by-one from a plurality of paper sheets stacked in a cassette;
   a transfer roller for transferring the picked-up paper sheet forwardly along the periphery thereof;
   first supporting means for guiding and elastically supporting the transferred paper sheet;
   a supporting roller formed on one side portion of a cartridge carrier so as to move horizontally along with the first supporting means and supporting the first supporting means;
   second supporting means for elastically supporting another side portion of the cartridge carrier to maintain a certain distance between a rotation axle of the supporting roller and the first supporting means and regulating the gap between the print head and the printing paper sheet transferred onto the guiding pad; and
   an extracting roller for outwardly extracting therefrom the paper sheet printed using the ink jetted from a nozzle of a print head.

2. The apparatus of Claim 1, wherein said first supporting means comprises a body guiding forwardly the paper sheet being transferred, a coordinate axle formed at a lower portion of the carrier frame and rolling on the axis thereof minutely, a friction roller provided at one end portion of the body and rolled frictionally with the transfer roller, a pressing member placed forwardly facing the friction roller and pressing to the transfer roller the paper sheet transferred by the rotation of the friction roller, an elastic supporting member mounted between another end portion of the body and the carrier frame for pressing to the transfer roller the paper sheet being passed through between the gearing roller and the pressing member.

3. The apparatus of Claim 1, wherein said guiding plate is formed parallel to the print head.

4. The apparatus of Claim 1, wherein said second supporting means comprises a roller mounted on a rotation axle and moving along a guiding shelf, and a plate spring provided on an upper portion of the rotation axle so that a reaction force occurs at a lower portion of the roller by elasticity.

5. The apparatus of Claim 1, wherein said second supporting means comprises an elastic rotation axle provided at a lower portion of the carrier frame, and a roller fixed on the elastic rotation axle and moving on the guiding shelf.

