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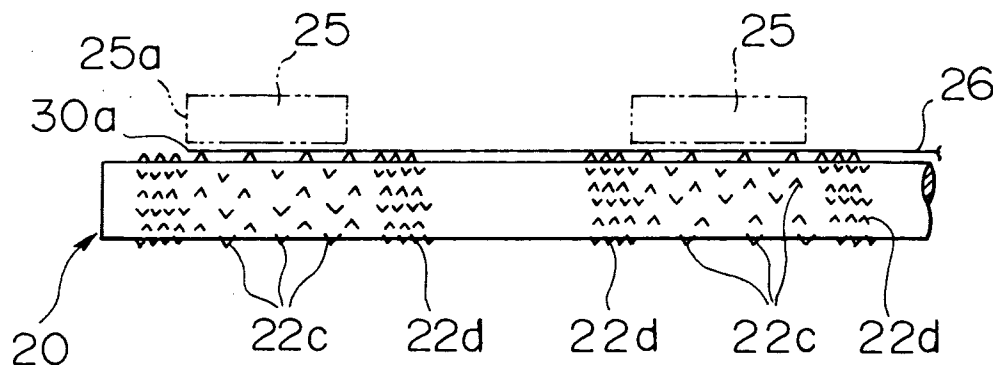
AL LT LV RO SI(30) Priority: **24.10.1996 JP 282427/96****24.10.1996 JP 282428/96****19.02.1997 JP 51044/97**(71) Applicant: **ALPS ELECTRIC CO., LTD.****Ota-ku Tokyo 145 (JP)**

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(57) A paper feed roller is capable of providing highly accurate, stable feeding power in both forward and reverse directions regardless of the direction of rotation of the paper feed roller. In order to permit stable, accurate paper feed for an extended use, a plurality of protuberances (22c, 22d) are formed by partly projecting the outer peripheral surface of a metallic shaft (20) by sub-

jecting the metallic shaft to plastic working. Each of the protuberances is shaped nearly like a semi-dome composed of a vertical plane oriented to the direction of the rotation of the paper feed roller and a quarter-sphere surface continuing from the vertical plane, and the orientations of the vertical planes are alternately shifted for each row of protuberances.

FIG. 6**EP 0 842 883 A1**

Description

The present invention relates to a paper feed roller used for a paper feed mechanism of a printer and, more particularly, to a paper feed roller ideally used for a printer which is required to ensure highly accurate paper feed.

Serial printers such as ink-jet printers and thermal-transfer printers are extensively used as output devices for computers, word processors, etc. In the serial printers, while a carriage on which a recording head is mounted is moved along a platen, the recording head is selectively driven to record one line of data on a recording sheet; upon completion of the recording of one line, the recording sheet is fed for one line for the next recording. This operation is repeated to accomplish predetermined recording.

Fig. 7 shows a thermal-transfer printer which is an example of such a serial printer; a tabular platen 2 is disposed approximately at the center of a frame 1 of the printer so that the recording surface thereof is almost vertical, and a carriage shaft 3 is disposed at a lower position in front of the platen 2 of the frame 1 such that it is parallel to the platen 2. A flange-shaped guide 4 is formed at the front edge of the frame 1; and a carriage 5 is installed on the carriage shaft 3 and the guide 4 in such a manner that it can reciprocate along the carriage shaft 3 and the guide 4. Installed at the front edge of the carriage 5 is a thermal head 6 which is opposed to the platen 2 and which is moved into contact with or away from the platen 2 by a driving mechanism not shown. Detachably mounted on the top surface of the carriage 5 is a ribbon cassette (not shown) which contains an ink ribbon and guides the ink ribbon between the platen 2 and the thermal head 6. Further disposed on the top surface of the carriage 5 are a take-up bobbin 7 for taking up the ink ribbon from the ribbon cassette and a feeding bobbin 8 for feeding the ink ribbon.

Provided behind the platen 2 is a paper inserting port 9 through which a recording sheet, not shown, is inserted; there is also a paper feed roller 10 for feeding the sheet inserted through the paper inserting port 9 toward the front of the platen 2, i.e. the recording section. A pressure roller 11 pressed against the paper feed roller 10 is rotatably provided beneath the paper feed roller 10; a paper feed gear 12 is mounted on one side surface of the frame 1 such that it juts out and it is coaxial with the paper feed roller 10. Connected to the paper feed gear 12 is a motor gear 15 of a paper feed motor 14 via a plurality of transmission gears 13, 13; when the paper feed roller 10 is rotated by the paper feed motor 14 via the motor gear 15, the transmission gears 13, and the paper feed gear 12, the paper nipped between the paper feed roller 10 and the pressure roller 11 is fed.

In such a thermal-transfer printer, the paper is inserted through the paper inserting port 9, clamped between the paper feed roller 10 and the pressure roller 11, and the paper feed motor 14 is driven to rotate the

paper feed roller 10 to feed the paper to the recording start position. With the thermal head 6 pressed against the platen 2 via the ink ribbon and the paper, the carriage 5 is moved along the platen to selectively energize and drive the recording elements of the thermal head 6 in accordance with image information so as to selectively melt and transfer the ink of the ink ribbon to the paper, thereby performing desired recording. Upon completion of one line of recording, the paper is fed by a predetermined amount before implementing the next recording.

