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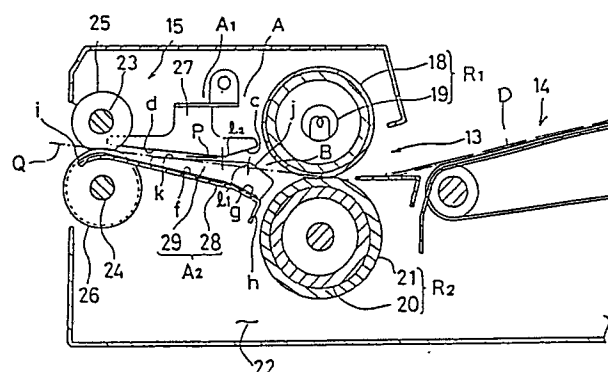
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Paper guide means in image-forming apparatus.

A paper guide means comprising an upper guide part and a lower guide part is provided in the downstream side of a paper-discharging direction of a fixation roller and a paper guide passage formed by a longitudinal rib-like upper guide member (27) forming the upper guide part and a longitudinal rib-like lower guide member (29) forming the lower guide part is narrowed to satisfactorily discharge a recording paper without giving the recording paper the curling after fixed.



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PAPER GUIDE MEANS IN IMAGE-FORMING APPARATUS

The present invention relates to a paper-discharging apparatus in an image-forming apparatus such as a copying machine and a printer, in particular to a paper guide means in an image-forming apparatus for guiding a recording paper, which was subjected to the thermal fixation, toward a paper-discharging apparatus provided with a plurality of pairs of paper-discharging rollers consisting of an upper paper-discharging roller and a lower paper-discharging roller arranged in an axial direction of said paper-discharging rollers at appointed intervals.

For example, a paper guide means for guiding a recording paper toward a paper-discharging apparatus in a copying machine as shown in FIGS. 8, 9 has been proposed.

As obvious from FIGS. 8, 9, this paper guide means comprises upper guide members 27 and lower guide members 29 in the form of longitudinal rib arranged so as to position a guide-finishing end side thereof in the vicinity of a nip portion of an upper paper-

discharging roller 25 and a lower paper-discharging roller 26 (a portion where the paper-discharging operation of a recording paper D by both said upper paper-discharging roller 25 and said lower paper-discharging roller 26 is carried out). And, if the paper guide means is constructed in a face-plate shape, water vapour generated from the recording paper D when subjected to the thermal fixation becomes difficult to diffuse and as a result, water vapour is confined in the paper guide means, whereby dewing on a face portion of the face plate-shaped paper guide means in the vicinity of a water vapour source according to circumstances. However, since both said guide members 27 and said guide members 29 are in the form of longitudinal rib, said water vapour can be effectively diffused, whereby leading to such an advantage that a trouble due to the dewing can be prevented.

However, although it depends upon the properties of the recording paper, in the case where a particularly weak-kneed recording paper, such as a tracing paper, is an object to be discharged, a front end corner

portion of the recording paper D extending outwardly from said lower guide member 29 is hung down and the hung down corner portion is engaged with a supporting axis 24 of the lower paper-discharging roller 26 to be apt to be delayed, and as a result, the front end corner portion of the recording paper D is greatly curled downward, so that frequently the curled portion is rolled in the upper paper-discharging roller 25 and the lower paper-discharging roller 26 to produce a so-called corner-bending of the recording paper D, of which front end corner portion is greatly curled, is discharged as it is even though the front end corner portion of the recording paper D is not rolled in the rollers 25, 26.

In addition, since a height of a paper guide passage P defined by the upper guide member 27 and the lower guide member 29 is large, the recording paper D waves greatly up and down in the paper-supply direction until the front end of the recording paper D drawn out from a thermal fixation apparatus 13 is nipped by the paper-discharging rollers 25, 26, and since the recording paper D is cooled until it is nipped by the paper-discharging rollers 25, 26, particularly

the front half portion of the recording paper D greatly waves and is discharged as it is according to circumstances.

It is an object of the present invention to solve the above described conventional problems by simple and rational improvements.

To this end, the present invention is characterized by that a lower guide plate provided with a portion, in which the lower paper-discharging roller is to be put, formed therein is arranged so as to dislocate a guide-starting end side of said guide plate in the vicinity of a lower roller for use in the thermal fixation and a guide-finishing end side of said guide plate between a supporting axis of said lower paper-discharging roller and said upper paper-discharging roller, respectively, said guide plate being provided with lower guide members in the form of longitudinal rib standing thereon with intervals in an axial direction of said supporting axis, and upper guide members in the form of longitudinal rib being arranged so as to form a narrow paper guide passage between a lower edge of said upper guide

members and an upper edge of said lower guide members as seen from the axial direction of said supporting axis.