FIG. 1

CONVENTIONAL ART

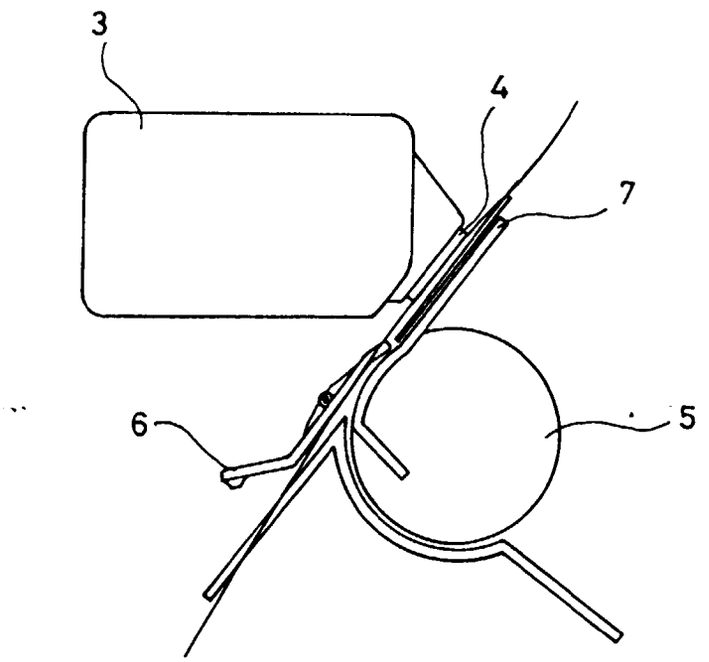


FIG. 2

CONVENTIONAL ART

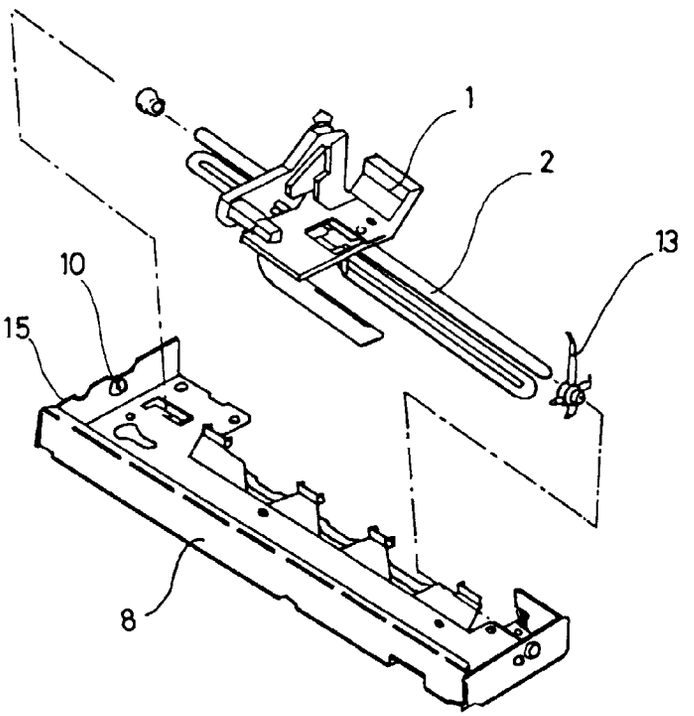


FIG. 3

CONVENTIONAL ART

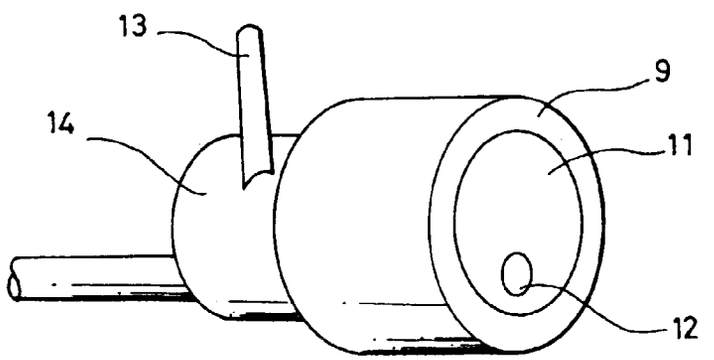


FIG. 4

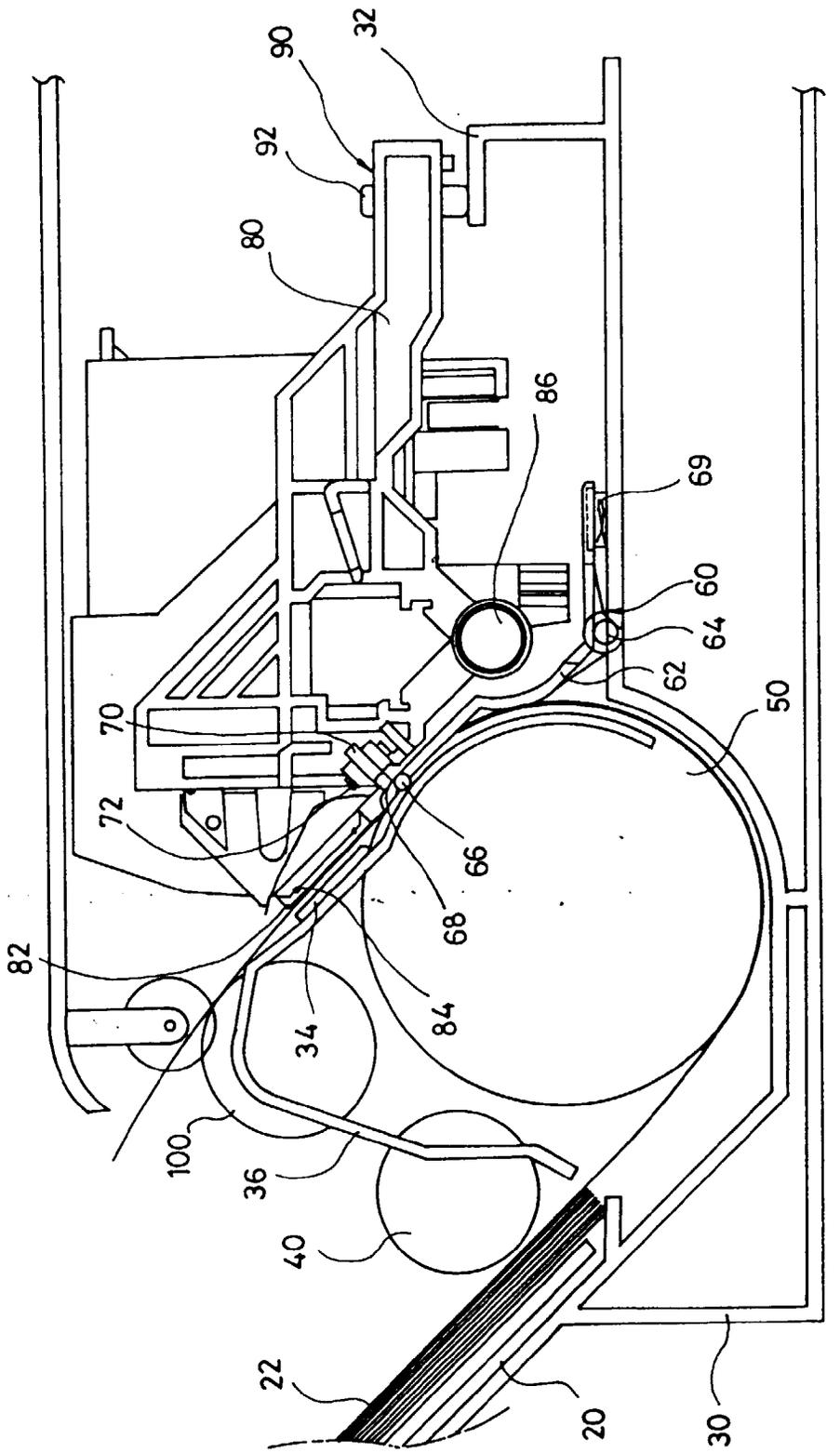


FIG. 5

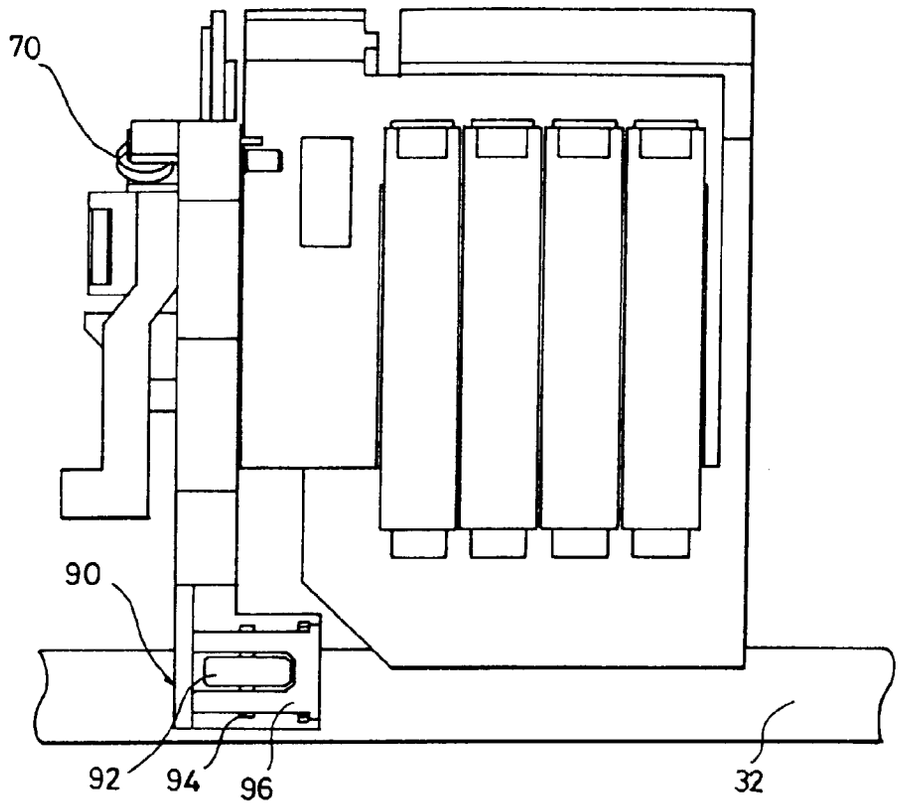


FIG. 6

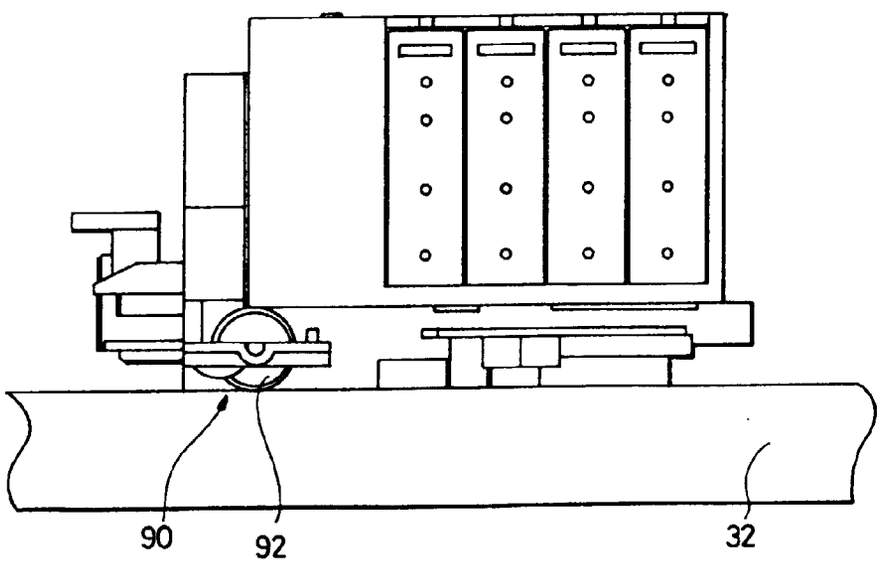


FIG. 7