Thus, in the serial printer, since the paper is fed by one line each time one line of recording is finished, highly accurate paper feed is required. Highly accurate feed is required because, if a sheet is fed by an amount less than a predetermined value, then a "white streak" which is a blank part in a line is produced, while if the sheet is fed by an amount more than the predetermined value, then a "black streak" where recording is made at the same place twice is produced, resulting in overlapped print.

As shown in Fig. 7, the conventional paper feed roller 10 in the serial printer generally has a rubber roller main body attached around the outer periphery of the metallic shaft. In such a paper feed roller 10, the rubber roller main body is elastically deformed when the pressure roller 11 is pressed against it, posing a problem in that the radius of the rubber roller changes and the accurate paper feed amount cannot be obtained. In addition, if the elastic deformation of the rubber roller is not axially even, then the lateral feeding amount of the rubber roller will be accordingly uneven, presenting a problem of "skew."

In order to solve the problem caused by the elastic deformation of the rubber roller described above, a paper feed roller 10 is provided which is composed of a columnar metallic shaft 10a provided with irregular ceramic particulates 15 of about 20 to about 50 microns attached thereto as shown in Fig. 8. With this arrangement, the surface of the paper feed roller 10 does not elastically deform even when the pressure roller 11 comes in pressure contact; further, the surface projections of the ceramic particulates 15 bite in the paper to provide an appropriate gripping force, thus permitting stable, highly accurate paper feed.

However, in such a paper feed roller 10 composed of the metallic shaft 10a provided with the ceramic particulates 15 attached to the surface thereof, the ceramic particulates 15 come off in an extended use, and the feeding power accordingly deteriorates. There is another disadvantage in that, when the paper feed roller 10 is used for a thermal-transfer printer, the thermal head 6 moves while being pressed against the platen 2 in such a state where the ceramic particulates 15 which have come off are held therebetween, thus causing damage to the recording elements of the thermal head 6 by the hard ceramic particulates 15.

Accordingly, it is an object of the present invention to provide a paper feed roller which has overcome the

disadvantages with the conventional paper feed roller described above and which is capable of providing stable feeding power for a long period of time.

To this end, according to one aspect of the present invention, there is provided a paper feed roller equipped with a plurality of protuberances arranged on the outer peripheral surface of a metallic shaft, which has a circular cross section, in a zigzag pattern in the axial and/or circumferential direction, the protuberances being formed by partly projecting the outer peripheral surface of the metallic shaft itself by plastic working. With this arrangement, the plurality of protuberances laid out in a zigzag pattern are able to firmly grip a sheet, thus permitting highly accurate, stable paper feed power in both forward and reverse directions to be obtained and also enabling the stable paper feed power to be maintained for an extended period of time.

According to another aspect of the present invention, there is provided a paper feed roller in which the foregoing plurality of protuberances are formed so that each of them is shaped nearly like a semi-dome composed of a vertical plane oriented to the direction of rotation of the roller and a quarter-sphere surface continuing from the vertical plane, and that the orientations of the vertical planes are alternately shifted for each row of protuberances. With this arrangement, the paper feed roller is capable of performing stable feed of a sheet in both forward and reverse directions without scratching the sheet.

According to still another aspect of the present invention, there is provided a paper feed roller, wherein the plurality of protuberances are formed so that the density thereof is lower in an area where the pressure roller which is pressed against the paper feed roller and which nips a sheet between itself and the paper feed roller is in pressure contact, while the density thereof is higher in an area where the pressure roller is not in pressure contact, thus causing all the protuberances to help feed the sheet until the sheet is nipped between the paper feed roller and the pressure roller, then to allow the protuberances in the lower-density area, which are formed in the position opposed to the pressure roller, to sufficiently grip the sheet after the sheet has been nipped between the paper feed roller and the pressure roller. This arrangement enables the paper feed roller to perform stable paper feed.

According to yet another aspect of the present invention, there is provided a paper feed roller, wherein, among the plurality of protuberances, taller protuberances are formed to be 60 to 90 microns high, while shorter protuberances are formed to be 30 to 55 microns high, thus enabling the taller protuberances to evenly act in feeding the sheet after the sheet has been clamped between the paper feed roller and the pressure roller. This enables the paper feed roller to perform stable paper feed without causing skew of the sheet.

According to a further aspect of the present invention, there is provided a paper feed roller, wherein the

foregoing protuberances are arranged at pitches of 0.2 to 0.6 mm in the circumferential direction and at pitches of 0.6 to 1.8 mm in the axial direction. With this arrangement, the paper feed roller is able to provide an appropriate gripping force so as to ensure stable paper feed.