With the above described characteristic construction, even though the front end corner portion of the recording paper runs off the lower guide member to be hung down, it can be upward guided above the supporting axis of the lower paper-discharging roller by means of the guide plate, whereby preventing the curling phenomenon due to the engagement of the front end corner portion of the recording paper with the supporting axis.

In addition, since the paper guide passage defined by the upper guide members and the lower guide members is narrow, even though the recording paper waves in said guide passage, the wave can be reduced to a hardly noticable extent.

One preferred embodiment of the present invention is shown in FIGS. 1 to 5, in which

FIG. 1 is a sectional view showing a thermal fixation apparatus and a paper-discharging apparatus;

FIG. 2 is a rear view showing the paper-discharging apparatus as shown in FIG. 1;

FIG. 3 is a perspective view showing an upper guide member;

FIG. 4 is a perspective view showing a lower guide member; and

FIG. 5 is a rough longitudinal sectional view showing a whole copying machine.

Another preferred embodiment is shown in FIGS. 6, 7, in which

FIG. 6 is a perspective view showing a lower guide part; and

FIG. 7 is a sectional view showing main parts.

In addition, FIG. 8 is a perspective view showing the conventional paper guide means; and

FIG. 9 is a sectional view showing the conventional paper guide means as shown in FIG. 6.

The present invention will be below described with reference to the drawings, in which FIGS. 1, 2

show a paper guide means A and FIG. 5 shows an outline of a whole copying machine as an example of an image-forming apparatus. This copying machine comprises a body 3 provided with a manuscript-weight 2 for a contact glass 1 in an upper portion thereof, said body 3 being provided with a photoreceptor 4 laid therein, said photoreceptor 4 being surrounded by an electrifying portion 5, a developing portion 6, a transferring portion 7, a recording paper-separating portion 8 and a cleaning portion 9 arranged in this order in the rotating direction R thereof, an optical movable exposing apparatus 10 being provided in a lower space of said contact glass 1, and a paper-transferring apparatus 12 for transferring a recording paper D within a cassette case 11 to said transferring portion 7, a paper-transferring apparatus 14 for transferring the recording paper D separated from the photoreceptor 4 to a thermal fixation apparatus 13, a paper guide means A for guiding the recording paper D thermally fixed to a paper-discharging apparatus 15 and a paper-discharging tray 31 for receiving the recording paper D from said paper-discharging apparatus 15.

Said thermal fixation apparatus 13 comprises a heating roller R_1 and a pressing roller R_2 arranged up and down in the paired form, said heating roller R_1

being formed of a metallic cylindrical roller body 18, of which surface is coated with fluorine resins and the like, provided with a heater 19, such as a heating lamp and a coil, included therein, and said pressing roller R_2 being formed of a metallic roller body 20 on which an elastic cylindrical body 21 of large thick made of silicon rubber and the like is put. Both said heating roller R_1 and said pressing roller R_2 are installed on side plates 22, 22.

Said paper-discharging apparatus 15 for discharging said recording paper D, which was subjected to the thermal fixation, to said tray 31 comprises a pair of supporting axes 23, 24 consisting of an upper supporting axis 23 and a lower supporting axis 24 rotatably mounted on said side plates 22, 22 so that an axis shaft line thereof may be parallel to axis shaft lines of said rollers R_1 , R_2 for use in the fixation, said upper supporting axis 23 being adapted to be dislocatable up and down along a long hole b formed in said side plates 22, 22, and a plurality of sets (4 sets in this preferred embodiment) of a pair of an upper paper-discharging roller 25 of small width and a lower paper-discharging roller 26 of large width mounted on said

supporting axes 23, 24 with appointed intervals in the direction of axis shaft line thereof.

And, of said lower paper-discharging rollers 26 two central ones are single-flanged rollers provided with a flange 26B on one side of a roller body 26A while two ones of both sides are double-flanged rollers provided with flanges 26B, 26B on both sides of the roller body 26A so as to bend the recording paper D to be wound in the direction of width, whereby discharging said recording paper under the condition that it is strong-kneed.

In addition, a peripheral speed of said lower paper-discharging roller 26 is adapted to be slightly larger than that of the thermal fixation roller R_1 . That is to say, for example in a copying machine capable of copying 16 pieces of A4 size copying paper a minute if the peripheral speed of the thermal fixation roller R_1 is 136.2 mm/sec, the peripheral speed of the roller body 26A as shown in FIG. 2 is 136.9 mm (faster than that of the thermal fixation roller R_1 by about 0.5 %) while the peripheral speed of the flange 26B is 148.5 mm/sec (faster than that of the thermal fixation roller R_1 by about 9 %).