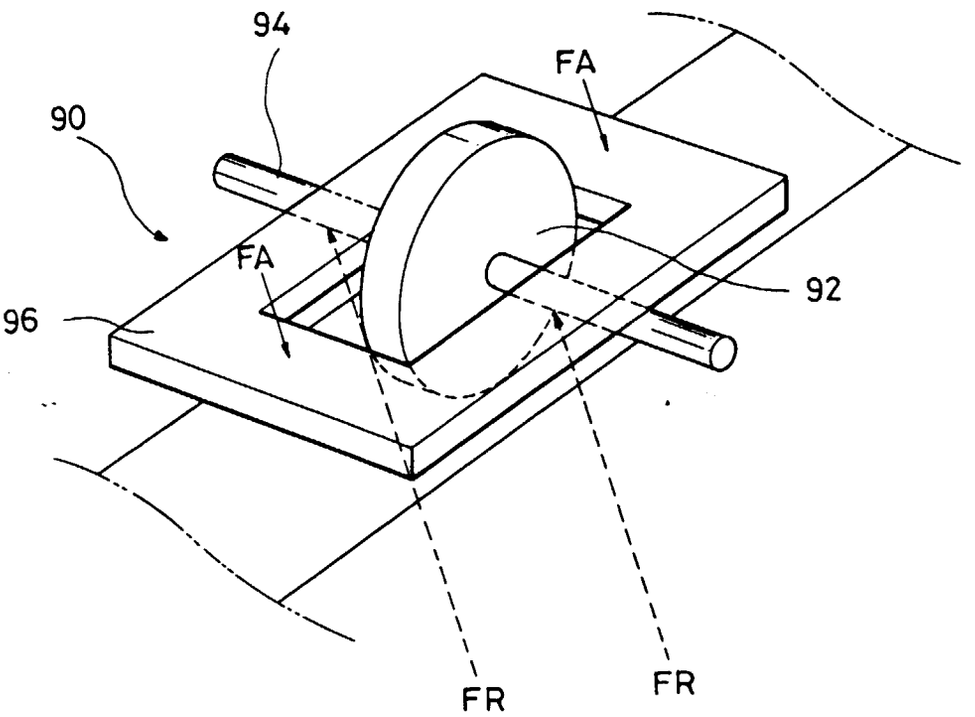


FIG. 8A

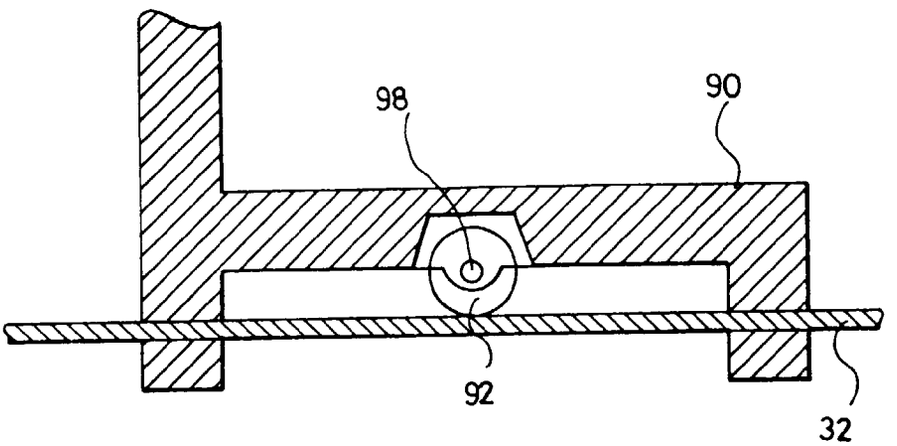
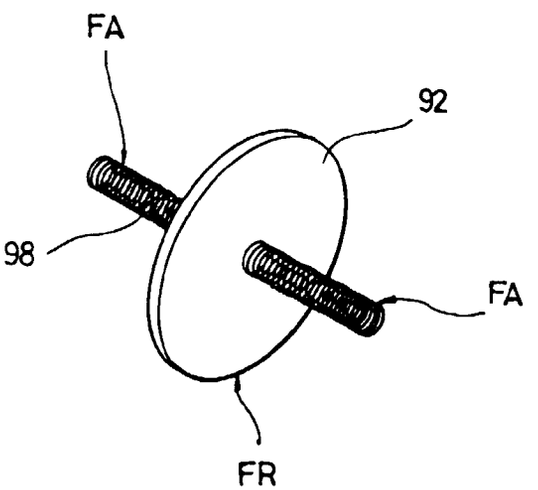


FIG. 8B



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 40 1273

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.6)
X	EP-A-0 435 695 (CANON KABUSHIKI KAISHA) * column 26, line 15 - line 27; figure 17 * ---	1-5	B41J25/308
X	EP-A-0 650 846 (HEWLETT-PACKARD COMPANY) * page 6, line 20 - line 43; figure 7 * ---	1-3	
A	IBM TECHNICAL DISCLOSURE BULLETIN, vol. 26, no. 12, May 1984, NEW YORK US, pages 6373-6374, XP002012313 REX, D.K.: "PRINTHEAD ADJUSTMENT" * the whole document * ---	1-5	
A	US-A-4 010 834 (LINDER) * figure 1 * ---	1-3	
A	PATENT ABSTRACTS OF JAPAN vol. 14, no. 237 (M-976) [4180] , 21 May 1990 & JP-A-02 063782 (JUKI CORP), 5 March 1990, * abstract * ---	1	TECHNICAL FIELDS SEARCHED (Int.Cl.6) B41J
A	EP-A-0 418 815 (CANON KABUSHIKI KAISHA) * column 23, line 7 - line 52; figures 3A,19 * -----	5	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	2 September 1996	Joosting, T

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)