According to still a further aspect of the present invention, there is provided a paper feed roller, wherein the protuberances are formed to have a height of 30 to 90 microns. With this arrangement, the protuberances are able to have an appropriate grip on paper to ensure stable paper feed, and the paper feed roller permits the paper to be accurately set at the start position.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a top plan view schematically showing the structure of a paper feed roller in accordance with an embodiment of the present invention;

Fig. 2 is an enlarged view of the protuberances of the paper feed roller shown in Fig. 1;

Fig. 3 is a perspective view showing the structure of a punch used for forming the protuberances of the paper feed roller in accordance with the present invention;

Fig. 4 is a schematic representation illustrating how the protuberances grip the paper nipped between the paper feed roller according to the embodiment of the invention and a pressure roller;

Fig. 5 is a schematic representation illustrating the positional relationship between the distal ends of the respective protuberances of the paper feed roller and the outer peripheral surface of the pressure roller shown in Fig. 4;

Fig. 6 is a top plan view showing a paper feed roller according to another embodiment of the present invention;

Fig. 7 is a perspective view illustrating the schematic structure of a thermal-transfer printer which is an example of a serial printer; and

Fig. 8 is a top plan view showing an example of a conventional paper feed roller.

Embodiments of a paper feed roller in accordance with the present invention will now be described in conjunction with the accompanying drawings, by way of example only.

Fig. 1 and Fig. 2 show an embodiment of the paper feed roller in accordance with the present invention, in which Fig. 1 is a top plan view of the paper feed roller, and Fig. 2 is an enlarged view of protuberances.

As illustrated, formed on the outer peripheral surface of a paper feed roller 20 composed of a metallic shaft 21 having a circular cross section are a plurality of protuberances 22 arranged at predetermined intervals longitudinally in the circumferential direction and the axial direction of the metallic shaft by plastically machining the metallic shaft 21. Portions 23 where the protuberances 22 are formed are located at positions opposed

to pressure rollers 25 which are indicated by chain lines and which are provided on a printer; the axial width of each of the portions 23 is slightly larger than the width of each of the pressure rollers. Each of the protuberances 22 is shaped nearly like a semi-dome composed of a vertical plane oriented to the direction of rotation of the paper feed roller 20 and a quarter-sphere surface continuing from the vertical plane as shown in the enlarged view of Fig. 2; the interval between the protuberances 22 is 0.2 to 0.6 mm in the circumferential direction and 0.6 to 1.8 mm in the axial direction. There are two types of protuberances differing in height, namely, the taller ones being 60 to 90 microns high and the shorter ones being 30 to 55 microns high, and they are arranged so that every second or third one will be the taller or shorter type. When using general type of paper, providing the protuberances of only one height will permit satisfactorily highly accurate paper feed to be accomplished.

A vertical plane 22c of each of the protuberances 22 shaped like a semi-dome faces in the direction of rotation of the paper feed roller 20, and the vertical planes 22c of the same row of the plurality of the protuberances 22 are oriented in the same direction. Further, the orientations of the vertical planes 22c of the protuberances 22 of the two adjacent rows are opposite to each other, and the protuberances 22 in a plurality of rows are arranged in a zigzag pattern.

In a printer, a plurality of rotatable pressure rollers 25 which can be pressed against the paper feed roller 20 are disposed at predetermined intervals. As illustrated, the width of each of the areas 23 where the protuberances are provided is made greater than the width of each of the pressure roller 25 to constitute the paper feed mechanism adapted to feed paper by clamping the paper between the paper feed roller 20 and the pressure rollers 25.

The fabricating method for the paper feed roller 20 constructed as set forth above will now be described.

Fig. 3 shows the shape of the essential section of a punch 26 used for the press working in the manufacture of the paper feed roller 20. As illustrated in this drawing, the punch 26 has stopper sections 26a at both ends thereof; at the time of press working, the stopper sections 26a are held against a positioning section of machining equipment, not shown, to ensure dimensional accuracy of the protuberances to be formed. When the punch 26 is held against a shaft 21, the surface of the shaft 21 is cut and raised, and a slipper-shaped section is formed, the slipper-shaped section being composed of a depression 22b and the protuberance 22 which is shaped like the foregoing semi-dome. The shaft 21 may be either solid or hollow as long as it has a circular cross section.

Teeth 27 of the punch 26 are shaped such that the projecting surfaces thereof differ in height; therefore, cutting and raising the surface of the shaft 21 automatically produces the differences in cutting depth and ac-

cordingly produces differences in the height of the formed protuberances 22. Further, one cycle of press working forms one row of the protuberances; in actual machining operation, two punches 26 are provided such that the teeth 27 thereof are set in the opposite directions from each other with the shaft 21 located therebetween, and also the positions of the teeth 27 of the two punches 26 are shifted by a half pitch in the axial direction of the shaft 21. Hence, two rows are formed at the same time so that the two rows of the protuberances 22 are shifted by a half pitch and the orientations thereof are opposite from each other in the circumferential direction. Upon completion of one cycle of press working, the shaft 21 is turned by a predetermined angle for the next cycle of press working. The predetermined angle is the angle at which the protuberances 22 facing in the opposite direction are formed by the other punch 26. The vertical planes 23c of the protuberances 22 formed on adjoining rows when one lap of press working has been finished are oriented opposite from each other and the protuberances of the respective rows are laid out in a zigzag form. After completing one lap of the press working, the shaft 21 is moved longitudinally by a predetermined distance, and the protuberances 22 in the area opposed to the next pressure roller 25 are formed in the same manner. By repeating this series of press working, the paper feed roller 20 provided with the desired protuberances 22 can be obtained.