Said paper guide means A for supplying said paper-discharging apparatus 15 with the recording paper D, which was subjected to said thermal fixation, comprises an upper guide member A_1 and a lower guide member A_2 , said upper guide member A_1 , as shown in FIGS. 1 to 4, comprising an upper guide part 27 formed of a longitudinal rib-like part formed by downwardly folded both sides of a plate element punched in a H-letter shape by pressing, a lower side edge d of said upper guide part 27 other than a front side edge c of a guide-starting side of said upper guide part 27 rising forward being fixedly mounted on a member 30 extending between said side plates 22, 22 slightly above a line Q linking the

nip portions of said rollers R_1 , R_2 for use in the thermal fixation and said paper-discharging rollers 25, 26 with each other so that a portion of guide-finishing end side thereof may be overlapped on said upper paper-discharging roller 25.

Said lower guide member A_2 comprises a guide plate 28 provided with a portion e, in which said lower paper-discharging roller 26 is to be put, arranged so that a guide-starting end side of said guide plate 28 may be positioned in the vicinity of said lower pressing roller R_2 for use in thermal fixation and the guide-finishing end side of said guide plate 28 may be positioned between said supporting axis 24 of said lower paper-discharging roller 26 and said upper paper-discharging roller 25, said guide plate 28 being provided with longitudinal rib-like lower guide parts 29 standing thereon at appointed intervals in the direction of axis shaft line of said supporting axis 24, in particular said guide plate 28 comprises a main guide surface portion f arranged so as to be greatly separated downward from said line Q at the guide-starting end side thereof and approach to the line Q at the guide-finishing end side thereof,

an inclined surface portion g descending forward and connected with the starting end side of said main guide surface portion f under the condition that it is still further separated from the line Q to an extent more than said main guide surface portion f at the guide-starting end side thereof, a reinforcing rib surface portion h bent downward at the starting end side of said inclined surface portion g and a bent surface portion i connected with the guide-finishing end side of said main guide surface portion f so as to be in the almost same level as the peripheral surface of said lower paper-discharging roller 26.

On the other hand, said lower guide parts 29 are built on said guide plate 28 so as to position halfway between adjacent upper guide parts 27, the guide-finishing end side of said lower guide parts 29 being positioned in the vicinity of said lower paper-discharging roller 26, said guide-finishing end side of said lower guide parts 29 being made nearly coincident with said line Q as seen in the direction of axis shaft line of said supporting axis 24, and the guide-starting end side of an upper side edge k other than a front side edge j of the forward descending guide-starting end side being projected slightly above said line Q, whereby the narrow paper-guide

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passage P is formed between the lower side edge d of said upper guide parts 27 and the upper side edge k of said lower guide parts 29 so that a forward expanding recording paper-receiving portion B may be formed by said upper front side edge c and said lower front side edge j.

Referring to FIG. 1, ℓ_1 designates a length of the upper side edge k projecting upward from said line Q at the guide-starting end side and has a dimension of for example about 2 mm. In addition, ℓ_2 designates a width of the smallest portion of said paper guide passage P and has a dimension of for example 1.5 to 2 mm.

According to the above described construction, the recording paper D drawn out from the thermal fixation apparatus 13 is guided by the upper side edge k of the lower guide parts 29 and the lower side edge d of the upper guide parts 27 to be introduced into the narrow paper guide passage P, in which the up and down movement of the recording paper a is restricted, and introduced into the paper-discharging apparatus 15 under the condition that the up and down movement of the recording paper a is restricted, and then discharged onto the paper-discharging tray 31.

And, even though the front end corner portion of the recording paper D guided by the lower guide member A_2 is projected out of the lower guide parts 29 to be hung down, said main guide surface portion f of the guide plate 28 is adapted to approach to the upper side edge k of the lower guide parts 29 with an

approach to the guide-finishing end side, so that at last the front end corner portion of said recording paper D is gradually lifted up to the vicinity of said line Q by said main guide surface portion f to be introduced into the paper-discharging apparatus 15 without being engaged with the lower supporting axis 24 or greatly curling downward (curling downward at both side end portions in the progressive direction of the recording paper D due to the guide plate).

And, since the guide-starting end side of said upper side edge k is projected upward from said line Q, the recording paper D subjected to the fixation is sent in the paper guide passage P, in which the up and down movement of the recording paper D is restricted, whereby still more effectively preventing said curling from generating.

In addition, although in general an upward curling is generated so that the front and rear ends of said recording paper D in the progressive direction thereof may be lifted when the recording paper D is passed through the fixation rollers R_1 , R_2 , in the above described preferred embodiment the front end of the recording paper D is pulled in the progressive direction when discharged by selecting the peripheral

speed of the lower paper-discharging roller 26 slightly larger than that of the fixation roller R_1 and providing the lower guide part 29 with the upward projection, the lower surface side of the recording paper D is drawn by said projection, whereby effectively correcting said upward curling.

On the other hand, since water vapour is generated from the recording paper D when subjected to the thermal fixation but the guide-starting end side of said guide plate 28 is greatly separated from said line Q, said water vapour is difficult to be confined in the vicinity of the source thereof or since said inclined surface portion g is adapted to be greatly separated from the front side edge j of the lower guide parts 29 and descend forward, the front end corner portion of the recording paper D slightly hung down from the front side edge j can be prevented from contacting with a dew even if the inclined surface portion g in the vicinity of the water vapour source is dewed and a dew is finally fallen from the inclined surface portion g even if it is grown, so that the

troubles due to the dewing can be prevented.

In addition, the present invention is not limited by the above described preferred embodiment. For example, in order to make the diffusion of water vapor and the discharge of condensed water effective, such constructions as shown in FIGS. 6, 7 may be adopted.

That is to say, as shown in both drawings, each inclined surface portion g is provided with an opening 40 while a pointed end portion thereof is folded to form a vertical plate portion S . And, a second inclined surface portion m having an inclination larger than that of the inclined surface portion g is connected with the opening 40 so as to turn toward said vertical plate portion S from one edge portion of the opening 40 and a predetermined desired gap l_3 (for example 8 mm) is formed between a pointed end portion m' of the second inclined surface portion m and the lower thermal fixation roller R_2 .

With such a construction, water vapor trapped within a space defined by the front side edge j and the inclined surface portion g is diffused toward the

lower side through the opening 40, whereby preventing the dewing. And, even though it is dewed due to the sudden temperature change, water drops are fallen along the second inclined surface portion m to the lower vertical plate portion S, whereby preventing water drops from falling down onto the lower thermal fixation roller R_2 , so that the fixing function is not damaged. Accordingly, no trouble due to water vapor and condensed water occurs.

As above described, according to a paper guide means in an image-forming apparatus of the present invention, since a guide plate, of which guide-starting end side is positioned above a supporting axis of a lower paper-discharging roller, is provided between a thermal fixation apparatus and a paper-discharging apparatus and lower guide parts are installed on said guide plate in a standing manner, the front end corner portion of a recording paper can be surely prevented from being engaged with a supporting axis even if said front end corner portion of the recording paper is projected out of said lower guide parts to be hung down, whereby the front end corner portion of the recording paper can be prevented from being rolled in paper-discharging rollers to be bent at the corner or curled to a great extent.

In addition, a paper guide passage defined by the upper guide parts and the lower guide parts is formed so as to be narrow, so that the up and down movement of the recording paper leading to the waving phenomenon of the recording paper can be restricted, whereby reducing the waving of the recording paper to a hardly noticable extent.

CLAIMS

Claim 1. A paper guide means in an image-forming apparatus for guiding a recording paper, which was subjected to a thermal fixation, toward a paper-discharging apparatus provided with a plurality of pairs of paper-discharging rollers consisting of an upper paper-discharging roller (25) and a lower paper-discharging roller (26) arranged in an axial direction of said paper-discharging rollers at appointed intervals, characterized by that a lower guide plate (28) provided with a portion (e), in which said lower paper-discharging roller (26) is to be put, formed therein is arranged so as to dislocate a guide-starting end side of said guide plate in the vicinity of a lower roller for use in the thermal fixation and a guide-finishing end side of said guide plate between a supporting axis (23,24) of said lower paper-discharging roller and said upper paper-discharging roller, respectively, said guide plate being provided with lower guide members (29) in the form of

longitudinal rib standing thereon with intervals in an axial direction of said supporting axis, and upper guide members (27) in the form of longitudinal rib being arranged so as to form a narrow paper guide passage between a lower edge of said upper guide members and an upper edge of said lower guide members as seen from the axial direction of said supporting axis.

Claim 2. A paper guide means in an image-forming apparatus as set forth in Claim 1, in which a distance between an upper surface of said guide plate (28) and the upper edge of said lower guide members (29) is increased toward the guide-starting end side of the guide plate.

Claim 3. A paper guide means in an image-forming apparatus as set forth in Claim 1, in which said guide-finishing end side of said guide plate (28) is positioned in the vicinity of said upper paper-discharging roller (25).

Claim 4. A paper guide means in an image-forming apparatus as set forth in Claim 1, in which a guide-starting end side of an upper side edge of said lower guide part (29) is projected upward from a line linking a nip portion of the thermal fixation rollers (18,20) and a nip portion of the paper-discharging rollers (25,26).

Claim 5. A paper guide means in an image-forming apparatus as set forth in Claim 1, in which a peripheral speed of said lower paper-discharging roller (26) is larger than that of the thermal fixation roller.

Claim 6. A paper guide means in an image-forming apparatus as set forth in Claim 1,

in which said upper guide members (27) are positioned halfway between adjacent lower guide members (29).

Claim 7. A paper guide means in an image-forming apparatus as set forth in Claim 1, in which an inclined surface portion of a guide-starting end side of said guide plate (28) is provided with an opening and a pointed end of said inclined surface portion is folded to form a vertical plate portion.