The operation of the paper feed roller 20 according to the embodiment will now be described with reference to Fig. 4 and Fig. 5.

Because of the reason set forth below, it is advantageous that more protuberances 22 are put in operation until a sheet 30 is nipped between the paper feed roller 20 and the pressure rollers 25.

Until the leading edge of the sheet 30 is caught between the paper feed roller 20 and the pressure rollers 25, the sheet 30 is fed only by the frictional force of the paper feed roller 20, and it is required to lift the pressure rollers 25 by the thickness of the sheet against the load of the pressure rollers 25. As the number of protuberances 22 increases, that is, as the density of the protuberances 22 increases, the coefficient of friction relative to the sheet 30 increases, leading to a greater feeding power. This is advantageous especially for thicker paper such as postcards when the pressure rollers 25 are lifter higher.

After the sheet 30 is clamped between the paper feed roller 20 and the pressure rollers 25, the protuberances 22 are required to provide a predetermined amount of grip on the sheet 30; at this point, fewer protuberances are advantageous because of the reason set forth below. If the load applied to one protuberance 22 is denoted as F_a , the total load of the pressure rollers 25 is denoted as F , and the number of the protuberances 22 subjected to the load applied by the pressure rollers 25 is denoted as n , then the following expression is given:

$$F_a = F/n$$

As is obvious from the formula, as the number n of the protuberances 22 is decreased, i.e. as the density of the protuberances 22 is decreased, the load applied to one protuberance 22 increases.

In this embodiment, as previously described, the protuberances have two different heights as illustrated in Fig. 5, and both the tall and short protuberances 22 provide the frictional force applied to the sheet 30 until the sheet 30 is nipped between the paper feed roller 20 and the pressure rollers 25; in this case, the advantage obtained by more protuberances 22 is displayed and the frictional force applied to the sheet 30 increases with a resultant increase in the feeding power. After the sheet 30 has been nipped between the paper feed roller 20 and the pressure rollers 25, only tall protuberances 22a grip the sheet so as to provide the required grip.

Since the vertical planes 22c of the protuberances 22 of adjacent rows are oriented in opposite directions as shown in Fig. 2, fixed paper feed accuracy can be obtained regardless of the feeding direction of the sheet 30, i.e. the direction of rotation of the paper feed roller 20. Therefore, even in the case of a printer which records a full-color image by feeding a single sheet 30 in the forward and reverse directions to record in different colors in an overlapping mode, no color blur occurs and a full-color image of high quality can be produced.

Furthermore, the areas 23, wherein the protuberances are provided, are formed at intervals by plastic working by a press in the portions where the pressure rollers 25 are pressed against the paper feed roller 20, so that the protuberances can be formed with accurate heights at lower cost. In addition, since the protuberances 22 do not come off the paper feed roller 20 even after an extended use, stable paper feed accuracy can be maintained for a long time of period as compared with the case where the ceramic particulates 15 are attached to the surface of the paper feed roller 20.

In the foregoing embodiment, the description has been given to the paper feed roller 20 which has the protuberances 22 of two different heights and the rows of the tall and short protuberances are alternately arranged; however, when regular paper is used, higher paper feed accuracy than that obtained by the conventional paper feed roller can be obtained even when the all the protuberances 22 have the same height. In such a case, setting the height of the protuberances 22 to 30 to 90 microns will lead to a good result.

An outer end 25a of the pressure roller 25 which is pressed against the protuberance area 23 positioned at an axial end of the paper feed roller 20 is disposed inward from an end 30a of the sheet 30; hence, the entire surface of the pressure roller 25 is pressed against the paper feed roller 20 via the sheet 30 to provide a constant coefficient of friction relative to the sheet 30, thus leading to higher paper feed accuracy.

As illustrated in Fig. 6, the same advantage provided by the paper feed roller 20 of the two different heights can be obtained by forming the protuberances 22c in the areas, against which the pressure rollers 25 are pressed, so that the density thereof is lower or sparser than that of protuberances 22d in the areas, against which the pressure rollers 25 are not pressed. In this case, a still greater advantage can be obtained by making the protuberances 22c in the areas, against which the pressure rollers 25 are pressed, taller and by making the protuberances 22d in the areas, against which the pressure rollers 25 are not pressed, shorter.

When recording on an overhead projector (OHP) sheet, it is difficult for the distal ends of the protuberances 22 to grip the surface thereof because the surface is harder than that of regular paper. For this reason, circumferential pitch $P1$ and axial pitch $P2$ of the protuberances 22 greatly influence the gripping force at the time of feeding and the chances of the occurrence of skew. The results of experiences indicate that an appropriate gripping force which permits an OHP sheet to be fed with a minimum of chances of skew can be obtained when circumferential pitch $P1$ of the protuberances 22 is set to 0.2 to 0.6 mm and axial pitch $P2$ is set to 0.6 to 1.8 mm.

When pitches $P1$ and $P2$ are set to smaller values out of the foregoing ranges, the load applied to one protuberance 22 is dispersed and grows smaller, making it impossible to secure sufficient grip. On the other hand, if axial pitch $P2$ is too large, then an insufficient number of protuberances 22 bite in the sheet with a resultant insufficient gripping force; if circumferential pitch $P1$ is too large, then the OHP sheet warps excessively between the protuberances 22, adversely affecting the paper feed accuracy.