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Fig. 1

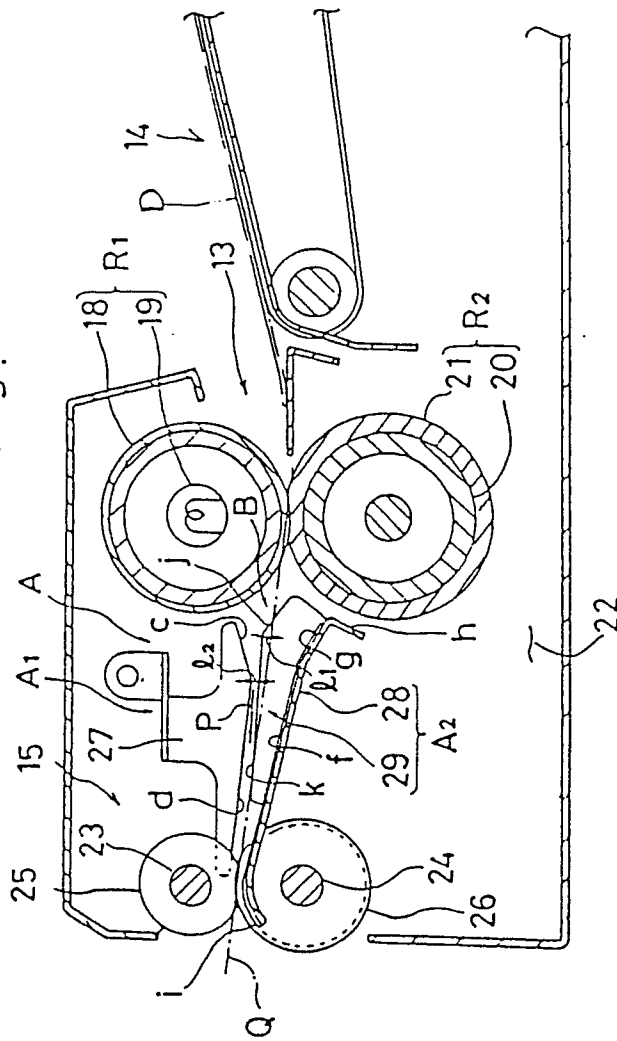
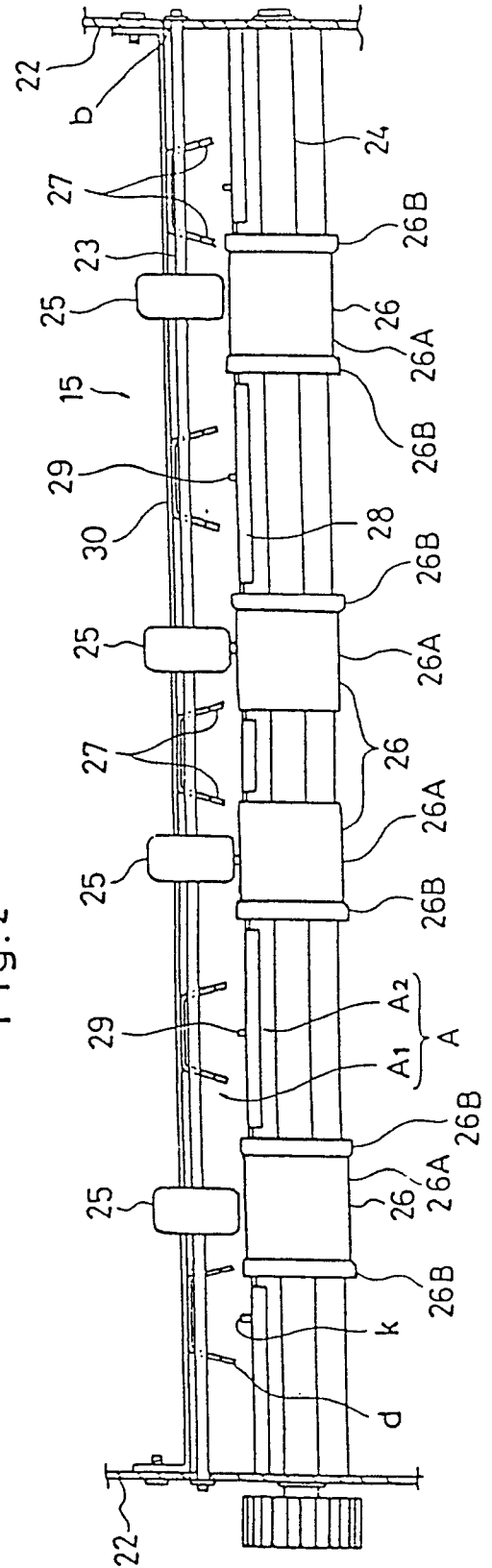
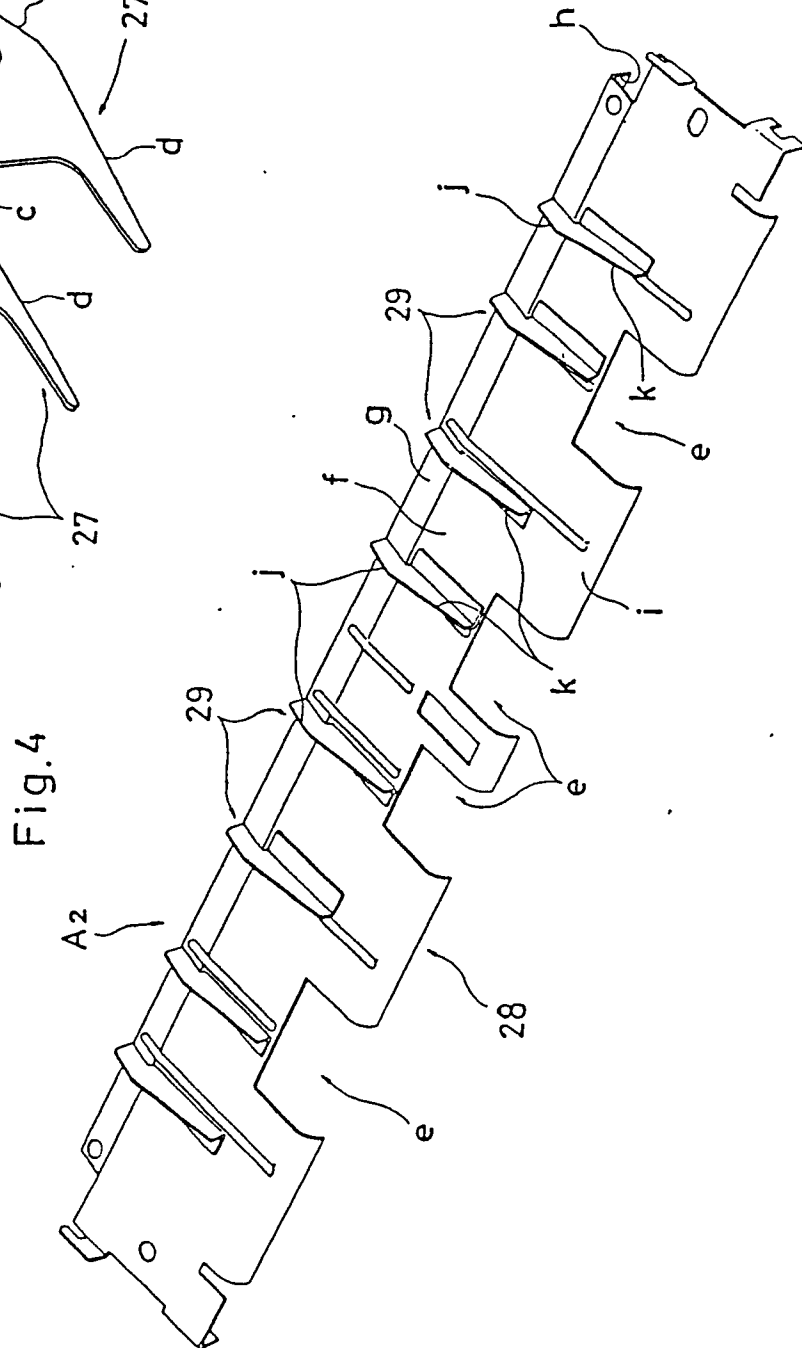
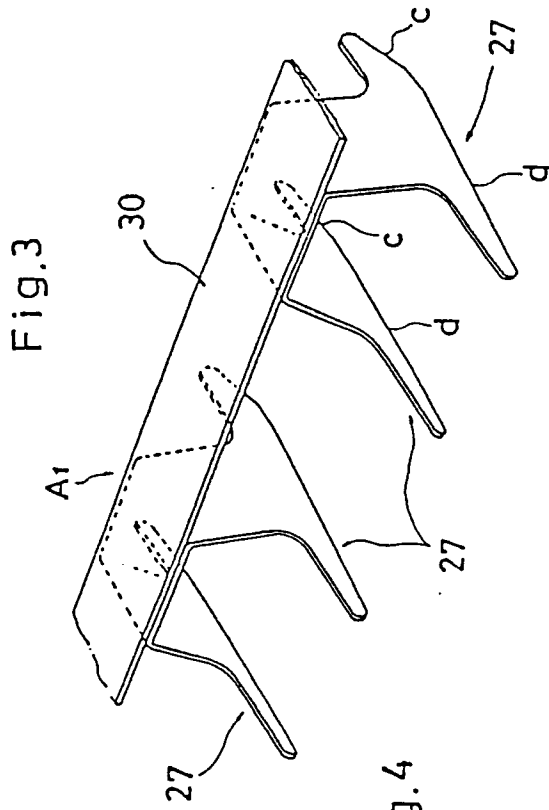