In the aforesaid embodiment, the description has been given to the paper feed roller 20 which has the protuberances 22 of two different heights and the rows of the tall and short protuberances are alternately arranged; however, when regular paper is used, higher paper feed accuracy than that obtained by the conventional paper feed roller can be obtained even when the all the protuberances 22 have the same height. In such a case, the height of the protuberances 22 markedly affects the paper feed accuracy; setting the height of the protuberances 22 to 30 to 90 microns makes it possible to provide appropriate grip of the protuberances on both regular paper and OHP sheet without scratching them, thus enabling highly accurate paper feed and high accuracy in feeding the paper and sheet to a start position between the paper feed roller 20 and the pressure rollers 25. If the protuberances 22 are shorter than 30 microns, then the sheet 30 would come in contact also with the outer peripheral surface of the paper feed roller 20 in addition to the protuberances 22, and the load is dispersed with a resultant insufficient grip of the protuberances 22 on the sheet 30. On the other hand, if the protuberances 22 are taller than 90 microns, then the load-

ing edge of the sheet 30 would be caught by the protuberances when the sheet 30 is inserted, preventing the sheet 30 from being fed to the point where the paper feed roller 20 is in contact with the pressure rollers 25; as a result, a paper feed failure may occur or the protuberances 22 may excessively bite in the sheet 30, scratching the sheet 30.

Still higher paper feed accuracy can be achieved by forming the pressure rollers 25 by employing a material which has hardness of 60 to 90 degrees (e.g. nylon).

Thus, since a plurality of protuberances, which are partly projected, are formed in a zigzag form on the outer peripheral surface of the metallic shaft by plastically machining the metallic shaft itself, the paper feed roller in accordance with the present invention is able to provide highly accurate, stable paper feed power in both forward and reverse directions regardless of the direction of rotation of the paper feed roller, in addition to the advantage in that good grip by the protuberances on the paper is secured, and stable paper feed accuracy can be maintained for an extended use since the protuberances do not come off the paper feed roller.

Moreover, the foregoing plurality of protuberances of the paper feed roller are formed so that each of them is shaped nearly like a semi-dome composed of a vertical plane oriented to the direction of the rotation of the roller and a quarter-sphere surface continuing from the vertical plane, and the orientations of the vertical planes are alternately shifted for each row of protuberances; hence, the paper feed roller is capable of performing stable paper feed in both forward and reverse directions without scratching the paper.

Further, the foregoing plurality of protuberances are formed so that the density thereof is lower in an area where the pressure roller, which is pressed against the paper feed roller and which clamps the paper between itself and the paper feed roller, is in pressure contact, while the density thereof is higher in an area where the pressure roller is not in pressure contact, thus causing all the protuberances to help feed the paper until the paper is nipped between the paper feed roller and the pressure rollers, then to allow the protuberances in the lower-density area, which are formed in the position opposed to the pressure roller, to sufficiently grip the paper after the paper has been nipped between the paper feed roller and the pressure rollers; hence, the paper feed roller is capable of ensuring stable paper feed.

Further, the taller protuberances among the plurality of protuberances of the paper feed roller are formed to be 60 to 90 microns high, while the shorter protuberances are formed to be 30 to 55 microns, so that the taller protuberances may evenly act in feeding the paper after the paper has been clamped between the paper feed roller and the pressure rollers; hence, stable paper feed can be accomplished without causing the paper to skew.

In addition, the plurality of protuberances of the paper feed roller are arranged at pitches of 0.2 to 0.6 mm

in the circumferential direction and at pitches of 0.6 to 1.8 mm in the axial direction; hence, the paper feed roller provides an appropriate gripping force, permitting stable paper feed.

Further, the plurality of protuberances of the paper feed roller are formed to a height of 30 to 90 microns, so that the protuberances provide appropriate grip on paper, thus permitting stable paper feed and also accurate setting of the paper at a start position.

Claims

1. A paper feed roller used for a printer, said paper feed roller comprising a plurality of protuberances formed on the outer peripheral surface of a metallic shaft, which has a circular cross section, in a zigzag pattern in an axial direction and/or a circumferential direction, said plurality of protuberances being formed by partly projecting the outer peripheral surface of said metallic shaft by plastic working.
2. A paper feed roller according to Claim 1, wherein said plurality of protuberances are formed so that each of them is shaped nearly like a semi-dome composed of a vertical plane oriented to the direction of the rotation of the paper feed roller and a quarter-sphere surface continuing from said vertical plane, and the orientations of said vertical planes are alternately shifted for each row of protuberances.
3. A paper feed roller according to Claim 1, wherein said plurality of protuberances are formed so that the density thereof is lower in an area where a pressure roller, which is pressed against said paper feed roller and which nips paper between itself and said paper feed roller, is in pressure contact, while the density thereof is higher in an area where said pressure roller is not in pressure contact.
4. A paper feed roller according to Claim 1, wherein said plurality of protuberances have two different heights, taller protuberances being 60 to 90 microns high, while shorter protuberances being 30 to 55 microns.
5. A paper feed roller according to Claim 1, wherein said plurality of protuberances are arranged at a circumferential pitch of 0.2 to 0.6 mm and at an axial pitch of 0.6 to 1.8 mm.
6. A paper feed roller according to Claim 1, wherein said plurality of protuberances are 30 to 90 microns high.