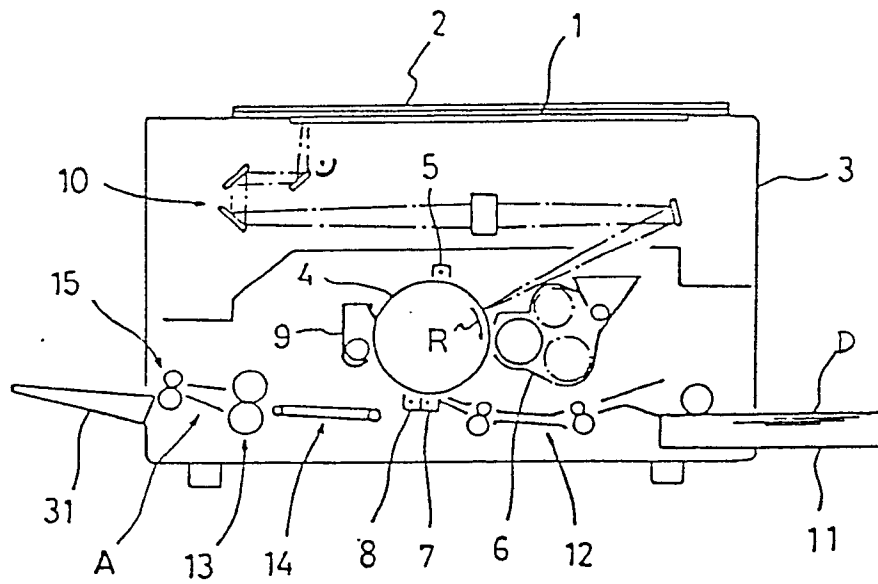
Fig. 2





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Fig.5



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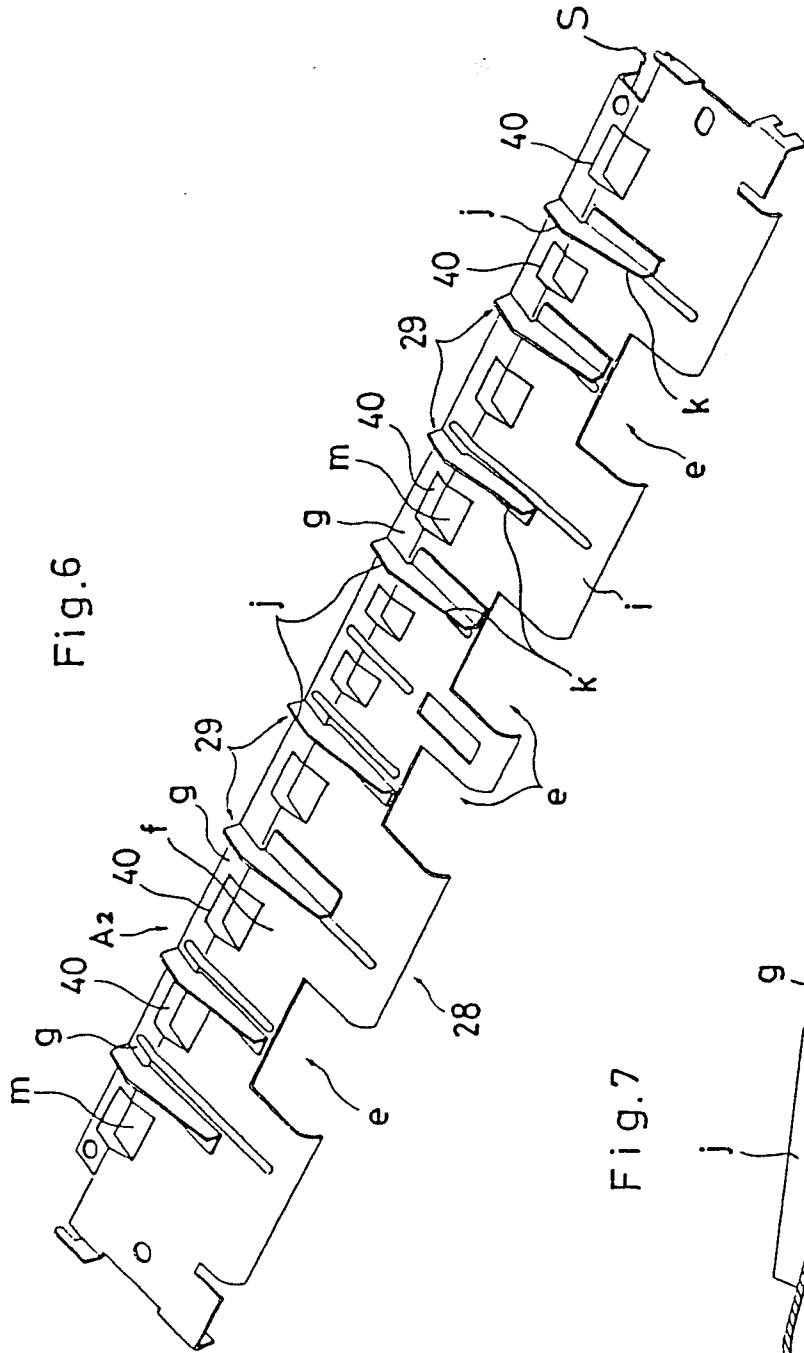
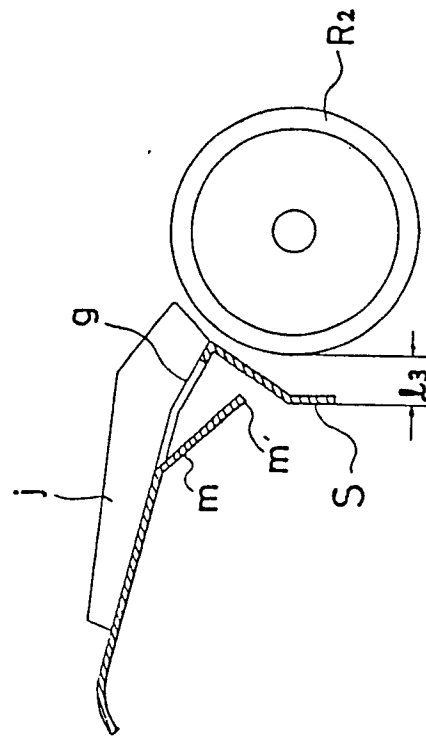


Fig.7



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Fig.8

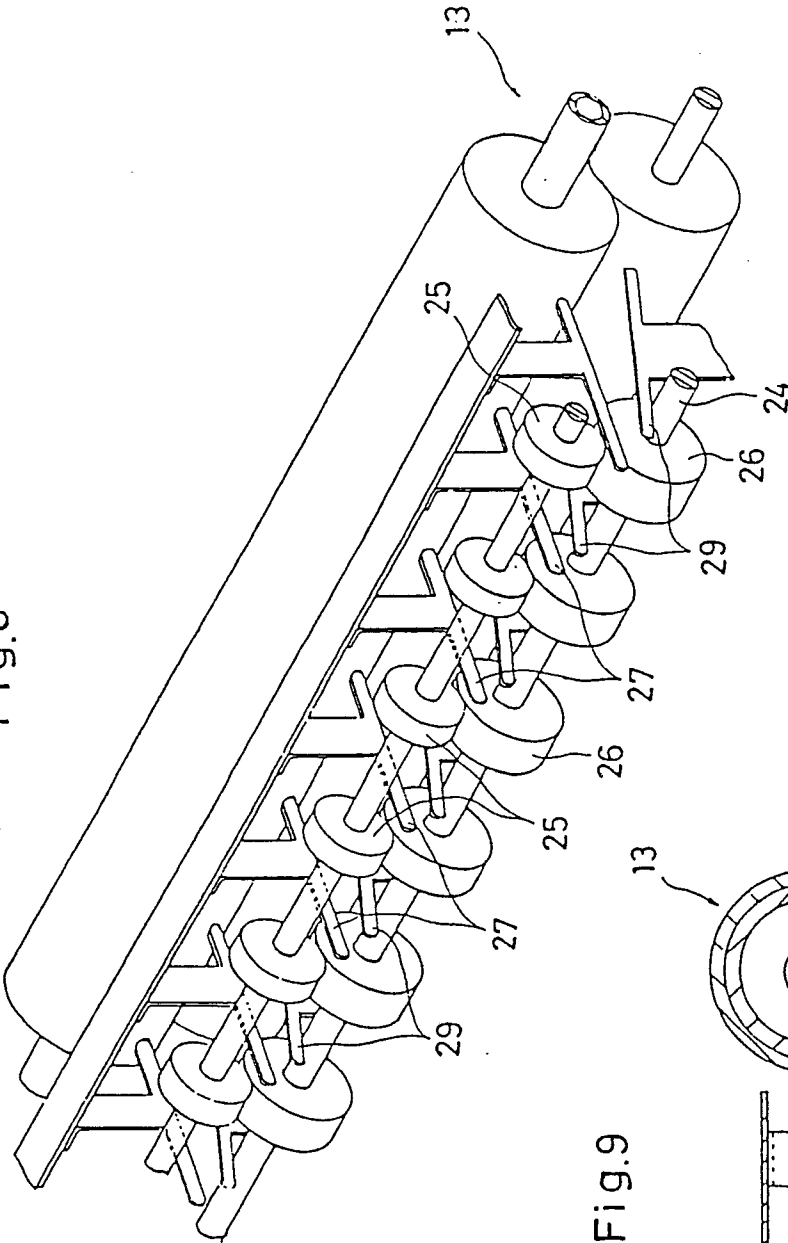


Fig.9