FIG. 1

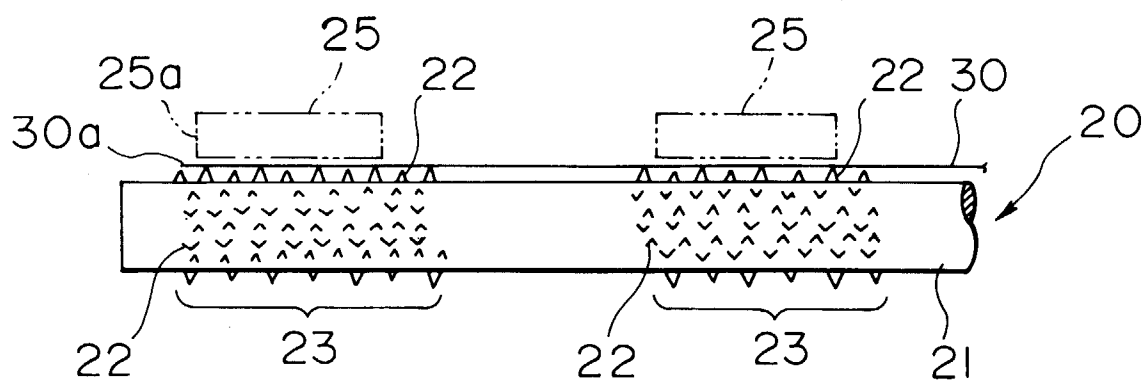


FIG. 2

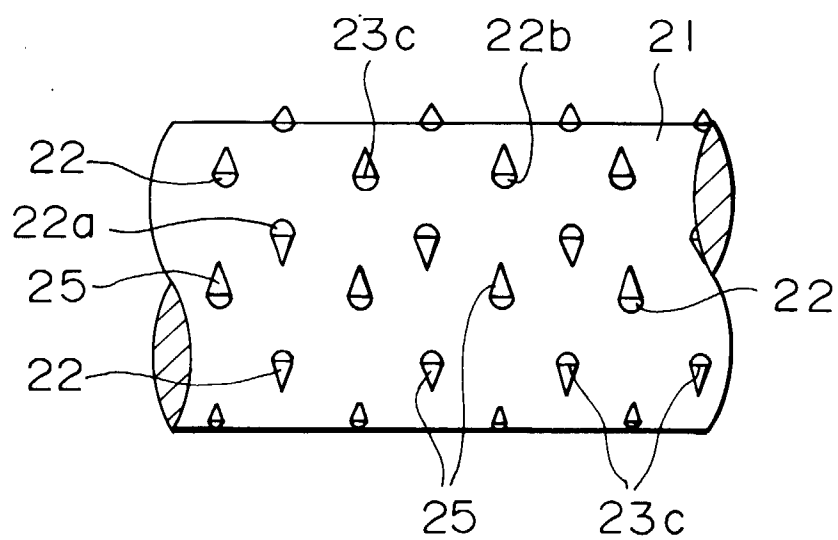


FIG. 3

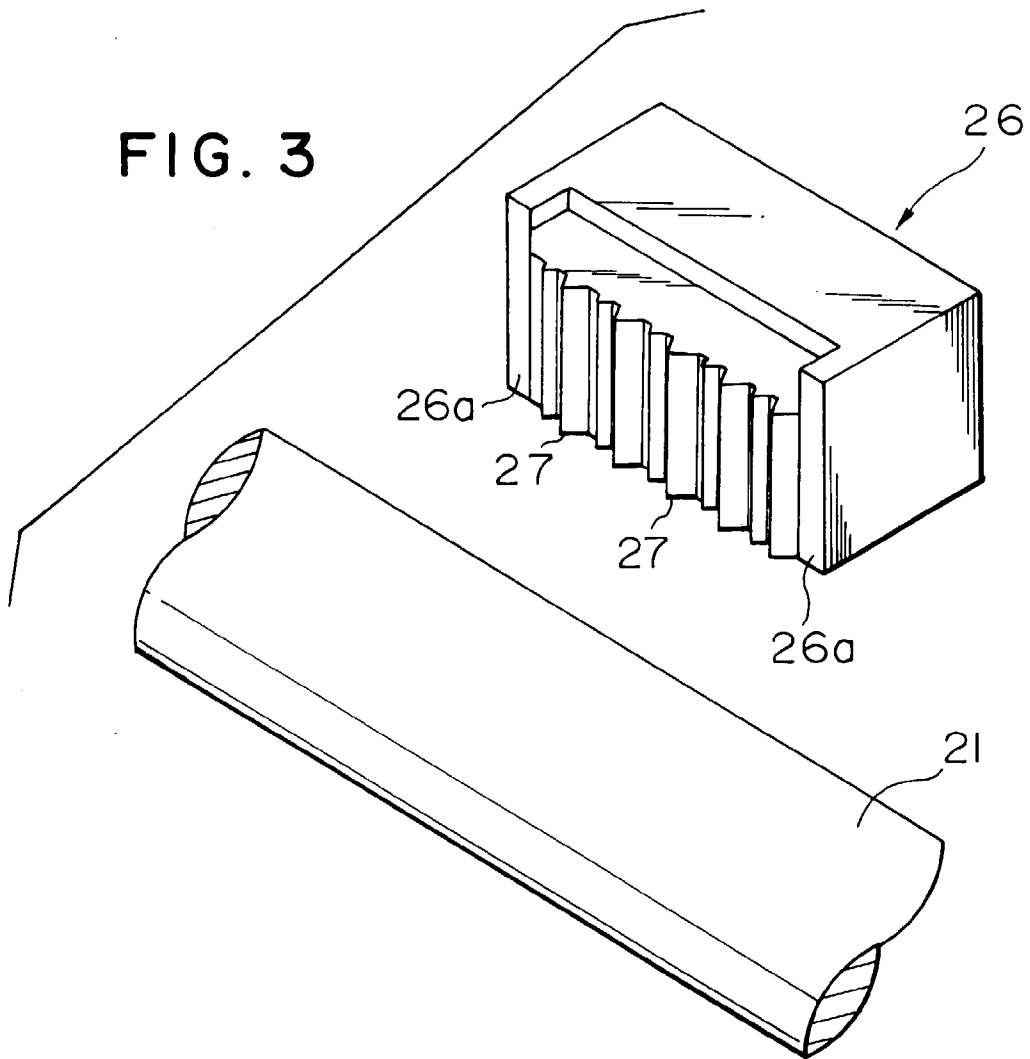


FIG. 4

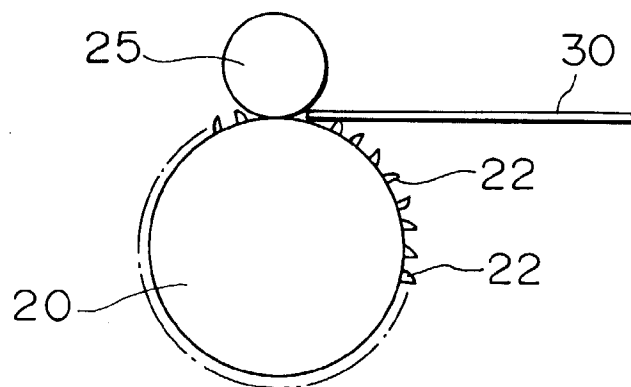


FIG. 5

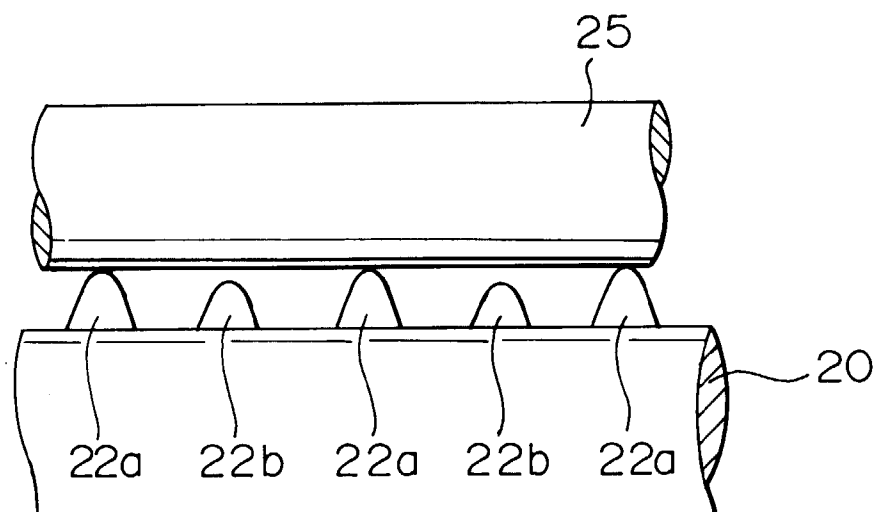


FIG. 6

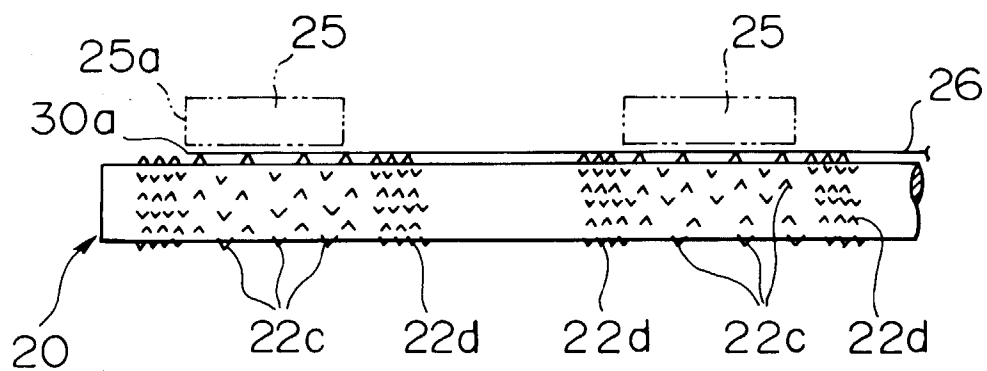


FIG. 7

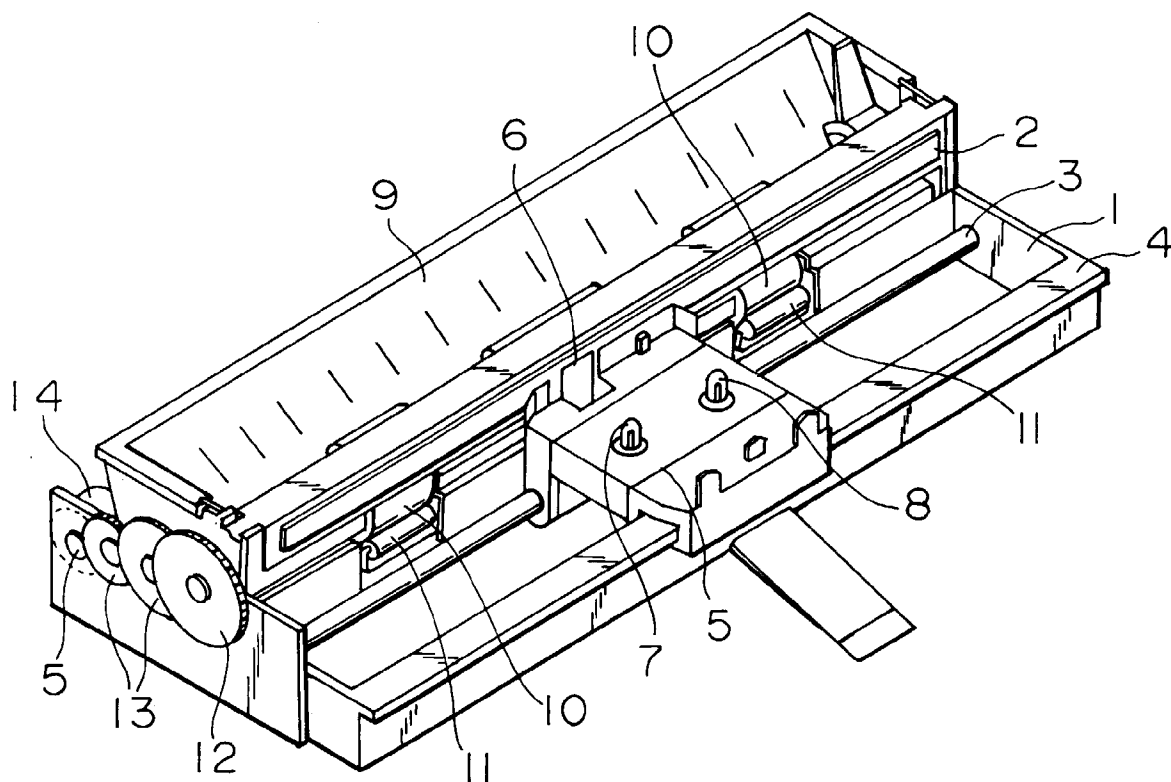
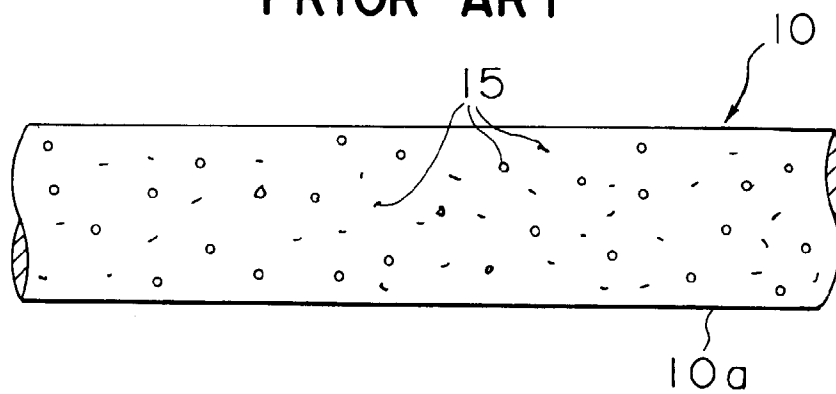


FIG. 8
PRIOR ART





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 97 30 8098

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	PATENT ABSTRACTS OF JAPAN vol. 096, no. 008, 30 August 1996 -& JP 08 086309 A (PIOLAX INC), 2 April 1996, * abstract *	1	B65H27/00
P,X	PATENT ABSTRACTS OF JAPAN vol. 097, no. 011, 28 November 1997 -& JP 09 188433 A (PIOLAX INC), 22 July 1997, * abstract *	1-6	
X	PATENT ABSTRACTS OF JAPAN vol. 009, no. 146 (M-389), 21 June 1985 -& JP 60 023248 A (NIHON BERU PARTS KK), 5 February 1985, * abstract *	1	
A		2-4	
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 664 (M-1523), 8 December 1993 -& JP 05 221059 A (SEIKO EPSON CORP), 31 August 1993, * abstract *	1-6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B65H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 9 February 1998	Examiner Haaken, W
CATEGORY OF CITED DOCUMENTS		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	
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